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 – MINOR MINERAL – CLUSTER – NON-FOREST LAND

CLUSTER EXTENT = 9.97.12 ha (3 Proposed + 1 Existing Quarry)

THIRU.VAZHAITHOTTA GOUNDER ROUGH STONE & GRAVEL QUARRY

At

S.F.Nos. 80/2B(P) & 81/2(P),

Karunchamigoundenpalayam Village, Madukkarai Taluk, Coimbatore District

Project Proponent

K.Vazhaithotta Gounder,

S/o. Kanthasamy Gounder,

No. 2/170, Murugan Kovil Street,

Palathurai, Madukkarai Taluk,

Coimbatore District – 641 105

Extent of 2.48.0ha

Obtained ToR
Lr.No.SEIAA-TN/F.No.8733/SEAC/ToR-1051/2022 Dated: 31.01.2022

Environmental Consultant	Laboratory
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 & 38 Category 'A' Certificate No : NABET/EIA/1922/SA 0139** Phone: 0427-2431989, Email: ifthiahmed@gmail.com, geothangam@gmail.com **Web: www.gemssalem.com**	**CHENNAI METTEX LAB PRIVATE LIMITED** Jothi Complex, 83, M.K.N.Road Guindy, Chennai – 600 032, Tamil Nadu, India, Approved By AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD

Baseline Monitoring Period: March 2022 to May 2022

DECEMBER 2022

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

Code	Name of the Owner	S.F. Nos	Extent (ha)	Status
PROPOSED QUARRIES				
P1	K. Vazhaithotta Gounder	80/2B(P) & 81/2(P)	2.48.0	ToR Obtained vide Lr.No. SEIAA-TN/F.No.8733/SEAC/ToR-1051/2022 Dated:31.01.2022
PUBLIC HEARING CONDUCTED QUARRIES				
P2	P. Sureshkumar	80/2A(P) & 81/1(P),	4.85.62	Public hearing was conducted on 28.08.2021
P3	P. Varadharaj	91/1A	1.23.0	EC obtained on 18.08.2022 Vide Lr.No. SEIAA-TN/F.No.8349/1(a)/EC. No:5209/2020 dated 18.08.2022
Total			**8.56.62**	
Existing Quarries				
E1	K. Ramasamy	94,95/1A2, 95/1B2	1.40.5 ha	01.06.2016 to 31.05.2021
Expired Quarries				
EX1	R.Krishnasamy	87/2, 88/1	3.40.0	27.02.2009 to 26.02.2014
EX2	P.Padmanaban	91/1B, 91/1c, 91/1D (Part) 92/1 (Part), 92/1C	2.08.5	12.10.2009 to 11.10.2014
Total			**5.48.5**	
TOTAL CLUSTER EXTENT (P1+P2+P3+E1)			**9.97.12**	

Note:-

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

TERMS OF REFERENCE (ToR) COMPLIANCE
Thiru.K.Vazhaithotta Gounder – P1

"ToR Obtained vide Lr.No Letter No.SEIAA- TN/F.No.8733/SEAC/ToR-1051/2022 Dated:31.01.2022"

	SPECIFIC CONDITIONS	
1	Restricting the depth of mining to 32m ultimate depth and quantity of 258755cu.m of Rough stone for five years with a bench height of 5m as per the approved mining plan considering the hydro-geological regime of the surrounding area as well as to ensure sustainable and safe mining.	Noted and agreed
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) Detail of approved depth of mining. d) Actual depth of the mining achieved earlier. e) Name of the person already mined in that leases area. f) If EC and CTO already obtained, the copy of the same shall be submitted. g) whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches.	Previous mining operation was carried out by Thiru. K. Vazhaithotta Gounder, for the period of 5 years from 22.12.2015 to 21.12.2020. The Approved depth is 12m, The Actual depth is 12m. EC obtained vide Lr. No. SEAA-TN/F.No.3731/EC/1(a)/2427/2015 dated 24.11.2015. CTO obtained vide Proceedings No. F.0599CBS/RS/DEE/TNPCB/CBS/W/2015 Dated: 02/12/2015.
3	A detailed study of the lithology of the mining lease area shall be furnished	The detailed lithological variations of the applied area are studied by VES method and discussed under Chapter 3.
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.	Noted and agreed
5	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. which 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.	Hydrogeological study was carried out detailing the number of wells located around the site and is discussed in Chapter 3.
6	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.	The detailed of baseline data are discussed in Chapter No.3.
7	The Proponent shall carry out the Cumulative impact study due to mining from all the mines on the environment in terms of air pollution, water pollution, & health impacts, accordingly the Environment Management plan should be prepared.	The cumulative impact study on the environment in term of air pollution, water pollution & health impacts due to mining and other activities around the project site is discussed in Chapter
8	The Socio-economic studies should be carried out within a 5 km buffer zone from the mining activity.	The Socio-Economic Studies were carried out for 10 km buffer zone from proposed project and discussed under Chapter 3, Page No. 90 – 109.
9	A tree survey study shall be carried out (nos., name of the species, age, diameter etc.,) both within the	The applied area is devoid of major vegetation. The proposal for green belt development is discussed in Chapter No.4.

	mining lease applied area & 300m buffer zone and its management during mining activity	
10	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report.	Mine-Closure plan for the proposed project is discussed in Chapter No:4 .
11	All the queries raised during public hearing by the local habitants need to be addressed and the protective measures or management plan may be revised accordingly and to be submitted to SEIAA/SEAC with regard to the Office Memorandum of MoEF& CC accordingly.	The details will be discussed in the Final EIA report.
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.35012016) and O.A. No.200/2016 and O.A.No.58012016 (M.A.No.tl82l20l6) and O.A.No.l02l20l7 and O.A.No.40t4l20l6 (M.A.No.75812016, M.A.No.92012016, M.A.No.112212016, M.A.No.12l20l7 & M.A. No. 843/2017) and O.A.No.40512016 and O.A.No.520 of 20 1 6 (M.A.No.9 8l l20l 6, M.A.No.98 21201 6 & M.A.No .384 12017).	Noted and agreed
13	The purpose of green belt around the project is to capture the fugitive emissions and to attenuate the noise generated, in addition to the improvement in the aesthetics. A wide range of indigenous plants species should be planted in and around the premise in consultation with the DFO, District / State Agriculture University. The plants species should have thick canopy cover, perennial green nature, native origin and large leaf areas. Medium size trees and small trees alternating with shrubs shall be planted. Miyawaki method of planting i.e. planting different types of trees at very close intervals may be tried which will give a good green cover. Greenbelt needs to be developed in the periphery of the mines area so that at the closure time the trees would have grown well"	Noted and agreed
14	The project proponent shall furnish the details of the existing/proposed green belt area earmarked with GPS coordinates and list of trees that are proposed to be planted surrounding the mining area at least to a width of 3m along with a copy of photos/documents, and the same shall be included in the EIA Report.	The existing green belts are shown in Chapter No.2. The applied area is devoid of major vegetation. The proposal for green belt development is discussed in Chapter No.4.
ADDITIONAL CONDITIONS		
1	As per the recommendation of SEAC and as accepted by the proponent, the Restricting the depth of mining to 32m ultimate depth and quantity of 258755cu.m of Rough Stone and Gravel for five years with a bench height of 5m as per the approved mining plan considering the hydro-geological regime of the surrounding area as well as to ensure sustainable and safe mining.	Agreed and noted.
2	As per the MoEF & CC office memorandaum 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.	Agreed and noted.
3	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.	Noted and agreed

4	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.	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.
5	Action should be specifically suggested for sustainable restoration of ecosystem for flow of goods and services.	Noted and agreed
6	Action should be specifically suggested for sustainable management of the area and restoration of ecosystem for flow of goods and services	Noted and agreed
STANDARD TERMS OF REFERENCE		
1	Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.	Not applicable. This is Not a violation category project. This proposal falls under B1 Category (Cluster Condition).
2	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	The applied land for quarrying is a Patta Land. Document is enclosed along with Approved Mining Plan as Annexure Volume 1.
3	All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.	Noted & agreed.
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).	Map showing – Project area is superimposed on Satellite imagery is enclosed in Figure No. 2.1 Project area boundary coordinates superimposed on Toposheet – Figure No. 1.3. Surface Features around the project area covering 10km radius – Figure No. 2.2. Geology map of the project area covering 10km radius - Figure No. 2.7. Geomorphology Map of the Study Area covering 10 km radius – Figure No. 2.8.
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. 2.7. Geomorphology Map of the Study Area covering 10 km radius – Figure No. 2.8.
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 for ensuring compliance with the EC conditions may also be given. The system of	The proponent has framed their Environmental Policy and the same is discussed in the Chapter No 10.1.

	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. Land use plan of the project area showing pre-operational, operational and post-operational phases are discussed in Chapter No. 2, Table No 2.3.
11	Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given	Not Applicable. 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.	Not Applicable. There is no Forest Land involved in the proposed project area. The proposed project area is a patta land. Approved Mining Plan is enclosed as Annexure Volume 1.
13	Status of forestry clearance for the broken-up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	Not Applicable. The proposed project area does not involve any Forest Land.
14	Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.	Not Applicable. The project doesn't attract Recognition of Forest Rights Act, 2006.
15	The vegetation in the RF / PF areas in the study area, with necessary details, should be given.	No Reserve Forest within the Study Area.
16	A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study	Not Applicable.

	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.	There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.
17	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/(existing as well as proposed), if any, within 10 KM of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished	Not Applicable. There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.
18	A detailed biological study of the study area [core zone and buffer zone (10 KM radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.	Detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] was carried out and discussed under Chapter No. 3, Page No. 81 – 89. 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.
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	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.

	whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.	
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 (Summer) March 2022 – May 2022 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 9.6.1 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: 4.5 KLD Discussed under Chapter 2, Table No 2.15.
25	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	Not Applicable. Water for dust suppression, greenbelt development and domestic use will be sourced from accumulated rainwater/seepage water in mine pits and purchased from local water vendors through water tankers on daily requirement basis. Drinking water will be sourced from the approved water vendors.
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.	Part of the working pit will be allowed to collect rain water during the spell of rain will be used for greenbelt development and dust suppression. The Mine Closure Plan is prepared for converting the excavated pit into rain water harvesting structure and serve as water reservoir for the project village during draught season.
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 Environment including Surface Water and Ground Water are discussed in Chapter 4.
28	Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation	Not Applicable. The ground water table inferred 65-70m below ground level.

		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 ultimate depth of quarry is 32m BGL. This proposal of 32 m below ground level will not intersect the ground water table, which is inferred from the hydro-geological carried out at the project site. Discussed under Chapter 3.
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.	Not Applicable. There is no stream, seasonal or other water bodies passing within the project area. Therefore, no modification/ diversion of water bodies is anticipated.
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.	Highest elevation of the project area is 278m AMSL. Ultimate depth of the mine is 32m BGL Water level of the area is 65-70m BGL
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.	Greenbelt Development Plan is discussed under Chapter 4.
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.	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 significant impact due to the proposed transportation from the project area. Details in Chapter 2.
33	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	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.
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.	Discussed under Chapter 2. Mine Closure Plan is a part of Approved Mining Plan enclosed as Annexure Volume – 1.
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	Occupational Health Impacts of the project and preventive measures are detailed under Chapter 4.

	with required facilities proposed in the mining area may be detailed.	
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.	No Public Health Implications anticipated due to this project. Details of CER and CSR are discussed under Chapter 8.
37	Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	No Negative Impact on Socio Economic Environment on the Study Area is anticipated and this project shall benefit the Socio-Economic Environment by ways of employment for 32 people. Details in Chapter 2.
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.	Detailed Environment Management Plan for the project to mitigate the anticipated impacts described under Chapter 4 is discussed under 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.	The outcome of public hearing will be updated in the final EIA/AMP 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 Rs.62,42,000/- CER Cost is Rs. 5,00,000/-
42	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	Details in Chapter 7.3.
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.	Details in Chapter 8.
44	Besides the above, the below mentioned general points are also to be followed: -	
a	Executive Summary of the EIA/EMP Report	Enclosed as separate booklet.
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 indicated.
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	Baseline monitoring reports are enclosed with This report in Chapter 3. Original Baseline monitoring reports will be submitted in the final EIA report during appraisal.
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.	Will be enclosed along with Final EIA EMP Report.
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	Noted & Agreed. Instructions issued by MoEF & CC O.M. No. J-11013/41/2006-IA.II (I) Dated: 4th August, 2009 are followed.

	August, 2009, which are available on the website of this Ministry, should be 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	Noted & agreed.
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 the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.	Not 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.	Surface Plan – Figure No. 2.2 Geological Plan – Figure No 2.9 Working Plan – Figure No 2.9 Closure Plan – Figure No.2.10

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.   INTRODUCTION

1.0   PREAMBLE

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.

Rough Stone & Gravel is the major requirements for construction industry. This EIA report is prepared by considering Cumulative load of proposed quarries of Thiru. K. Vazhaithotta Gounder Rough Stone & Gravel Quarries consisting of Three Proposed and one Existing Quarries with total extent of Cluster of 9.97.12 ha in Karunchamigoundenpalayam Village, Madukkarai Taluk, Coimbatore District and Tamil Nadu State, cluster area calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016.

Baseline Monitoring study has been carried out during the period of March 2022 to May 2022 and this EIA and EMP report is prepared for considering cumulative impacts arising out of this project, the Cumulative Environmental Impact Assessment study is undertaken, which is followed by preparation of a detailed Environmental Management Plan (EMP) individually to minimize those adverse impacts.

1.1   PURPOSE OF THE REPORT

The Ministry of Environment and Forests, Govt. of India, through its EIA notification S.O. 1533(E) of 14thSeptember 2006 and its subsequent amendments   as per Gazette Notification S.O. 3977 (E) of 14thAugust 2018, Mining Projects are classified under two categories i.e. A (> 100 Ha) and B (≤ 100 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 B-1 and appraised by SEAC/ SEIAA as well as for cluster situation.

The proposed project is 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 ToR for carrying out public hearing for the grant of Environmental Clearance from SEIAA, Tamil Nadu"

FIGURE.1.1 SATELLITE IMAGERY CLUSTER QUARRIES
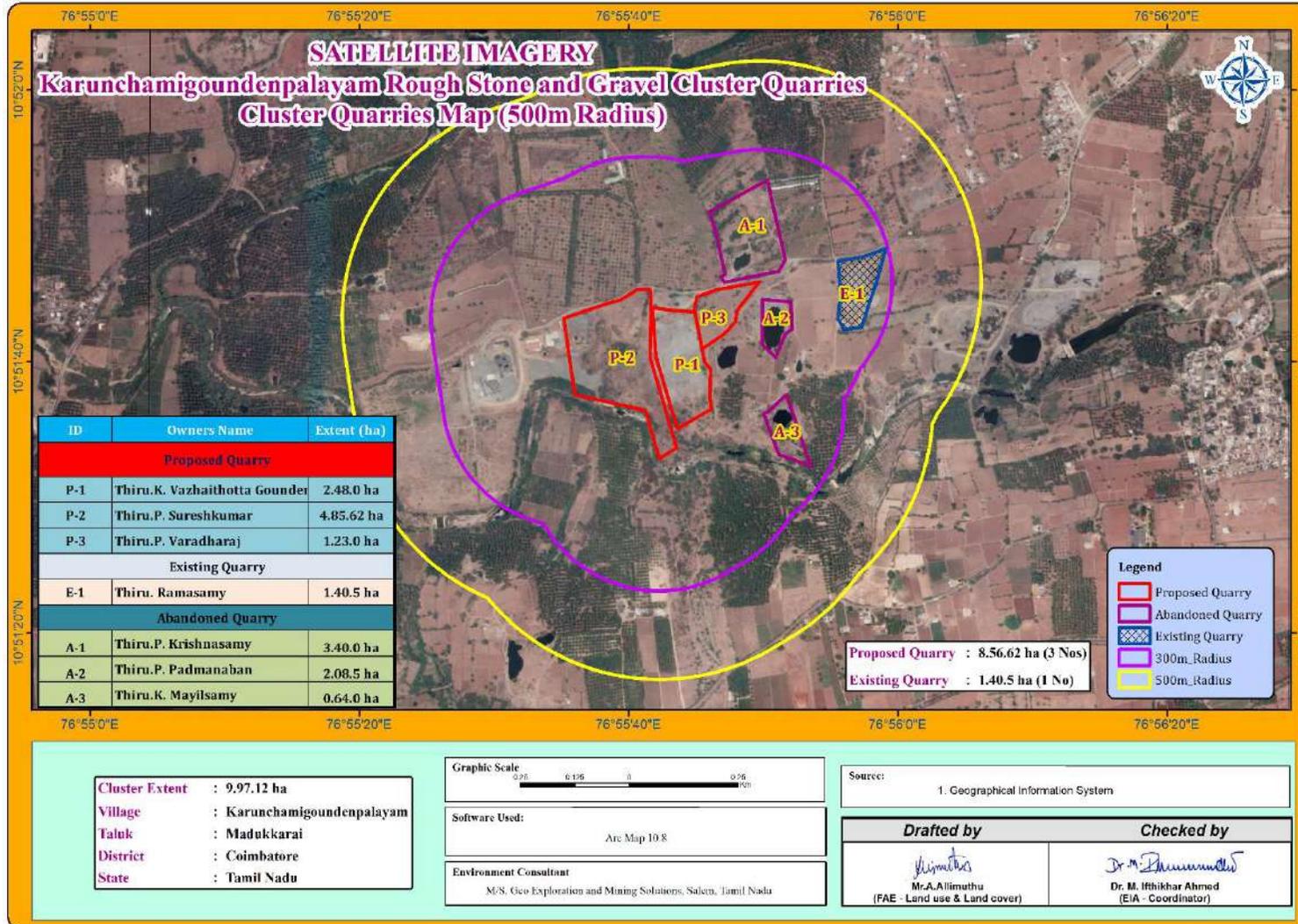
1.2   IDENTIFICATION OF PROJECT AND PROJECT PROPONENT
1.2.1   Identification of Project
TABLE 1.1: SALIENT FEATURES OF THE PROPOSED PROJECTS

Code	Proposal 'P1'
Name of the Project	Thiru. K.Vazhaithotta Gounder
S.F. No.	80/2B(P) & 81/2(P)
Extent	2.48.0 ha
Land Type	Patta Land
Village Taluk and District	Karunchamigoundenpalayam Village, Madukkarai Taluk, Coimbatore District

Source: Approved Mining Plan.

1.2.2   Identification of Project Proponent
TABLE 1.2.1: DETAILS OF PROJECT PROPONENT

Code	Proposal 'P1'
Name of the Project	Thiru. K.Vazhaithotta Gounder Rough Stone and Gravel Quarry
Address	S/o. Kanthasamy Gounder, No.2/170, Murugan Kovil Street, Palathurai, Madukkarai Taluk, Coimbatore District – 641 105
Mobile	+91 93631 22838 & +91 99448 50802
Status	Individual

Source: Approved Mining Plan.

1.3   BRIEF DESCRIPTION OF THE PROJECT
1.3.1   Nature and Size of the Project

Common Mining Methodology is proposed for one proposed mine.

The quarrying operation is 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.

TABLE 1.3: BRIEF DESCRIPTION OF THE PROJECT

Proposal – P1		
Name of the Quarry	Thiru. K.Vazhaithotta Gounder Rough Stone & Gravel Quarry	
Toposheet No	58 – B/13	
Latitude between	10°51'35.03''N to 10°51'43.94''N	
Longitude between	76°55'41.79''E to 76°55'46.12''E	
Elevation	278 m AMSL	
Proposed Depth of Mining (as per ToR)	32m (2m Gravel + 30m Rough Stone)	
Geological Resources	Rough Stone in m^3	Gravel m^3
	8,23,620	12,533
Mineable Reserves	Rough Stone in m^3	Gravel m^3
	3,13,815	5,596
Yearwise Production as per ToR Conditions	2,58,755	5,596
Existing Pit Dimension	192m (L) x 88m (W) x 12m (D)	
Ultimate Pit Dimension	237m (L) x 88m (W) x 32m (D)	
Water Level in the surrounds area	65 – 70m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied area is flat terrain. The area has gentle sloping towards southeastern side. The altitude of the area is 278 m (max) above mean sea level. The area is covered by 2m thickness of Gravel Formation. Massive Charnockite is found after 2m (Gravel Formation) which is clearly inferred from the nearby existing quarrying pit.	
Machinery proposed	Jack Hammer	8 Nos
	Compressor	2 Nos
	Excavator with bucket and rock breaker	2 Nos

	Tippers	3 Nos
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	32 Nos	
Project Cost	Rs.62,42,000/-	
CER Cost @ 2% of Project Cost	Rs 5,00,000/-	
Nearby Water Bodies	Kumitipathi River	50m SW
	Odai	470m North
	Odai	4km SE
	Walayar Lake	7.5km SW
Greenbelt Development Plan	Proposed to plant 1250 trees in Safety Zone and Village roads	
Proposed Water Requirement	4.5 KLD	
Nearest Habitation	700m - Northwest	

Source: Approved Mining Plan

1.3.2 Location of the Project

❖ The proposed quarry project falls in Karunchamigoundenpalayam Village, Madukkarai Taluk and Coimbatore District.

❖ Thiru. K. Vazhaithotta Gounder   Rough Stone & Gravel Quarries cluster is located about 5km West of Karunchamigoundenpalayam Village which is situated in 6km Southeast of Madukkarai Taluk. Madukkarai Taluk is situated in 11km south of Coimbatore District.

❖ The area is marked in the Survey of India, Toposheet No. 58-B/13.

FIGURE 1.2 KEY MAP SHOWING THE LOCATION OF THE CLUSTER SITE
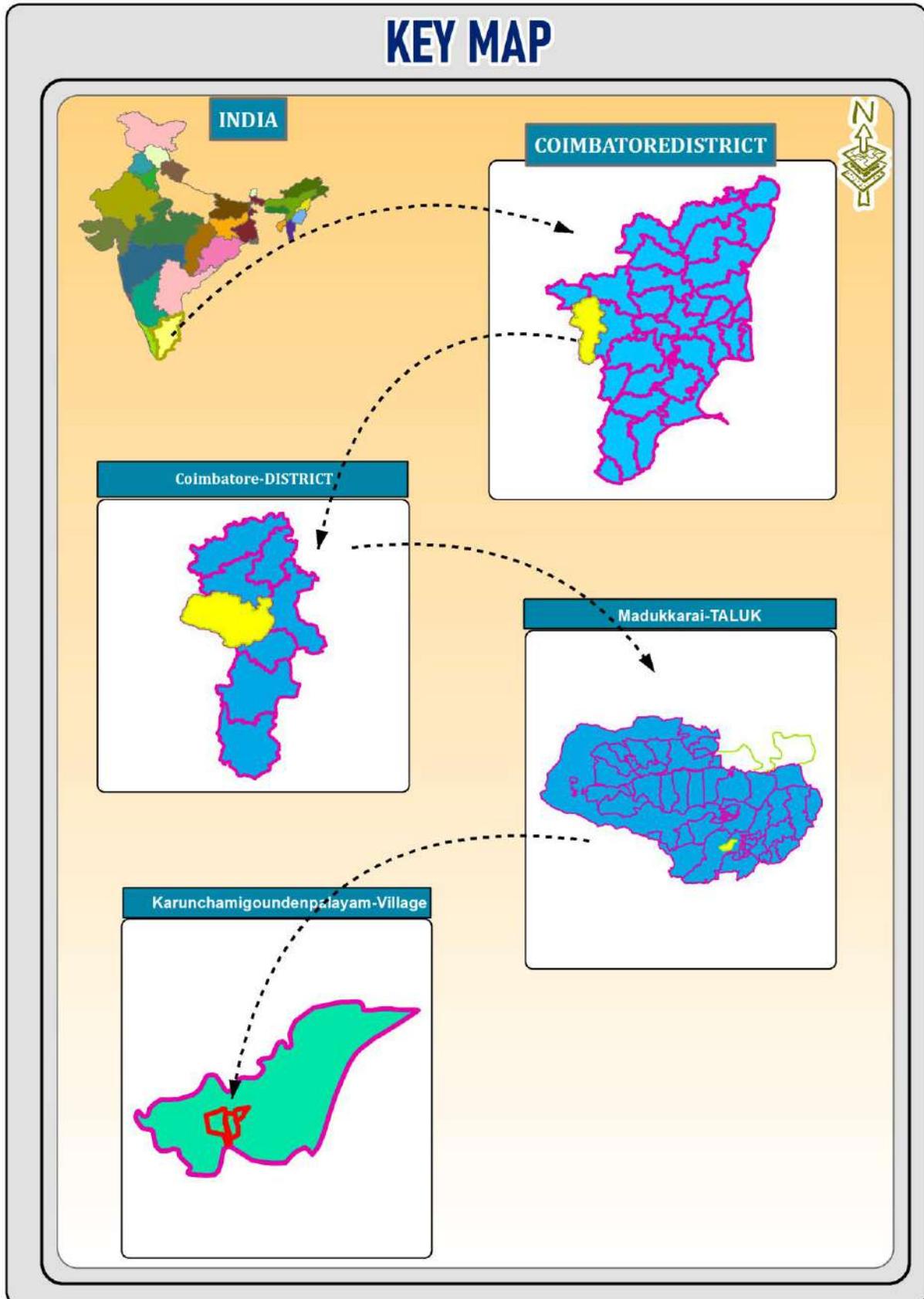
Source: Survey of India Toposheet 58-B/13

FIGURE 1.3: TOPOSHEET MAP OF THE STUDY AREA 10 KM RADIUS
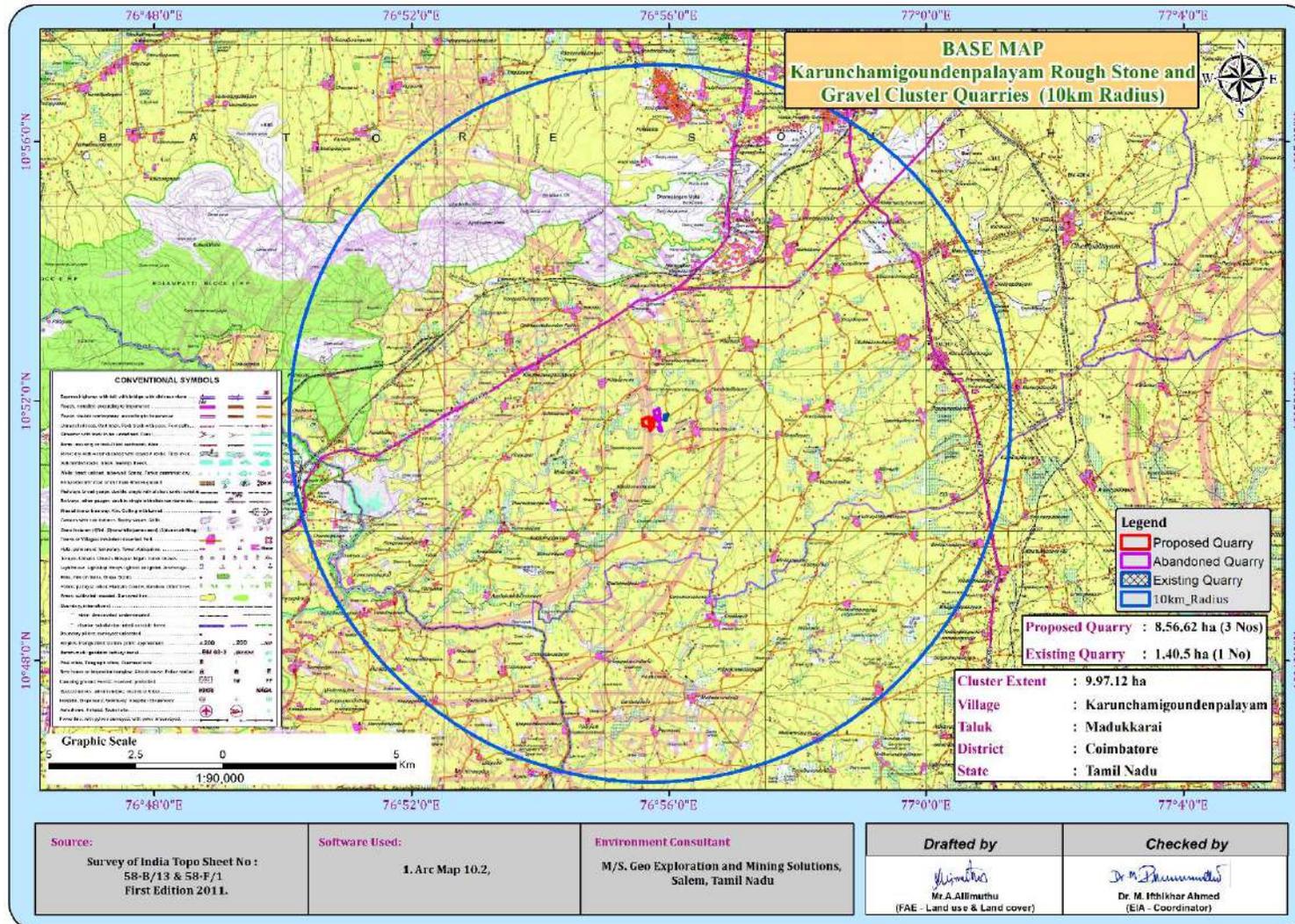
Source: Survey of India Toposheet 58-B/13

1.4   ENVIRONMENTAL CLEARANCE

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

1. Screening
2. Scoping
3. Public consultation &
4. Appraisal

SCREENING - P1

- The proponent applied for Rough Stone and Gravel Quarry Lease Dated: 12.06.2020 & 27.11.2020

- Precise Area Communication Letter was issued by the District Collector, Coimbatore, vide letter Rc.No.240/Mines/2020 Dated: 11.12.2020.
- The Mining Plan was prepared by Qualified Person and approved by Assistant Director, Geology and Mining, Coimbatore District, vide R.C.No. 240/Mines/2020, Dated:02.03.2021
- 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/66812/2021, Dated: 21.08.2021.

SCOPING – P1

- The proposal was placed in 237ᵗʰ SEAC meeting held on 08/10/2021 and the committee recommended for issue of ToR.

- The proposal was considered in 481ᵗʰ SEIAA meeting held on 24.01.2022 & 25.01.2022 and issued ToR vide Lr No. SEIAA-TN/F.No.8733/SEAC/ToR -1051/2022 Dated: 31.01.2022.

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. The report has been prepared using the following references:

- Guidance Manual of Environmental Impact Assessment for Mining of Minerals, Ministry of Environment and Forests, February, 2010
- EIA Notification, 14ᵗʰSeptember, 2006
- ToR of the Proposed Projects
- Approved Mining Plan of the Proposed Projects.

1.5   TERMS OF REFERENCE (ToR)

ToR issued vide –
- ToR Lr No.SEIAA-TN/F.No.8733/SEAC/ToR- 1051/2022 Dated: 31.01.2022. – P1

1.6   POST ENVIRONMENT CLEARANCE MONITORING

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

1.7   GENERIC STRUCTURE OF EIA DOCUMENT

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

1.8   THE SCOPE OF THE STUDY

The main scope of the EIA study is to quantify the cumulative impact in the study area due to cluster quarries and formulate the effective mitigation measures for 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 summer season (March 2022 – May 2022) 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 1.4: ENVIRONMENT ATTRIBUTES

Sl.No.	Attributes	Parameters	Source and Frequency
1	Ambient Air Quality	PM10, PM 2.5, SO2, NO2	Continuous 24-hourly samples twice a week for three months at 8 locations (1 Core & 7 Buffer)
2	Meteorology	Wind speed and direction, temperature, relative humidity and rainfall	Near project site continuous for three months with hourly recording and from secondary sources of IMD station
3	Water quality	Physical, Chemical and Bacteriological parameters	Grab samples were collected at 6 locations – 5 ground water and 1 surface 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)	8 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

The data has been collected as per the requirement of the ToR issued by SEIAA – TN.

1.8.1   Regulatory Compliance & Applicable Laws/Regulations

➢ 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 Lr No.SEIAA-TN/F.No.8733/SEAC/ToR- 1051/2022 Dated: 31.01.2022. – P1

2.   PROJECT DESCRIPTION

2.0   GENERAL

The Proposed Rough Stone Quarries requires Environmental Clearance. There are 3 proposed Quarries & ONE Existing Quarry forming a cluster; calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016 and the total extent of cluster is 9.97.12 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 the proposed quarries.

Method is mining is common for all the proposed quarries in the cluster. Rough Stone is proposed to be excavated by 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

- The proposed quarry project falls in Karunchamigoundenpalayam Village, Madukkarai Taluk and Coimbatore District.
- Thiru. K. Vazhaithotta Gounder   Rough Stone & Gravel Quarries cluster is located about 5km West of Karunchamigoundenpalayam Village which is situated in 6km Southeast of Madukkarai Taluk. Madukkarai Taluk is situated in 11km south of Coimbatore District.
- The area is marked in the Survey of India, Toposheet No. 58-B/13.

The project does not fall within 10 km radius of any Eco – sensitive zone, National Park, Tiger Reserve, Elephant Corridor and Biosphere Reserves.

TABLE 2.1: SITE CONNECTIVITY

Nearest Roadway	NH-544- Coimbatore – Palakkad – 3.0km-NW SH-26- K.G.Chavadi – Ottankulam road- 4.0km-NW
Nearest Village	Mudukkarai Pachapalayam - 1.0km SE
Nearest Town	Madukkarai – 6km – NE
Nearest Railway	Madukkarai – 5km – NE
Nearest Airport	Coimbatore Airport – 17kms - NE
Seaport	Kochi- 126km – SW

Source: Survey of India Toposheet

TABLE 2.2: BOUNDARY CO-ORDINATES OF PROPOSED PROJECT
P1 - Thiru.K.Vazhaithotta Gounder

Boundary Pillar No.	Latitude	Longitude
1	10° 51' 43.94"N	76° 55' 41.79"E
2	10° 51' 43.78"N	76° 55' 43.13"E
3	10° 51' 43.63"N	76° 55' 44.90"E
4	10° 51' 39.98"N	76° 55' 45.65"E
5	10° 51' 39.45"N	76° 55' 46.09"E
6	10° 51' 37.35"N	76° 55' 46.05"E
7	10° 51' 36.48"N	76° 55' 46.12"E
8	10° 51' 35.03"N	76° 55' 43.62"E
9	10° 51' 40.27"N	76° 55' 42.04"E

Source: Approved Mining Plan

FIGURE 2.1: QUARRY LEASE PLAN / SURFACE PLAN -P1

Source: Approved Mining Plan

FIGURE 2.2: PHOTOGRAPHS OF THE PROPOSED SITE

FIGURE 2.3: VILLAGE MAP SUPERIMPOSED ON GOOGLE EARTH IMAGE
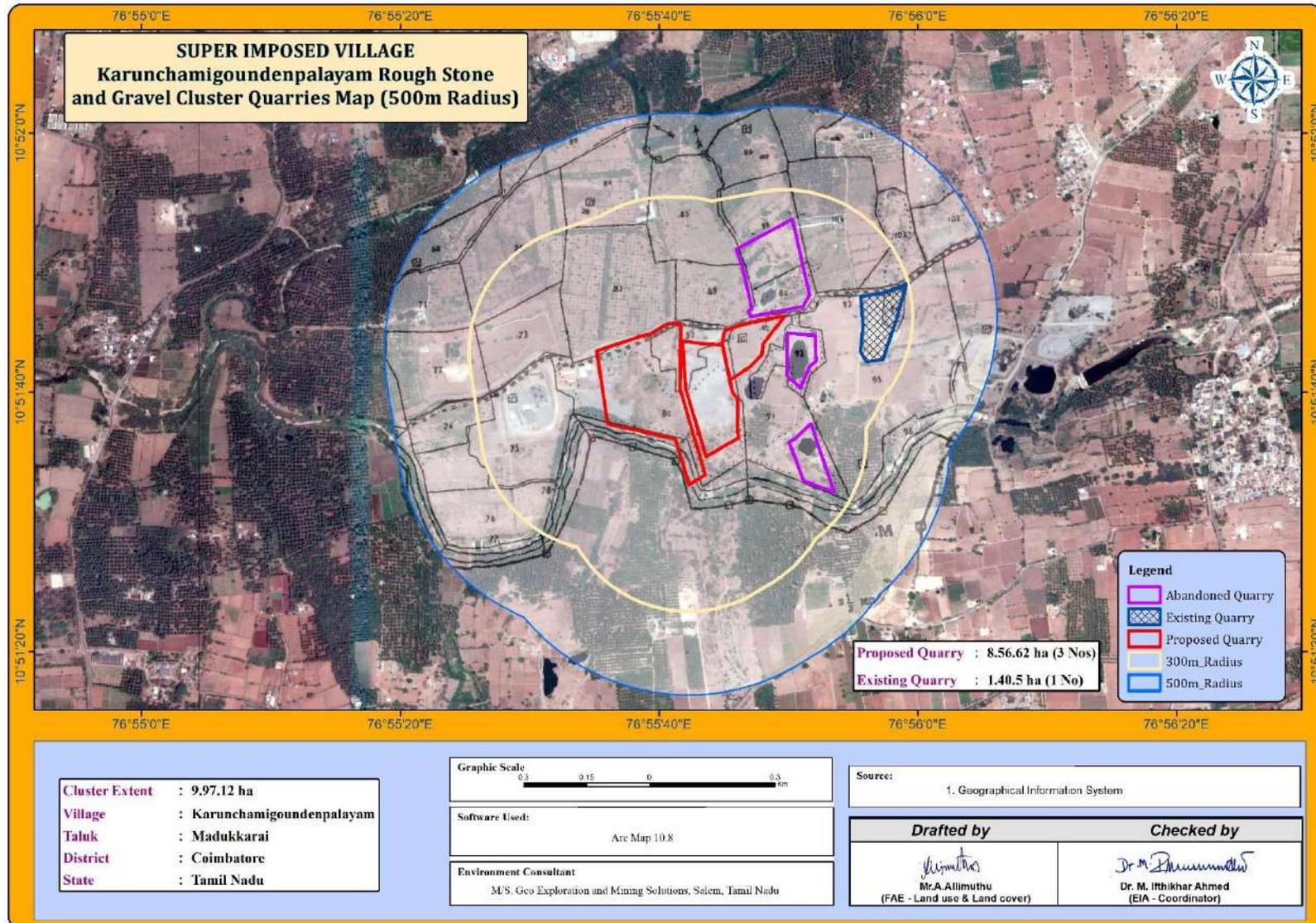
FIGURE 2.4: IMAGE SHOWING SURFACE FEATURES AROUND 10 KM RADIUS
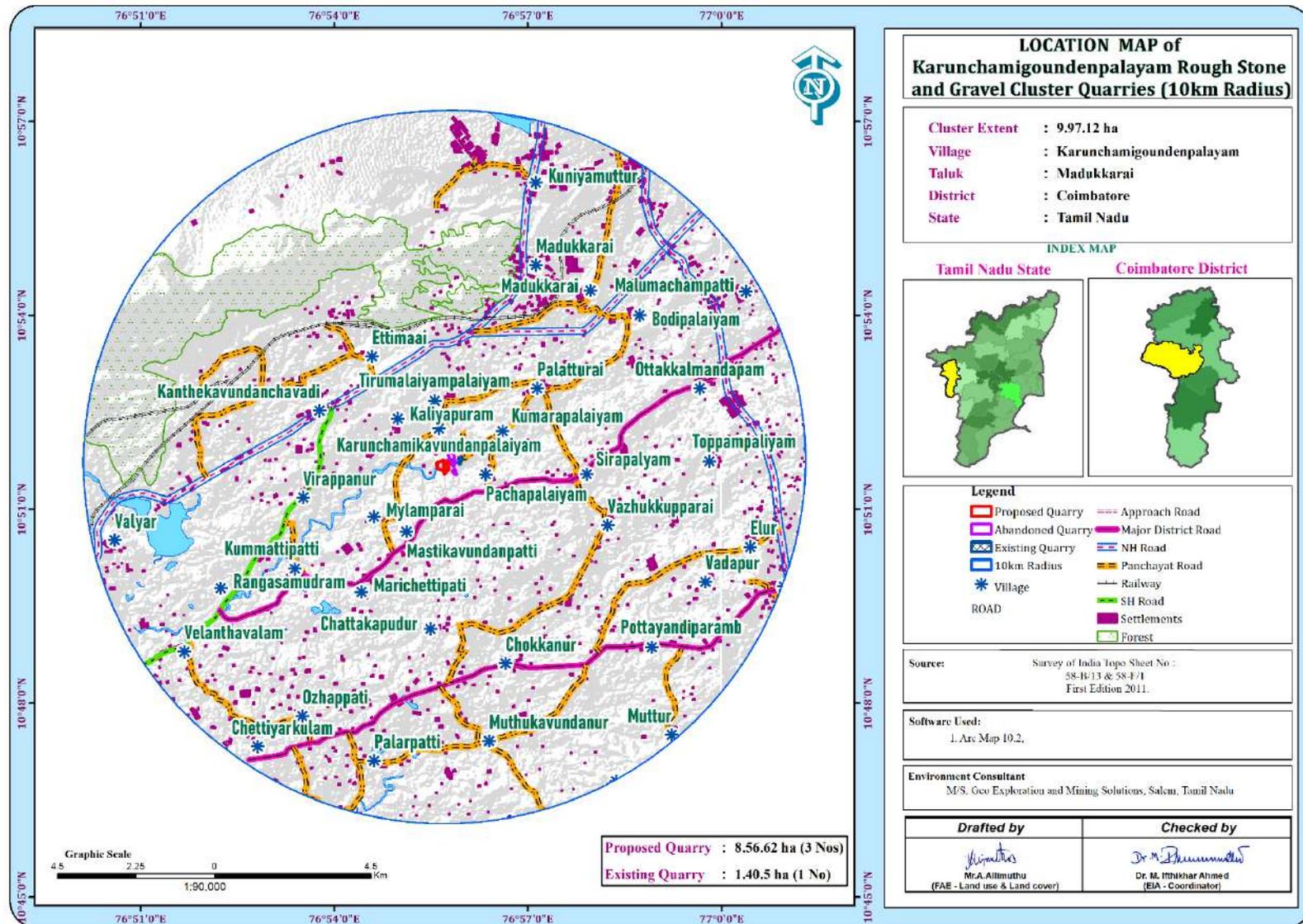
Source: Bhuvan

FIGURE 2.5: IMAGE SHOWING SURFACE FEATURES AROUND 5KM RADIUS
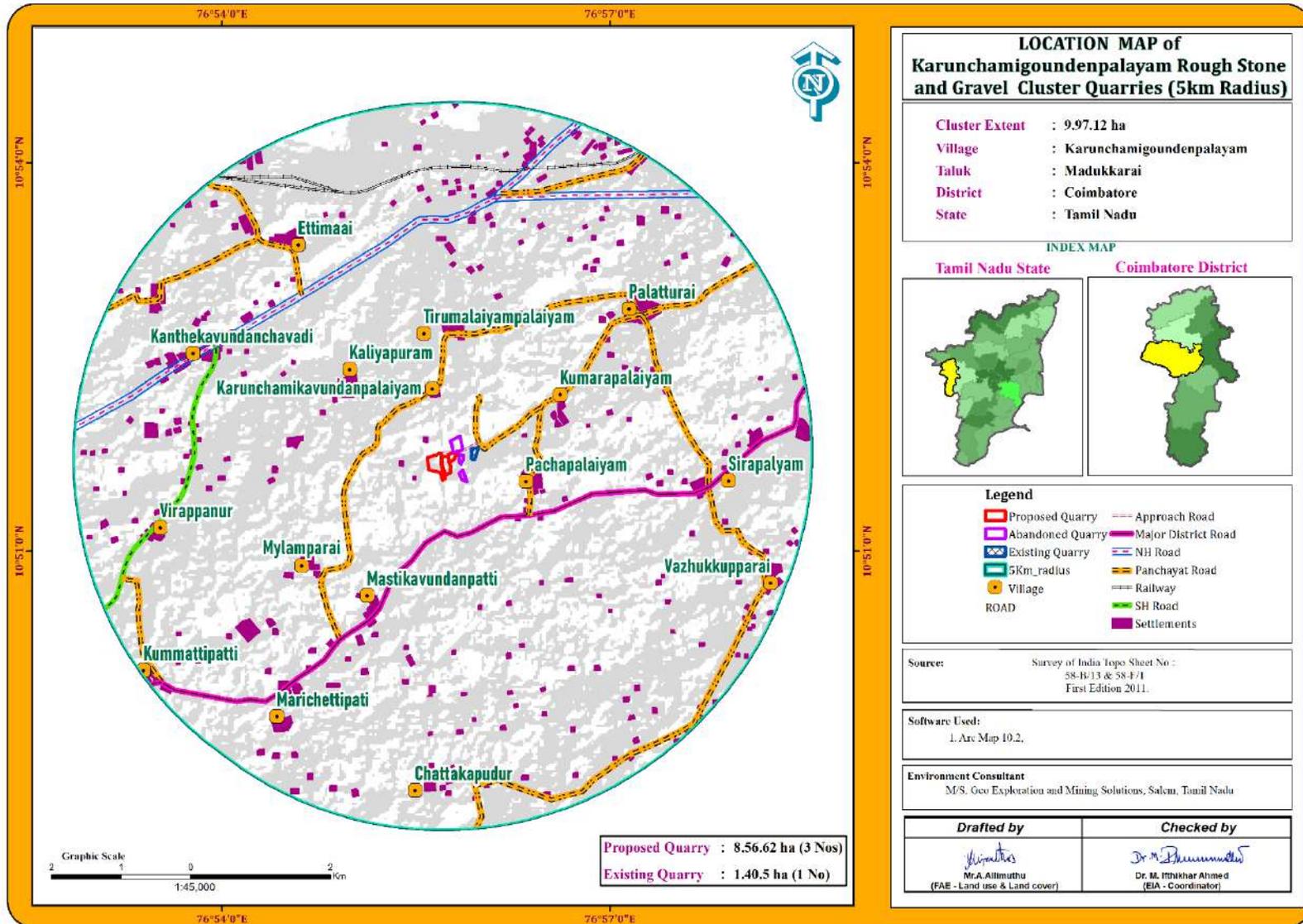
Source: Bhuvan

FIGURE 2.6: IMAGE SHOWING SURFACE FEATURES AROUND 1 KM RADIUS
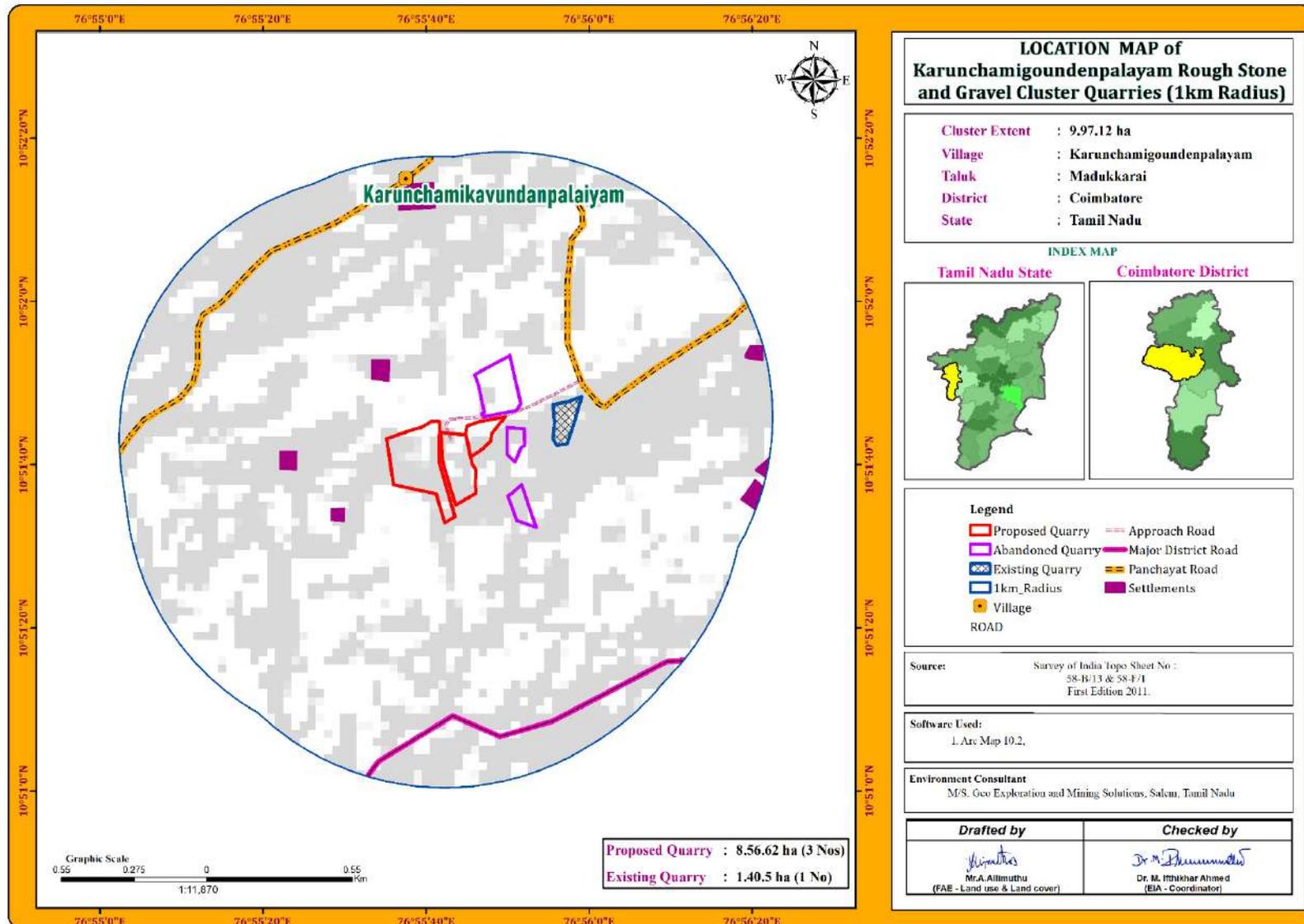
Source:Bhuvan

2.2.1　Project Area

- Proposed Project is site specific
- There is No beneficiation or processing proposed inside the project area.
- There is no forest land involved in the proposed project and is devoid of major vegetation and trees.

TABLE 2.3: LAND USE PATTERN P1

DESCRIPTION	PRESENT AREA IN (HA)	AREA AT THE END OF LIFE OF QUARRY (HA)
Area under quarry	1.64.5	1.98.6
Infrastructure	Nil	0.01.0
Roads	0.01.0	0.01.0
Green Belt	Nil	0.34.8
Un – utilized area	0.82.5	0.12.6
TOTAL	**2.48.0**	**2.48.0**

Source: Approved Mining Plan

2.2.2　Size or Magnitude of Operation

TABLE 2.4: OPERATIONAL DETAILS FOR PROPOSED PROJECT P1

PARTICULARS	DETAILS	
	Rough Stone	**Gravel**
Geological Resources in m³	8,23,620	12,533
Mineable Reserves in m³	3,13,815	5,596
Production in m³	2,58,755	5,596
Mining Plan Period	5 Years	
Number of Working Days	300 Days	
Production per day in m³	172	6
No of Lorry loads (12m³ per load)	14	1
Total Depth of Mining	32m (2m Gravel + 30m Rough Stone)	

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 the Charnockite body N30°E to S30°W with dipping SE60°.

Stratigraphy of the area –

```
AGE                          FORMATION
Recent          -       Quaternary formation (Gravel)
    ---------Unconformity-----------
Archaean        -       Charnockite

                        Peninsular Gneiss complex
```
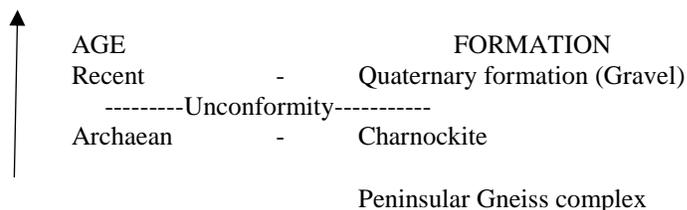
Geologically, the district is covered by rocks belonging to Archean age comprising the khondalite group, Charnockite Group, migmatite group, Sathayamangalam group, Bhavani Group and Alkali complex of Proterozoic age and Recent to Late Pleistocene rocks of Cainozoic age.

The Charnockite Group of rocks consisting of Charnockite, pyroxene granulites and associated magnetite quartzite, the Knodalite Group comprising gametiferous – sillimanite gneiss, calc-granulite, crystalline limestone, sillimanite quartzites and associated migmatitic gneisses. The rocks are restricted to the central and southern portions of the district, especially around Sulur, Madukkarai and Pollachi taluks.

The fissile homblende gneisses (Peninsular gneiss – younger phase) of Bhavani Group with enclaves of schistose, micaceous and amphibolitic rocks, fuchsitge – kyanite quartzites, ferruginous quartzite (Satyamangalam Group) intruded by a number of ultramafic and basic rocks and granites are seen in the Northern portions of the district

especially around Mettupalayam and Northern areas of Coimbatore. The granites are Proterozoic age and occupy the Western end and Eastern Part of the District as separate bodies and are recognized as Maruthamalai Granite and Punjapuliyampatti Granites respectively. The quaternary alluvium is seen in the Western areas of Coimbatore town. The alluvium is more than 30m thick in the Chinnathadagam valley northwest of Coimbatore and in the Siruvani valley west of Coimbatore.

Source: District Survey Report for Minor Minerals Coimbatore District – May 2019

https://www.tnmines.tn.gov.in/pdf/dsr/9.pdf

2.3.2   Local Geology: -

The study area follows the regional trend and mainly comprises of Hard Rock Formation as a homogeneous formation / Batholith formation of Charnockite. All the project areas are plain terrain, all the project areas is covered with gravel formation of 2m thickness; Massive Charnockite formation is found after 2 m gravel formation which is clearly inferred from the nearby existing quarry pit.

2.3.3   Hydrogeology

Coimbatore District is underlain by crystalline metamorphic complex in the western parts of district and sedimentary tract in eastern side. An area of 4551 Sq.km is covered by crystalline rocks (63%) and 2671 Sq.km is covered by sediments (37%). The general geological sequence of formation is given below:

Quaternary - Laterites, Sands and Clays
Tertiary - Sandstone, Gravels and Clays
Cretaceous - Limestone, Calcareous Sandstone and Clay unconformity.
Archaean - Charnockites, Gneisses, Granites, Dolerites and Pegmatite

- The major part of the area is covered by metamorphic crystalline rocks of charnockite, granitic gneiss of Archaean age intruded by dolerite dykes and pegmatite veins. These rocks are highly metamorphosed and have been subjected to very severe folding, crushing and faulting.
- Ground Water occurs under the phreatic condition and wherever there are deep seated fractures, it occurs under semi-confined to confined conditions.
- Occurrence of Ground Water in hard rock depends upon the intensity and depth of weathering, fractures and fissures present in the rocks.
- Granites and gneisses yield moderately compared to the yield in Charnockites.
- Depth of well in hard rock generally ranges between 8 and 15m below ground level.
- Generally yield in open wells ranges from 30 to 250m^3 /day and in bore well between 260 and 430 m^3 /day. The weathered thickness varies from 2.5 m to 42m in general there are 3 to 5 fracture zones within 100 m and 1 to 4 fracture zones between 100 and 200 m.

The Cretaceous formation is represented by Arenaceous Lime stone, Calcareous sand - stone and marl. The Tertiary formation is argillaceous comprising of Silty clay stones, argillaceous Lime stone.

The Quaternary deposits represented by the river deposits of Ponnaiyar and Varahanadhi spread over as patches in Tiruppur District. The alluvium consists of unconsolidated sands, gravelly sands, clays and clayey sands. The thickness of the sands ranges between 15 and 25 m in the alluvial formation which also form potential aquifers. In some areas, sand stone of tertiary formation are the potential groundwater reservoirs.

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 Coimbatore 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 12 m. These formations are porous and permeable which have good water bearing zones.

Tertiary Cuddalore sandstone

Tertiary formations are represented by Cuddalore Sandstone and characterised as fluvial to brakish marine deposits. Predominantly this formation is divided into Lower and Upper Cuddalore formations. In the Upper Cuddalore formations the groundwater occurs in semi confined conditions, whereas in the Lower Cuddalore the groundwater occurs in confined condition with good groundwater potential.

Cretaceous Formations

Groundwater occurring in the lens shape in the sandy clay lenses and fine sand is underlain by white and black clay beds which constitute phreatic aquifer depth which ranges 10m to 15m below ground level. Phreatic aquifer in Limestone is potential due to the presence of Oolitic Limestone.

Hard Rock Formations

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

Granitic Gneiss

Groundwater occurs under water table conditions in weathered, jointed and fractural formations. The pore space developed in the weathered mantle acts as shallow granular aquifers and forms the potential water bearing and yielding zones water table is shallow in canal and tank irrigation regions and it is somewhat deeper in other regions.

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 thickness of aquifer in this district is highly erratic and varies between 15 m to 40 m below ground level. The inter granular Porosity is essentially dependent on the intensity and degree of weathering and fracture development in the bed rock. As discussed earlier deep weathering has developed in Gneissic formations and moderate weathering in charnockite formations. The range of aquifer parameters in hard rock and sedimentary formations are given below:

TABLE 2.4A: RANGE OF AQUIFER PARAMETERS

Parameters	Range
Well yield in LPM	50-300 lpm
Transmissivity (T) m2 /day	1.49-164.18 m2 /day
Permeability (K) m/day	0.25-26.75 m/day

Source: http://nwm.gov.in/sites/default/files/Notes%20on%20Coimbatore%20District.pdf

FIGURE 2.6A: GROUND WATER LEVEL VARIATIONS OF COIMBATORE DISTRICT
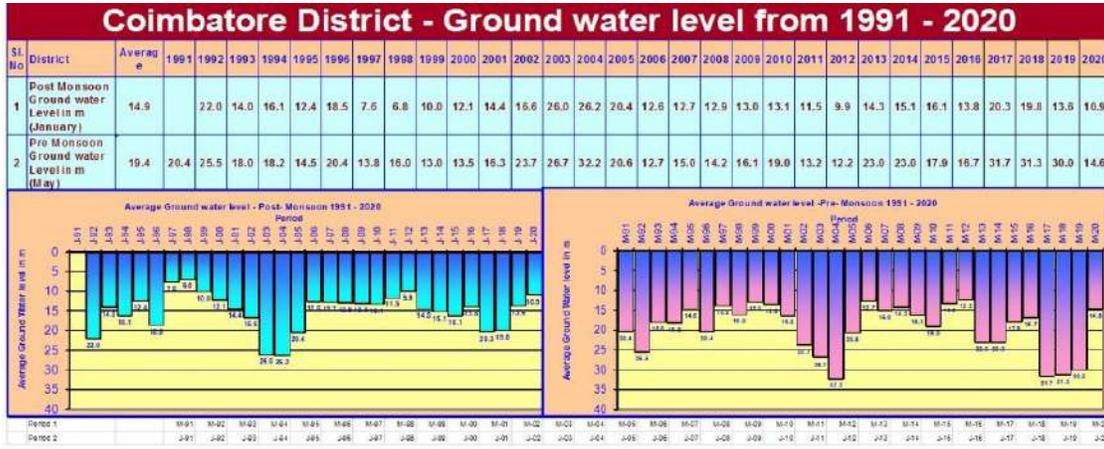
Source: https://www.twadboard.tn.gov.in/content/coimbatore

TABLE 2.5: GROUND WATER LEVEL VARIATIONS OF COIMBATORE DISTRICT

Jan 2017	May 2017	Jan 2018	May 2018	Jan 2019	May 2019	Jan 2020	May 2020	Jan 2021	May 2021	5 Years Pre Monsoon Average	5Years Post Monsoon Average
20.4	29.6	19.8	22.3	13.7	17.6	10.9	14.6	9.3	13.0	16.5	12.6

Source: https://www.twadboard.tn.gov.in/content/coimbatore

FIGURE 2.7: REGIONAL GEOLOGY MAP
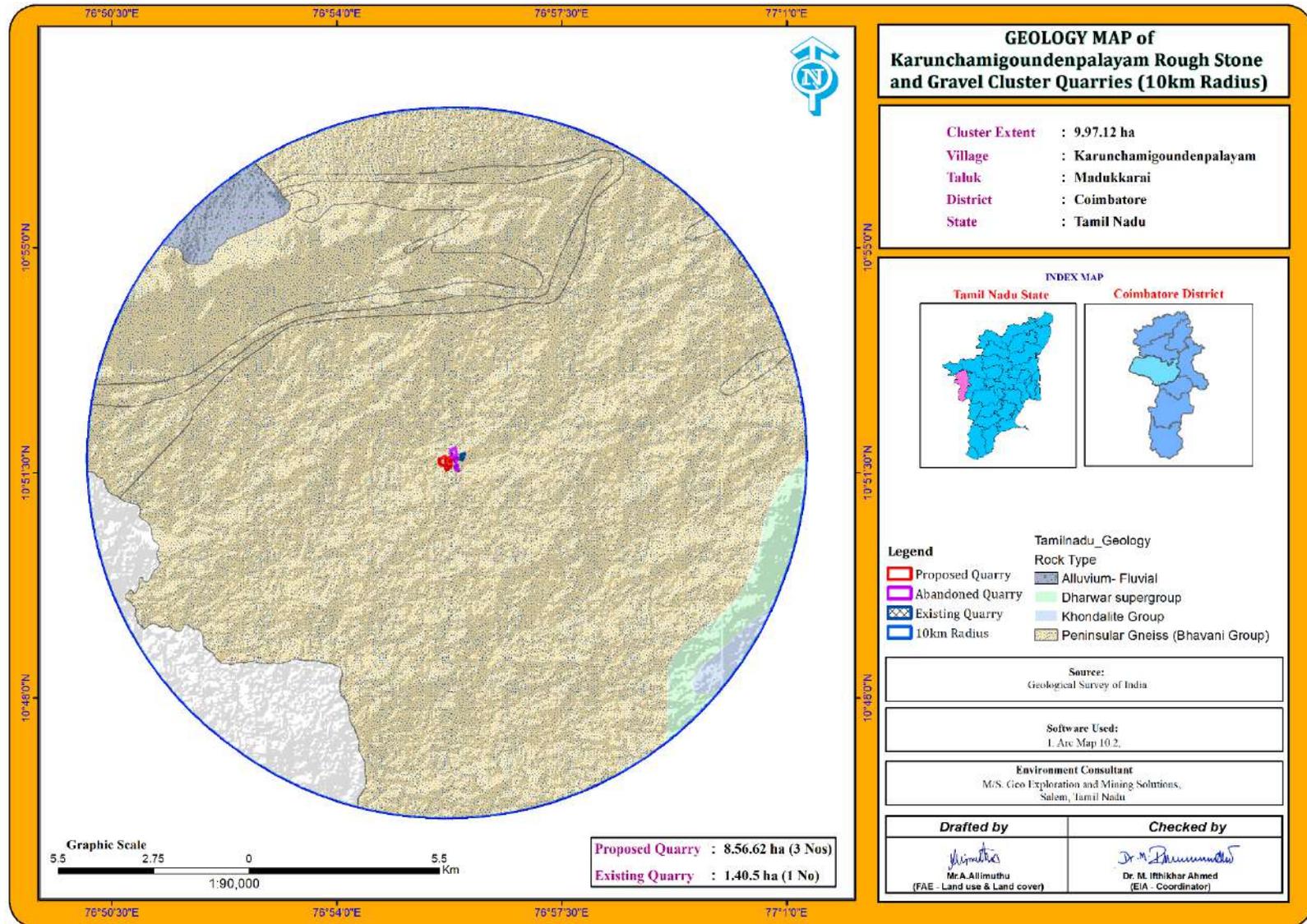
Source: From the above map it is inferred that the cluster quarries falls in the hard rock terrain (Peninsular Gneiss)

FIGURE 2.8: GEOMORPHOLOGY MAP
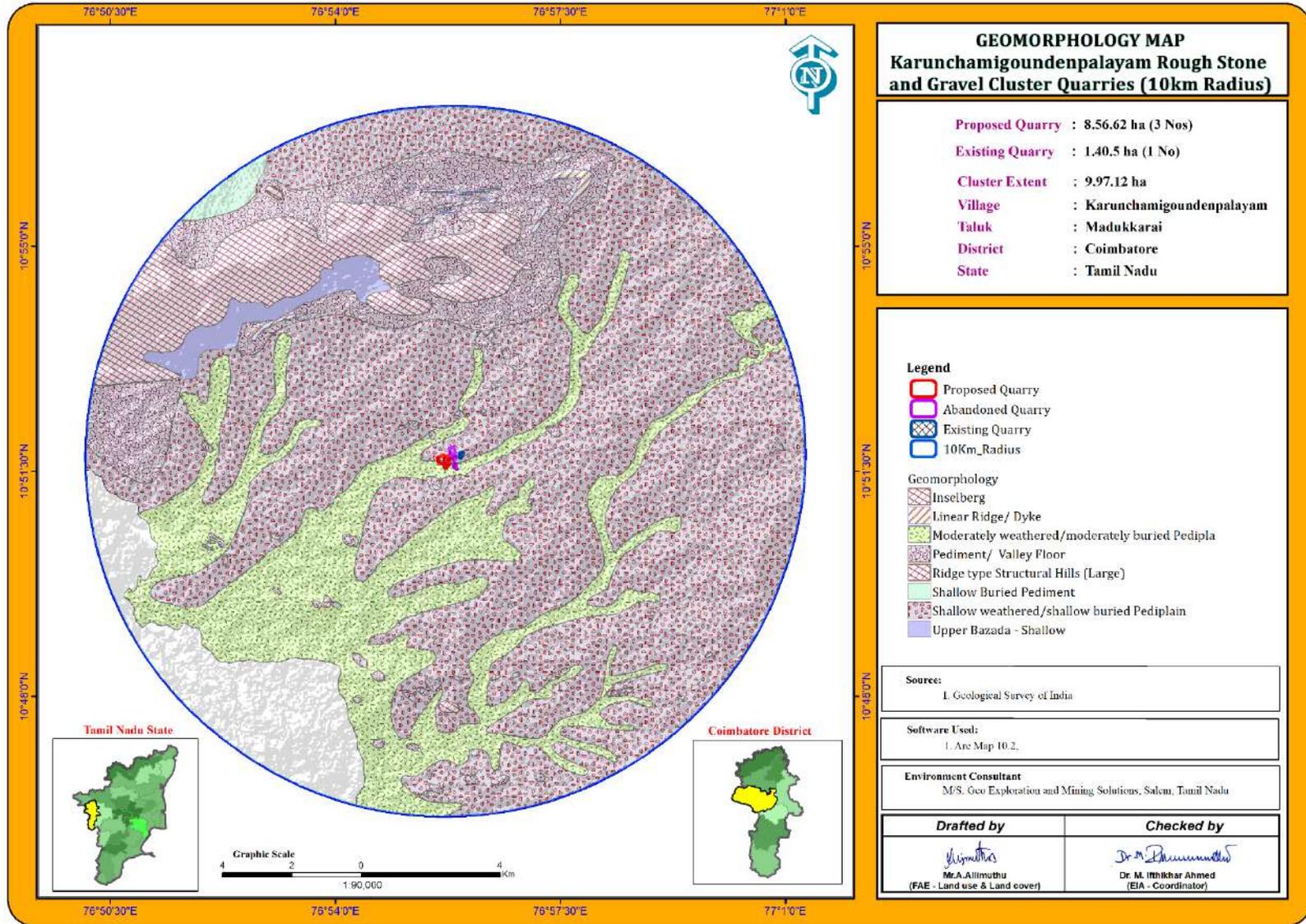
FIGURE 2.9: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS
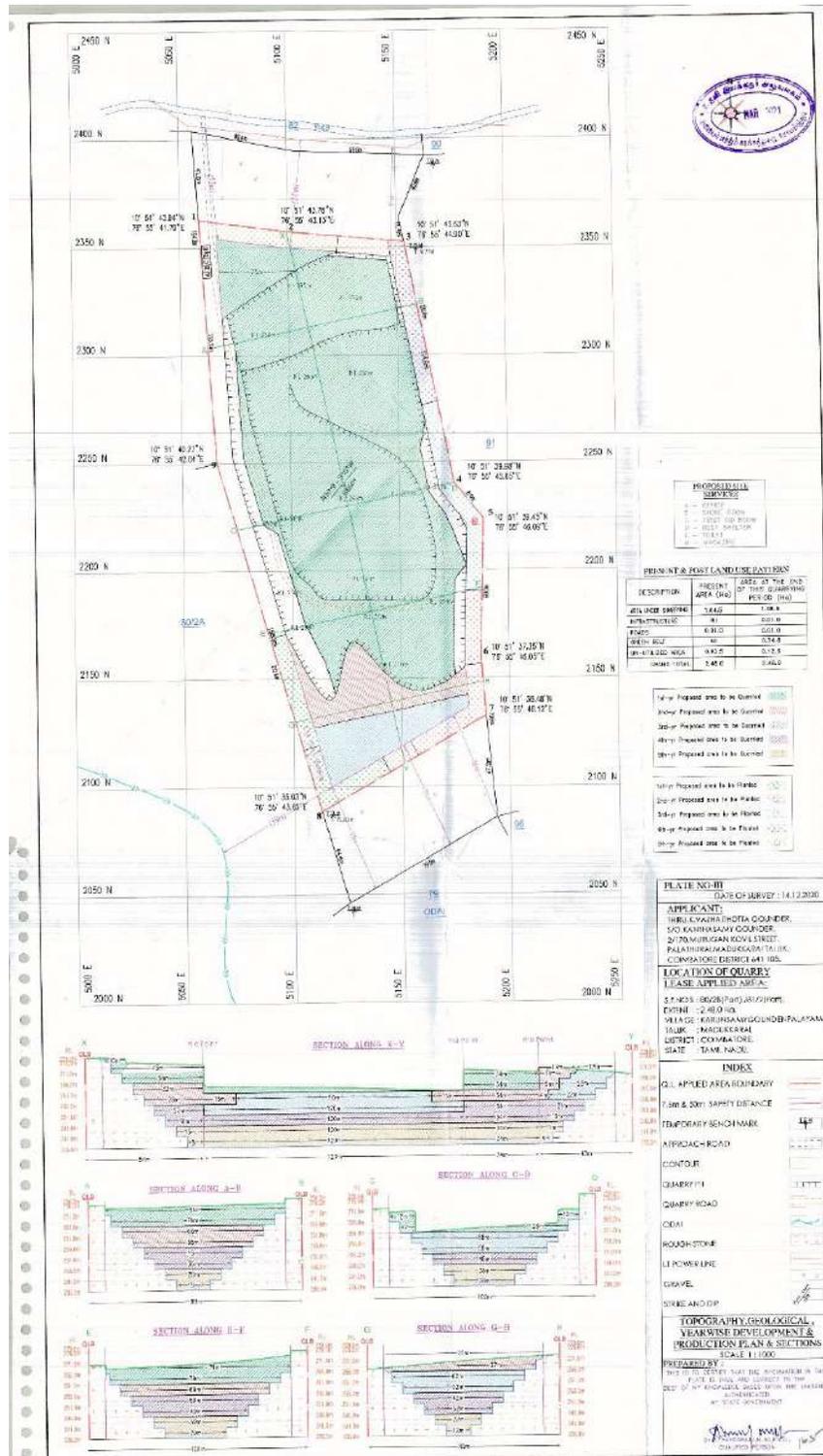
Source: Approved Mining Plan

FIGURE 2.10: CLOSURE PLAN AND SECTIONS P1
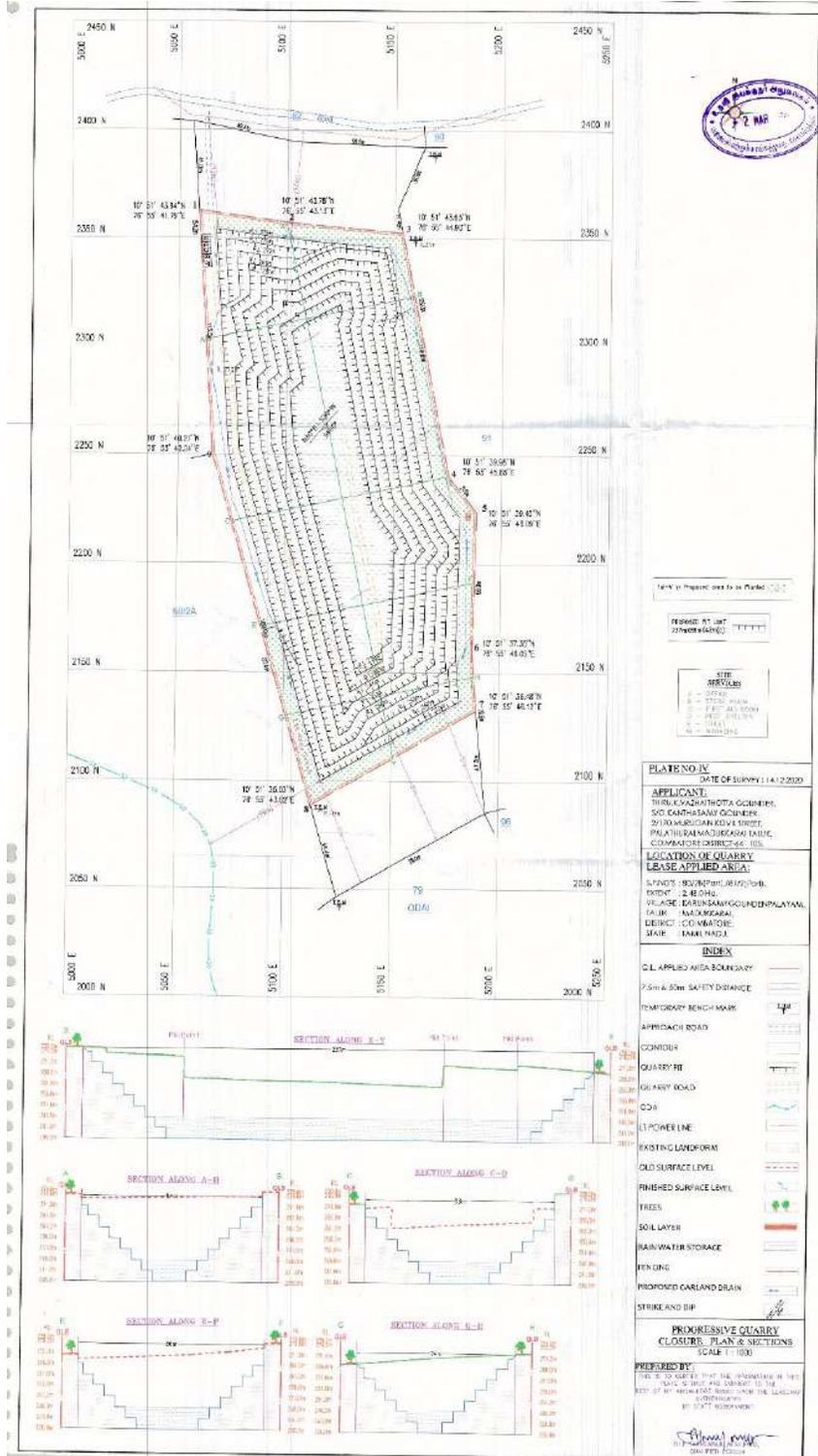
Source: Approved Mining Plan

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 for all the proposed projects.

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 7.5m & 10m 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) for all the proposed projects.

TABLE 2.6: AVAILABLE GEOLOGICAL RESOURCES OF PROPOSED PROJECT P1

Description	Rough Stone	Gravel
Geological Resource in m^3	8,23,620	12,533
Mineable Resource in m^3	3,13,815	5,596

Source: Approved Mining Plan

TABLE 2.7: YEAR-WISE PRODUCTION PLAN P1

YEAR	ROUGH STONE (m^3)	GRAVEL (m^3)
I	51,751	700
II	51,751	2,448
III	51,751	2,448
IV	51,751	-
V	51,751	-
TOTAL	**2,58,755**	**5,596**

Source: Approved Mining Plan

Disposal of Waste

There is no waste anticipated in these Rough Stone quarrying operation. The entire quarried out materials will be utilized (100%). Top layer of Gravel formation will be removed and sold to needy customers directly.

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 2.8: ULTIMATE PIT DIMENSION P1

Length (Max) (m)	Width (Max) (m)	Depth (Max) (m)
237	88	42m

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 Goal
To return the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities.

Closure Principles
The closure principles guide the selection of closure objectives.

Closure Objectives
A closure objective describes what the selected closure activity aims to achieve. Typically, closure objectives are specific to the mine's components. They must be achievable and measurable and allow for the development of closure criteria.

Closure Criteria
Closure criteria measure whether the selected closure activity meets a particular closure objective.

Closure Options
Proponents propose a set of closure options to achieve the closure objectives.

Selected Closure Activity
The selected closure activity is chosen from the closure options, and once approved, the proponent can begin the final engineering and design phase.

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
- There is a river on southern side of the project area. The river will not be hindered by any of mine closure activities
- 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

Closure Goal
"To return the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities." Proponents can add to this goal (with stakeholder input), provided the reclamation standard expressed in this goal is maintained or improved.

Closure Principles
These principles guide the selection of closure objectives:
- Physical Stability
- Chemical Stability
- No Long-Term Active Care
- Future Use

Component-Specific Objectives
Objectives are developed for each mine component. Examples of components include:

Open Pits	Waste Rock and Overburden Piles	Buildings and Equipment	Transportation Routes

Infrastructure	Landfills and Other Waste Disposal	Water Management Systems

Post-Closure Monitoring –

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

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

TABLE 2.9: MINE CLOSURE BUDGET P1

Activity	Year					Cost	Total Cost
	I	II	III	IV	V		
Plantation in Nos	125	125	125	125	125	@ 100 Rs/ Saplings	Rs 62,500
Plantation cost	12,500	12,500	12,500	12,500	12,500		
Plantation in the around the approach road and panchayat roads	125	125	125	125	125		Rs 62,500
	12,500	12,500	12,500	12,500	12,500		
Renovation of Wire Fencing (680 meters)	2,04,000					@ 300Rs per meter	Rs 2,04,000
Renovation of Garland Drain (640 meters)	1,92,000					@ 300Rs per meter	Rs 1,92,000
TOTAL							**Rs 5,21,000**

Source: Proposed by FAE's and EC

2.5 METHOD OF MINING

Proposed Method of Mining is common for the Proposed Project – The method of mining is Opencast Mechanized Mining Method is being proposed by formation of 7.0-meter height bench with a bench width not less than the bench height. However, as far as the quarrying of Rough Stone is concerned, observance of the provisions of Regulation 106 (2) (b) as above is seldom possible due to various inherent petro genetic factors coupled with mining difficulties. Hence it is proposed to obtain relaxation to the provisions of the above regulation from the Director of Mines Safety for which necessary provision is available with the Regulation 106 (2) (b) of MMR-1961, under Mine Act – 1952.

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 Excavators attached with Rock Breakers unit will be deployed for breaking large boulders to required fragmented sizes to avoid secondary blasting and 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.

2.5.1 Drilling & Blasting Parameters

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	–	25 mm

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 respective project proponents have 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 2.10 PROPOSED MACHINERY DEPLOYMENT

PROPOSAL – P1				
S.NO.	TYPE	NOS	SIZE/CAPACITY	MOTIVE POWER
1	Jack hammers	8	1.2m to 2.0m	Compressed air
2	Compressor	2	400psi	Diesel Drive
3	Excavator with Bucket / Rock Breaker	2	300 HP	Diesel Drive
4	Tippers	3	20 Tonnes	Diesel Drive

Source: Approved Mining Plans

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

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

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

Dendritic patterns, which are by far the most common, develop in areas where the rock (or unconsolidated material) beneath the stream has no particular fabric or structure and can be eroded equally easily in all directions. There are no streams, canals or water bodies crossing within the project area. The drainage pattern of the area is

dendritic – sub dendritic.

2.6.3 Traffic Density

The traffic survey conducted based on the transportation route of material, the Rough Stone and Gravel is proposed to be transported mainly through the Karumbukadai-Kumarapalayam Panchayat Road located 1.5km Northeast side and Okkilipalayam-Valanthavalam District Road located 3.3 km Southeast side of the project area.

Traffic density measurements were performed at three locations

1. Karumbukadai-Kumarapalayam Panchayat Road located 1.5km Northeast
2. Okkilipalayam-Valanthavalam District Road located 3.3 km Southeast side

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

one person on either direction for counting the traffic. At the end of each hour, fresh counting and recording was undertaken.

TABLE.2.11: TRAFFIC SURVEY LOCATIONS

Station Code	Road Name	Distance and Direction	Type of Road
TS1	Karumbukadai-Kumarapalayam (Panchayat Road)	1.5km NE	Panchayat Road
TS2	Okkilipalayam-Valanthavalam (District Road)	3.3km SE	District Road

Source: On-site monitoring by GEMS FAE & TM

TABLE 2.12: EXISTING TRAFFIC VOLUME

Station code	HMV		LMV		2/3 Wheelers		Total PCU
	No	PCU	No	PCU	No	PCU	
TS1	85	255	60	60	200	100	415
TS2	145	435	110	110	330	165	710

Source: On-site monitoring by GEMS FAE & TM

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

TABLE 2.13: ROUGH STONE & GRAVEL HOURLY TRANSPORTATION REQUIREMENT

Transportation of Rough Stone & Gravel per day		
Capacity of trucks	No. of Trips per day Cumulatively	Volume in PCU
10 tonnes	34	34

Source: Data analysed from Approved Mining Plan

FIGURE.2.11: MINERAL TRANSPORTATION ROUTE MAP

TABLE 2.14: SUMMARY OF TRAFFIC VOLUME

Route	Existing Traffic volume in PCU	Incremental traffic due to the project	Total traffic volume	Hourly Capacity in PCU as per IRC – 1960guidelines
Karumbukadai-Kumarapalayam (Panchayat Road)	415	34	449	1200
Okkilipalayam-Valanthavalam (District Road)	710	34	744	1500

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

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

2.6.4   Mineral Beneficiation and Processing

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

2.7   PROJECT REQUIREMENT

2.7.1   Water Source & Requirement

Detail of water requirements in KLD as given below:

TABLE 2.15: WATER REQUIREMENT FOR P1

*Purpose	Quantity	Source
Dust Suppression	2.0 KLD	From Existing bore wells from nearby area
Green Belt development	1.5 KLD	From Existing bore wells from nearby area
Domestic purpose	1.0 KLD	From Existing, bore wells and drinking water will be sourced from Approved Water vendors.
Total	**4.5 KLD**	

Source: Prefeasibility report

* Drinking water will be sourced from Approved Water Vendors

2.7.2   Power and Other Infrastructure Requirement

No proposed project requires power supply for the mining operations. 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 SEB by respective 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

High speed Diesel (HSD) will be used for mining machineries. Diesel will be brought from nearby Fuel Stations.
Average diesel consumption is around　　　　　　　=　　　500 Liters of HSD / day per proposed project.

2.7.4 Project Cost

TABLE 2.16: PROJECT COST OF PROPOSED PROJECT

Project Cost	Rs.62,42,000/-

Source: Approved Mining Plan &Prefeasibility Report

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 mines regulations, 1961 for the proposed project.

TABLE 2.17: PROPOSED MANPOWER DEPLOYMENT

PROPOSAL	P1
Mines Manager/Mines Foreman	1
Mate/Blaster	1
Jack hammer operator	16
Excavator Operator	2
Tippers Driver	3
Helper	3
Cleaner & Co-Operator	5
Watchman/Security	5
Total	**32**

Source: Approved Mining Plan of Project

2.9   PROJECT IMPLEMENTATION SCHEDULE

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

TABLE 2.18: 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						Production Start Period
Time line may vary; subjected to rules and regulations /& other unforeseen circumstances							

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

3.   DESCRIPTION OF ENVIRONMENT

3.0   GENERAL

This chapter presents a regional background to the baseline data at the very onset, which will help in better appreciation of micro-level field data, generated on several environmental and ecological attributes of the study area. The baseline status of the project environment is described section wise for better understanding of the broad-spectrum conditions. The baseline environment quality represents the background environmental scenario of various environmental components such as Land, Water, Air, Noise, Biological and Socio-economic status of the study area. Field monitoring studies to evaluate the base line status of the project site were carried out covering March 2022, April 2022 and May 2022 with CPCB guidelines. Environmental data has been collected with reference to cluster quarries by Chennai Mettex Lab Private Limited, Notified Laboratory, for the below attributes –

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

Study Area

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

Study Period

The baseline study was conducted during the Pre-monsoon season i.e., March 2022 - May 2022.

Study Methodology

- The project area was surveyed in detail with the help of Total Station and the boundary pillars were picked up with the help of GPS. The boundary coordinates were superimposed on the satellite imagery to understand the relief of the area, besides Land use pattern of the area was studied through the Bhuvan (ISRO)
- Soil samples were collected and analysed for relevant physio-chemical characteristics, exchangeable Cations, nutrients & micro nutrients etc., in order to assess the impact due to mining activities and to recommend saplings for Greenbelt development
- Ground water samples were collected during the study period from the existing bore wells, while surface water was collected from ponds in the buffer zone. The samples were analysed for parameters necessary to determine water quality (based on IS: 10500:2012 criteria) and those which are relevant from the point of view of environmental impact of the proposed mines
- A 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
- In order to assess the Ambient Air Quality (AAQ), samples of ambient air were collected by installation of Respiratory Dust Samplers (RDS) for Fugitive dust, 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 from census handbook 2011 and from the satellite imagery	Study Area	Satellite Imagery Primary Survey
*Soil	Physio-Chemical Characteristics	Once during the study period	7 (2 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 (March – May 2022)	9 (2 core & 7 buffer)	IS 5182 Part 1-23 National Ambient Air Quality Standards, CPCB
*Noise Levels	Ambient Noise	Hourly observation for 24 Hours per location	9 (2 core & 7 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 Enviro-Tech Services Laboratories in association with GEMS

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

3.1   LAND ENVIRONMENT

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

3.1.1   Land Use/ Land Cover

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

TABLE 3.2: LAND USE / LAND COVER TABLE 10 KM RADIUS

S.No	CLASSIFICATION	AREA_HA	AREA_%
	BUILTUP		
1	URBAN	1358.15	3.94
2	RURAL	472.42	1.37
3	MINING	2200.64	6.38
	AGRICULTURAL LAND		
4	CROP LAND	12114.87	35.11
5	PLANTATION	10547.54	30.57
	FOREST		
6	FOREST DECIDUOS	2957.03	8.57
	BARREN/WASTE LANDS		
7	SCRUB LAND	4075.37	11.81
8	BARREN ROCKY	268.03	0.78
	WETLANDS/ WATER BODIES		
9	WATER BODIES/LAKE	513.95	1.49
	TOTAL	34508.00	100.00

Source: Survey of India Toposheet and Landsat Satellite Imagery

FIGURE 3.1: PIE DIAGRAM OF LAND USE AND LAND IN STUDY AREA
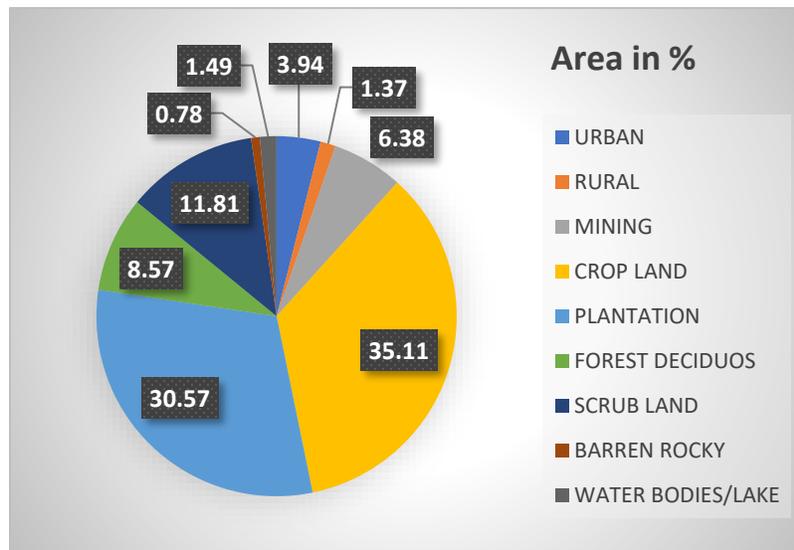
FIGURE 3.2: LAND USE LAND COVER MAP 10KM RADIUS

LANDUSE-LANDCOVER MAP
Karunchamigoundenpalayam Rough Stone
and Gravel Cluster Quarries (10km Radius)

S.No	CLASSIFICATION	AREA_HA	AREA_%
	BUILTUP		
1	URBAN	1358.15	3.94
2	RURAL	472.42	1.37
3	MINING	2200.64	6.38
	AGRICULTURAL LAND		
4	CROP LAND	12114.87	35.11
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	FOREST		
6	FOREST DECIDUOS	2957.03	8.57
	BARREN/WASTE LANDS		
7	SCRUB LAND	4075.37	11.81
8	BARREN ROCKY	268.03	0.78
	WETLANDS/ WATER BODIES		
9	WATER BODIES/LA	513.95	1.49
	TOTAL	34508.00	100.00

Legend
Proposed Quarry
Abandoned Quarry
Existing Quarry
10Km_Radius

Classes
Built Up
- Urban
- Rural
- Mining
Agricultural Land
- Crop Land
- Agricultural Plantation
- Fallow Land
- Current Shifting Cultivation
Forest
- Evergreen/ Semi Evergreen
- Deciduous
- Forest Plantation
- Scrub Forest
- Swamp/ Mangroves

Classes
Grass / Grazing
- Grass/Grazing
Barren / Waste Lands
- Salt Affected Land
- Gullied/Ravenous Land
- Scrub Land
- Sandy Area
- Barren Rocky
- Barn
Wetlands / Water bodies
- Water bodies
- Rivers/Streams/Canals
- Inland Wetland
- Coastal Wetland
Snow and Glaciers
- Snow/Glaciers

Cluster Extent	: 9.97.12 ha
Village	: Karunchamigoundenpalayam
Taluk	: Madukkarai
District	: Coimbatore
State	: Tamil Nadu

Proposed Quarry : 8.56.62 ha (3 Nos)
Existing Quarry : 1.40.5 ha (1 No)

Kerala State

Source:	Software Used:	Environment Consultant	Drafted by	Checked by
https://bhuvan-app3.nrsc.gov.in/ data/download/index.php	1. Arc Map 10.2,	M/S. Geo Exploration and Mining Solutions, Salem, Tamil Nadu	Mr.A.Ailimuthu (FAE - Land use & Land cover)	Dr. M. Ifthikhar Ahmed (EIA - Coordinator)

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 land (includes crop land & Plantation land) 65.68% followed by Built-up Lands (includes Urban & Rural) 11.69%, Barren Land 12.59%; Water bodies 1.49 % and Mining – 6.38%.

The total mining area within the study area is 2200.64 ha i.e., 6.38%. The cluster area of 9.97.12 ha contributes about 0.38% of the total mining area within the study area. This small percentage of Mining Activities shall not have any significant impact on the environment.

3.1.2 Topography

The proposed project area is flat terrain, covered with gravel formation of 2m thickness; Massive Charnockite formation is found after 2m gravel formation which is clearly inferred from the existing quarry pit.

3.1.3 Drainage Pattern of the Area

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

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

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

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

3.1.4 Seismic Sensitivity

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

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

3.1.5 Environmental Features in the Study Area

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

TABLE 3.3: DETAILS OF ENVIRONMENT SENSITIVITY AROUND THE CLUSTER

Sl.No	Sensitive Ecological Features	Name	Arial Distance in km from Cluster
1	National Park / Wild life Sanctuaries	None	Nil within 10km Radius
2	Reserve Forest	Ettimadai	4 km NW
3	Lakes/Reservoir/Dams/Stream/Rivers	Kumitipathi River	50m SW
		Odai	470m North
		Odai	4km SE
		Walayar Lake	7.5km SW
4	Tiger Reserve / Elephant Reserve/ Biosphere Reserve	None	Nil within 10Km Radius
5	Critically Polluted Areas	None	Nil within 10km Radius
6	Mangroves	None	Nil within 10km Radius
7	Mountains/Hills	None	Nil within 10km Radius
8	Notified Archaeological Sites	None	Nil within 10km Radius
9	Industries / Thermal Power Plants	None	Nil within 10km Radius
10	Defence Installation	None	Nil within 10km Radius

Source: Survey of India Toposheet

TABLE 3.4: NEARBY WATER BODIES FROM THE PROPOSED PROJECT SITE

No	Name	Distance Direction
1	Kumitipathi River	50m SW
2	Odai	470m North
3	Odai	4km SE
4	Walayar Lake	7.5km SW

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 3.4 and Figure 3.5.

The objective of the soil sampling is -

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

TABLE 3.5: SOIL SAMPLING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	S-1	Core zone	Project area	10°51'36.20"N 76°55'44.98"E
2	S-2	Core zone	Project area	10°51'42.15"N 76°55'59.90"E
3	S-3	Arisipalayam	2.8km East	10°51'56.98"N 76°58'03.83"E
4	S-4	Thirumalaiyampalayam	1.3km North	10°52'42.93"N 76°55'39.22"E
5	S-5	Chinnayakavundan pudur	4.3km Northwest	10°53'08.73"N 76°53'22.26"E
6	S-6	Meenakshipuram	4km Southeast	10°49'39.94"N 76°57'35.23"E
7	S-7	Veerapanur	3.8km Southwest	10°51'07.15"N 76°53'16.33"E

Source: On-site monitoring/sampling by Chennai Mettex Lab Private Limited 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. Five (7) 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 3.5.

TABLE 3.6: METHODOLOGY OF SAMPLING COLLECTION

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

Source: On-site monitoring/sampling by Chennai Mettex Lab 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 and physico-chemical characteristics of the soils are presented below in Table 3.6 & Test Results in Table 3.7.

TABLE 3.7: SOIL QUALITY STANDARD

Sl.No.	Soil Test	Remarks	
1	pH	<4.5 Extremely acidic 4.51- 5.50 Very strongly acidic 5.51-6.0 moderately acidic 6.01-6.50 slightly acidic 6.51-7.30 Neutral	7.31-7.80 slightly alkaline 7.81-8.50 moderately alkaline 8.51-9.0 strongly alkaline 9.01 very strongly alkaline
2	Electrical Conductivity (in μmohs/cm)	Normal <1000, Critical for germination 1000 – 2000, Critical for growth 2000- 4000, Injurious to most crops > 4000	
3	Organic Carbon (in %)	Upto 0.2: very less 0.21-0.4: less 0.41-0.5 medium, 0.51-0.8: on an average sufficient 0.81-1.00: sufficient >1.0 more than sufficient	
4	Nitrogen (in Kg/ha)	Upto 50 very less 51-100 less 101-150 good 151-300 Better >300 sufficient	
5	Phosphorus (in Kg/ha)	Upto 15 very less 16-30 less 31-50 medium, 51-65 on an average sufficient 66-80 sufficient >80 more than sufficient	
6	Potash (in Kg/ha)	0 -120 very less 120-180 less 181-240 medium 241-300 average 301-360 better >360 more than sufficient	

FIGURE 3.3: SOIL SAMPLING LOCATIONS AROUND 10 KM RADIUS

Soil Sampling Location Map
Karunchamigoundenpalayam Rough Stone and Gravel Cluster Quaariess (10km Radius)

Cluster Extent	:	9.97.12 ha
Village	:	Karunchamigoundenpalayam
Taluk	:	Madukkarai
District	:	Coimbatore
State	:	Tamil Nadu

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	S-1	Core Zone	Project Area	10°51'36.20"N 76°55'44.98"E
2	S-2	Core Zone	Project Area	10°51'42.15"N 76°53'59.90"E
3	S-3	Arisipalayam	2.8km East	10°51'56.98"N 76°58'3.83"E
4	S-4	Thirumalaiyampalayam	1.3km North	10°52'42.93"N 76°55'39.22"E
5	S-5	Chinnayakavundan Pudur	4.3km NW	10°53'8.73"N 76°53'22.26"E
6	S-6	Meenakshipuram	4km SE	10°49'39.94"N 76°57'35.23"E
7	S-7	Veerapanur	3.8km SW	10°51'7.15"N 76°53'16.33"E

Source: Survey of India Topo Sheet No : 58-B/13 & 58-F/1 First Edition 2011.

Software Used: 1. Arc Map 10.2.

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

Drafted by	Checked by
Mr.A.Allimuthu (FAE - Land use & Land cover)	Dr. M. Ifthikhar Ahmed (EIA - Coordinator)

Legend
- Soil Sampling Locations
- Proposed Quarry
- Abandoned Quarry
- Existing Quarry
- 10km_Radius

Proposed Quarry : 8.56.62 ha (3 Nos)
Existing Quarry : 1.40.5 ha (1 No)

Graphic Scale
1:90,000

FIGURE 3.4: SOIL MAP

TABLE 3.8: SOIL QUALITY OF THE STUDY AREA

S.No	Parameters	Units	S1	S2	S3	S4	S5	S6	S7
1	pH at 27°C	-	8.18	8.48	8.52	7.50	8.54	8.36	8.33
2	Electrical Conductivity@25°C	μs/cm	590	660	570	630	640	588	608
3	Texture	-	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam
4	Clay	%	48.4	33	44.4	43.8	38.6	36.4	36.2
5	Sand	%	36.4	39	33.2	33.2	42.2	42.8	43.2
6	Silt	%	23.2	31	20.8	24.2	19.8	22.2	21.8
7	Water Holding Capacity	%	50.2	50.4	48.3	44.8	44.2	46.8	46.8
8	Bulk Density	g/cc	1.30	1.16	1.16	1.18	1.24	1.38	1.40
9	Porosity	%	39.4	36.2	34.0	34.6	42.6	40.2	40.2
10	Exchangeable Calcium(as Ca)	mg/Kg	166	184	190	194	248	218	220
11	Exchangeable Magnesium(asMg)	mg/Kg	64	38.6	34.2	150	160	120	122
12	Exchangeable Manganese(asMn)	mg/Kg	30.6	37.4	32.6	34.8	33.8	22.4	22.2
13	Exchangeable Zinc as Zn	mg/Kg	0.74	1.14	0.88	0.94	0.88	1.30	1.30
14	Available Boron (as B)	mg/Kg	0.68	0.96	1.49	0.80	0.94	1.80	1.80
15	Soluble Chloride(as Cl)	mg/Kg	168	178	180	170	170	194	202
16	Soluble Sulphate(as SO_4)	%	0.016	0.017	0.016	0.014	0.012	0.016	0.018
17	Available Potassium(as K)	mg/Kg	46.2	42.2	42.8	37.8	38.8	36.2	36.2
18	Available Phosphorous(as P)	mg/Kg	1.40	1.54	1.70	1.28	1.14	1.48	1.48
19	Available Nitrogen(as N)	mg/Kg	180	178	180	174	150	180	184
20	Cadmium (as Cd)	mg/Kg	ND	ND	ND	ND	ND	ND	ND
21	Chromium (asCr)	mg/Kg	ND	ND	ND	ND	ND	ND	ND
22	Copper(asCu)	mg/Kg	ND	ND	ND	ND	ND	ND	ND
23	Lead (asPb)	mg/Kg	0.42	0.52	0.58	0.72	0.48	0.40	0.42
24	Total Iron	mg/Kg	2.8	1.4	1.6	2.8	3.0	1.92	2.2
25	Organic Matter	%	3.3	2.2	3.8	3.6	3.66	3.6	3.6
26	Organic Carbon	%	1.6	1.60	1.8	1.94	2.4	1.88	1.84
27	CEC	meq/l00g	45.3	42.2	32.2	37.8	39.8	38.4	38.8

Source: Sampling Results by Chennai Mettex Lab Private Limited

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 to Sandy Loam Soil and Bulk Density of Soils in the study area varied between 1.16 – 1.40 g/cc. The Water Holding Capacity ranging from 44.2-50.4% and Porosity of the soil samples is ranging from 34.0-42.6%.

Chemical Characteristics –

- The nature of soil is slightly alkaline to strongly alkaline with pH range 7.50 to 8.54
- The available Nitrogen content range between 150 to 184 kg/ha
- The available Phosphorus content range between 1.14 to 1.70 kg/ha
- The available Potassium range between 36.2 to 46.2 mg/kg

3.2 WATER ENVIRONMENT

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

3.2.1 Surface Water Resources:

There are no major surface water bodies within the study area apart from Kumittipathi River on the South side of applied area and 50m Safety Provided; Odai at 470m North side of the area, another Odai at 4km South-eastern side of the area and Walayar Lake at 7.5km Southwestern side of the area. 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 Archaeans and Recent Alluvium. The occurrence and behaviour of groundwater are controlled by rainfall, topography, geomorphology, geology, structures etc., Ground water is occurring in pheratic conditions in weathered and fractured gneiss rock formation. 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 9.2 to 11 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 3.8 and shown as Figure 3.5.

TABLE 3.9: WATER SAMPLING LOCATIONS

S.NO	CODE	LOCATIONS	DISTANCE & DIRECTION	COORDINATES
SURFACE WATER				
1	SW1	Kumittipathi river	4.0km Southwest	10°50'26.96"N 76°53'28.76"E
2	SW2	Walayar lake	7km Southwest	10°50'30.36"N 76°51'40.37"E
GROUND WATER				
3	WW1	Core zone	Near Project Area (SW)	10°51'35.17"N 76°55'39.63"E
4	WW2	Chinnayakavundan Pudur	4.0km NW	10°52'49.17"N 76°53'18.71"E
5	BW1	Core zone	Near Project Area (SW)	10°51'38386"N 76°55'54.79"E
6	BW2	Meenakshipuram	3.8km SE	10°49'46.62"N 76°57'31.70"E

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

FIGURE 3.5: WATER SAMPLING LOCATIONS AROUND 10 KM RADIUS
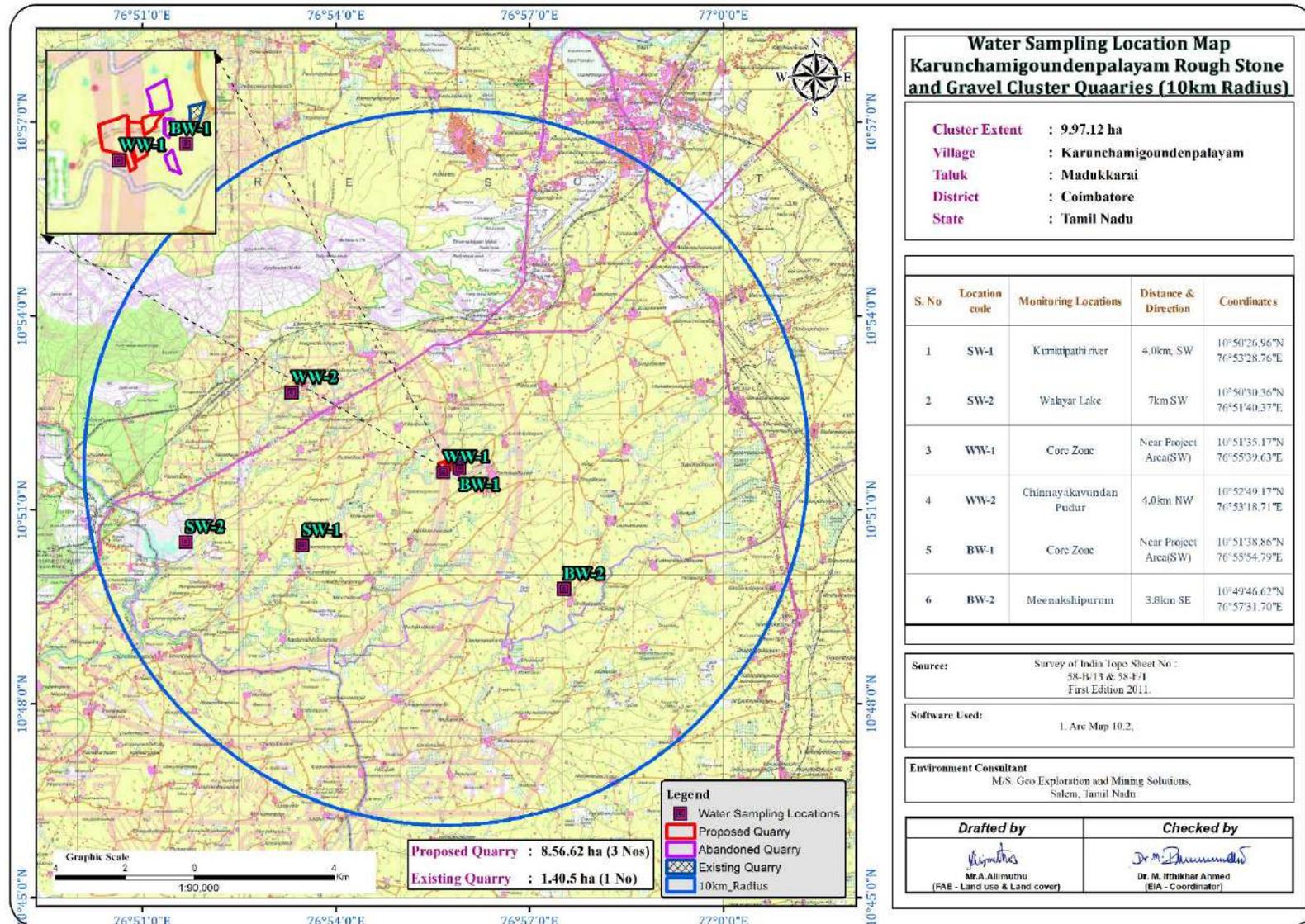
TABLE 3.10: GROUND WATER SAMPLING RESULTS

S.No	Parameters	Units	RESULTS				IS 10500: 2012 Standards	
			WW1	WW2	BW1	BW2	Acceptable limit	Permissible limit
1	Color	Hazen	5	10	10	10	5	15
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	pH@ 25°C	-	7.43	7.41	7.36	7.41	6.5-8.5	No relaxation
5	EC @ 25°C	µs/ cm	1080	880	410	980	-	-
6	Turbidity	NTU	1.8	<0.5	< 5	< 5	1	5
7	Total Dissolved Solids	mg /l	630	520	550	560	500	2000
8	Total Hardness as CaCO3	mg/l	258	160	164	178	200	600
9	Calcium as Ca	mg/l	84.2	44.5	51.8	39.7	75	200
10	Magnesium as Mg	mg/l	11.8	11.8	8.3	19.1	30	100
11	Total Alkalinity as CaCO3	mg/l	240	156	140	190	200	600
12	Chloride as Cl-	mg/l	181	155	158	158	250	1000
13	Sulphate as SO4-	mg/l	72	30	36	38	200	400
14	Iron as Fe	mg/l	BDL (DL:0.01 mg/l)	0.08	0.41	0.48	0.3	No relaxation
15	Free Residual Chlorine	mg/l	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)	0.2	1
16	Fluoride as F	mg/l	0.50	0.36	0.48	0.56	1.0	1.5
17	Nitrates as NO_3	mg/l	26	18	16	19	45	No relaxation
18	Copper as Cu	mg/l	BDL (DL:0.01 mg/l)				0.05	1.5
19	Manganese as Mn	mg/l	BDL (DL:0.02 mg/l)				0.1	0.3
20	Mercury as Hg	mg/l	BDL (DL:0.0005 mg/l)				0.001	No relaxation
21	Cadmium as Cd	mg/l	BDL (DL:0.001 mg/l)				0.003	No relaxation
22	Selenium as Se	mg/l	BDL (DL:0.005 mg/l)				0.01	No relaxation
23	Aluminium as Al	mg/l	BDL (DL:0.005 mg/l)				0.03	0.2

24	Lead as Pb	mg/l	BDL (DL:0.005 mg/l)				0.01	No relaxation
25	Zinc as Zn	mg/l	BDL(DL : 0.05 mg/l)				5	15
26	Total Chromium as Cr	mg/l	BDL(DL : 0.02 mg/l)				0.05	No relaxation
27	Boron as B	mg/l	BDL(DL : 0.05 mg/l)				0.5	1.0
28	Mineral Oil	mg/l	BDL(DL : 0.01 mg/l)				0.5	No relaxation
29	Phenolic Compounds as C_6H_5OH	mg/l	BDL (DL:0.0005 mg/l)				0.001	0.002
30	Anionic Detergents as MBAS	mg/l	BDL (DL:0.01 mg/l)				0.2	1.0
31	Cyanide as CN	mg/l	BDL (DL:0.01 mg/l)				0.05	No relaxation
32	Barium as Ba	mg/l	BDL(DL:0.05 mg/l)				0.7	No relaxation
33	Ammonia (as Total Ammonia-N)	mg/l	BDL (DL:0.01 mg/l)				0.5	No relaxation
34	Sulphide as H_2S	mg/l	BDL (DL:0.01 mg/l)				0.05	No relaxation
35	Molybdenum as Mo	mg/l	BDL (DL:0.02 mg/l)				0.07	No relaxation
36	Total Arsenic as As	mg/l	BDL (DL:0.005 mg/l)				0.01	0.05
37	Total Suspended Solids	mg/l	BDL (DL:1.0 mg/l)	8	14	BDL (DL:1.0 mg/l)	-	-
38	Total Coliform	MPN/ 100ml	240	170	110	170	Shall not be detectable in any100 ml	
39	E-Coli		< 1.8	< 1.8	< 1.8	< 1.8		

TABLE 3.11: SURFACE WATER SAMPLING RESULTS

Sl. No.	Parameter	Unit	RESULT		CPCB Designated Best Use
			SW1	SW2	
1	Color	Hazen	5	10	300
2	Odour	-	Agreeable	Agreeable	Not specified
3	Taste	-	Agreeable	Agreeable	Not specified
4	pH@ 25°C	-	7.62	7.24	6.5 – 8.5
5	EC @ 25°C	µs/ cm	890	880	
6	Turbidity	NTU	1.2	<0.5	Not specified
7	Total Dissolved Solids	mg /l	498	510	1500
8	Total Hardness as $CaCO_3$	mg/l	153	168	Not specified
9	Calcium as Ca	mg/l	47	51.8	Not specified
10	Magnesium as Mg	mg/l	8.8	9.3	Not specified
11	Total Alkalinity as $CaCO_3$	mg/l	190	160	Not specified
12	Chloride as Cl^-	mg/l	130	178	600
13	Sulphate as SO_4^-	mg/l	36	32	400
14	Iron as Fe	mg/l	0.34	0.30	50
15	Free Residual Chlorine	mg/l	BDL(DL: 0.1)	BDL (DL:0.1 mg/l)	400
16	Fluoride as F	mg/l	0.42	0.48	1.5
17	Nitrates as NO_3	mg/l	12.2	16.4	50
18	Copper as Cu	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	1.5
19	Manganese as Mn	mg/l	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	Not specified
20	Mercury as Hg	mg/l	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	Not specified
21	Cadmium as Cd	mg/l	BDL (DL:0.001 mg/l)	BDL (DL:0.001 mg/l)	0.01
22	Selenium as Se	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	Not specified
23	Aluminium as Al	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	Not specified
24	Lead as Pb	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	0.1
25	Zinc as Zn	mg/l	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	15
26	Total Chromium	mg/l	BDL(DL : 0.02 mg/l)	BDL(DL : 0.02 mg/l)	0.05
27	Boron as B	mg/l	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	Not specified
28	Mineral Oil	mg/l	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)	Not specified
29	Phenolic Compounds as C_6H_5OH	mg/l	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	0.005
30	Anionic Detergents as MBAS	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	Not specified
31	Cyanide as CN	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	0.05
32	Biological Oxygen Demand, 3 days @ 27°C	mg/l	BDL(DL:2.0 mg/l)	BDL(DL:2.0 mg/l)	
33	Chemical Oxygen Demand	mg/l	6	14	
34	Dissolved Oxygen	mg/l	6.2	5.8	
35	Barium as Ba	mg/l	BDL(DL:0.05 mg/l)	BDL(DL:0.05 mg/l)	300
36	Ammonia (as Total Ammonia-N)	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	Not specified

37	Sulphide as H$_2$S	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	Not specified
38	Molybdenum as Mo	mg/l	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	Not specified
39	Total Arsenic as As	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	0.2
40	Total Suspended Solids	mg/l	13	BDL (DL:1.0 mg/l)	
41	Total Coliform	MPN/ 100ml	1600	1600	5000
42	E-Coli		70	210	Not specified

3.2.4   Interpretation& Conclusion
Surface Water
Ph:

The pH varied from 7.24 to 7.62 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 498 to 510 mg/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 130 to 178 mg/l. Nitrates varied from 12.2 to 16.4 mg/l, while sulphates varied from 32 to 36 mg/l.

Ground Water

The pH of the water samples collected ranged from 7.36 to 7.43 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. The Total Dissolved Solids were found in the range of 520 - 630 mg/l in all samples. The Total hardness varied between 160 – 258mg/l for all samples.

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

3.2.5   Hydrology and Hydrogeological studies

The district is underlain by hard rock formation fissured and fractured crystalline rocks constitute the important aquifer systems in the district. Geophysical prospecting was carried out in that area by SSRMP-80 Instrument by qualified Geo physicist with the help of IGIS software and it was inferred that the low resistance encountered at the depth between 65-70m. The maximum depth proposed out of proposed projects is 32m. Hence there is no possibilities of water table intersection during the entire mine life period besides it is also inferred topographically that there are no major water bodies intersecting the project area. There is no necessity of stream, channel diversion due to these proposed projects.

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

TABLE 3.12: WATER LEVEL OF OPEN WELLS 1 KM RADIUS

S.No	Name	LATITUDE	LONGITUDE	MARCH	APRIL	MAY
1	OW-1	76° 56' 19.47"E	10° 51' 44.96"N	10.1	10.9	11.5
2	OW-2	76° 56' 30.92"E	10° 51' 39.21"N	9.9	10.7	11.3
3	OW-3	76° 56' 42.55"E	10° 51' 36.60"N	10.4	11.2	11.8
4	OW-4	76° 56' 35.61"E	10° 51' 48.10"N	9.1	9.9	10.5
5	OW-5	76° 56' 14.59"E	10° 52' 05.04"N	10.6	11.4	12
6	OW-6	76° 56' 20.78"E	10° 52' 19.72"N	10.4	11.2	11.8
7	OW-7	76° 56' 01.08"E	10° 52' 18.82"N	10.2	11	11.6
8	OW-8	76° 55' 43.59"E	10° 52' 02.14"N	9.8	10.6	11.2
9	OW-9	76° 55' 42.23"E	10° 51' 49.92"N	11	11.8	12.4
10	OW-10	76° 55' 12.11"E	10° 51' 44.59"N	10.2	11	11.6
11	OW-11	76° 55' 39.64"E	10° 51' 35.03"N	10.1	10.9	11.5
12	OW-12	76° 55' 41.53"E	10° 51' 22.42"N	9.6	10.4	11
13	OW-13	76° 55' 57.46"E	10° 51' 27.89"N	9.4	10.2	10.8
14	OW-14	76° 56' 01.52"E	10° 51' 24.54"N	10.4	11.2	11.8
15	OW-15	76° 55' 57.02"E	10° 51' 15.13"N	10.1	10.9	11.5
16	OW-16	76° 56' 14.17"E	10° 51' 17.68"N	10	10.8	11.4

Source: Onsite monitoring data

TABLE 3.13: WATER LEVEL OF BOREWELLS 1 KM RADIUS

S.No	Name	LATITUDE	LONGITUDE	MARCH	APRIL	MAY
1	BW1	10° 51' 52.29"N	76° 56' 03.74"E	66.4	67.2	67.6
2	BW2	10° 51' 27.94"N	76° 56' 10.04"E	65.3	66.1	66.5
3	BW3	10° 51' 20.12"N	76° 55' 55.93"E	65.6	66.4	66.8
4	BW4	10° 51' 41.74"N	76° 55' 32.60"E	65.8	66.6	67
5	BW5	10° 51' 37.60"N	76° 56' 20.47"E	66.1	66.9	67.3
6	BW6	10° 51' 21.42"N	76° 55' 41.36"E	65.2	66	66.4
7	BW7	10° 51' 57.75"N	76° 56' 20.44"E	65	65.8	66.2
8	BW8	10° 51' 26.06"N	76° 56' 24.12"E	65.3	66.1	66.5
9	BW9	10° 51' 15.88"N	76° 55' 17.19"E	66.3	67.1	67.5
10	BW10	10° 52' 09.90"N	76° 56' 04.42"E	66	66.8	67.2
11	BW11	10° 52' 02.61"N	76° 56' 38.55"E	66.6	67.4	67.8

Source: Onsite monitoring data

FIGURE 3.6: DRAINAGE MAP AROUND 10 KM RADIUS FROM PROJECT SITE
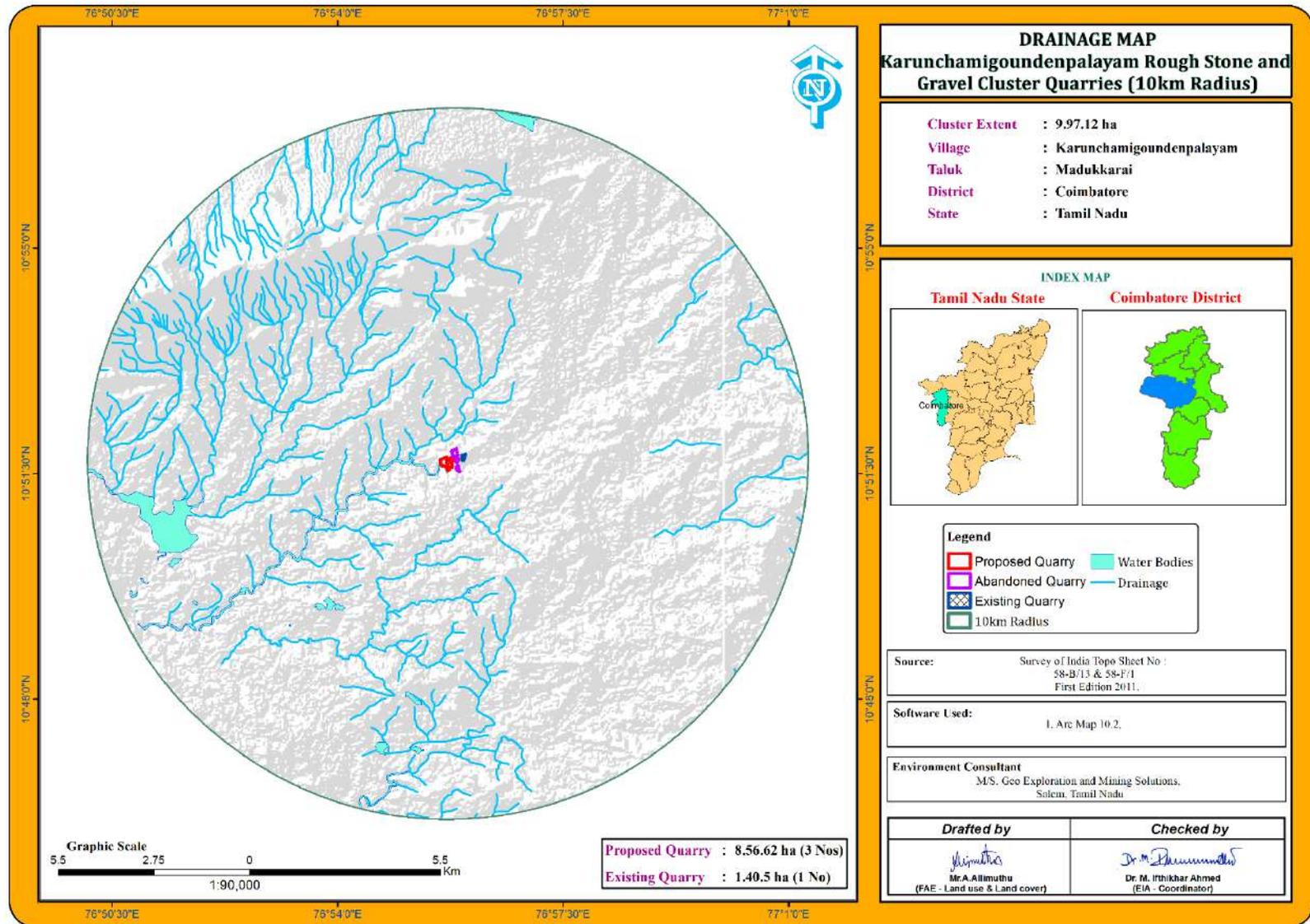
FIGURE 3.7: GROUND WATER PROSPECT MAP
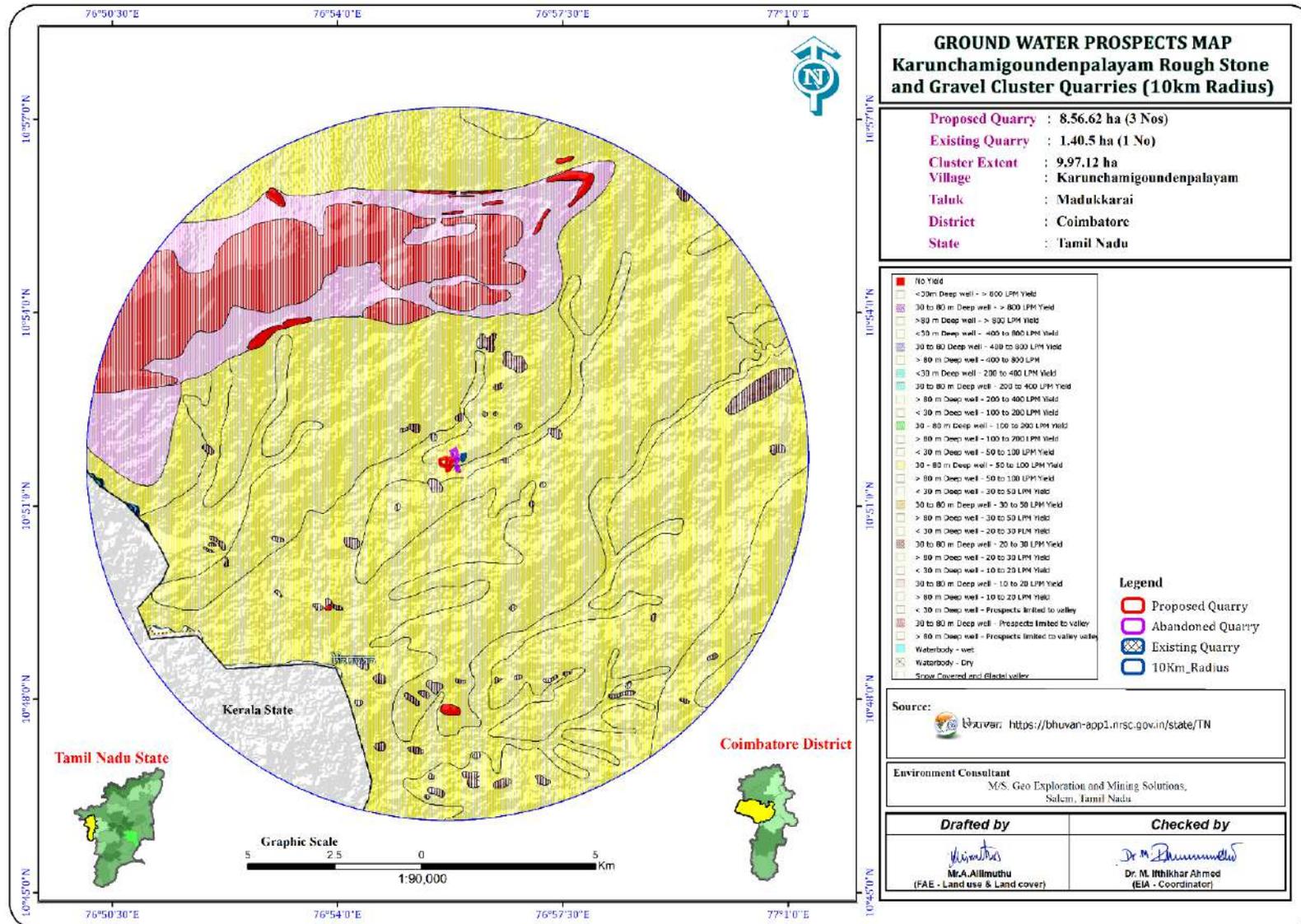
Source : Bhuvan

FIGURE 3.8: OPEN WELL CONTOUR MAP – MARCH 2022
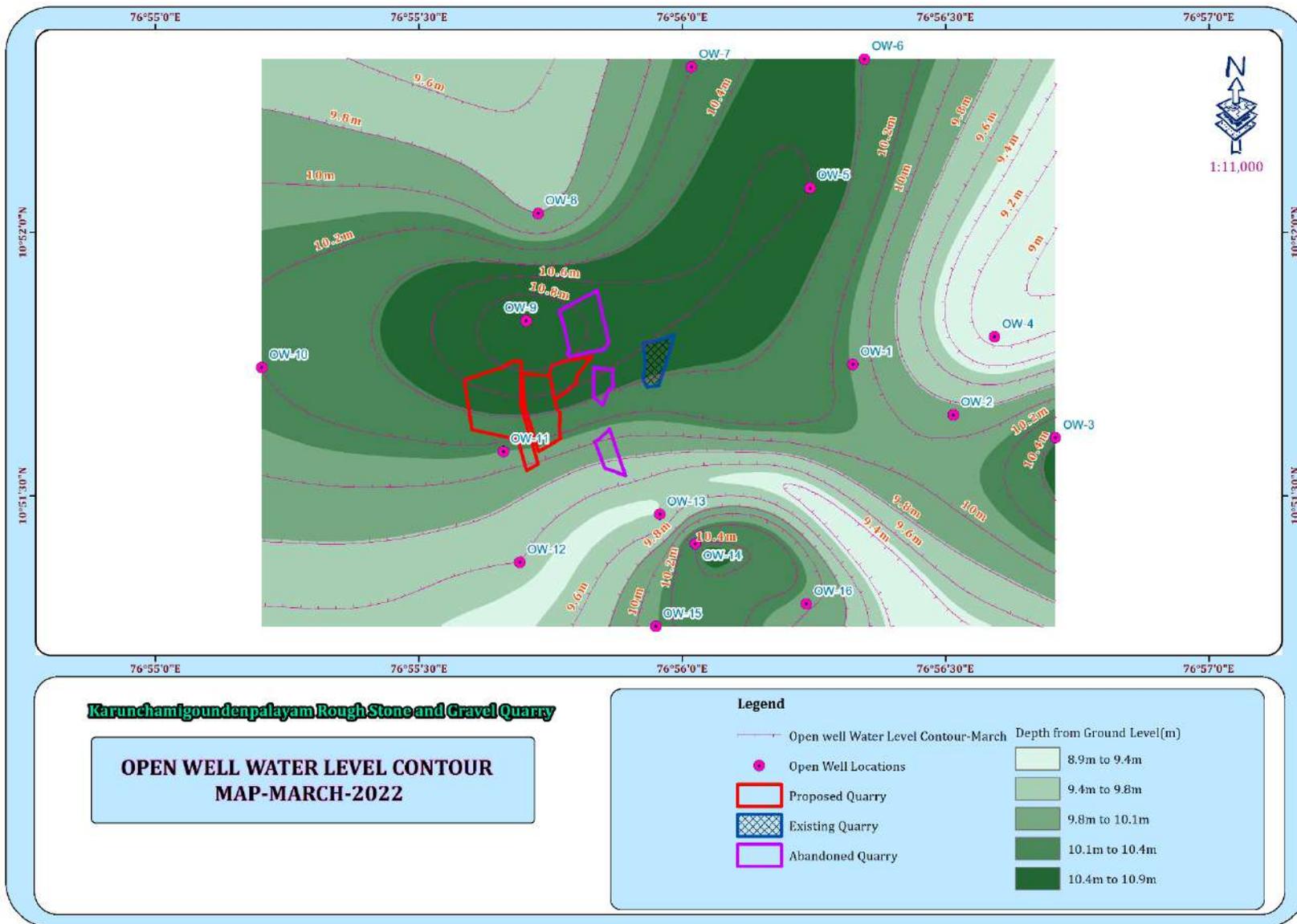
FIGURE 3.9: OPEN WELL CONTOUR MAP – APRIL 2022
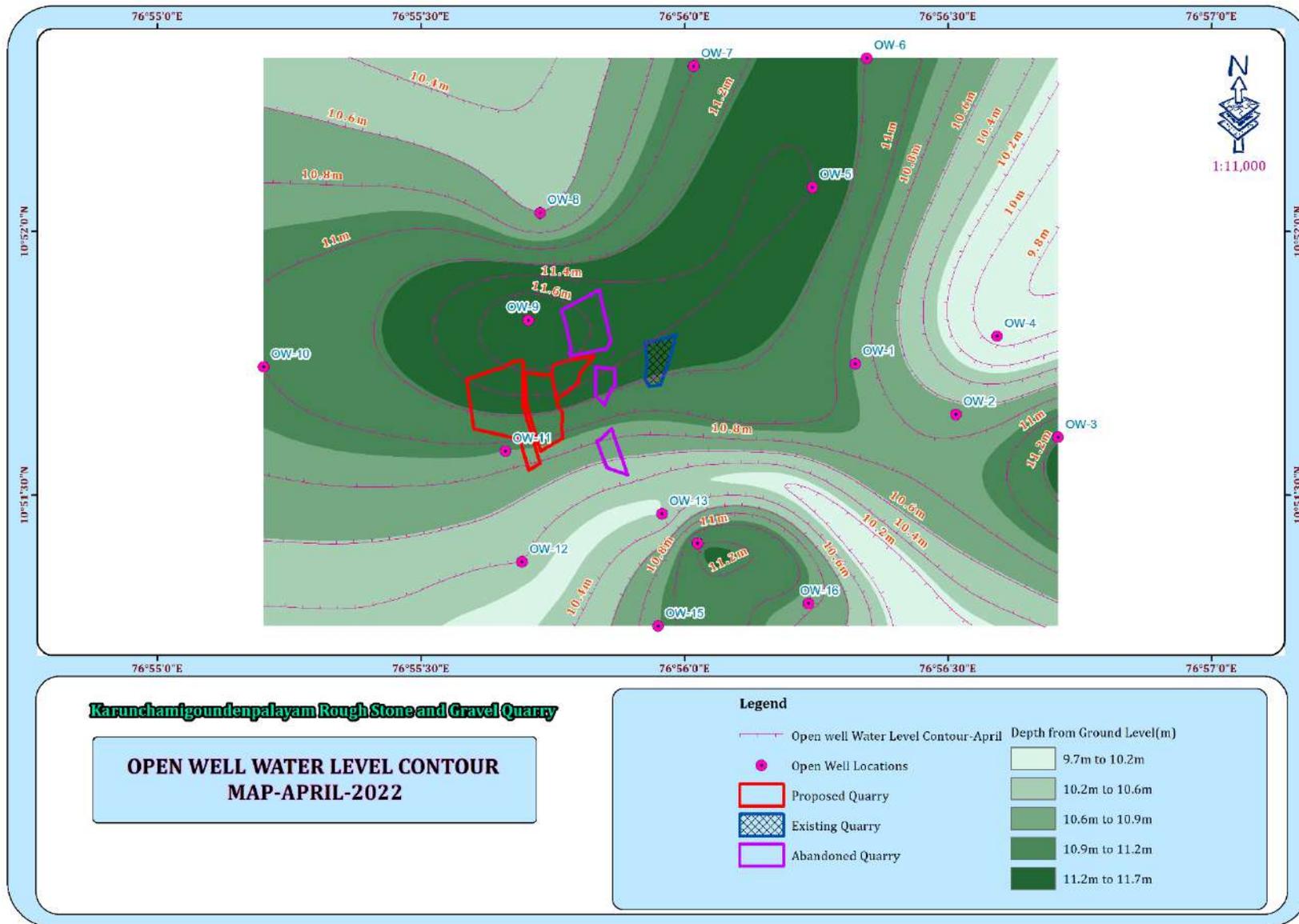
FIGURE 3.10: OPEN WELL CONTOUR MAP – MAY 2022
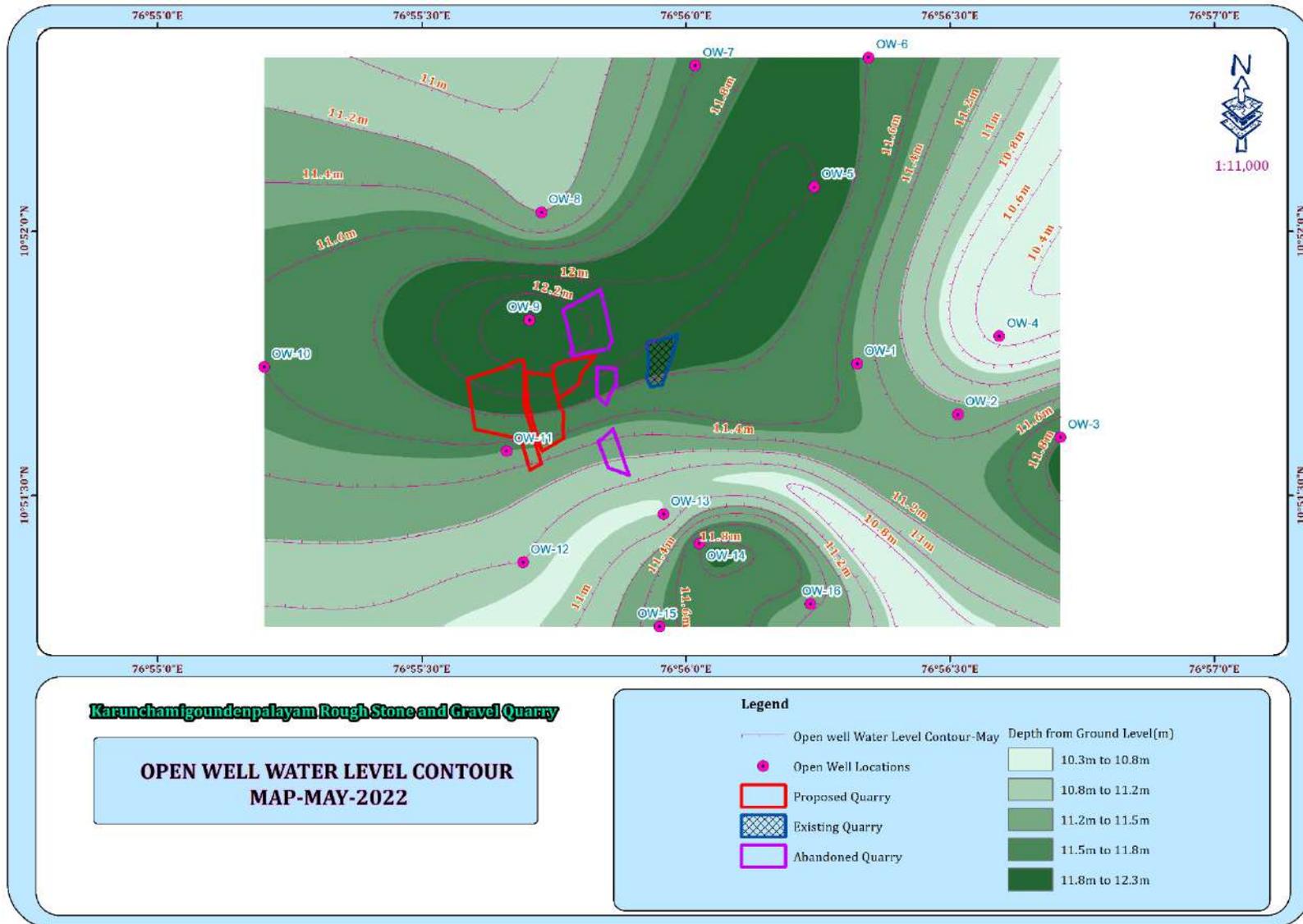
FIGURE 3.11: BOREWELL CONTOUR MAP – MARCH 2022
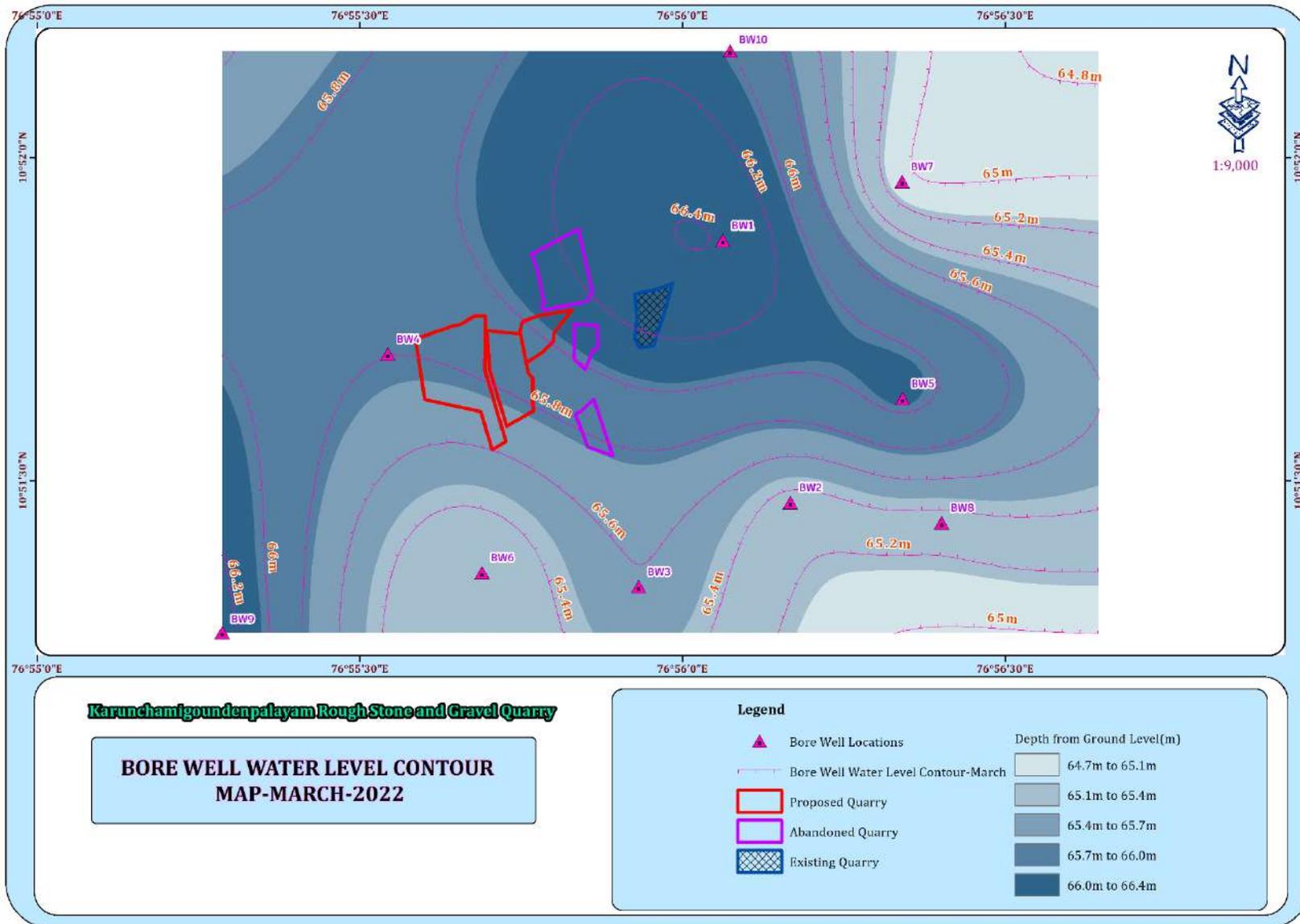
FIGURE 3.12: BOREWELL CONTOUR MAP – APRIL 2022
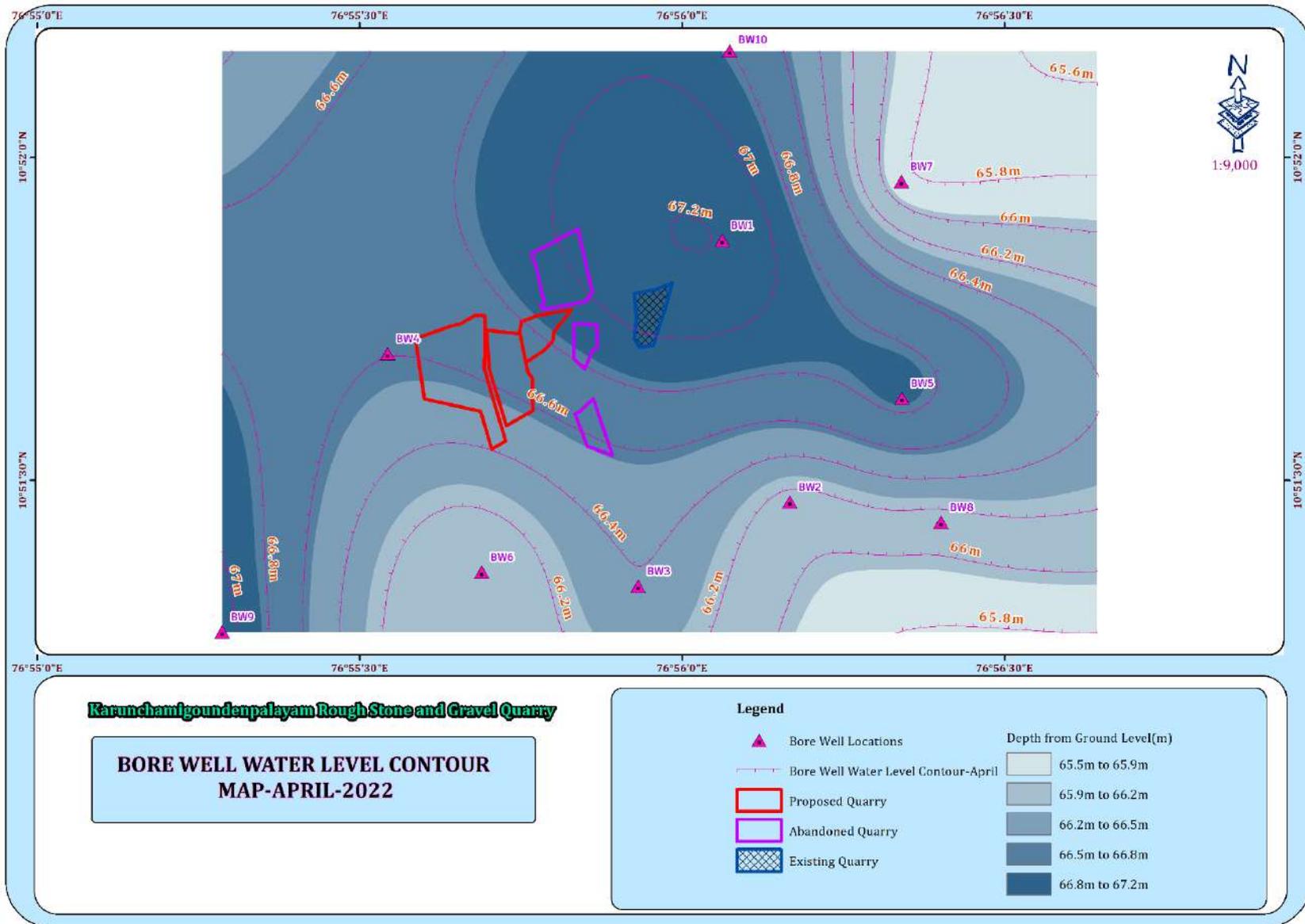
FIGURE 3.13: BOREWELL CONTOUR MAP – MAY 2022
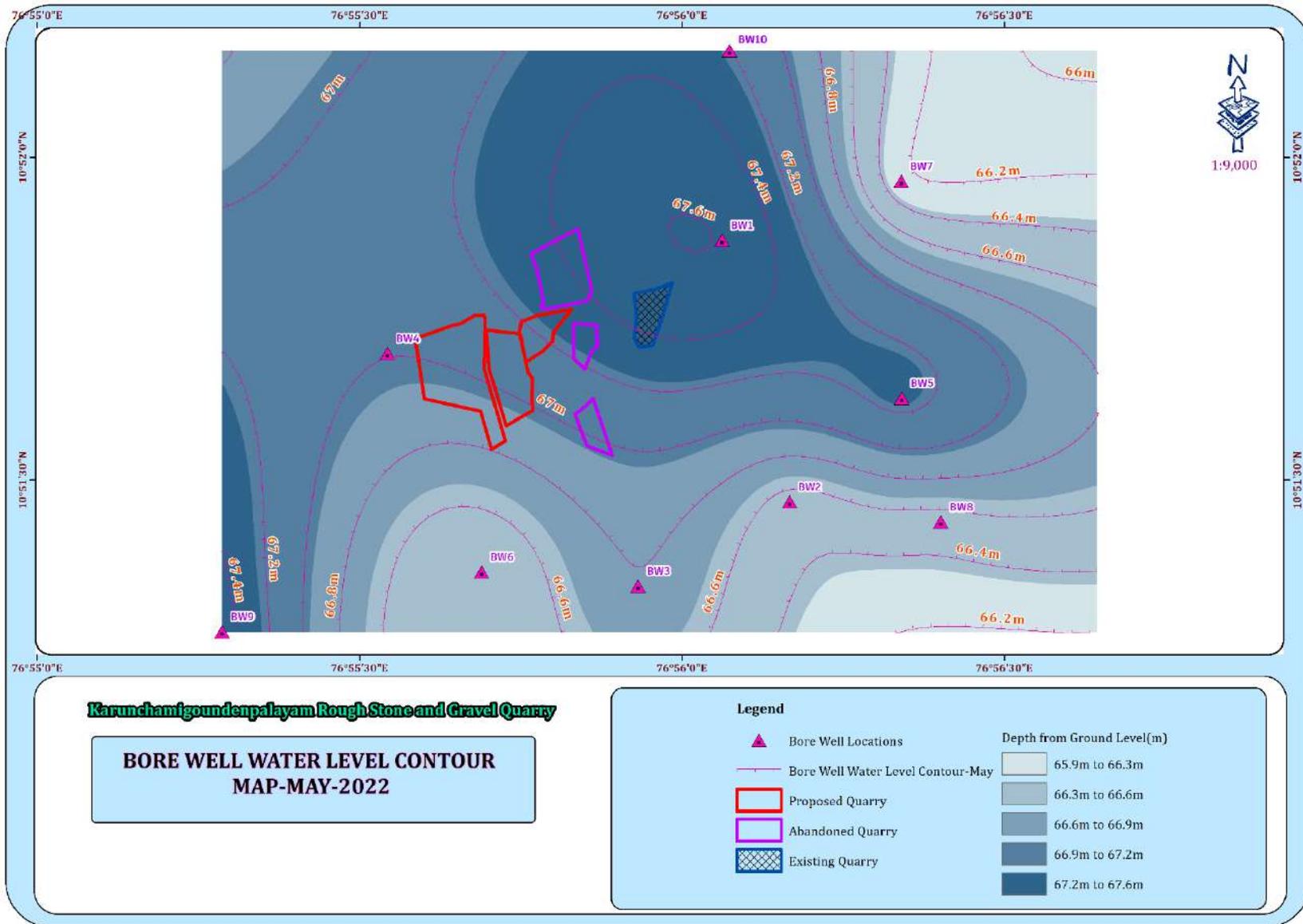
3.2.5.1 Methodology and Data Acquisition

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

The present study utilizes maximum current electrode separation AB/2. The data from this survey are commonly arranged and contoured in the 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,

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

ρr = Resistivity of Rocks

ρw = Resistivity of water in pores of rock

F   = Formation Factor

$\varnothing$ = Fractional pore volume

A   = Constants with values ranging from 0.5 to 2.5

3.2.5.2 Survey Layout

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

The field equipment deployed for the study is in a deep resistivity meter with a model of SSR – MP – AT. This Signal stacking Resistivity meter is a high-quality data acquisition system incorporating several innovation features for Earth resistivity. In the presence of random earth Noises the signal to 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
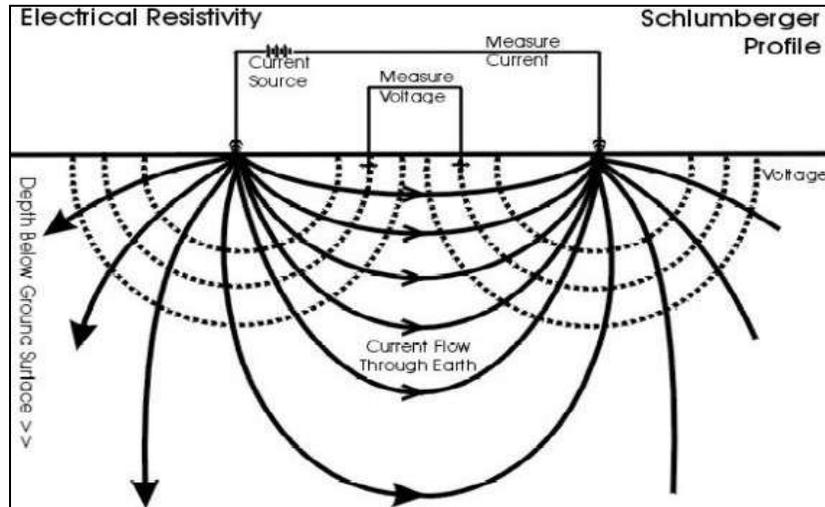
Measurements of ground Resistivity is essentially done by sending a current through two electrodes called current electrodes (C_1& C_2) and measuring the resulting potential by two other electrodes called potential electrode (P_1& P_2). The amount of current required to be sent into the ground depends 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 65-70m. The maximum depth of the proposed project is 32m. 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.

3.3   AIR ENVIRONMENT

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

The baseline studies on air environment include identification of specific air pollution parameters and their existing levels in ambient air. The ambient air quality with respect to the study zone of 10 km radius around the cluster forms the baseline information. The sources of air pollution in the region are mostly due to vehicular traffic, dust arising from unpaved village road and domestic & agricultural activities. The prime objective of the baseline air quality study was to establish the existing ambient air quality of the study area. These will also be useful for assessing the conformity to standards of the ambient air quality during the operation of proposed project in cluster.

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

3.3.1   Meteorology & Climate

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

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

Climate

➢ Coimbatore are in the middle and the summers are that easy to define.

➢ The best time to visit are March, April, May.

➢ The month with the highest relative humidity is July (79.35 %). The month with the lowest relative humidity is March (46.90 %).

➢ The month with the highest number of rainy days is October (21.03 days). The month with the lowest number of rainy days is February (2.77 days).

➢ Coimbatore's climate is classified as tropical. The summers here have a good deal of rainfall, while the winters have very little. The Köppen-Geiger climate classification is Aw. The average annual temperature in Coimbatore is 25.4 °C | 77.8 °F. The annual rainfall is 952 mm | 37.5 inch.

➢ Precipitation is the lowest in January, with an average of 13 mm | 0.5 inch. Most of the precipitation here falls in October, averaging 181 mm | 7.1 inch. At an average temperature of 28.9 °C | 84.1 °F, April is the hottest month of the year. December is the coldest month, with temperatures averaging 23.2 °C | 73.7 °F.

https://en.climate-data.org/asia/india/tamil-nadu/coimbatore-2788/

Rainfall

TABLE 3.14: RAINFALL DATA

Actual Rainfall in mm					Normal Rainfall in mm
2017	2018	2019	2020	2021	
873.4	1302	1272.4	1585.3	2119.1	1213.2

Source: https://www.twadboard.tn.gov.in/content/coimbatore

TABLE 3.15: METEOROLOGICAL DATA RECORDED AT SITE

S.No	Parameters		Mar – 2022	Apr – 2022	May – 2022
1	Temperature (0C)	Max	28.59	28.37	26.99
		Min	22.78	24.62	23.78
		Avg	25.685	26.495	25.385
2	Relative Humidity (%)	Avg	62.47	74.25	84.97
3	Wind Speed (m/s)	Max	3.55	2.75	5.52
		Min	1.19	0.8	1.55
		Avg	2.37	1.775	3.535
4	Cloud Cover (OKTAS)		0-8	0-8	0-8
5	Wind Direction		ENE,SSW	W,SE	WSW,W

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

Correlation between Secondary and Primary Data

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

• The average maximum and minimum temperatures of IMD, Coimbatore_Agro showed a higher in respect of on-site data i.e. in Karunchamigoundenpalayam village.

• The relative humidity levels were lesser at site as compared to IMD, Coimbatore_Agro.

• The wind speed and direction at site shows similar trend that of IMD, Coimbatore_Agro.

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

FIGURE 3.14: WINDROSE DIAGRAM
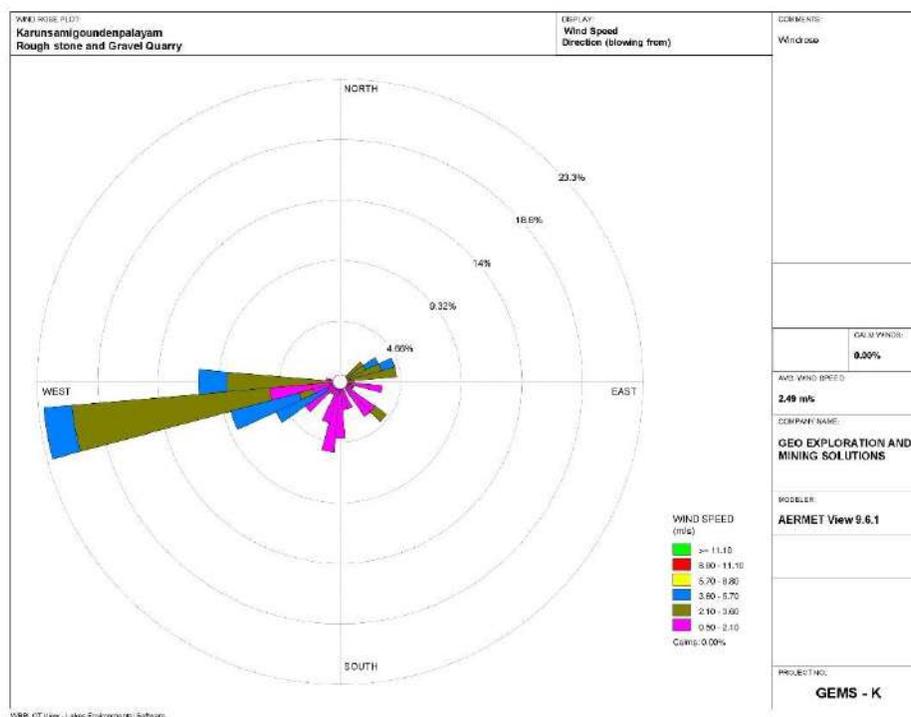
 Source: Wind Rose plot view, Lake Environmental Software

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

• Predominant winds were from East – West.
• Wind velocity readings were recorded between 0.8 to 5.52m/s
• Calm conditions prevail of about 3.33 % of the monitoring period
• Temperature readings ranging from 22.78 to 28.59°C
• Relative humidity ranging from 62.47 to 84.97 %
• 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 Chennai Mettex 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 values 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 eight (8) locations, adopting a continuous 24 hourly (3 shift of 8-hour) schedule for the period March 2022 – May 2022. 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.

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

3.3.5 Ambient Air Quality Monitoring Stations

Nine (9) monitoring stations were set up in the study area as depicted in Figure 3.6.1 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	AAQ1	Core Zone	Project area	10°51'43.87"N 76°55'41.87"E
2	AAQ2	Core Zone	Project area	10°52'44.71"N 76°55'43.61"E
3	AAQ3	Arisipalayam	3km East	10°51'58.25"N 76°58'11.65"E
4	AAQ4	Seerapalayam	4.5km NE	10°53'23.86"N 76°58'32.00"E
5	AAQ5	Chinnayakavundanpudur	4.3km NW	10°53'07.85"N 76°53'22.12"E
6	AAQ6	Meenakshipuram	4km SE	10°49'40.04"N 76°57'35.30"E
7	AAQ7	Kuttykavundanpatty	3km SW	10°50'01.97"N 76°54'30.61"E
8	AAQ8	Veerapanur	3.8km SW	10°51'06.27"N 76°53'16.91"E
9	AAQ9	Thirumalaiyampalayam	1.3km North	10°52'44.71"N 76°55'43.61"E

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

FIGURE 3.15: AMBIENT AIR QUALITY LOCATIONS AROUND 10 KM RADIUS
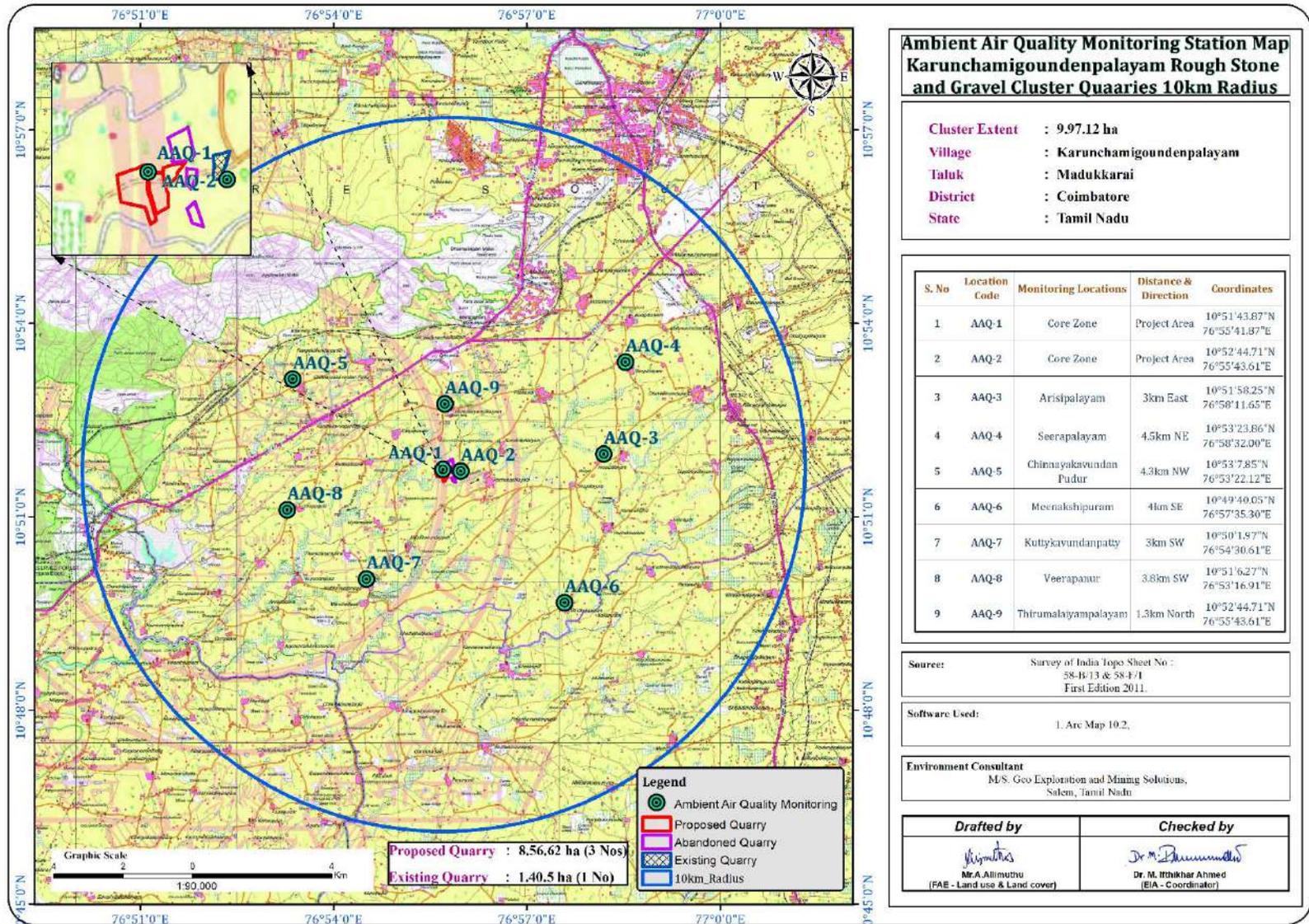
TABLE 3.19: AMBIENT AIR QUALITY DATA LOCATION AAQ1

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM_{10}	$PM_{2.5}$	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	mg/m^3	$\mu g/m^3$	ng/m^3	ng/m^3	$\mu g/m^3$	ng/m^3
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03:03:2022	7:00-7:00	126	52.9	23.2	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04:03:2022	7:15-7:15	102	61.1	38.8	9.2	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10:03:2022	7:00-7:00	111	50.4	21.5	10.3	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11:03:2022	7:15-7:15	128	56.8	27.1	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17:03:2022	7:00-7:00	104	65.2	22.4	9.2	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18:03:2022	7:15-7:15	113	58.5	39.9	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24:03:2022	7:00-7:00	122	64.6	31.6	10.3	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25:03:2022	7:15-7:15	109	51.3	24.3	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31:03:2022	7:00-7:00	128	60.2	20.2	9.8	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01:04:2022	7:15-7:15	102	52.1	25.0	10.3	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07:04:2022	7:00-7:00	121	51.4	30.5	9.2	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08:04:2022	7:15-7:15	117	55.0	39.8	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14:04:2022	7:00-7:00	120	63.2	38.4	8.7	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15:04:2022	7:15-7:15	102	62.5	25.1	10.3	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21:04:2022	7:00-7:00	125	50.8	22.0	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22:04:2022	7:15-7:15	119	51.1	21.2	10.3	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28:04:2022	7:00-7:00	106	56.0	38.5	9.8	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29:04:2022	7:00-7:00	123	69.2	39.1	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05:05:2022	7:15-7:15	102	68.5	36.5	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06:05:2022	7:00-7:00	115	54.4	23.1	9.2	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12:05:2022	7:15-7:15	101	61.7	22.5	8.7	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13:05:2022	7:00-7:00	124	58.8	25.2	10.3	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19:05:2022	7:15-7:15	110	69.9	38.0	9.8	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20:05:2022	7:00-7:00	102	56.5	24.3	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26:05:2022	7:15-7:15	128	65.8	31.9	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27:05:2022	7:00-7:00	119	58.5	22.9	10.3	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03:06:2022	7:00-7:00	105	65.7	30.8	9.8	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04:06:2022	7:15-7:15	122	54.4	28.4	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20);　**O_3**: BDL (DL:20);　**CO**: BDL (DL:1.0);　　　　　　　　**Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0);　**BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

TABLE 3.20: AMBIENT AIR QUALITY DATA LOCATION AAQ2

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM$_{10}$	PM$_{2.5}$	SO$_2$	NO$_2$	NH$_3$	O$_3$	CO	Pb	Ni	As	C$_6$H$_6$	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	mg/m^3	µg/m^3	ng/m^3	ng/m^3	µg/m^3	ng/m^3
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03:03:2022	7:00-7:00	126	59.9	29.9	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04:03:2022	7:15-7:15	102	61.6	31.1	9.2	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10:03:2022	7:00-7:00	111	55.5	25.5	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11:03:2022	7:15-7:15	105	68.2	22.8	8.7	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17:03:2022	7:00-7:00	128	52.1	25.2	9.2	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18:03:2022	7:15-7:15	102	51.4	38.1	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24:03:2022	7:00-7:00	121	54.7	34.4	10.3	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25:03:2022	7:15-7:15	102	67.5	31.5	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31:03:2022	7:00-7:00	126	65.2	26.3	8.7	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01:04:2022	7:15-7:15	113	52.1	35.6	10.3	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07:04:2022	7:00-7:00	118	56.9	22.8	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08:04:2022	7:15-7:15	125	69.1	38.5	9.8	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14:04:2022	7:00-7:00	112	55.4	25.1	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15:04:2022	7:15-7:15	121	61.2	34.2	10.3	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21:04:2022	7:00-7:00	114	52.8	21.5	8.7	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22:04:2022	7:15-7:15	125	55.6	22.8	9.2	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28:04:2022	7:00-7:00	102	58.3	28.4	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29:04:2022	7:00-7:00	116	65.2	35.1	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05:05:2022	7:15-7:15	103	65.8	31.6	8.7	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06:05:2022	7:00-7:00	112	61.4	23.8	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12:05:2022	7:15-7:15	121	52.7	32.5	10.3	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13:05:2022	7:00-7:00	105	55.9	28.1	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19:05:2022	7:15-7:15	122	59.5	34.0	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20:05:2022	7:00-7:00	103	56.2	21.2	8.7	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26:05:2022	7:15-7:15	122	53.1	32.1	9.8	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27:05:2022	7:00-7:00	105	62.5	28.8	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03:06:2022	7:00-7:00	118	65.2	35.4	10.3	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04:06:2022	7:15-7:15	102	51.9	22.2	9.2	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH$_3$**: BDL (DL:20); **O$_3$**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C$_6$H$_6$**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)

Remarks: The values observed for the pollutants given above are within the CPCB standards.

TABLE 3.21: AMBIENT AIR QUALITY DATA LOCATION AAQ3

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM_{10}	$PM_{2.5}$	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	mg/m^3	$\mu g/m^3$	ng/m^3	ng/m^3	$\mu g/m^3$	ng/m^3
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03:03:2022	7:00-7:00	119	52.6	25.6	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04:03:2022	7:15-7:15	101	69.2	32.2	9.2	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10:03:2022	7:00-7:00	125	55.5	21.5	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11:03:2022	7:15-7:15	102	61.1	39.1	10.3	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17:03:2022	7:00-7:00	113	54.2	26.4	9.8	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18:03:2022	7:15-7:15	108	68.6	25.8	8.7	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24:03:2022	7:00-7:00	125	55.3	22.5	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25:03:2022	7:15-7:15	111	54.2	31.2	8.7	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31:03:2022	7:00-7:00	122	52.5	34.1	9.2	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01:04:2022	7:15-7:15	114	66.1	28.4	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07:04:2022	7:00-7:00	105	65.0	35.6	10.3	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08:04:2022	7:15-7:15	128	51.2	22.9	8.7	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14:04:2022	7:00-7:00	112	52.8	31.5	9.8	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15:04:2022	7:15-7:15	101	65.2	25.1	8.7	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21:04:2022	7:00-7:00	125	58.0	38.4	10.3	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22:04:2022	7:15-7:15	112	64.1	37.7	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28:04:2022	7:00-7:00	101	52.4	34.5	9.2	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29:04:2022	7:00-7:00	122	56.8	25.3	8.7	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05:05:2022	7:15-7:15	115	59.9	23.6	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06:05:2022	7:00-7:00	104	60.6	25.2	8.7	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12:05:2022	7:15-7:15	128	65.5	32.5	9.8	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13:05:2022	7:00-7:00	119	52.2	31.9	9.2	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19:05:2022	7:15-7:15	108	61.1	35.8	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20:05:2022	7:00-7:00	124	55.5	28.5	8.7	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26:05:2022	7:15-7:15	105	68.2	34.2	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27:05:2022	7:00-7:00	128	54.1	21.1	10.3	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03:06:2022	7:00-7:00	105	62.2	22.4	10.3	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04:06:2022	7:15-7:15	116	55.0	35.0	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH₃**: BDL (DL:20); **O₃**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C₆H₆**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

TABLE 3.22: AMBIENT AIR QUALITY DATA LOCATION AAQ4

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM$_{10}$	PM$_{2.5}$	SO$_2$	NO$_2$	NH$_3$	O$_3$	CO	Pb	Ni	As	C$_6$H$_6$	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	mg/m^3	µg/m^3	ng/m^3	ng/m^3	µg/m^3	ng/m^3
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03:03:2022	7:00-7:00	106	58.6	28.8	8.7	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04:03:2022	7:15-7:15	122	61.2	31.1	9.2	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10:03:2022	7:00-7:00	101	59.1	25.5	10.3	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11:03:2022	7:15-7:15	115	55.5	29.2	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17:03:2022	7:00-7:00	108	62.8	23.1	9.8	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18:03:2022	7:15-7:15	122	51.2	32.4	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24:03:2022	7:00-7:00	129	64.1	25.8	10.3	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25:03:2022	7:15-7:15	125	58.4	38.5	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31:03:2022	7:00-7:00	111	55.9	25.6	9.2	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01:04:2022	7:15-7:15	104	56.6	21.2	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07:04:2022	7:00-7:00	128	63.3	24.1	10.3	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08:04:2022	7:15-7:15	105	52.2	35.4	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14:04:2022	7:00-7:00	122	51.8	38.8	9.8	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15:04:2022	7:15-7:15	111	64.5	32.9	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21:04:2022	7:00-7:00	103	55.1	29.6	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22:04:2022	7:15-7:15	120	68.2	26.3	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28:04:2022	7:00-7:00	102	51.4	30.2	8.7	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29:04:2022	7:00-7:00	115	60.8	22.5	9.2	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05:05:2022	7:15-7:15	129	52.1	31.1	9.8	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06:05:2022	7:00-7:00	108	51.0	25.4	9.2	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12:05:2022	7:15-7:15	111	55.2	38.7	8.7	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13:05:2022	7:00-7:00	124	69.5	24.8	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19:05:2022	7:15-7:15	107	65.2	21.5	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20:05:2022	7:00-7:00	118	51.0	30.2	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26:05:2022	7:15-7:15	105	58.2	25.1	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27:05:2022	7:00-7:00	102	67.8	35.5	9.8	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03:06:2022	7:00-7:00	121	51.9	28.8	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04:06:2022	7:15-7:15	119	62.5	34.5	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH$_3$**: BDL (DL:20); **O$_3$**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C$_6$H$_6$**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)

Remarks: The values observed for the pollutants given above are within the CPCB standards.

TABLE 3.23: AMBIENT AIR QUALITY DATA LOCATION AAQ5

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM_{10}	$PM_{2.5}$	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	mg/m^3	$\mu g/m^3$	ng/m^3	ng/m^3	$\mu g/m^3$	ng/m^3
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03:03:2022	7:00-7:00	105	59.6	26.6	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04:03:2022	7:15-7:15	121	65.2	35.2	8.7	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10:03:2022	7:00-7:00	108	54.5	22.5	10.3	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11:03:2022	7:15-7:15	122	58.8	31.8	8.7	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17:03:2022	7:00-7:00	113	65.4	25.4	9.8	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18:03:2022	7:15-7:15	128	62.1	28.1	9.2	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24:03:2022	7:00-7:00	105	51.0	35.2	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25:03:2022	7:15-7:15	124	65.9	32.0	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31:03:2022	7:00-7:00	111	55.5	31.3	8.7	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01:04:2022	7:15-7:15	109	68.1	24.6	9.8	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07:04:2022	7:00-7:00	125	54.7	22.9	8.7	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08:04:2022	7:15-7:15	110	62.7	32.8	10.3	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14:04:2022	7:00-7:00	102	51.5	35.5	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15:04:2022	7:15-7:15	121	63.2	28.2	9.2	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21:04:2022	7:00-7:00	115	56.9	38.0	10.3	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22:04:2022	7:15-7:15	102	56.2	24.5	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28:04:2022	7:00-7:00	127	58.0	28.2	9.2	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29:04:2022	7:00-7:00	106	64.4	31.0	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05:05:2022	7:15-7:15	109	67.1	39.2	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06:05:2022	7:00-7:00	118	61.5	26.3	9.8	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12:05:2022	7:15-7:15	125	55.8	33.0	8.7	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13:05:2022	7:00-7:00	102	59.9	22.2	9.8	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19:05:2022	7:15-7:15	111	55.3	31.5	10.3	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20:05:2022	7:00-7:00	120	68.3	38.8	9.2	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26:05:2022	7:15-7:15	107	61.0	21.0	8.7	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27:05:2022	7:00-7:00	120	52.2	32.2	10.3	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03:06:2022	7:00-7:00	112	65.1	27.3	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04:06:2022	7:15-7:15	127	58.8	35.6	9.8	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: BDL: Below Detection Limit ;**DL**: Detection Limit ; 7 **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0);
Pb: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

TABLE 3.24: AMBIENT AIR QUALITY DATA LOCATION AAQ6

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM_{10}	$PM_{2.5}$	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	mg/m^3	$\mu g/m^3$	ng/m^3	ng/m^3	$\mu g/m^3$	ng/m^3
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03:03:2022	7:00-7:00	129	59.9	23.6	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04:03:2022	7:15-7:15	105	65.5	35.2	9.2	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10:03:2022	7:00-7:00	121	61.2	25.5	8.7	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11:03:2022	7:15-7:15	134	64.4	21.6	10.3	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17:03:2022	7:00-7:00	102	58.1	34.2	8.7	20.7.	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18:03:2022	7:15-7:15	125	52.2	32.5	9.8	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24:03:2022	7:00-7:00	108	61.5	20.1	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25:03:2022	7:15-7:15	102	55.8	32.4	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31:03:2022	7:00-7:00	121	62.4	28.5	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01:04:2022	7:15-7:15	115	53.5	24.2	10.3	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07:04:2022	7:00-7:00	104	66.6	31.8	8.7	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08:04:2022	7:15-7:15	121	58.2	20.5	9.2	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14:04:2022	7:00-7:00	103	64.1	32.2	8.7	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15:04:2022	7:15-7:15	116	51.4	29.1	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21:04:2022	7:00-7:00	129	55.5	38.4	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22:04:2022	7:15-7:15	105	59.8	21.5	9.8	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28:04:2022	7:00-7:00	112	52.5	34.9	8.7	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29:04:2022	7:00-7:00	101	55.2	20.5	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05:05:2022	7:15-7:15	122	50.1	32.4	10.3	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06:05:2022	7:00-7:00	125	62.5	25.1	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12:05:2022	7:15-7:15	125	61.9	38.2	9.2	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13:05:2022	7:00-7:00	114	55.5	27.5	8.7	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19:05:2022	7:15-7:15	111	58.1	34.8	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20:05:2022	7:00-7:00	102	64.2	21.5	8.7	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26:05:2022	7:15-7:15	123	51.4	32.4	9.2	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27:05:2022	7:00-7:00	118	62.8	25.5	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03:06:2022	7:00-7:00	102	60.5	39.6	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04:06:2022	7:15-7:15	122	52.2	33.3	9.8	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)

Remarks: The values observed for the pollutants given above are within the CPCB standards.

TABLE 3.25: AMBIENT AIR QUALITY DATA LOCATION AAQ7

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM_{10}	$PM_{2.5}$	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	mg/m^3	$\mu g/m^3$	ng/m^3	ng/m^3	$\mu g/m^3$	ng/m^3
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03:03:2022	7:00-7:00	106	53.6	26.1	10.3	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04:03:2022	7:15-7:15	113	61.1	31.8	9.2	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10:03:2022	7:00-7:00	104	59.9	25.2	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11:03:2022	7:15-7:15	128	51.5	29.5	10.3	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17:03:2022	7:00-7:00	125	65.2	38.4	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18:03:2022	7:15-7:15	114	62.8	35.8	9.8	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24:03:2022	7:00-7:00	109	50.5	22.9	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25:03:2022	7:15-7:15	127	64.4	31.6	10.3	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31:03:2022	7:00-7:00	115	58.1	24.3	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01:04:2022	7:15-7:15	109	65.2	35.2	10.3	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07:04:2022	7:00-7:00	128	52.9	38.5	10.3	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08:04:2022	7:15-7:15	115	61.0	35.8	8.7	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14:04:2022	7:00-7:00	104	55.2	22.7	9.2	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15:04:2022	7:15-7:15	121	63.3	21.4	8.7	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21:04:2022	7:00-7:00	112	55.9	26.0	10.3	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22:04:2022	7:15-7:15	125	67.8	33.1	9.8	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28:04:2022	7:00-7:00	108	54.5	22.2	9.2	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29:04:2022	7:00-7:00	124	51.2	39.5	10.3	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05:05:2022	7:15-7:15	112	55.1	28.8	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06:05:2022	7:00-7:00	101	58.4	35.7	8.7	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12:05:2022	7:15-7:15	125	50.9	20.4	8.7	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13:05:2022	7:00-7:00	108	68.5	32.1	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19:05:2022	7:15-7:15	127	65.1	21.0	9.8	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20:05:2022	7:00-7:00	109	61.4	25.6	10.3	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26:05:2022	7:15-7:15	114	69.8	32.9	9.2	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27:05:2022	7:00-7:00	126	59.4	20.8	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03:06:2022	7:00-7:00	102	53.5	31.1	10.3	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04:06:2022	7:15-7:15	108	55.2	25.8	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH₃**: BDL (DL:20); **O₃**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C₆H₆**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)

Remarks: The values observed for the pollutants given above are within the CPCB standards.

TABLE 3.25: AMBIENT AIR QUALITY DATA LOCATION AAQ8

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM_{10}	$PM_{2.5}$	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	mg/m^3	$\mu g/m^3$	ng/m^3	ng/m^3	$\mu g/m^3$	ng/m^3
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03:03:2022	7:00-7:00	101	58.2	25.2	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04:03:2022	7:15-7:15	128	61.4	31.1	9.2	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10:03:2022	7:00-7:00	102	54.9	25.5	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11:03:2022	7:15-7:15	120	67.3	38.9	8.7	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17:03:2022	7:00-7:00	104	58.2	21.6	9.8	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18:03:2022	7:15-7:15	129	65.1	30.3	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24:03:2022	7:00-7:00	108	52.5	32.2	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25:03:2022	7:15-7:15	115	53.2	33.5	8.7	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31:03:2022	7:00-7:00	102	56.8	36.4	10.3	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01:04:2022	7:15-7:15	120	69.5	29.8	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07:04:2022	7:00-7:00	111	63.2	25.9	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08:04:2022	7:15-7:15	107	69.1	20.6	9.8	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14:04:2022	7:00-7:00	128	58.2	32.3	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15:04:2022	7:15-7:15	115	55.5	21.5	10.3	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21:04:2022	7:00-7:00	102	54.4	38.8	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22:04:2022	7:15-7:15	120	68.9	24.4	9.2	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28:04:2022	7:00-7:00	122	57.9	37.7	8.7	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29:04:2022	7:00-7:00	111	64.8	25.4	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05:05:2022	7:15-7:15	104	58.5	29.1	8.7	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06:05:2022	7:00-7:00	127	69.4	36.2	9.8	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12:05:2022	7:15-7:15	105	56.6	35.5	9.2	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13:05:2022	7:00-7:00	119	65.3	38.8	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19:05:2022	7:15-7:15	126	58.2	35.9	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20:05:2022	7:00-7:00	103	65.1	24.6	10.3	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26:05:2022	7:15-7:15	112	54.5	31.6	9.8	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27:05:2022	7:00-7:00	125	67.4	20.3	8.7	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03:06:2022	7:00-7:00	101	51.8	32.2	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04:06:2022	7:15-7:15	118	62.5	25.1	8.7	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)

Remarks: The values observed for the pollutants given above are within the CPCB standards.

TABLE 3.25: AMBIENT AIR QUALITY DATA LOCATION AAQ9

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM$_{10}$	PM$_{2.5}$	SO$_2$	NO$_2$	NH$_3$	O$_3$	CO	Pb	Ni	As	C$_6$H$_6$	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	mg/m^3	µg/m^3	ng/m^3	ng/m^3	µg/m^3	ng/m^3
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03:03:2022	7:00-7:00	123	59.2	29.5	8.7	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04:03:2022	7:15-7:15	100	61.1	32.2	10.3	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10:03:2022	7:00-7:00	115	58.8	25.1	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11:03:2022	7:15-7:15	100	54.4	26.8	9.2	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17:03:2022	7:00-7:00	121	60.1	23.9	8.7	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18:03:2022	7:15-7:15	108	63.8	35.6	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24:03:2022	7:00-7:00	110	52.3	32.3	8.7	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25:03:2022	7:15-7:15	129	68.9	31.5	9.2	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31:03:2022	7:00-7:00	106	54.2	24.2	8.7	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01:04:2022	7:15-7:15	113	61.9	25.1	10.3	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07:04:2022	7:00-7:00	120	52.2	22.4	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08:04:2022	7:15-7:15	112	63.8	25.2	9.8	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14:04:2022	7:00-7:00	128	58.1	39.5	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15:04:2022	7:15-7:15	119	59.7	38.8	8.7	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21:04:2022	7:00-7:00	105	57.4	34.5	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22:04:2022	7:15-7:15	114	54.5	21.4	8.7	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28:04:2022	7:00-7:00	101	51.2	25.2	10.3	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29:04:2022	7:00-7:00	110	65.1	22.0	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05:05:2022	7:15-7:15	102	60.8	36.2	8.7	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06:05:2022	7:00-7:00	128	53.9	33..1	9.2	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12:05:2022	7:15-7:15	105	66.5	22.5	9.8	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13:05:2022	7:00-7:00	104	55.2	25.8	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19:05:2022	7:15-7:15	111	62.1	28.4	10.3	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20:05:2022	7:00-7:00	102	50.8	24.1	10.3	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26:05:2022	7:15-7:15	118	61.7	20.2	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27:05:2022	7:00-7:00	125	52.9	31.0	8.7	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03:06:2022	7:00-7:00	106	65.8	22.3	9.8	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04:06:2022	7:15-7:15	119	58.5	30.6	9.2	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH$_3$**: BDL (DL:20); **O$_3$**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C$_6$H$_6$**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)

Remarks: The values observed for the pollutants given above are within the CPCB standards.

TABLE 3.26: SUMMARY OF AAQ – 1 to AAQ – 9

Particulate matter (size less than 10μm) PM$_{10}$ (μg/m^3)									
PM10	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9
Arithmetic Mean	58.8	58.9	58.9	58.3	60.0	58.5	59.0	60.7	58.7
Minimum	50.4	51.4	51.2	51.0	51.0	50.1	50.5	51.8	50.8
Maximum	69.9	69.1	69.2	69.5	68.3	66.6	69.8	69.5	68.9
NAAQ Norms	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Particulate matter (size less than 2.5 μm PM2.5 (μg/m3)									
PM2.5	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9
Arithmetic Mean	29.0	29.3	29.6	29.2	30.0	29.2	29.1	30.0	28.0
Minimum	20.2	21.2	21.1	21.2	21.0	20.1	20.4	20.3	20.2
Maximum	39.9	38.5	39.1	38.8	39.2	39.6	39.5	38.9	39.5
NAAQ Norms	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
Sulphur Dioxide (μg/m3)									
SO$_2$	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9
Arithmetic Mean	9.4	9.3	9.3	9.3	9.4	9.3	9.5	9.3	9.3
Minimum	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7
Maximum	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
Nitrogen Dioxide (μg/m3)									
NO$_2$	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9
Arithmetic Mean	21.8	22.0	21.9	21.8	22.1	22.0	21.9	22.2	22.1
Minimum	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7
Maximum	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0

TABLE 3.27: ABSTRACT OF AMBIENT AIR QUALITY DATA

Sl. No.	Parameter	Pollutant Concentration, μg/m³			
		PM$_{10}$	PM$_{2.5}$	SO$_2$	NO$_2$
1	No. of Observations	260	260	260	260
2	10th Percentile Value	51.8	21.5	8.7	20.7
3	20th Percentile Value	53.5	23.6	8.7	20.7
4	30th Percentile Value	55.3	25.2	8.7	20.7
5	40th Percentile Value	56.8	26.3	8.7	21.2
6	50th Percentile Value	58.6	29.5	9.2	21.6
7	60th Percentile Value	61.0	31.6	9.8	22.5
8	70th Percentile Value	62.6	32.5	9.8	22.9
9	80th Percentile Value	65.1	35.2	10.3	22.9
10	90th Percentile Value	67.5	38.1	10.3	23.7
11	95th Percentile Value	68.8	38.8	10.3	23.7
12	98th Percentile Value	69.5	39.2	10.3	23.7
13	Arithmetic Mean	60.9	31.0	9.5	22.2
14	Geometric Mean	60.6	30.4	9.5	22.2
15	Standard Deviation	6.2	6.3	0.7	1.3
16	Minimum	51.8	21.5	8.7	20.7
17	Maximum	69.5	39.2	10.3	23.7
18	**NAAQ Norms***	**60.0**	**100.0**	**80.0**	**80.0**
19	% Values exceeding Norms*	0.0	0.0	0.0	0.0

Legend: PM$_{2.5}$-Particulate Matter size less than 2.5 µm; PM$_{10}$-Respirable Particulate Matter size less than 10 µm; SO$_2$-Sulphur dioxide; NO$_x$-Oxides of Nitrogen; CO-Carbon monoxide; O$_3$-Ozone; NH$_3$-Ammonia;

Pb-Particulate Lead; As-Particulate Arsenic; Ni-Particulate Nickel; C$_6$H$_6$-Benzene & BaP- Benzo (a) pyrene in particulate phase levels were monitored below their respective detectable limits

* NAAQ Norms-National Ambient Air Quality Norms-Revised as per GSR 826(E) dated 16.11.2009 for Industrial, Residential, Rural and other Areas.

FIGURE 3.16: BAR DIAGRAM OF SUMMARY OF AAQ 1 – AAQ 9

Summary of Ambient Air Quality Data (AAQ 1 - AAQ9)

	PM10	PM2.5	SO2	NO2
98th Percentile Value	39.2	69.5	10.3	23.7
Arithmetic Mean	31.0	60.9	9.5	22.2
Minimum	21.5	51.8	8.7	20.7
Maximum	39.2	69.5	10.3	23.7
NAAQ Norms*	60.0	100.0	80.0	80.0
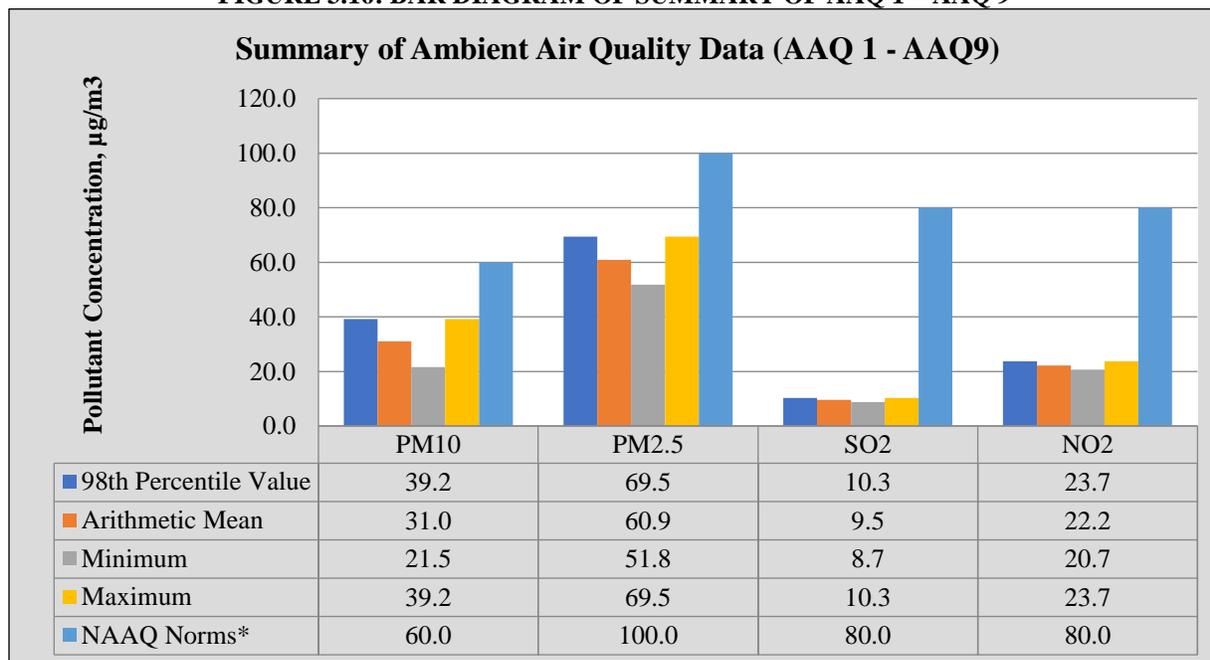
Source: Table 3.17 to 3.27

FIGURE 3.17: BAR DIAGRAM OF PARTICULATE MATTER PM$_{2.5}$

Particulate Matter (PM2.5, µg/m3)

	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9
■ Arithmetic Mean	29.0	29.3	29.6	29.2	30.0	29.2	29.1	30.0	28.0
■ Minimum	20.2	21.2	21.1	21.2	21.0	20.1	20.4	20.3	20.2
■ Maximum	39.9	38.5	39.1	38.8	39.2	39.6	39.5	38.9	39.5
■ NAAQ Norms	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
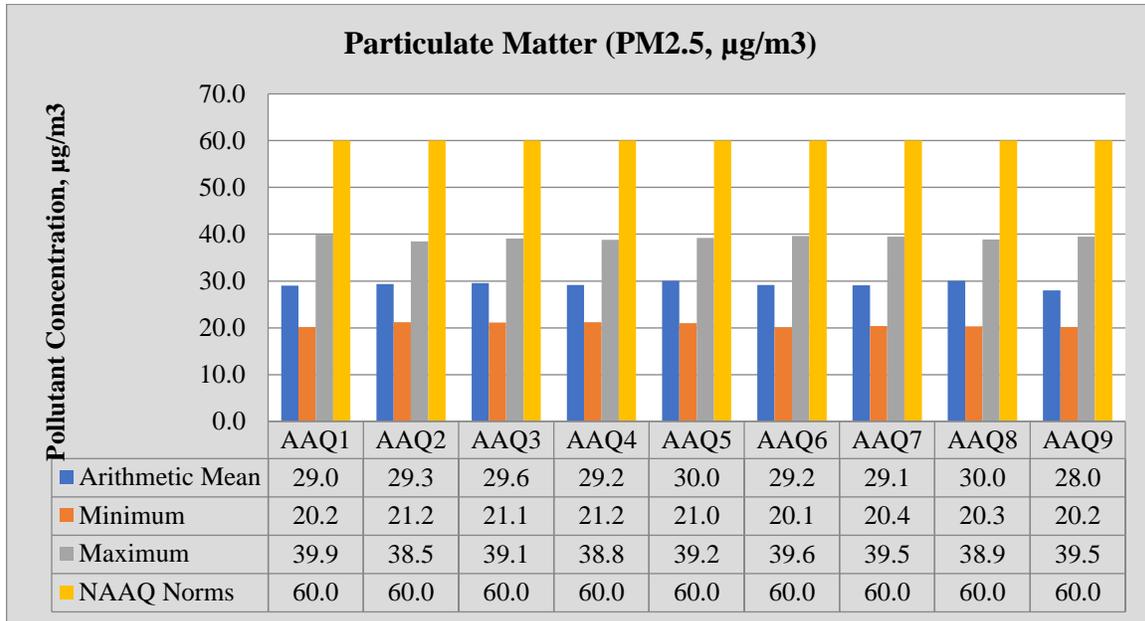
Source: Table 3.17 to 3.27

FIGURE 3.18: BAR DIAGRAM OF PARTICULATE MATTER PM$_{10}$

Particulate Matter (PM10, µg/m3)

	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9
■ Arithmetic Mean	58.8	58.9	58.9	58.3	60.0	58.5	59.0	60.7	58.7
■ Minimum	50.4	51.4	51.2	51.0	51.0	50.1	50.5	51.8	50.8
■ Maximum	69.9	69.1	69.2	69.5	68.3	66.6	69.8	69.5	68.9
■ NAAQ Norms	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
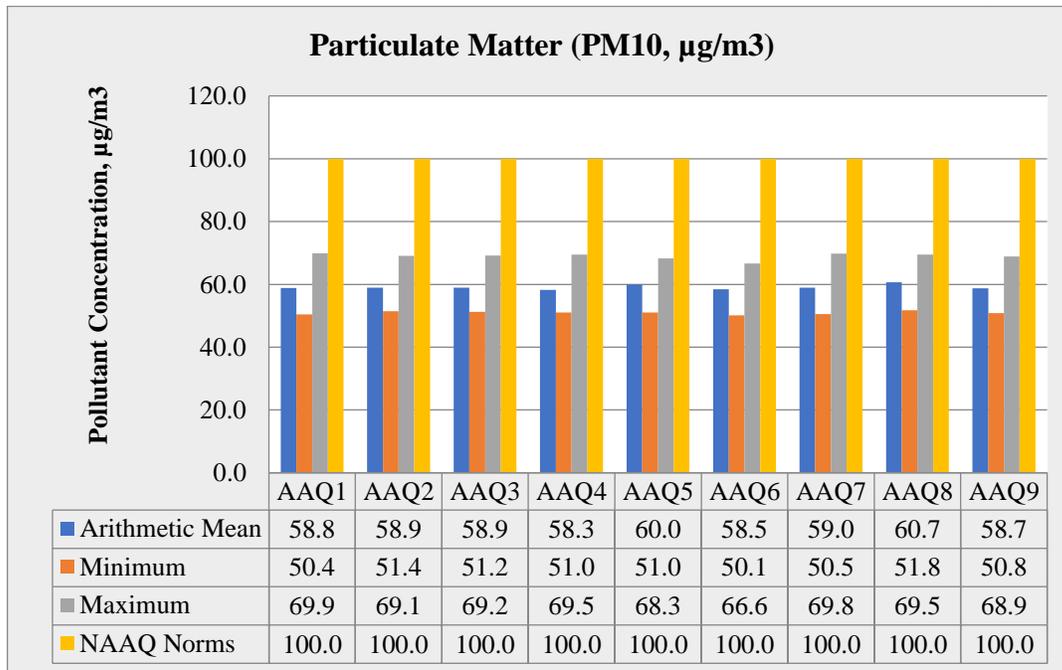
Source: Table 3.17 to 3.27

FIGURE 3.19: BAR DIAGRAM OF GASEOUS POLLUTANT SO$_2$

Gaseous Pollutant (SO2, µg/m3)

	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9
■ Arithmetic Mean	9.4	9.3	9.3	9.3	9.4	9.3	9.5	9.3
■ Minimum	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7
■ Maximum	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3
■ NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
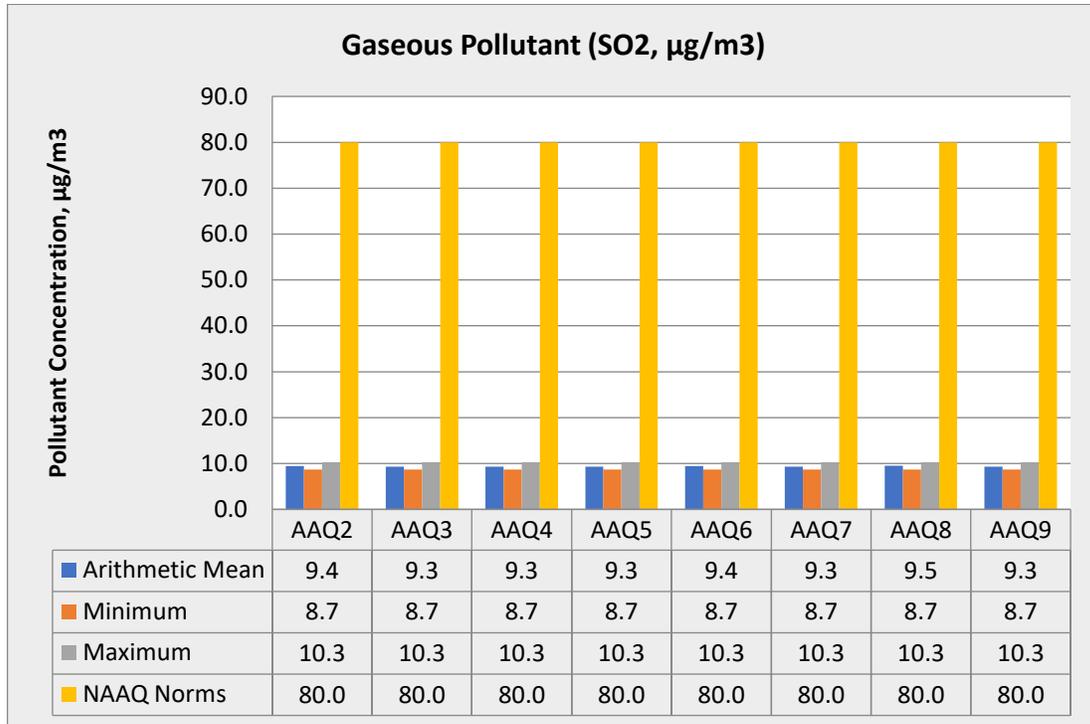
Source: Table 3.17 to 3.27

FIGURE 3.20: BAR DIAGRAM OF GASEOUS POLLUTANT NO$_x$

Gaseous Pollutant (NOx, µg/m^3)

	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9
■ Arithmetic Mean	21.8	22.0	21.9	21.8	22.1	22.0	21.9	22.2	22.1
■ Minimum	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7
■ Maximum	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7
■ NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
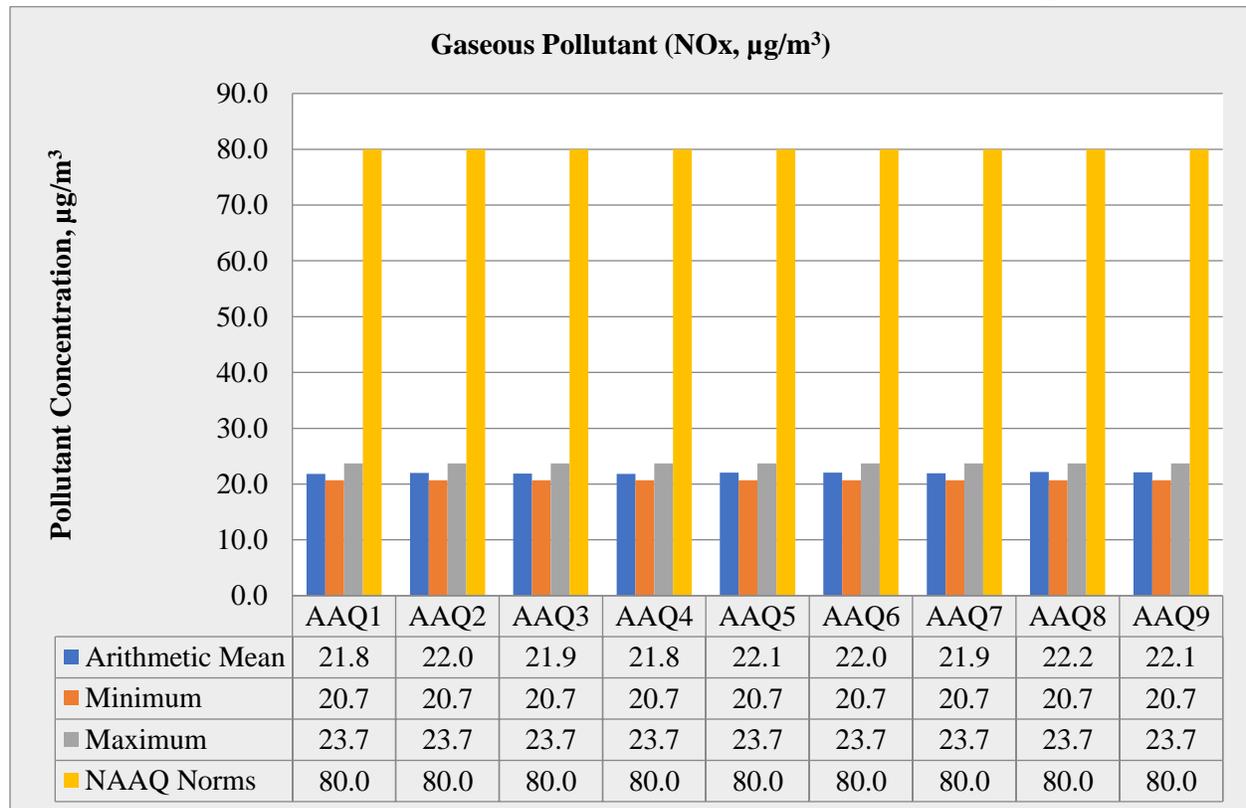
Source: Table 3.17 to 3.27

3.3.6   Interpretations & Conclusion

As per monitoring data, PM10 ranges from 50.4 µg/m^3 to 69.9 µg/m^3, PM$_{2.5}$ data ranges from 20.2 µg/m^3 to 39.9 µg/m^3, SO$_2$ ranges from 8.7 µg/m^3 to 10.3 µg/m^3 and NO$_2$ data ranges from 20.7 µg/m^3 to 23.7 µg/m^3. The concentration levels of the above criteria pollutants were observed to be well within the limits of NAAQS prescribed by CPCB.

3.3.7   FUGITIVE DUST EMISSION

- Instruments used for air monitoring –
    - Fugitive dust samples was collected by using APM 860 (Respirable Dust Sampler)
    - Fugitive dust was recorded at 9AAQ monitoring stations during the study period.
- Fugitive dust emission is predicted by the standard equations given in The Indian Mining & Engineering Journal and by US-EPA (Emission Factors as referred in AP - 42), powered by AERMOD ver. 9.6.1 of lakes Environment.

Emission Estimation –

The emission estimation is dependent of parameters such as meteorological, topographic conditions and the material characteristics. The amount of emission rate for the source on site into the atmosphere needs to be calculated.

Different Dust Sources –

- **Drilling Source –**

    The drilling source is most representative for a point source; this is an emission with a very small opening such as a stack or vent.

- **Haul roads and waste dump Source –**

    For haul roads the most representative dust source is assumed to be a volume source just above the ground surface and waste dump is assumed to be an area source.

- **Open pit Source –**

    It considers a dust source all over the quarry area.

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 nine (9) locations. The noise level monitoring locations were carried out by covering commercial, residential, rural areas within the radius of 10km. A noise monitoring methodology was chosen such that it best suited the purpose and objectives of the study.

TABLE 3.28: DETAILS OF SURFACE NOISE MONITORING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	N1	Core Zone	Project area	10°51'43.62"N 76°55'42.06"E
2	N2	Core zone	Project area	10°51'42.69"N 76°56'02.43"E
3	N3	Arisipalayam	2.8km East	10°51'57.22"N 76°58'04.01"E
4	N4	Seerapalayam	4.5km NE	10°53'22.27"N 76°58'32.80"E
5	N5	Chinnayakavundan pudur	4.3km NW	10°53'08.05"N 76°53'22.26"E
6	N6	Meenakshipuram	4km SE	10°49'40.04"N 76°57'35.77"E
7	N7	Kuttykavundanpatty	3km SW	10°50'01.54"N 76°54'30.34"E
8	N8	Veerapanur	3.8km SW	10°51'05.30"N 76°53'18.50"E
9	N9	Thirumalaiyampalayam	1.3km North	10°52'44.44"N 76°55'41.83"E

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

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

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

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

T = Time interval of observation

FIGURE 3.21: NOISE MONITORING STATIONS AROUND 10 KM RADIUS
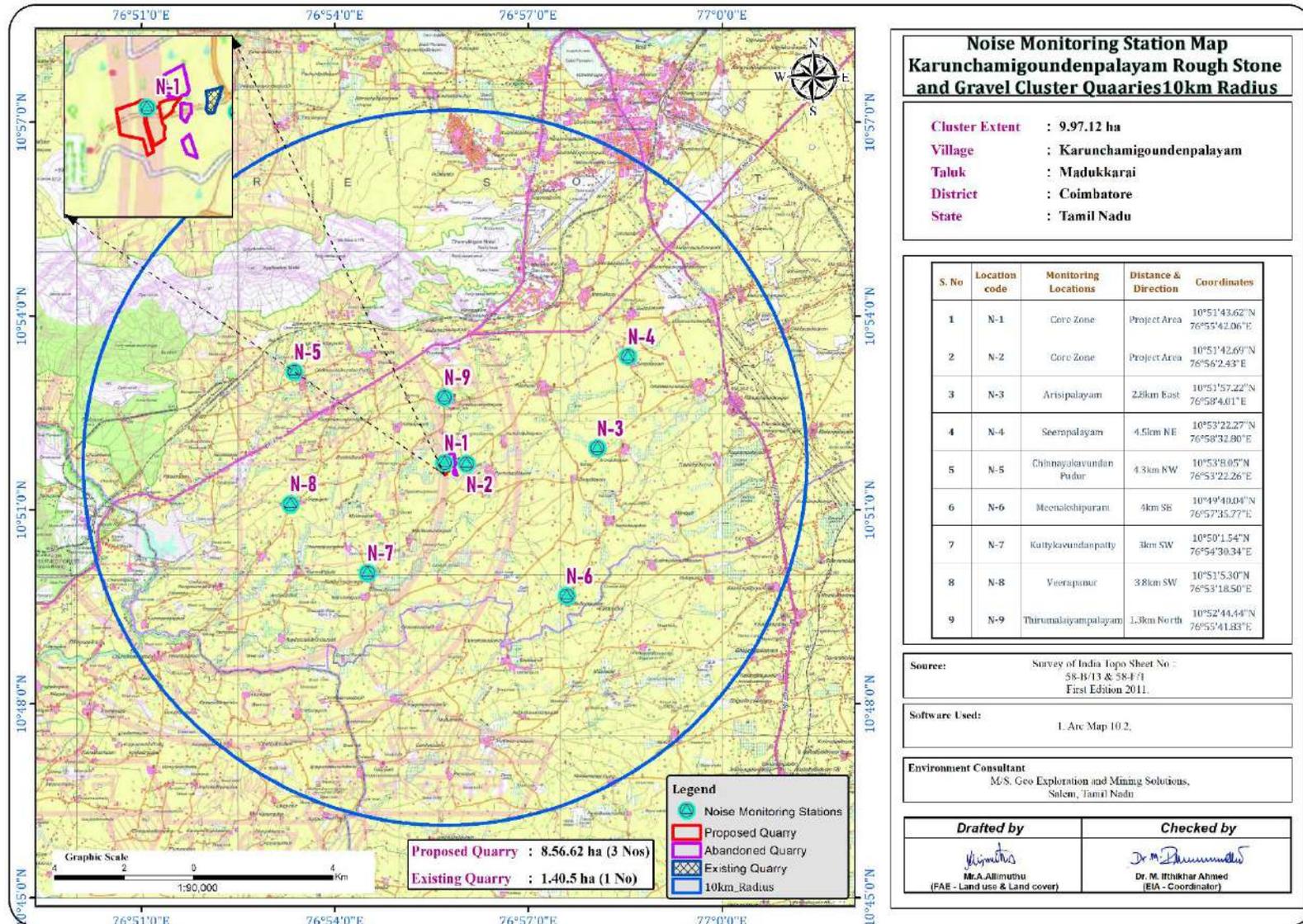
3.4.3   Analysis of Ambient Noise Level in the Study Area

The Digital Sound pressure level has been measured by a sound level meter (Model: HTC SL-1352)
An analysis of the different Leq data obtained during the study period has been made. Variation was

noted during the day-time as well as night-time. The results are presented in below Table 3.29

Day time: 6:00 hours to 22.00 hours.

Night time: 22:00 hours to 6.00 hours.

TABLE 3.29: AMBIENT NOISE QUALITY RESULT

S. No	Locations	Noise level (dB (A) Leq)		Ambient Noise Standards
		Day Time	**Night Time**	
1	Core Zone	62.8	51.6	**Industrial**
2	Core zone	62.5	50.1	
3	Arisipalayam	49.8	37.8	**Day Time- 75 dB (A)**
4	Seerapalayam	49.4	38.6	**Night Time- 70 dB (A)**
5	Chinnayakavundan pudur	49.7	39.7	
6	Meenakshipuram	49.6	41.3	**Residential**
7	Kuttykavundanpatty	50.7	41.3	
8	Veerapanur	49.5	39.7	**Day Time– 55 dB (A)**
9	Thirumalaiyampalayam	42.3	40.5	**Night Time- 45 dB (A)**

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

FIGURE 3.22: DAY TIME NOISE LEVELS IN CORE AND BUFFER ZONE
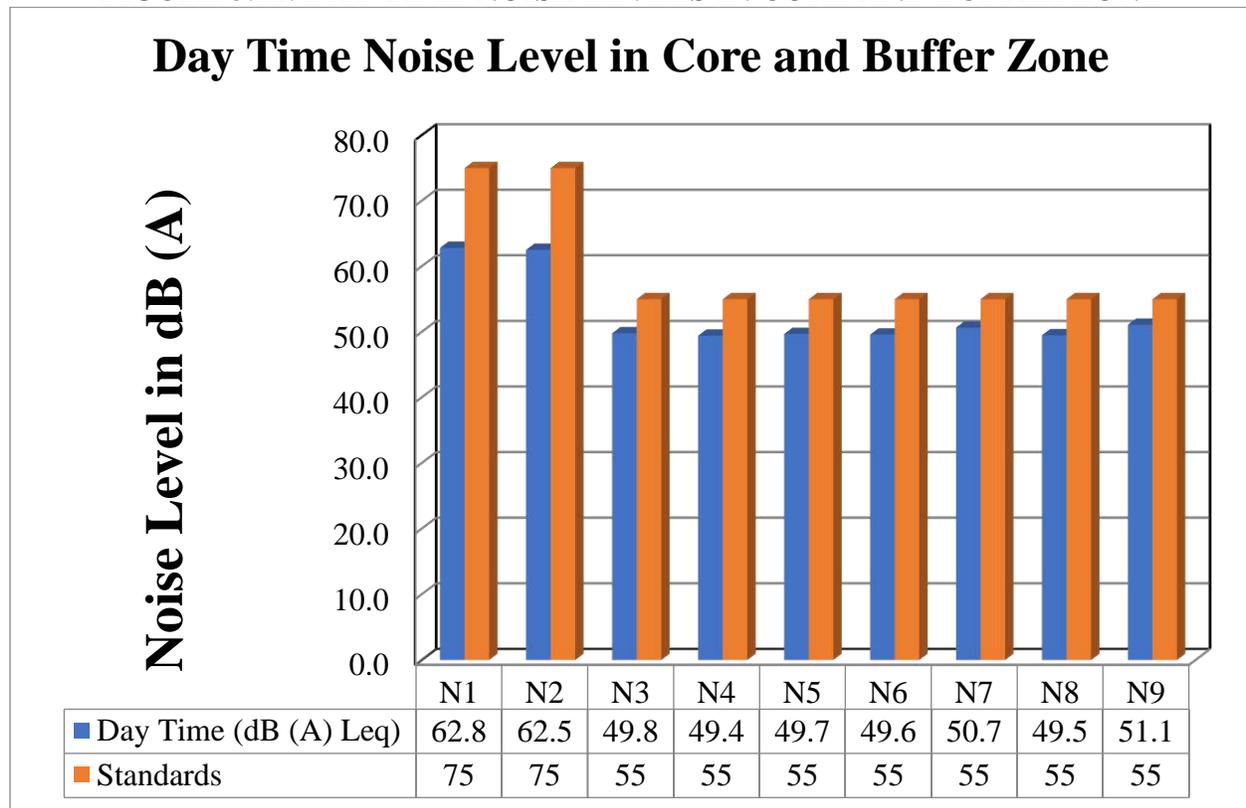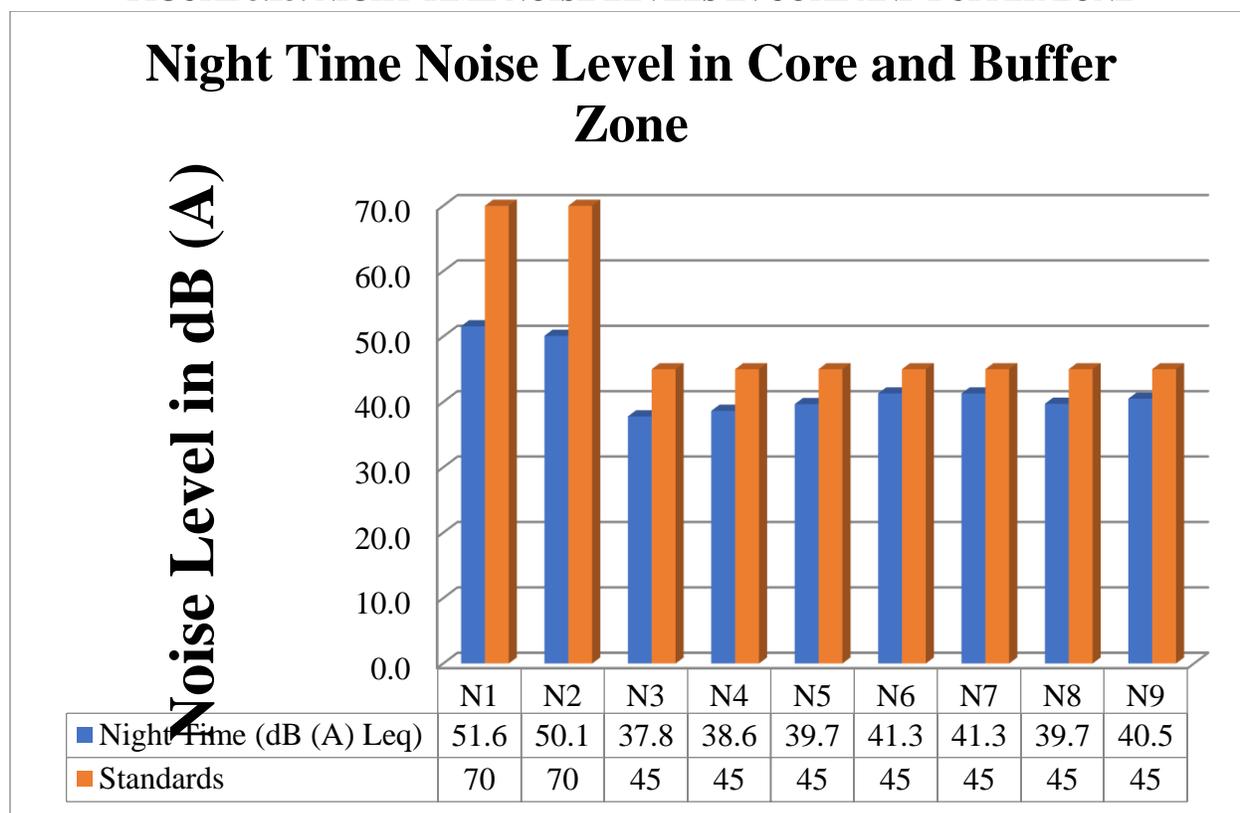

	N1	N2	N3	N4	N5	N6	N7	N8	N9
Day Time (dB (A) Leq)	62.8	62.5	49.8	49.4	49.7	49.6	50.7	49.5	51.1
Standards	75	75	55	55	55	55	55	55	55

FIGURE 3.23: NIGHT TIME NOISE LEVELS IN CORE AND BUFFER ZONE

Night Time Noise Level in Core and Buffer Zone

	N1	N2	N3	N4	N5	N6	N7	N8	N9
Night Time (dB (A) Leq)	51.6	50.1	37.8	38.6	39.7	41.3	41.3	39.7	40.5
Standards	70	70	45	45	45	45	45	45	45

3.4.4   Interpretation & Conclusion:

Ambient noise levels were measured at 9 locations around the cluster area. Noise levels recorded in core zone during day time were from 62.5 – 62.8 dB (A) Leq and during night time were from 50.1 – 51.6 dB (A) Leq. Noise levels recorded in buffer zone during day time were from 42.3 – 50.7 dB (A) Leq and during night time were from 37.8 – 41.3 dB (A) Leq.

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

3.5   ECOLOGICAL ENVIRONMENT

Ecology is a branch of science which dealing the relations and interactions between organisms and their environment. An ecological survey of the study area was conducted, particularly with reference to listing of species and assessment of the existing baseline ecological conditions in the study area. The main objective of biological study is to collect the baseline data regarding flora and fauna in the study area. Data has been collected through extensive survey of the area with reference to flora and fauna. Information is also collected from different sources i.e. government departments such as District Forest Office, Government of Tamil Nadu. On the basis of onsite observations as well as forest department records the checklist of flora and fauna was prepared

3.5.1   Scope of Work

Scope of work for this study includes identification of ecologically sensitive receptors, based on literature survey, field investigations and their mitigation with conservation action plan. The study was carried out in the core as well as buffer zone of the Proposed Rough stone and gravel quarry. The study was carried out systematically and scientifically using primary and secondary data in order to bring out factual information on the ecological conditions of the mine site and 10 km radius study area.

The study involved assessment of general habitat type, vegetation pattern, preparation of inventory of flora and fauna of terrestrial ecosystem within 10 km radius from the boundary of Proposed Mine site. Biological assessment of the site was done to identify ecologically sensitive areas and whether there are any rare, endangered, endemic or threatened (REET) species of flora & fauna in the core area as well its buffer zone to be impacted. The study also designed to suggest suitable mitigation measures if necessary for protection of wildlife habitats and conservation of REET species if any.

3.5.2   Objectives of Biological Studies

The present study was undertaken with the following objectives:

1. To study the likely impact of the proposed mining project on the local biodiversity and to suggest mitigation measure, if required, for vulnerable biota.
2. To assess the nature and distribution of vegetation (Terrestrial and Aquatic) in and around the mining activity.
3. Detail of flora and fauna, Endemic, Rare, Endangered and Threatened (RET Species) separately for core and buffer area based on such primary field survey and clearly indicating the Schedule of fauna present. In case of any schedule- 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.
4. Devise management & conservation measures for biodiversity.

3.5.3   Methodology of Sampling

The present study was carried out in given steps

1. Field survey was conducted by visual encounter survey for flora present within the 10 km radius study area of all the proposed mine site.
2. After surveying the core and buffer areas, a detailed floral inventory has been compiled. List of all plants of the study area was prepared and their habitats were recorded.
3. Verification of Rare, Endangered and Threatened Flora species from IUCN Red Data Book.
4. Plants and Animals communities were noted.

Site selection criteria: The core study area is located at Village: Karunchamigoundanpalayam, Taluk: Madukkarai, District: Coimbatore, Tamil Nadu. The buffer study area comprises of 10 km radius from the proposed rough stone and Gravel quarry area.

Selection of sampling locations was made with reference to topography, land use, vegetation pattern, etc. The observations were taken on natural vegetation, roadside plantation and non-forest area (agricultural field, in plain areas, village wasteland, etc.) for quantitative representation of different species.

A methodology of Sampling Flora and fauna studies were carried out to assess the list of terrestrial plant and animal species that occur in the core area and the buffer area up to 10 km radius from the project site. No damage is created to flora and fauna during the sampling.

In order to provide representative ecological status for the study area, the 10-km buffer zone has been divided into four quartiles for biodiversity sampling, i.e., NE (Quartile-1), NW (Quartile-2) SW (Quartile-3) and SE (Quartile-4) is given in Fig. 3.20. Each of the quartiles have been examined for representative flora on randomly sampled quadrats for trees (25x25-m), shrubs (10x10-m) and herbs (2x2-m) depending upon prevailing geographical conditions and bio-diversity aspects of study area.

FIGURE 3.24: A SCHEMATIC DIAGRAM FOR FLORAL RANDOM SAMPLING
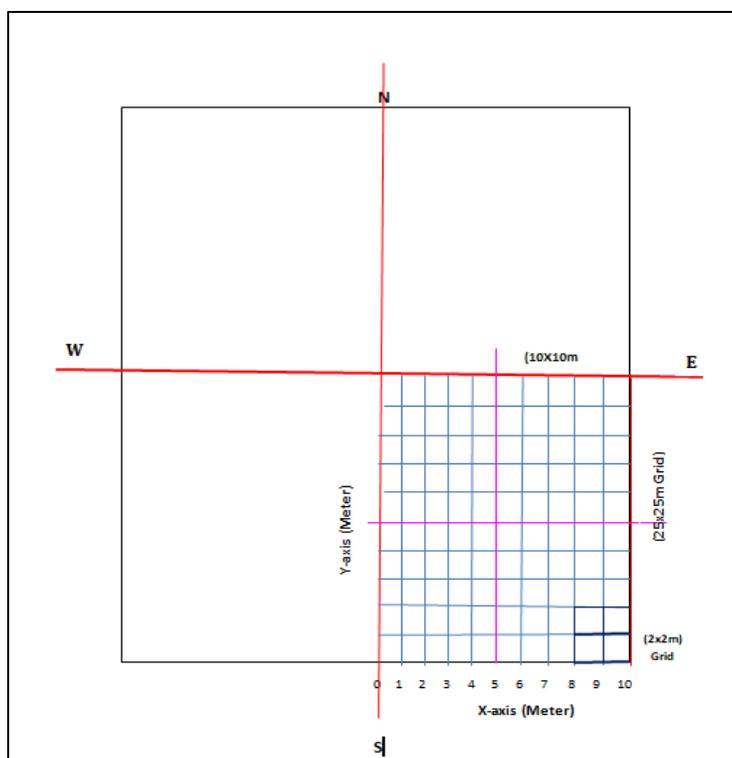
Phyto-sociological Survey method

Phyto-sociological parameters, viz., Abundance, Density, Frequency (%) were measured. A total of 10 quadrats were laid down randomly within core area and 40 quadrats were laid down within four quartiles randomly (10/quartile) in buffer area. In core area 10 quadrats were laid randomly to enumerated trees, shrubs, and herbs as per the Following formulae used for calculating the frequency (%), abundance and density of the floral species encountered in the 10 quadrats studied.

Quadrats method

Quadrats of 25×25-m were laid down randomly within core and 5-km buffer area; each quadrat was laid to assess the trees (>5 cm GBH) and one, 10×10-m sub-quadrat nested within the quadrat for shrubs. The quadrats were laid randomly to cover the area to maximize the sampling efforts and minimize the species homogeneity, such as small stream area, trees in agricultural bunds, tank bunds, farm forestry plantations, wildlife areas, natural forest area, avenue plantations, house backyards, etc. In each quadrat individuals belonging to tree (25×25-m) and shrub (10×10-m) were recorded separately and have been identified on the field. Quadrates sampling methods is given in Fig no.3.20.

FLORA IN CORE ZONE

Baseline study showed that very low species richness (14) comprising of five trees (5), three shrub (3) and six herbs (6). Fourteen flora varieties distributed among 11 families with dominated by Arecaceae (2) and Rubiaceae (7) each species. No species found as threatened category. Details of flora with the scientific name were mentioned in Table No. 3.31. The result of core zone of flora studies shows that Fabaceae and Lamiaceae, Amaranthaceae are the main dominating species in the study area it mentioned in Table No.3.31 and the details of diversity of flora family's pattern are given in Fig No.3.27. No species found as threatened category (Table No. 3.29).

FLORA IN BUFFER ZONE

Similar type of environment also in buffer area but with more flora diversity compare than core zone area because nearby agriculture land was found to dominate mostly in all the directions. Majority of the flat landscape around project unit is occupied by agriculture fields. It contains a total of 65 species belonging to 36 families have been recorded from the buffer zone. Taxonomically a total of 30 species belonging to 22 families have been recorded from the Buffer mining lease area. Based on habitat classification of the enumerated plants the majority of species

were tree 15 followed by shrubs 5 Herbs 8 and rest 2 is a creeper. The result of buffer zone of flora studies shows that Fabaceae and Moraceae, Lamiaceae are the main dominating species in the study area it mentioned in Table No.3.32. There is no Rare, Endangered and Threatened Flora species in mining area and their surrounding area. Details of flora with the scientific name were mentioned in Table No.3.30 The diversity of flora families is given in Fig No.3.6.

TABLE 3.30: FLORA IN CORE ZONE

SI.No	English Name	Vernacular Name	Scientific Name	Family Name
TREES				
1	Coconut	Thennai maram	Cocos nucifera	Arecaceae
2	Asian Palmyra plam	Panai maram	Borassus flabellifer	Arecaceae
3	Neem or Indian lilac	Vembu	Azadirachta indica	Meliaceae
4	Acacia Nilotica	Karuvelam maram	Vachellia nilotica	Fabaceae
5	Noni	Nuna maram	Morinda citrifolia	Rubiaceae
SHRUBS				
6	Milk Weed	Erukku or Crown flower	Calotropis gigantea	Apocynaceae
7	Avaram	Avarai	Senna auriculata	Fabaceae
8	Touch-me-not	Thottalchinungi	Mimosa pudica	Mimosaceae
HERBS				
9	Tridax daisy	Veetukaayapoondu	Tridax procumbens	Asteraceae
10	Indian doab	Arugampul	Cynodon dactylon	Poaceae
11	Mountain knotgrass	Poolai poondu	Aerva lanata	Amaranthaceae
12	Yellow-fruit Nightshade	Kantang kathrikai	Solanum virginianum	Solanaceae
13	Common leucas	Thumbai	Leucas aspera	Lamiaceae
14	Devil's thorn	Nerunji	Tribulus terrestris	Zygophyllales

TABLE 3.31: FLORA IN BUFFER ZONE

SI.No	English Name	Vernacular Name	Scientific Name	Family Name	*Use type
TREES					
1	Mango	Manga	Mangifera indica	Anacardiaceae	E
2	Coconut	Thennai maram	Cocos nucifera	Arecaceae	EM
3	Asian Palmyra plam	Panai maram	Borassus flabellifer	Arecaceae	E
4	Guava	Koyya	Psidium guajava	Myrtaceae	EM
5	Jack fruit	Palamaram	Artocarpus heterophyllus	Moraceae	E
6	Neem or Indian lilac	Vembu	Azadirachta indica	Meliaceae	M
7	Papaya	Pappali maram	Carica papaya L	Caricaceae	EM
8	Date palm	Pericham	Phoenix dactylifera	Arecaceae	EM
9	Indian fir tree	Nettilinkam	Polylathia longifolia	Annonaceae	E
10	Acacia Nilotica	Karuvelam maram	Vachellia nilotica	Fabaceae	M
11	Noni	Nuna maram	Morinda citrifolia	Rubiaceae	M
12	Lemon	Ezhumuchaipalam	Citrus lemon	Rutaceae	EM
13	Manilkara zapota	Sapota	Manilkara zapota	Sapotaceae	E
14	custard apple	seethapazham	Annona reticulata	Annonaceae	E
15	banana tree	Vazhaimaram	Musa	Musaceae	E,M
SHRUBS					
16	Indian mallow	Thuthi	Abutilon indicum	Meliaceae	M
17	Milk Weed	Erukku	Calotropis gigantea	Apocynaceae	M
18	Indian plum	Elanthapazham	Ziziphus mauritiana	Rhamnaceae.	E
19	Avaram	Avarai	Senna auriculata	Fabaceae	M
20	Touch-me-not	Thottalchinungi	Mimosa pudica	Mimosaceae	M
HERBS					
21	Carrot grass	Parttiniyam	Parthenium hysterophorus	Asteraceae	NE
22	Wild eggplant	Kantankattiri	Solanum xanthocarpum	Solanaceae	M
23	Sickle senna	Thagarai	Sennatora	Fabaceae	E

24	Tridax daisy	Veetukaayapoondu	Tridax procumbens	Asteraceae	M
25	Indian doab	Arugampul	Cynodon dactylon	Poaceae	E
26	Common Cocklebur	Marul-umattai	Xanthium strumarium	Asteraceae	M
27	European black nightshade	Manathakkali	Solanumnigrum	Solanaceae	EM
28	Common leucas	Thumbai	Leucas aspera	Lamiaceae	M
CLIMBER					
29	Pointed gourd	Kovakkai	Trichosanthes dioica	Cucurbitaceae	EM
30	Bottle Guard	Sorakkai	Lagenaria siceraria	Cucurbitaceae	EM

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

AQUATIC VEGETATION

The field survey for assessing the aquatic vegetation was also undertaken during the study period. The list of aquatic plants observed in the study area is given in Table 3.32.

TABLE 3.32: AQUATIC VEGETATION

Sl.No	Scientific name	Common Name	Tamil Name	IUCN List
1	*Eichornia crassipe*	Water hyacinth	Agayatamarai	NA
2	*Aponogetonnatans*	Floating laceplant	Kottikizhnagu	NA
3	*Nymphaea nouchali*	Blue waterlily	Nellambal	LC

*LC- Least Concern, NA-Not yet assessed

FAUNA

The faunal survey has been carried out as per the methodology cited and listed out Mammals, birds, Reptiles, Amphibians and Butterflies. All the listed species were compared with Red Data Book and Indian Wildlife Protection Act, 1972. There are no rare, endangered, threatened (RET) and endemic species present in core area.

FAUNA METHODOLOGY

The study of fauna takes substantial amount of time to understand the specific faunal characteristics of the area. The assessment of fauna has been done on the bases of primary data collected from the lease sites. The presence was also confirmed from the local inhabitants depending on the animal sightings and the frequency of their visits in the project area. In addition, officials, local peoples were another source of information for studying the fauna of the area. Field activities are physical/active search, covering rocks, burrows, hollow inspection and location of nesting sites and habitat assessment etc. Taxonomical identification was done by the field guide book and wildlife envis data base (wiienvis.nic.in/Database/Schedule Species Database) and Zoological Survey of India (ZSI). Detailed faunas methodology is mentioned in the Table No. 3.5.

Survey and Monitoring of Mammals

Intensive survey has been done by line transect methods (Walking and in vehicle) for all major habitats for surveying of mammals by direct and indirect evidence. Indirect methods such as faecal matter (i.e., scat) and pug mark by establishing 10×100-m linear transects depending on the habitat (i.e., existing wildlife game routes/forest trails used).

Direct observation technique has been used for surveying large and medium sized mammals. But this technique is perfectly suitable for surveying of diurnal mammals; however, good photographs were also taken for species identification.

Survey and Monitoring of Birds

Birds are sampled by using point count methods, and opportunistic bird sightings. By this bird vocal sounds and photographs, the species were identified in consultation with village local people.

Point count: in this method, the observer will stand in a randomly chosen point and birds seen or heard in 50m radius are recorded for 5-min. this observation is repeated in another point at least 30m from the first point. We have enumerated 20 point – counts in each quartile, which constitute a total of 80 points-count (20 x 4) within 10 km radius area.

Opportunistic bird sightings: while traveling in study area, many bird species will be detected in survey time. Such species are recoded by their appearance or by their call.

Survey and Monitoring of reptiles

Several survey techniques such as standard walk transect visual encounter survey methods were used to sampling reptiles in each and every habitat of the study area. While doing this survey, photographs were taken for identification of species. Species identification was done by using standard field guides in consultation with village people expert.

The butterfly was enumerated by 2 linear transects of 10×100 m were laid within each quartile at minimum interval of 1 km. Further, amphibians and fishes documented in existing literature and secondary information in consultation with local people and wildlife experts.

FAUNA IN CORE ZONE

Baseline study reported that there is very low species richness (21) comprising of eight birds, nine insects, three reptiles and one mammal in core zone of Thiru. K. Vazhaithotta Gounder Rough stone and Gravel quarry area. No species is under endemic, endangered or vulnerable status. Number of species are low might be due to lack of vegetation and forest cover in mining lease area. This has happened because of scarcity of rain in and around the mining lease, which are indicated by the spiny plant's domination.

Dominant species are mostly birds and insects and three amphibians were observed during the extensive field visit (Hoplobatrachus tigerinus), (Rana hexadactyla), (Bufo melonosticatus). There are no critically endangered, endangered, vulnerable and endemic species were observed. Details of fauna in core zone with the scientific name were mentioned in Table No. 3.33.

TABLE 3.33: FAUNA IN CORE ZONE

SI.No	English Name	Family Name	Scientific Name	WPA Schedule	*IUCN Class
INSECTS					
1	Striped tiger	Nymphalidae	Danaus plexippus	NL	NL
2	Ant	Formicidae	Camponotus Vicinus	NL	NL
3	Praying mantis	Mantidae	mantis religiosa	NL	NL
4	Grasshopper	Acrididae	Hieroglyphus sp	NL	LC
5	Common Tiger	Nymphalidae	Danaus genutia	NL	NL
6	Red-veined darter	Libellulidae	Sympetrum fonscolombii	NL	LC
7	Milkweed butterfly	Nymphalidae	Danainae	NL	LC
8	Termite	Blattodea	Hamitermes silvestri	NL	LC
9	Stick insect	Lonchodidae	carausius morosus		
REPTILES					
10	Garden lizard	Agamidae	Calotes versicolor	NL	LC
11	Common house gecko	Gekkonidae	Hemidactylus frenatus	NL	LC
12	Fan-Throated Lizard	Agamidae	Sitanaponticeriana	NL	LC
MAMMALS					
13	Cattle	Bividae	Bus taurus	NL	NL
AVES					
14	Asian green bee-eater	Meropidae	Meropsorientalis	NL	LC
15	Common myna	Sturnidae	Acridotheres tristis	NL	LC
16	House crow	Corvidae	Corvussplendens	NL	LC
17	Common cuckoo	Cucalidae	Cuculus canorus	NL	LC
18	Cattle egret	Ardeidae	Bubulcus ibis	NL	LC
19	Red-vented Bulbul	Pycnonotidae	Pycnonotuscafer	Schedule IV	LC
20	Koel	Cucalidae	Eudynamys	Schedule IV	LC
21	White-breasted waterhen	Rallidae	Amaurornis phoenicurus	NL	LC

*NE- Not evaluated; LC- Least Concern, NT –Near Threatened, T-Threatened

FAUNA IN BUFFER ZONE

Baseline study reported that there is low species richness (30) comprising of eleven birds, thirteen insects, three reptiles and three mammals in Buffer zone of Thiru. K. Vazhaithotta Gounder Rough stone and Gravel Quarries area. There are one Schedule II species and twenty-two species are under schedule IV according to Indian wild life Act 1972. A total 15 species of bird were sighted in the study area. There are no critically endangered, endangered, vulnerable and endemic species were observed.

The result of core & Buffer zone of fauna studies shows that Nymphalidae and *Scincidae, Agamidae* are the main dominating species in the study area; it is mentioned in Table No.3.35. There is no schedule I Species in study area. A detail of fauna diversity of family's pattern is given in Fig No.3.30. There are no critically endangered, endangered, vulnerable and endemic species were observed. Details of faunal diversity in buffer zone are given in Table No.3.34.

TABLE 3.34: FAUNA IN BUFFER ZONE

SI.No	English Name	Family Name	Scientific Name	WPA Schedule	*IUCN Class
INSECTS					
1	Common Indian crow	Nymphalidae	Euploea core	Schedule IV	LC
2	Striped tiger	Nymphalidae	Danaus plexippus	NL	NL
3	Angled castor	Nymphalidae	Ariadne	NL	NL
4	Ant	Formicidae	Camponotus Vicinus	NL	NL
5	Green marsh hawk	Libellulidae	Orthetrum sabina	NL	LC
6	Praying mantis	Mantidae	mantis religiosa	NL	NL
7	Grasshopper	Acrididae	Hieroglyphus sp	NL	LC
8	Common Tiger	Nymphalidae	Danaus genutia	NL	NL
9	Red-veined darter	Libellulidae	Sympetrum fonscolombii	NL	LC
10	Milkweed butterfly	Nymphalidae	Danainae	NL	LC
11	Termite	Blattodea	Hamitermes silvestri	NL	LC
12	Stick insect	Lonchodidae	carausius morosus	NL	NL
13	Spotted joker	Nymphalidae	Byblia ilithyia	NL	NL
REPTILES					
14	Garden lizard	Agamidae	Calotes versicolor	NL	LC
15	Common house gecko	Gekkonidae	Hemidactylus frenatus	NL	LC
16	Fan-Throated Lizard	Agamidae	Sitanaponticeriana	NL	LC
MAMMALS					
17	Indian palm squirrel	Sciuridae	Funambulus palmarum	NL	LC
18	Cattle	Bividae	Bus taurus	NL	NL
19	Rat	Muridae	Rattusrattus	Schedule V	LC
AVES					
20	Black drongo	Dicruridae	Dicrurus macrocercus	Schedule IV	LC
21	Asian green bee-eater	Meropidae	Meropsorientalis	NL	LC
22	Rose-ringed parkeet	Psittaculidae	Psittacula krameri	NL	LC
23	Common myna	Sturnidae	Acridotheres tristis	NL	LC
24	House crow	Corvidae	Corvussplendens	NL	LC
25	Common cuckoo	Cucalidae	Cuculus canorus	NL	LC
26	Cattle egret	Ardeidae	Bubulcus ibis	NL	LC
27	Red-vented Bulbul	Pycnonotidae	Pycnonotuscafer	Schedule IV	LC
28	Koel	Cucalidae	Eudynamys	Schedule IV	LC
29	Shikra	Accipitridae	Accipiter badius	NL	LC
30	White-breasted waterhen	Rallidae	Amaurornis phoenicurus	NL	LC

*NL- Not listed, LC- Least concern, NT- Near threatened

FIGURE 3.25: FLORAL DIVERSITY IN CORE & BUFFER ZONE
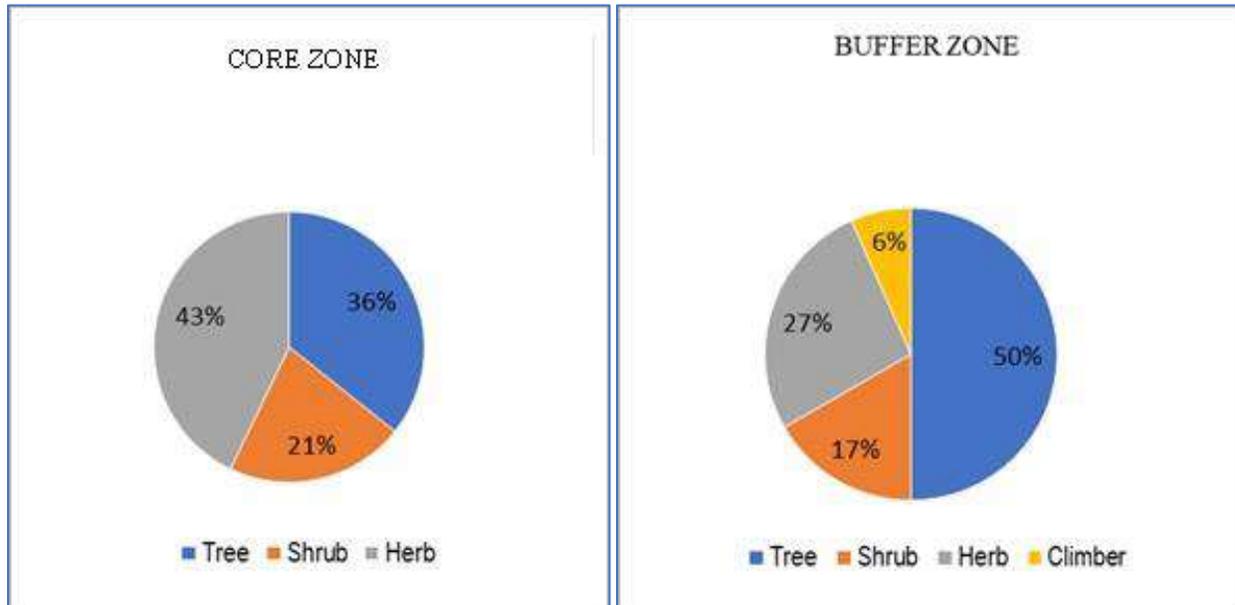
FIGURE 3.26: FAUNA DIVERSITY IN CORE & BUFFER ZONE
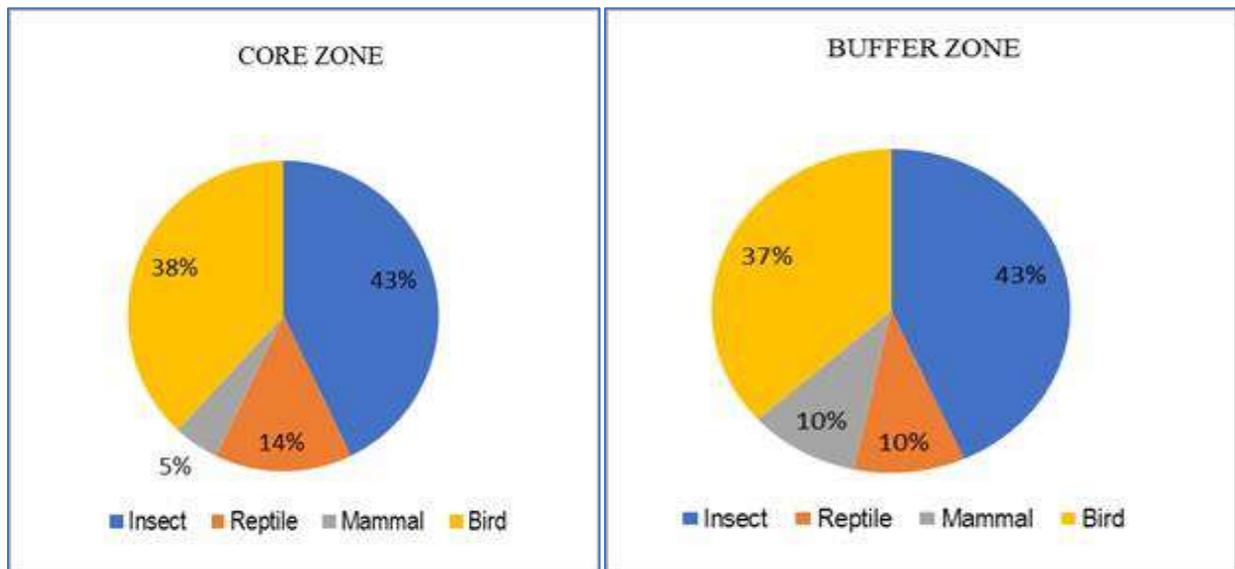
3.5.4   Interpretation& Conclusion:

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

3.6   SOCIO ECONOMIC ENVIRONMENT

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

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

3.6.1   Objectives of the Study

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

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

3.6.3   District Profile

Coimbatore is the third largest city of Tamil Nadu, Coimbatore, is one of the most industrialized cities in Tamil Nadu, known as the textile capital of South India or the Manchester of the South, the city is situated on the banks of the river Noyyal, Coimbatore existed even prior to the 2nd or 3rd century AD by Karikalan, the first of the early Cholas. Among its other great rulers were Rashtrakutas, Chalukyas, Pandyas, Hoysalas and the Vijayanagara kings.

There are more than 25,000 small, medium, large sale industries and textile mill. Coimbatore is also famous for the manufacture of motor pump sets and varied engineering goods. The development of Hydro electricity from the Pykara Falls in the 1930 led to a cotton boom in Coimbatore.

3.6.4   Study area:

KARUNCHAMIGOUNDENPALAYAM VILLAGE

Karunchamigoundenpalayam Village, with population of 343 is Coimbatore South sub district's the 2nd least populous village, located in Coimbatore South sub district of Coimbatore district in the state Tamil Nadu in India. Total geographical area of Karunchamigoundenpalayam village is 4 km² and it is the 4th smallest village by area in the sub district. Population density of the village is 83 persons per km2.

Nearest town of the village is Madhukarai. Pin code of Karunchamigoundenpalayam village is 641105. The village comes under Nachippalayam panchayat. Coimbatore South is the sub district head quarter and the distance from the village is 18 km. District head quarter of the village is Coimbatore which is 18 km away.

TABLE 3.35: KARUNCHAMIGOUNDENPALAYAM VILLAGE POPULATION FACTS

Number of Households	95
Population	343
Male Population	171
Female Population	172
Children Population	33
Sex-ratio	1006
Literacy	68.71%
Male Literacy	72.08%
Female Literacy	65.38%
Scheduled Tribes (ST) %	0

Scheduled Caste (SC) %	0

Source https://www.census2011.co.in/data/village/644460-karunchamigoundenpalayam-tamil-nadu.html

TABLE 3.36: DEMOGRAPHICS POPULATION OF KARUNCHAMIGOUNDENPALAYAM VILLAGE

Total Population	Male Population	Female Population
343	171	172

Source https://www.census2011.co.in/data/village/644460-karunchamigoundenpalayam-tamil-nadu.html

Sex Ratio of Karunchamigoundenpalayam Village -Census 2011

Average Sex Ratio of Karunchamigoundenpalayam village is 1006 which is higher than Tamil Nadu state average of 996. Child Sex Ratio for the Karunchamigoundenpalayam as per census is 941, lower than Tamil Nadu average of 943.

Literacy of Karunchamigoundenpalayam Village

The literacy rate of Karunchamigoundenpalayam village was 68.71 % compared to 80.09 % of Tamil Nadu. In Karunchamigoundenpalayam Male literacy stands at 72.08 % while female literacy rate was 65.38 %.

Worker's profile of Karunchamigoundenpalayam Village

Karunchamigoundenpalayam has 53% (182) population engaged in either main or marginal works. 66% male and 40% female population are working population. 64% of total male population are main (full time) workers and 2% are marginal (part time) workers. For women 25% of total female population are main and 15% are marginal workers.

TABLE 3.37: KARUNCHAMIGOUNDENPALAYAM VILLAGE CENSUS 2011 DATA

Description	Census 2011 Data
Village Name	Karunchamigoundenpalayam
Teshil Name	Madhukkarai
District Name	Coimbatore
State Name	Tamil Nadu
Total Population	343
Total Area	95
Total No of House Holds	171
Total Male Population	172
Total Female Population	33
0-6 Age group Total Population	17
0-6 Age group Male Population	16
0-6 Age group Female Population	213
Total Person Literates	111
Total Male Literates	102
Total Person Illiterates	130
Total Male Illiterates	60
Total Male Illiterates	70
Scheduled Cast Persons	0
Scheduled Cast Males	0
Scheduled Cast Females	0
Scheduled Tribe Persons	0
Scheduled Tribe Males	0
Scheduled Tribe Females	0

Source: https://www.census2011.co.in/data/village/644460-karunchamigoundenpalayam-tamil-nadu.html

TABLE 3.38: KARUNCHAMIGOUNDENPALAYAM WORKING POPULATION CENSUS 2011

Particulars	Total	Male	Female
Total No. of Houses	95	-	-
Population	343	171	172
Child (0-6)	33	17	16

Schedule Caste	0	0	0
Schedule Tribe	0	0	0
Literacy	68.71 %	72.08 %	65.38 %
Total Workers	182	113	69
Main Worker	152	-	-
Marginal Worker	30	4	26

Source: https://www.census2011.co.in/data/village/644460-karunchamigoundenpalayam-tamil-nadu.html

TABLE 3.39: POPULATION DATA OF STUDY AREA

SI.No.	Village Name	No of House Holds	Total Population	Male	Female	Total Literate Population	Male Literate	Female Literate	Total Illiterate Population	Male Illiterate	Female Illiterate
1	Arisippalayam	700	2400	1212	1188	1670	883	787	730	329	401
2	Karunchamigoundenpalayam	95	343	171	172	213	111	102	130	60	70
3	Kuthiraialampalayam	444	1448	685	763	887	483	404	561	202	359
4	Madampatti	1999	6771	3359	3412	4748	2584	2164	2023	775	1248
5	Mavuthampathi	818	2843	1442	1401	1870	1057	813	973	385	588
6	Muthur	378	1385	683	702	897	508	389	488	175	313
7	Myleripalayam	1393	4990	2451	2539	3169	1746	1423	1821	705	1116
8	Nachippalayam	878	3008	1517	1491	2019	1105	914	989	412	577
9	Palathurai	767	2727	1346	1381	1906	1033	873	821	313	508
10	Pichanur	1687	6261	3094	3167	4312	2333	1979	1949	761	1188
11	Poravipalayam	1874	6568	3280	3288	4130	2311	1819	2438	969	1469
12	Pottaiyandiporambu	445	1530	764	766	901	502	399	629	262	367
13	Sangarayapuram	255	816	416	400	604	338	266	212	78	134
14	Seerappalayam	1646	5881	3053	2828	4457	2470	1987	1424	583	841
15	Sokkanur	1776	6020	2978	3042	3627	2066	1561	2393	912	1481
16	Solavampalayam	1837	6387	3195	3192	4074	2234	1840	2313	961	1352
17	Thambagoundenpalayam	133	482	234	248	374	193	181	108	41	67
18	Theethipalayam	2386	8629	4296	4333	6329	3424	2905	2300	872	1428
19	Vadaputhur	1467	5176	2561	2615	3663	1985	1678	1513	576	937
20	Valukkupparai	1412	4891	2376	2515	3043	1670	1373	1848	706	1142
21	Kinathukadavu Urban	1421	5025	2505	2520	3729	1973	1756	1296	532	764

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

TABLE 3.40: WORKERS PROFILE OF STUDY AREA

SI.No	Village Name	Total Workers Population	Male Workers	Female Workers	Total Main Workers	Main Workers Male	Main Workers Female	Main Cultivation Workers	Main Agriculture Workers	Main Other Workers	Non-Worker Population
1	Arisippalayam	1126	771	355	974	702	272	117	281	561	152
2	Karunchami goundenpalayam	182	113	69	152	109	43	57	2	93	30
3	Kuthiraialampalayam	896	473	423	806	441	365	172	437	185	90
4	Madampatti	3594	2159	1435	3269	2041	1228	437	1471	1305	325
5	Mavuthampathi	1603	942	661	1289	777	512	358	551	358	314
6	Muthur	827	489	338	781	465	316	144	454	177	46
7	Myleripalayam	2912	1666	1246	2581	1539	1042	568	584	1343	331
8	Nachippalayam	1803	1047	756	1598	934	664	458	479	642	205
9	Palathurai	1403	894	509	768	557	211	93	85	579	635
10	Pichanur	3214	1928	1286	3094	1868	1226	534	1288	1224	120
11	Poravipalayam	4248	2355	1893	3377	2082	1295	524	1772	983	871
12	Pottaiyandiporambu	889	518	371	498	321	177	150	106	241	391
13	Sangarayapuram	518	301	217	446	274	172	178	120	144	72
14	Seerappalayam	2623	1845	778	2451	1760	691	149	450	1786	172
15	Sokkanur	3810	2051	1759	3654	2013	1641	925	1990	693	156
16	Solavampalayam	3367	2134	1233	3037	2014	1023	240	926	1827	330
17	Thambagoundenpalayam	224	142	82	193	134	59	37	20	135	31
18	Theethipalayam	3901	2690	1211	3284	2362	922	253	772	2202	617
19	Vadaputhur	2670	1677	993	2479	1623	856	491	466	1487	191
20	Valukkupparai	3055	1645	1410	2640	1429	1211	898	1135	570	415
21	Kinathukadavu Urban	2377	1600	777	2333	1589	744	87	472	1541	44

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

TABLE 3.41: COMMUNICATION & TRANSPORT FACILITIES IN THE STUDY AREA

Sl	Village Name	PO	SPO	PTO	T	PCO	MP	IC / CSC	PCF	BS	PBS	RS	NH	SH	MDR	BTR	GR	NWR	FP
1	Arisippalayam	2	1	2	1	2	1	2	2	1	1	2	2	1	2	1	1	2	1
2	Karunchamigoundenpalayam	2	2	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
3	Kuthiraialampalayam	2	2	2	1	2	1	2	2	1	2	2	2	1	2	1	1	2	1
4	Madampatti	2	1	2	1	1	1	1	2	1	1	2	1	1	1	1	1	2	1
5	Mavuthampathi	2	1	2	1	1	1	2	2	1	2	2	1	1	1	1	1	2	1
6	Muthur	2	1	2	1	1	1	2	2	1	1	2	2	2	1	1	1	2	1
7	Myleripalayam	2	1	2	1	1	1	2	2	1	2	2	1	1	1	1	1	2	1
8	Nachippalayam	2	2	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
9	Palathurai	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
10	Pichanur	2	1	2	1	1	1	2	2	1	1	2	1	1	1	1	1	2	1
11	Poravipalayam	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
12	Pottaiyandiporambu	2	2	2	1	1	1	2	2	1	2	2	2	1	1	1	1	2	1
13	Sangarayapuram	2	2	2	1	1	1	2	2	2	2	2	2	2	2	1	1	2	1
14	Seerappalayam	2	1	2	1	2	1	2	2	1	1	2	1	1	1	1	1	2	1
15	Sokkanur	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
16	Solavampalayam	2	1	2	1	1	1	2	2	1	1	1	1	2	1	1	1	2	1
17	Thambagoundenpalayam	2	2	2	1	1	1	2	2	1	1	2	2	2	2	1	1	2	1
18	Theethipalayam	2	1	2	1	1	1	1	2	1	1	2	1	1	1	1	1	2	1
19	Vadaputhur	2	2	2	1	1	1	1	2	1	1	2	2	2	2	1	1	2	1
20	Valukkupparai	2	1	2	1	1	1	1	1	1	1	2	2	2	2	1	1	2	1

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

TABLE 3.42: WATER & DRAINAGE FACILITIES IN THE STUDY AREA

Sl	Village Name	TP	CW	UCW	HP	TW/BH	S	R/C	T/P/L	CD	OD	CT
1	Arisippalayam	1	2	2	2	1	2	1	2	1	1	1
2	Karunchamigoundenpalayam	1	2	1	1	1	2	2	2	1	1	1
3	Kuthiraialampalayam	1	1	1	1	1	2	2	2	1	1	1
4	Madampatti	1	1	1	1	1	2	2	1	1	1	1
5	Mavuthampathi	1	1	1	1	1	1	1	1	1	1	1
6	Muthur	1	1	1	1	1	2	2	2	1	1	2
7	Myleripalayam	1	1	1	1	1	2	2	2	1	1	2
8	Nachippalayam	1	1	1	1	1	2	2	2	1	1	1
9	Palathurai	1	1	1	1	1	2	2	2	1	1	1
10	Pichanur	1	1	1	1	1	1	2	2	1	1	2
11	Poravipalayam	1	1	1	2	1	1	2	2	1	1	1
12	Pottaiyandiporambu	1	1	1	2	1	2	2	2	1	1	1
13	Sangarayapuram	1	1	1	1	1	2	2	2	1	1	2
14	Seerappalayam	1	1	1	1	1	1	1	2	1	1	2
15	Sokkanur	1	1	1	2	1	1	2	2	1	1	2
16	Solavampalayam	1	1	1	1	1	2	2	2	1	1	1
17	Thambagoundenpalayam	1	2	2	2	2	2	2	2	1	1	2
18	Theethipalayam	1	1	1	2	1	2	2	2	1	1	1
19	Vadaputhur	1	1	1	1	1	2	2	2	1	1	1
20	Valukkupparai	1	1	1	1	1	1	2	1	1	1	1

Abbreviations: T - Tap Water; R / C - River / Canal; CW - Covered Well; T/P/L - Tank / Pond / Lake; UCW - Uncovered Well; CD - Covered Drainage; HP - Hand Pump; OD - Open Drainage; TW/BH - Tube / Bore Well; CT - Community Toilet Complex for General public; S - Spring
Note – 1 - Available within the village; 2 - Not available

TABLE 3.43: OTHER FACILITIES IN THE STUDY AREA

Sl	Village Name	ATM	CB	COB	ACS	SHG	PDS	RM	AMS	NC	NC-AC	CC	SF	PL		NPS	APS	BDRO	PS
1	Arisippalayam	2	2	2	2	1	1	2	2	1	1	2	1	1		1	1	1	1
2	Karunchamigoundenpalayam	2	2	2	2	2	1	2	2	1	1	2	2	2		1	1	1	1
3	Kuthiraialampalayam	2	2	2	1	1	1	2	2	1	1	1	1	1		1	1	1	1
4	Madampatti	2	2	1	2	1	1	2	2	1	1	1	1	1		1	1	1	1
5	Mavuthampathi	2	2	2	2	1	1	2	2	1	1	1	1	1		1	1	1	1
6	Muthur	2	2	2	2	1	1	1	2	1	1	2	2	2		1	1	1	1
7	Myleripalayam	2	2	2	2	1	1	2	2	1	1	1	1	2		1	1	1	1
8	Nachippalayam	2	1	2	2	1	1	1	2	1	1	2	2	2		1	1	1	1
9	Palathurai	2	2	2	2	1	1	2	1	1	1	1	1	1		1	1	1	1
10	Pichanur	2	2	2	1	1	1	1	2	1	1	1	1	2		1	1	1	1
11	Poravipalayam	2	2	2	1	1	1	1	2	1	1	1	1	2		1	1	1	1
12	Pottaiyandiporambu	2	2	2	2	1	1	2	2	1	1	1	1	1		1	1	1	1
13	Sangarayapuram	2	2	2	2	1	1	1	2	1	1	2	2	2		2	1	2	1
14	Seerappalayam	1	1	2	2	1	1	2	2	1	1	2	1	1		1	1	1	1
15	Sokkanur	2	1	2	1	1	1	2	2	1	1	1	1	2		1	1	1	1
16	Solavampalayam	2	2	2	2	1	1	2	2	1	1	2	1	2		1	1	1	1
17	Thambagoundenpalayam	2	2	2	2	1	2	2	2	1	1	2	2	2		1	2	1	1
18	Theethipalayam	2	2	1	2	1	1	1	2	1	1	1	1	1		1	1	1	1
19	Vadaputhur	1	2	2	2	1	1	2	2	1	1	1	1	1		1	1	1	1
20	Valukkupparai	2	2	1	1	1	1	2	2	1	1	1	1	2		1	1	1	1

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

TABLE 3.44: EDUCATIONAL FACILITIES IN THE STUDY AREA

Sl	Village Name	PPS		PS		MS		SS		SSS		DC		EC		MC		MI		PT		VTS		SSD	
		G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P
1	Arisippalayam	1	2	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2
2	Karunchamigoundenpalayam	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	Kuthiraialampalayam	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
4	Madampatti	1	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
5	Mavuthampathi	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2
6	Muthur	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
7	Myleripalayam	1	2	1	2	1	2	2	2	2	2	2	2	2	1	2	2	2	2	2	1	2	2	2	2
8	Nachippalayam	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
9	Palathurai	1	2	1	2	1	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2
10	Pichanur	1	2	1	2	1	2	1	2	2	2	2	1	2	1	2	2	2	1	2	1	2	2	2	2
11	Poravipalayam	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
12	Pottaiyandiporambu	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
13	Sangarayapuram	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
14	Seerappalayam	1	1	1	1	1	1	2	2	2	2	2	1	2	1	2	2	2	2	2	1	2	2	2	2
15	Sokkanur	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
16	Solavampalayam	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
17	Thambagoundenpalayam	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
18	Theethipalayam	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
19	Vadaputhur	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
20	Valukkupparai	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

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

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

TABLE 3.45: MEDICAL FACILITIES IN THE STUDY AREA

Sl. No.	Village Name	CHC	PHC	PHSC	MCW	TBC	HA	HAM	D	VH	MHC	FWC	NGM-I/O
1	Arisippalayam	0	1	1	1	1	0	0	1	0	0	1	
2	Karunchamigoundenpalayam	0	0	0	0	0	0	0	0	0	0	0	b
3	Kuthiraialampalayam	0	0	0	0	0	0	0	0	0	0	0	b
4	Madampatti	0	0	1	0	0	0	0	0	1	0	0	b
5	Mavuthampathi	0	0	0	0	0	0	0	0	0	0	0	b
6	Muthur	0	0	0	0	0	0	0	0	0	0	0	b
7	Myleripalayam	0	1	1	1	1	0	0	1	0	0	1	
8	Nachippalayam	0	0	1	0	0	0	0	0	0	0	0	a
9	Palathurai	0	0	1	0	0	0	0	0	0	0	0	b
10	Pichanur	0	0	3	0	0	0	0	0	1	0	0	c
11	Poravipalayam	0	1	1	1	1	0	0	1	1	0	1	
12	Pottaiyandiporambu	0	0	1	0	0	0	0	0	0	0	0	b
13	Sangarayapuram	0	0	0	0	0	0	0	0	0	0	0	b
14	Seerappalayam	0	0	3	0	0	0	0	0	0	0	0	a
15	Sokkanur	0	1	1	1	1	0	0	1	1	0	1	
16	Solavampalayam	0	0	3	0	0	0	0	0	0	0	0	b
17	Thambagoundenpalayam	0	0	0	0	0	0	0	0	0	0	0	b
18	Theethipalayam	0	0	1	1	0	0	0	0	0	0	0	b
19	Vadaputhur	0	0	1	0	0	0	0	0	0	0	0	b
20	Valukkupparai	0	0	1	0	0	0	0	0	1	0	0	a

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

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

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

3.6.6 Recommendation and Suggestion

- Awareness program to be conducted to make the population aware to get education and a better livelihood.

- Vocational training programme can be organized to make the people self - employed, particularly for women and unemployed youth.

- On the basis of qualification and skills local community may be preferred. Long term and short-term employments can be generated.

- Health care centre and ambulance facility can be provided to the population to get easy access to medical facilities. Maternity facility should be made available at the place to avoid going to distant places for treatment which involves risks. Apart from that as these areas are prone to various diseases a hospital with modern facilities should be opened on a priority basis in a central place to provide better health facilities to the villagers around the project.

- While developing an Action Plan, it is very important to identify the population who falls under the marginalized and vulnerable groups. So that special attention can be given to these groups with special provisions while making action plans.

3.6.7 Summary & Conclusion

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

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

4. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.0   GENERAL

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

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

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

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

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

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

4.1   LAND ENVIRONMENT:

4.1.2 Anticipated Impact

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

4.1.2 Common Mitigation Measures

- The mining activity will be gradual confined in blocks and excavation will be undertaken progressively along with other mitigative measures like phase wise development of greenbelt etc.
- Construction of garland drains all around the quarry pits and construction of check dam 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.,
- At conceptual stage, the land use pattern of the quarry will be changed into Greenbelt area and temporary reservoir
- In terms of aesthetics, natural vegetation surrounding the quarry will be retained (such as in a buffer area i.e., 7.5 m safety barrier and other safety provided) so as to help minimise dust emissions.
- Proper fencing will be carried out at the conceptual stage, Security will be posted round the clock, to prevent inherent entry of the public and cattle

4.1.3 Soil Environment

The proposed project area is covered by thin layer of gravel formation and the average thickness is about 2 m, the excavated gravel will be dumped sold to needy customers in open market.

4.1.4 Impact on Soil Environment

- Mining operations routinely modify the surrounding landscape by exposing previously undisturbed earthen materials. Erosion of top layer (gravel), extracted fine material can result in substantial sediment loading to surface waters and drainage ways. During rainy season surface run off may cause siltation in low lying areas. The top layer of the project site in the form of Gravel formation, the Gravel will be directly loaded into tippers and sold. There is no removal of topsoil anticipated.

4.1.5 Common Mitigation Measures

- Run-off diversion – Garland drains will be constructed all around the project boundary to prevent surface flows from entering the quarry works areas. And will be discharged into vegetated natural drainage lines, or as distributed flow across an area stabilised against erosion.
- Sedimentation ponds - Run-off from working areas will be routed towards sedimentation ponds. These trap 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 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

Detail of water requirements in KLD as given below:

TABLE 4.1: WATER REQUIREMENTS FOR P1

*Purpose	Quantity	Source
Dust Suppression	2.0 KLD	From Existing bore wells from nearby area
Green Belt development	1.5 KLD	From Existing bore wells from nearby area
Domestic purpose	1.0 KLD	From Existing, bore wells and drinking water will be sourced from Approved Water vendors.
Total	**4.5 KLD**	

* Water for drinking purpose will be brought from approved water vendors
Source: Approved Mining Plan Pre-Feasibility Report

4.2.2 Mitigation Measures

- 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.
- Providing benches with inner slopes and through a system of drains and channels, allowing rain water to descent into surrounding drains, so as to minimize the effects of erosion & water logging arising out of uncontrolled descent of water.
- Reuse the water collected during storm for dust suppression and greenbelt development within the mines
- Installing interceptor traps/oil separators to remove oils and greases. Water from the tipper wash-down facility and machinery maintenance yard will pass through interceptor traps/oil separators prior to its reuse;
- Using flocculating or coagulating agents to assist in the settling of suspended solids during monsoon seasons;
- Periodic (every 6 month once) analysis of quarry pit water and ground water quality in nearby villages.
- Domestic sewage from site office & urinals/latrines provided in ML is discharged in septic tank followed by soak pits.
- Waste water discharge from mine will be treated in settling tanks before using for dust suppression and tree plantation purposes.
- De-silting will be carried out before and immediately after the monsoon season.
- Regular monitoring (every 6 month once) and analysing the quality of water in open well, bore wells and surface water

4.3   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

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.

The impact on Air Environment is due to the mining and allied activities during Land Development phase, Mining process and Transportation. The emissions of Sulphur dioxide (SO_2), Oxides of Nitrogen (NOx) due to excavation/loading equipment and vehicles plying on haul roads are marginal. Loading - unloading and transportation of Rough Stone, wind erosion of the exposed area and movement of light vehicles will be the main polluting source in the mining activities releasing Particulate Matter (PM_{10}) affecting Ambient Air of the area. Prediction of impacts on air environment has been carried out taking into consideration cumulative production three proposed quarries. Air environment and net increase in emissions by Open pit source modelling in AERMOD Software.

4.3.2.1 Emission Estimation

An emissions factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant.
The general equation for emissions estimation is:

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

Where:
E = emissions;
A = activity rate;
EF = emission factor, and
ER = overall emission reduction efficiency, %

The proposed mining activity includes various activities like ground preparation, excavation, handling and transport of 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.

TABLE 4.2: ESTIMATED EMISSION RATE FOR PM$_{10}$

Activity	Source type	Value	Unit
Drilling	Point Source	0.095883154	g/s
Blasting	Point Source	0.001960316	g/s
Mineral Loading	Point Source	0.043426568	g/s
Haul Road	Line Source	0.002494635	g/s/m
Overall Mine	Area Source	0.057432133	g/s

TABLE 4.3: ESTIMATED EMISSION RATE FOR SO$_2$

Activity	Source type	Value	Unit
Overall Mine	Area Source	0.000876938	g/s

TABLE 4.4: ESTIMATED EMISSION RATE FOR NO$_X$

Activity	Source type	Value	Unit
Overall Mine	Area Source	0.000048776	g/s

4.3.2 Frame work of Computation & Model details

By using the above-mentioned inputs, ground level concentrations due to the quarrying activities have been estimated to know the incremental concentration in ambient air quality and impact in the study area. The effect of air pollutants upon receptors are influenced by concentration of pollutants and their dispersion in the atmosphere. Air quality modelling is an important tool for prediction, planning and evaluation of air pollution control activities besides identifying the requirements for emission control to meet the regulatory standards and to apply mitigation measures to reduce impact caused by quarrying activities. 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 10 km around the source to assess the impact at each receptor separately at the various locations and maximum incremental GLC value at the project site. Maximum impact of 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.

FIGURE 4.1: AERMOD TERRAIN MAP
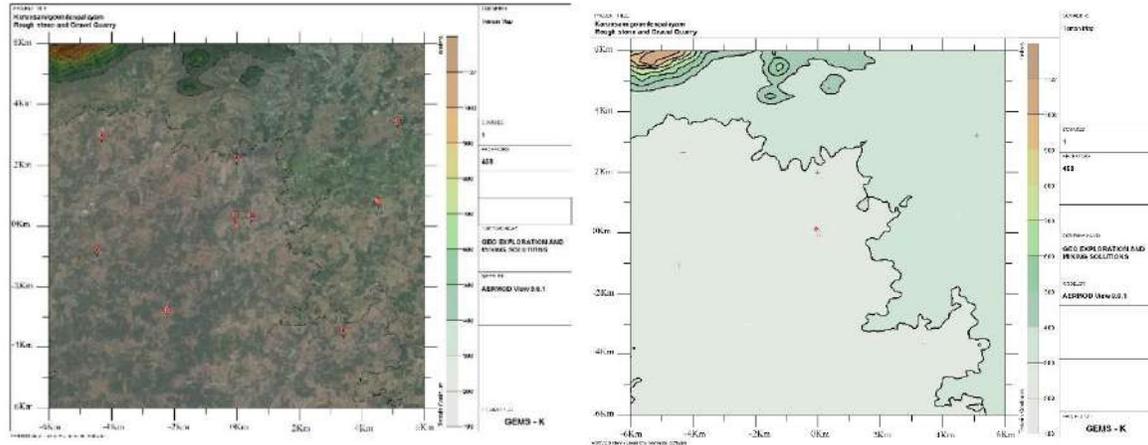
FIGURE 4.2: PREDICTED INCREMENTAL CONCENTRATION OF PM$_{10}$
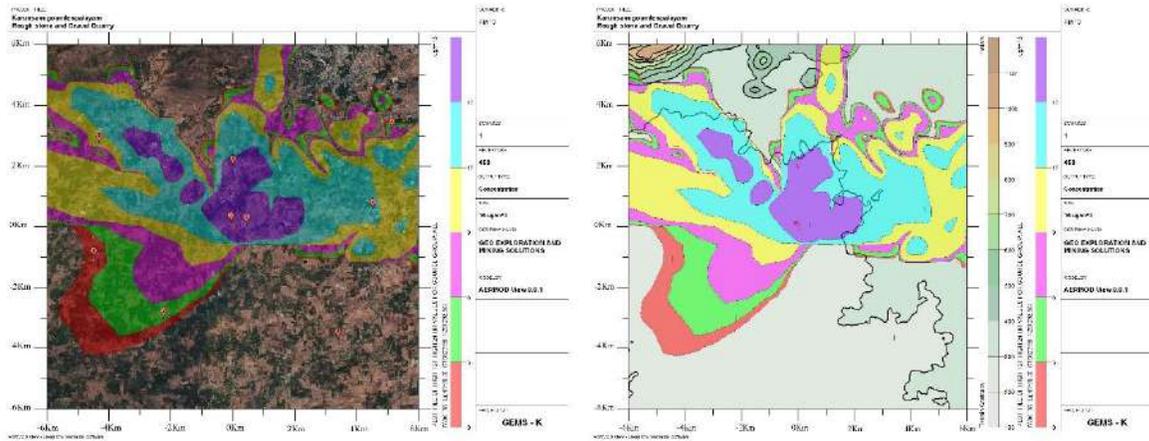
FIGURE 4.3: PREDICTED INCREMENTAL CONCENTRATION OF PM$_{2.5}$
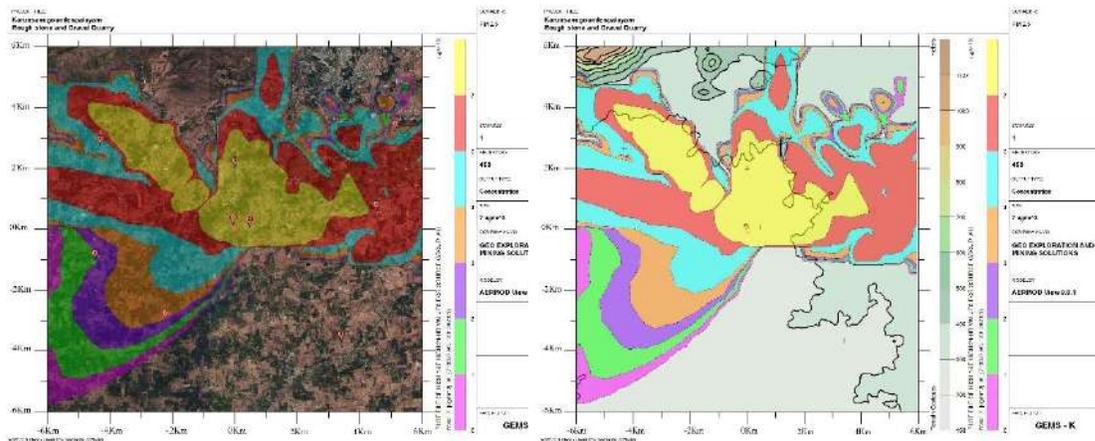
FIGURE 4.4: PREDICTED INCREMENTAL CONCENTRATION OF SO₂
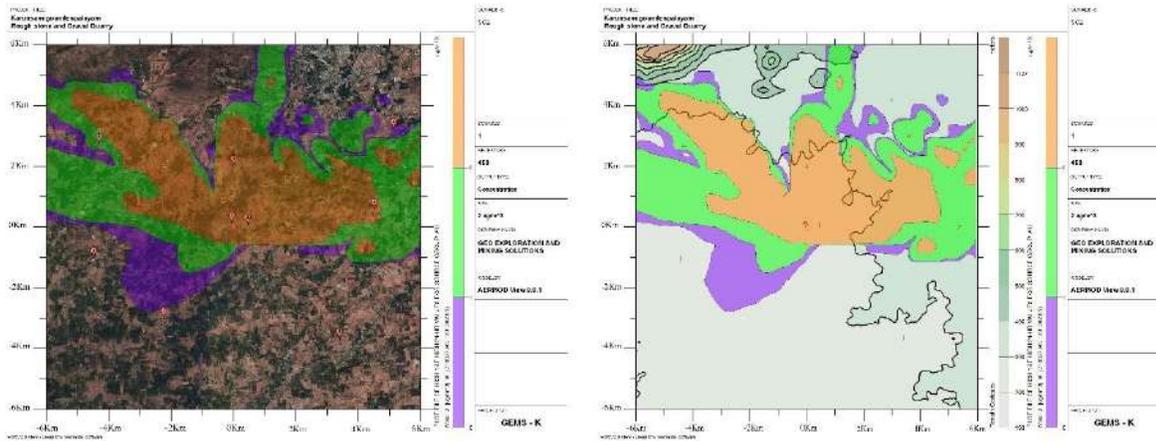
FIGURE 4.5: PREDICTED INCREMENTAL CONCENTRATION OF NOₓ
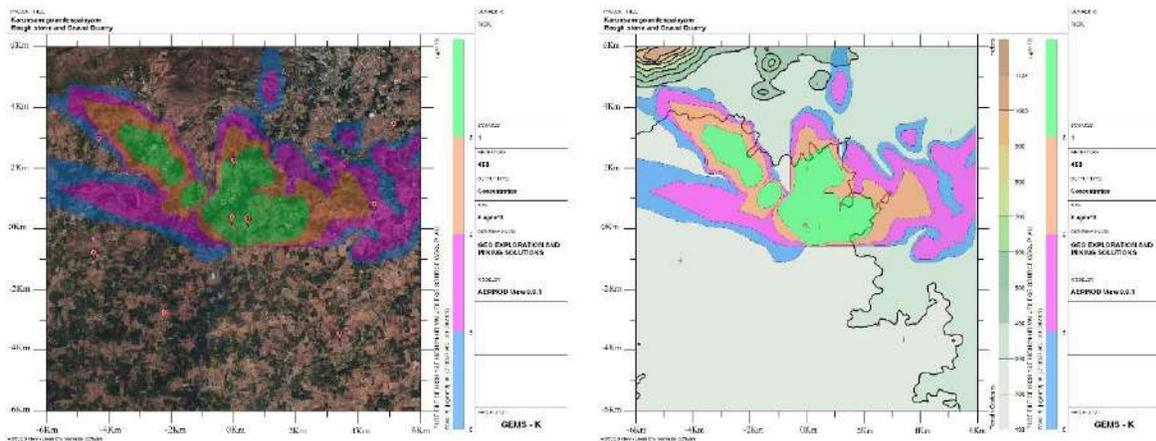
FIGURE 4.6: PREDICTED INCREMENTAL CONCENTRATION OF FUGITIVE DUST
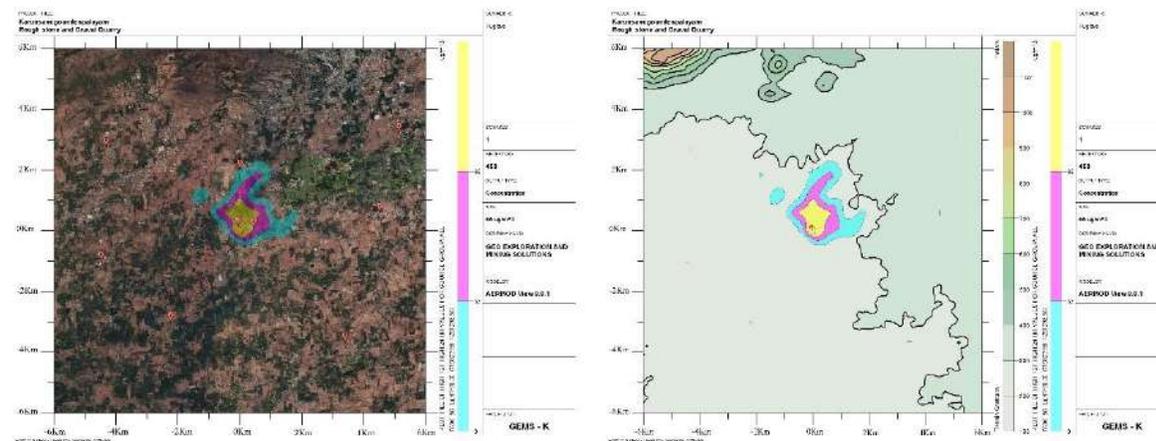
4.3.2.1 Model Results

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

TABLE 4.5: INCREMENTAL & RESULTANT GLC OF PM$_{10}$

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline PM$_{10}$ (µg/m³)	Incremental value of PM$_{10}$ due to mining (µg/m³)	Total PM$_{10}$ (µg/m³) (5+6)
AAQ1	10°51'43.87"N 76°55'41.87"E	-52	128	58.8	15.98	74.8
AAQ2	10°51'42.24"N 76°55'58.58"E	449	72	58.9	15.55	74.5
AAQ3	10°51'58.25"N 76°58'11.65"E	4519	565	58.9	13.91	72.8
AAQ4	10°53'23.86"N 76°58'32.00"E	5142	3220	58.3	7.00	65.3
AAQ5	10°53'7.85"N 76°53'22.12"E	-4323	2721	60.0	11.02	71.0
AAQ6	10°49'40.05"N 76°57'35.30"E	3411	-3702	58.5	0	58.5
AAQ7	10°50'1.97"N 76°54'30.61"E	-2230	-3026	59.0	4.50	63.5
AAQ8	10°51'6.27"N 76°53'16.91"E	-4482	-1039	60.7	1.66	62.4
AAQ9	10°52'44.71"N 76°55'43.61"E	-2	2008	58.7	15.27	74.0

TABLE 4.6: INCREMENTAL & RESULTANT GLC OF PM$_{2.5}$

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline PM$_{2.5}$ (µg/m³)	Incremental value of PM$_{2.5}$ due to mining (µg/m³)	Total PM$_{2.5}$ (µg/m³) (5+6)
AAQ1	10°51'43.87"N 76°55'41.87"E	-52	128	29.0	7.89	36.9
AAQ2	10°51'42.24"N 76°55'58.58"E	449	72	29.3	7.60	36.9
AAQ3	10°51'58.25"N 76°58'11.65"E	4519	565	29.6	6.37	36.0
AAQ4	10°53'23.86"N 76°58'32.00"E	5142	3220	29.2	3.61	32.8
AAQ5	10°53'7.85"N 76°53'22.12"E	-4323	2721	30.0	4.49	34.5
AAQ6	10°49'40.05"N 76°57'35.30"E	3411	-3702	29.2	0	29.2
AAQ7	10°50'1.97"N 76°54'30.61"E	-2230	-3026	29.1	2.71	31.8
AAQ8	10°51'6.27"N 76°53'16.91"E	-4482	-1039	30.0	1.62	31.6
AAQ9	10°52'44.71"N 76°55'43.61"E	-2	2008	28.0	7.18	35.2

TABLE 4.7: INCREMENTAL & RESULTANT GLC OF SO$_2$

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline So$_2$ (µg/m³)	Incremental value of So$_2$ due to mining (µg/m³)	Total So$_2$ (µg/m³) (5+6)
AAQ1	10°51'43.87"N 76°55'41.87"E	-52	128	9.4	2.44	11.84
AAQ2	10°51'42.24"N 76°55'58.58"E	449	72	9.3	2.31	11.61
AAQ3	10°51'58.25"N 76°58'11.65"E	4519	565	9.3	2.03	11.33
AAQ4	10°53'23.86"N 76°58'32.00"E	5142	3220	9.3	0.46	9.76
AAQ5	10°53'7.85"N 76°53'22.12"E	-4323	2721	9.4	1.51	10.91
AAQ6	10°49'40.05"N 76°57'35.30"E	3411	-3702	9.3	0	9.3
AAQ7	10°50'1.97"N 76°54'30.61"E	-2230	-3026	9.5	0	9.5
AAQ8	10°51'6.27"N 76°53'16.91"E	-4482	-1039	9.3	0	9.3
AAQ9	10°52'44.71"N 76°55'43.61"E	-2	2008	9.3	2.28	11.58

TABLE 4.8: INCREMENTAL & RESULTANT GLC OF NO$_X$

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline Nox (µg/m³)	Incremental value of Nox due to mining (µg/m³)	Total Nox (µg/m³) (5+6)

AAQ1	10°51'43.87"N 76°55'41.87"E	-52	128	21.8	8.77	30.57
AAQ2	10°51'42.24"N 76°55'58.58"E	449	72	22.0	8.39	30.39
AAQ3	10°51'58.25"N 76°58'11.65"E	4519	565	21.9	4.00	25.9
AAQ4	10°53'23.86"N 76°58'32.00"E	5142	3220	21.8	0	21.8
AAQ5	10°53'7.85"N 76°53'22.12"E	-4323	2721	22.1	1.10	23.2
AAQ6	10°49'40.05"N 76°57'35.30"E	3411	-3702	22.0	0	22.0
AAQ7	10°50'1.97"N 76°54'30.61"E	-2230	-3026	21.9	0	21.9
AAQ8	10°51'6.27"N 76°53'16.91"E	-4482	-1039	22.2	0	22.2
AAQ9	10°52'44.71"N 76°55'43.61"E	-2	2008	22.1	8.12	30.22

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. Common 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-metalled haul roads will be compacted weekly before being put into use.
- Over loading of tippers will be avoided to prevent spillage.
- It will be ensured that all transportation vehicles carry a valid PUC certificate
- Grading of haul roads and service roads to clear accumulation of loose materials

Green Belt –

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

Occupational Health –

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

4.4   NOISE ENVIRONMENT

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 in close proximity to the project area. 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.

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

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 4.10: 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

*50 feet from source = 15.24 meters
Source: U.S. Department of Transportation (Federal Highway Administration) – Construction Noise Handbook

The total noise to be produced by mining activity is calculated to be 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 4.11: PREDICTED NOISE INCREMENTAL VALUES

Location ID	N1	N2	N3	N4	N5	N6	N7	N8	N9
Maximum Monitored Value (Day) dB(A)	62.8	62.5	49.8	49.4	49.7	49.6	50.7	49.5	51.1
Incremental Value dB(A)	49.2	43.6	47.0	38.5	37.2	36.3	35.8	35.5	43.2
Total Predicted Noise level dB(A)	63.0	46.1	51.6	49.7	49.9	49.8	50.8	49.7	51.8

The incremental noise level is found within the range of 43.6 –49.2 dB (A) in Core Zone and 35.5 – 47.0 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 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;
- The blasting will be carried out during favourable atmospheric condition and less human activity timings by using nonelectrical initiation system;
- 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 are 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

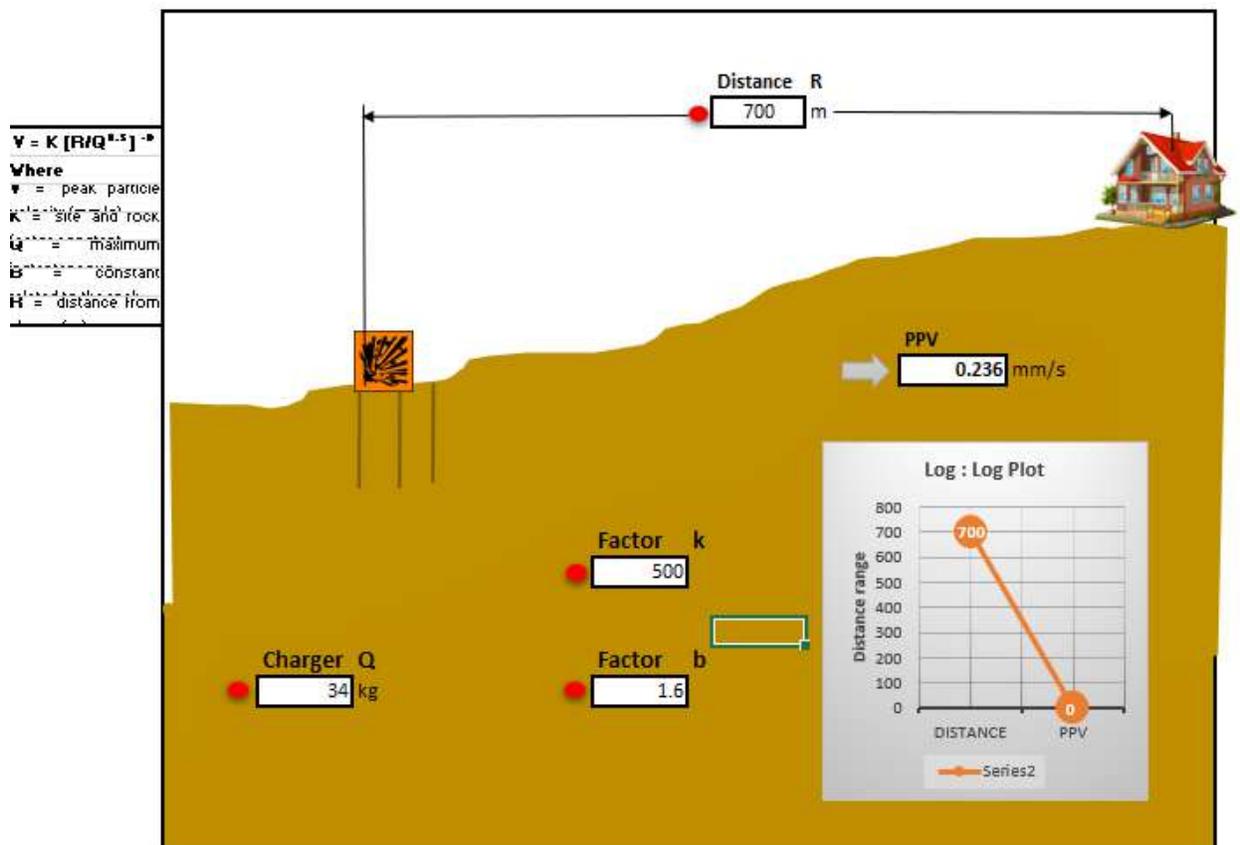Q = maximum instantaneous charge (kg)

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

R = distance from charge (m)

TABLE 4.12: PREDICTED PPV VALUES DUE TO BLASTING

Quarry	Maximum Charge in kgs	Nearest Habitation in m	PPV in mm/s
P1	34	700	0.236

FIGURE 4.6: GROUND VIBRATION PREDICTION

From the above graph, the charge per blast of 34 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 project proponent ensures that the charge per blast shall be less than 100 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

- The blasting operations in the cluster quarries are carried out 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 more 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.
- Sufficient angular stemming material will be used to confine the explosive force and minimise environmental disturbance caused by venting / misfire.
- 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   ECOLOGY AND BIODIVERSITY

4.5.1 Impact on Ecology and Biodiversity

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

The proposed mining activities include removal of some scattered bushes and other thorny species. Although impacts on key habitat elements will occur on a local scale, but on a regional scale they would not be critical for the life cycle needs of the species observed or expected. Moreover, during conceptual stage, the mined-out areas on the top bench will be re-vegetated by planting local /native species and lower benches will be converted into rainwater harvesting structure following completion of mining activities, which will replace habitat resources for fauna species in this locality over a longer time. Existing roads will be used; new roads will not be constructed to reduce impact on flora.

Wild life is not commonly found in the project area and its immediate environs because of lack of vegetal cover and surface water. Except few domestic animals, reptiles, hares and some common birds are observed in the study area.

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

4.5.2 Mitigation Measures

Keeping all this in mind the mitigations have been suggested under environmental management plan. With the understanding of the role of plant species as bio-filter to control air pollution, appropriate plant species (mainly tree species) have been suggested conceding the area/site requirements and needed performance of specific species. The details of year wise proposed plantation program are given in Table 4.13.

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

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

The objectives of the green belt cover will cover the following:
- Noise abatement
- Ecological restoration
- Aesthetic, biological and visual improvement of area due to improved vegetative and plantations cover.

4.5.2.2.1. Species Recommendation for Plantation granted in the district

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

TABLE 4.13: 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, and Casuarina will be planted along the Lease boundary and avenue plantation will be carried out in respective proposed projects. The rate of survival expected to be 80% in this area. Afforestation Plan is given in Table No.4.13 and budget of green belt development plan are given in Table No.4.14.

TABLE 4.14: GREENBELT DEVELOPMENT PLAN

PROPOSAL FOR P1					
Year	No. of trees proposed to be planted	Survival %	Area to be covered	Name of the species	No. of trees expected to be grown
I	1250	80%	Plantation is along safety distance , panchayat road and village road	Neem, Pongamia Pinnata, Casuarina etc.,	1000

TABLE 4.15: BUDGET FOR GREENBELT DEVELOPMENT PLAN

Activity	Year					Cost	Total Cost
	I	II	III	IV	V		
Plantation in Nos	125	125	125	125	125	@ 100 Rs/ Saplings	Rs 62,500
Plantation cost	12,500	12,500	12,500	12,500	12,500		
Plantation in the around the approach road and panchayat roads	125	125	125	125	125		Rs 62,500
	12,500	12,500	12,500	12,500	12,500		
Renovation of Wire Fencing (680 meters)	2,04,000					@ 300Rs per meter	Rs 2,04,000
Renovation of Garland Drain (640 meters)	1,92,000					@ 300Rs per meter	Rs 1,92,000
TOTAL							**Rs 5,21,000**

After complete extraction of mineral, the excavated pits will be allowed to collect rainwater and seepage water to serve as a reservoir to charge the nearby wells. Fish culture will also be attempted. A bund will be constructed around the pits. In order to minimize the impact of mining on the vegetation outside the mine lease area, it is recommended that adequate protection measures must be implemented. As mining involves movement of vehicles and increased anthropogenic activities, some of the areas can be fenced by involving local people and educating them about increased benefits of such activities.

4.5.3. Anticipated Impact on Fauna

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

4.5.3.1. Measures for protection and conservation of wildlife species

- Undertaking mitigative measures for conducive environment to the flora and fauna in consultation with Forest Department.
- Dust suppression system will be installed within mine and periphery of mine.
- Plantation around mine area will help in creating habitats for small faunal species and to create better environment for various fauna. Creating and developing awareness for nature and wildlife in the adjoining villages.

4.5.3.2. Mitigation Measures

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

4.5.4. Impact on Aquatic Biodiversity

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

4.5.5. Impact Assessment on Biological Environment

A detail of impact and assessments was mentioned in Table No 4.15.

TABLE 4.16: ECOLOGICAL IMPACT ASSESSMENTS

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

TABLE 4.17: ANTICIPATED IMPACT OF ECOLOGY AND BIODIVERSITY

Sl. No	Aspect Description	Likely Impacts on Ecology and Biodiversity (EB)	Impact Consequence - Probability Description / Justification	Significance	Mitigation Measures
			Pre-Mining Phase		
1	Uprooting of vegetation of lease area	Site specific loss of common floral diversity (Direct impact)	Site possesses common floral (not trees) species. Clearance of these species will not result in loss of flora	Less severe	No immediate action required. However, Greenbelt /plantation will be developed in project site and in periphery of the project

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

4.6   SOCIO ECONOMIC

4.6.1 Anticipated Impact

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

4.6.2 Mitigation Measures

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

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 from any of the proposed quarries.

4.9   MINE CLOSURE

Mine closure plan is the most important environmental requirement in mining projects. 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. Therefore, progressive mine closure plan should be specifically dealt with in the mining plan and is to be reviewed along with mining plan. 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)

5.1 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.

5.2 FACTORS BEHIND THE SELECTION OF PROJECT SITE

Thiru. K. Vazhaithotta Gounder Rough Stone and Gravel Quarries Project at Karunchamigoundenpalayam Village is a mining 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

5.3 ANALYSIS OF ALTERNATIVE SITE

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

5.4 FACTORS BEHIND SELECTION OF PROPOSED TECHNOLOGY

Mechanized open cast 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

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

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 CTE/CTO.

6.1 METHODOLOGY OF MONITORING MECHANISM

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

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

The responsibilities of this cell will be:

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

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

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

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

FIGURE 6.1: PROPOSED ENVIRONMENTAL MONITORING CELL P1 TO P6
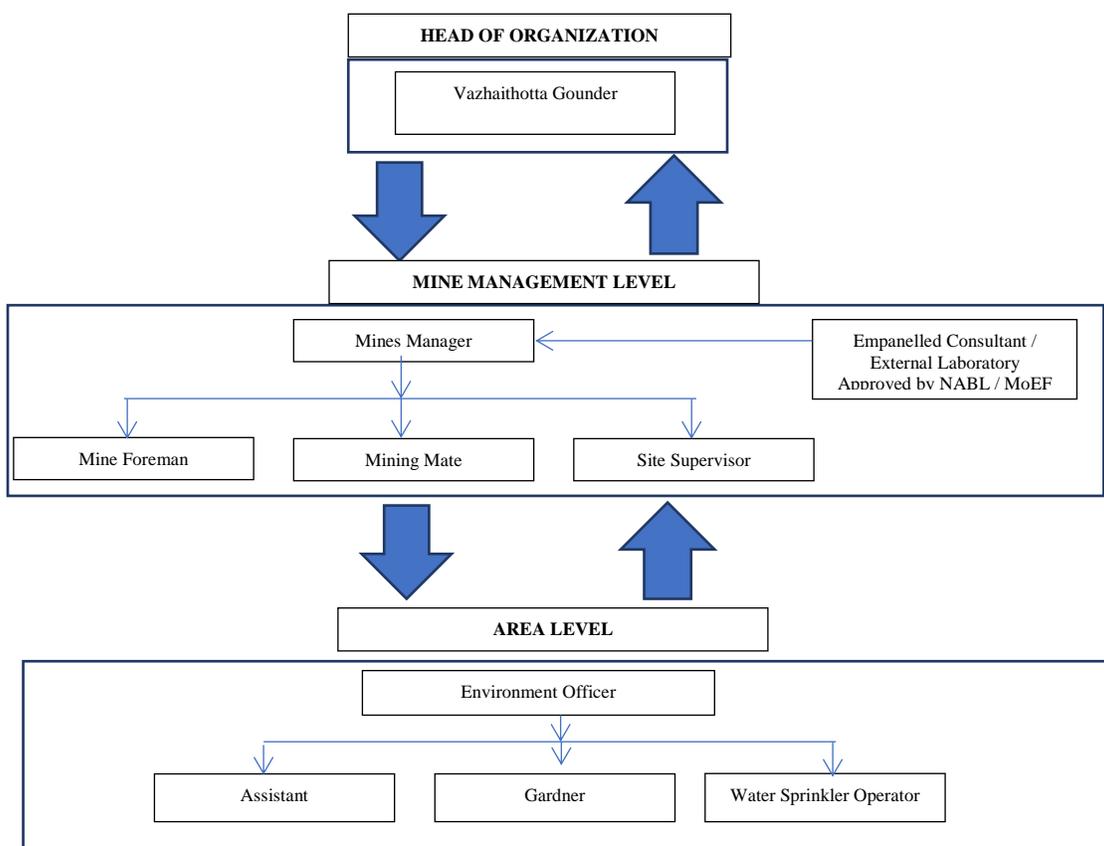
* The Environmental Monitoring Cell will be formed in all the proposed projects

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 FOR PROPOSED PROJECT

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

6.3   MONITORING SCHEDULE AND FREQUENCY

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

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

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

The details of monitoring is detailed in Table 6.2

TABLE 6.2: PROPOSED MONITORING SCHEDULE POST EC

S. No.	Environment Attributes	Location	Monitoring		Parameters
			Duration	Frequency	
1	Air Quality	2 Locations (1 Core & 1 Buffer)	24 hours	Once in 6 months	Fugitive Dust, PM2.5, PM10, SO2 and NOx.
2	Meteorology	At mine site before start of Air Quality Monitoring & IMD Secondary Data	Hourly / Daily	Continuous online monitoring	Wind speed, Wind direction, Temperature, Relative humidity and Rainfall
3	Water Quality Monitoring	2 Locations (1 SW & 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 per quarry is Rs 3,80,000/- and the recurring cost is Rs 76,000/- per annum

TABLE 6.3 ENVIRONMENT MONITORING BUDGET PER QUARRY

Sl.No.	Parameter	Capital Cost	Recurring Cost per annum
1	Air Quality		
2	Meteorology		
3	Water Quality	Rs. 3,80,000/-	Rs. 76,000/-
4	Hydrology		
5	Soil Quality		

6	Noise Quality		
7	Vibration Study		
	Total	**Rs 3,80,000/-**	**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	Safe operating procedure established for drilling (SOP) will be strictly followed.

		Due to high pressure of compressed air, hoses may burst Drill Rod may break	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
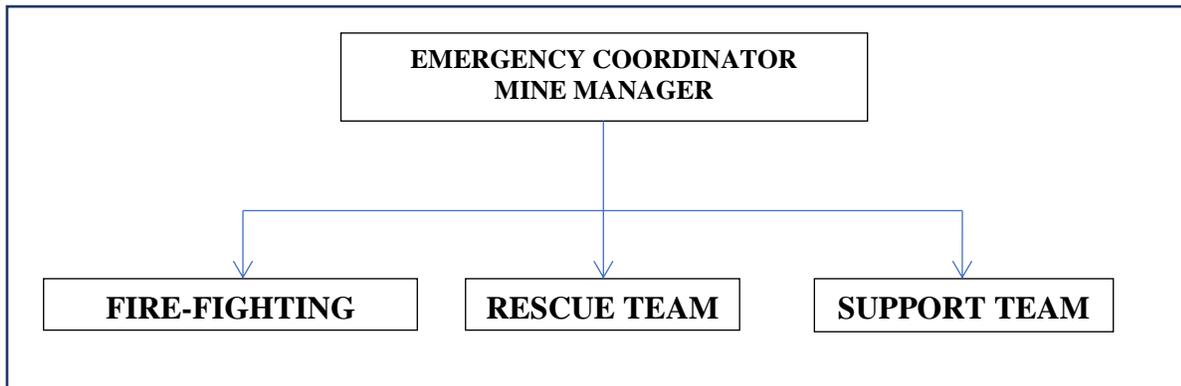
The emergency organization shall be headed by emergency coordinator who will be qualified competent mines manager. In his absence senior most people available at the mine shall be emergency coordinator till arrival of mines manager. There would be three teams for taking care of emergency situations – Fire-Fighting Team, Rescue Team and Support Team. The proposed composition of the teams is given in Table 7.2.

TABLE 7.2: PROPOSED TEAMS TO DEAL WITH EMERGENCY SITUATION

DESIGNATION	QUALIFICATION
FIRE-FIGHTING TEAM	
Team Leader/ Emergency Coordinator (EC)	Mines Manager
Team Member	Mines Foreman
Team Member	Mining Mate
RESCUE TEAM	
Team Leader/ Emergency Coordinator (EC)	Mines Manager
Team Member/ Incident Controller (IC)	Environment Officer
Team Member	Mining Foreman
SUPPORT TEAM	
Team Leader/ Emergency Coordinator (EC)	Mines Manager
Assistant Team Leader	Environment Officer
Team Member	Mining Mate
Security Team Leader/ Emergency Security Controller	Mines Foreman

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

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.

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.

The features of alarm system will be explained to one and all to avoid panic or misunderstanding during disaster. In order to prevent or take care of hazard / disasters if any the following control measures have been adopted.

- All safety precautions and provisions of Metalliferous Mines Regulations (MMR), 1961 is strictly followed during all mining operations.
- Observance of all safety precautions for blasting and storage of explosives as per MMR 1961.
- Entry of unauthorized persons into mine & allied areas is completely prohibited.
- Fire-fighting and first-aid provisions in the mines office complex and mining area are provided.
- Provisions of all the safety appliances such as safety boot, helmets, goggles, dust masks, ear plugs and ear muffs etc. are made available to the employees and the use of same is strictly adhered to through regular monitoring.
- Training and refresher courses for all the employees working in hazardous premises.
- Working of mine, as per approved plans and regularly updating the mine plans.
- Cleaning of mine faces is regularly done.
- Handling of explosives, charging and blasting are carried out only by qualified persons following SOP.
- Checking and regular maintenance of garland drains and earthen bunds to avoid any inflow of surface water in the mine pit.
- Provision of high-capacity standby pumps with generator sets with enough quantity of diesel for emergency pumping especially during monsoon.
- A blasting SIREN is used at the time of blasting for audio signal.
- Before blasting and after blasting, red and green flags are displayed as visual signals.

- ▪ Warning notice boards indicating the time of blasting and NOT TO TRESPASS are displayed at prominent places.
- ▪ Regular maintenance and testing of all mining equipment were carried out as per manufacturer's guidelines.

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

Code	Name of the Owner	S.F. Nos	Extent(ha)	Status
PROPOSED QUARRIES				
P1	K. Vazhaithotta Gounder	80/2B(P) & 81/2(P)	2.48.0	ToR Obtained vide Lr.No. SEIAA-TN/F.No.8733/SEAC/ToR-1051/2022 Dated:31.01.2022
PUBLIC HEARING CONDUCTED QUARRIES				
P2	P. Sureshkumar	80/2A(P) & 81/1(P),	4.85.62	Public hearing was conducted on 28.08.2021
P3	P. Varadharaj	91/1A	1.23.0	EC obtained on 18.08.2022 Vide Lr.No.SEIAA-TN/F.No.8349/1(a)/EC.No:5209/2020 dated 18.08.2022
Total			**8.56.62**	
Existing Quarries				
E1	K. Ramasamy	94,95/1A2, 95/1B2	1.40.5	01.06.2016 to 31.05.2021
Expired Quarries				
EX1	R.Krishnasamy	87/2, 88/1	3.40.0	27.02.2009 to 26.02.2014
EX2	P.Padmanaban	91/1B, 91/1c, 91/1D (Part) 92/1 (Part), 92/1C	2.08.5	12.10.2009 to 11.10.2014
Total			**5.48.5**	
TOTAL CLUSTER EXTENT (P1+P2+P3+E1)			**9.97.12**	

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

TABLE 7.5A: SALIENT FEATURES OF PROPOSALS

Proposal – P1	
Name of the Quarry	Thiru. K.Vazhaithotta Gounder Rough Stone & Gravel Quarry
Toposheet No	58 – B/13
Latitude between	10°51'35.03''N to 10°51'43.94''N
Longitude between	76°55'41.79''E to 76°55'46.12''E
Elevation	278 m AMSL
Proposed Depth of Mining (as per ToR)	32m (2m Gravel + 30m Rough Stone)
Geological Resources	Rough Stone in m^3 Gravel m^3 8,23,620 12,533
Mineable Reserves	Rough Stone in m^3 Gravel m^3 3,13,815 5,596
Yearwise Production	2,58,755 5,596
Existing Pit Dimension	192m (L) x 88m (W) x 12m (D)
Ultimate Pit Dimension	237m (L) x 88m (W) x 32m (D)
Water Level in the surrounds area	65 – 70m bgl

Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied area is flat terrain. The area has gentle sloping towards southeastern side. The altitude of the area is 278 m (max) above mean sea level. The area is covered by 2m thickness of Gravel Formation. Massive Charnockite is found after 2m (Gravel Formation) which is clearly inferred from the nearby existing quarrying pit.	
Machinery proposed	Jack Hammer	8 Nos
	Compressor	2 Nos
	Excavator with bucket and rock breaker	2 Nos
	Tippers	3 Nos
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	32 Nos	
Project Cost	Rs.62,42,000/-	
CER Cost @ 2% of Project Cost	Rs 5,00,000/-	
Nearby Water Bodies	Kumitipathi River	50m SW
	Odai	470m North
	Odai	4km SE
	Walayar Lake	7.5km SW
Greenbelt Development Plan	Proposed to plant 1250 trees in Safety Zone and Village roads	
Proposed Water Requirement	4.5 KLD	
Nearest Habitation	700m - Northwest	

Source: Approved Mining Plan

P2 – P. SURESH KUMAR		
Name of the Quarry	Thiru. P. Suresh Kumar Rough Stone & Gravel Quarry	
Toposheet No	58 – B/13	
Latitude between	10°51'32.92''N to 10°51'45.38''N	
Longitude between	76°55'35.18''E to 76°56'43.56''E	
Elevation	275 m AMSL	
Proposed Depth of Mining (as per ToR)	44m (2m Gravel + 30m Rough Stone)	
Geological Resources	Rough Stone in m^3	Gravel m^3
	15,07,244	1,44,210
Mineable Reserves	Rough Stone in m^3	Gravel m^3
	7,39,998	99,750
Yearwise Production	7,39,998	99,750
Ultimate Pit Dimension	190m (L) x 175m (W) x 44m (D) (14m agl + 30m bgl)	
Water Level in the surrounds area	65 – 70m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied area is elevated topography. The area has gentle sloping towards southwestern side. The altitude of the area is 275 m (max) above mean sea level. The area is covered by 3m thickness of Gravel Formation. Massive Charnockite is found after 3m (Gravel Formation) which is clearly inferred from the nearby existing quarrying pit.	
Machinery proposed	Jack Hammer	13 Nos
	Compressor	3 Nos
	Excavator with bucket and rock breaker	3 Nos
	Tippers	8 Nos
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	43 Nos	
Project Cost	Rs.1,30,18,264/-	
CER Cost @ 2% of Project Cost	Rs 10,00,000/-	
Nearby Water Bodies	Kumitipathi River	50m SW
	Odai	470m North
	Odai	4km SE
	Walayar Lake	7.5km SW
Greenbelt Development Plan	Proposed to plant 2000 trees in Safety Zone and Village roads	
Proposed Water Requirement	5.0 KLD	
Nearest Habitation	650m - Northwest	

P3 - P. VARADHARAJ		
Name of the Quarry	Thiru. P. Varadharaj Rough Stone & Gravel Quarry	
Toposheet No	58 – B/13	
Latitude between	10° 16' 21.88"N to 10° 16' 23.65"N	
Longitude between	78° 43' 00.31"E to 78° 43' 02.21"E	
Elevation	277 m AMSL	
Proposed Depth of Mining (as per ToR)	22m	
Geological Resources	Rough Stone in m³	Gravel m³
	4,58,640	22,932
Mineable Reserves	Rough Stone in m³	Gravel m³
	98,270	14,110
Yearwise Production as per ToR Conditions	98,270	14,110
Ultimate Pit Dimension	71m (L) x 83m (W) x 22m (D)	
Water Level in the surrounds area	65 – 70m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied area is flat terrain. The area has gentle sloping towards southeastern side. The altitude of the area is 277 m (max) above mean sea level. The area is covered by 2m thickness of Gravel Formation. Massive Charnockite is found after 2m (Gravel Formation) which is clearly inferred from the nearby existing quarrying pit.	
Machinery proposed	Jack Hammer	6 Nos
	Compressor	2 Nos
	Excavator with bucket and rock breaker	1 Nos
	Tippers	2 Nos
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	18 Nos	
Project Cost	Rs.48,60,000/-	
CER Cost @ 2% of Project Cost	Rs 5,00,000/-	
Nearby Water Bodies	Kumitipathi River	100m South
	Odai	470m North
	Odai	4km SE
	Walayar Lake	7.5km SW
Greenbelt Development Plan	Proposed to plant 750 trees in Safety Zone and Village roads	
Proposed Water Requirement	2.0 KLD	
Nearest Habitation	730m - Northwest	

Source: Approved Mining Plan

E1 - K. Ramasamy	
Name of the Quarry	Thiru. K. Ramasamy Rough Stone & Gravel Quarry
Toposheet No	58 – B/13
Latitude between	10° 16' 21.88"N to 10° 16' 23.65"N
Longitude between	78° 43' 00.31"E to 78° 43' 02.21"E
Elevation	277 m AMSL
Proposed Depth of Mining (as per ToR)	22m

Geological Resources	Rough Stone in m^3	Gravel m^3
	98092	

Mineable Reserves	Rough Stone in m^3	Gravel m^3
	34,745	1876

Yearwise Production as per ToR Conditions	33,689	1876

Water Level in the surrounds area	65 – 70m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied area is flat terrain. The area has gentle sloping towards southeastern side. The altitude of the area is 290 m (max) above mean sea level. The area is covered by 2m thickness of Gravel Formation. Massive Charnockite is found after 2m (Gravel Formation) which is clearly inferred from the nearby existing quarrying pit.	

Machinery proposed	Jack Hammer	7 Nos
	Excavator with bucket and rock breaker	2 Nos
	Tippers	2 Nos

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	15 Nos	
Project Cost	Rs.57,70,000/-	
CER Cost @ 2% of Project Cost	Rs 1,15,400/-	
Greenbelt Development Plan	Proposed to plant 150 trees in Safety Zone and Village roads	
Proposed Water Requirement	2.0 KLD	

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 7.6 & 7.7.

TABLE 7.6: CUMULATIVE PRODUCTION LOAD OF ROUGH STONE

Quarry	PROPOSED PRODUCTION DETAILS			
	Production for five-year plan period	Per Year in m^3	Per Day in m^3	Number of Lorry Load Per Day
P1	2,58,755	51,751	172	14
P2	7,39,998	1,47,999	493	41
P3	98,270	19,654	66	5
E1	33,689	6737	22	2
Total	11,30,712	2,26,141	753	62

TABLE 7.7: CUMULATIVE PRODUCTION LOAD OF GRAVEL

Quarry	PROPOSED PRODUCTION DETAILS			
	Production for three-year plan period	Per Year in m^3	Per Day in m^3	Number of Lorry Load Per Day
P1	5,596	1,865	6	1
P2	99,750	33,250	111	9
P3	14,110	4,703	16	2
E1	1876	625	2	1
Total	1,21,332	40,443	135	13

On a cumulative basis considering the 4 quarries it can be seen that the overall production of Rough Stone is 753 m^3 per day and overall production of Gravel is 135 m^3 per day with a capacity of 64 trips of Rough Stone per day and 13 Trips per day of Gravel from the cluster.

Note: Per day production of Rough Stone is calculated for 5 Years Lease Period and for Gravel production with 1, 2 or 3 or 5 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 4 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 7.14.

TABLE 7.8: EMISSION ESTIMATION FROM QUARRIES WITHIN 500 METER RADIUS

EMISSION ESTIMATION FOR QUARRY "P1"				
	Activity	Source type	Value	Unit
	Drilling	Point Source	0.095883154	g/s
	Blasting	Point Source	0.001960316	g/s
Estimated Emission Rate for PM$_{10}$	Mineral Loading	Point Source	0.043426568	g/s
	Haul Road	Line Source	0.002494635	g/s
	Overall Mine	Area Source	0.057432133	g/s
Estimated Emission Rate for SO$_2$	Overall Mine	Area Source	0.000876938	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000048776	g/s
EMISSION ESTIMATION FOR QUARRY "P2"				
	Activity	Source type	Value	Unit
	Drilling	Point Source	0.116223167	g/s
	Blasting	Point Source	0.005129535	g/s
Estimated Emission Rate for PM$_{10}$	Mineral Loading	Point Source	0.047104694	g/s
	Haul Road	Line Source	0.002510289	g/s
	Overall Mine	Area Source	0.079379866	g/s
Estimated Emission Rate for SO$_2$	Overall Mine	Area Source	0.0019763000	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.0002087170	g/s
EMISSION ESTIMATION FOR QUARRY "P3"				
Estimated Emission Rate for PM$_{10}$	Activity	Source type	Value	Unit
	Drilling	Point Source	0.045179735	g/s
	Blasting	Point Source	0.000045534	g/s
	Mineral Loading	Point Source	0.034047809	g/s
	Haul Road	Line Source	0.002483254	g/s
	Overall Mine	Area Source	0.032740650	g/s
Estimated Emission Rate for SO$_2$	Overall Mine	Area Source	6.86302E-05	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000001157	g/s
EMISSION ESTIMATION FOR QUARRY "E1"				
Estimated Emission Rate for PM$_{10}$	Activity	Source type	Value	Unit
	Drilling	Point Source	0.113658443	g/s
	Blasting	Point Source	0.005129535	g/s
	Mineral Loading	Point Source	0.045048692	g/s
	Haul Road	Line Source	0.002454894	g/s

	Overall Mine	Area Source	0.063503893	g/s
Estimated Emission Rate for SO$_2$	Overall Mine	Area Source	0.001676861	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000166973	g/s

Source: Emission Calculations

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.

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

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.

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

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 7.10: 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	45.1	49.9	51.1	
Habitation Near P2	45.1	49.2	50.6	55
Habitation Near P3	46.7	47.4	50.1	
Habitation Near E1	46.7	47.4	50.1	

Source: Lab Monitoring Data

The incremental noise level is found within the range of 47.4 – 49.9 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), dated19.09.2006 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 5 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 5 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.

Another impact due to blasting activities is fly rocks. These may fall on the houses or agricultural fields nearby the mining areas and may cause injury to persons or damage to the structures.

Nearest Habitations from 4 mines respectively are as in below Table 7.12

TABLE 7.11: NEAREST HABITATION FROM EACH MINE

Location ID	Distance & Direction
Habitation Near P1	700 Northwest
Habitation Near P2	650m – Northwest
Habitation Near P3	700m – Northwest
Habitation Near E1	430 m North 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 7.12: GROUND VIBRATIONS

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
P1	14	700 Northwest	0.116
P2	41	650m – Northwest	0.274
P3	5	700m – Northwest	0.051
E1	2	430 m North East	0.053

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 5 mines shall contribute towards CER and the community shall develop.

TABLE 7.13: SOCIO ECONOMIC BENEFITS

Location ID	Project Cost	CER @ 2%
P1	62,42,000	5,00,000
P2	1,30,18,264	10,00,000
P3	48,60,000	5,00,000
E1	57,70,000	1,15,400
Total	**2,99,90,264**	**16,15,400**

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.

- 4 Projects in Cluster shall fund towards CER – **Rs 16,15,400/-**

TABLE 7.14: EMPLOYMENT BENEFITS FROM 5 MINES

Location ID	Employment
P1	32
P2	43
P3	18
E1	15
Total	**108**

A total of 93 people will get employment due to 3 proposed quarries in cluster.

TABLE 7.15: GREENBELT DEVELOPMENT BENEFITS FROM 5 MINES

CODE	No of Trees proposed to be planted	Survival %	Area Covered Sq.m	Name of the Species	No. of Trees expected to be grown
P1	1250	80%	3,480	Neem, Casuarina, etc.,	1000
P2	2000	80%	3,270	Neem, Pungam, Naval	1600
P3	750	80%	2,000	Neem, Casuarina, etc.,	600
E1	150	80%	1,000	Neem, Casuarina, etc.,	120
Total	**4,150**	80%	**9,750**		**3,320**

Based on the Proposed Mining Plan it is anticipated to plant and maintain native species of Neem, Casuarina, etc in the Cluster Trees Planted over a period of 5 Years with Survival Rate of 80% and expected growth is around 3,320 Trees over an area of 9,750 Sq.m. in the Proposed Quarry.

7.5   PLASTIC WASTE MANAGEMENT PLAN

All 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 7.16: 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 Karunchamigoundenpalayam village aims to produce 2,58,755 m^3 Rough Stone and 5,596 m^3 Gravel over a period of 5 Years. This will enhance the socio-economic activities in the adjoining areas and will result in the following benefits

- Increase in Employment Potential
- Improvement in Socio-Economic Welfare
- Improvement in Physical Infrastructure
- Improvement in Social infrastructure

8.1　　EMPLOYMENT POTENTIAL

It is proposed to provide employment to about 32 persons for carrying out mining operations and give preference to the local people in providing employment in this Project. 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 Karunchamigoundenpalayam Village, Madukkarai Taluk and Coimbatore 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

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

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

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

CSR Cost Estimation

▪ CSR activities will be taken up in the Karunchamigoundenpalayam village mainly contributing to education, health, training of women self-help groups and contribution to infrastructure etc., CSR budget is allocated as 2.0% of the profit.

CORPORATE ENVIRONMENT RESPONSIBILITY

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

As per para 6 (II) of the office memorandum, being a green field project & Capital Investment is ≤ 100 crores, Thiru K.Vazhaithotta Gounder shall contribute 2% of Capital Investment towards CER as per directions of EAC/SEAC. Cumulative Capital cost is Rs. 62,42,000/- and 2% of the same works out to Rs.1,25,000/-

TABLE 8.1: CER – ACTION PLAN

Activity	Beneficiaries	Total
Water Purifier, Plantation and environmental related books	Karunchamigoundenpalayam Govt. School	Rs.5,00,000/-
Renovation Toilets	Karunchamigoundenpalayam Govt. School	
TOTAL		**Rs.5,00,000/-**

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

9.   ENVIRONMENTAL COST BENEFIT ANALYSIS

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

10.   ENVIRONMENTAL MANAGEMENT PLANS

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's Karunchamigoundenpalayam Cluster Quarry 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. Aesthetic of the Environment will not be affected. 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 is no overburden or waste anticipated from proposed project.

TABLE 10.2: PROPOSED CONTROLS FOR SOIL MANAGEMENT

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

Source: Proposed by FAE's & EIA Coordinator

10.4   WATER MANAGEMENT

In the proposed quarrying project, no process is involved for the effluent generation, effluent is mainly containing Oil & grease from the workshop, no workshops are proposed inside the project area.

The quarrying operation is proposed upto a depth of 32m BGL, the water table in the area is 65 m – 70 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 shall be 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

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

TABLE 10.7 PROPOSED GREENBELT ACTIVITIES FOR 5 YEAR PLAN PERIOD

PROPOSAL FOR P1					
Year	No. of trees proposed to be planted	Survival %	Area to be covered	Name of the species	No. of trees expected to be grown
I	1250	80%	Plantation along safety distance , panchayat road and village road.	Neem, Pongamia Pinnata, Casuarina etc.,	1000

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

The objectives of the greenbelt development plan are –
- Provide a green belt around the periphery of the 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 TO PLANT IN THE GREENBELT

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

Source: Proposed by FAE's & EIA Coordinator

10.9 OCCUPATIONAL SAFETY & HEALTH MANAGEMENT

Occupational safety and health are very closely related to productivity and good employer-employee relationship. The main factors of occupational health impact in quarries are fugitive dust and noise. Safety of employees during 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

- Identifying workers with conditions that may be aggravated by exposure to dust & noise and establishing baseline measures for determining changes in health.

- Evaluating the effect of noise on workers

- Enabling corrective actions to be taken when necessary

- Providing health education

The health status of workers in the mine shall be regularly monitored under an occupational surveillance program. Under this program, all the employees are subjected to a detail 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)	███	███	███	███	███

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

10.9.2   Proposed Occupational Health and Safety Measures

- The mine site will have adequate drinking water supply so that workers do not get dehydrated.
- 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.
- Supervisor will be instructed for reporting any problems with hearing protectors or noise control equipment.

- At noisy working activity, exposure time will be minimized.
- Dust generating sources will be identified and proper control measure will be adopted.
- Periodic medical examinations will be provided for all workers.
- Strict observance of the provisions of DGMS Acts, Rules and Regulations in respect of safety both by management and the workers.
- The width of road will be maintained more than thrice the width of the vehicle. A code of traffic rules will be implemented.
- In respect of contract work, safety code for contractors and workers will be implemented. They will be allowed to work under strict supervision of statutory person/officials only after they will impart training at vocational training 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 Proponents 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.

TABLE 10.10: LIST OF PERIODICAL TRAININGS PROPOSED FOR EMPLOYEES

Course	Personnel	Frequency	Duration	Instruction
New-Employee Training	All new employees exposed to mine hazards	Once	One week	Employee rights Supervisor responsibilities Self-rescue Respiratory devices Transportation controls Communication systems Escape and emergency evacuation Ground control hazards Occupational health hazards Electrical hazards First aid Explosives
Task Training Like Drilling, Blasting, Stemming, safety, Slope stability, Dewatering, Haul road maintenance,	Employees assigned to new work tasks	Before new Assignments	Variable	Task-specific health &safety procedures and SOP for various mining activity. Supervised practice in assigned work tasks.
Refresher Training	All employees who received new-hire training	Yearly	One week	Required health and safety standards Transportation controls Communication systems Escape ways, emergency evacuations Fire warning Ground control hazards First aid Electrical hazards Accident prevention Explosives Respirator devices
Hazard Training	All employees exposed to mine hazards	Once	Variable	Hazard recognition and avoidance Emergency evacuation procedures Health standards Safety rules Respiratory devices

Source: Proposed by FAE's & EIA Coordinator as per DGMS Norms

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 10.11: EMP BUDGET FOR PROPOSED PROJECTS

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	24800	24800
	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 -8 Units	200000	20000
	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 - 3 Units	15000	750
	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	49600
	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	672763
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	24800	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	496000	10000
	3. Progressive Closure Activity Green belt development - 500 trees per one hectare - Proposal for 1250 Trees - (250 Inside Lease Area & 1000 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)	50000	7500
		Avenue Plantation @ 300 per plant (capital) for plantation outside the lease area and @ 30 per plant maintenance (recurring)	300000	30000
	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	66900	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	1526655	
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) -32 Employees	128000	32000
Health check up for workers will be provisioned	IME & PME Health check up @ Rs. 1000/- per employee	0	32000
First aid facility will be provided	Provision of 2 Kits per Hectare @ Rs. 2000/-	0	4960
Mine will have safety precaution signages, boards.	Provision for signages and boards made	10000	2000
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	496000	10000
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	124000	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	
TOTAL			**4845255**	**1866373**

Year Wise Break Up	
1st Year	RS.67,11,628
2nd Year	RS. 19,59,692
3rd Year	RS. 20,57,676
4th Year	RS. 21,60,560
5th Year	RS. 22,68,588
Total	RS.**152 lakhs**

In order to implement the environmental protection measures, an amount of Rs.48.45 lakhs as capital cost and recurring cost as Rs. 18.66lakhs as recurring cost is proposed considering present market price considering present market scenario for the proposed project.

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 .

11.   SUMMARY AND CONCLUSION

Thiru. K. Vazhaithotta Gounder Rough Stone & Gravel Quarries (Extent – 9.97.12 ha) 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.

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 March to May 2022 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 32 people directly in the project.

As discussed, it is safe to say that the proposed quarry is 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. K. Vazhaithotta Gounder Rough Stone & Gravel Quarries (Extent – 9.97.12 ha).

12.   DISCLOSURE OF CONSULTANT

Thiru. K. Vazhaithotta Gounder Rough Stone & Gravel Quarries, has engaged M/s Geo Exploration and Mining Solutions, an Accredited Organization under Quality Council of India – National Accreditation Board for Education & Training, New Delhi, for carrying out the EIA Study as per the ToR Issued.

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

Declaration by experts contributing to the EIA/EMP for Thiru. K. Vazhaithotta Gounder Rough Stone & Gravel Quarries Project over an Extent of 9.97.12 ha in Karunchamigoundenpalayam Village of Madukkarai Taluk, Coimbatore District of Tamil Nadu. It is also certified that information furnished in the above EIA study are true and correct to the best of our Knowledge.

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

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

Designation**:**   **EIA Coordinator**

Date & Signature:

Period of Involvement:

Associated Team Member with EIA Coordinator:
1. **Mr. S. Nagamani**
2. **Mr. P.Viswanathan**
3. **Mr. 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 localgeology 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 ofIndia, 2011. ▪ Impact Assessment & Preventive ManagementPlan	Mrs. K. Anitha	
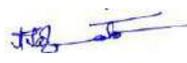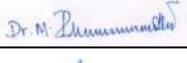
SI	Area	Involvement	Name	Signature
		▪ Corporate Environment Responsibility.		
6	EB	▪ Collection of Baseline data of Flora and Fauna. ▪ Identification of species labelled as Rare, Endangered and threatened as per IUCN list. ▪ Impact of the project on flora and fauna. ▪ Suggesting species for greenbelt development.	Mrs. Amirtham	
			Mr. Alagappa Moses	
7	RH	▪ Identification of hazards and hazardous substances	Mr. N. Senthilkumar	
		▪ Risks and consequences analysis	Mr. S. Pavel	
		▪ Vulnerability assessment ▪ Preparation of Emergency Preparedness Plan ▪ Management plan for safety.	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	
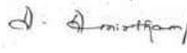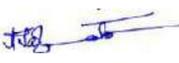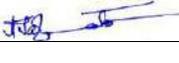
LIST OF TEAM MEMBERS ENGAGED IN THIS PROJECT

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	S. Nag...

			▪ Analyse & provide inputs and assist FAE with meteorological data, emission estimation, AERMOD modelling and suggesting control measures	
2	Mr. Viswanathan	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	*(signature)*
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	*(signature)*
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	*(signature)*
5	Mr. A. Allimuthu	SE	▪ Site Visit with FAE ▪ Assist FAE with collection of data's ▪ Provide inputs by analysing primary and secondary data	*(signature)*
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	*(signature)*
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	*(signature)* E. Vadivel
8	Mr. D. Dinesh	NV	▪ Site Visit with FAE	*(signature)*

			▪ 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	*P Panshy*
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	*T. amma*

DECLARATION BY THE HEAD OF THE ACCREDITED CONSULTANT ORGANIZATION

I, Dr. M. Ifthikhar Ahmed, Managing Partner, Geo Exploration and Mining Solutions, hereby, confirm that the above-mentioned Functional Area Experts and Team Members prepared the EIA/EMP for Thiru. K. Vazhaithotta Gounder Rough Stone & Gravel Quarries Project over an Extent of 9.97.12 ha in Karunchamigoundenpalayam Village of Madukkarai Taluk, Coimbatore 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/1922/SA0139 Dated: 11-10-2021**

Validity: **Valid till 29.01.2023**