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-GOVERNMENT LAND

CLUSTER EXTENT = 9.50.0 ha

THIRU. N.M. ARUMUGABALAJI ROUGH STONE QUARRY

at

Mellur Duraisamipuram Village, Rajapalayam Taluk, Virudhunagar District,

Project Proponent	Proposed Project	Extent
Thiru.N.M. Arumugabalaji, S/o.N.Muthupandian, Door.No.11/339-CIB, 6th Cross Street, V.O.C. Nagar, Rajapalayam Taluk, Virudhunagar District-626 102.	S.F. No 328(Part-III) Mellur Duraisamipuram Village, Rajapalayam Taluk, Virudhunagar District, Tamil Nadu.	**1.25.0 ha**
ToR obtained vide **Lr No. SEIAA-TN/F.No. 9610/SEAC/1(a)/ToR-1331/2022 dated:10.02.2023**		

Environmental Consultant

GEO EXPLORATION AND MINING SOLUTIONS

Old No. 260-B, New No. 17,
Advaitha Ashram Road, Alagapuram,
Salem – 636 004, Tamil Nadu, India
Accredited for sector 1 Category 'A' & 31,38 Category 'B'
Certificate No: NABET/EIA/2225/RA0276
Phone: 0427-2431989,
Email: ifthiahmed@gmail.com, geothangam@gmail.com
Web: www.gemssalem.com

Baseline Monitoring Period - March to May 2023

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

JUNE- 2023

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

PROPOSED QUARRY				
Code	**Name of the Owner**	**S.F. Nos**	**Extent**	**Status**
P1	**Thiru.N.M.Arumugabalaji,** S/o.N.Muthupandian, Door.No.11/339-CIB, 6th Cross Street, V.O.C.Nagar, Rajapalayam Taluk, Virudhunagar District-626 102	328(Part-III)	1.25.0 ha	TOR Obtained: **Lr No. SEIAA-TN/F.No. 9610/SEAC/I(a)/ToR-1331/2022 dated:10.02.2023**.
Nearby Proposed Quarry				
P2	**Tmt. R. Ineyasnega** W/o. Rajkumar, No.54, South Car Street, Vellaikkottai, Aruppukottai & Taluk, Virudhunagar District – 626 101.	328 (P-III)	1.25.0 Ha	KV1/243/2018 dt. 09.11.2018
TOTAL			**2.50.0 ha**	
EXISTING QUARRY				
Code	**Name of the Owner**	**S.F. No**	**Extent**	**Status**
E1	**Thiru.N.Muthupandiyan**	328 (P-I)	2.50.0 ha	01.03.2019 To 29.02.2024
E2	**Thiru.M.Kanthakrishnakumar**	328 (P-II)	2.50.0 ha	01.03.2019 To 29.02.2024
E3	**Thiru.S.Victor Alponse Raja**	328(Part-III)	2.00.0 ha	19.04.2018 To 18.04.2023
	TOTAL		**7.00.0ha**	
	ABANDONED QUARRY			
Code	**Name of the Owner**	**S.F. No**	**Extent**	**Status**
A1	**Nila Mahalir SGSY**	**328**	**5.00.0 Ha**	02.06.2011 To 01.06.2016
		Total	**5.00.0 Ha**	
TOTAL CLUSTER EXTENT			**9.50.0 ha**	

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

As per above notification S.O.2269(E) dated : 01.07.2016 in para (b) in Appendix XI,- (ii)(5): The lease not operative for three years or more and leases which have got environmental clearance as on 15th January, 2016 shall not be counted for calculating the area of cluster, but shall be included in the Environment Management Plan and the Regional Environmental Management Plan"

TERMS OF REFERENCE (ToR) COMPLIANCE

Thiru.N.M.Arumugabalaji,

"ToR issued vide Lr No.SEIAA-TN/F.No. 9610/SEAC/I(a)/ToR-1331/2022 dated:10.02.2023"

SPECIFIC CONDITIONS		
1	Proponent shall furnish the letter received from DFO concemed stating the proximity details of Reserve Forests, Protected Areas, Sanctuaries, Tiger reserve etc., up to a radius of25 km from the proposed site..	Noted and agreed
2	EIA Report shall include mitigation measures to be undertaken as Nellai Wildlife Sanctuary and Giant Squinel Wildlife Sanctuary are proximate to the proposed mine lease area.	Noted and agreed
3	Detailed study report on flora and fauna in and nearby the quarry site.	flora and fauna is detailed in chapter 3
4	The Proponent shall develop greenbelt and garland drain around the boundary ofthe proposed quarry and the photographs indicating the same shall be shown during the EIA appraisal.	Noted and agreed
5	The Proponent shall carry out Bio diversity study through reputed Institution and the same shall be included in EIA Report	Noted and agreed
6	The structures within the radius of (i) 100 m, (ii) 300 m, and (iii) 500 m shall be enumerated with details such as dwelling houses with number ofoccupants, whether it belongs to the owner (or) not, places ofworship, industries, factories, sheds, etc.	Noted and agreed
7	The Proponent shall submit a conceptual 'Slope Stability Assessment' for the proposed quarry during the appraisal while obtaining the EC, when the depth of the proposed working is extended beyond 30 m below ground level.	Noted and agreed
8	Since the proposed lease exists in the hilly terrain, the Project Proponent (PP) shall prepare and submit an 'Action Plan' for carrying out the formation ofthe benches from top to downwards in the proposed quarry lease including the removal ofboulder formed over the sloping face during the time ofappraisal for obtaining the EC.	Noted and agreed
9	The PP shall submit detailed mitigation measures particularly related to dust pollution with respect to the location of the dwellings and Nellai Wildlife Sanctuary surrounding the proposed project based on the wind direction during the time of appraisal for	Noted and agreed

	obtaining the EC..	
10	The Proponent shall furnish the affidavit stating that the blasting operation in the proposed quarry is carried out by the statutory competent person as per the MMR I 961 such as blaster, mining mate, mine foreman, II/I Class Mine manager appointed by the Proponent	Noted and agreed
11	The EIA Coordinators shall obtain and fumish the details of quarry/quarries operated by the proponent ill the past, either in the same location or else where in the State with video and photographic evidences.	Noted and agreed
12	The EIA coordinators shall obtain and fumish the detairs of quarry/quanies operated by the proponent in the past, either in the same location or elsewhere in the state with video and photographic evidences.	Noted & agreed.
13	If the proponent has already carried out the mining activity in the proposed mining lease area after 15.01.2016, then the proponent shall fumish the following details from AD/DD mines, a) What was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines? b) Quantity of minerals mined out. c) Highest production achieved in any one year d) Derail of approved depth of mining. e) Actual depth of the mining achieved earlier. t) Name ofthe person already mined in that leases area. g) If EC and CTO already obtained, the copy of the same shall be submitted. h) Whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches..	It is a fresh quarry
14	All corner coordinates of the mine lease area, superimposed on a high-resolution Imagery/Toposheet, Geomorphology, Lithology and geology of the mining lease area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and Buffer zone area).	superimposed on a high-resolution Imagery/Toposheet in chapter-2.
15	The PP shall carry out Drone video survey covering the cluster, Green belt, fencing etc	It is a new quarry
16	The proponent shall fumish photographs of adequate fencing installed, green belt developed along the periphery including replantation of existing trees & safety distance between the adjacent quarries &	Noted and agreed

	water bodies nearby provided as per the approved mining plan.	
17	The Project proponent shall provide the details of mineral reserves and mineable reserves, planned production capacity, proposed working methodology justifications, with the anticipated impacts of the mining operations on the surrounding environment and the remedial measures for the same.	The details of mineral reserves and mineable reserves are explained in chapter-2 & 4.
18	The Project proponent shall provide the Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of Mines Act, 1952 and the MMR, 196l for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment.	Noted and agreed
19	The Project Proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells, and surface water bodies such as rivers' tanks, canals, ponds etc. within l km (radius) along with the collected water level data for both monsoon and non-monsoon seasons from the PWD / TWAD so as to assess the impacts on the wells due to mining activity. Based on actual monitored data' it may clearly be shown whether working will intersect groundwater' Necessary data and documentation in this regard may be Provided.	The hydro-geological study are explained in chapter – 3.
20	The proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quantity' air quality' soil quality & flora/fauna including 8affic/vehicular movement study	It is a fresh quarry
21	The Proponent shall carry out the Cumulative impact study due to mining operations carried out in the quarry specifically with reference to the specific environment in terms of soil, health, biodiversity, air pollution, water pollution, climate change and flood control & health impacts. Accordingly, the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind.	The Cumulative impact study due to mining operations is explained in chapter – 7
22	Rain water harvesting management with recharging details along with water balance (both monsoon & non-monsoon) be submitted.	Noted and agreed
23	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 pre	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.

	operational, operational and post operational phases and submitted. Inpact, if any, of change of land use should be given.	
24	Details of the land for storage of Overburden/Waste Dumps (or) Rejects outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be provided.	Not applicable
25	Proximity to Areas declared as 'Critically Polluted' (or) the Project areas which attracts the court restrictions for mining operations, should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the TNPCB (or) Dept. of Geology and Mining should be secured and furnished to the effect that the proposed mining activities could be considered.	Not Applicable. Project area / Study area is not declared in 'Critically Polluted' Area and does not come under 'Aravalli Range.
26	Description of water conservation measures proposed to be adopted itr the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	Mine Closure in Chapter -2
27	Impact on local transport infrastructure due to the Project should be indicated.	Transportation details mentioned in Chapter -2
28	A tree survey study shall be carried out (nos., name of the species, age, diameter etc.,) both within the mining lease applied area & 300m buffer zone and its management during mining activity.	Details of the trees in the buffer zone given in Chapter No.3.
29	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific.	Mine closure plan is detailed in Chapter:4.
30	Public Hearing points raised and commitments of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA,/EMP Report of the Project and to be submitted to SEIAA/SEAC with regard to the Office Memomndum of MoEF& CC accordingly.	Noted and agreed
31	The Public hearing advertisement shall be published in one major National daily and onemost circulated vernacular daily.	Noted and agreed
32	The PP shall produce/display the EIA report, Executive summary and other related information with respect to public hearing io Tamil Language also.	Noted and agreed
33	As a part of the study of flora and fauna around the vicinity of the proposed site, the EIA coordinator shall strive to educate the local students on the importance of preserving local flora and fauna by involving them in the study, wherever possible.	Noted and agreed

34	The purpose of green belt around the project is to capture the fugitive emissions. Carbon sequestration and to attenuate the noise generated, in addition to improving the aesthetics. A wide range of indigenous plant species should be planted as given in the appendix in consultation with the DFO, State Agriculture University. The plant species with dense/moderate canopy of native origin should be chosen. Species of Small medium/tall trees altemating with shrubs should be planted io a mixed manner.	Species are proposed to plant in the safety barrier as mentioned in the ToR appendix. Proposed species are given in the Chapter No 4
35	Taller/one year old Saplings raised in appropriate size of bags; preferably eco-friendly bags should be planted in proper espacement as per the advice of local forest authorities / botanist / Horticulturist with regard to site specific choices. The proponent shall earmark the greenbelt area with GPS coordinates all along the boundary of the project site with at least 3 meters wide and in between blocks in an organized manner.	It is a Fresh Lease. Around 950 trees are proposed to plant
36	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	Disaster management Plan details in Chapter-7
37	A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report.	A Risk Assessment and management Plan Chapter- 7
38	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	Occupational Health impacts chapter- 10
39	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed lemedial measures should be detailed along with budgetary allocations.	It is explained in Chapter -3
40	The Socio-economic studies should be carried out within a 5 km buffer zone from the mining activity. Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	Details are listed in Chapter:3.
41	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
42	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.	Noted and agreed

43	If any quarrying operations were carried out in the proposed quarrying site for which now the EC is sought, the Project Proponent shall furnish the detailed compliance to EC conditions given in the previous EC with the site photographs which shall duly be certified by MoEF&CC, Regional Office, Chennai (or) the concerned DEE/TNPCB.	It is a Fresh Lease
44	The PP shall prepare the EMP for the entire life of mine and also fumish the sworn affidavit stating to abide the EMP for the entire life of mine.	Noted and agreed
45	Concealing any factual information or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this Terms of Reference besides attracting penal provisions in the Environment (Protection) Act, 1986.	Noted and agreed

S.No	**ADDITIONAL CONDITIONS**	
1	Considering the environmental impacts due to mining, safety of the working personnel and following the principle of sustainable mining' the depth of mining is restricted to 46m and the quantity of Rough stone to 1,04,530 m^3 as per the approved mining plan	Noted & agreed
2	Proponent shall comply with all the conditions imposed in the Precise area communication letter before applying for EC	Noted & agreed
3	The members must coordinate among themselves for the effective implementation of EMP as committed including Green Belt Development, Water sprinkling, tree plantation, blasting etc.,	Noted & agreed
4	Detailed Operational Plan must be submitted which must include the blasting frequency with respect to the nearby quarry situated in the cluster, the usage of haul roads by the individual quarry in the form of route map and network	Noted & agreed
5	The committee shall deliberate on risk management plan pertaining to the cluster in a holistic manner especially during natural calamities lake intense rain and the mitigation measures considering the inundation of the cluster and evacuation plan.	Noted & agreed
6	The Cluster Management Committee shall form Environmental Policy to practice sustainable mining in a scientific and systematic manner in accordance with the law. The role played by the committee in implementing the environmental policy devised	Noted & agreed

	shall be given in detail	
7	The Cluster Management Committee shall form Environmental Policy to practice sustainable mining in a scientific and systematic manner in accordance with the law. The role played by the committee in implementing the environmental policy devised shall be given in detail.	Noted & agreed
8	The committee shall furnish action plan regarding the restoration strategy with respect to the individual quarry falling under the cluster in a holistic manner.	Noted & agreed
9	The committee shall fumish the Emergency Management plan within the cluster.	
10	The committee shall deliberate on the health of the workers/staff involved in the mining as well as the health of the public.	Noted & agreed
11	Detailed study shall be carried out in regard to impact of mining around the proposed mine lease area covering the entire mine lease period as per precise area communication order issued from reputed research institutions on the following	Noted & agreed
12	Soil health & bio-diversity	Noted & agreed
13	Climate change leading to Droughts, Floods etc.	Noted & agreed
14	Pollution leading to release of Greenhouse gases (GHG), rise in Temperature, & Livelihood of the local people	Noted & agreed
15	Possibilities of water contamination and impact on aquatic ecosystem health	Noted & agreed
16	Agriculture, Forestry & Traditional practices	Noted & agreed
17	Hydrothermal/Geothermal effect due to destruction in the Environment	Noted & agreed
18	Bio-geochemical processes and its foot prints including environmental stress	Noted & agreed
19	Sediment geochemistry in the surface streams	Noted & agreed
20	The committee shall furnish an action plan to achieve sustainable development goals	Noted & agreed

	with reference to water, sanitation & safety.	
21	The committee shall furnish the fire safety and evacuation plan in the case of fire accidents.	Noted & agreed
22	The measures taken to control Noise, Air, Water, Dust Control and steps adopted to efficiently utilise the Energy shall be furnished	Noted & agreed
23	Details of type of vegetations including no. of trees & shrubs within the proposed mining area and. If so, transplantation of such vegetations all along the boundary of the proposed mining area shall committed mentioned in EMP Impact on surrounding agricultural fields around the proposed mining Area	Noted & agreed
24	Impact on surrounding agricultural fields around the proposed mining Area.	
25	Erosion Control measures	Noted & agreed
26	Impact on soil flora & vegetation around the project site.	Noted & agreed
27	Detailed study shall be carried out in regard to impact of mining around the proposed mine lease area on the nearby Villages, Water-bodies/ Rivers, & any ecological fragile areas.	Noted & agreed
28	The project proponent shall furnish VAO certificate with reference to 300m radius regard to approved habitations, schools, Archaeological sites, Structures, railway lines, roads, water bodies such as streams, odai, vaari, canal, channel, river, lake pond, tank etc.	Noted & agreed
29	As per the MoEF& CC office memorandum F.No.22-65l2017-lA.lll dated: 30.09.2020 and 20.10.2020 the proponent shall address the concerns raised during the public consultation and all the activities proposed shall be part of the Environment Management Plan	Noted & agreed
30	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 & agreed
31	The Environmental Impact Assessment should study the biodiversity, the natural ecosystem, the soil micro flora, fauna and soil seed banks and	Noted & agreed

	suggest measures to maintain the natural Ecosystem	
32	Action should specifically suggest for sustainable management of the area and restoration of ecosystem for flow of goods and services	Noted & agreed
33	The project proponent shall study impact on fish habitats and the food WEB/ food chain in the water body and Reservoir	Noted & agreed
34	The Terms of Reference should specifically study impact on soil health, soil erosion, the soil physical, chemical components and microbial components.	Noted & agreed
35	The Environmental Impact Assessment should study impact on forest, vegetation, endemic, vulnerable and endangered indigenous flora and fauna	Noted & agreed
36	The Environmental Impact Assessment should study impact on standing trees and the existing trees should be numbered and action suggested for protection.	Noted & agreed
37	The Environmental Impact Assessment should study on wetlands, water bodies. Rivers streams, Iakes and farmer sites.	Noted & agreed
38	The Environmental Impact Assessment should hold detailed study on EMP with budget for Green belt development and mine closure plan including disaster management plan.	Noted & agreed
39	The Environmental Impact Assessment should study impact on climate change, temperature rise, pollution and above soil & below soil carbon stock	Noted & agreed
40	The Environmental Impact Assessment should study impact on protected areas, Reserve Forests, National Parks, Corridors and Wildlife pathways, near project site.	Noted & agreed
41	The project proponent shall study and furnish the impact of project on plantations in adjoing pafta lands, Horticulture, Agriculture and livestock.	
42	The project proponent shall study and furnish the details on potential fragmentation impact of natural environment, by the activities	Noted & agreed
43	The project proponent shall study and furnish the impact on aquatic plants and animals in water bodies and possible scars on the landscape damages to nearby caves, heritage site, and archaeological sites possible land form changes visual and aesthetic impacts	Noted & agreed
44	The project proponent shall study and furnish the possible pollution due to plastic and microplastic on the environment. The ecological risks and	Noted & agreed

	impacts of plastic & microplastics on aquatic environment and fresh water systems due to activities, contemplated during mining may be investigated and reported	
45	The project proponent shall detailed study on impact of mining on Reserve forests free ranging wildlife.	Noted & agreed
46	Hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within I km (radius) so as to assess the impacts on the nearby waterbodies due to mining activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided, covering the entire mine lease period	Noted & agreed
47	To furnish disaster management plan and disaster mitigation measures in regard to all aspects to avoid/reduce vulnerability to hazards & to cope with disaster/untoward accidents in & around the proposed mine lease area due to the proposed method of mining activity & its related activities covering the entire mine lease period as per precise area communication order issued.	Noted & agreed
48	To furnish risk assessment and management plan including anticipated vulnerabilities during operational and post operational phases of Mining	Noted & agreed
49	Detailed Mine Closure Plan covering the entire mine lease period as per precise area communication order issued.	Noted & agreed
50	Detailed Environment Management Plan along with adaptation, mitigation & remedial strategies covering the entire mine lease period as per precise area communication order issued	Noted & 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 Government 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).	Satellite imagery of the project area along with boundary coordinates is given in the Chapter No 1 Figure No .1.1 Page No.2 Geomorphology of the area is given in Chapter No 2 Figure No 2.8. Page No.21 Land use pattern of the project area is tabulated in the Chapter No.2. Table No.2.3 Page No.17 Land use pattern of the Study area is tabulated in the Chapter No.3 Table No 3.3 Page No.36.
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 reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or	The proponent has framed their Environmental Policy and the same is discussed in the Chapter No 10.1.

	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	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 Government 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	Not Applicable.

	compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	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 area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.	Not Applicable. There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.
17	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/(existing as well as proposed), if any, within 10 KM of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished	Not Applicable. There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.
18	A detailed biological study of the study area [core zone and buffer zone (10 KM radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.	Detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] was carried out and discussed under Chapter No. 3. There is no schedule I species of animals observed within study area as per Wildlife Protection Act 1972 as well as no species is in vulnerable, endangered or threatened category as per IUCN. There is no endangered red list species found in the study area.
19	Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravalli Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.	Not Applicable. Project area / Study area is not declared in 'Critically Polluted' Area and does not come under 'Aravalli Range.

20	Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL. HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).	Not Applicable. The project doesn't attract The C. R. Z. Notification, 2018.
21	R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need-based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.	Not Applicable. There are no approved habitations within a radius of 300 meters. Therefore, R&R Plan / Compensation details for the Project Affected People (PAP) is not anticipated and Not Applicable for this project.
22	One season (non-monsoon) [i.e., March-May (Summer Season); October-December (post monsoon season); December-February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.	Baseline Data were collected for One Season (Summer) March - May 2023 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	Total Water Requirement: 1.6 KLD Discussed under Chapter 2, Table No 2.13.

	balance should also be provided. Fresh water requirement for the Project should be indicated.	
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 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.	Not Applicable. The ground water table inferred 40 - 45 m below ground level. The ultimate depth of quarry is 76m (61m agl + 15m bgl) This proposal of 76m (61m agl + 15m bgl) 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 70m AMSL. Ultimate depth of the mine is 76m (61m agl + 15m bgl) Water level of the area is 40 -45 m 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	Greenbelt Development Plan is discussed under Chapter 4.

	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.	
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 with required facilities proposed in the mining area may be detailed.	Occupational Health Impacts of the project and preventive measures are detailed under Chapter 4.
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 24 people directly and 10 people indirectly. 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.1,23,37,000/- 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.
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 August, 2009, which are available on the website of this Ministry, should be followed.	Noted & agreed. Instructions issued by MoEF & CC O.M. No. J-11013/41/2006-IA. II (I) Dated: 4th August, 2009 are followed.

h	Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation	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.

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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 is the major requirements for construction industry. This EIA report is prepared by considering Cumulative load of proposed & existing quarries of Thiru.N.M. Arumugabalaji Rough Stone Quarry consisting of two Proposed and three Existing Quarry with total extent of Cluster of 9.50.0 ha in Mellur Duraisamipuram Village, Rajapalayam Taluk, Virudhunagar District, Tamil Nadu, cluster area calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016.

This EIA Report is prepared in compliance with ToR obtained vide –

Code	Name of the Owner	Extent	ToR Status
P1	**Thiru.N.M. Arumugabalaji**	**1.25.0 Ha**	**Lr.No.SEIAA-TN/F.No. 9610/SEAC/I(a)/ToR-1331/2022 dated:10.02.2023.**

The Baseline Monitoring study has been carried out during the period of **March - May 2023** and this EIA / EMP report is prepared for considering cumulative impacts arising out of these projects, the Cumulative Environmental Impact Assessment study is undertaken, which is followed by preparation of a detailed Environmental Management Plan (EMP) individually to minimize those adverse impacts.

1.1 PURPOSE OF THE REPORT

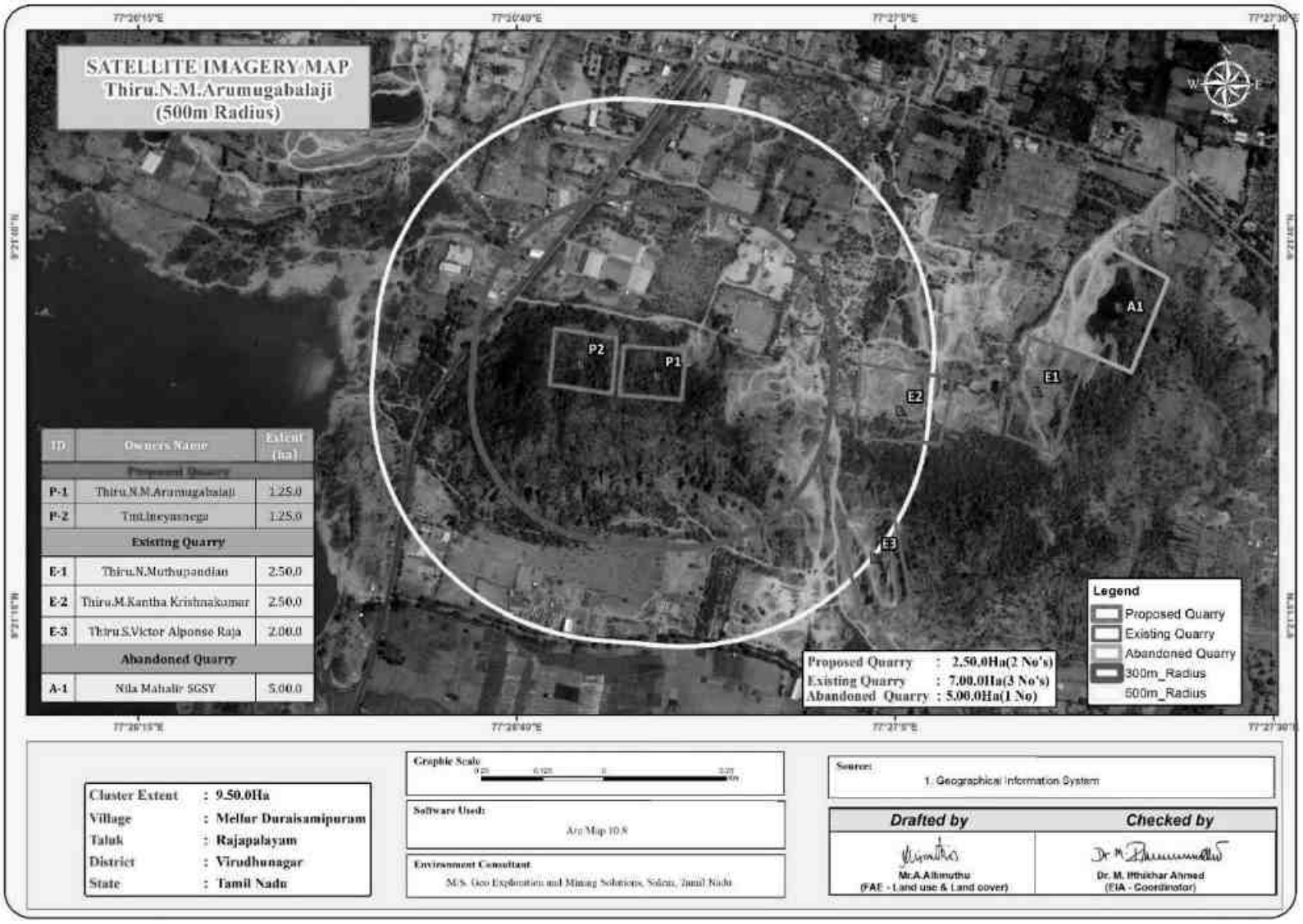
The Ministry of Environment and Forests, Govt. of India, through its EIA notification S.O. 1533(E) of 14thSeptember 2006 and its subsequent amendments as per Gazette Notification S.O. 3977 (E) of 14th August 2018, Mining Projects are classified under two categories i.e., A (> 100 Ha) and B (≤ 100 Ha), 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 projects are categorized under category “B1” Activity 1(a) (mining lease area in cluster situation) and will be considered at SEIAA – TN after conducting Public Hearing and Submission of EIA/EMP Report for Grant of Environmental Clearance.

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

FIGURE: 1.1 SATELLITE IMAGERY CLUSTER QUARRIES



1.2 IDENTIFICATION OF PROJECT AND PROJECT PROPONENT

1.2.1 Identification of Project

TABLE 1.1: SALIENT FEATURES OF THE PROPOSED PROJECTS

Name of the Project	Thiru.N.M. Arumugabalaji Rough stone Quarry
S.F. No.	328(Part-III)
Extent	1.25.0 ha
Land Type	Government Land
Village Taluk and District	Mellur Duraisamipuram Village, Rajapalayam Taluk, Virudhunagar District, Tamil Nadu State

Source: Approved Mining Plan.

1.2.2 Identification of Project Proponent

TABLE 1.2: DETAILS OF PROJECT PROPONENT

Name of the Company	Thiru.N.M. Arumugabalaji
Address	S/o.N.Muthupandian, Door.No.11/339-CIB, 6th Cross Street, V.O.C.Nagar, Rajapalayam Taluk, Virudhunagar District-626 102
Mobile	+91 95003 86817
Aadhaar No	4060 3897 4353
Status	Proprietor

Source: Approved Mining Plan.

1.3 BRIEF DESCRIPTION OF THE PROJECT

1.3.1 Nature and Size of the Project

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

TABLE 1.3: BRIEF DESCRIPTION OF THE PROJECT -P1

Name of the Quarry	Thiru.N.M. Arumugabalaji Rough Stone Quarry	
S.F. No.	328(Part-III)	
Extent	1.25.0 ha	
Village and Taluk	Mellur Duraisamipuram Village, Rajapalayam Taluk,	
Land Type	It is a government poramboke land (classified as poramboke land)	
Land Ownership	It is a Governent Land	
Toposheet No	58 - G/07	
Latitude between	09°21'29.20"N to 09°21'32.80"N	
Longitude between	77°26'46.80"E to 77°26'51.15"E	
Highest Elevation	250m(Max) AMSL	
Proposed Depth of Mining	76m (61m above ground level + 15m below ground level).	
Lease Period	10 Years	
Mining Plan Period	5Years	
Geological Resources	Rough Stone in m^3	Top soil m^3
	6,55,930	12,500
Mineable Reserves	Rough Stone in m^3	Top soil m^3

	1,57,530	10,350
Proposed Quantity of Production for five years	Rough Stone in m^3	Top soil m^3
	1,07,530	10,350
Ultimate Pit Dimension	Pit 1- 115m (L) * 90 m (W) * 76m (D) (61m agl + 15m bgl)	
Water Level in the surrounds area	The Water table is found at a depth of 45m in summer and at 40m in rainy seasons.	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied area is exhibits Hillock topography. The area has gentle sloping towards North Eastern side. The altitude of the area is 250m (Max) above Mean Sea level. The area is covered by the Topsoil which is about 1m thickness. Massive Charnockite is found after 1m (Topsoil) which is clearly inferred from the existing quarrying pits.	
Machinery proposed	Jack Hammer	4 Nos
	Compressor	1 No
	Excavator with Bucket and Rock Breaker	1 No
	Tippers	1No
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	24 Nos	
Project Cost	Rs 1,16,57,000/-	
CER Cost	Rs.5,00,000/-	
Nearest water Bodies	Odai	460m-NW
	Periyakulam Kanmoi	570m_W
	Pudur Pond	5.5Km_E
	Thenmaai Kanmoi	5Km_SE
	Rajasingapaeri	7.5Km_SW
	Sastha kovil dam	7.1km-NW
Greenbelt Development Plan	Proposed to plant 950 trees in Safety Barriers and nearest panchayat Roads have been identified	
Proposed Water Requirement	1.6 KLD	
Nearest Habitation	1.4km -South East	

Source: Approved Mining Plan

1.3.2 Location of the Project

The lease applied area is about 60.0km South Western side of Virudhunagar, the lease applied area is about 15.0km from South Western side of Rajapalayam Taluk and the lease applied area located along Mellur Duraisamipuram village is located 3.5km on the North Western side.

	60.0km		15.0km		3.5km	
Virudhunagar	⟶ South West	Rajapalayam	⟶ South West	Mellur Duraisamipuram	⟶ North West	Lease applied area

- ♣ Proposed quarry projects fall in Mellur Duraisamipuram Village, Rajapalayam Taluk, Virudhunagar District, Tamil Nadu State.
- ♣ The entire quarry lease area falls in the Govt land, the lease applied area is Hillock area.
- ♣ The Altitude of the area is **225-250m (**Maximum) above MSL.
- ♣ The area is mentioned in GSI Topo sheet No. **58 – G/07**

FIGURE: 1.2 KEY MAP SHOWING THE LOCATION KEY MAP

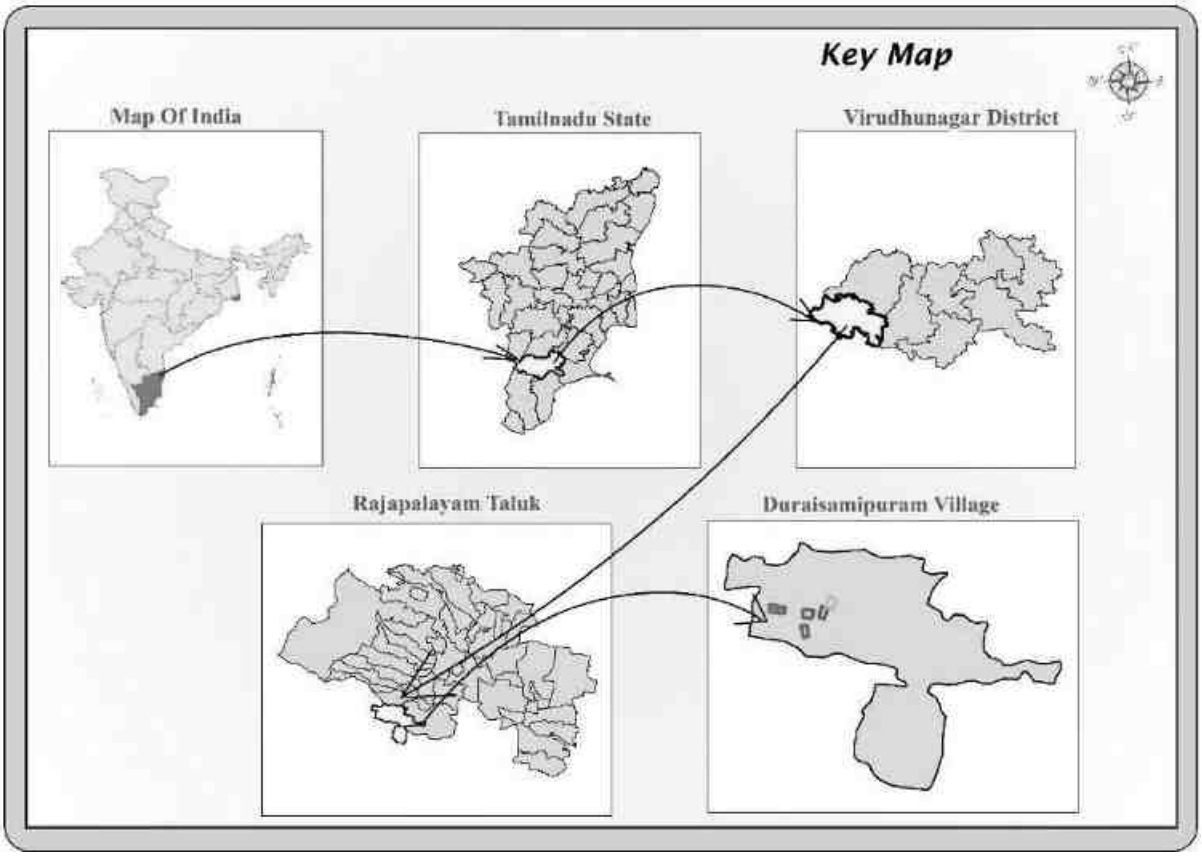


FIGURE 1.3: TOPOSHEET MAP OF THE STUDY AREA 10 KM RADIUS

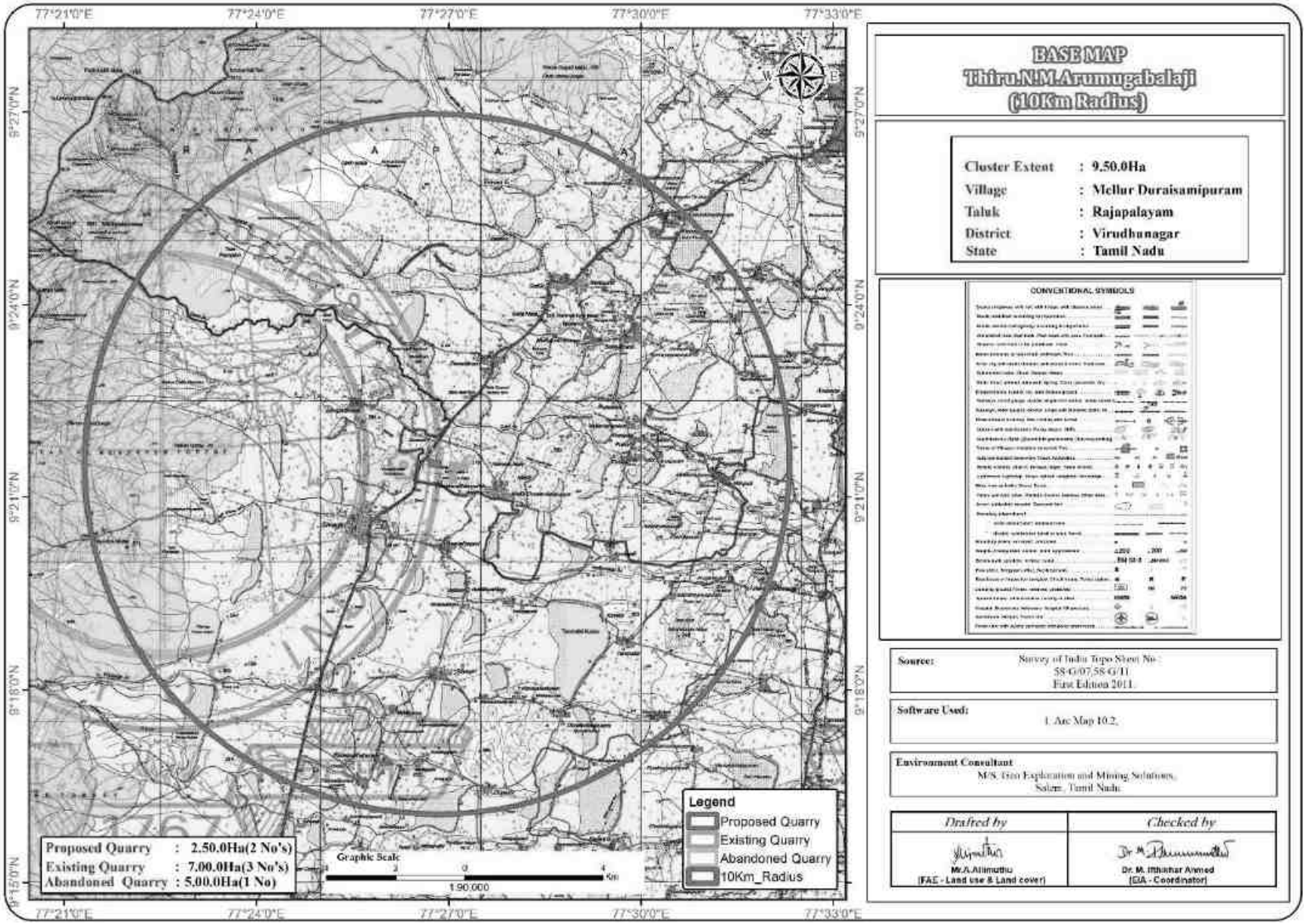
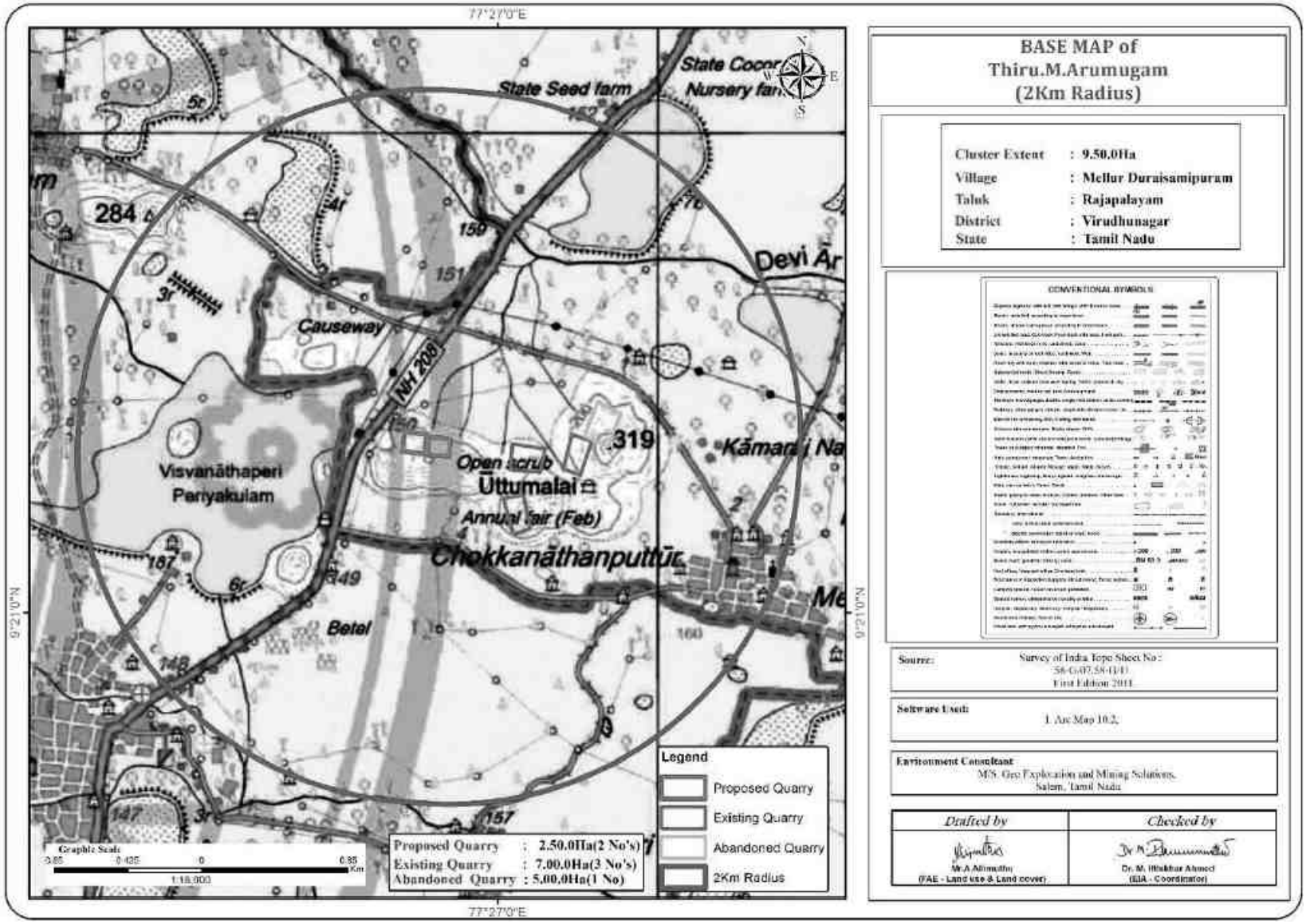


FIGURE 1.4: TOPOSHEET MAP OF THE STUDY AREA 2 KM



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 Quarry Lease Dated: **16.02.2018**
- Precise Area Communication Letter was issued by the District Collector, Virudhunagar **Rc.No. K.V.1 /242/ 2018 Dated: 13.04.2018**
- The Mining Plan was prepared by Recognized Qualified Person and approved by Deputy Director, Geology and Mining, Virudhunagar District, **Roc.No.KV1/242/2018 Dated: 07.05.2018.**
- 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 Environmental Clearance vides online Proposal No. SIA/TN/MIN/77887/2022, Dated: 08.06.2022.

SCOPING -P1

- The proposal was placed in 346th SEAC meeting held on 12.01.2023 and the committee recommended for issue of ToR.
- The proposal was considered in 591st SEIAA meeting held on 10.02.2023 and issued ToR vide **Lr No. SEIAA-TN/F.No. 9610/SEAC/1(a)/ToR-1331/2022 dated:10.02.2023**.

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
- **Lr No.SEIAA-TN/F.No. 9610/SEAC/1(a)/ToR-1331/2022 dated:10.02.2023**-P1
- Approved Mining Plan.

1.5 TERMS OF REFERENCE (ToR)

Compliance to ToR issued vide –

- **Lr No. SEIAA-TN/F.No. 9610/SEAC/1(a)/ToR-1331/2022 dated:10.02.2023** -P1

  Are detailed in Page No. I – XLIX.

1.6 POST ENVIRONMENT CLEARANCE MONITORING

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

1.7 GENERIC STRUCTURE OF EIA DOCUMENT

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

1.8 THE SCOPE OF THE STUDY

The main scope of the EIA study is to quantify the cumulative impact in the study area due to cluster quarries and formulate the effective mitigation measures 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 – May 2023) 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	PM_{10}, $PM_{2.5}$, SO_2, NO_2	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 – 4 Ground water and 2 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 (1 Core & 7 Buffer) – 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: Onsite Monitoring Data/Sampling by Laboratories, the data has been collected as per the requirement of the ToR issued by SEIAA – TN.

1.8.1 Regulatory Compliance & Applicable Laws/Regulations for Proposed Quarry

- 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.
- Lr No. SEIAA-TN/F.No. 9610/SEAC/1(a)/ToR-1331/2022 dated:10.02.2023

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2. PROJECT DESCRIPTION

2.0 GENERAL

The Proposed Rough Stone Quarry require Environmental Clearance. There are two (2) proposed and three (3) existing quarries forming a cluster; calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016 and the total extent of cluster is 9.50.0 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 the 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 are 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 pit head to the needy crushers and rock breakers to avoid secondary blasting.

2.2 LOCATION OF THE PROJECT

The lease applied area is about 60.0km South Western side of Virudhunagar, the lease applied area is about 15.0km from South Western side of Rajapalayam Taluk and the lease applied area located along Mellur Duraisamipuram village is located 3.5km on the North Western side.

	60.0km		15.0km		3.5km	
Virudhunagar	⟶ South West	Rajapalayam	⟶ South West	Mellur Duraisamipuram	⟶ North West	Lease applied area

- ♣ Proposed quarry projects fall in Mellur Duraisamipuram Village, Rajapalayam Taluk, Virudhunagar District, Tamil Nadu State.
- ♣ The entire quarry lease area falls in the Govt land, the lease applied area is Hillock area.
- ♣ The Altitude of the area is **225-250m (**Maximum) above MSL.
- ♣ The area is mentioned in GSI Topo sheet No. **58 – G/07**

TABLE 2.1: SITE CONNECTIVITY

Nearest Roadway	(NH – 208) Kollam – Tirumangalam - 250.0m -W (SH-41) Rajapalayam – Sankarankovil -11.0km – E
Nearest Village	1.4km - SE
Nearest Town	Rajapalayam –15.0km – NE
Nearest Railway	Cholapuram Railway station –13.0km – E
Nearest Airport	Madurai - 88Km – NE
Seaport	Thoothukudi-105km – SE
Interstate Boundary	Tamilnadu-Kerala -13km-W

Source: Survey of India ***Toposheet***

TABLE 2.2: BOUNDARY CO-ORDINATES OF PROPOSED PROJECT-P1

Boundary Pillar No.	Latitude	Longitude
1	09° 21' 29.42"N	77° 26' 46.80"E
2	09° 21' 32.80"N	77° 26' 47.06"E
3	09° 21' 32.42"N	77° 26' 51.15"E
4	09° 21' 29.20"N	77° 26' 50.86"E

Source:Approved Mining Plans Datum: UTM-WGS84 Zone 44N

FIGURE 2.1: GOOGLE IMAGE OF THE PROJECT-P1

FIGURE 2.2: QUARRY LEASE PLAN / SURFACE PLAN

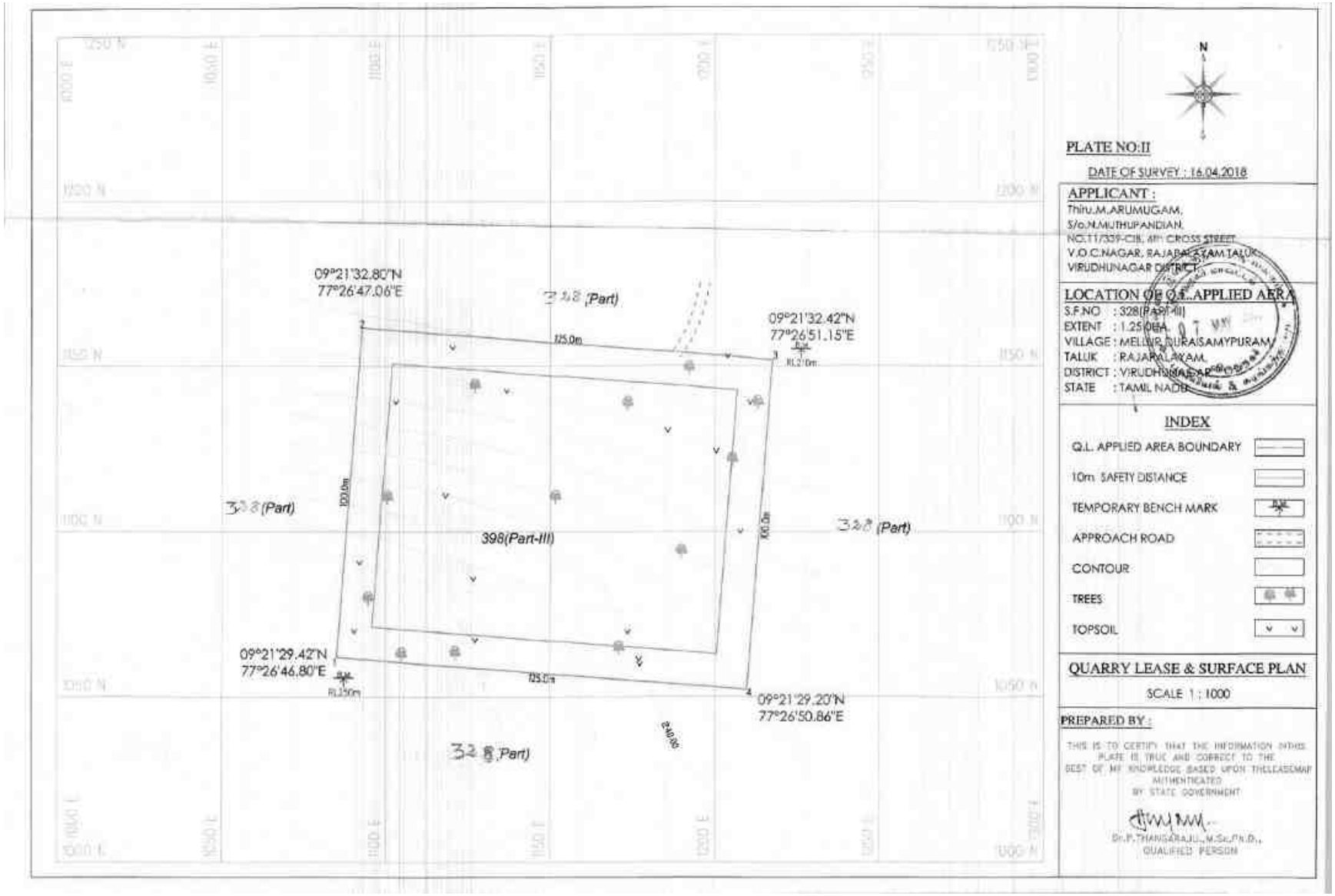


FIGURE 2.3: GOOGLE EARTH IMAGE SHOWING AROUND 500M RADIUS

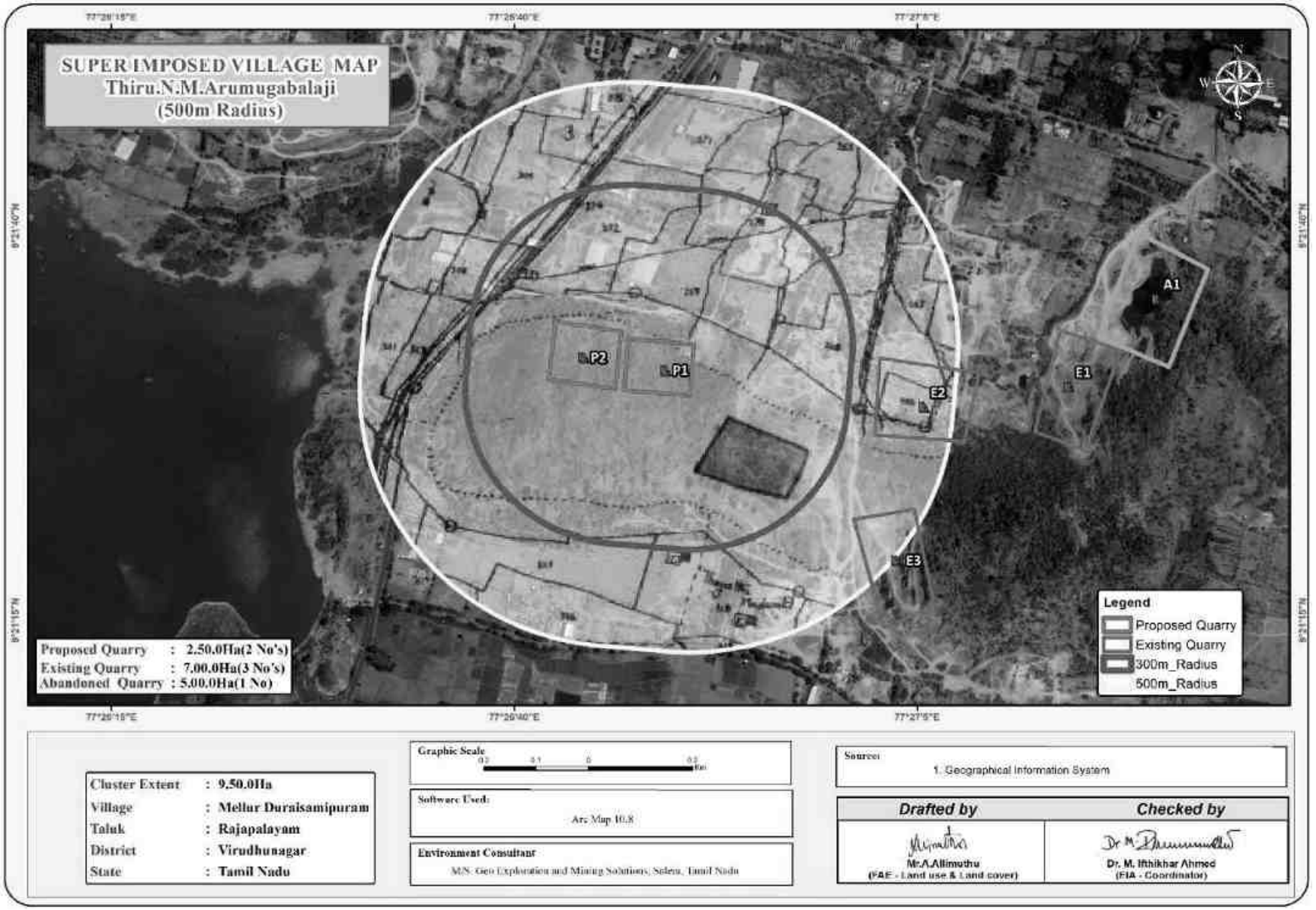


FIGURE 2.4: IMAGE SHOWING SURFACE FEATURES AROUND 10 KM RADIUS

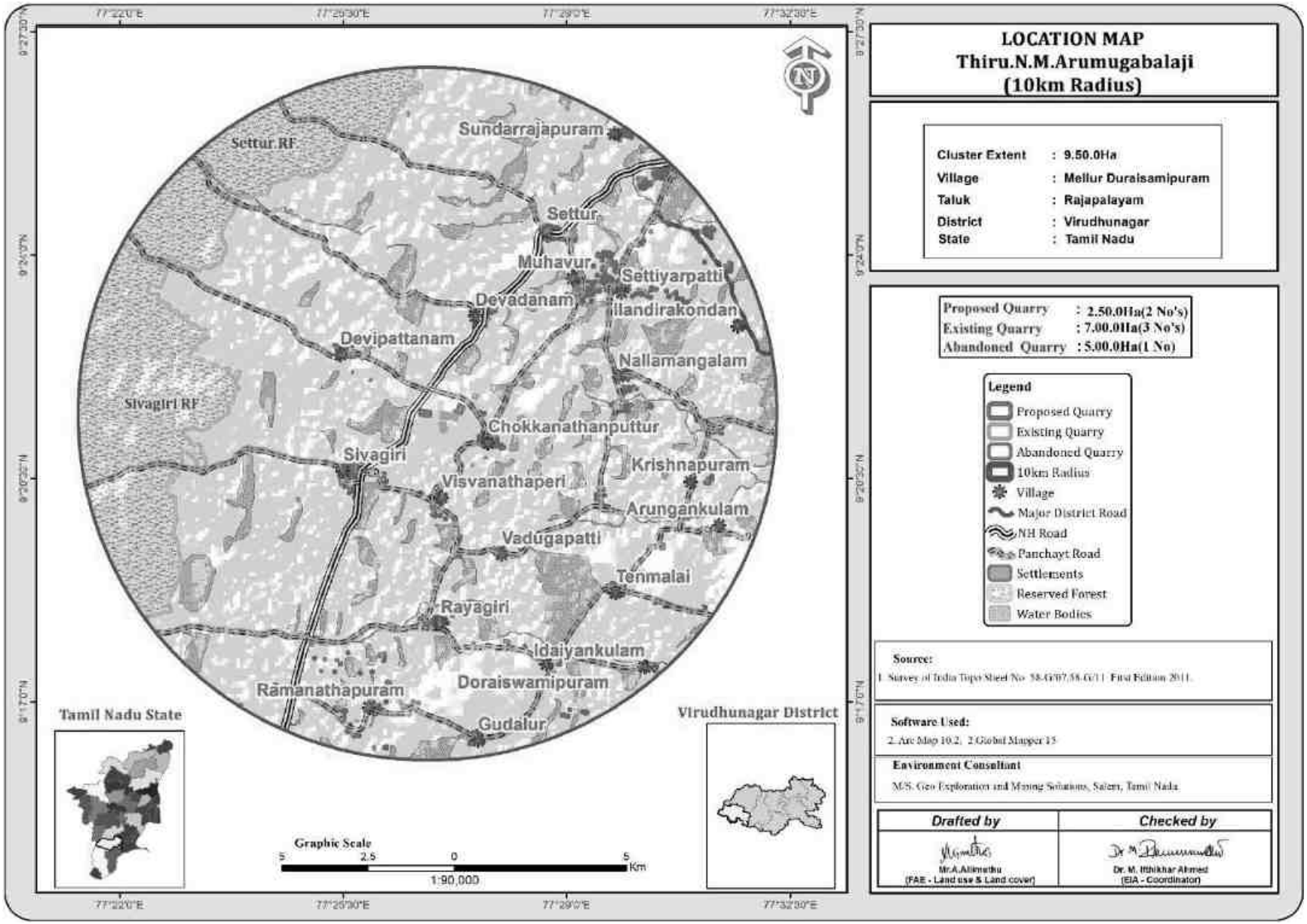


FIGURE 2.5: IMAGE SHOWING SURFACE FEATURES AROUND 5KM RADIUS

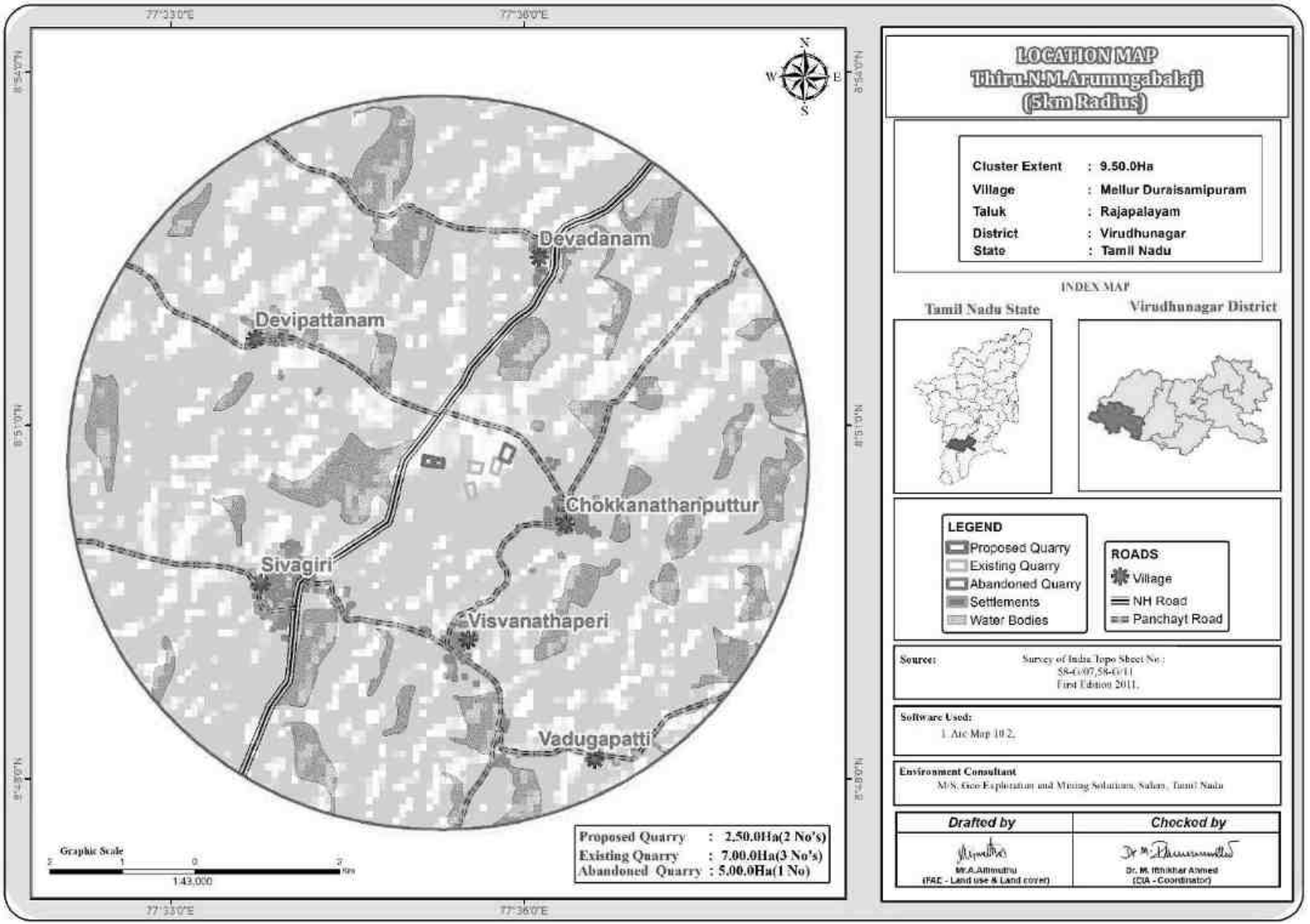
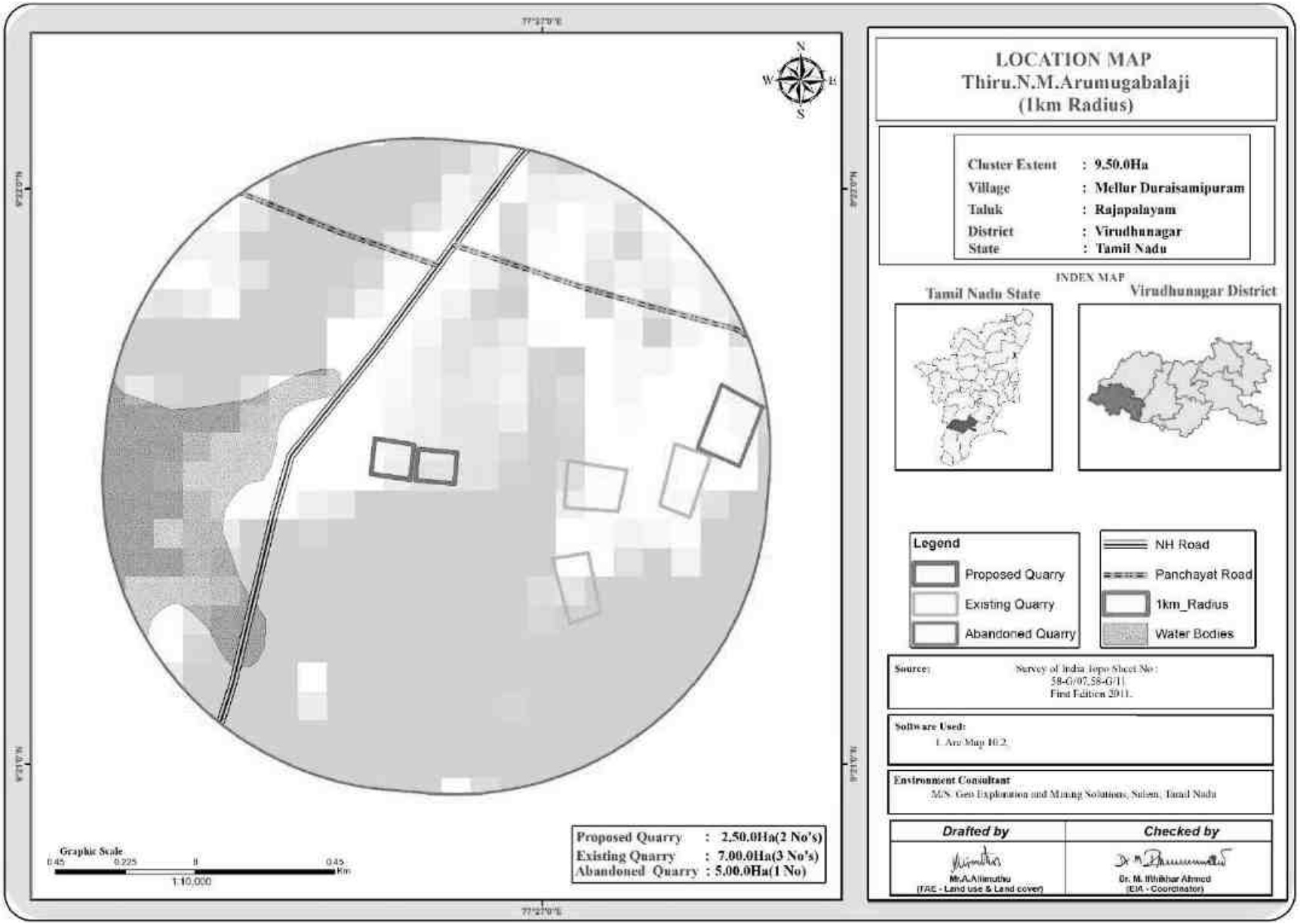


FIGURE 2.6: IMAGE SHOWING SURFACE FEATURES AROUND 1 KM RADIUS



2.2.1 Project Area

- The 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 projects and is devoid of major vegetation and trees.

TABLE 2.3: LAND USE PATTERN OF THE PROPOSED PROJECT

Description	Present area (Ha)	Area at the end of this quarrying period (Ha)
Area under quarrying	Nil	1.03.5
Infrastructure	Nil	0.01.0
Roads	Nil	0.01.0
Green Belt	Nil	0.15.0
Unutilized	1.25.0	0.04.5
Grand Total	**1.25.0**	**1.25.0**

Source: Approved Mining Plan

2.2.2 Size or Magnitude of Operation

TABLE 2.4: OPERATIONAL DETAILS FOR PROPOSED PROJECT

PARTICULARS	DETAILS	
	Rough Stone (5 Year Plan period)	Top Soil (1 Years Plan period)
Geological Resources in m^3	6,55,930	12,500
Mineable Reserves in m^3	1.57,530	10,350
Yearwise reserves in m^3	1.07,530	10,350
Number of Working Days	300 Days	300 Days
Production per day in m^3	71	35
No of Lorry loads (12 m^3 per load)	6	2
Total Depth of Mining	76m (61m above ground level + 15m below ground level).	

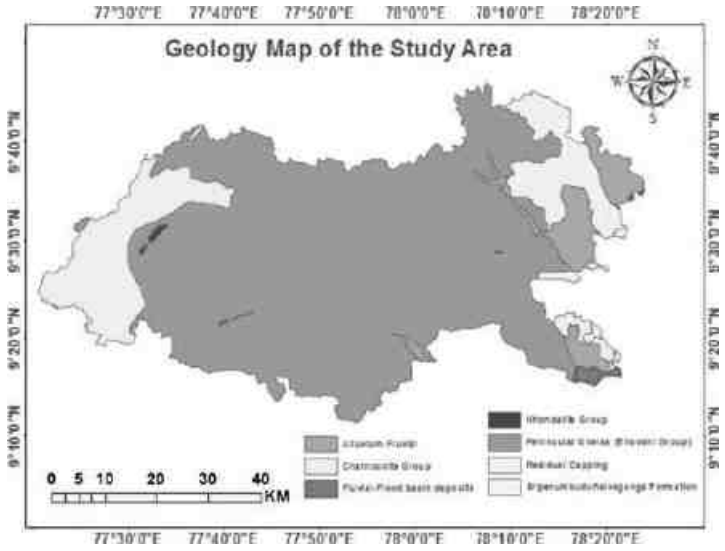
Source: Approved Mining Plan

2.3 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 N40°E – S40°W with dipping towards SE70°.

Regional stratigraphic sequence:

AGE		FORMATION
Recent	-	Quaternary formation (Gravel)
---------Unconformity----------		
Archaean	-	Charnockite Peninsular Gneiss complex



Geomorphology

Virudhunagar district is bordered by Western Ghats (Ridge and valley complex) in the West. Vally fill area is observed in Watrap block. A major part of the district constitutes a plain terrain with a gentle slope toward East and Southeast, except for the hilly terrain in the west. The prominent geomorphic units identified in the district through interpretation of Satellite imagery are; 1. Flood Plain, 2. Bazada, 3. Pediment, 4. Shallow & deep buried Pediments and 6. Structural Hills.

Source: http://cgwb.gov.in/District_Profile/TamilNadu/Virudhunagar.pdf)

The district is divisible into three geomorphological units viz the western most hill ranges (denudational hills of Western Ghats), uplands (pediments) and the plains (pediplains). The hill ranges rise upto 2019 meters above mean sea level at Kottaimalai. The other notable hill is Andipatti hill with a NE-SW trend, in the northwestern part of the district. The Vaippar and Gundar rivers which flow to the east are ephemeral streams. The drainage pattern is subdendritic.

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. The lease applied area is exhibits flat terrain. The area has gentle

sloping towards southeastern side. The maximum altitude of the area is 72m above Mean Sea level. The area is covered by the Gravel which is maximum thickness of 2m depth. Massive Charnockite is found after 2m (Gravel formation) which is clearly inferred from the existing quarry pits in the cluster.

2.3.3 Hydrogeology

Virudhunagar district is underlain entirely by Archaean Crystalline formations with Recent alluvial deposits occurring along the river and streams courses. Weathered, fissured and fractured crystalline rock sand there centalluvial deposits constitute the important aquifer systems in thedistrict. The hard consolidated crystalline rocks of Archaean age represent weathered, fissured and fractured formations of gneisses, granites, charnockites and other associated rocks. The Specific capacity of large diameter wells tested in crystalline rocks from 31 to 200 lpm / m. of drawdown. The yield characteristics of wells vary considerably depending on the topographic set-up, lithology and the degree of weathering.

Source: https://Virudhunagar.nic.in/departments/geology-mining/

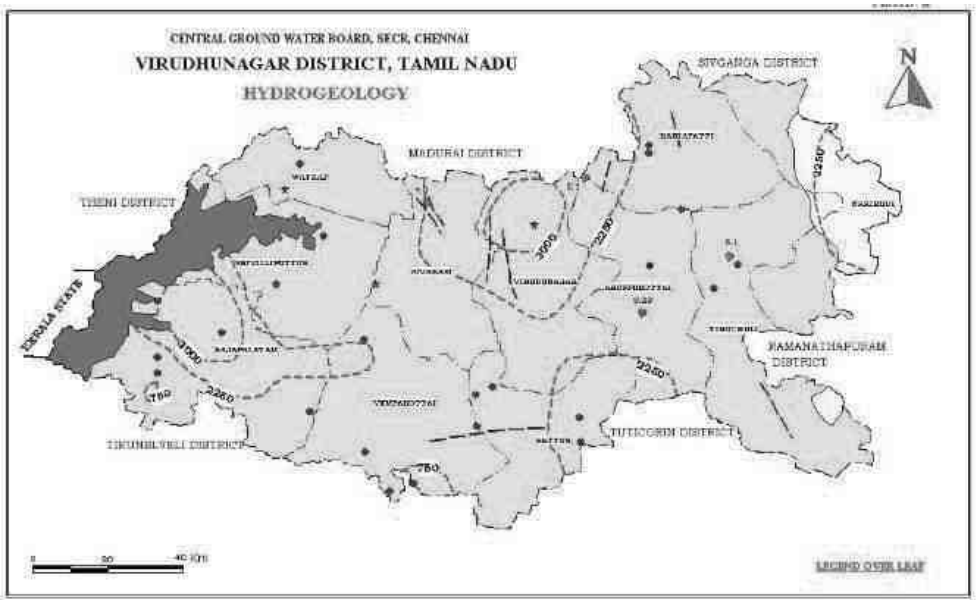


FIGURE 2.7: REGIONAL GEOLOGY MAP

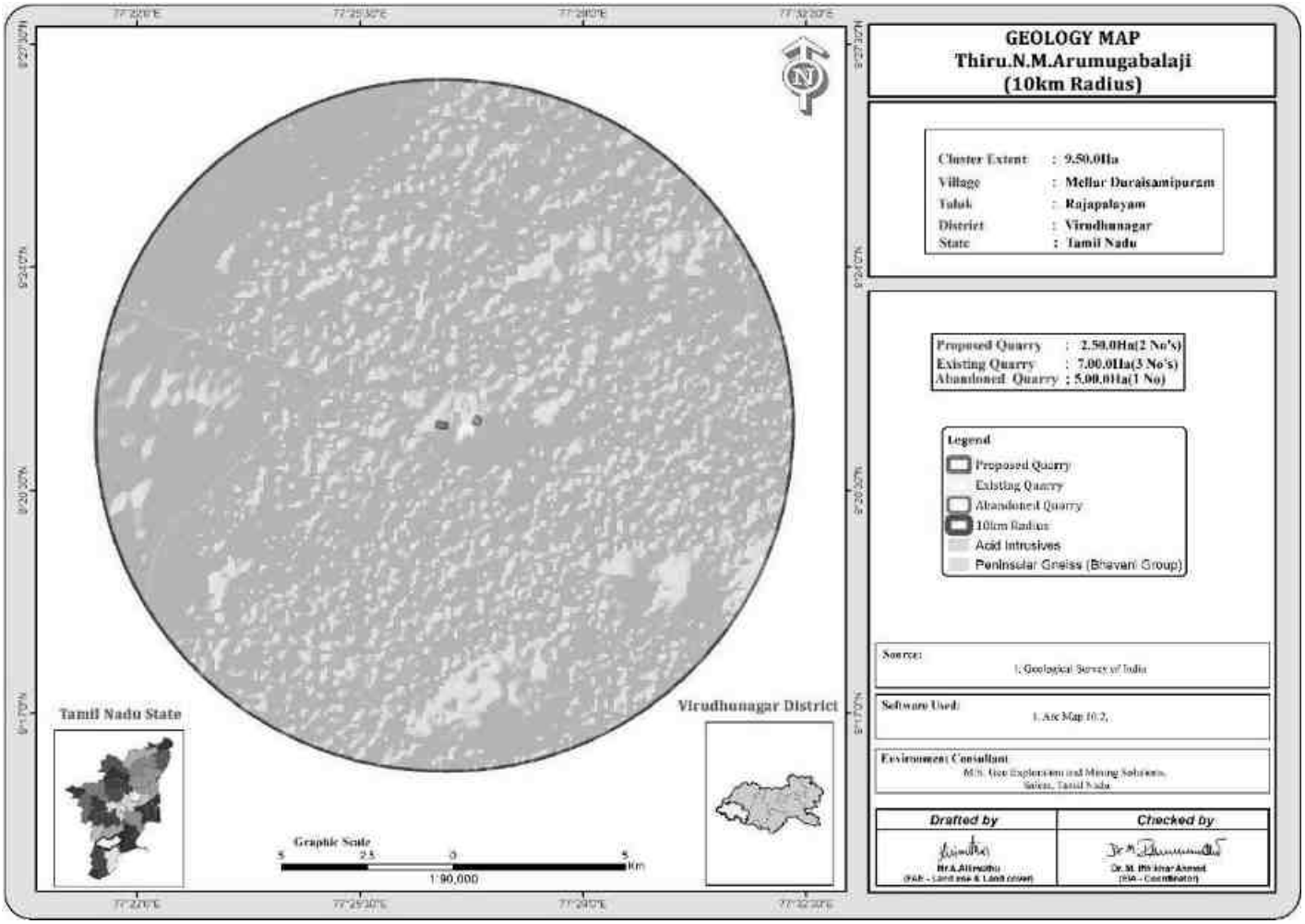


FIGURE 2.8: GEOMORPHOLOGY MAP

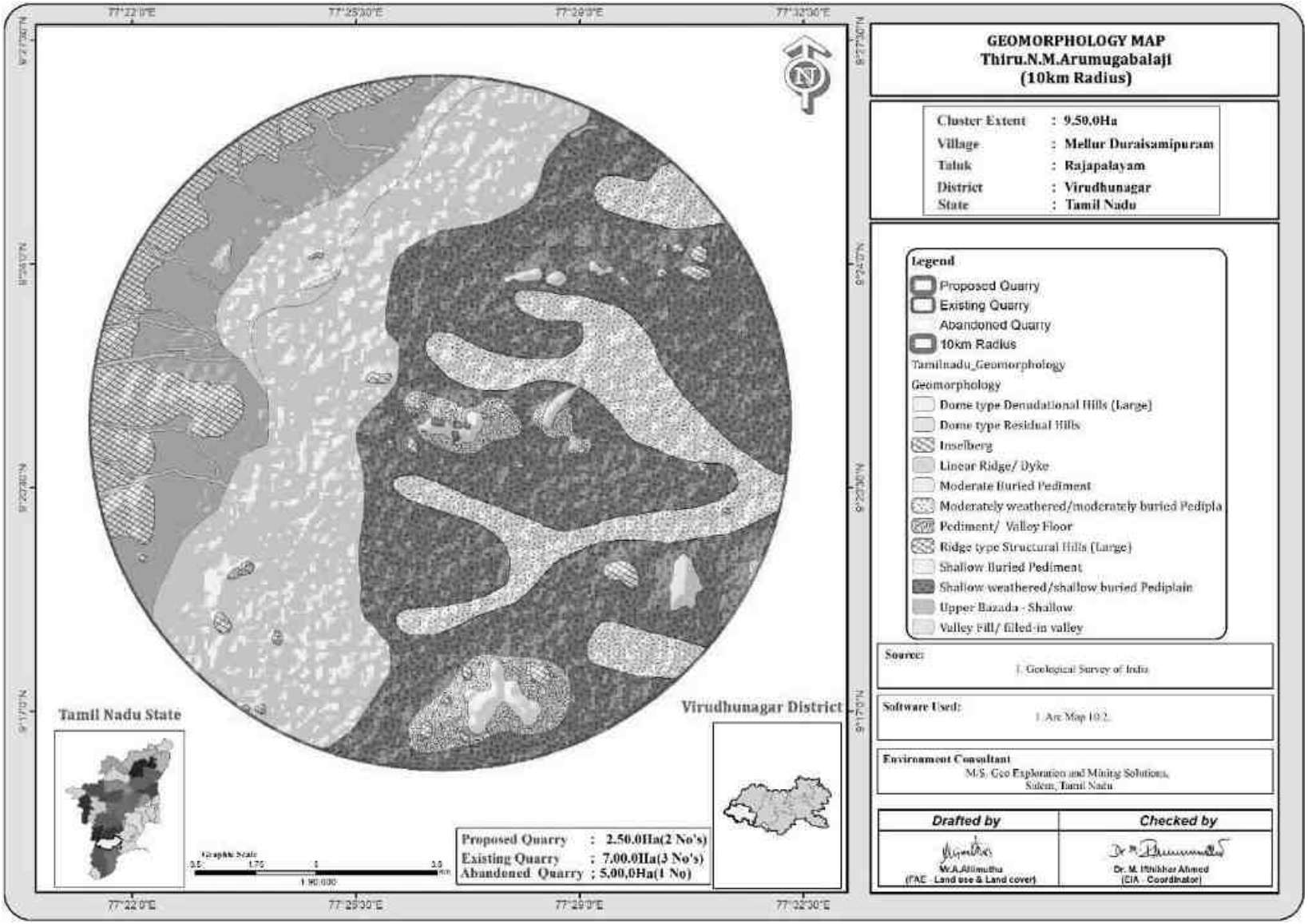


FIGURE 2.9: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS-P1

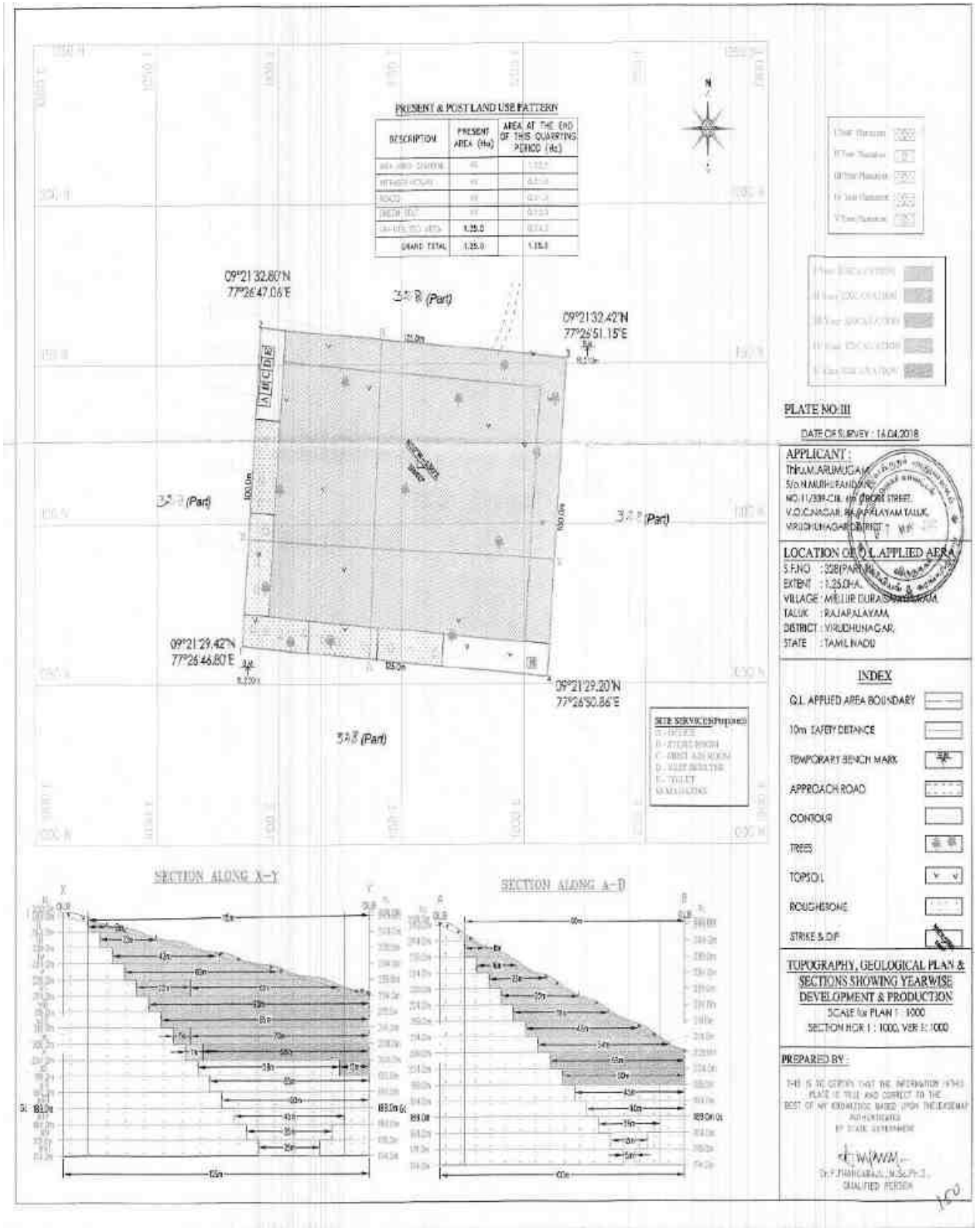
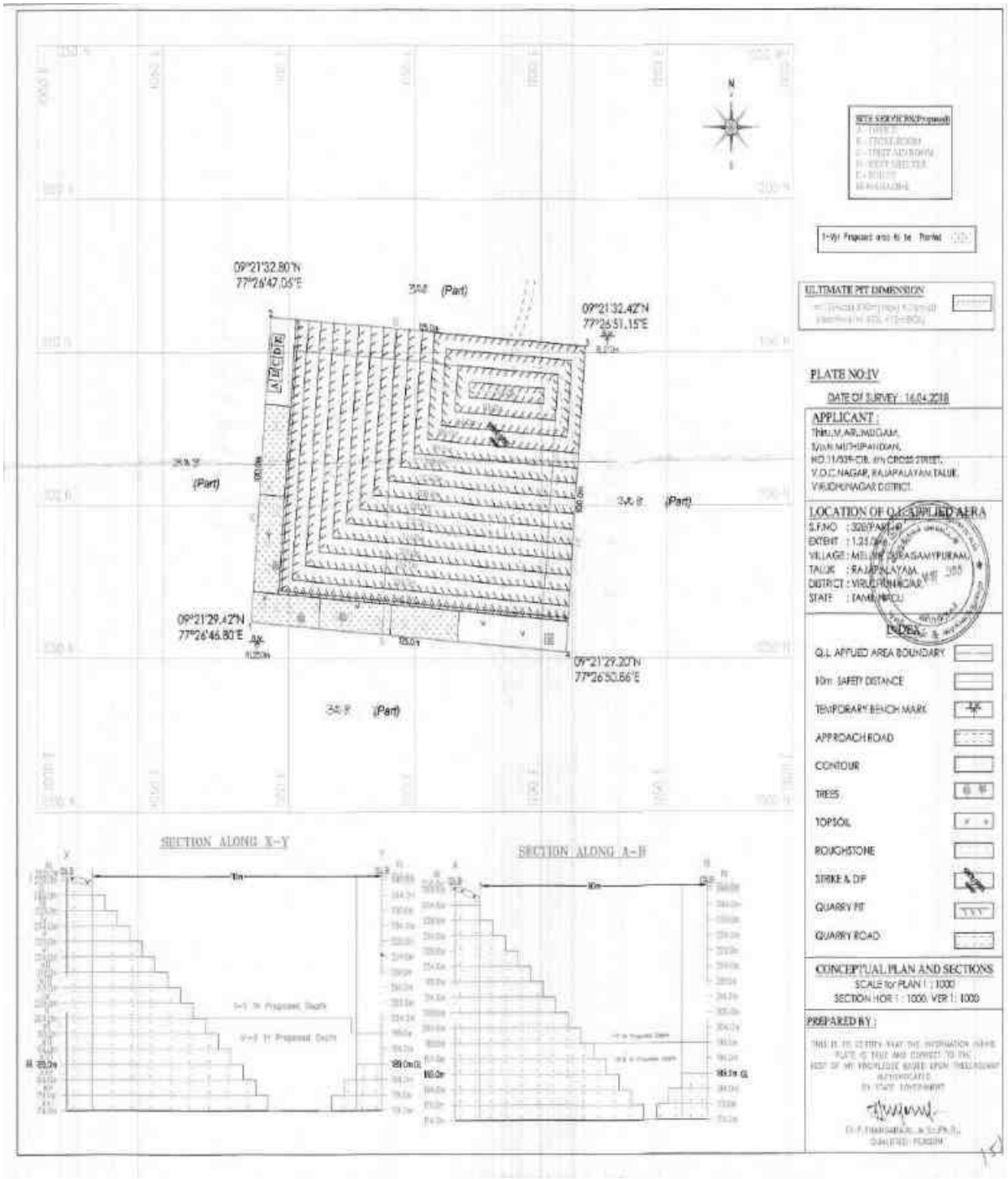


FIGURE 2.10: CLOSURE PLAN AND SECTIONS -P1



2.4 RESOURCES AND RESERVES

The Resources and Reserves of Rough Stone were calculated based on Cross-Section Method by plotting sections to cover the maximum lease area for the proposed project.

Based on the availability of Geological Resources the Mineable Reserves are calculated by considering excavation system of bench formation and leaving essential safety distance of 7.5 m (Safety Barrier all around the applied area) and safety distance as per precise area communication letter and deducting the locked up reserves during bench formation (Also called as Bench Loss) and the Mineable Reserves is calculated considering there is no waste / overburden / side burden (100% Recovery Anticipated) for all the proposed project.

TABLE 2.5: AVAILABLE GEOLOGICAL RESOURCES OF PROPOSED PROJECT-P1

Description	Rough Stone in m^3	Topsoil in m^3
Geological Resource in m^3	6,55,930	12,500
Mineable Resource in m^3	1.57,530	10,350

Source: Approved Mining Plan

TABLE 2.6: YEAR-WISE PRODUCTION PLAN-P1

Year	Rough Stone in m^3	Top soil in m^3
1st	2,1685	10,350
2nd	21,070	-
3rd	21,440	-
4th	21,635	-
5th	21,700	-
Total	**1,07,530**	**10,350**

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 Top soil 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.

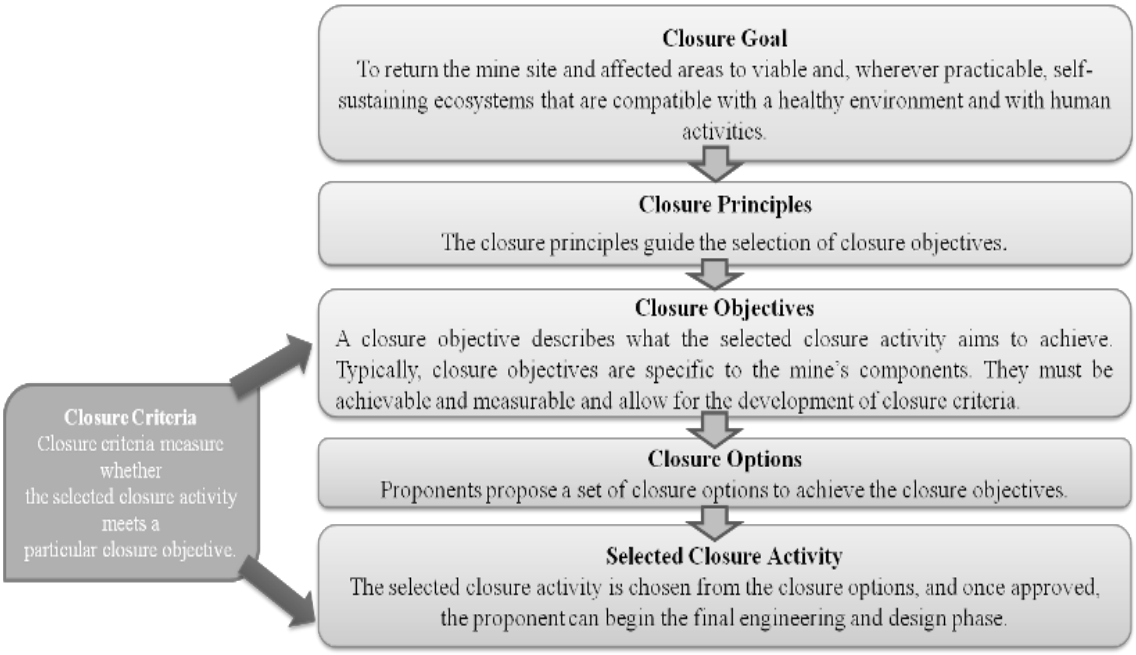
TABLE 2.7 ULTIMATE PIT DIMENSION -P1

Pit	Length (Max) (m)	Width (Max) (m)	Depth (Max)
Pit1	115	90	76m (61 m above ground level + 15 m Below Ground level

Source: Approved Mining Plan

- At the end of life of mine, the excavated mine pit / void will act as artificial reservoir for collecting rain water and helps to meet out the demand or crises during drought season.
- After mine closure the greenbelt developed along the safety barrier and top benches and temporary water reservoir will enhance the ecosystem.

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



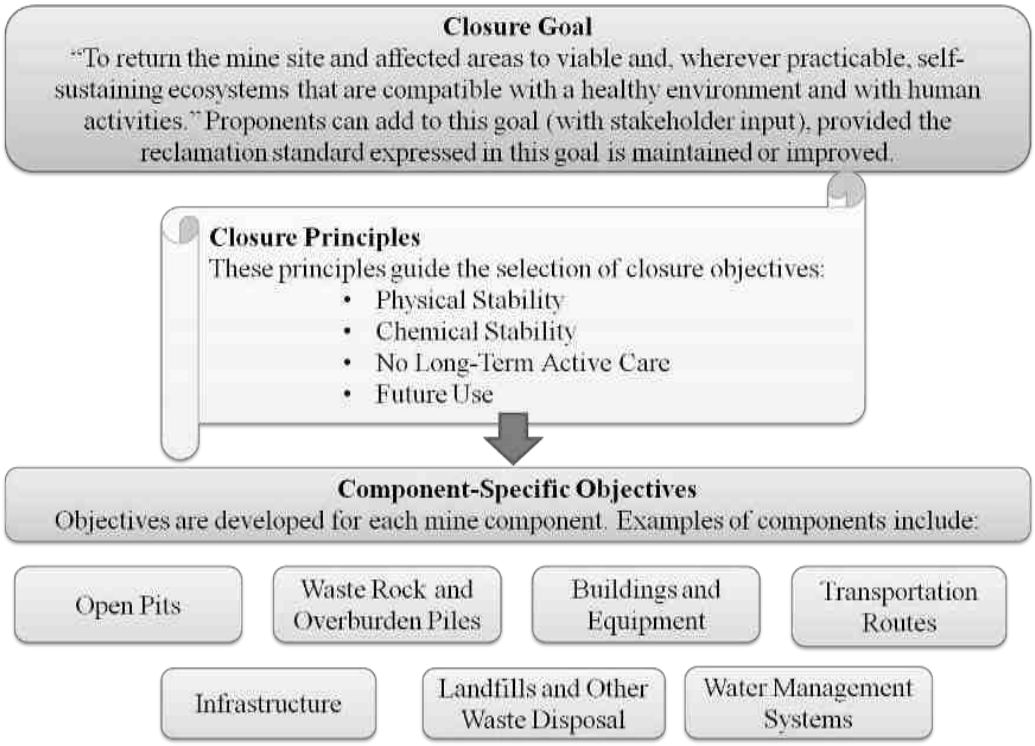
Closure Objectives –

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

Closure Planning & Options Considerations in Mine Design –

- The closure of mine is well planned at the initial stage of planning & design consideration by the internal and external stake holders
- Construction of 2m height bund all along the mine pit boundary and ensure its stability all time & construction of garland drain along the natural slope to avoid sliding and collection of soil to the pit & surface runoff during rainfall
- After complete exploitation of mineral, the lowest bench foot wall side will be maintained as plain surface without any sump pits to avoid any accidents
- All the sharp edges will be dressed to smoother face before the closure of mine and ensure no loose debris on hanging wall side
- The project proponent as a part of social responsibilities assures to supply the stored mine pit water to the nearby villages after effective treatment process as per the standards of TNPCB & TWAD

- Native species will be planted in 3 row patterns on the boundary barriers and 1st bench, a full-time sentry will be appointed at the gate to prevent inherent entry of public & cattle.
- The access road to the quarry will be cut-off immediately after the closure
- The layout design shall be prepared and get approved from Department of Geology and Mining.
- The proponent is instructed to construct as per the layout approved
- Physical and chemical stability of structures left in place at the site, the natural rehabilitation of a biologically diverse, stable environment, the ultimate land use is optimized and is compatible with the surrounding area and the requirements of the local community, and taking the needs of the local community into account and minimizing the socio-economic impact of closure
- There will be a positive change in the environmental and ecology due to the mine closure



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 2.8: MINE CLOSURE BUDGET-P1

ACTIVITY		YEAR					RATE	AMOUNT (INR)
		I	II	III	IV	V		
Plantation under safety zone	**Nos.**	50	50	50	50	50	@100 Rs Per sapling	Rs.25,000/-
	Cost	5000	5000	5000	5000	5000		
Plantation cost in the quarried out top benches, approach road and panchayat road	**Nos.**	100	100	100	100	100		Rs.50,000/-
	Cost	10000	10000	10000	10000	10000		
Wire Fencing (In Mtrs) 430		1,29,000	-	-	-	-	@300 Rs Per Meter	Rs.1,29,000/-
Garland drain (In Mtrs) 400		1,20,000	-	-	-	-	@300 Rs Per Meter	Rs.1,20,000/-
TOTAL								**Rs.3,24,000/-**

Source: Proposed by FAE's and EC

2.5 METHOD OF MINING

The method of mining is Opencast Mechanized Mining Method is being proposed by formation of 5.0-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

Diameter of hole – 32 mm 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

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 2.9 PROPOSED MACHINERY DEPLOYMENT-P1

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

Source: Approved Mining Plan

2.6 GENERAL FEATURES

2.6.1 Existing Infrastructures

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

2.6.2 Drainage Pattern

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 is proposed to be transported mainly through . Village Road & Sivagiri - Chokkanathanputur Road -South side of the Cluster and 2. Village Road & Inam Kovil Patti - Sethur Road – North East side.

Traffic density measurements were performed at two locations

1. Village Road & Sivagiri - Chokkanathanputur Road -South side
2. Village Road & Inam Kovil Patti - Sethur Road – North East 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.2.10: TRAFFIC SURVEY LOCATIONS

Station Code	Road Name	Distance and Direction	Type of Road
TS1	Village Road & Chokkanathanputur Road	1.2Km & SE	SH Road
TS2	Village Road & Inam Kovil Patti to Sethur Road	5.5Km & NE	Panchayat Road

Source: On-site monitoring by GEMS FAE & TM

TABLE 2.11: EXISTING TRAFFIC VOLUME

Station code	HMV		LMV		2/3 Wheelers		Total PCU
	No	PCU	No	PCU	No	PCU	
TS1	140	420	120	120	280	140	680
TS2	60	240	80	80	190	95	415

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 HOURLY TRANSPORTATION REQUIREMENT

Transportation of Rough Stone per day		
Capacity of trucks	No. of Trips per day Cumulatively	Volume in PCU
10 tonnes	15	15

Source: Data analysed from Approved Mining Plan

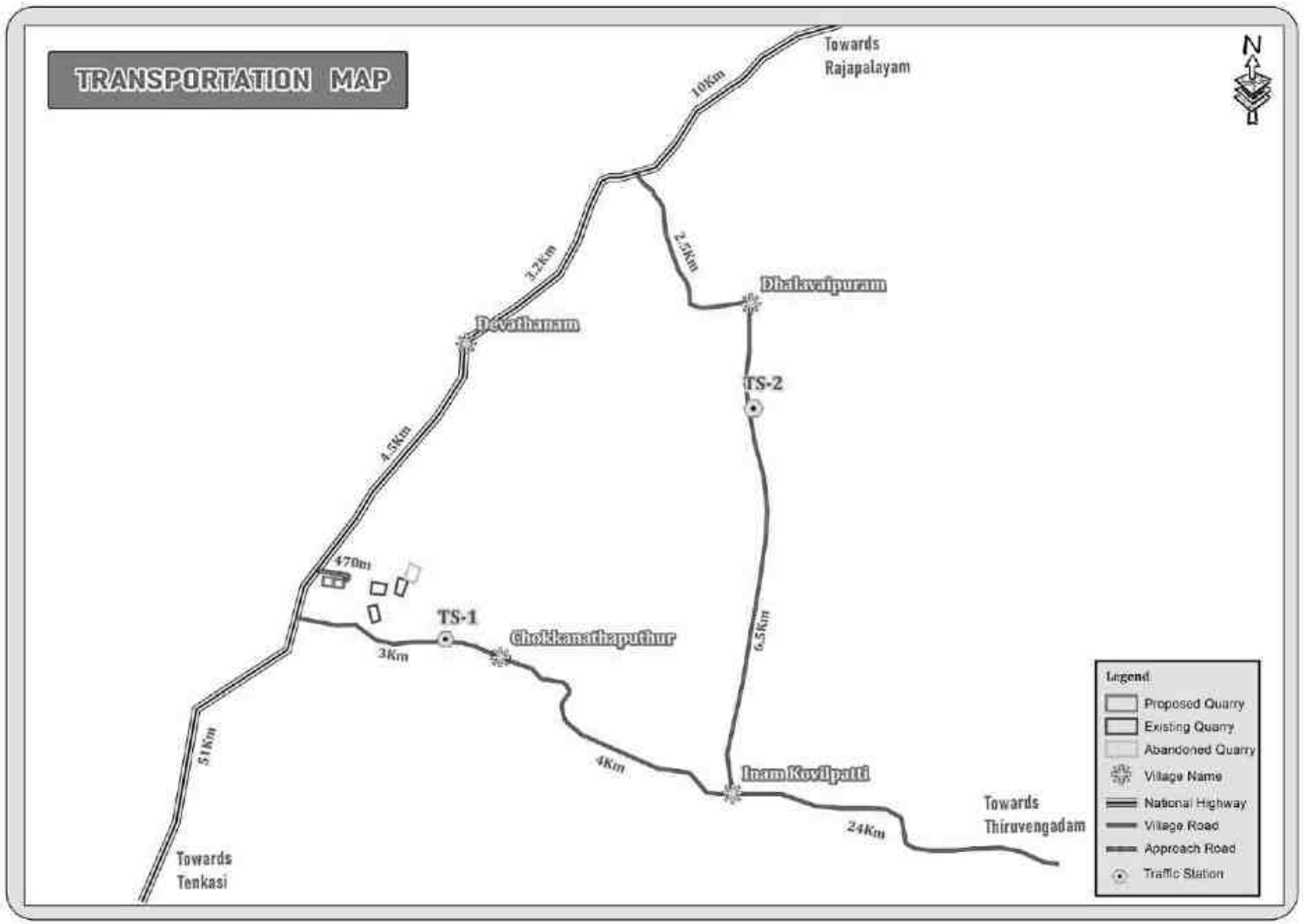
TABLE 2.12: SUMMARY OF TRAFFIC VOLUME

Route	Existing T raffic volume in PCU	Incremental traffic due to the project	Total traffic volume	Hourly Capacity in PCU as per (IRC – 1960 Guidelines)
Village Road & Chokkanathanputur Road	680	14	694	1800
Village Road & Inam Kovil Patti to Sethur Road	415	14	429	1200

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

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

FIGURE.2.11: MINERAL TRANSPORTATION ROUTE MAP



2.6.4 Mineral Beneficiation and Processing

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

2.7 PROJECT REQUIREMENT

2.7.1 Water Source & Requirement

Detail of water requirements in KLD as given below:

TABLE 2.13: WATER REQUIREMENT FOR THE PROJECT-P1

*Purpose	Quantity	Source
Domestic & Drinking purpose	0.3KLD	From Existing, bore wells and drinking water will be sourced from Approved Water vendors.
Dust Suppression	0.7KLD	From nearby tank
Green Belt	0.6KLD	From nearby tank
Total	**1.6 KLD**	

Source: Prefeasibility report

* Drinking water will be sourced from Approved Water Vendors

2.7.2 Power and Other Infrastructure Requirement

No proposed projects require 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 quarrying machineries. Diesel will be brought from nearby Fuel Stations.

Top soil:

Per hour Excavator will consume = 10 liters / hour

Per hour Excavator will excavate = 60$m^3$of top soil

Top soil Quantity = 10,350/60 = 173 hours

Diesel consume = 173hours x 10 liters

Total diesel consumption = **1,730** Liters of HSD will be utilized for top soil

Rough stone:

Per hour Excavator will consume = 16 liters / hour

Per hour Excavator will excavate = 20$m^3$of Rough stone

Rough stone quantity = 1,07,530/20 =5,377 hours

Diesel consume = 5,377 hours x 16 liters

Total diesel consumption = 86,032Liters of HSD will be utilized for Rough stone

Total diesel consumption is around **87,762Liters** of HSD for the entire period of life.

2.7.4 Project Cost

TABLE 2.14 PROJECT COST OF PROPOSED PROJECT

Project Cost	Rs. 1,16,57,000/-

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 2.15: PROPOSED MANPOWER DEPLOYMENT

Sno	Employment	No. of persons
1	Mines Manager/Mines Foreman	1
2	Mate/Blaster	1
3	Jack hammer operator	10
4	Excavator Operator & Driver	3
5	Security	1
6	Labour & Helper	5
7	Cleaner & Co-operator	3
	Total	**24**

Source: Approved Mining Plans of respective 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 2.16: 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, April and May 2023** with CPCB guidelines. Environmental data has been collected with reference to cluster quarries by by **EHS 360 Labs Private** Limited, – An accredited by ISO/IEC 17025:2017 (NABL) Laboratory, for the below attributes –

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

Study Area

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

Study Period

The baseline study was conducted during the Summer season i.e., March to May 2023

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 NRSC-Bhuvan, Hyderabd.
- 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's from census handbook 2011 and from the satellite imagery	Study Area	Satellite Imagery Primary Survey
*Soil	Physio-Chemical Characteristics	Once during the study period	6 (1 core & 5 buffer zone)	IS 2720 Agriculture Handbook - Indian Council of Agriculture Research, New Delhi
*Water Quality	Physical, Chemical and Bacteriological Parameters	Once during the study period	6 (2 surface water & 4 ground water)	IS 10500& CPCB Standards
Meteorology	Wind Speed Wind Direction Temperature Cloud cover Dry bulb temperature Rainfall	1 Hourly Continuous Mechanical/Automatic Weather Station	1	Site specific primary data& Secondary Data from IMD Station
*Ambient Air Quality	PM_{10} $PM_{2.5}$ SO_2 NO_X Fugitive Dust	24 hourly twice a week (Mar to May 2023)	8 (1core & 7 buffer)	IS 5182 Part 1-23 National Ambient Air Quality Standards, CPCB
*Noise Levels	Ambient Noise	Hourly observation for 24 Hours per location	8 (1 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 **EHS 360 Labs Private** Limited, in association with GEMS
* All monitoring and testing have been carried out as per the Guidelines of CPCB and MoEF & CC.

3.1 Land Environment

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

3.1.1 LAND USE/ LAND COVER

To study the land use pattern of the core as well as a buffer zone, land use/land cover details have been identified/ maps have been prepared in accordance with the **Standard ToR point no. 4 & 10 Stating**:

Point No. 4 All comer coordinates of the mine lease area, superimposed on a High-Resolution Imagery/ topo sheet. 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).

Point No. 10. Lard 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.

Current vintage data of Indian Remote Sensing Satellite ResourceSat1 LISSIII (False Color Composite) has been used for Land Use / Land Cover study. Satellite image has been procured from National Remote Sensing Centre, Hyderabad.

3.1.2 OBJECTIVE

The objectives of the LULC study are as follow:

- To develop the Land use & Land cover map using land coordinates of the quarry area (Core Zone) and 10 km radius from the quarry site (Buffer area).
- To Identify and mark the important Land use and Land cover features using the primary and secondary data collected.
- To evaluate the impacts on Proposed/existing land use/cover features of the buffer area.
- To identify the mitigative measures for the sustainable use of land and to protect the buffer zone from the adverse impacts.

Technical specification of Satellite imagery Data Used:

Current vintage data of Indian Remote Sensing Satellite RESOURCESAT1 (LISS-III) digital FCC (False Color Composite) has been used for preparation of Land use/ Land cover thematic map of study area. Satellite image has been procured from National Remote Sensing Centre, Hyderabad. Survey of India Toposheet as a reference map on 1:50,000 scale has been used for preparation of base layer data like road, rail network; village for geo-referencing of satellite image.

Satellite Image - Resourcesat1-LISSIII, 23.5m Resolution

Satellite Data Source - NRSC, Hyderabad

Satellite Vintage - 14st July 2020, Swath 141km wide.

SOI Toposheet No - 58 G/07 &11

Software Used - ArcGIS 10.8

The satellite image (FCC colour 3,2,1) of the buffer zone is given in 3.1

The spatial resolution and the spectral bands in which the sensor collects the remotely sensed data are two important parameters for any land use survey. Resourcesat1-LISSIII, 23m Resolution of 23.5m and a 141 km wide swath of the earth in 23.5m resolution covering wide areas the data is collected in 4 visible bands namely band number and Resolution.

TABLE 3.2: Resourcesat1-LISSIII SENSOR characteristics

Band Number	Description	Wavelength	Resolution
Band 1	Green	0.52-0.59 µm	23.5 meters
Band 2	Red	0.62-0.68 µm	23.5meters

Band 3	NIR	0.77-0.86 µm	23.5meters
Band 4	SWIR	1.55-1.70 µm	70meters

Source: NRSC, Hyderabad

3.1.3 METHODOLOGY

The land use / land cover map is prepared by adopting the interpretation techniques of the Satellite image in combination with collateral data such as Survey of India topographical maps. Image classification is done by using visual interpretation techniques and digital classification using any of the image processing software. The various activities for preparation of LULC include pre-processing, rectification, image enhancements and classifying the satellite data for assessing the change in land use land cover due to proposed developmental activities.

- Preliminary/primary data collection of the study area
- Satellite data procurement from NRSC
- Secondary data collection from authorized bodies
- Survey of India Toposheet (SOI)
- Mine Layout
- Cadastral / Khasra map
- GPS Coordinates of Lease Boundary
- Processing of satellite data using ArcGIS 10.8 and preparing the Land Use & Land cover maps (e.g. Mine area, Existing Quarries, Settlements, Agriculture land, Non agriculture land, water bodies, etc.) by Digital Image Processing (DIP) technique.
- Geo-Referencing of the Survey of India Toposheet
- Geo-Referencing of satellite Imagery with the help of Geo-Referenced Toposheets
- Enhancement of the Satellite Imagery
- Base Map layer creation (Roads, Railway, Village Names, and other Secondary data, etc.)
- Data analysis and Classification using Digital interpretation techniques.
- Ground truth studies or field Verification.
- Error fixing / Reclassification
- Final Map Generation.

The land use/Land cover Map of the buffer zone is given in 3.4(b).

Land Use Pattern of the Buffer Zone (Study area)

Details of the same are given in Table - 3.3 and the map is shown in Figure - 3.2

TABLE: 3.3 LAND USE / LAND COVER DETAILS OF STUDY AREA

S.No	Classification	Area_Ha	Area_%
BUILTUP			
1	Builtup Urban	475.26	1.51
2	Builtup Rural	589.38	1.88
3	Builtup Mining	93.84	0.30
AGRICULTURAL LAND			
4	Crop Land	16230.60	51.65
5	Agricultural Plantation	1863.88	5.93
6	Fallow Land	2567.91	8.17
FOREST			
7	Evergreen Forest	1022.16	3.25
8	Decidious Forest	1775.72	5.65
9	Forest Plantation	1100.22	3.50
10	Scrub Forest	740.67	2.36
BARREN/WASTELAND			
11	Scrub Land	666.19	2.12
12	Barren Rocky	706.37	2.25
WATERBODIES			
13	Waterbodies	3591.88	11.43
		31424.09	100.00

Source: Bhuvan, NRSC.

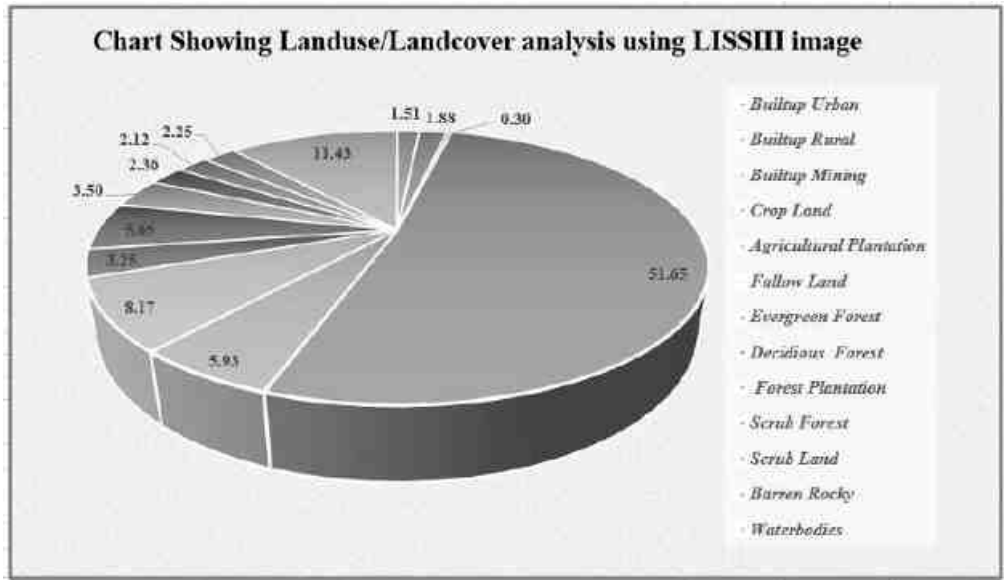


FIGURE 3.1: CHART SHOWING LANDUSE/LANDCOVER ANALYSIS USING LISS III Data

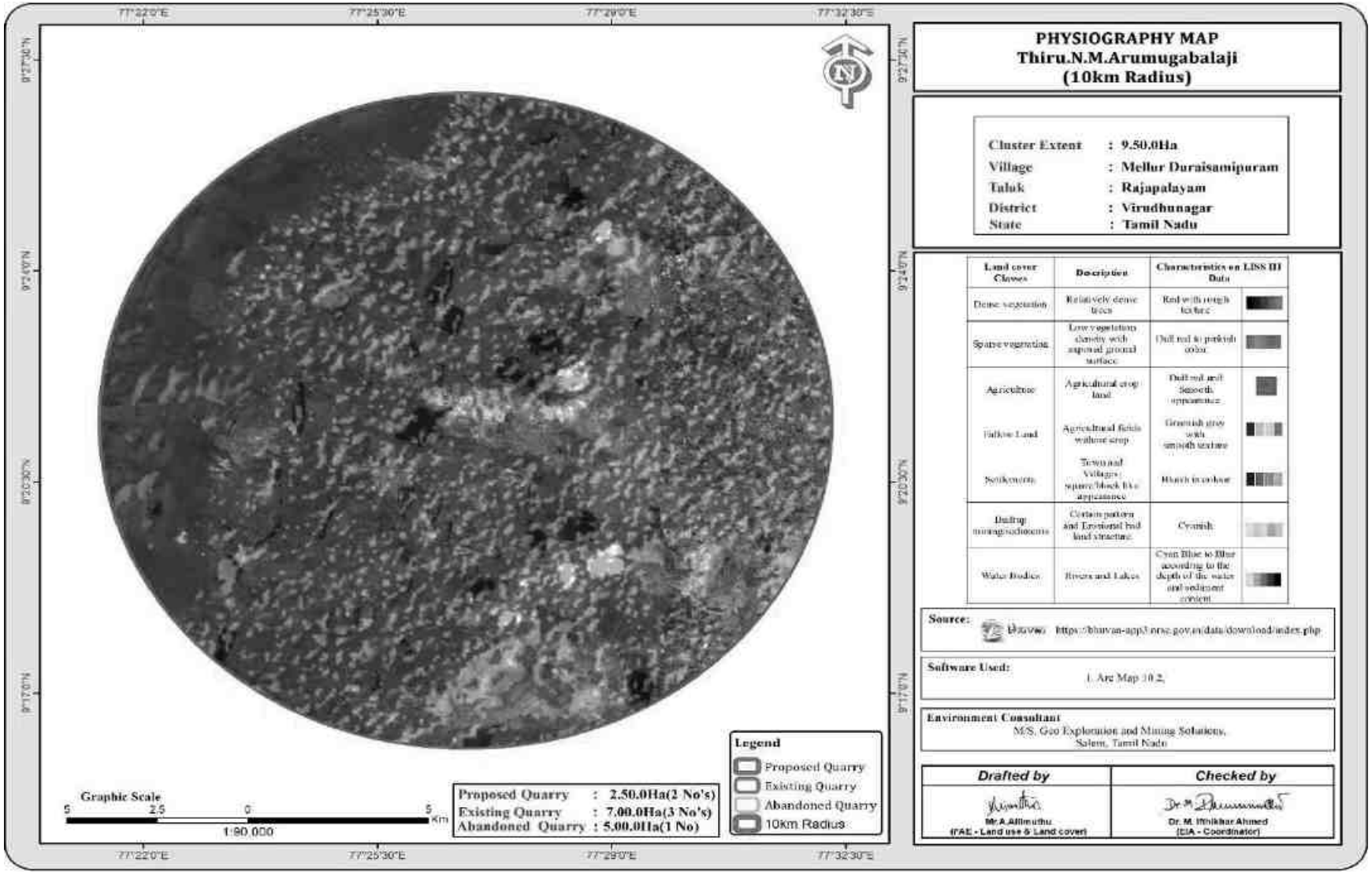


FIGURE 3.2: MAP SHOWING FALSE COLOR COMPOSITE (3,2,1) SATELLITE IMAGERY OF THE STUDY AREA

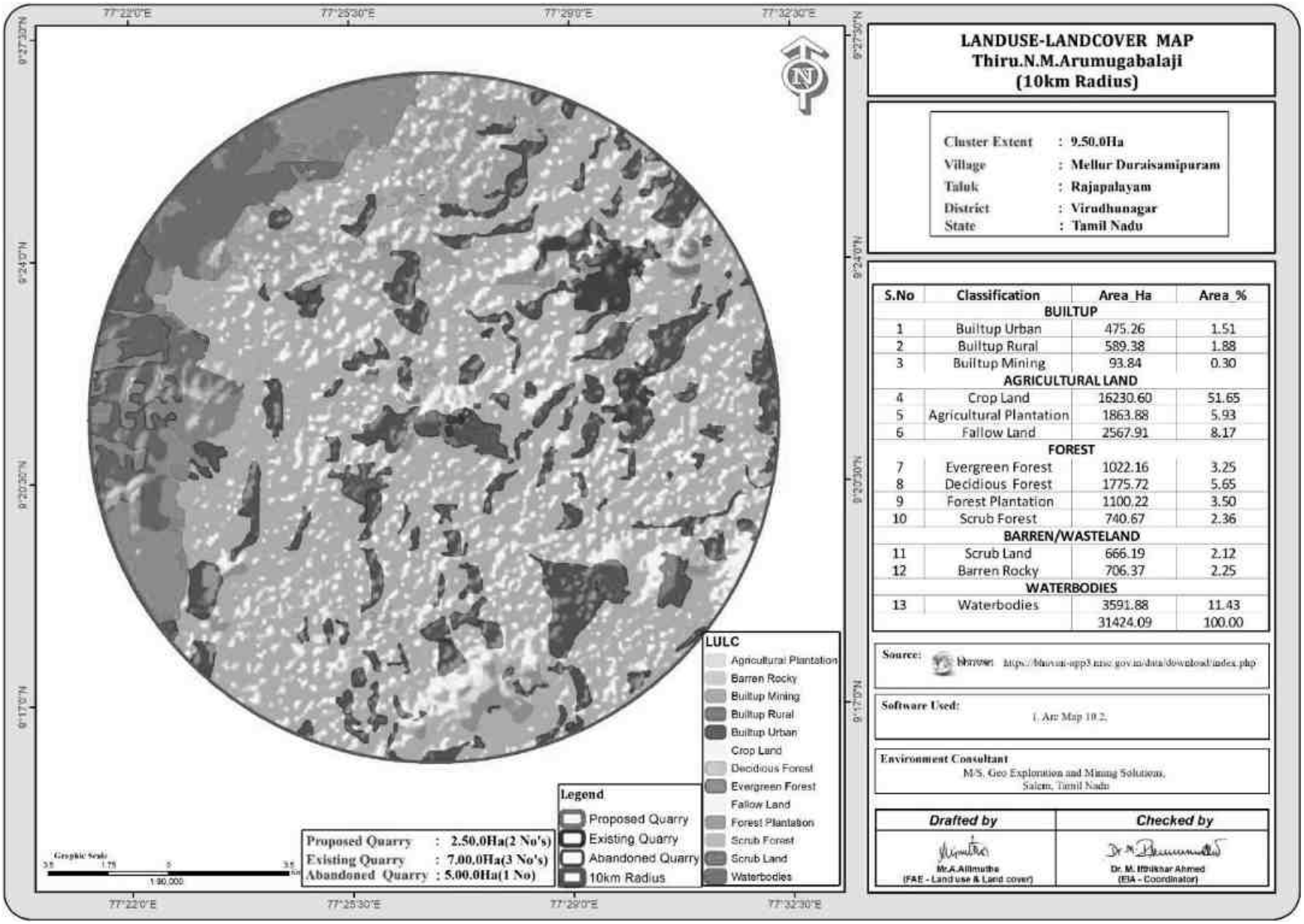


FIGURE 3.3: LAND USE LAND COVER MAP 10KM RADIUS

3.1.4 Interpretation

- The 10 km radius study area mainly comprises of crop land & Agriculture Plantation land accounting of 51.65% & 5.93 % of the total study area. The study area also consists of fallow land of 8.17%.
- Water Bodies such as ponds/ lakes comprises of 11.43% of the core and buffer area.
- The Scrub land accounts of 2.12%. As per the primary survey, it was observed the scrub land is mainly occupied by the grass with stony waste and left-over domestic waste generated by the nearby areas.
- 0.30% of the total study area is occupied by the mine industries of captive mines. The area occupied by Mainly Rough stone quarry of the total buffer area. As also observed within the primary survey, the 10 km buffer area.
- The 10 km study area mostly covers of crop land 51.65%. As per current study 2.12% of the area is occupied by scrub land.
- The forest area covered Sivagiri R.F and Settur R.F (Western ghats) is about 8.9% in the buffer zone area.
- Forest plantation covered in an area is 3.50% (1100.22 Ha), Scrub Forest is about 2.36% in buffer zone.
- 3.39% of the area is covered under the human Settlement. The nearest village within the 3km radius from the project site boundary is observed to be villages like Chokkanathputhur, Sivagiri, Kovilur and Terku Devadanam etc.,

3.1.4.1Cropping Pattern of the Buffer Zone

In Virudhunagar District the major Horticulture crops grown are Mango, Guava, Banana, Amla, Tomato, Brinjal, Bhendi, Onion, coriander, Chillies, flowers like jasmine, Arali, Tuberose etc., In total about 13590 ha of area covered by various Horticulture crops in this district. Doubling production and tripling income of farmers is the primary objective. Encouraging cultivation of traditional cultivars in horticultural crops, adopting Hi-Tech Horticulture technologies, promoting horticulture as a profitable and viable sector by leveraging technologies, encouraging farm mechanization and improved Post Harvest Management etc., **Source: https://virudhunagar.nic.in/horticulture/**

3.1.4.2 Interpretation and Conclusion

- Mellur Duraisamypuram in Rough stone quarry has proposed Project.
- Out of the total project area i.e.,31424.09ha, 0.30% (i.e., 1863.88 ha) will be developed under greenbelt development/ plantation.
- As new Proposed mine is coming in the area, percentage of human settlement will be increased in surrounding of project site and Infrastructure facilities also will be developed on the basis of requirement.
- The 10 km study area mostly covers of crop land 51.65%. As per current study 2.12% of the area is occupied by scrub land.
- The forest area covered Sivagiri R.F and Settur R.F (Western ghats) is about 8.9% in the buffer zone area.
- Forest plantation covered in an area is 3.50% (1100.22 Ha), Scrub Forest is about 2.36% in buffer zone.

- The project site falls under the rough stone quarry region. Therefore, the area is appropriate for developing Road development and building etc., it shows that the region has good prospects in the future. Due to proposed rough stone quarry in this region, economic condition of locals is expected to be improved directly & indirectly. Hence project will prove to be the best economic proposal for the coming times.

3.1.7 TOPOGRAPHY

The lease applied area is exhibits Hillock topography. The area has gentle sloping towards Northeastern side. The altitude of the area is 250m AMSL The area is covered by 1m thickness of Topsoil formation. Massive Charnockite which is clearly inferred from the existing quarry pits.

3.1.7 DIGITAL ELEVATION MODEL

Digital Elevation Model (DEM) has been prepared for the project at Mellur Durasamipuram Village, Rajapalayam Taluk, Virudhunagar District for a 10 km radius study area.

Data Used

- DEM Data : SRTM (DEM) -1ArcSecond-90m Resolution
- Data Source : https://urs.earthdata.nasa.gov/
- Software Used : Arc GIS 10.8

Methodology

SRTM (DEM) data has been used for the creation of the Digital Elevation Model of the study area. IRS Satellite-derived DEM with 30m or coarser posting shall be made available as a free download. IRS Satellite-derived DEM less than 30m and more than 10m postings may be made available at par with the base price for all categories of users.

Source: https://urs.earthdata.nasa.gov/

1st Stage:

The first processing stage involves importing and merging the 7.5' x 7.5' tiles into continuous elevation surfaces in DEM format.

2nd Stage:

Re-sampling the data at 15 m is done and a contour interval of 10 m through the usual process of interpolation is created.

3rd Stage:

DEM data is converted in grid format through Arc GIS 10.8 to obtain elevation information of the study area. Contours are then generated at 10 m intervals through spatial analysis of Arc GIS and with SRTM DEM data.

4th Stage:

Integration of DEM with contour map showing spatial analyst is done.

The Digital Elevation Model (DEM) of the Study Area with Contour Map DEM is given in Figure - 3.3.

Slope

The slope map was derived from SRTM DEM data of the study area. The slope of the study area was classified into four classes: less than 1Percent/degree Flat to almost flat, and no meaningful denudation process. 1 to 3 percent/degree gentle low speed ground motion, sheet erosion and soil rosion in the 3^0 to 10^0 more gentle the same as above but with a higher magnitude and slightly steep, a lot of ground movement and erosion especially landslides that are flat. Slope zone 5 class divide 0-07º, 0.7-1.2º, 1.2-3.6^0, 3.6-9.9^0, and above-10º (Fig.3.5)

Slope Class	Nature, Process and Natural Conditions
0^0-2^0 (0-2%)	Flat to almost flat, no meaningful denudation process
2^0 - 4^0 (2-7%)	Gentle, low-speed ground motion, sheet erosion and soil erosion (sheet & rill erosion), erosion swamps.
4^0 - 8^0 (7-15%)	More Gentle, the same as above, but with a higher magnitude.
8^0 - 16^0 (15-30%)	Slightly steep, a lot of ground movement and erosion, especially landslides that are flat.
16^0 - 35^0 (30-70%)	Steep, intensive denudation processes and ground movements are common.
35^0 - 55^0 (70-140%)	Very steep, rocks generally begin to unfold, a very intensive denudational process, have begun to produce rework material.
> 55^0 >140%	Very steep, exposed rocks, a very strong denudational process and prone to falling rocks, rarely grown plants (limited)

Source: Calculation of this slope using van zuidam classification, 1985

Interpretation *& Conclusion*

It is very clear from the DEM that the elevation varies from 126m to 237m in the whole study area, thus having an elevation difference of 111m. The areas in the Northern, Wester portion have higher elevation which is covered by plain land while the low-lying areas are generally used for agricultural purpose with builtup land. The contour over the DEM shows that the project site is 850-860m in the elevation range of 10 m interval present on the flat land in the study area.

3.1.2 Topography

The lease applied area is exhibits Hillock topography. The area has gentle sloping towards Northeastern side. The altitude of the area is 250m AMSL The area is covered by 1m thickness of Topsoil formation. Massive Charnockite which is clearly inferred from the existing quarry pits..

3.1.6 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.

3.1.8 Seismic Sensitivity

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

3.1.9 Environmental Features in the Study Area

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

TABLE 3.4: DETAILS OF ENVIRONMENT SENSITIVITY AROUND THE CLUSTER

Sl.No	Sensitive Ecological Features	Name	Arial Distance in km from Cluster
1	National Park / Wild life Sanctuaries	Nellai Wildlife Sanctuary	5.5 km-west
2	Reserved Forest	Sivagiri R. F	5.5 km West
3	Tiger Reserve/ Elephant Reserve/ Biosphere Reserve	None	Nil within 10Km Radius
4	Critically Polluted Areas	None	Nil within 10Km Radius
5	Mangroves	None	Nil within 10km Radius
6	Mountains/Hills	None	Nil within 10km Radius
7	Notified Archaeological Sites	None	Nil within 10km Radius
8	Industries/ Thermal Power Plants	None	Nil within 10km Radius
9	Defence Installation	None	Nil within 10km Radius

Source: Survey of India Toposheet

TABLE 3.5: NEARBY WATER BODIES FROM THE PROPOSED PROJECT SITE

S.No	LABEL	DISTANCE & DIRECTION
1	Odai	460m-NW
2	Periyakulam Kanmoi	570m_W
3	Pudur Pond	5.5Km_E
4	Thenmaai Kanmoi	5Km_SE
5	Rajasingapaeri	7.5Km_SW
6	Sastha kovil dam	7.1km-NW

Source: Village Cadastral Map and Field Survey

3.1.10 Soil Environment

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

The objective of the soil sampling is -

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

TABLE 3.6: SOIL SAMPLING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	S-1	Core Zone	Project Area	9°21'31.03"N 77°26'48.25"E
2	S-2	Vadhapatti	4.5km SE	9°19'22.65"N 77°28'4.67"E
3	S-3	Kovil Patti	5.3km SE	9°20'22.77"N 77°29'33.17"E
4	S-4	Muhavoor	5.5km NE	9°23'28.40"N 77°29'3.11"E
5	S-5	Puthur	5.3km East	9°21'31.28"N 77°29'45.64"E
6	S-6	Sivagiri	3km SW	9°20'43.43"N 77°25'20.70"E

Source: On-site monitoring/sampling by Laboratories in association with GEMS

Methodology –

For studying soil quality, sampling locations were selected to assess the existing soil conditions in and around the project site representing various land use conditions. The samples were collected by auger boring into the soil up to 90-cm depth. Six (6) locations were selected for soil sampling on the basis of soil types, vegetative cover, industrial & residential activities including infrastructure facilities, which would accord an overall idea of the soil characteristics. The samples were analysed for physical and chemical characteristics. The samples were sent to laboratory for analysis. The samples were filled in Polythene bags, coded and sent to laboratory for analysis and the details of methodology in respect are given in below Table 3.6.

TABLE 3.7: METHODOLOGY OF SAMPLING COLLECTION

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

Source: On-site monitoring/sampling by Laboratories 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, 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.

FIGURE 3.4: SOIL SAMPLING LOCATIONS AROUND 10 KM RADIUS

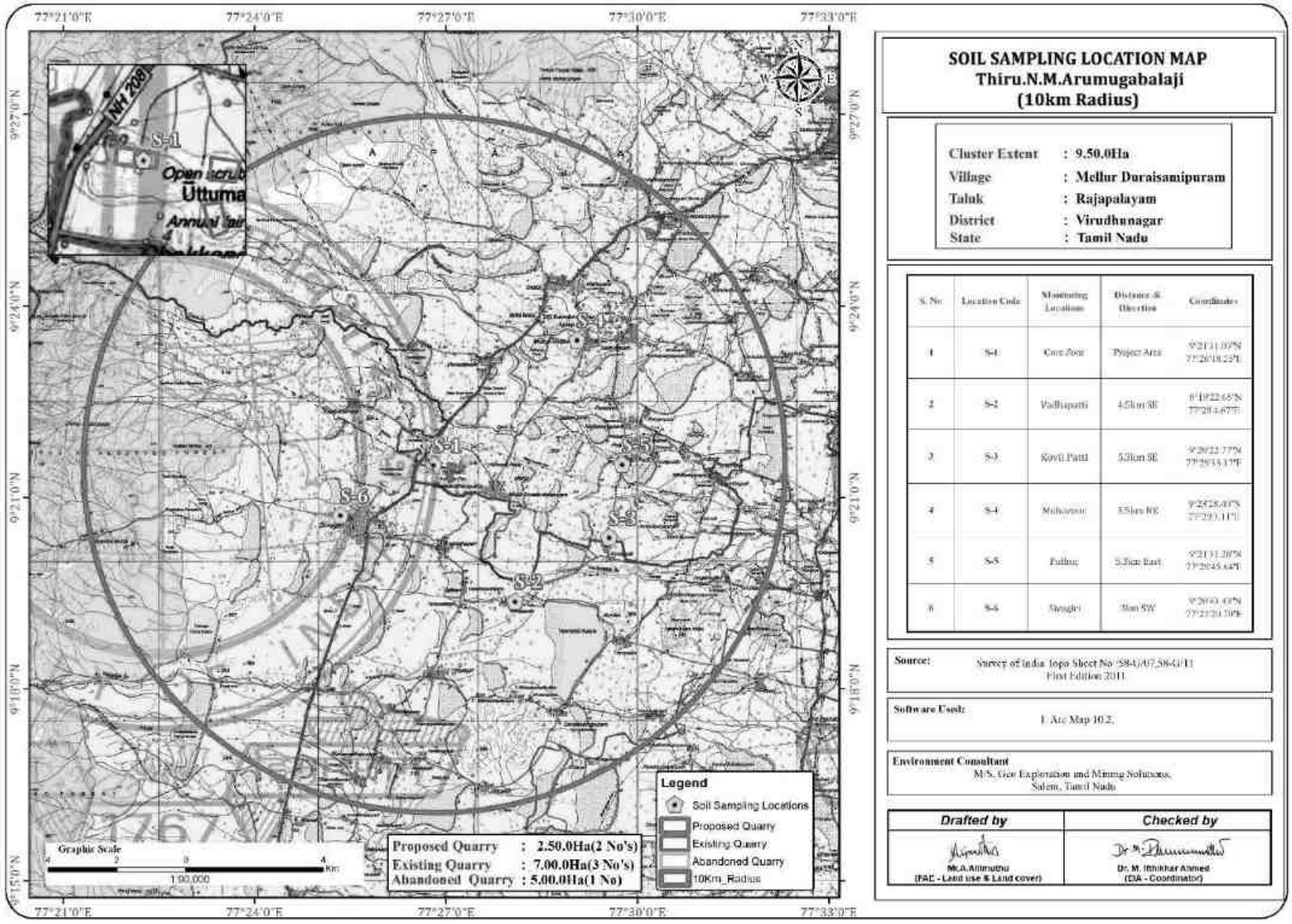


FIGURE 3.5: SOIL MAP

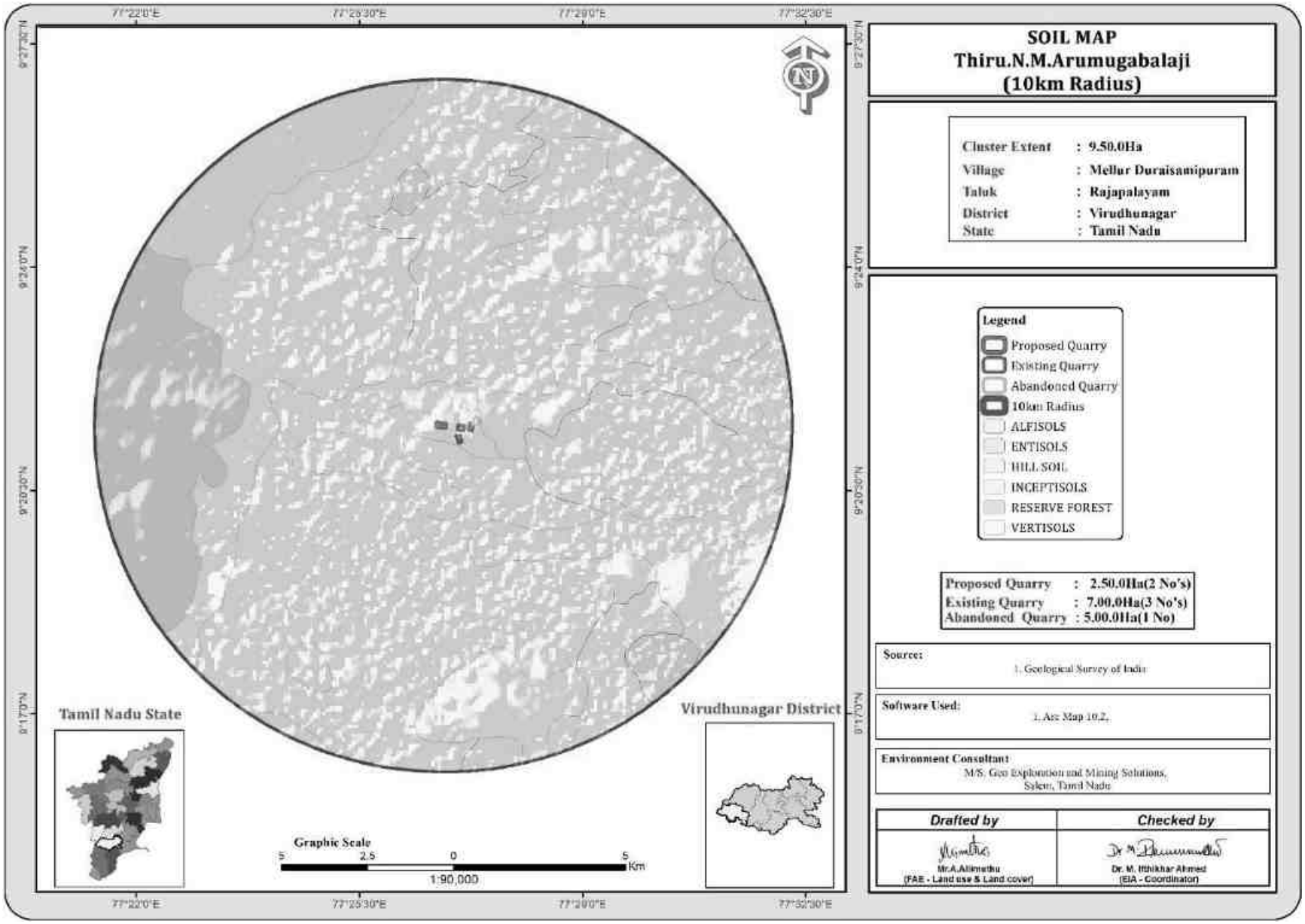


TABLE 3.8: SOIL QUALITY OF THE STUDY AREA

S. No.	Test Parameter	Unit	S1 Results	S2 Results	S3 Results	S4 Results	S5 Results	S6 Results	Test Method
1	pH @ 25°C	…	8.12	8.63	7.99	7.72	8.10	7.87	IS 2720 (Part-26)
2	Conductivity @ 25°C	µs/cm	432	573	495	536	345	545	IS 14767
3	Texture	…	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Loam	IS 2720 (Part-4)
4	Sand	%	33.4	33.7	33.5	32.8	34.7	33.0	IS 2720 (Part-4)
5	Silt	%	36.2	35.6	34.6	36.3	35.9	36.9	IS 2720 (Part-4)
6	Clay	%	30.4	30.7	31.9	30.9	29.4	30.1	IS 2720 (Part-4)
7	Water Holding Capacity	%	41.9	44.6	46.5	47.8	46.4	40.9	IS 2720 (Part-2)
8	Bulk Density	g/cm^3	1.02	1.18	1.03	1.31	1.20	1.29	IS 2386 (Part-4)
9	Porosity	%	44.8	45.2	43.2	42.4	43.5	47.6	IS 13030
10	Calcium as Ca	mg/kg	154	199	183.4	166.2	176	179.8	IS 2720 (Part-23)
11	Magnesium as Mg	mg/kg	67.9	86.5	89.8	75.8	74.6	77.9	ETS/STP/SOIL-08
12	Manganese as Mn	mg/kg	29.4	27.6	26.2	28.7	29.3	21.3	ETS/STP/SOIL-18
13	Zinc as Zn	mg/kg	1.07	1.51	2.61	2.74	2.12	1.34	ETS/STP/SOIL-18
14	Boron as B	mg/kg	1.02	1.68	1.64	1.61	1.27	1.40	ETS/STP/SOIL-18
15	Chloride as Cl	mg/kg	133	145	144	147	146	129	APHA 23rd Edn 2019 4500 Cl B
16	Total Soluble Sulphate as SO_4	%	0.021	0.024	0.019	0.024	0.025	0.027	IS 2720 (Part-27)
17	Potassium as K	mg/kg	35.7	41.6	39.4	39.7	31.9	32.7	ETS/STP/SOIL-18
18	Total Phosphorus as P	mg/kg	1.07	2.31	1.51	1.56	1.23	1.63	ETS/STP/SOIL-19
19	Total Nitrogen as N	mg/kg	282	329	326	293	289	357	ETS/STP/SOIL-15
20	Cadmium as Cd	mg/kg	BDL (DL : 1.0 mg/kg)						ETS/STP/SOIL-18
21	Total Chromium as Cr	mg/kg	BDL (DL : 1.0 mg/kg)						ETS/STP/SOIL-18
22	Copper as Cu	mg/kg	BDL (DL : 1.0 mg/kg)						ETS/STP/SOIL-18
23	Lead as Pb	mg/kg	0.7	1.51	0.91	1.11	0.40	0.83	ETS/STP/SOIL-18
24	Iron as Fe	mg/kg	2.54	1.75	2.67	2.71	2.31	2.67	ETS/STP/SOIL-18
25	Organic Matter	%	2.08	3.41	3.20	2.56	2.68	2.51	IS 2720 (Part-22)
26	Organic Carbon	%	1.21	1.98	1.86	1.49	1.56	1.46	IS : 2720 Part 22: 1972 (Reaff: 2015)
27	Cation Exchange Capacity	meq/100g	39.6	37.4	35.7	34.5	41.3	33.5	IS 2720 (Part-24)

Source: Sampling Results by Laboratories

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 Loam Soil and Bulk Density of Soils in the study area varied between 1.02– 1.31 g/cm^3. The Water Holding Capacity 40.9-47.8% and Porosity of the soil samples is found to be medium i.e. ranging from 42.4– 47.6%.

Chemical Characteristics –

- The nature of soil is slightly alkaline to strongly alkaline with pH range 7.72 to 8.63
- The available Nitrogen content range between 282 to 357 kg/ha
- The available Phosphorus content range between 1.07 to 2.31 kg/ha
- The available Potassium range between 31.9 to 41.6 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:

The study area is studded with few tanks that serve as the source of drinking water and also their surplus feeds adjoining tanks. 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 freshwater for couple of months after rainy season.

S.No	LABEL	DISTANCE & DIRECTION
1	Odai	460m-NW
2	Tank	510m-W
3	Canal	2.0km-S
4	Pond	4.4km-W
5	Tank	5.1km-SE

3.2.2 Ground Water Resources:

In view of the comparatively high level of ground water development in the major part of the district and the quality problems due to lithogenic and anthropogenic factors, it is necessary to exercise caution while planning further development of available ground water resources in the district. The development of ground water for irrigation in the district is mainly through dug wells tapping the weathered residuum. The yields of dug wells are improved at favorable locations by construction of extension bores, which are 50 to 100m. deep. Bore wells have also become popular as the source for irrigation in the district in recent years. Dug wells with extension bores wherever necessary is ideal for hard rock areas whereas large diameter dug wells with radial well is suitable for alluvial areas.

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 3.6.

TABLE 3.9: WATER SAMPLING LOCATIONS

S. No	Location code	Monitoring Locations	Distance & Direction	Coordinates
1	SW-1	Periyakulam Kanmai	1.5km SW	9°21'5.11"N 77°26'6.84"E
2	SW-2	Thenmalai Kanmai	6km SE	9°19'16.20"N 77°29'13.42"E
3	WW-1	Near Crusher	550m SE	9°21'12.26"N 77°26'54.09"E
4	WW-2	Muhavoor	5.5km NE	9°23'28.23"N 77°29'0.09"E
5	BW-1	Near Crusher	180m NE	9°21'32.47"N 77°26'57.01"E
6	BW-2	Devipattanam	2.2km NW	9°22'20.66"N 77°25'58.42"E

Source: On-site monitoring/sampling by Laboratories in association with GEMS

FIGURE 3.6: WATER SAMPLING LOCATIONS AROUND 10 KM RADIUS

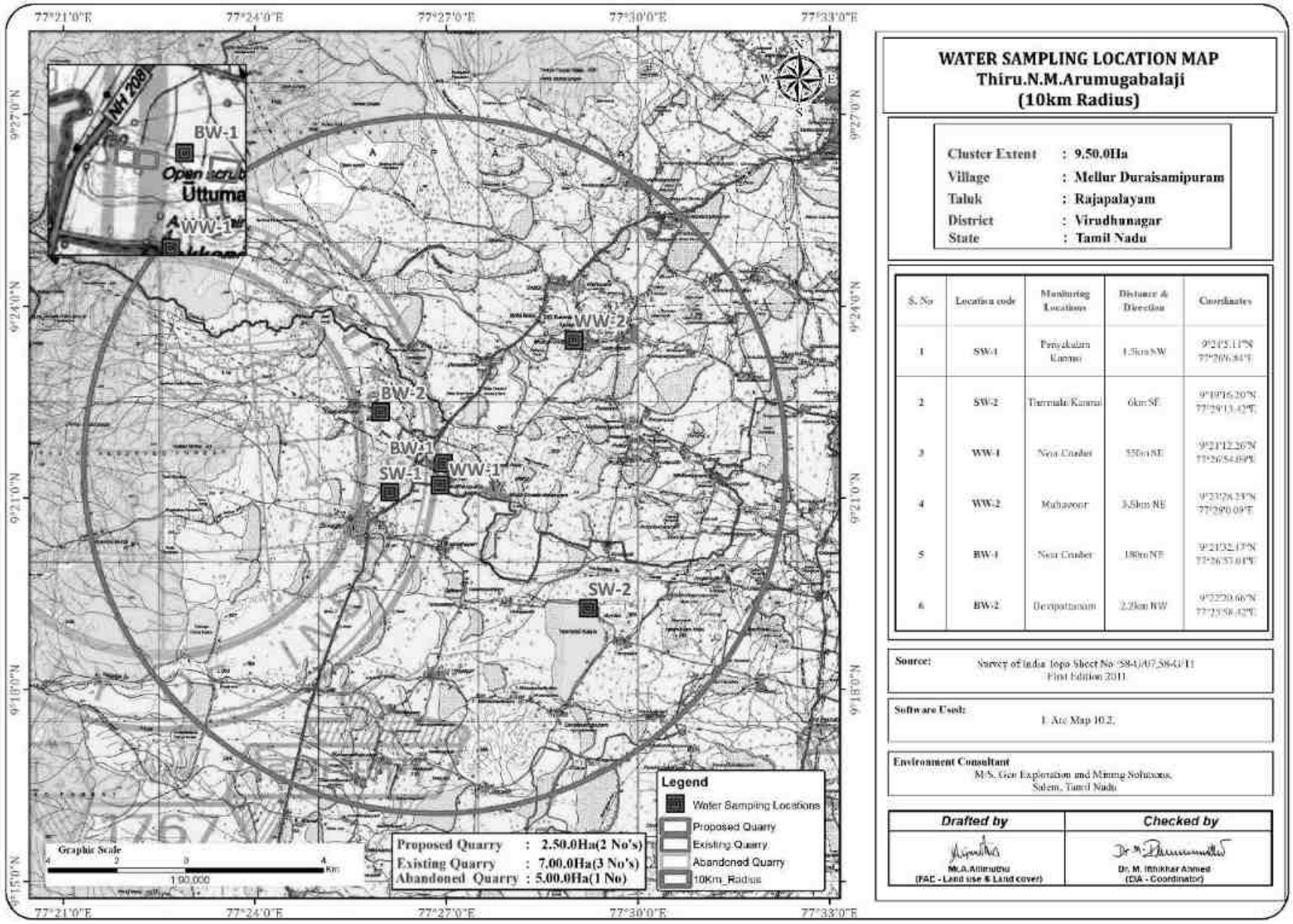


TABLE:3.10 SURFACE & GROUND WATER SAMPLING RESULTS

S. No.	Test Parameter	Unit	SW 1	SW 2	WW1	WW 2	BW 1	BW 2	Specification/Limit (As per IS:10500: 2012)		Test Method
									Desirable	Permissible	
1	Colour	Hazen	6	6	5	5	5	5	5	15	APHA 2120-B
2	Odour	…	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	APHA 2150-B
3	pH	…	7.83	7.96	7.31	7.91	7.63	7.87	6.5 - 8.5	No Relaxation	APHA 4500-H+
4	Conductivity	µs/cm	1034	1011	972	1033	926	880	Not Specified	Not Specified	APHA 2510-B
5	Turbidity	NTU	4.2	3.7	1.7	2.4	2.2	1.8	1	5	APHA 2130-B
6	Total Dissolved Solids, (TDS)	mg/L	610	596	573	609	546	519	500	2000	APHA 2540-C
7	Total Hardness, ($CaCO_3$)	mg/L	248	243.08	210.1	218.2	197.9	189.8	200	600	APHA 2340-C
8	Calcium, (Ca)	mg/L	62.5	64.4	58.2	59.9	50.2	42.1	75	200	APHA 3500:(Ca)-B
9	Magnesium (Mg)	mg/L	22.3	20.03	15.7	16.7	17.7	20.6	30	100	APHA 3500:(Mg)-B
10	Total Alkalinity (CaCO3)	mg/L	218	220	183	197	162	165	200	600	APHA 2320-B
11	Chloride, (Cl)	mg/L	110	116	137.6	156	143	129.6	250	1000	APHA 4500:(Cl-)-B
12	Sulphate, (SO_4)	mg/L	48.2	59.4	51.2	57.1	48.7	48.7	200	400	APHA 4500:(SO_4)-E
13	Iron, (Fe)	mg/L	0.5	0.59	0.32	0.36	0.29	0.52	0.3	No Relaxation	APHA-3120B
14	Chlorine (Residual)	mg/L	BDL (DL:0.1 mg/l)						0.2	1	APHA 4500:(Cl)-B
15	Fluoride, (F)	mg/L	0.41	0.37	0.24	0.24	0.16	0.36	1	1.5	APHA 4500:(F-)-D
16	Nitrate, (NO_3)	mg/L	13.2	14.6	9.6	7.3	7.4	8.4	45	No Relaxation	APHA 4500:(NO_3-)-B
17	Copper, (Cu)	mg/L	BDL (DL:0.01 mg/l)						0.05	1.5	APHA 3120B
18	Manganese, (Mn)	mg/L	BDL (DL:0.02 mg/l)						0.1	0.3	APHA-3120B
19	Mercury, (Hg)	ug/L	BDL (DL:0.0005 mg/l)						0.001	No Relaxation	APHA-3114C
20	Cadmium, (Cd)	mg/L	BDL (DL:0.001 mg/l)						0.003	No Relaxation	APHA 3120B
21	Selenium, (Se)	mg/L	BDL (DL:0.005 mg/l)						0.01	No Relaxation	APHA-3120B
22	Aluminium, (Al)	mg/L	BDL (DL:0.005 mg/l)						0.03	0.2	APHA-3120B
23	Lead, (Pb)	mg/L	BDL (DL:0.005 mg/l)						0.01	No Relaxation	APHA-3120B
24	Zinc, (Zn)	mg/L	BDL (DL:0.005 mg/l)						5	15	APHA-3120B
25	Total Chromium, (Cr)	mg/L	BDL (DL: 0.02 mg/l)						Not Specified	Not Specified	APHA-3120B
26	Boron, (B)	mg/L	BDL (DL: 0.05 mg/l)						0.5	1	APHA 4500:(B)-C
27	Mineral Oil	mg/L	BDL (DL: 0.01 mg/l)						0.5	No Relaxation	IS 3025 (Part-39)
28	Phenolic Compound, (C_6H_5OH)	mg/L	BDL (DL:0.0005 mg/l)						0.001	0.002	APHA 5530-C
29	Anionic Detergent(MBAS)	mg/L	BDL (DL:0.01 mg/l)						0.2	1	APHA 5540-C

S. No.	Test Parameter	Unit	SW 1	SW 2	WW1	WW 2	BW 1	BW 2	Specification/Limit (As per IS:10500: 2012)		Test Method
									Desirable	Permissible	
30	Cyanide, (CN)*	mg/L	BDL (DL:0.01 mg/l)						0.05	No Relaxation	APHA 4500:(CN-)-D
31	BOD @ 27°C for 3 days	mg/l	8.2	13.2	< 2	< 2	< 2	< 2	Shall Not Be Detectable		IS 3025 Part 44:1993 (Reaff:2019)
32	Chemical Oxygen Demand	mg/l	28	48	< 2	< 2	< 2	< 2	Shall Not Be Detectable		IS 3025 Part 58:2006 (Reaff:2017)
33	Dissolved Oxygen	mg/l	5.9	6.1	< 2	< 2	< 2	< 2			IS 3025 Part 38:1989 (Reaff:2019)
34	Barium, (Ba)	mg/L	BDL (DL:0.05 mg/l)						0.7	No Relaxation	APHA 3120B
35	Ammonia (as Total NH_3-N)*	mg/L	BDL (DL:0.01 mg/l)						0.5	No Relaxation	APHA 4500:(NH3)-C
36	Sulphide, (H_2S)	mg/L	BDL (DL:0.01 mg/l)						0.05	No Relaxation	APHA 4500:(S_2-)-D
37	Molybdenum, (Mo)	mg/L	BDL (DL:0.02 mg/l)						0.07	No Relaxation	APHA-3120B
38	Arsenic, (As)	mg/L	BDL (DL:0.005 mg/l)						0.01	0.05	APHA 3120B
39	Total Suspended Solids (TSS)	mg/L	27.6	26.8	BDL (DL:1.0 mg/l)				Not Specified	Not Specified	APHA 2540-D
40	Tatal Coliform	MPN/100ml	1420	1160	212	111	166		Not Specified	Not Specified	APHA 23rd Edn. 2017:9221B
41	Escherichia	MPN/100ml	132	142	<1.8	<1.8	<1.8	<1.8	Not Specified	Not Specified	APHA 23rd Edn. 2017:9221F

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

3.2.4 Interpretation& Conclusion

Surface Water

Ph:

The pH 7.83 to 7.96 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 Solid 596-610 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 110-116 mg/l. Nitrates 13.2 – 14.6 mg/l, while sulphate 48.2 – 59.4 mg/l.

Ground Water

The pH of the water samples collected ranged from 7.31 – 7.91 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 519-609 mg/l in all samples. The Total hardness varied between 189.8-218.2 -mg/l for all samples.

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

3.2.5 Hydrology and Hydrogeological studies

The district is underlain by hard rock formation fissured and fractured crystalline rocks constitute the important aquifer systems in the district. Geophysical prospecting was carried out in that area by SSRMP-80 Instrument by qualified Geo physicist with the help of IGIS software and it was inferred that the low resistance encountered at the depth between 45-40m. The maximum depth proposed out of proposed project is 15m BGL. Hence there is no possibilities of water table intersection during the entire mine life period besides it is also inferred topographically that there are no major water bodies intersecting the project area. There is no necessity of stream, channel diversion due to these proposed projects.

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

TABLE 3.12: WATER LEVEL OF OPEN WELLS 1 KM RADIUS

S.No	LABEL	LATITUDE	LONGITUDE	Mar-23	Apr-23	May-23
1	OW1	77° 26' 29.99"E	9° 21' 07.730"N	11	11.6	12.2
2	OW2	77° 26' 54.25"E	9° 20' 56.306"N	11.3	11.9	12.5
3	OW3	77° 27' 19.01"E	9° 20' 55.387"N	11.1	11.7	12.3
4	OW4	77° 27' 20.02"E	9° 21' 03.904"N	11.2	11.8	12.4
5	OW5	77° 27' 41.34"E	9° 21' 21.877"N	11.5	12.1	12.7
6	OW6	77° 27' 25.61"E	9° 21' 54.389"N	11.4	12	12.6
7	OW7	77° 27' 06.19"E	9° 22' 04.479"N	11.8	12.4	13
8	OW8	77° 26' 45.96"E	9° 21' 57.396"N	11.7	12.3	12.9
9	OW9	77° 26' 09.72"E	9° 21' 51.237"N	11.6	12.2	12.8
10	OW10	77° 25' 55.52"E	9° 21' 34.352"N	11.9	12.5	13.1

Source: Onsite monitoring data

TABLE 3.13: WATER LEVEL OF BOREWELLS 1 KM RADIUS

S.No	Name	LATITUDE	LONGITUDE	Mar-23	Apr-23	May-23
1	BW1	77° 27' 39.41"E	9° 21' 13.659"N	55.6	56.2	56.8
2	BW2	77° 27' 38.98"E	9° 21' 32.109"N	55.8	56.4	57
3	BW3	77° 27' 05.99"E	9° 21' 49.580"N	55.7	56.3	56.9
4	BW4	77° 26' 45.36"E	9° 21' 50.438"N	56	56.6	57.2
5	BW5	77° 26' 34.95"E	9° 21' 37.529"N	56.3	56.9	57.5
6	BW6	77° 26' 42.91"E	9° 21' 13.920"N	56.5	57.1	57.7
7	BW7	77° 27' 11.86"E	9° 21' 03.960"N	56.9	57.5	58.1
8	BW8	77° 27' 35.14"E	9° 21' 02.595"N	56.7	57.3	57.9

Source: Onsite monitoring data

FIGURE 3.7: WATER LEVEL CONTOUR MAP OF OPEN WELLS 1 KM RADIUS – MARCH 2023

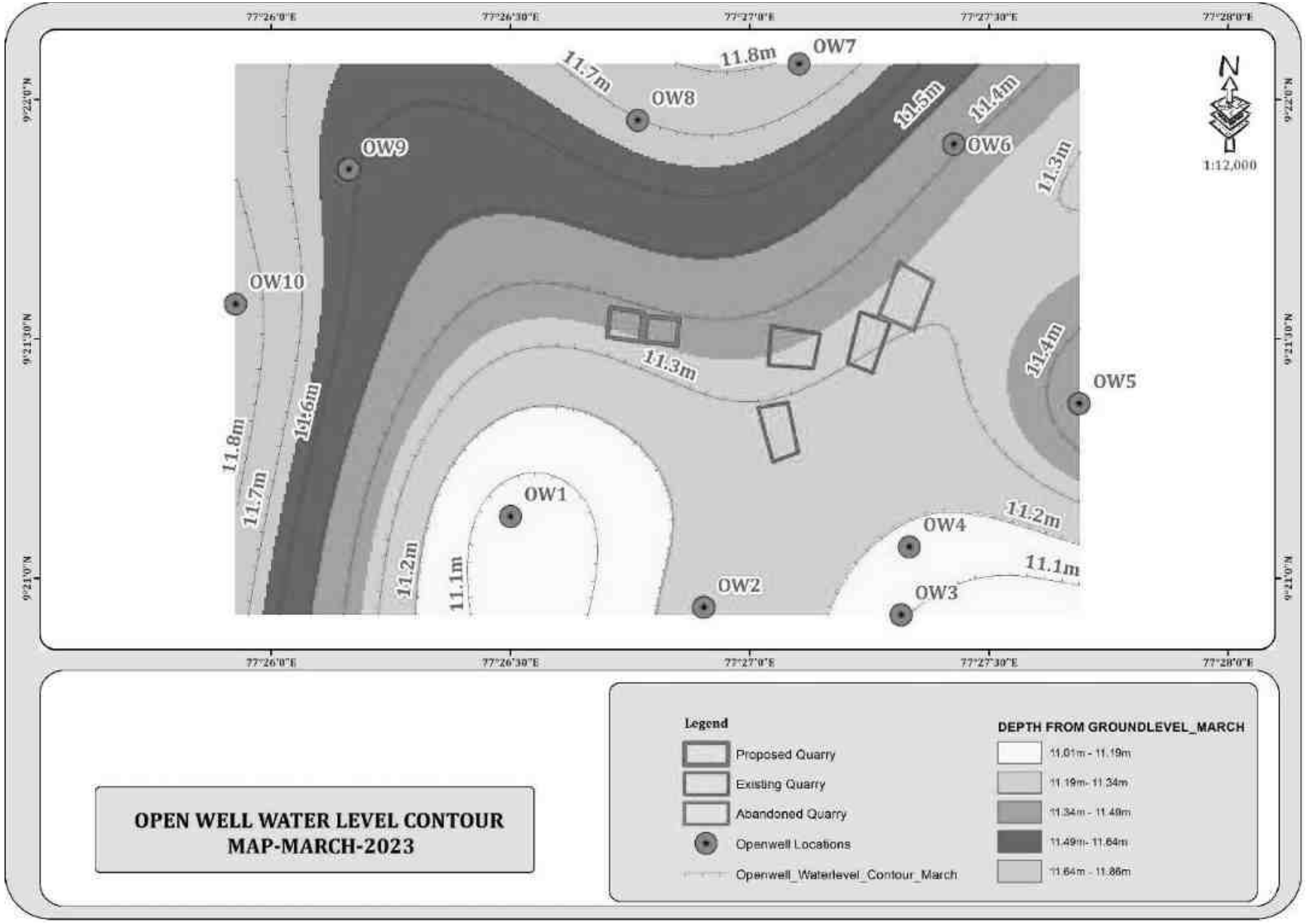


FIGURE 3.8: WATER LEVEL CONTOUR MAP OF OPEN WELLS 1 KM RADIUS – APRIL 2023

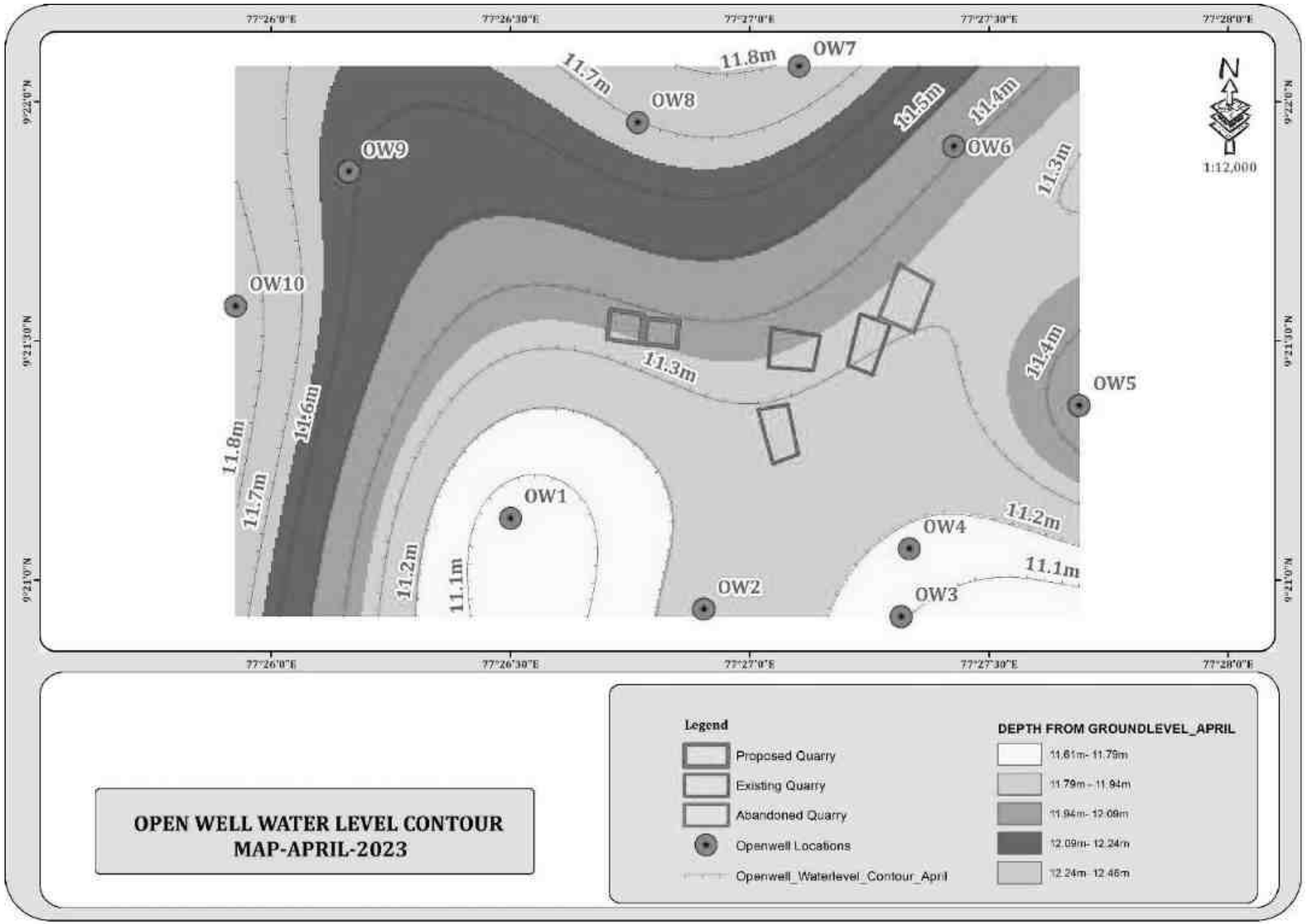


FIGURE 3.9: WATER LEVEL CONTOUR MAP OF OPEN WELLS 1 KM RADIUS – MAY 2023

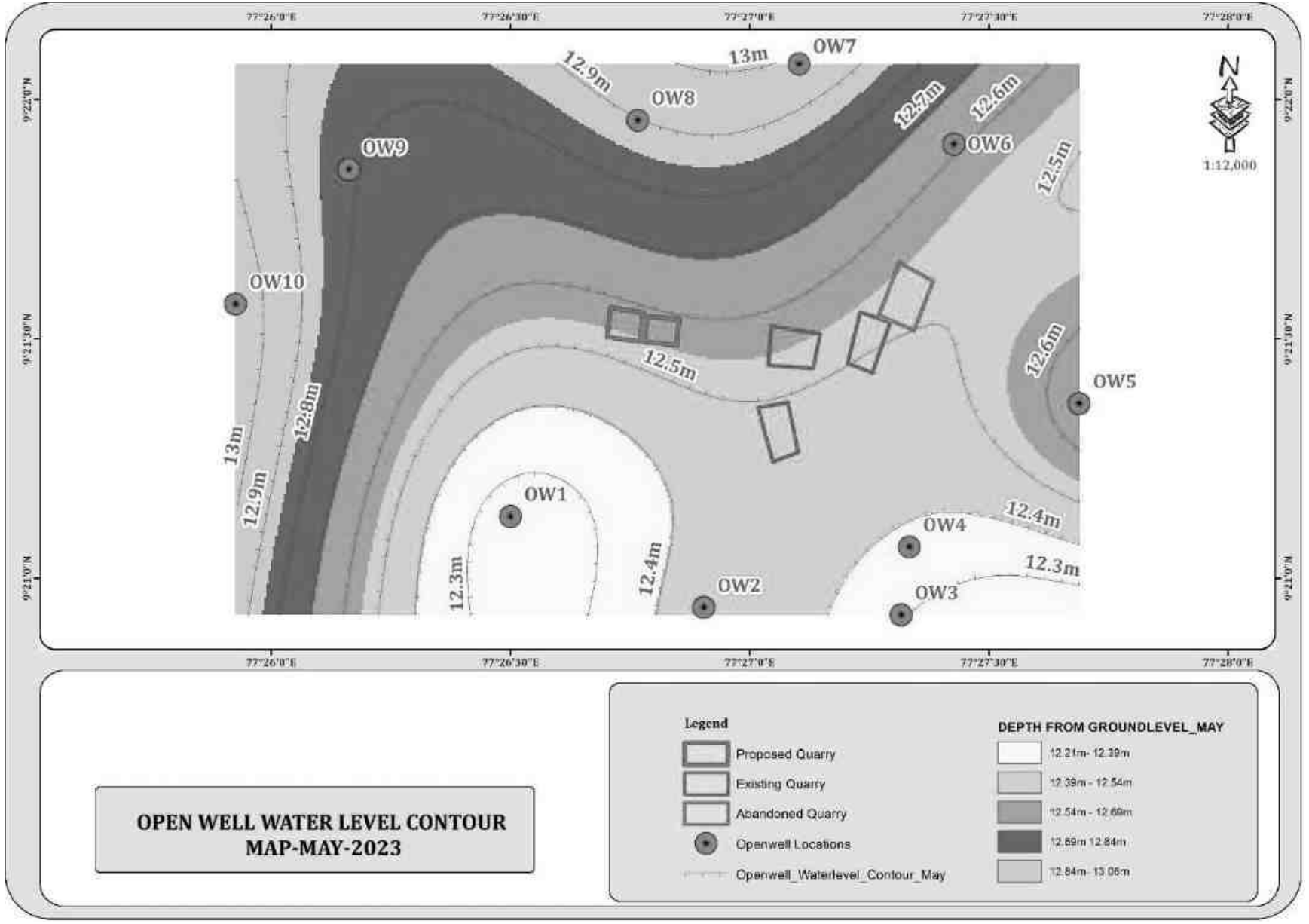


FIGURE 3.10: WATER LEVEL CONTOUR MAP OF BORE WELLS 1 KM RADIUS – MARCH 2023

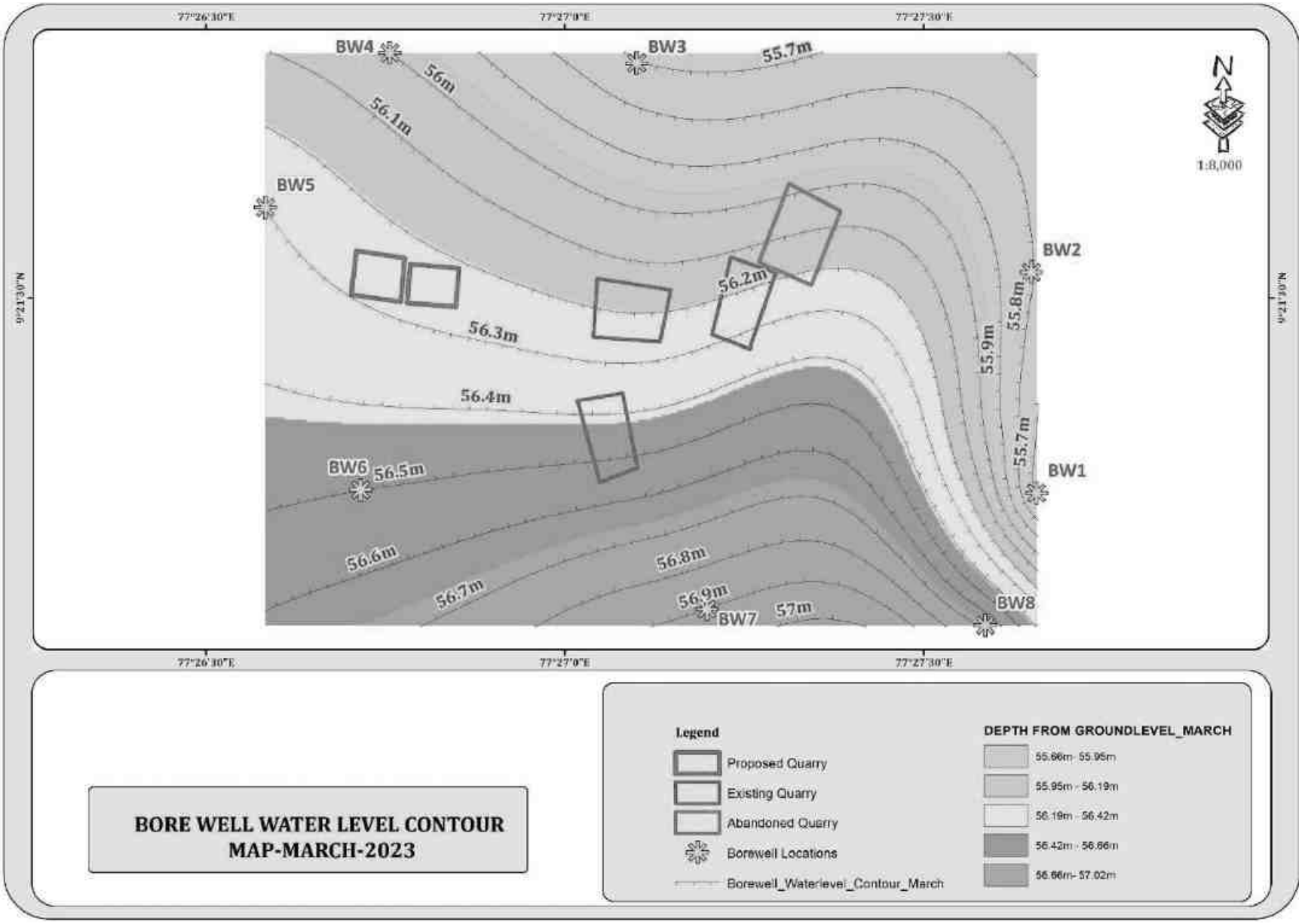


FIGURE 3.11: WATER LEVEL CONTOUR MAP OF BORE WELLS 1 KM RADIUS – APRIL 2023

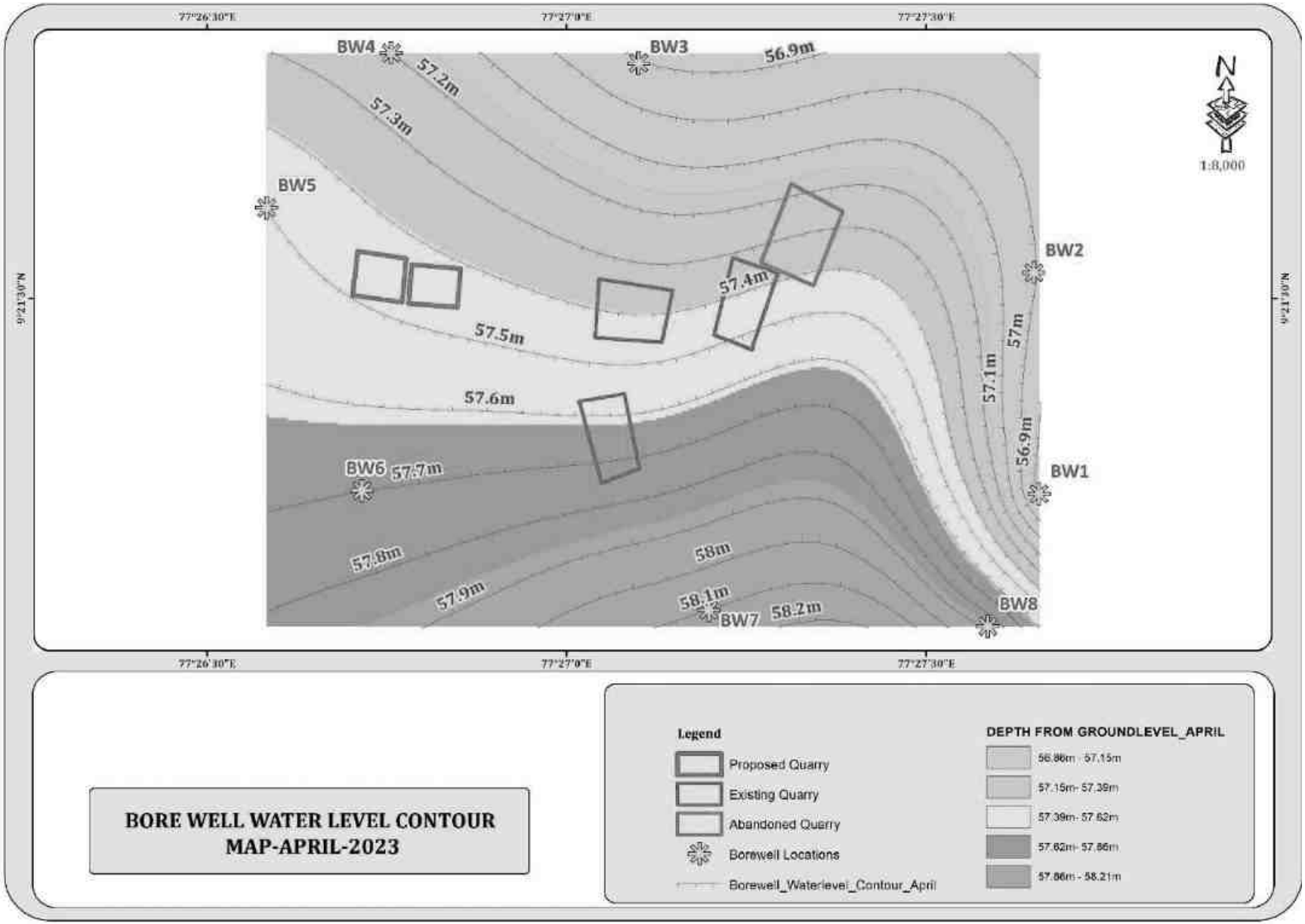


FIGURE 3.12: WATER LEVEL CONTOUR MAP OF BORE WELLS 1 KM RADIUS – MAY 2023

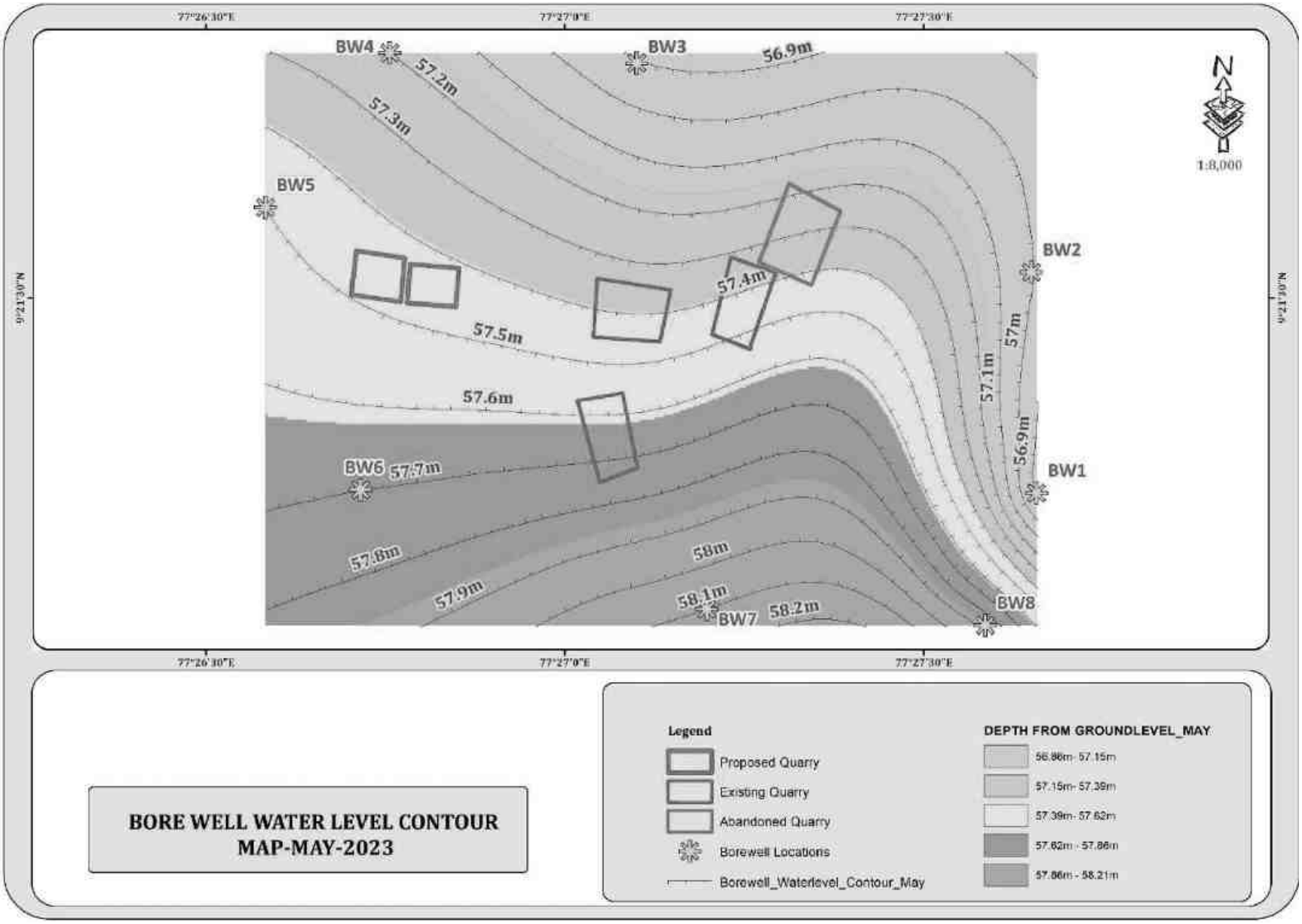


FIGURE 3.13: DRAINAGE MAP AROUND 10 KM RADIUS FROM PROJECT SITE

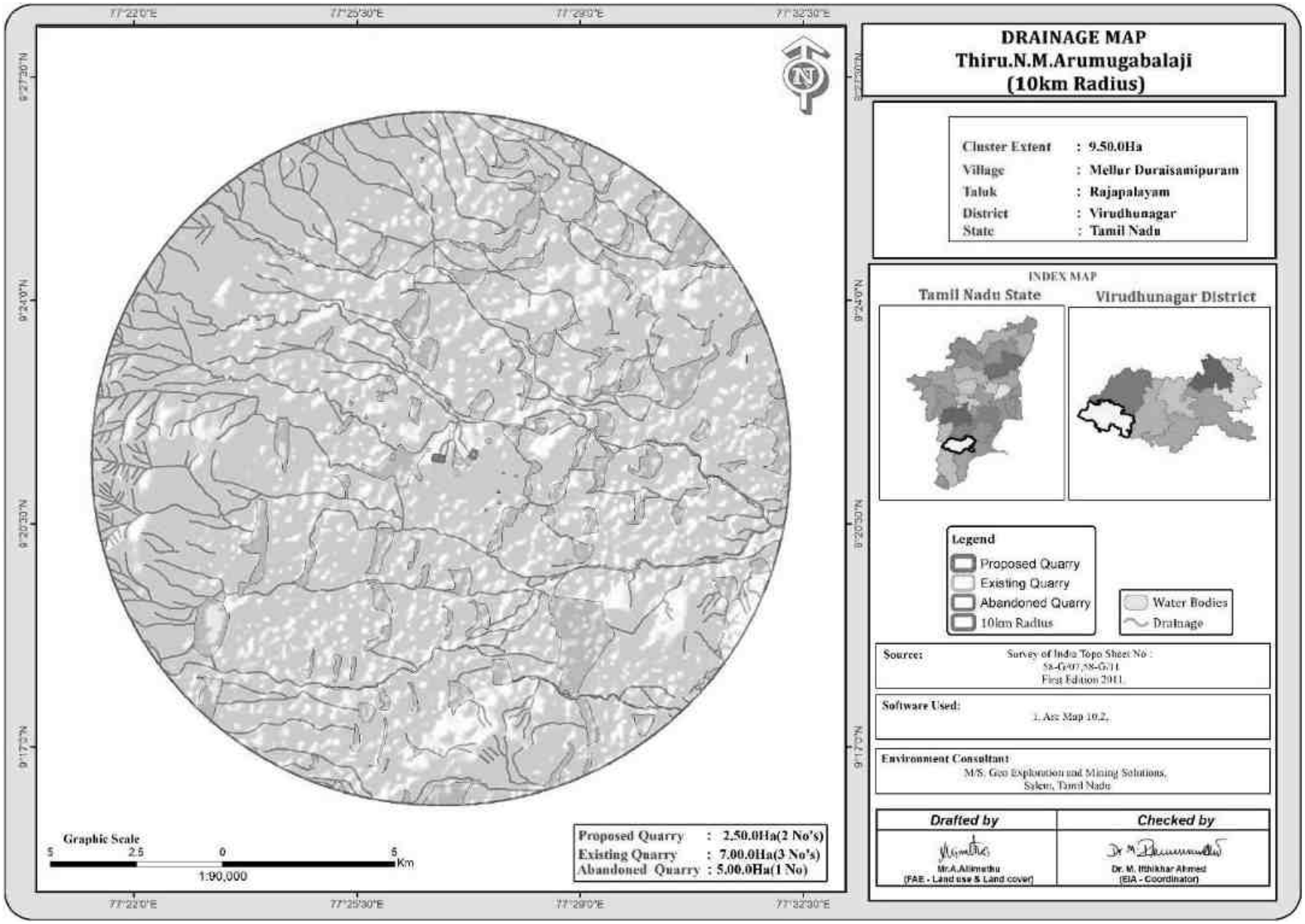
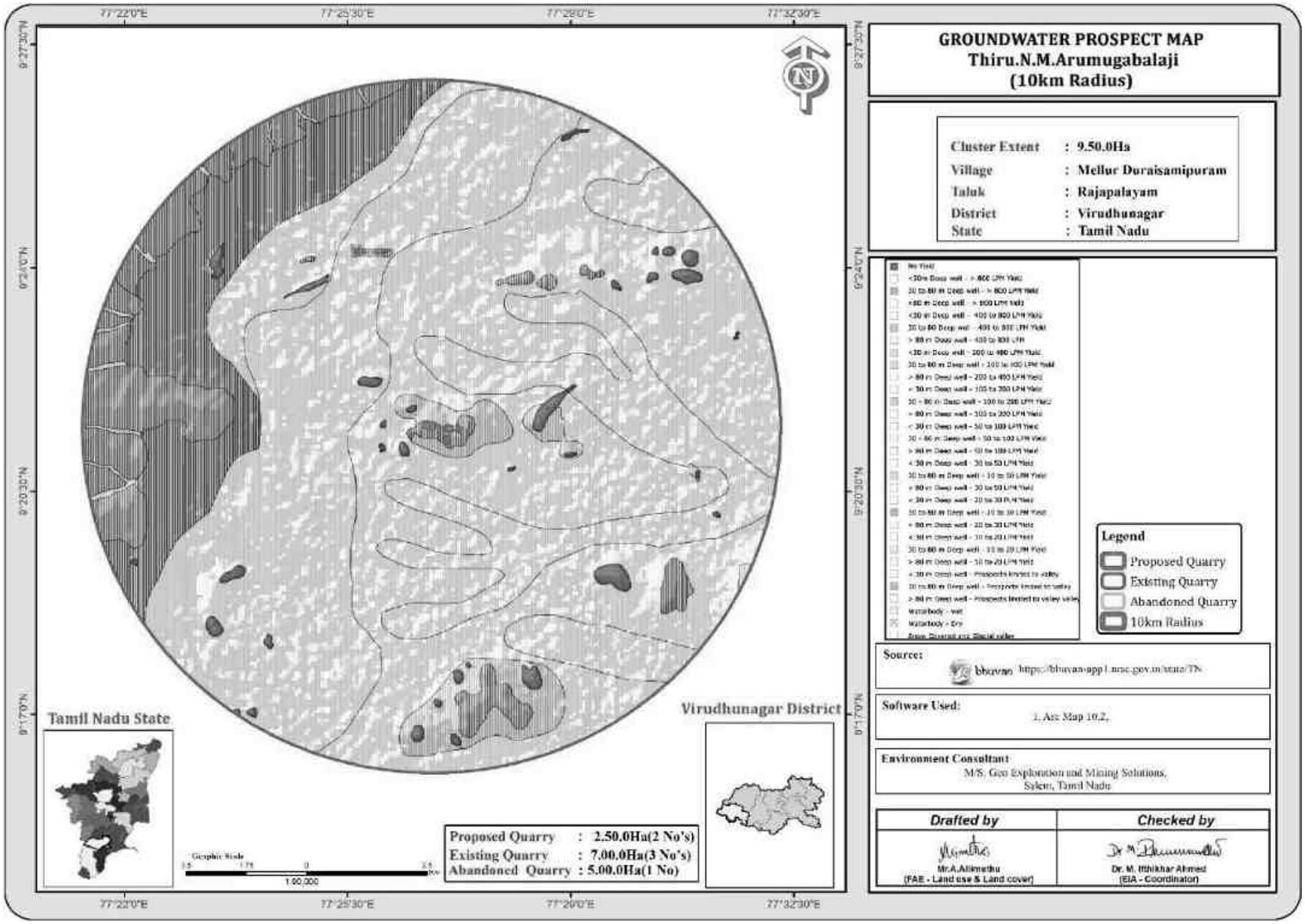


FIGURE 3.14: GROUND WATER PROSPECT MAP



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

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

ΔV = potential difference between receiving electrodes

G = Geometric Factor.

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

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

ρr = Resistivity of Rocks

ρw = Resistivity of water in pores of rock

F = Formation Factor

$\emptyset$ = Fractional pore volume

A = Constants with values ranging from 0.5 to 2.5

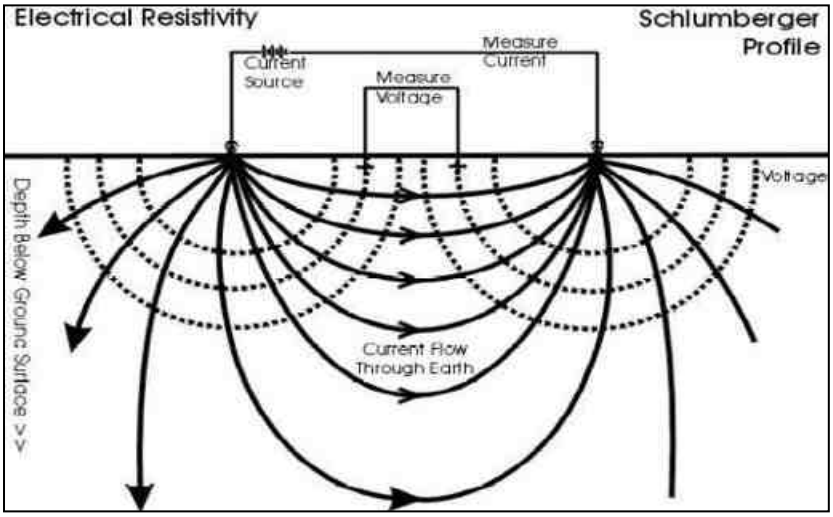
3.2.5.2 Survey Layout

The 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 45-40m. The maximum depth proposed out of proposed projects is (61m AGL+15m BGL). Hence there is no possibilities of water table intersection during the entire mine life period besides it is also inferred topographically that there are no major water bodies intersecting the project area.

3.2.5.4 Geophysical Data Interpretation

The geophysical data's 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 projects in cluster.

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

3.3.1 Meteorology & Climate

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

A temporary meteorological station was installed at project site by covering 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

- The Virudhunagar lies on 102m above sea level the climate here is considered to be a local steppe climate. The average annual temperature is 28.6 °C | 83.4 °F.
- The precipitation here is around 829 mm |32.6 inch per year. The driest month is May, with 9 mm |0.4inch. The greatest amount of precipitation occurs in October, with an average of 144 mm | 5.6 inch.
- The warmest month of the year is October, with an average temperature of 32.2°C | 89.9 °F.
- The lowest average temperatures in the year occur in December, when it is around 22°C | 71.6°F.
- The difference in precipitation between the driest month and the wettest month is 107mm | 7inch. The variation in temperatures throughout the year is 3.4°C | 38.1 °F.

Source: https://en.climate-data.org/asia/india/tamil-nadu/virudhunagar

TABLE 3.14: RAINFALL DATA

Actual Rainfall in mm					Normal Rainfall in mm
2017	2018	2019	2020	2021	
715.3	468.4	524.5	684.2	919.8	628.9

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

TABLE 3.15: METEOROLOGICAL DATA RECORDED AT SITE

S.No	Parameters		Mar-2023	Apr– 2023	May- 2023
1	Temperature (^{0}C)	Max	29.75	30.5	27.26
		Min	24.05	26.26	24.32
		Avg	26.9	28.38	25.79
2	Relative Humidity (%)	Avg	58.71	64.06	84.28
3	Wind Speed (m/s)	Max	3.02	2.82	2.68
		Min	1.1	1.07	1.16
		Avg	2.06	1.94	1.92
4	Cloud Cover (OKTAS)		0-8	0-8	0-8
5	Wind Direction		ENE, NE	SSW, ENE	W, WSW

Source: On-site monitoring/sampling by **EHS 360 Labs Private** Limited, association with GEMS

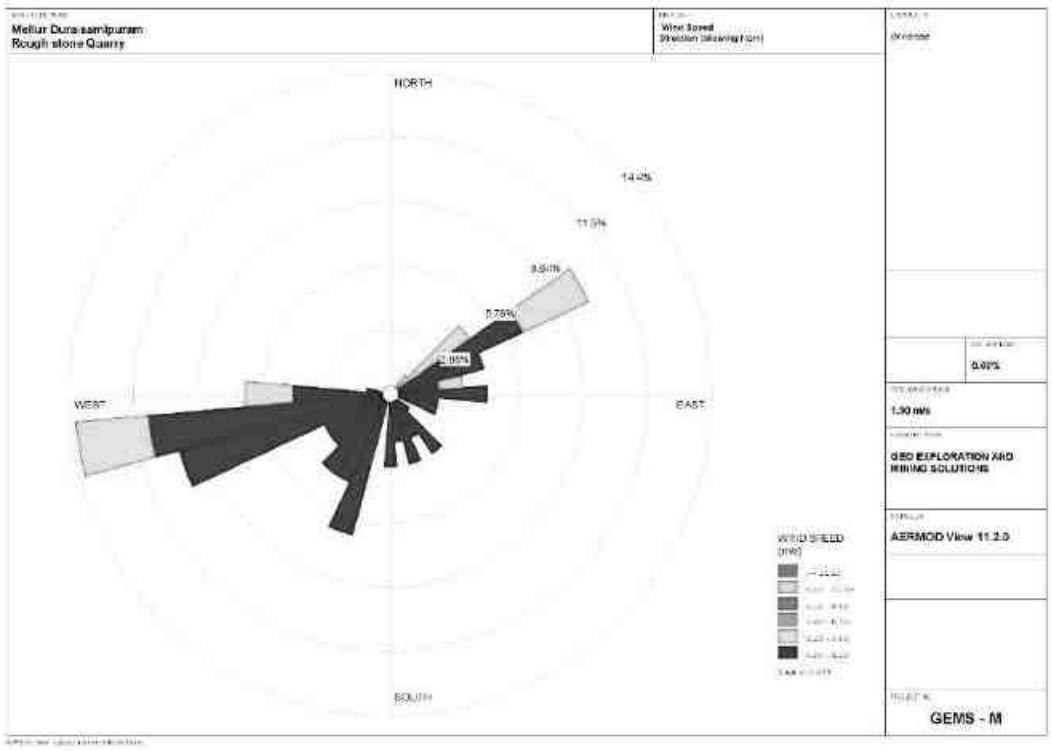
Correlation between Secondary and Primary Data

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

- The average maximum and minimum temperatures of IMD, Virudhunagar _Agro showed a higher in respect of on-site data i.e., in Mellur duraisamipuram village.
- The relative humidity levels were lesser at site as compared to IMD, Virudhunagar _Agro.
- The wind speed and direction at site shows similar trend that of IMD, Virudhunagar _Agro.

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

FIGURE 3.15: WINDROSE DIAGRAM



Source: Wind Rose plot view, Lake Environmental Software

In the abstract of collected data wind rose were drawn on presented in figure No.3.15 during the monitoring period in the study area

- Predominant winds were from NE, ENE,SSE,S SW,WSW
- Wind velocity readings were recorded between 0.00 to 5.70 m/s
- Calm conditions prevail of about 0.00 % of the monitoring period
- Temperature readings ranging from 26.4 to 33.78C
- Relative humidity ranging from 55.69 to 80.28 %
- 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 MONITORING

Parameter	Method	Instrument
$PM_{2.5}$	Gravimetric Method Beta attenuation Method	Fine Particulate Sampler Make – Thermo Environmental Instruments – TEI 121
PM_{10}	Gravimetric Method Beta attenuation Method	Respirable Dust Sampler Make –Thermo Environmental Instruments – TEI 108
SO_2	IS-5182 Part II (Improved West & Gaeke method)	Respirable Dust Sampler with gaseous attachment
NO_x	IS-5182 Part II (Jacob & Hochheiser modifiedmethod)	Respirable Dust Sampler with gaseous attachment
Free Silica	NIOSH – 7601	Visible Spectrophotometry

Source: Sampling Methodology followed by Laboratories & 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/m^3)	Annual Avg.* 24 hours**	50.0 80.0	20.0 80.0
2	Nitrogen Dioxide (µg/m^3)	Annual Avg. 24 hours	40.0 80.0	30.0 80.0
3	Particulate matter (size less than 10µm) PM_{10} (µg/m^3)	Annual Avg. 24 hours	60.0 100.0	60.0 100.0
4	Particulate matter (size less than 2.5 µm $PM_{2.5}$ (µg/m^3)	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 to May, 2023. 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

Eight (8) 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	9°21'32.23"N 77°26'48.71"E
2	AAQ 2	Near Crusher	450m SE	9°21'17.19"N 77°26'59.27"E
3	AAQ 3	Vadhapatti	4.5km SE	9°19'22.52"N 77°28'6.84"E
4	AAQ 4	Kovil Patti	5.3km SE	9°20'22.30"N 77°29'31.91"E
5	AAQ 5	Devipattanam	2.0km NW	9°22'16.37"N 77°26'2.95"E
6	AAQ 6	Muhavoor	5.5km NE	9°23'28.77"N 77°29'3.99"E
7	AAQ 7	Puthur	5.3km East	9°21'38.60"N 77°29'46.03"E
8	AAQ 8	Sivagiri	3km SW	9°20'42.65"N 77°25'19.73"E

Source: On-site monitoring/sampling by Laboratories in association with GEMS

FIGURE 3.16: AMBIENT AIR QUALITY LOCATIONS AROUND 10 KM RADIUS

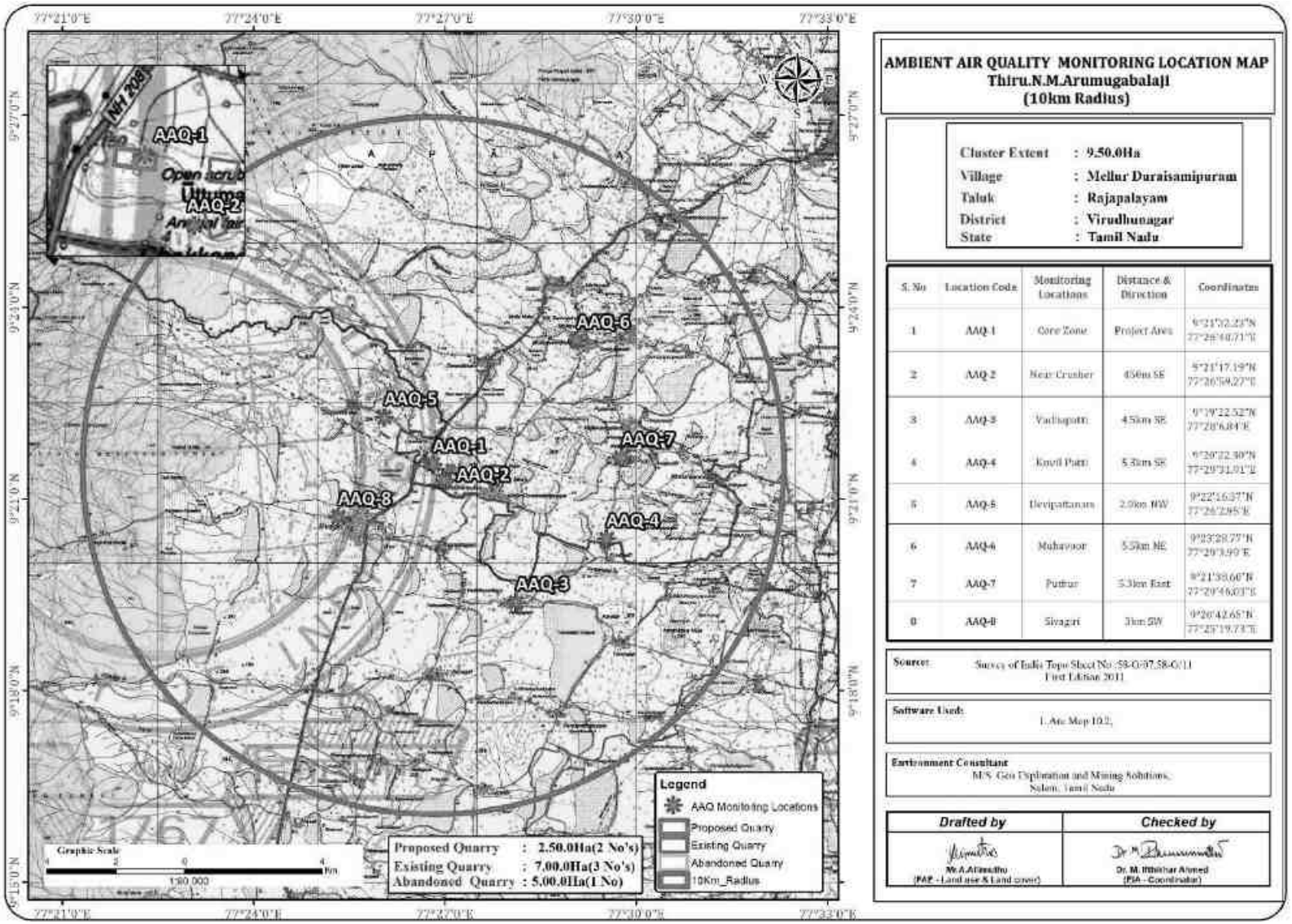


TABLE 3.19 AMBIENT AIR QUALITY DATA LOCATION AAQ1

Period: Mar – May-2023 *Location: AAQ1- Core Zone* Sampling Time: 24-hourly

Monitoring			Particulates, µg/m³		Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	Ni, ng/m³	As, ng/m³	C_6H_6, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60(24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
06.03.2023	07.00-07.00	55.3	43.2	23.2	6.2	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.03.2023	07.15-07.15	56.2	42.1	24.5	5.0	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.03.2023	07.00-07.00	58.4	44.3	22.0	7.3	23.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.03.2023	07.15-07.15	60.2	45.1	23.1	6.4	20.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.03.2023	07.00-07.00	59.2	46.2	25.1	5.2	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.03.2023	07.15-07.15	57.3	47.2	24.3	6.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.03.2023	07.00-07.00	60.3	46.3	25.6	7.1	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.03.2023	07.15-07.15	59.2	45.2	22.5	8.2	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.04.2023	07.00-07.00	57.4	44.2	24.4	5.0	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.04.2023	07.15-07.15	58.2	42.0	25.3	6.3	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.04.2023	07.00-07.00	56.2	44.3	22.1	7.2	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.04.2023	07.15-07.15	57.3	46.5	25.3	8.3	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.04.2023	07.00-07.00	58.0	48.2	24.2	6.4	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.04.2023	07.15-07.15	59.4	45.1	23.5	7.8	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.04.2023	07.00-07.00	58.0	42.5	21.2	6.0	20.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.04.2023	07.15-07.15	56.2	46.3	22.5	7.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.05.2023	07.00-07.00	57.0	45.1	23.6	8.3	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
02.05.2023	07.15-07.15	56.3	46.3	24.1	5.3	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.05.2023	07.00-07.00	58.2	47.5	25.2	6.4	20.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.05.2023	07.15-07.15	59.2	42.0	24.0	7.2	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.05.2023	07.00-07.00	60.2	43.0	25.6	8.3	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.05.2023	07.15-07.15	57.3	44.6	23.1	6.0	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.05.2023	07.00-07.00	58.1	47.2	24.5	7.2	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23.05.2023	07.15-07.15	59.2	45.3	26.0	8.0	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.05.2023	07.00-07.00	60.2	46.1	24.3	6.5	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.05.2023	07.15-07.15	58.6	45.3	25.2	5.3	22.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

TABLE 3.20 AMBIENT AIR QUALITY DATA LOCATION AAQ2

Period: Mar – May-2023 *Location: AAQ2- Near Crusher* Sampling Time: 24-hourly

Monitoring			Particulates, µg/m³		Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM2.5	PM10	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	Ni, ng/m³	As,ng/m³	C_6H_6, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60(24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
06.03.2023	07.15-07.15	62.5	46.2	25.3	6.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.03.2023	07.30-07:30	63.1	47.2	26.2	5.2	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.03.2023	07.15-07.15	64.3	48.6	27.2	6.3	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.03.2023	07.30-07:30	65.2	49.2	24.3	5.0	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.03.2023	07.15-07.15	62.0	46.3	25.2	6.2	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.03.2023	07.30-07:30	63.4	47.2	26.2	6.0	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.03.2023	07.15-07.15	64.5	48.2	27.1	5.5	21.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.03.2023	07.30-07:30	62.3	49.0	26.3	6.3	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.04.2023	07.15-07.15	61.0	45.6	25.2	5.3	21.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.04.2023	07.30-07:30	63.4	47.2	27.3	6.2	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.04.2023	07.15-07.15	65.2	48.3	25.0	7.2	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.04.2023	07.30-07:30	64.2	49.1	26.3	7.5	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.04.2023	07.15-07.15	62.3	46.2	27.4	6.3	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.04.2023	07.15-07.15	61.0	47.2	27.0	7.1	22.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.04.2023	07.00-07.00	60.0	48.3	26.3	6.5	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.04.2023	07.15-07.15	63.4	47.0	25.1	7.3	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.05.2023	07.00-07.00	65.2	46.0	24.0	8.2	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
02.05.2023	07.15-07.15	63.1	45.3	26.5	6.4	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.05.2023	07.00-07.00	64.2	46.0	27.1	8.5	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.05.2023	07.15-07.15	65.7	47.1	25.3	7.2	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.05.2023	07.00-07.00	63.1	48.3	25.1	8.0	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.05.2023	07.15-07.15	62.4	49.1	26.0	6.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.05.2023	07.00-07.00	63.5	48.2	27.3	7.9	22.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23.05.2023	07.15-07.15	64.1	46.2	28.3	8.3	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.05.2023	07.00-07.00	65.2	47.3	26.3	6.4	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.05.2023	07.15-07.15	63.2	45.2	24.5	8.2	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

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TABLE 3.21AMBIENT AIR QUALITY DATA LOCATION AAQ3

Period: Mar – May-2023 AAQ3- Vadhapatti Sampling Time: 24-hourly

Monitoring			Particulates, µg/m³		Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM2.5	PM10	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	Ni, ng/m³	As, ng/m³	C_6H_6, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
06.03.2023	7:00-7:00	62.3	44.5	24.3	5.2	20.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.03.2023	7:15-7:15	61.0	43.2	23.1	6.3	19.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.03.2023	7:00-7:00	63.4	45.0	24.5	7.0	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.03.2023	7:15-7:15	64.2	46.3	25.2	5.4	20.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.03.2023	7:00-7:00	63.0	47.1	23.0	6.3	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.03.2023	7:15-7:15	61.2	48.2	24.1	7.0	19.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.03.2023	7:00-7:00	62.5	46.0	25.3	5.2	20.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.03.2023	7:15-7:15	63.4	47.2	23.2	6.3	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.04.2023	7:00-7:00	64.2	48.3	24.5	7.1	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.04.2023	7:15-7:15	62.0	48.0	21.0	6.2	19.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.04.2023	7:00-7:00	63.5	45.2	25.3	7.1	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.04.2023	7:15-7:15	64.1	46.1	22.1	5.2	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.04.2023	7:00-7:00	63.5	47.2	23.0	6.3	19.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.04.2023	7:15-7:15	62.4	48.3	24.5	7.4	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.04.2023	7:00-7:00	61.0	46.2	25.3	5.2	20.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.04.2023	7:15-7:15	64.3	47.3	24.3	6.0	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.05.2023	7:00-7:00	62.3	48.0	25.3	7.2	19.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
02.05.2023	7:15-7:15	61.0	45.2	24.1	5.4	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.05.2023	7:00-7:00	62.3	46.3	23.5	7.0	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.05.2023	7:15-7:15	63.5	47.1	25.0	6.3	20.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.05.2023	7:00-7:00	64.2	48.2	23.4	7.2	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.05.2023	7:15-7:15	62.3	46.2	24.5	6.5	19.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.05.2023	7:00-7:00	61.0	45.2	23.1	5.5	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23.05.2023	7:15-7:15	63.4	44.3	24.6	6.3	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.05.2023	7:00-7:00	64.2	47.2	25.5	7.4	19.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.05.2023	7:15-7:15	62.0	48.3	24.6	6.3	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

TABLE 3.22 AMBIENT AIR QUALITY DATA LOCATION AAQ4

Period: Mar – May-2023 Location: AAQ4 – Kovil Patti Sampling Time: 24-hourly

Monitoring			Particulates, µg/m³		Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM2.5	PM10	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	Ni, ng/m³	As, ng/m³	C_6H_6, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60(24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
06.03.2023	7:00-7:00	55.3	43.2	23.1	5.5	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.03.2023	7:15-7:15	56.2	44.1	23.4	6.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.03.2023	7:00-7:00	58.4	45.0	24.1	5.3	23.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.03.2023	7:15-7:15	60.2	46.2	25.6	6.2	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.03.2023	7:00-7:00	59.2	44.1	26.1	5.0	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.03.2023	7:15-7:15	57.3	45.2	27.0	6.2	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.03.2023	7:00-7:00	60.3	46.3	24.3	5.3	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.03.2023	7:15-7:15	59.2	44.2	25.1	6.4	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.04.2023	7:00-7:00	57.4	42.1	26.2	5.8	21.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.04.2023	7:15-7:15	58.2	43.5	27.0	6.2	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.04.2023	7:00-7:00	56.2	45.1	22.3	5.4	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.04.2023	7:15-7:15	57.3	46.0	24.5	6.3	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.04.2023	7:00-7:00	58.0	43.1	25.6	5.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.04.2023	7:15-7:15	59.4	44.5	26.3	5.0	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.04.2023	7:00-7:00	58.0	42.0	24.1	6.2	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.04.2023	7:15-7:15	56.2	43.6	22.0	6.8	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.05.2023	7:00-7:00	57.0	44.5	23.5	5.3	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
02.05.2023	7:15-7:15	56.3	45.2	24.3	6.4	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.05.2023	7:00-7:00	58.2	46.3	25.6	6.0	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.05.2023	7:15-7:15	59.2	44.0	26.1	5.6	22.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.05.2023	7:00-7:00	60.2	45.6	27.2	6.3	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.05.2023	7:15-7:15	57.3	46.2	25.3	5.8	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.05.2023	7:00-7:00	58.1	43.1	24.1	6.3	22.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23.05.2023	7:15-7:15	59.2	42.1	25.0	5.2	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.05.2023	7:00-7:00	60.2	45.0	26.3	6.1	23.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.05.2023	7:15-7:15	58.6	44.3	27.1	6.3	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

TABLE 3.23 AMBIENT AIR QUALITY DATA LOCATION AAQ5

Period: Mar – May-2023 AAQ5- Devipattanam Sampling Time: 24-hourly

Monitoring			Particulates, µg/m³		Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM2.5	PM10	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	Ni, ng/m³	As, ng/m³	C_6H_6, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60(24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
06.03.2023	7:00-7:00	63.0	45.2	22.1	6.2	18.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.03.2023	7:15-7:15	64.2	43.1	21.1	7.3	19.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.03.2023	7:00-7:00	65.3	44.6	23.2	8.2	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.03.2023	7:15-7:15	66.0	45.0	24.2	7.0	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.03.2023	7:00-7:00	62.4	46.2	25.1	8.3	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.03.2023	7:15-7:15	63.5	47.3	23.2	6.4	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.03.2023	7:00-7:00	64.5	45.0	21.4	7.3	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.03.2023	7:15-7:15	65.3	46.3	22.5	8.2	19.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.04.2023	7:00-7:00	66.0	47.1	20.3	6.1	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.04.2023	7:15-7:15	62.5	45.0	21.2	7.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.04.2023	7:00-7:00	63.1	46.3	24.5	8.5	19.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.04.2023	7:15-7:15	64.2	47.2	23.6	6.3	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.04.2023	7:00-7:00	63.0	44.0	21.4	7.4	21.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.04.2023	7:15-7:15	62.0	45.2	25.3	8.2	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.04.2023	7:00-7:00	64.3	46.3	24.0	6.3	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.04.2023	7:15-7:15	65.1	47.1	23.1	7.5	19.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.05.2023	7:00-7:00	66.3	45.0	22.6	8.2	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
02.05.2023	7:15-7:15	62.0	42.0	21.3	6.3	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.05.2023	7:00-7:00	63.4	43.1	24.0	7.2	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.05.2023	7:15-7:15	64.5	46.5	25.3	8.1	19.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.05.2023	7:00-7:00	65.3	47.1	22.1	7.0	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.05.2023	7:15-7:15	66.0	44.2	23.6	6.2	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.05.2023	7:00-7:00	64.5	45.3	24.5	7.3	24.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23.05.2023	7:15-7:15	63.1	47.0	25.3	8.2	23.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.05.2023	7:00-7:00	65.2	44.2	24.3	6.4	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.05.2023	7:15-7:15	66.0	45.3	23.3	7.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

TABLE 3.24 AMBIENT AIR QUALITY DATA LOCATION AAQ6

Period: Mar – May-2023 Location: AAQ6 – Muhavoor Sampling Time: 24-hourly

Monitoring			Particulates, µg/m³		Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM2.5	PM10	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	Ni, ng/m³	As, ng/m³	C_6H_6, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60(24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
06.03.2023	7:00-7:00	62.3	45.2	23.2	6.0	18.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.03.2023	7:15-7:15	65.2	46.3	22.1	7.2	19.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.03.2023	7:00-7:00	63.2	44.1	24.0	6.3	20.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.03.2023	7:15-7:15	64.0	45.2	25.3	7.1	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.03.2023	7:00-7:00	65.2	46.0	26.0	6.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.03.2023	7:15-7:15	60.2	44.1	22.1	7.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.03.2023	7:00-7:00	61.3	46.2	23.0	6.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.03.2023	7:15-7:15	62.5	45.2	24.5	6.3	19.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.04.2023	7:00-7:00	63.1	46.0	25.6	7.5	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.04.2023	7:15-7:15	64.2	44.3	25.0	6.1	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.04.2023	7:00-7:00	65.8	45.1	26.0	7.8	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.04.2023	7:15-7:15	62.3	46.3	23.1	6.3	19.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.04.2023	7:00-7:00	63.1	45.2	22.2	7.2	18.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.04.2023	7:15-7:15	65.2	46.3	23.5	6.5	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.04.2023	7:00-7:00	63.0	45.0	24.3	7.3	19.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.04.2023	7:15-7:15	64.1	46.2	25.6	6.2	18.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.05.2023	7:00-7:00	65.8	44.3	26.4	7.0	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
02.05.2023	7:15-7:15	63.4	42.0	24.3	6.1	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.05.2023	7:00-7:00	62.3	43.6	22.5	7.0	17.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.05.2023	7:15-7:15	60.1	45.8	25.1	6.5	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.05.2023	7:00-7:00	61.2	44.6	23.0	7.3	20.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.05.2023	7:15-7:15	63.5	46.0	26.2	6.5	19.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.05.2023	7:00-7:00	62.4	45.2	24.0	7.2	17.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23.05.2023	7:15-7:15	64.5	46.3	25.3	6.8	18.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.05.2023	7:00-7:00	65.3	44.2	26.0	7.3	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.05.2023	7:15-7:15	64.2	46.3	25.0	6.0	19.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

TABLE 3.25 AMBIENT AIR QUALITY DATA LOCATION AAQ7

Period: Mar – May-2023 *Location: AAQ7– Puthur* Sampling Time: 24-hourly

Monitoring			Particulates, µg/m³		Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM2.5	PM10	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	Ni, ng/m³	As, ng/m³	C_6H_6, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60(24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
06.03.2023	7:00-7:00	64.2	44.5	22.1	7.1	18.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.03.2023	7:15-7:15	62.3	44.2	23.1	6.2	16.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.03.2023	7:00-7:00	65.1	46.1	25.3	7.3	17.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.03.2023	7:15-7:15	66.0	47.3	26.4	6.0	20.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.03.2023	7:00-7:00	67.2	43.0	28.1	7.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.03.2023	7:15-7:15	63.1	44.2	27.0	7.0	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.03.2023	7:00-7:00	62.5	45.3	29.3	7.3	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.03.2023	7:15-7:15	64.3	44.0	23.4	6.2	17.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.04.2023	7:00-7:00	65.2	45.2	24.6	7.4	16.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.04.2023	7:15-7:15	67.2	46.3	25.1	6.0	17.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.04.2023	7:00-7:00	64.0	47.1	23.0	7.5	18.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.04.2023	7:15-7:15	65.3	45.0	24.0	6.4	19.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.04.2023	7:00-7:00	66.4	43.5	25.8	7.2	16.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.04.2023	7:15-7:15	67.2	46.0	26.0	6.8	17.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.04.2023	7:00-7:00	66.0	43.1	27.4	7.1	18.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.04.2023	7:15-7:15	62.3	45.0	29.2	6.5	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.05.2023	7:00-7:00	63.1	46.3	24.0	7.4	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
02.05.2023	7:15-7:15	64.2	44.0	27.3	6.0	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.05.2023	7:00-7:00	65.0	45.1	25.2	7.3	22.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.05.2023	7:15-7:15	66.3	46.8	27.0	7.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.05.2023	7:00-7:00	67.1	45.0	25.3	6.2	18.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.05.2023	7:15-7:15	65.3	46.3	26.8	7.1	20.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.05.2023	7:00-7:00	64.2	44.5	28.1	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23.05.2023	7:15-7:15	63.1	42.0	29.2	6.1	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.05.2023	7:00-7:00	64.0	46.1	26.4	7.3	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.05.2023	7:15-7:15	62.1	44.2	27.2	6.4	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

TABLE 3.26 AMBIENT AIR QUALITY DATA LOCATION AAQ8

Period: Mar – May-2023 Location: AAQ8– Sivagiri Sampling Time: 24-hourly

Monitoring			Particulates, µg/m3		Gaseous Pollutants, µg/m3					Other Pollutants (Particulate Phase) , µg/m3				
Date	Period, hrs.	SPM	PM2.5	PM10	SO2	NO2	NH3	O3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m3	Ni, ng/m3	As, ng/m3	C6H6, ng/m3	BaP, ng/m3
NAAQ Norms*		(24 hrs.)	60(24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
06.03.2023	7:00-7:00	65.3	43.2	22.0	5.2	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.03.2023	7:15-7:15	64.2	44.1	21.3	6.3	20.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.03.2023	7:00-7:00	66.3	45.3	22.4	7.0	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.03.2023	7:15-7:15	67.2	42.0	23.5	8.2	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.03.2023	7:00-7:00	68.2	43.5	24.6	5.4	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.03.2023	7:15-7:15	65.0	44.5	25.3	6.1	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.03.2023	7:00-7:00	66.2	45.6	26.7	7.3	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.03.2023	7:15-7:15	67.3	46.2	27.8	8.4	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.04.2023	7:00-7:00	68.4	45.0	25.0	5.6	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.04.2023	7:15-7:15	66.5	44.3	28.3	6.1	20.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.04.2023	7:00-7:00	67.3	42.1	26.1	7.3	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.04.2023	7:15-7:15	68.2	43.5	24.3	8.2	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.04.2023	7:00-7:00	66.0	45.2	25.8	5.5	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.04.2023	7:15-7:15	65.4	46.2	26.5	6.6	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.04.2023	7:00-7:00	67.0	43.2	27.3	7.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.04.2023	7:15-7:15	66.0	42.1	28.1	5.3	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.05.2023	7:00-7:00	64.3	44.5	26.1	6.2	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
02.05.2023	7:15-7:15	65.8	46.3	25.3	5.0	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.05.2023	7:00-7:00	66.3	42.1	24.5	7.0	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.05.2023	7:15-7:15	67.2	41.5	25.3	6.3	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.05.2023	7:00-7:00	68.2	43.2	26.2	6.8	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.05.2023	7:15-7:15	67.0	44.5	27.1	7.0	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.05.2023	7:00-7:00	64.2	46.2	28.3	5.2	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23.05.2023	7:15-7:15	66.3	44.2	26.0	6.3	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.05.2023	7:00-7:00	65.4	43.5	25.4	7.1	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.05.2023	7:15-7:15	66.3	42.1	27.0	5.6	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

TABLE 3.28: ABSTRACT OF AMBIENT AIR QUALITY DATA

1	**Parameter**	**PM2.5**	**PM10**	**SO_2**	**NO_2**
2	No. of Observations	260	260	260	260
3	10^{th} Percentile Value	22.3	43.2	5.3	19.0
4	20^{th} Percentile Value	23.2	44.2	6.0	20.1
5	30^{th} Percentile Value	24.0	45.0	6.2	20.3
6	40^{th} Percentile Value	24.4	45.2	6.3	21.1
7	50^{th} Percentile Value	25.0	46.0	6.4	21.5
8	60^{th} Percentile Value	25.3	46.2	7.0	22.1
9	70^{th} Percentile Value	25.6	46.3	7.2	22.3
10	80^{th} Percentile Value	26.3	47.2	7.3	23.0
11	90^{th} Percentile Value	27.2	48.2	8.0	23.5
12	95^{th} Percentile Value	28.1	48.3	8.2	24.0
13	98^{th} Percentile Value	29.2	49.1	8.4	24.6
14	Arithmetic Mean	25.5	46.3	6.9	22.0
15	Geometric Mean	25.4	46.2	6.9	21.9
16	Standard Deviation	2.1	1.8	1.0	1.8
17	Minimum	22.3	43.2	5.3	19.0
18	Maximum	29.2	49.1	8.4	24.6
19	**NAAQ Norms***	**100.0**	**60.0**	**80.0**	**80.0**
	% 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_6H_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.

TABLE 3.29: SUMMARY OF AMBIENT AIR QUALITY DATA

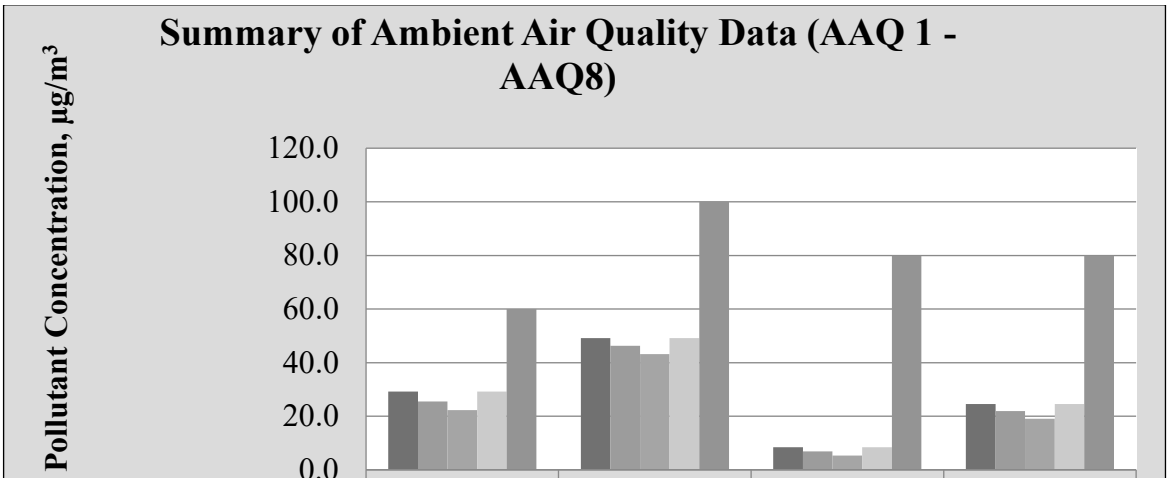
PM2.5	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	24.0	25.7	24.1	25.0	23.2	24.4	26.0	25.6
Minimum	21.2	24.0	21.0	22.0	20.3	22.1	22.1	21.3
Maximum	26.0	28.3	25.5	27.2	25.3	26.4	29.3	28.3
NAAQ Norms	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

PM10	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	45.0	47.3	46.5	46.5	45.4	45.2	45.0	44.0
Minimum	42.0	45.2	43.2	44.3	42.0	42.0	42.0	41.5
Maximum	48.2	49.2	48.3	48.3	47.3	46.3	47.3	49.2
NAAQ Norms	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

SO_2	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	6.7	6.8	6.3	5.9	7.3	6.8	6.9	6.5
Minimum	5.0	5.0	5.2	5.0	6.1	6.0	6.0	5.0
Maximum	8.3	8.5	7.4	6.8	8.5	7.8	7.5	8.5
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0

NO_2	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	22.2	22.5	20.5	22.3	20.9	19.9	19.9	22.5
Minimum	20.2	21.0	19.3	20.3	18.2	17.5	16.2	20.1
Maximum	24.1	23.5	21.6	24.6	24.2	22.3	23.5	24.6
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0

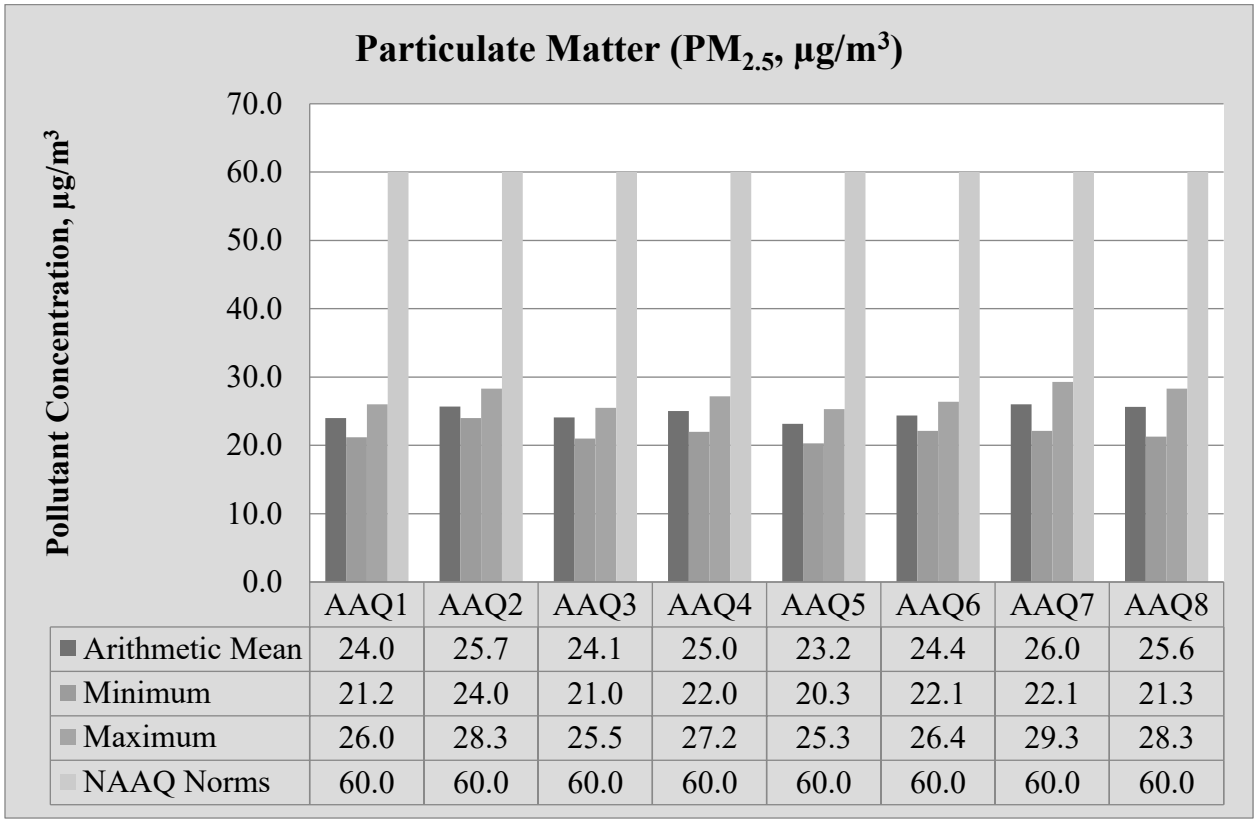
FIGURE 3.17: BAR DIAGRAM OF SUMMARY OF AAQ 1 – AAQ 8



	PM2.5	PM10	SO2	NO2
98th Percentile Value	29.2	49.1	8.4	24.6
Arithmetic Mean	25.5	46.3	6.9	22.0
Minimum	22.3	43.2	5.3	19.0
Maximum	29.2	49.1	8.4	24.6
NAAQ Norms*	60.0	100.0	80.0	80.0

Source: Table 3.17 to 3.27

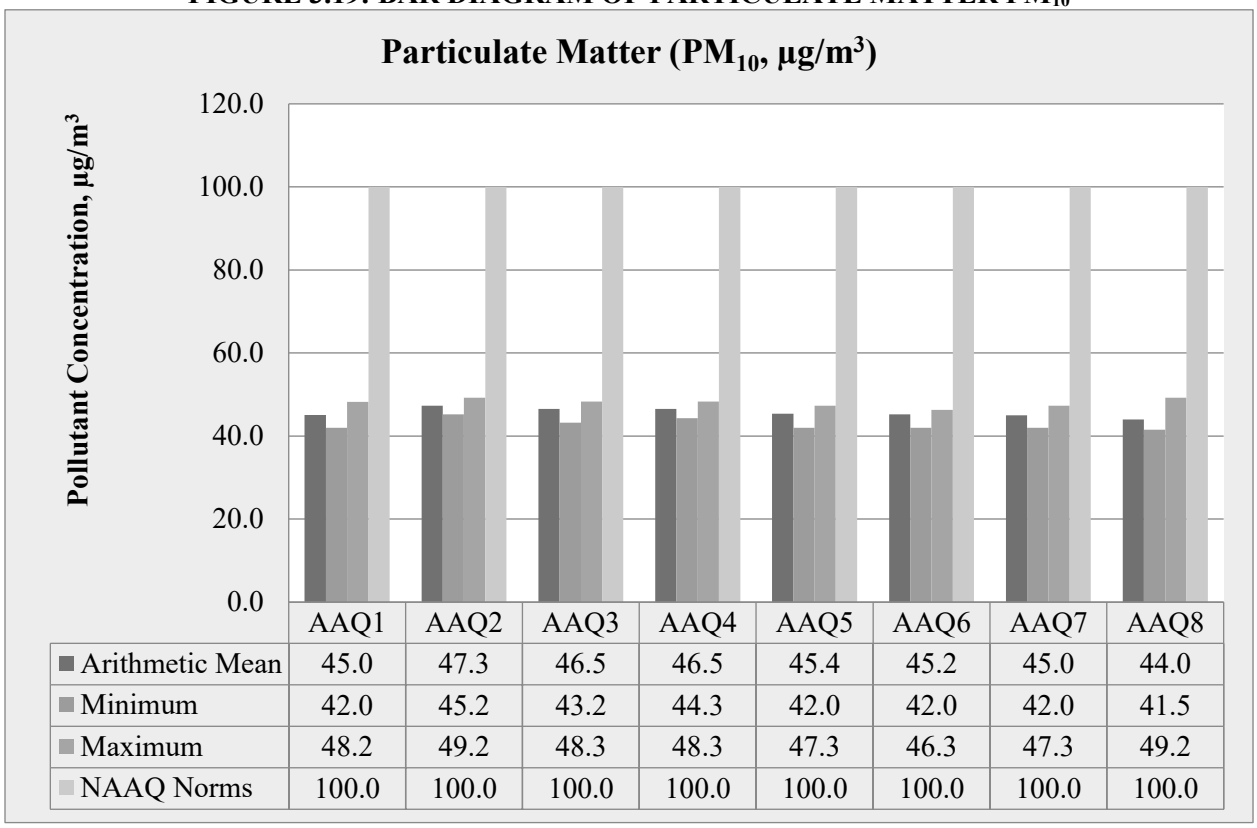
FIGURE 3.18: BAR DIAGRAM OF PARTICULATE MATTER $PM_{2.5}$



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	24.0	25.7	24.1	25.0	23.2	24.4	26.0	25.6
Minimum	21.2	24.0	21.0	22.0	20.3	22.1	22.1	21.3
Maximum	26.0	28.3	25.5	27.2	25.3	26.4	29.3	28.3
NAAQ Norms	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

Source: Table 3.17 to 3.27

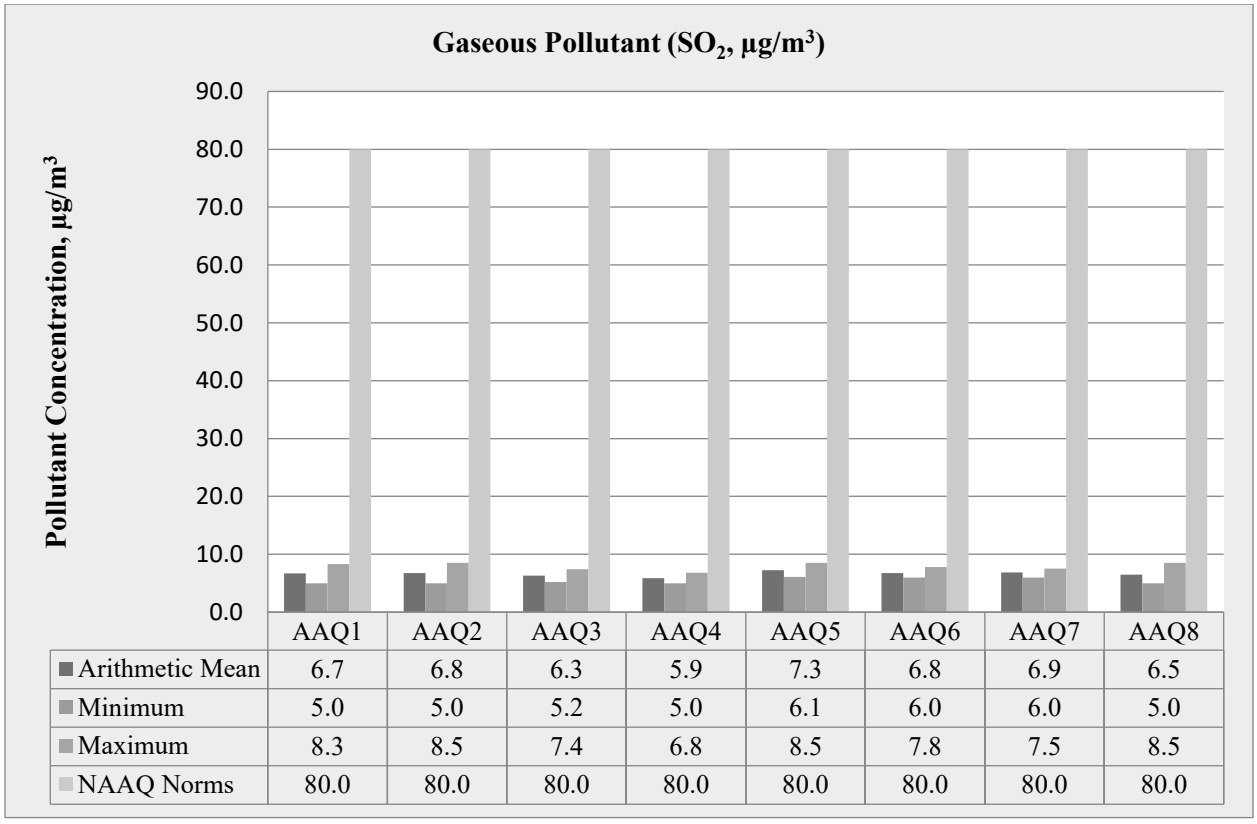
FIGURE 3.19: BAR DIAGRAM OF PARTICULATE MATTER PM_{10}



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	45.0	47.3	46.5	46.5	45.4	45.2	45.0	44.0
Minimum	42.0	45.2	43.2	44.3	42.0	42.0	42.0	41.5
Maximum	48.2	49.2	48.3	48.3	47.3	46.3	47.3	49.2
NAAQ Norms	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Table 3.17 to 3.27

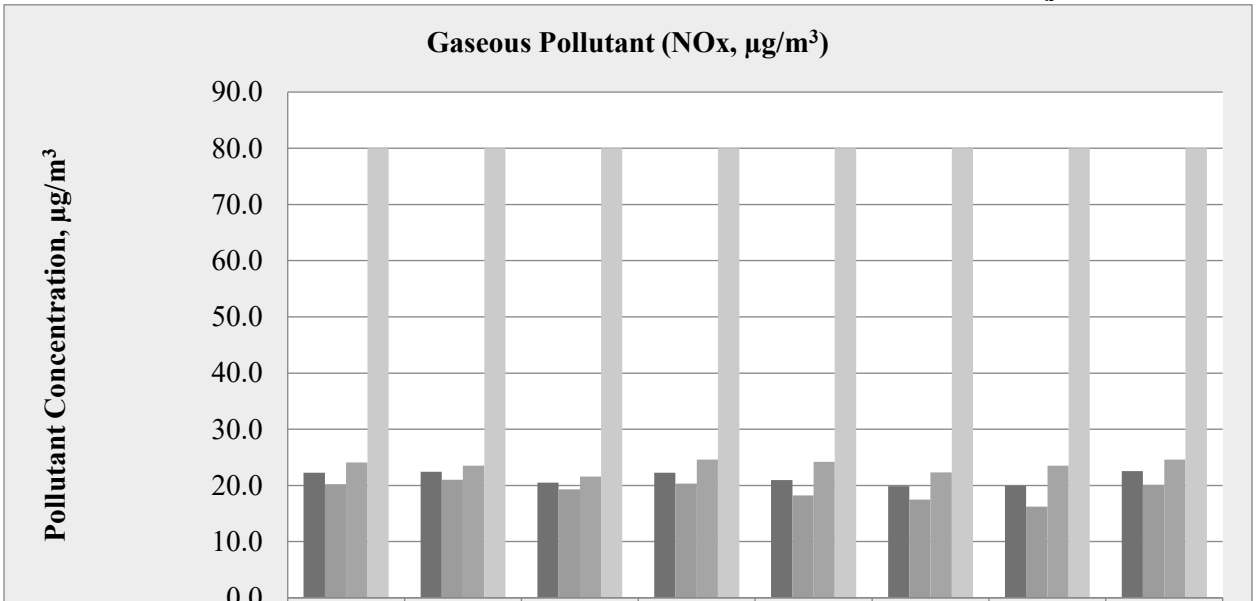
FIGURE 3.20: BAR DIAGRAM OF GASEOUS POLLUTANT SO_2



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	6.7	6.8	6.3	5.9	7.3	6.8	6.9	6.5
Minimum	5.0	5.0	5.2	5.0	6.1	6.0	6.0	5.0
Maximum	8.3	8.5	7.4	6.8	8.5	7.8	7.5	8.5
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 3.21: BAR DIAGRAM OF GASEOUS POLLUTANT NO_x



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	22.2	22.5	20.5	22.3	20.9	19.9	19.9	22.5
Minimum	20.2	21.0	19.3	20.3	18.2	17.5	16.2	20.1
Maximum	24.1	23.5	21.6	24.6	24.2	22.3	23.5	24.6
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

3.3.6 Interpretations & Conclusion

As per monitoring data, PM_{10} ranges from 43.2 µg/m^3 to 49.1 µg/m^3, $PM_{2.5}$ data ranges from 22.3 µg/m^3 to 29.2 µg/m^3, SO_2 ranges from 5.3 µg/m^3 to 8.4 µg/m^3 and NO_2 data ranges from 19.0 µg/m^3 to 24.6 µg/m^3. The concentration levels of the above criteria pollutants were observed to be well within the limits of NAAQS prescribed by CPCB.

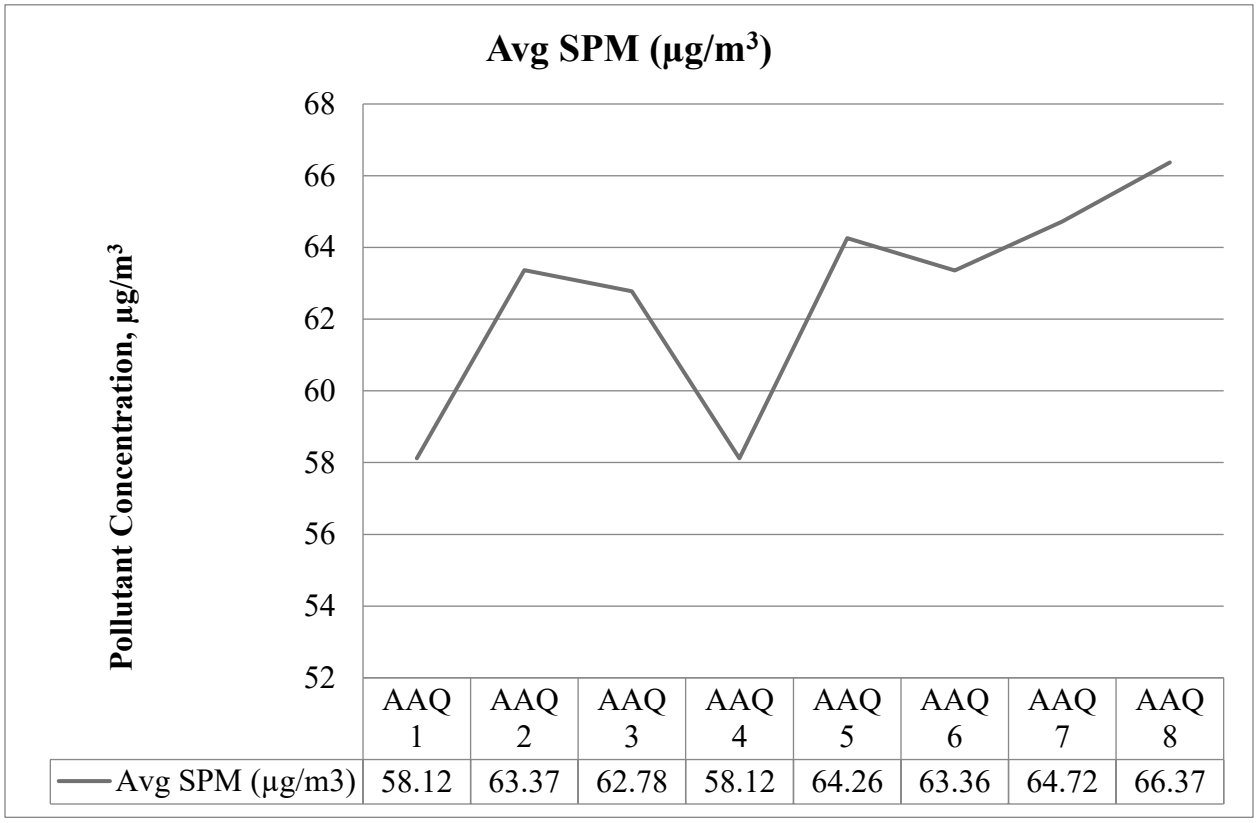
3.3.7 FUGITIVE DUST EMISSION –

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

TABLE 3.30: AVERAGE FUGITIVE DUST SAMPLE VALUES

AAQ Locations	Avg SPM (µg/m3)
AAQ 1	58.12
AAQ 2	63.37
AAQ 3	62.78
AAQ 4	58.12
AAQ 5	64.26
AAQ 6	63.36
AAQ 7	64.72
AAQ 8	66.37

FIGURE 3.22: LINE DIAGRAM OF AVERAGE SPM VALUES



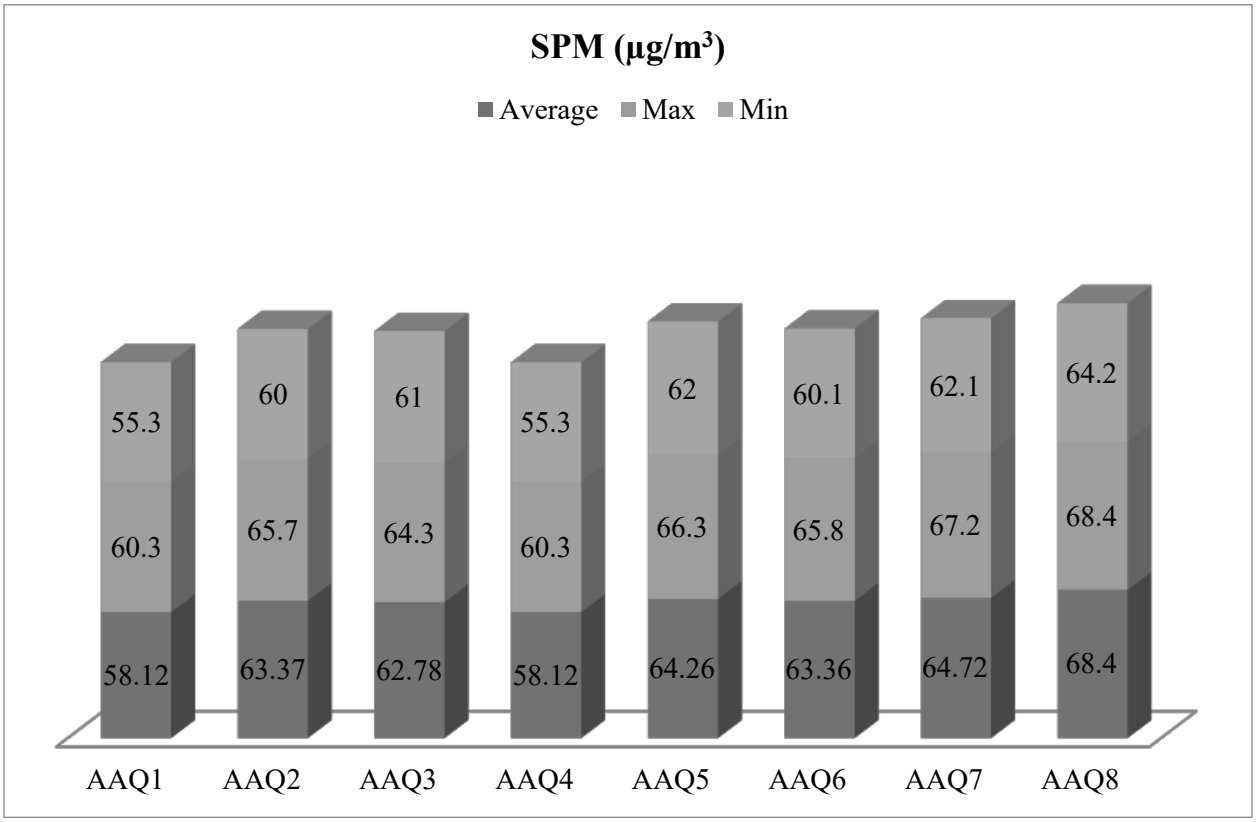
Source: Table 3.27

TABLE 3.31: FUGITIVE DUST SAMPLE VALUES IN µg/m³

SPM	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	58.12	63.37	62.78	58.12	64.26	63.36	64.72	68.4
Minimum	55.3	60	61	55.3	62	60.1	62.1	64.2
Maximum	60.3	65.7	64.3	60.3	66.3	65.8	67.2	68.4

Source: Calculations from Lab Analysis Reports

FIGURE 3.23: BAR DIAGRAM OF SPM VALUES



Source: Table 3.28

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 Eight 8 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 3.32 DETAILS OF SURFACE NOISE MONITORING LOCATIONS

S. No	Location code	Monitoring Locations	Distance & Direction	Coordinates
1	N-1	Core Zone	Project Area	9°21'32.21"N 77°26'47.68"E
2	N-2	Near Crusher	450m SE	9°21'17.67"N 77°26'58.91"E
3	N-3	Vadhapatti	4.5km SE	9°19'23.19"N 77°28'5.03"E
4	N-4	Kovil Patti	5.3km SE	9°20'22.27"N 77°29'31.53"E

5	N-5	Devipattanam	2.0km NW	9°22'16.09"N 77°26'2.62"E
6	N-6	Muhavoor	5.5km NE	9°23'28.88"N 77°29'4.48"E
7	N-7	Puthur	5.3km East	9°21'37.88"N 77°29'46.19"E
8	N-8	Sivagiri	3km SW	9°20'42.26"N 77°25'21.14"E

Source: On-site monitoring/sampling by Laboratories in association with GEMS

3.4.2 Method of Monitoring

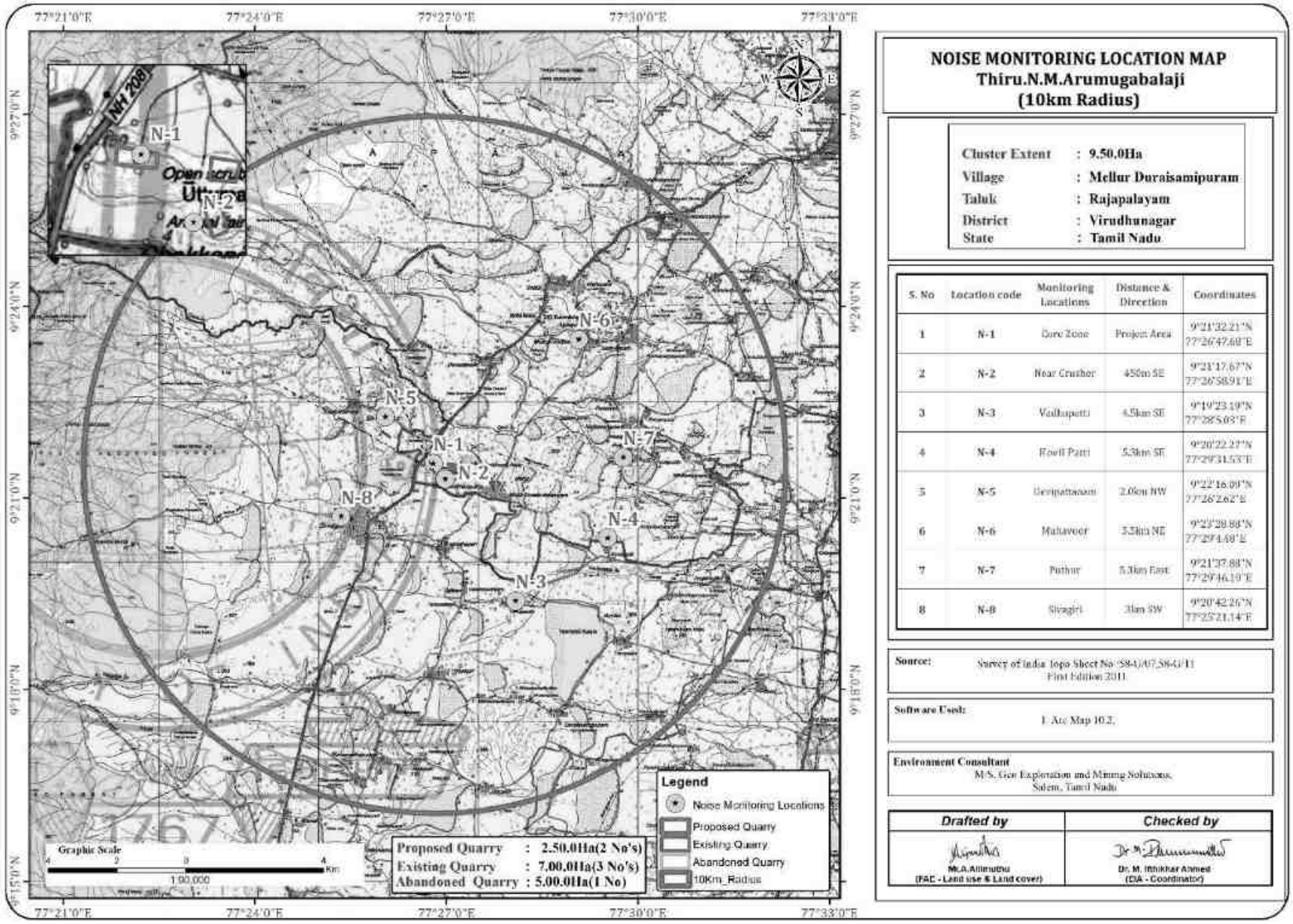
Digital Sound Level Meter was used for the study. All reading was taken on the 'A-Weighting' frequency network, at a height of 1.5 meters from ground level. The sound level meter does not give a steady and consistent reading and it is quite difficult to assess the actual sound level over the entire monitoring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

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∑ (10Ln/10)

Where L = Sound pressure level at function of time dB (A) T = Time interval of observation

FIGURE 3.24: 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 3.30

Day time: 6:00 hours to 22.00 hours.

Night time: 22:00 hours to 6.00 hours.

TABLE 3.33: AMBIENT NOISE QUALITY RESULT

S. No	Locations	Noise level (dB (A) Leq)		Ambient Noise Standards
		Day Time	Night Time	
1	Core Zone	41.8	36.7	**Industrial Day Time- 75 dB (A) Night Time- 70 dB (A)**
2	Near Crusher	41.6	35.9	
3	Vadhapatti	40.0	35.1	**Residential Day Time– 55 dB (A) Night Time- 45 dB (A)**
4	Kovil Patti	40.1	35.8	
5	Devipattanam	39.3	36.6	
6	Muhavoor	38.7	35.4	
7	Puthur	38.0	34.3	
8	Sivagiri	37.5	34.4	

Source: On-site monitoring/sampling by Laboratories in association with GEMS

FIGURE 3.25: DAY TIME NOISE LEVELS IN CORE AND BUFFER ZONE

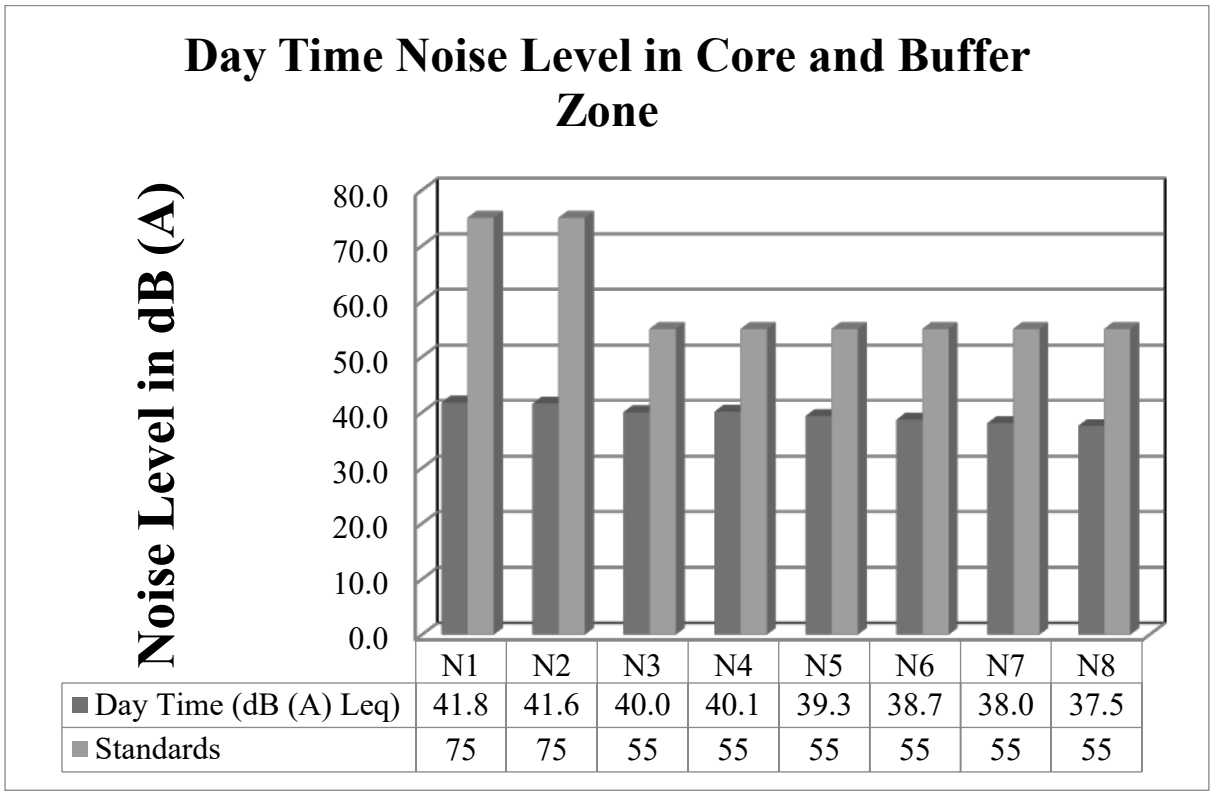
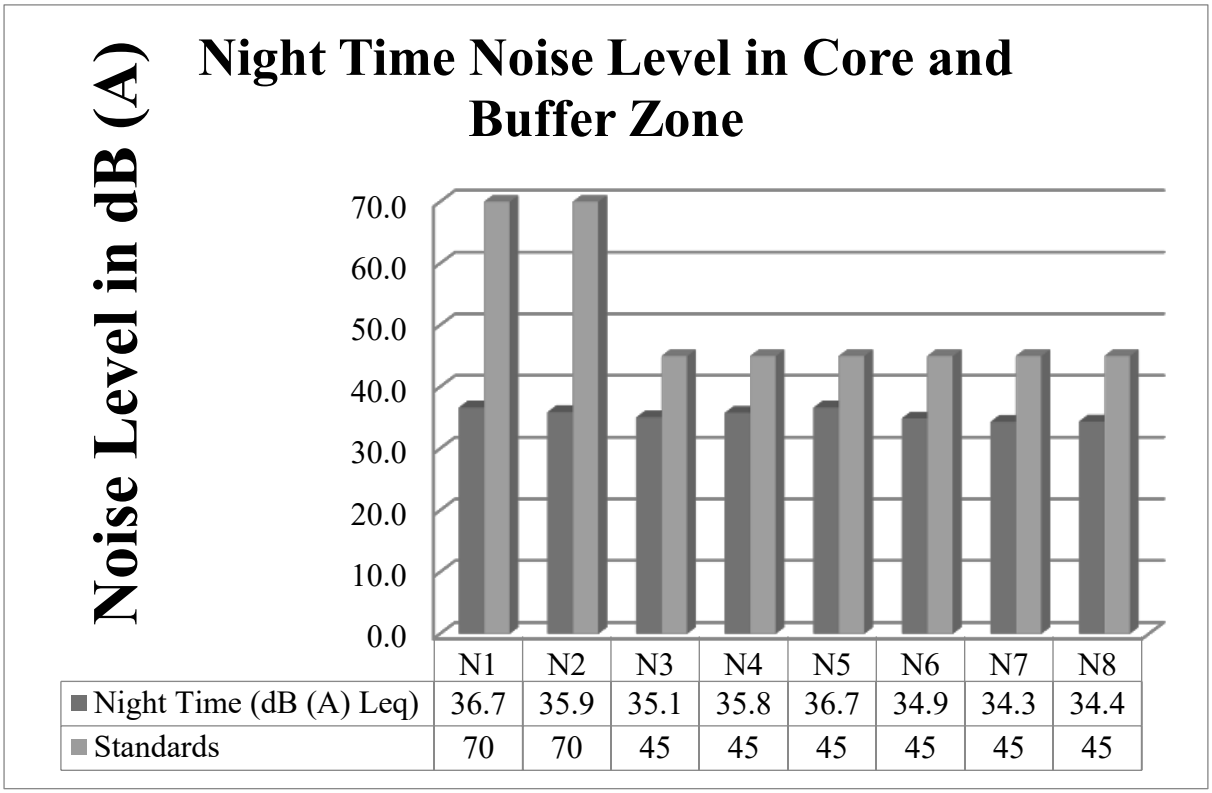


FIGURE 3.26: NIGHT TIME NOISE LEVELS IN CORE AND BUFFER ZONE



	N1	N2	N3	N4	N5	N6	N7	N8
Night Time (dB (A) Leq)	36.7	35.9	35.1	35.8	36.7	34.9	34.3	34.4
Standards	70	70	45	45	45	45	45	45

3.4.4 Interpretation & Conclusion:

Ambient noise levels were measured at 8 (Eight) locations around the proposed project area. Noise levels recorded in core zone during day time were from 41.6 – 41.8 dB (A) Leq and during night time were is 35.9-36.7 dB (A) Leq. Noise levels recorded in buffer zone during day time were from 37.5 – 40.1 dB (A) Leq and during night time were from 34.3 – 36.7 dB (A) Leq.

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

3.5 ECOLOGICAL ENVIRONMENT

3.5.1.Study area Ecology

The core area extent of 1.25.0 Ha of Rough stone quarry has an impact on the diversity of flora and fauna of the surrounding area. But present work was carried out on the detailed study of the impacts of the Rough stone quarry on the ecology and biodiversity of the core lease area with the proper mitigation and sustainable management plan. The proposed applied lease area exhibits hillock topography. The following methods were applied during the baseline study of flora, fauna, and diversity assessment.

3.5.2. Objectives of Biological Studies

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

3.5.3. Methodology of Sampling

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

The faunal elements (animal species) of core and buffer zone were identified by direct sightings or indirect evidences viz. pug marks, skeletal remains, scats and droppings etc. (Jayson and Easa 2004). Standard binocular was used for the observations. The authenticity of faunal elements occurrence was confirmed by interaction with the local people. Avifauna identification was done with pictorial descriptions of published literature. Information pertaining to existence of any migratory corridors and paths were obtained from local inhabitants. The status of each faunal element was determined and the Wildlife schedule category was ascertained as per the IUCN-Red Data Book and Indian wildlife (Protection) Act, 1972.

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

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

A. Sampling

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

B. Sampling Size

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

C. Timing of Study

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

D. Observations from Sampling

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

E. Equipment/ References

- Canon Mark III Camera with 50-500mm lens– Snap shots taken
- Leica Binoculars (8x 20) to spot/identify species
- IUCN Red Data Book – https://www.iucnredlist.org/species

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

3.5.4. Part I Field Sampling Techniques

3.5.4.1 Transect walk – Birds

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

3.5.4.2 Modified Pollard Walk – for Butterflies

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

3.5.4.3 Visual Encounter Survey (VES) - reptiles and Amphibians

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

3.5.4.4 Observational methods- Mammals

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

3.5.4.5 Multiple Stage Quadrat – Vegetation

A variety of habitat or vegetation structure variables were measured using the Multiple Stage Quadrat sampling protocol (Sykes and Horrill 1977). All of those areas were sampled, and the major corners were temporarily delineated with colored ribbons. Each site was identified in the field using a compass and clinometer, and the plot's latitude, longitude, and elevation were recorded using a handheld Global Positioning System (Garmin 12XL).

3.5.4.5 Floral analysis

The vegetation structure of the region was randomly checked at selected habitats and sampling was done study area. Most of the buffer zone area is under cultivation and hence sampling near pond side and road side are restricted to dense covered regions.

Quadrats of 10 × 10-m were laid down randomly within the core and 5-km buffer area; each quadrat was laid to assess the trees (>5 cm GBH) and one, 5 × 5-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 areas, trees in agricultural bunds, tank bunds, farm forestry plantations, wildlife areas, and natural forest area, avenue plantations, house backyards, etc. In each quadrat individuals belonging to tree (10 × 10-m) and shrub (5 × 5-m) were recorded separately and have been identified on the field. Only photographs were taken during the field survey and no damage is created to flora and fauna during the sampling. The plants were identified using floras by Gamble (1915-36), Saxena and Brahmam (1994-96), Nair and Henry (1983), Henry et al. (1987), Henry et al. (1989) and also by using updated check list from www.theplantlist.org.

3.5.4.6 Flora Composition in the Core Zone

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

Table No: 3.5.5.1 Flora in the Core Zone of Rough stone quarry

SI.No	English Name	Vernacular Name	Scientific Name	Family Name
Trees				
1.	Velvet mesquite	Mullu Maram	*Prosopis juliflora*	Fabaceae
2.	White Bark Acacia	Vela maram	*Vachellia leucophloea*	Fabaceae
3.	Neem or Indian lilac	Vembu maram	*Azadirachta indica*	Meliaceae
4.	Millettia Pinnata	Pongam oiltree	*Pongamia pinnata*	Fabaceae
5.	Asian Palmyra palm	Panai maram	*Borassus flabellifer*	Arecaceae
6.	Gum arabic tree	Karuvelam	*Vachellia nilotica*	Fabaceae
7.	Madras thorn	Kudukapuli	*Pithecellobium dulce*	Fabaceae
Shrubs				
1.	Avaram	Avarai	*Senna auriculata*	Fabaceae
2.	Devil's trumpet	Umathai	*Datura metel*	Solanaceae
3.	Coromandel Boxwood	Karai	*Canthium coromandelicum*	Rubiaceae
4.	Milk Weed	Erukku	*Calotropis gigantea*	Apocynaceae
Herbs				
1.	Common leucas	Thumbai	*Leucas aspera*	Lamiaceae
2.	Fish poison	Kolinchi	*Tephrosia purpurea*	Fabaceae
3.	Coat buttons	Thatha poo	*Tridax procumbens*	Asteraceae
4.	Devil‘s thorn	Nerunji	*Tribulus terrestris*	Zygophyllales
5.	Asthma-plant	Amman pacharisi	*Euphorbia hirta*	Euphorbiaceae
6.	Indian doab	Arugampul	*Cynodon dactylon*	Poaceae
7.	Malabar catmint	Pie Viratti	*Anisomeles malabarica*	Lamiaceae
Grasses				
1.	Eragrostis	Pullu	*Eragrostis ferruginea*	Poaceae
2.	Great brome	Thodappam	*Bromus diandrus*	Poaceae
3.	Eragrostis	Pullu	*Eragrostis ferruginea*	Poaceae
Creeper				
1.	Nut grass	Korai	*Cyperus rotandus*	Poaceae
2.	Stinking passionflower	Poonai puduku chedi	*Passiflora foetida L*	Passifloraceae

a.Azadirachta indica

b.Prosopis juliflora

c.Vachellia nilotica

d.Borassus flabellifer

e.Anisomeles malabarica

f**.**Calotropis gigantea

g.Pithecellobium dulce

h.Canthium coromandelicum

i.general view of the core zone area

Fig No: 3.1. Flora species observation in the Core zone area

3.5.5.2 Flora Composition in the Buffer Zone

Similar habitats may be found in the buffer area as well, although there is a wider variety of plants there than in the core zone area. The proposed project site and there are 109 species in the buffer zone study area in total, based on records. The floral (109) varieties among them Trees 45, herbs 28, shrubs 24, Climbers 6, Grasses 3, Creepers 2, and Cactus 1 were identified. The result of the buffer zone of flora studies shows that Fabaceae and Poaceae, Euphorbiaceae is the main dominating species in the study area mentioned in Table No.3.3. There are no impacts due to this mining activity. There are no Rare, Endangered, and Threatened Flora species in the mining area and their surrounding study area. Apart from the proposed project area, there is agricultural land. Horticulture and agricultural land are untouched. There are no Rare, Endangered, and Threatened Flora species in the mining area and their surrounding study area. A list of floral species has been prepared based on a primary survey (site observations) and discussion with local people (Secondary data). The total number of different plant life forms under trees, shrubs, herbs, and climbers is shown in Table 3.2 and their % distribution is shown in Figure 3.2.

Table 3.2: Number of floral life forms in the Study Area

S. No	Plant Life Form	Number of Species
1	Trees	45
2	Shrubs	24
3	Herbs	28
4	Climber	6
5	Creepers	3
6	Grassess	2
7	Cactus	1
Total No. of Species		109

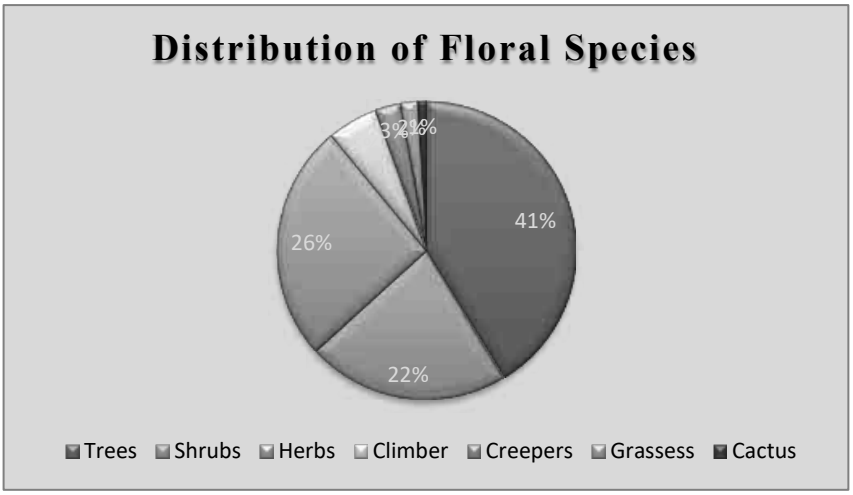


Fig No. 3.2: Pie diagram showing % distribution of floral life forms

Table No: 3.5.5.2 Flora in the Buffer zone of study area.

Trees		
Common Name	**Scientific Name**	**No of Species**
Vembu	*Azadirachta indica*	15
Vaagai	*Albizia lebbeck*	11
Manga	*Mangifera indica*	8
Malai vembu	*Melia azedarach L.*	6
Icham	*Phoenix sylvestris*	5
Mullu maram	*Prosopis juliflora*	18
Kudukapuli	*Pithecellobium dulce*	6
Shisham	*Dalbergia sissoo*	7
Cassia siamea	*ManjalKonrai*	9
Karuvelam	*Vachellia nilotica*	15
Porasu	*Butea monosperma*	5
Sarakkondrai	*Cassia fistula L.*	12
Bala maram	*Artocarpusintegrifolia*	17
Naval maram	*Syzygium cumini*	4
Neruppu Kondrai	*Royal poinciana*	3
Nochi	*Vitex negundo*	5
Panai maram	*Borassus flabellifer*	15
Moongil	*Bambusoideae*	7
Nuna maram	*Morinda tinctoria*	21
Thennai maram	*Cocos nucifera*	12
Savukku maram	*Casuarina equisetifolia*	16
Thailam maram	*Eucalyptus tereticornis*	5
Perunkondrai	*Peltophorum pterocarpum*	4
Pongam	*Millettia pinnata*	23
Alamaram	*Ficus benghalensis*	5
Nelli	*Phyllanthus emblica*	3
Puliyamaram	*Tamarindus indica*	11
Vazhaimaram	*Musa acuminata*	9
Seethapazham	*Annona reticulata*	5
Total		**282**

Shrubs			
Common Name	**Scientific Name**	**No of Speceis**	**Pi**
Kattukodi	*Cocculus hirsutus*	8	0.040609137
Malaisundai	*Solanum pubescens*	7	0.035532995
Umathai	*Datura metel*	14	0.07106599
Avarai	*Senna auriculata*	12	0.060913706
Kattumalli	*Jasminum trichotomum*	4	0.020304569
Neiveli Kattamani	*Ipomoea carnea*	8	0.040609137
Amanakku	*Ricinus communis*	5	0.025380711
Chemparuthi	*Hibiscu rosa-sinensis*	9	0.045685279
Erukku	*Calotropis gigantea*	31	0.157360406
Suraimullu	*Ziziphus oenoplia*	4	0.020304569
Kattamanakku	*Jatropha curcas*	18	0.091370558
Pei veratti	*Anisomeles malabarica*	16	0.081218274
Thottalchinungi	*Mimosa pudica*	11	0.055837563
Inki pazham	*Phyllanthus reticulatus*	12	0.060913706
Thuthi	*Abutilon indicum*	7	0.035532995
Sundaika	*Solanum torvum*	4	0.020304569
Marlumuttu	*Xanthium indicum*	5	0.025380711
Bramathndu	*Argemone mexicana*	3	0.015228426
Kundumani	*Abrus precatorius*	4	0.020304569
Arali	*Nerium indicum*	7	0.035532995
Unni chedi	*Lantana camara*	8	0.040609137
		197	

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

3.5.6 The vegetation in the RF / PF areas, ecologically sensitive areas

There are neither reserved (RF) nor protected (PF) forests either in the mine lease area or in the buffer zone. Thus, no forest land is involved in any manner. Hence, no certificate from the Forest department is required. There are no protected or ecologically sensitive areas such as National parks or Important Bird Areas (IBAs), or Wetlands or migratory routes of fauna or water bodies or human settlements within the proposed mine lease area. There are no Biosphere reserves or wildlife sanctuaries or National parks or Important Bird Areas (IBAs), or migratory routes of fauna. Thus, the area under study (Mine lease area and the 10 Km buffer zone) is not ecologically sensitive. It is away from the proposed project site.

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

3.5.7 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 the core area.

3.5.8. Fauna Composition in the Core Zone

Core Zone: During the study, it was found that the faunal diversity in the core site was limited to Butterflies, insects, and some species of mammals & reptiles among them numbers Insects 8, Reptiles 6, Mammals 3, and Avian 9. The core site has avifauna species like crow, Black drongo, Koel, etc. None of these species are threatened or endemic in the study area and surroundings. There is no Schedule I species and 13 species are under Schedule IV according to the Indian Wildlife Act 1972. There are no critically endangered, endangered, vulnerable, and endemic species were observed.

Table No: 3.5.8.1 Fauna in the Core zone of Rough stone quarry

Sl. No	Common Name	Scientific Name	Schedule list WLPC 1972
Insects			
1.	Common Tiger	*Danaus genutia*	NL
2.	Red-veined darter	*Sympetrum fonscolombii*	NL
3.	Tawny coster	*Danaus chrysippus*	Schedule IV
4.	House fly	*Musca domestica*	-
5.	Dragonfly	*Agriansp*	-
6.	Striped tiger	*Danaus plexippus*	Schedule IV
7.	Grey pansy	*Junonia atlites*	LC
8.	Common Tiger	*Danaus genutia*	LC
Reptiles			
1.	Oriental garden lizard	*Calotes versicolor*	NL
2.	Green vine snake	*Ahaetulla nasuta*	Schedule IV
3.	Oriental garden lizard	*Calotes versicolor*	NL
4.	Rat snake	*Ptyas mucosa*	Sch IV (Part II)
5.	Indian forest skink	*Sphenomorphus indicus*	NL
6.	House lizards	*Hemidactylus flaviviridis*	Schedule IV
Mammals			
1.	Indian Field Mouse	*Mus booduga*	Schedule IV
2.	Asian Small Mongoose	*Herpestes javanicus*	Schedule (Part II)
3.	Squirrel	*Funambulus palmarum*	Schedule IV
Aves			
1.	Rose-ringed parkeet	*Psittacula krameri*	Schedule IV
2.	Common myna	*Acridotheres tristis*	NL
3.	Blue-rock pigeon	*Colombalivia*	Schedule IV
4.	Yellow wagtail	*Motacilla flava*	Schedule IV
5.	Pond heron	*Ardeolagrayii*	Schedule IV
6.	Asian koel	*Eudynamysscolopacea*	Schedule IV
7.	Koel	*Eudynamys*	Schedule IV
8.	Black drongo	*Dicrurus macrocercus*	Schedule IV
9.	House crow	*Corvussplendens*	NL

*NL- Not listed, LC- Least Concern (**Sources:** Species observation in the field study)

3.5.9 Fauna Composition in the Buffer Zone

As animals, especially vertebrates move from place to place in search of food, shelter, mate or other biological needs, separate lists for core and buffer areas are not feasible however, a separate list of fauna pertaining to core and buffer zone are listed separately. Though there are no reserved forest in the buffer zone. As such there

are no chances of occurrence of any rare or endangered or endemic or threatened (REET) species within the core or buffer area.

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

The list of bird species recorded during the field survey and literature from the study area is given in Table 3.5.8.1 The list of reptilian species recorded during the field survey and literature from the study area are given in Table 3.7. The list of insect species recorded during the field survey and literature from the study area are given in Table 3.8. The list of Amphibian species recorded during the field survey and literature from the study area are given in Table 3.11 and List of Butterflies identified from the project site and their conservation status is given in Table No.3.9. It is apparent from the list that none of the species either spotted or reported is included in Schedule I of the Wildlife Protection Act. Similarly, none of them comes under the REET category.

Taxonomically a total of 69 species were identified from the project site. Based on habitat classification the majority of species were Insects 4, followed by birds 30, Reptiles 10, Mammals 5, amphibians 5, and Butterflies 15. A total of 30 species of bird were sighted in the study area. There are no critically endangered, endangered, vulnerable, and endemic species were observed. There are no impacts on nearby fauna species.

Dominant species are mostly birds and buffer flies, and five Amphibians were observed during the extensive field visit Duttaphrynus melanostictus, Rana tiger, Euphlyctis hexadactylus and, Hoplobatrachus tigerinus. There is no schedule I Species in the study area. There are no critically endangered, endangered, vulnerable, and endemic species were observed.

Table 3.5.8.2 List of Fauna & Their Conservation Status,
Mammals: (*directly sighted animals & Secondary data)

SI. No	Scientific Name	Common Name	Schedule list WLPA 1972	IUCN conservation statu
1.	*Rattus norwegicus*	Brown rat	Schedule IV	Least Concern
2.	*Funambulus palmarum*	Indian palm squirrel	Schedule IV	Least Concern
3.	*Herpestes javanicus*	Asian Small Mongoose	Schedule (Part II)	Not listed
4.	*Canis lupus familiaris*	Indian dog	Not listed	Not listed
5.	*Lepus nigricollis*	Indian hare	Schedule (Part II)	Least Concern
6.	*Bos Indicus*	Indian Cow	Not listed	Not listed
7.	*Mus booduga*	Indian Field Mouse	Schedule IV	Least Concern
8.	*Bandicota bengalens*	Indian mole rat	Schedule IV	Least Concern

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

Table 3.5.8.3 Listed birds

SI. No	Common Name	Scientific Name	Schedule list WLPA 1972	IUCN Red List data
1.	Koel	*Eudynamys*	Schedule IV	LC
2.	Cattle egret	*Bubulcus ibis*	NL	LC
3.	Common myna	*Acridotheres tristis*	NL	LC
4.	Paddy Bird	*Ardea grayii grayii*	Schedule IV	LC
5.	House crow	*Corvussplendens*	NL	LC
6.	Asian green bee-eater	*Meropsorientalis*	NL	LC
7.	Small blue Kingfisher	*Alcedo atthis*	Schedule IV	LC
8.	Rose-ringed parkeet	*Psittacula krameri*	NL	LC
9.	Common quail	*Coturnix coturnix*	Schedule IV	LC
10.	Small Sunbird	*Nectarinia asiatica*	Schedule IV	LC
11.	Black drongo	*Dicrurus macrocercus*	Schedule IV	LC
12.	Indian Robin	*Saxicoloides fulicata*	Schedule IV	LC
13.	Woodpecker bird	*Picidae*	Schedule IV	LC
14.	Two-tailed Sparrow	*Dicrurus macrocercus*	Schedule IV	LC
15.	Grey Francolin	*Francolinus pondicerianus*	Schedule IV	LC
16.	Pond Heron	*Ardeola grayii*	Schedule IV	LC
17.	Common Coot	*Fulica atra*	Schedule IV	LC
18.	House sparrow	*Passer domesticus*	Schedule IV	LC
19.	Indian Robin	*Saxicoloides fulicatus*	Schedule IV	LC
20.	Indian Roller	*Coracias benghalensis*	Schedule IV	LC
21.	Cuckoo	*Cuculuscanorus*	Schedule IV	LC
22.	House Sparrow	*Passer domesticus*	Schedule IV	LC

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

Table.3.5.8.6 List of Butterflies identified from the project site and their conservation status

SI. No	Scientific Name	Common Name	Schedule of Wild Protection Act	IUCN conservation status
1.	*Danaus chrysippus*	Plain Tiger	-	Not listed
2.	*Danaus genutia*	Common Tiger	-	Not listed
3.	*Danainae*	Milkweed butterfly	-	Least concern
4.	*Danaus plexippus*	Striped tiger	-	Not listed
5.	*Catopsiliapomona*	Common emigrant	-	Not listed
6.	*Euploea core*	Common Indian crow	-	Least concern
7.	*Eurema brigitta*	Small grass yellow	-	Least concern
8.	*Hebomoiaglaucippe*	Great orange tip	-	Not listed
9.	*Graphiumdoson*	Common jay	-	Not listed

SI. No	Scientific Name	Common Name	Schedule list WLPA 1972
1.	*Calotes versicolor*	Oriental garden lizard	NL
2.	*Chameleon zeylanicus*	Chameleon	Schedule IV
3.	*Bungarus caeruleus*	Common krait	Schedule IV
4.	*Hemidactylus flaviviridis*	House lizards	Schedule IV
5.	*Ophisops leschenaultii*	Snake eyed lizard	NL
6.	*Naja naja*	Indian cobra	Sch II (Part II)
7.	*Bungarus caeruleus*	Common krait	Schedule IV
8.	*Ahaetulla nasuta*	Green vine snake	Schedule IV
9.	*Ptyas mucosa*	Rat snake	Sch IV (Part II)
10.	*Mabuya carinatus*	Common skink	NL

3.5.10 Aquatic Ecology

The study area has small water bodies located on the north and east side it is away from the proposed project site. But no major drainage system can be found within the study area. No Aquatic diversity is noticed in the core zone area. Aquatic weeds are found to be growing everywhere in 10 km radius area, in every water bog, pond, etc. *Typha angustata* can be found growing all along the drains of villages, small water-logged depressions, and agricultural fields lacking water but containing enough moisture to support its growth. And where water is present, *Eichhornia crassipes* has taken its roots and covers the entire water surface by its sprawl and invasion.

3.5.10.1 Objectives of Aquatic Studies

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

3.5.10.2 Macrophytes

The macrophytes observed within the study area are tabulated in Table 3.5.10.1

Table No.3.5.10.1 Description of Macrophytes

S.No	Scientific name	Common Name	Vernacular Name (Tamil)	IUCN Red List of Threatened Species
1	*Aponogetonnatans*	Floating laceplant	Kottikizhnagu	NA
2	*Cyperus exaltatus*	Tall Flat Sedge	Koraikizhangu	LC
3	*Nymphaea nouchali*	Blue waterlily	Nellambal	LC
4	*Carex cruciata*	Cross Grass	Koraipullu	NA
5	*Chrysopogon aciculatus*	Golden false beardgrass	Kampuputpi	NA
7	*Nymphaea nauchali*	Blue lotus	Alli	LC
8	*Hydrilla verticillata*	Waterthymes	Amiranappaci	LC
9	*Nelumbo nucifera*	Sacred lotus	Chenthaamarai	LC
10	*Eichornia crassipe*	Water hyacinth	Agayatamarai	NA
11	*Marsilea quadrifolia*	Water clover	Aaraikeerai	LC

3.5.10.3 Aquatic Faunal Diversity

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

Table no. 3.5.10.2 Amphibians Observed/Recorded from the Study Area

SI. No	Scientific Name	Common Name	Schedule list WLPC 1972
1.	*Sphaerotheca breviceps*	Indian Burrowing frog	Schedule IV
2.	*Euphlyctis hexadactylus*	Green pond frog	Schedule IV
3.	*Bufomelanostictus*	Common Indian Toad	Schedule IV
4.	*Hoplobatrachus tigerinu*	Indian bull Frog	Schedule IV
5.	*Limnonectes limnocharis*	Paddyfield / Cricket Frog	Schedule IV
6.	*Microhyla ornata*	Ornate Narrow-mouthed Frog	Schedule IV
7.	*Sphaerotheca rolandea*	Southern Burrowing Frog	Schedule IV

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

3.5.10.4 Other Aquatic species

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

3.5.10.5 Phytoplanktons: Nitzschia, Microcystis, Oscillatoria, Navicula and Pediastrum sps.

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

3.5.10.7 Fishes

The fish species were seen during the primary field investigation near the study's area. Table 3.11 lists fish species such as Rohu, Catla, Catfish, and others.

3.5.10.8 Findings/Results

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

Records of threatened species in the area

No threatened species were observed

Endangered Species as per Wildlife (Protection) Act

No Endangered fauna was recorded in the project area**.**

Endemic Species of the Project areas

No endemic species were observed in the project area.

Migratory species of the Project areas

No migratory fauna observed in project area.

Migratory corridors and Flight paths

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

3.5.10.9 Conclusion

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

and discussed with local people, from the villages, herders and farmers who inhabit close to the proposed project area.

3.6 SOCIO ECONOMIC ENVIRONMENT

There is no habitation/ village within the radius of 10km from the project area. 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 slightly 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.

According to Census 2011 information the location of Chokkanathaputtur village is located in Rajapalayam taluka of Virudhunagar district in Tamil Nadu, India. It is situated 20km away from sub-district headquarter Rajapalayam As per 2009 statistics, **Mellur Duraisamypuram** is the gram panchayat of **Chokkanathaputtur village** in the study area.

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 Administrative Setup of Salem District

Virudhunagar District was formerly called Karmavirer Kamarajar District. The district is situated in the southern portion of Tamil Nadu State. The Virudhunagar district is bounded on north by Madurai and Sivagangai district, south by Tirunelveli and Tuticorin district, east by Ramanathapuram, west by Kerala state and northwest by Theni district. The administrative headquarters of Virudhunagar district is located at Virudhunagar town. Virudhunagar district consists of 3 Revenue divisions, 9 Taluks, 39 Firkas and 600 Revenue Villages.

Virudhunagar District consists of three Revenue Divisions viz., Aruppukottai, Sivakasi and Sattur, Ten Taluks viz., Rajapalayam, Srivilliputtur, Sattur, Sivakasi, Virudhunagar, Aruppukottai, Tiruchuli, Kariapatti, Vembakottai and Watrap (Vembakottai Taluk is formed as per G.O.(Ms) No. 321 Revenue Department dated : 31-08-2015) comprising of 600 Revenue Villages. The District has one Corporation, five Municipalities, nine Town Panchayats, eleven blocks and 450 Village Panchayats.

3.8.4 Study area - Mellur Duraisamypuram Village

Detailed socio-economic survey was conducted in the study area (Core and buffer zone) within 10 km radius of the area at **Mellur Duraisamypuram** Village the gram panchayat of **Chokkanathaputtur village**, Rajapalayam Taluk, Virudhunagar District, Tamil Nadu State. In order to determine the impact of the proposed project on nature and inhabitant. To get an overview of the villagers and their perspectives about this proposed activity, different demographic parameters and social aspects such population density, sex ratio, literacy rate, worker ratio etc. has been identified, analyzed, studied together. These impacts may be beneficial or

disadvantageous. If disadvantageous anticipated suggestions measures are advocated in order to have collective development.

Population Characteristics:

Chokkanathaputtur is a large village located in Rajapalayam Taluka of Virudhunagar district, Tamil Nadu with total 2620 families residing. The Chokkanathaputtur village has population of 9293 of which 4660 are males while 4633 are females as per Population Census 2011.

Child Sex Ratio:

Chokkanathaputtur village population of children with age 0-6 is 999 which makes up 10.75 % of total population of village. Average Sex Ratio of Chokkanathaputtur village is 994 which is lower than Tamil Nadu state average of 996. Child Sex Ratio for the Chokkanathaputtur as per census is 1002, higher than Tamil Nadu average of 943.

Literacy Rate:

Mellur Duraisamypuram village has lower literacy rate compared to Tamil Nadu. In 2011, literacy rate of Chokkanathaputtur village was 74.57 % compared to 80.09 % of Tamil Nadu. In Male literacy stands at 84.26 % while female literacy rate was 64.82 %.

Table 3.1: Population Characteristics- Mellur Duraisamypuram Village

Village	No. of Households	Total Population	Population Male	Population female	Sex Ratio	Total Literates	Total Illiterates
Mellur Duraisamypuram	2620	9293	4660	4633	994	6185	3108

Source: census2011, Tamilnadu

Table 3.2: Occupational Characteristics - Mellur Duraisamypuram Village

Particulars	Total	Male	Female
Total No. of Houses	2,620	-	-
Population	9,293	4,660	4,633
Child (0-6)	999	499	500
Schedule Caste	1,009	492	517
Schedule Tribe	2	1	1
Literacy	74.57 %	84.26 %	64.82 %
Total Workers	5,099	2,890	2,209
Main Worker	4,873	-	-
Marginal Worker	226	102	124

Source: https://www.census2011.co.in/data/village/641202-chokkanathaputtur-tamil-nadu.html

Caste Factor

Schedule Caste (SC) constitutes 10.86 % while Schedule Tribe (ST) were 0.02 % of total population in Chokkanathaputtur village.

Work Profile

In Mellur Duraisamypuram village out of total population, 5099 were engaged in work activities. 95.57 % of workers describe their work as Main Work (Employment or Earning more than 6 Months) while 4.43 % were involved in Marginal activity providing livelihood for less than 6 months. Of 5099 workers engaged in Main Work, 202 were cultivators (owner or co-owner) while 1606 were Agricultural labourer.

Table 3.3: Demography Characteristics of Buffer zone around 10km Radius

Sno	*Name*	*TRU*	*No_HH*	*TOT_P*	*TOT_M*	*TOT_F*	*P_06*	*M_06*	*F_06*	*P_SC*	*M_SC*	*F_SC*	*P_ST*	*M_ST*	*F_ST*	*P_LIT*	*M_LIT*	*F_LIT*	*P_ILL*	*M_ILL*	*F_ILL*
1	Ilandiraikondan	Rural	959	3422	1690	1732	390	208	182	1091	522	569	0	0	0	2080	1191	889	1342	499	843
2	Muthusamipuram	Rural	3016	10288	5120	5168	1021	565	456	3932	1974	1958	0	0	0	7072	3869	3203	3216	1251	1965
3	Vadakkudevadanam	Rural	809	2731	1332	1399	254	132	122	1287	619	668	0	0	0	1677	945	732	1054	387	667
4	Terku Devadanam	Rural	693	2373	1202	1171	233	125	108	737	368	369	0	0	0	1590	891	699	783	311	472
5	Kovilur	Rural	476	1677	846	831	186	90	96	0	0	0	0	0	0	1300	711	589	377	135	242
6	Nallamangalam	Rural	1094	3962	2021	1941	425	212	213	59	26	33	0	0	0	3016	1674	1342	946	347	599
7	Puthur	Rural	2306	8230	4162	4068	875	448	427	1794	884	910	137	70	67	5764	3237	2527	2466	925	1541
8	Chokkanathaputtur	Rural	2620	9293	4660	4633	999	499	500	1009	492	517	2	1	1	6185	3506	2679	3108	1154	1954
9	Dhalavoipuram (CT)	Urban	1543	5474	2707	2767	530	257	273	961	454	507	0	0	0	4322	2279	2043	1152	428	724
10	Viswanathapperi	Rural	3105	10483	5059	5424	1113	548	565	4679	2249	2430	15	7	8	6783	3672	3111	3700	1387	2313
11	Inam Kovilpatti	Rural	504	1747	872	875	178	92	86	566	290	276	0	0	0	1130	647	483	617	225	392
12	Rayagiri	Rural	389	1342	657	685	117	55	62	280	143	137	0	0	0	861	466	395	481	191	290
13	Thenmalai	Rural	3060	10283	4983	5300	1002	478	524	1889	893	996	0	0	0	6724	3793	2931	3559	1190	2369
14	Gudalur	Rural	1098	3662	1794	1868	378	208	170	853	411	442	0	0	0	2074	1182	892	1588	612	976
15	Tirumalapuram	Rural	1244	4525	2218	2307	455	219	236	2119	1024	1095	0	0	0	3035	1681	1354	1490	537	953

16	Sivagiri Reserve Forest	Rural	26	93	46	47	22	11	11	0	0	0	93	46	47	50	21	29	43	25	18
	Total		**22942**	**79585**	**39369**	**40216**	**8178**	**4147**	**4031**	**21256**	**10349**	**10907**	**247**	**124**	**123**	**53663**	**29765**	**23898**	**25922**	**9604**	**16318**

Table 3.4: Occupational Characteristics of Buffer zone around 10km Radius

S no	***Name***	**TOT_WORK_P**	**TOT_WORK_M**	**TOT_WORK_F**	**MAINWORK_P**	**MAINWORK_M**	**MAINWORK_F**	**MAIN_CL_P**	**MAIN_CL_M**	**MAIN_CL_F**	**MAIN_AL_P**	**MAIN_AL_M**	**MAIN_AL_F**	**MAIN_OT_F**	**NON_WORK_P**	**NON_WORK_M**	**NON_WORK_F**
1	Ilandiraikondan	1927	1004	923	1897	992	905	65	41	24	739	284	455	390	1495	686	809
2	Muthusamipuram	5389	3017	2372	5228	2949	2279	169	130	39	1950	1011	939	1172	4899	2103	2796
3	Vadakkudevadanam	1509	806	703	1398	781	617	56	39	17	698	329	369	217	1222	526	696
4	Terku Devadanam	1263	721	542	1209	691	518	12	7	5	626	325	301	92	1110	481	629
5	Kovilur	1008	531	477	1002	530	472	30	19	11	403	189	214	155	669	315	354
6	Nallamangalam	2247	1248	999	2230	1237	993	119	79	40	549	233	316	621	1715	773	942
7	Puthur	3586	2098	1488	2888	1755	1133	204	144	60	822	405	417	621	4644	2064	2580
8	Chokkanathaputtur	5099	2890	2209	4873	2788	2085	202	155	47	1606	810	796	1032	4194	1770	2424
9	Dhalavoipuram (CT)	2377	1636	741	2284	1609	675	9	6	3	49	26	23	584	3097	1071	2026
10	Viswanathapperi	5877	3120	2757	5297	2870	2427	755	428	327	2819	1375	1444	552	4606	1939	2667
11	Inam Kovilpatti	1192	628	564	1007	525	482	436	217	219	182	82	100	98	555	244	311
12	Rayagiri	711	397	314	449	270	179	57	48	9	266	168	98	29	631	260	371
13	Thenmalai	5777	3097	2680	5522	3009	2513	557	368	189	2804	1282	1522	658	4506	1886	2620

14	Gudalur	2072	1041	1031	1958	987	971	200	105	95	1392	659	733	127	1590	753	837
15	Tirumalapuram	2410	1300	1110	2327	1272	1055	242	154	88	1744	898	846	101	2115	918	1197
16	Sivagiri Reserve Forest	51	24	27	20	10	10	0	0	0	19	10	9	1	42	22	20
	Total	**42495**	**23558**	**18937**	**39589**	**22275**	**17314**	**3113**	**1940**	**1173**	**16668**	**8086**	**8582**	**6450**	**37090**	**15811**	**21279**

Source: Census 2011, Tamil Nadu.

3.6.5 Population Projection of the Study Area

Virudhunagar Population 2011 – 2030

The last census of Virudhunagar was done in 2011 and next census of 2021 has been postponed or cancelled. But we can do projection of future Virudhunagar 2023 Population on the basis likely Population Growth Rate

Year	Projected Population
2011	1,942,288
2021	2,120,000
2022	2,130,000
2023	2,150,000
2024	2,160,000
2025	2,170,000
2026	2,180,000
2027	2,190,000
2028	2,190,000
2029	2,200,000
2030	2,200,000
2031	2,210,000

Source: https://www.census2011.co.in/census/district/47-virudhunagar.html

3.6.6 Basic Amenities

A better network of physical infrastructure facilities (well-built roads, rail links, irrigation, power and telecommunication, information technology, market-network and social infrastructure support, viz. health and education, water and sanitation, veterinary services and co-operative) is essential for development of the rural economy.

A review of infrastructure facilities available in the area has been given on the basis of field survey. In this study the villages which fall within 10 km radius around the site has been covered. Infrastructure facilities available in the area are presented below.

All basic amenities Education (higher education, colleges, universities, medical college, Transport facilities, Railway station, Bus station area available in the district headquarters Virudhunagar 60km -NE and Rajapalayam at a distance of 15km –North East).

3.6.7 Interpretation

Based on the data, following inferences could be drawn:

- Total literacy rate in the study area is 74.57%.
- The study area had average educational facilities. The overall status depicts that the education is limited to primary and middle level.
- The schedule tribe community forms very less and Scheduled Caste forms 11% of the total population of study area.
- The Other Population forms 89% of the total population of study area.

- The study area is well connected by Taluk/Village Road.
- The study area not well health facilities of primary level.
- Considering the above facts, the proposed project will boost the socio-economic development activities in the area and hence will leave positive impact.
- The study area has mobile connectivity.

3.6.8 Conclusion

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

To identify and validate a model for a particular situation, predictions have been arrived at based on logical reasoning / consultation / extrapolation.

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

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

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

4.1 LAND ENVIRONMENT

4.1.2 Anticipated Impact from Proposed Project

- 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

4.1.3 Common Mitigation Measures for Proposed Project

- 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.

4.1.4 Soil Environment

The proposed project area is covered by thin layer of gravel formation and the average thickness is about 2 m – 3 m, the excavated gravel will be dumped sold to needy customers in open market.

4.1.5 Impact on Soil Environment from Proposed Project

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

4.1.6 Common Mitigation Measures for Proposed Project

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

4.1.7 Waste Dump Management

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

1.2 WATER ENVIRONMENT

4.2.1 Anticipated Impact from Proposed Project

- The major sources of water pollution normally associated due to mining and allied operations are:
    - Generation of waste water from vehicle washing.

- Washouts from surface exposure or working areas
- Domestic sewage
- Disturbance to drainage course in the project area
- 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

*Purpose	Quantity	Source
Dust Suppression	0.7 KLD	From Existing bore wells from nearby area
Green Belt development	0.6 KLD	From Existing bore wells from nearby area
Domestic purpose	0.3 KLD	From existing, bore wells and drinking water will be sourced from Approved water vendors.
Total	**1.6 KLD**	

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

Source: Approved Mining Plan Pre-Feasibility Report

4.2.2 Common Mitigation Measures for Proposed Project

- Garland drain, settling tank will be constructed along the proposed mining lease area. The Garland drain will be connected to settling tank and sediments will be trapped in the settling traps and only clear water will be discharged out to the natural drainage.
- 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 from Proposed Project

- 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.

4.3.2 Modelling of Incremental Concentration from Proposed Project

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.

4.3.3 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	0.105602229	g/s
Blasting	Point Source	0.003176727	g/s
Mineral Loading	Point Source	0.045121175	g/s
Haul Road	Line Source	0.002500454	g/s/m
Overall Mine	Area Source	0.044598932	g/s

TABLE 4.3: ESTIMATED EMISSION RATE FOR SO_2

Activity	Source type	Value	Unit
Overall Mine	Area Source	0.001170471	g/s

TABLE 4.4: ESTIMATED EMISSION RATE FOR NO_X

Activity	Source type	Value	Unit
Overall Mine	Area Source	0.000035635	g/s

4.3.4 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

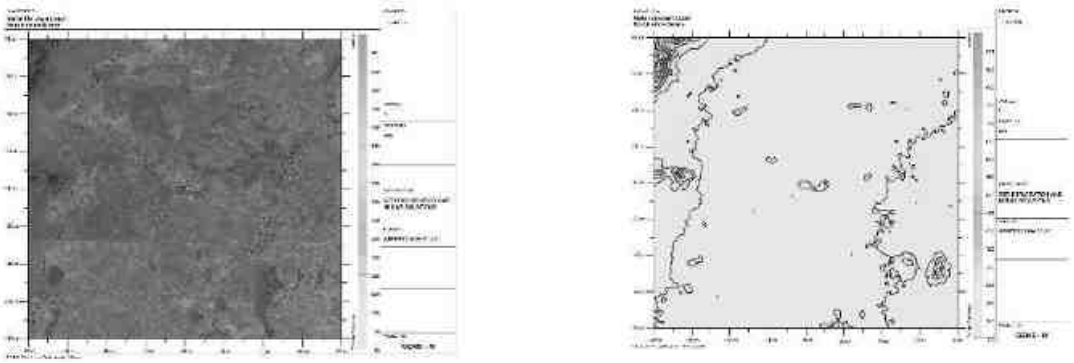


FIGURE 4.2: PREDICTED INCREMENTAL CONCENTRATION OF PM_{10}

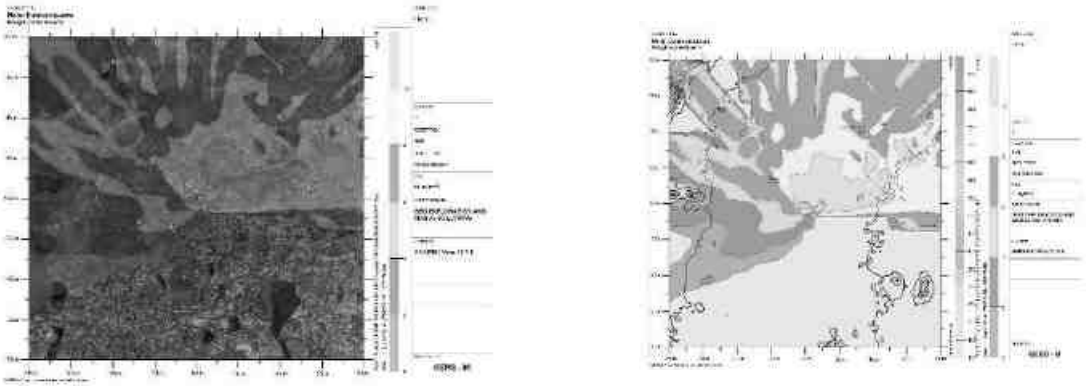


FIGURE 4.3: PREDICTED INCREMENTAL CONCENTRATION OF SO_2

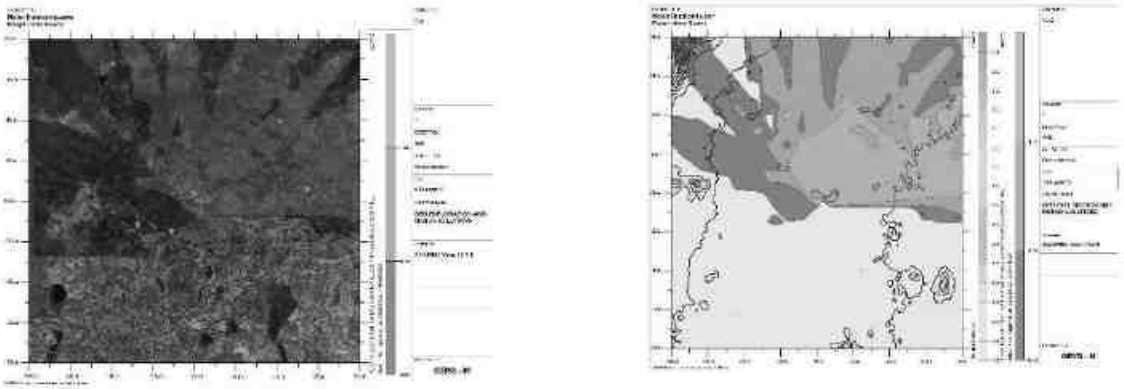


FIGURE 4.4: PREDICTED INCREMENTAL CONCENTRATION OF NO_X

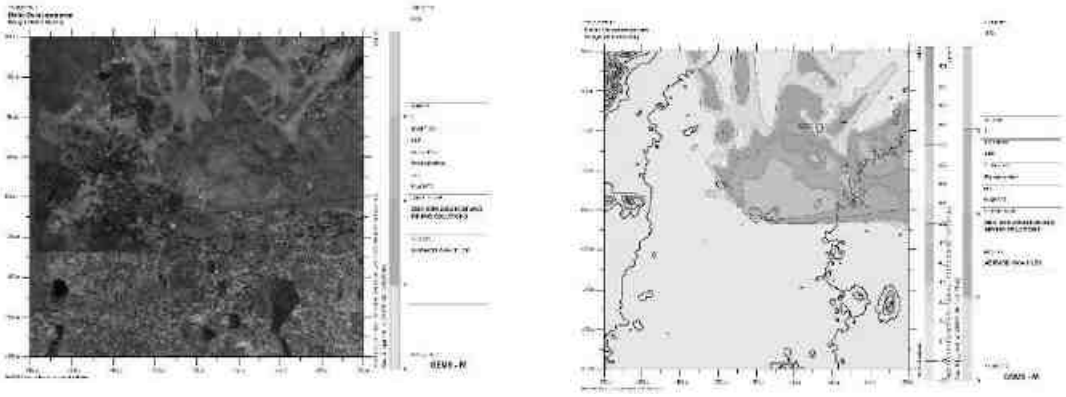
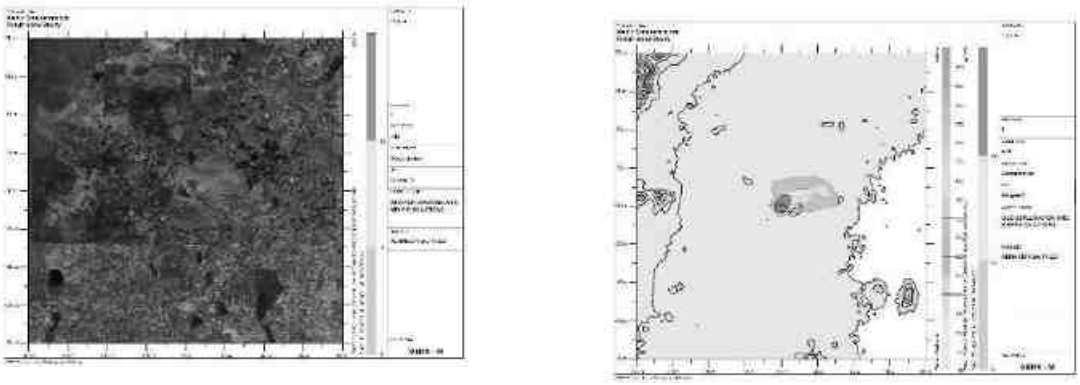


FIGURE 4.5: PREDICTED INCREMENTAL CONCENTRATION OF FUGITIVE DUST



The post project Resultant Concentrations of PM_{10}, $PM_{2.5}$, SO_2& NO_X (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} ($\mu g/m^3$)	Incremental value of PM_{10} due to mining ($\mu g/m^3$)	Total PM_{10} ($\mu g/m^3$)
AAQ1	9°21'32.23"N 77°26'48.71"E	-8	35	45.0	11.90	56.9
AAQ2	9°21'20.94"N 77°26'54.96"E	186	-316	47.3	11.15	58.45
AAQ3	9°19'22.52"N 77°28'6.84"E	2394	-3962	46.5	0	46.5
AAQ4	9°20'33.10"N 77°26'12.13"E	-1131	-1790	46.5	3.00	49.5
AAQ5	9°22'19.44"N 77°25'40.15"E	-2112	1494	45.4	6.70	52.1
AAQ6	9°23'28.77"N 77°29'3.99"E	4150	3634	45.2	7.50	52.7
AAQ7	9°21'38.60"N 77°29'46.03"E	5444	230	45.2	10.19	55.39
AAQ8	9°20'42.65"N 77°25'19.73"E	-2740	-1496	44.0	4.95	48.95

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

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline $PM_{2.5}$ ($\mu g/m^3$)	Incremental value of $PM_{2.5}$ due to mining ($\mu g/m^3$)	Total $PM_{2.5}$ ($\mu g/m^3$) (5+6)
AAQ1	9°21'32.23"N 77°26'48.71"E	-8	35	24.0	5.82	29.82
AAQ2	9°21'20.94"N 77°26'54.96"E	186	-316	25.7	5.49	31.19
AAQ3	9°19'22.52"N 77°28'6.84"E	2394	-3962	24.1	0	24.1
AAQ4	9°20'33.10"N 77°26'12.13"E	-1131	-1790	25.0	1.80	26.80
AAQ5	9°22'19.44"N 77°25'40.15"E	-2112	1494	23.2	3.74	26.94
AAQ6	9°23'28.77"N 77°29'3.99"E	4150	3634	24.4	4.66	29.06
AAQ7	9°21'38.60"N 77°29'46.03"E	5444	230	26.0	5.00	31
AAQ8	9°20'42.65"N 77°25'19.73"E	-2740	-1496	25.6	2.48	28.08

TABLE 4.7: INCREMENTAL & RESULTANT GLC OF SO_2

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline So_2 ($\mu g/m^3$)	Incremental value of So_2 due to mining ($\mu g/m^3$)	Total So_2 ($\mu g/m^3$) (5+6)
AAQ1	9°21'32.23"N 77°26'48.71"E	-8	35	6.7	1.59	8.29
AAQ2	9°21'20.94"N 77°26'54.96"E	186	-316	6.8	1.50	8.3
AAQ3	9°19'22.52"N 77°28'6.84"E	2394	-3962	6.3	0	6.3
AAQ4	9°20'33.10"N 77°26'12.13"E	-1131	-1790	5.9	0	5.9
AAQ5	9°22'19.44"N 77°25'40.15"E	-2112	1494	7.3	0.65	7.95
AAQ6	9°23'28.77"N 77°29'3.99"E	4150	3634	6.8	0.98	7.78
AAQ7	9°21'38.60"N 77°29'46.03"E	5444	230	6.9	1.39	8.29
AAQ8	9°20'42.65"N 77°25'19.73"E	-2740	-1496	6.5	0.20	6.7

TABLE 4.8: INCREMENTAL & RESULTANT GLC OF NO_X

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline Nox ($\mu g/m^3$)	Incremental value of Nox due to mining ($\mu g/m^3$)	Total Nox ($\mu g/m^3$) (5+6)
AAQ1	9°21'32.23"N 77°26'48.71"E	-8	35	22.2	8.73	30.93
AAQ2	9°21'20.94"N 77°26'54.96"E	186	-316	22.5	8.05	30.55
AAQ3	9°19'22.52"N 77°28'6.84"E	2394	-3962	20.5	0	20.5
AAQ4	9°20'33.10"N 77°26'12.13"E	-1131	-1790	22.3	0	22.3
AAQ5	9°22'19.44"N 77°25'40.15"E	-2112	1494	20.9	0	20.9
AAQ6	9°23'28.77"N 77°29'3.99"E	4150	3634	19.9	1.40	21.3
AAQ7	9°21'38.60"N 77°29'46.03"E	5444	230	19.9	4.00	23.9
AAQ8	9°20'42.65"N 77°25'19.73"E	-2740	-1496	22.5	0	22.5

TABLE 4.9: INCREMENTAL & RESULTANT GLC OF FUGITIVE DUST

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline Fugitive ($\mu g/m^3$)	Incremental value of Fugitive due to mining ($\mu g/m^3$)	Total Fugitive ($\mu g/m^3$) (5+6)
AAQ1	9°21'32.23"N 77°26'48.71"E	-8	35	58.12	82	140.12
AAQ2	9°21'20.94"N 77°26'54.96"E	186	-316	63.37	69	132.37
AAQ3	9°19'22.52"N 77°28'6.84"E	2394	-3962	62.78	0	62.78
AAQ4	9°20'33.10"N 77°26'12.13"E	-1131	-1790	58.12	0	58.12
AAQ5	9°22'19.44"N 77°25'40.15"E	-2112	1494	64.26	0	64.26
AAQ6	9°23'28.77"N 77°29'3.99"E	4150	3634	63.36	0	63.36
AAQ7	9°21'38.60"N 77°29'46.03"E	5444	230	64.72	0	64.72
AAQ8	9°20'42.65"N 77°25'19.73"E	-2740	-1496	66.37	0	66.37

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 $\mu g/m^3$ for PM_{10}, SO_2 & NO_X respectively. By adopting suitable mitigation measures, the pollutant levels in the atmosphere can be further being controlled.

4.3.6 Common Mitigation Measures for Proposed Project

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.

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

Where:

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

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

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

4.4.1 Anticipated Impact from Proposed Project

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**
Maximum Monitored Value (Day) dB(A)	44.7	44.5	45.6	45.6	46.2	47.1	45.2	44.9
Incremental Value dB(A)	60.1	47.0	27.0	25.6	34.1	25.3	25.6	30.6
Total Predicted Noise level dB(A)	60.2	49.0	45.7	45.6	46.5	47.1	45.2	45.1

The incremental noise level is found within the range of 44.5 – 44.7 dB (A) in Core Zone and 44.9 – 47.1 dB (A) in Buffer zone. The noise level at different receptors in buffer zone is lower due to the distance involved and other topographical features adding to the noise attenuation. The resultant Noise level due to monitored values and calculated values at the receptors are based on the mathematical formula considering attenuation due to Green Belt as 4.9 dB (A) the barrier effect. From the above table, it can be seen that the ambient noise levels at all the locations are within permissible limits of Industrial area (core zone) & Residential area (buffer zone) as per THE NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 (The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended vide S.O. 1046(E), dated 22.11.2000, S.O. 1088(E), dated 11.10.2002, S.O. 1569 (E), dated 19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment (Protection) Act, 1986.).

4.4.2 Common Mitigation Measures for Proposed Project

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 is listed in below table. The ground vibrations due to the blasting in the quarry are calculated using the empirical equation.

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

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

Where –

V = peak particle velocity (mm/s)

K = site and rock factor constant

Q = maximum instantaneous charge (kg)

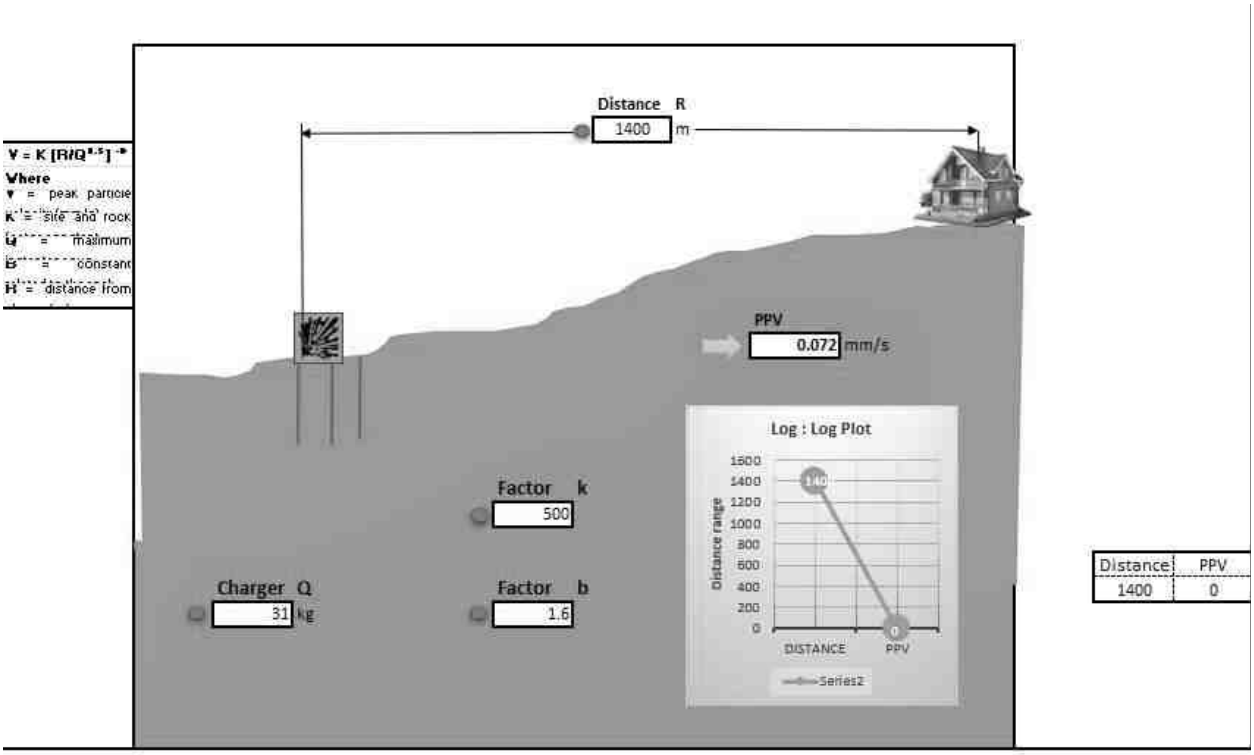
B = constant related to the rock and site (usually 1.6)

R = distance from charge (m)

TABLE 4.12: PREDICTED PPV VALUES DUE TO BLASTING

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in mm/s
P1	33	1400	0.072

FIGURE 4.6: GROUND VIBRATION PREDICTION



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From the above graph, the charge per blast of 31 kg is well below the Peak Particle Velocity of 8 mm/s as per Directorate General of Mines Safety for safe level criteria through Circular No. 7 dated 29/8/1997. But the all the project proponents ensure that the charge per blast shall be less than 154 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 Common Mitigation Measures for Proposed Project

- 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 a greater number of delays will be used per blasts;
- During blasting, other activities in the immediate vicinity will be temporarily stopped;
- Drilling parameters like depth, diameter and spacing will be properly designed to give proper blast;
- A fully trained explosives blast man (Mining Mate, Mines Foreman, 2nd Class Mines Manager/ 1st Class Mines Manager) will be appointed.
- A set of shot firing rules will be drawn up and blasting shall commence outlining the detailed operating procedures that will be followed to ensure that shot firing operations on site take place without endangering the workforce or public.
- 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 Hz.
- Vibration monitoring will be carried out every 6 months to check the efficacy of blasting practices

4.5 ECOLOGY AND BIODIVERSITY

Mining activities generally result in deforestation, land degradation, and water, air, and noise pollution which directly or indirectly affect the faunal and floral status of the mine area. However, the occurrence and magnitude of these impacts are entirely dependent upon the project location, mode of operation, and technology involved. Existing roads will be used; new roads will not be constructed to reduce the impact on flora. Wildlife is not commonly found in the lease area and its immediate environments because of the lack of vegetal cover and surface water.

4.5.1. Anticipated Impact on Flora

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

4.5.1.1. Mitigation Measures

The project site should have land to develop a greenbelt in and around the limits of the mine, along roads, and another vacant area. The main objective of the green belt is to provide a barrier between the source of pollution and the surrounding areas. Although the project will not lead to any tree cutting, it is proposed to improve the greenery of the locality through plantation services. To avoid dust emissions, the mined materials will be covered with tarpaulin during transportation.

4.5.1.2. Selection of Plant Species for Green Belt Development

The selection of plant species for the green belt development depends on various factors such as climate, elevation, and soil. The plants should exhibit the following desirable characteristics in order to be selected for plantation.

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

Table No 4.13 List of plant species proposed for Greenbelt development

SI.No	Name of the plant (Botanical)	Family Name	Common Name	Habit
1	*Azadirachta indica*	*Meliaceae*	Neem, Vembu	Azadirachta indica
2	*Albiziafalcatoria*	*Fabaceae*	Tamarind, Puliyamaram	Albiziafalcatoria
3	*Polyalthialongifolia*	*Annonaceae*	Kattumaram	Polyalthialongifolia
4	*Borassus Flabellifer*	*Arecaceae*	Palmyra Palm	Borassus Flabellifer
5	*Cassi roxburghii*	Fabaceae	Sengondrai	Tree
6	*Terminalia bellerica*	Combretaceae	Thandri	Tree
7	*Syzygium cumini*	Myrtaceae	Naval	Tree

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

TABLE 4.14: GREENBELT DEVELOPMENT PLAN

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	950	80%	Safety zone, Approach Road and village road	Neem, Pongamia Pinnata, etc.,	750

TABLE 4.15: BUDGET FOR GREENBELT DEVELOPMENT PLAN

Activity	Year & No of Trees	Cost	Total Cost
Greenbelt development within the project area and nearby village roads	1st year 950 Nos of trees	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant and maintenance	Rs 1,90,000/-
Total no. of Trees	**950 Trees**	**Total Budget**	**Rs 1,90,000/-**

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

- No rare, endemic & endangered species are reported in the buffer zone. However, during the course of mining, the management will practice the scientific method of mining with a 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 for all proposed projects
- Plantation around mine area will help in creating habitats for small faunal species and to create better environment for various fauna. Creating and developing awareness for nature and wildlife in the adjoining villages.

4.5.3.2. Mitigation Measures

- A suitable plan for the conservation of Schedule-I Species have been prepared and the necessary fund for implementation for the same will be made.
- All the preventive measures will be taken for the growth & development of fauna.
- Creating and developing awareness for nature and wildlife in the adjoining 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.
- Topsoil has a large number of seeds of native plant species in the mining area.
- Checks and controls the movement of vehicles in and out of the mine.
- Undertaking mitigative measures for a conducive environment for the flora and fauna in consultation with Forest Department.
- A dust suppression system will be installed within the mine and periphery of the mine.

4.5.4. Impact on Aquatic Biodiversity

Mining activities will not disturb the 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, like wetlands, rivers streams, lakes, and farmer sites. Noyyal River is located about 5.5km on the north side. There is no impact on fish habitats and the food WEB/ food chain in the water body and Reservoir. Aquatic biodiversity is observed in the study area.

4.5.5 Impacts on Bird Fauna:

The project does not involve any tree felling or removal of vegetation. Therefore, there may not be loss of nesting and roosting habitat of avian fauna.

4.5.6. Impacts on wildlife

There is no National Park, Wildlife Sanctuary, Biosphere Reserve, Wildlife corridors and Tiger/Elephant Reserve found within 10 km radius of the project site.

4.5.7. Impact Assessment on Biological Environment

This chapter highlights the various impacts on ecology and biodiversity due to mining activity. The major adverse impacts due to pre-mining and mining phases are loss of habitat, biodiversity, rare flora and fauna, fisheries and other aquatic life, migration of wildlife, and overall disruption of the ecology of the area. During the post-mining phase after land restoration, ecology may effectively improve. A detail of impact and assessments was mentioned in Table No.4.16

4.5.7.1. Anticipated Environmental Impacts and Mitigation Measures of Mellur Duraisamipuram Village, Rough stone quarry, Virudhunagar District, Tamil Nadu.

Details of anticipated issues for the next operation period were summarized with possible impacts and mitigation measures to meet the problem (Table No.4.16).

Table No: 4.16. Anticipated impact of Ecology and Biodiversity in Mellur Duraisamipuram Village, Rough stone quarry

S. 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)	The site possesses Common floral (not tree) species. Clearance of these species will not result in loss of flora.	Less severe	No immediate action is required. However, a Greenbelt /plantation will be developed on the project site and on the periphery of the project boundary, which will improve the floral and faunal diversity of the project area.
		Site specific loss of associated faunal diversity (Partial impact)	The site supports only common species, which use a wide variety of habitats of the buffer zone reserve forest area. So, there is no threat of Faunal diversity		
		Loss of Habitat (Direct impact)	Site does not for 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 the generation of dust (Particulate matter) due to haul roads and emission of Sulphur Dioxide, Nitrogen Dioxide, Carbon monoxide, 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 is far from the core area.	Less severe	All vehicles will be certified for appropriate Emission levels. More plantations have been suggested Upgrade the vehicles with alternative fuels such biodiesel, methanol, and biofuel around the mining area.

Table No. 4.17 Overall Ecological impact assessments of Mellur Duraisamipuram Village, Rough Stone quarry, Virudhunagar District, Tamil Nadu.

S.No	Attributes	Assessment
1	Impact of mining activity on agricultural land nearby the proposed project site.	Agricultural land is located away from the proposed project site. There are no impacts on the agricultural land & Horticulture. Kindly refer to the conclusion.
	Activities of the project affect the breeding/nesting sites of birds and animals	No breeding and nesting site was identified in the mining lease site. The fauna sighted mostly migrated from the buffer area.
2	Located near an area populated by rare or endangered species	No Endangered, Critically Endangered, or vulnerable species were sighted in the core mining lease area.
3	Proximity to national park/wildlife sanctuary/reserve forest /mangroves/ coastline/estuary/sea	There is no National Park/ Wildlife Sanctuary/ Reserve Forest/ Mangroves and Eco-Sensitive zone/ Critically polluted area/ HACA/CRZ located within 10 km radius of the area.
4	The proposed project restricts access to waterholes for wildlife	'No '
5	Proposed mining project impact surface water quality that also provides water to wildlife	'No 'scheduled or threatened wildlife animals are sighted regularly core in the core area.

6	Proposed mining project increase siltation that would affect nearby biodiversity areas.	Surface runoff management such as drains is constructed properly so there will be no siltation effect in the 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 the chances of water becoming polluted is low.
9	Mining projects affect the forest-based livelihood/ any specific forest product on which local livelihood depended.	'No'
10	The project likely to affect migration routes.	'No 'migration route was observed during the monitoring period.
11	The project is likely to affect the 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 is likely to affect wetlands, Fish breeding grounds, and marine ecology.	'No'. Wetland was not present in the near core Mining lease area. No breeding and nesting ground is present in the core mining area.

(*Source: EIA Guidance Manual-Mining and Minerals, 2010)

4.6 SOCIO ECONOMIC IMPACT

4.6.1 Construction Phase

Anticipated Impacts:

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

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

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

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

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

Mitigation measures:

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

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

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

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

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

4.6.2 Operation Phase:

Anticipated Impacts:

♣ Long term exposure to the pollutants such as PM, SO2 and NO2 Cement dust have a potential to create health impacts such as risk of cardiovascular and respiratory disease, eye irritation, bronchitis, lung damage, increased heart ailments, etc.

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

Mitigation Measures:

♣ In order to mitigate the long-term health impacts, efficient Air Pollution Control Equipment (APCE) like Bag House / Bag Filter / ESP will be installed at all major stacks to keep the emissions within the permissible limits. To reduce the gaseous emission, Pyro-process itself acts as a long SO2 scrubber and De - NOx system will be installed for fuel burning along with calciner for low NOx formation. To reduce fugitive emission from vehicles and machineries will be regularly monitored and maintained.

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

4.6.3 Impact Evaluation:

Table 4.3.1 Impact Evaluation Impact evaluation is given in table below.

<table>
<tr><td>Impact Evaluation Element</td><td colspan="4">Impact on socio economics due to the applied for Mellur Duraisamypuram rough stone quarry over an extent of 9.50.0 ha of both Government poramboke and Patta lands of Mellur Duraisamypuram Village, Rajapalayam Taluk, Virudhunagar District, Tamil Nadu State.</td></tr>
<tr><td>Potential Effect/ Concern</td><td colspan="4">Proposed project will provide direct & indirect employment opportunities to the local residents, which will help to increase their earning and better living standard as well as further up-liftment of socio-economic status of the area.</td></tr>
<tr><td colspan="5">Characteristics of Impacts</td></tr>
<tr><td rowspan="2">Nature</td><td colspan="2">Positive</td><td>Nagative</td><td>Netural</td></tr>
<tr><td colspan="2">✓</td><td></td><td></td></tr>
<tr><td rowspan="2">Type</td><td>Direct</td><td>Indirect</td><td colspan="2">Cumulative</td></tr>
<tr><td></td><td></td><td colspan="2">✓</td></tr>
<tr><td rowspan="2">Extent</td><td>Project area</td><td>Local</td><td>Zonal</td><td>Regional</td></tr>
<tr><td></td><td>✓</td><td></td><td></td></tr>
<tr><td rowspan="2">Duration</td><td colspan="2">Short time</td><td colspan="2">Long term</td></tr>
<tr><td colspan="2"></td><td colspan="2">✓</td></tr>
<tr><td>Intensity</td><td colspan="2">Low</td><td>Medium</td><td>High</td></tr>
</table>

			✓	
Frequency	Remote (R)	Occasional (O)	Periodic (P)	Continuous (C)
			✓	
Significance of Impact				
Significance	Insignificant	Minor	Moderate	Major
			✓	

IMPACT ON HUMAN SETTLEMENT

There is no human settlement in or adjacent to the cluster area of rough stone quarry. Nearest human settlement from cluster area as Sokkanathan puthur village – above 1km – E, there will not be any impact on the human settlement in the area. The operation of the rough stone quarry and associated activities will improve the economic development, civic amenities, and educational facilities in the project vicinity. Overall, due to employment generation and economic progress, there will be positive changes in the socio-economic condition of the people residing in the vicinity of the project site.

EMPLOYMENT

This is a rough stone quarry project. The quarry will provide total manpower for 24 nos of persons for mine management and another for activities such as excavation, transportation etc. Mostly local persons will be employed in the mine. Additional manpower requirement in the mine will be employed from the nearby villages. Thus, there will not be any population growth in the area due to the rough stone quarry project.

IMPACT ON CIVIC AMENITIES

The existing infrastructure facilities are sufficient to provide the needs of the rough stone quarry. However, the quarry management will take efforts as a part of CER for improvement in civic amenities like sanitation, drinking water facilities, transport road, etc in the nearby villages.

IMPACT ON HEALTH CARE FACILITIES

There are primary health care facilities in the nearby villages and hospital is available in Rajapalayam town. Mine management will also conduct periodic medical camps in the nearby villages as a part of CER.

IMPACT ON ECONOMIC ASPECTS

The quarry will have fulltime (24 nos.) for mine management such as excavation, transportation etc. Mostly local persons will be employed in the mine. The local population will be given preference in employment. The employment potential will improve economic conditions of these families directly and provide employment to many other families indirectly who are involved in business and service-oriented activities. This will, in-turn improve the quality of life in the region.

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 quarry.

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.N.M.Arumugabalaji Rough Stone Quarry Project at Mellur Duraisamipuram 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 – III, 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. 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 this project. This technology is having least gestation period, economically viable, safest and less labour intensive. The method has in built 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 Project Proponent. 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).

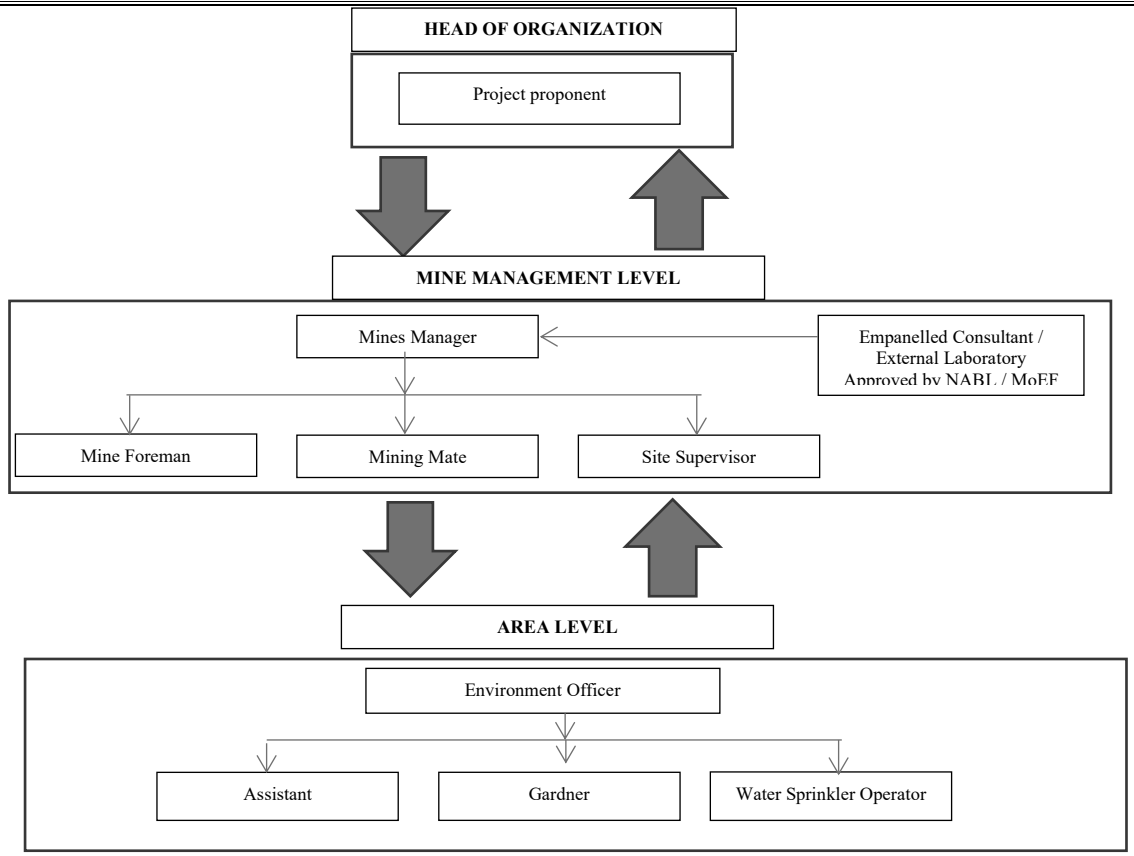


FIGURE 6.1: PROPOSED ENVIRONMENTAL MONITORING CELL PROPOSAL

* The Environmental Monitoring Cell will be formed in the proposed project

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 PROJECTS

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 are detailed in Table 6.2

TABLE 6.2: PROPOSED MONITORING SCHEDULE POST EC FOR MINES

S. No.	Environment Attributes	Location	Monitoring		Parameters
			Duration	Frequency	
1	Air Quality	2 Locations (1 Core & 1 Buffer)	24 hours	Once in 6 months	Fugitive Dust, $PM_{2.5}$, PM_{10}, SO_2 and NO_x.
2	Meteorology	At mine site before start of Air Quality Monitoring & IMD Secondary Data	Hourly / Daily	Continuous online monitoring	Wind speed, Wind direction, Temperature, Relative humidity and Rainfall
3	Water Quality Monitoring	2 Locations (1SW & 1 GW)	-	Once in 6 months	Parameters specified under IS:10500, 1993 & CPCB Norms
4	Hydrology	Water level in open wells in buffer zone around 1 km at specific wells	-	Once in 6 months	Depth in bgl
5	Noise	2 Locations (1 Core & 1 Buffer)	Hourly – 1 Day	Once in 6 months	Leq, Lmax, Lmin, Leq Day & Leq Night
6	Vibration	At the nearest habitation (in case of reporting)	–	During blasting Operation	Peak Particle Velocity
7	Soil	2 Locations (1 Core & 1 Buffer)	–	Once in six months	Physical and Chemical Characteristics
8	Greenbelt	Within the Project Area	Daily	Monthly	Maintenance

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

6.4 BUDGETARY PROVISION FOR EMP

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

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

TABLE 6.3 ENVIRONMENT MONITORING BUDGET

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

Source: Approved Mining Plan

6.5 REPORTING SCHEDULES OF MONITORED DATA

The monitored data on air quality, water quality, noise levels and other environmental attributes will be periodically examined by the 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
- Post-COVID Health Management Plan

7.1. PUBLIC CONSULTATION

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

7.2 RISK ASSESSMENT

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

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

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

TABLE 7.1 RISK ASSESSMENT& CONTROL MEASURES

S. No	Risk factors	Causes of risk	Control measures
1	Accidents due to explosives and heavy mining machineries	Improper handling and unsafe working practice	▪ All safety precautions and provisions of Mine Act, 1952, Metalliferous Mines Regulation, 1961 and Mines Rules, 1955 will be strictly followed during all mining operations; ▪ Workers will be sent to the Training in the nearby Group Vocational Training Centre ▪ Entry of unauthorized persons will be prohibited; ▪ Fire-fighting and first-aid provisions in the mine office complex and mining area; ▪ Provisions of all the safety appliances such as safety boot, helmets, goggles etc. will be made

			available to the employees and regular check for their use ▪ Working of quarry, as per approved plans and regularly updating the mine plans; ▪ Cleaning of mine faces on daily basis shall be daily done in order to avoid any overhang or undercut; ▪ Handling of explosives, charging and firing shall be carried out by competent persons only under the supervision of a Mine Manager; ▪ Maintenance and testing of all mining equipment as per manufacturer‘s guidelines.
2	Drilling	Improper and unsafe practices Due to high pressure of compressed air, hoses may burst Drill Rod may break	▪ Safe operating procedure established for drilling (SOP) will be strictly followed. ▪ Only trained operators will be deployed. ▪ No drilling shall be commenced in an area where shots have been fired until the blaster/blasting foreman has made a thorough Examination of all places, ▪ Drilling shall not be carried on simultaneously on the benches at places directly one above the other. ▪ Periodical preventive maintenance and replacement of worn out accessories in the compressor and drill equipment as per operator manual. ▪ All drills unit shall be provided with wet drilling shall be maintained in efficient working in condition. ▪ Operator shall regularly use all the personal protective equipment.
4	Blasting	Fly rock, ground vibration, Noise and dust. Improper charging, stemming & Blasting/ fining of blast holes Vibration due to movement of vehicles	▪ Restrict maximum charge per delay as per regulations and by optimum blast hole pattern, vibrations will be controlled within the permissible limit and blasting can be conducted safely. ▪ SOP for Charging, Stemming & Blasting/Firing of Blast Holes will be followed by blasting crew during initial stage of operation ▪ Shots are fired during daytime only. ▪ All holes charged on any one day shall be fired on the same day. ▪ The danger zone will be distinctly demarcated (by means of red flags)
5	Transportation	Potential hazards and unsafe workings contributing to accident and injuries Overloading of material While reversal & overtaking of vehicle	▪ 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.

		Operator of truck leaving his cabin when it is loaded.	▪ 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 III. The area is far away from the sea hence the disaster due to heavy floods and tsunamis are not anticipated.

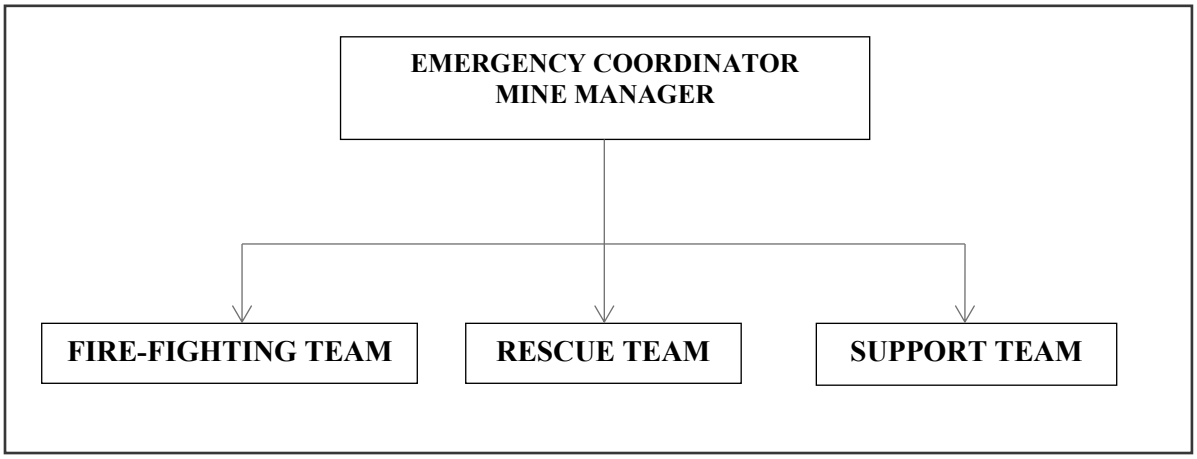
The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities.

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

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

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

FIGURE 7.1: DISASTER MANAGEMENT TEAM LAYOUT



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

TABLE 7.2: PROPOSED TEAMS TO DEAL WITH EMERGENCY SITUATION

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

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

Roles and responsibilities of emergency team –

(a) Emergency coordinator (EC)

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

(b) Incident controller (IC)

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

(c) Communication and advisory team

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

(d) Roll call coordinator

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

(e) Search and rescue team

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

(f) Emergency security controller

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

Emergency control procedure –

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

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

Proposed fire extinguishers at different locations –

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

TABLE 7.3: PROPOSED FIRE EXTINGUISHERS AT DIFFERENT LOCATIONS

LOCATION	TYPE OF FIRE EXTINGUISHERS
Electrical Equipment's	CO_2 type, foam type, dry chemical powder type
Fuel Storage Area	CO_2 type, foam type, dry chemical powder type, Sand bucket
Office Area	Dry chemical type, foam type

Alarm system to be followed during disaster –

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

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 IN CLUSTER

PROPOSED QUARRY				
Code	**Name of the Owner**	**S.F. Nos**	**Extent**	**Status**
P1	**Thiru.N.M.Arumugabalaji,** S/o.N.Muthupandian, Door.No.11/339-CIB, 6th Cross Street, V.O.C.Nagar, Rajapalayam Taluk, Virudhunagar District-626 102	328(Part-III)	1.25.0 ha	TOR Obtained: **Lr No. SEIAA-TN/F.No. 9610/SEAC/I(a)/ToR-1331/2022 dated:10.02.2023**.
Nearby Proposed Quarry				
P2	**Tmt. R. Ineyasnega** W/o. Rajkumar, No.54, South Car Street, Vellaikkottai, Aruppukottai & Taluk, Virudhunagar District – 626 101.	328 (P-III)	1.25.0 Ha	KV1/243/2018 dt. 09.11.2018
TOTAL			**2.50.0 ha**	
EXISTING QUARRY				
Code	**Name of the Owner**	**S.F. No**	**Extent**	**Status**
E1	**Thiru.N.Muthupandiyan**	328 (P-I)	2.50.0 ha	01.03.2019 To 29.02.2024
E2	**Thiru.M.Kanthakrishnakumar**	328 (P-II)	2.50.0 ha	01.03.2019 To 29.02.2024
E3	**Thiru.S.Victor Alponse Raja**	328(Part-III)	2.00.0 ha	19.04.2018 To 18.04.2023
	TOTAL		**7.00.0ha**	
	ABANDONED QUARRY			
Code	**Name of the Owner**	**S.F. No**	**Extent**	**Status**
A1	**Nila Mahalir SGSY**	**328**	**5.00.0 Ha**	02.06.2011 To 01.06.2016
		Total	**5.00.0 Ha**	
TOTAL CLUSTER EXTENT			**9.50.0 ha**	

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

TABLE 7.5: SALIENT FEATURES OF PROPOSAL -P1

Name of the Quarry	Thiru.N.M. Arumugabalaji Rough Stone Quarry	
S.F. No.	328(Part-III)	
Extent	1.25.0 ha	
Village and Taluk	Mellur Duraisamipuram Village, Rajapalayam Taluk,	
Land Type	It is a government poramboke land (classified as poramboke land)	
Land Ownership	It is a Governent Land	
Toposheet No	58 - G/07	
Latitude between	09°21'29.20"N to 09°21'32.80"N	
Longitude between	77°26'46.80"E to 77°26'51.15"E	
Highest Elevation	250m(Max) AMSL	
Proposed Depth of Mining	76m (61m above ground level + 15m below ground level).	
Lease Period	10 Years	
Mining Plan Period	5Years	
Geological Resources	Rough Stone in m^3	Top soil m^3
	6,55,930	12,500
Mineable Reserves	Rough Stone in m^3	Top soil m^3
	1,57,530	10,350
Proposed Quantity of Production for five years	Rough Stone in m^3	Top soil m^3
	1,07,530	10,350
Ultimate Pit Dimension	Pit 1- 115m (L) * 90 m (W) * 76m (D) (61m agl + 15m bgl)	
Water Level in the surrounds area	The Water table is found at a depth of 45m in summer and at 40m in rainy seasons.	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied area is exhibits Hillock topography. The area has gentle sloping towards North Eastern side. The altitude of the area is 250m (Max) above Mean Sea level. The area is covered by the Topsoil which is about 1m thickness. Massive Charnockite is found after 1m (Topsoil) which is clearly inferred from the existing quarrying pits.	
Machinery proposed	Jack Hammer	4 Nos
	Compressor	1 No
	Excavator with Bucket and Rock Breaker	1 No
	Tippers	1No
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	24 Nos	
Project Cost	Rs 1,16,57,000/-	
CER Cost	Rs.5,00,000/-	
Nearest water Bodies	Odai	460m-NW
	Periyakulam Kanmoi	570m_W
	Pudur Pond	5.5Km_E
	Thenmaai Kanmoi	5Km_SE
	Rajasingapaeri	7.5Km_SW
	Sastha kovil dam	7.1km-NW
Greenbelt Development Plan	Proposed to plant 950 trees in Safety Barriers and nearest panchayat Roads have been identified	

Proposed Water Requirement	1.6 KLD
Nearest Habitation	1.4km -South East

Source: Approved Mining Plan

Air Environment –

Calculating the Cumulative Load of Mining within the cluster is as shown in table 7.17& 7.18.

TABLE 7.8: CUMULATIVE PRODUCTION LOAD OF ROUGH STONE

	PROPOSED PRODUCTION DETAILS			
Quarry	**5 Years in m^3**	**Per Year in m^3**	**Per Day in m^3**	**Number of Lorry Load Per Day ($12m^3$ per load)**
P1	1,07,530	21,506	71	6
Total	**1,07,530**	**21,506**	**71**	**6**

TABLE 7.9: CUMULATIVE PRODUCTION LOAD OF TOPSOIL

	PROPOSED PRODUCTION DETAILS			
Quarry	**1 Years in m^3**	**Per Year in m^3**	**Per Day in m^3**	**Number of Lorry Load Per Day ($12m^3$ per load)**
P1	10,350	10,350	35	6
Total	**10,350**	**10,350**	**35**	**6**

On a cumulative basis considering all the 4quarries it can be seen that the overall production of Rough Stone is 71 m^3 per day with a capacity of 6 trips of Rough Stone per day.

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 7.19.

TABLE 7.11: EMISSION ESTIMATION FROM QUARRIES WITHIN 500 METER RADIUS

EMISSION ESTIMATION FOR QUARRY "P1"				
	Activity	**Source type**	**Value**	**Unit**
Estimated Emission Rate for PM_{10}	Drilling	Point Source	0.105602229	g/s
	Blasting	Point Source	0.003176727	g/s
	Mineral Loading	Point Source	0.045121175	g/s
	Haul Road	Line Source	0.002500454	g/s
	Overall Mine	Area Source	0.044598932	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.001170471	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000035635	g/s

Source: Emission Calculations

TABLE 7.12: INCREMENTAL & RESULTANT GLC WITHIN CLUSTER

PM_{10} in µg/m³	
Background	43.8
Incremental	16.89
Resultant	60.70
NAAQ Norms	**100 µg/m³**
$PM_{2.5}$ in µg/m³	
Background	20.8
Incremental	8.79
Resultant	29.60
NAAQ Norms	**100 µg/m³**
SO_2 in µg/m³	
Background	7.1
Incremental	2.59
Resultant	9.7
NAAQ Norms	**80 µg/m³**
NO_x in µg/m³	
Background	22.70
Incremental	11.70
Resultant	34.40
NAAQ Norms	**80 µg/m³**

Noise Environment –

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

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

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

Where:

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

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

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

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

Source data has been computed taking into account of all the machinery and activities used in the mining process.

TABLE 7.13: 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	44.7	37.2	45.4	55

Source: Lab Monitoring Data

The incremental noise level is found within the range of 44.7 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 4 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 4 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 2 mines respectively are as in below Table 7.22

TABLE 7.14: NEAREST HABITATION FROM EACH MINE

Location ID	Distance in Meters
Habitation Near P1	1400

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 7.15: GROUND VIBRATIONS AT 4 MINES

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
P1	31	1400	0.072

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

TABLE 7.16: SOCIO ECONOMIC BENEFITS

Code	Project Cost	CER Cost
P1	Rs. 1,20,37,000/-	Rs.5,00,000/-
Total	**Rs. 1,20,37,000/-**	**Rs.5,00,000/-**

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

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

TABLE 7.17: EMPLOYMENT BENEFITS

Quarry	**Employment**
P1	24

A total of 24 people will get employment due to 1 proposed mine

TABLE 7.18: GREENBELT DEVELOPMENT BENEFITS FROM QUARRY

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	950	80%	Safety zone, village roads	Neem, Pungam,etc.,	750

Based on the Proposed Mining Plans it's anticipated that there shall growth of native species of Neem, Casuarina, etc in the Entire Cluster at a rate of 950 Trees Planted over a period of 5 Years with Survival Rate of 80% and expected growth is around 750 Trees to planted safety zone and village roads.

In the proposed quarries, it is anticipated to plant 950 Trees Planted over a period of 5 Years with Survival Rate of 80% and expected growth is around 750 Trees to planted safety zone and village roads.

7.5 PLASTIC WASTE MANAGEMENT PLAN FOR PROPOAL

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 7.19: 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

Thiru.N.M.Arumugabalaji for Quarrying Rough Stone at Mellur Duraisamipuram Village aims to produce cumulatively 1,07,530 m^3 Rough Stone over a period of 5 Years & 10,350 m^3 of Top soilover a period of 1 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 24 persons for carrying out mining operations and give preference to the local people in providing employment in this cluster. In addition, there will be opportunity for indirect employment to many people in the form of contractual jobs, business opportunities, service facilities etc. the economic status of the local people will be enhanced due to mining project.

8.2 SOCIO-ECONOMIC WELFARE MEASURES PROPOSED

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

8.3 IMPROVEMENT IN PHYSICAL INFRASTRUCTURE

The proposed quarries are located in Mellur Duraisamipuram Village, Rajapalayam Taluk and Virudhunagar 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.,

8.6 CORPORATE SOCIAL RESPONSIBILITY

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

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

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

8.7 CSR Cost Estimation

CSR activities will be taken up in the Nadanthai (North) Village mainly contributing to education, health, training of women self-help groups and contribution to infrastructure etc., CSR budget is allocated as 2.5% of the profit.

8.8 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, the proposed project shall contribute 2% of capital investment towards CER as per directions of EAC/SEAC. However, the SEAC has suggested to allocate CER fund on the basis of the extent of the project. Therefore, Rs. 5,00,000 is allocated for CER. The proposed utilization of the budget of CER activities is given in Table 8.1.

TABLE 8.1: CER – ACTION PLAN

S. No.	Activity	Budget (Rs.in Lakh)
1	The applicant Indents to involve in corporate environment responsibilities (CER) activities such as renovation of existing toilet, plantation within the school premises, donating environment related books to the nearby school library, etc.	Rs.5,00,000
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 PLAN

10.0 GENERAL

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

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

10.1 ENVIRONMENTAL POLICY

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

The Proponent Thiru.N.M.Arumugabalaji

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, only oil & grease from the machinery wash is anticipated and domestic sewage from mine office.

The quarrying operation is proposed upto a depth of 76m (61m AGL + 15m BGL), the water table in the area is 45m – 40m 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 2140 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

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	950	80%	Safety zone, village roads	Neem, Pongamia, Pinnata, etc.,	750

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 PROJECT

	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	12500	12500
	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 - 4 Units	100000	10000
	No overloading of trucks/tippers/tractors	Manual Monitoring through Security guard	0	5000
	Stone carrying trucks will be covered by tarpaulin	Monitoring if trucks will be covered by tarpaulin	0	10000
	Enforcing speed limits of 20 km/hr within ML area	Installation of Speed Governers @ Rs. 5000/- per Tipper/Dumper deployed - 1 Units	5000	250
	Regular monitoring of exhaust fumes as per RTO norms	Monitoring of Exhaust Fumes by Manual Labour	0	5000
	Regular sweeping and maintenance of approach roads for at least about 200 m from ML Area	Provision for 2 labours @ Rs.10,000/labour (Contractual) per Hectare	0	25000
	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	279578
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	12500	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	250000	10000
	3. Progressive Closure Activity Green belt development - 500 trees per one hectare - Proposal for 950 Trees - (450 Inside Lease Area & 500 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)	90000	13500
		Avenue Plantation @ 300 per plant (capital) for plantation outside the lease area and @ 30 per plant maintenance (recurring)	150000	15000
	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	48600	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	634427	0

Implementation of EC, Mining Plan & DGMS Condition	Size 6' X 5' with blue background and white letters as mentioned in MoM Appendix II by the SEAC TN	Fixed Display Board at the Quarry Entrance as permanent structure mentioning Environmental Conditions	10000	1000
	Air, Water, Noise and Soil Quality Sampling every 6 Months for Compliance Report of EC Conditions	Submission of 2 Half Yearly Compliance - Lab Monitoring Report as per CPCB norms	0	50000
	Workers will be provided with Personal Protective Equipment's	Provision of PPE @ Rs. 4000/- per employee with recurring based on wear and tear (say, @ Rs. 1000/- per employee) - 24 Employees	96000	24000
	Health check up for workers will be provisioned	IME & PME Health check up @ Rs. 1000/- per employee	0	24000
	First aid facility will be provided	Provision of 2 Kits per Hectare @ Rs. 2000/-	0	2500
	Mine will have safety precaution signages, boards.	Provision for signages and boards made	10000	2000
	No parking will be provided on the transport routes. Separate provision on the south side of the hill will be made for vehicles /HEMMs. Flaggers will be deployed for traffic management	Parking area with shelter and flags @ Rs. 50,000/- per hectare project and Rs. 10,000/- as maintenance cost	62500	10000
	Installation of CCTV cameras in the mines and mine entrance	Camera 4 Nos, DVR, Monitor with internet facility	30000	5000

	Implementation as per Mining Plan and ensure safe quarry working	Mines Manager (1st Class / 2nd Class / Mine Foreman) under regulation 34 / 34 (6) of MMR, 1961 and Mining Mate under regulation 116 of MMR,1961 @ 40,000/- for Manager & @ 25,000/- for Foreman / Mate	0	780000
CER	As per MoEF &CC OM 22-65/2017-IA.III Dated 25.02.2021	Detailed Description in following slides and Budget allocation is included as per MoeEF & CC OM	500000	0
TOTAL			**2238500**	**1388328**

Year wise Break Up Cost

Year	Total Cost
1st	36,26,828
2nd	14,57,744
3rd	15,30,631
4th	16,07,163
5th	17,84,721

Cost inflation 5% per annum

In order to implement the environmental protection measures, an amount of Rs.22.38 lakhs as capital cost and recurring cost as Rs. 13.88 lakhs 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 area.

11. SUMMARY AND CONCLUSION

Thiru.N.M.Arumugabalaji Rough Stone Cluster (Extent: 9.50.0 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.

A detailed Draft EIA EMP Report is prepared for public and other stakeholders' suggestions and a final EIA/EMP Report will be prepared based on the outcome of Public Consultation.

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 Mar to May 2023 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 24 people directly in the cluster and indirectly around 15-20 people.

As discussed, it is safe to say that the proposed quarries are not likely to cause any significant impact to the ecology of the area, as adequate preventive measures will be adopted to keep the various pollutants within the permissible limits. Green belt development around the area will also be taken up as an effective pollution mitigate technique, as well as to serve as biological indicators for the pollutants released from the Thiru.N.M.Arumugabalaji Rough Stone Cluster (Extent: 9.50.0 ha)

12. DISCLOSURE OF CONSULTANT

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

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** **38**	**A** **B**	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	Mrs. Jisha parameswaran	In-house	-	-	SW	B
5	Mr. Govindasamy	In-house	-	-	WP	B
6	Mrs. K. Anitha	In-house	-	-	SE	A
7	Mrs. Amirtham	In-house	-	-	EB	B
8	Mr. A. Allimuthu	In-house	-	-	LU	B
9	Mr. N. Senthilkumar	Empanelled	**38** **28**	**B** **B**	AQ WP RH	B B A
10	Mr. Alagappa Moses	Empanelled	-	-	EB	A
11	Mr. S. Pavel	Empanelled	-	-	RH	B
12	Mr. J. R. Vikram Krishna	Empanelled	**1** **38**	**A** **B**	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.N.M.Arumugabalaji Rough Stone Quarry Project over an Extent of 1.25.0 ha in Mellur Duraisamipuram Village, Rajapalayam Taluk, Virudhunagar 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**

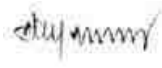
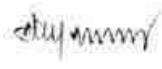
Date & Signature: 

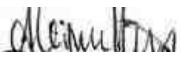
Period of Involvement: **January 2022 to till date**

Associated Team Member with EIA Coordinator:

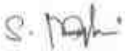
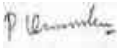
1. **Mr. S. Nagamani**
2. **Mr. P. Viswanathan**
3. **Mr. M.Santhoshkumar**
4. **Mr. S. Ilavarasan**

FUNCTIONAL AREA EXPERTS ENGAGED IN THE PROJECT

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

6	EB	▪ Collection of Baseline data of Flora and Fauna. ▪ Identification of species labelled as Rare, Endangered and threatened as per IUCN list. ▪ Impact of the project on flora and fauna. ▪ Suggesting species for greenbelt development.	Mr. Alagappa Moses	
7	RH	▪ Identification of hazards and hazardous substances ▪ Risks and consequences analysis ▪ Vulnerability assessment ▪ Preparation of Emergency Preparedness Plan ▪ Management plan for safety.	Mr. 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. J. R. Vikram Krishna	

LIST OF TEAM MEMBERS ENGAGED IN THIS PROJECT

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

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

DECLARATION BY THE HEAD OF THE ACCREDITED CONSULTANT ORGANIZATION

I, Dr. M. Ifthikhar Ahmed, Managing Partner, Geo Exploration and Mining Solutions, hereby, confirm that the above-mentioned Functional Area Experts and Team Members prepared the EIA/EMP for Thiru.N.M. Arumugabalaji Rough Stone Quarry Project over an Extent of 1.25.0 ha in Mellur Duraisamipuram Village, Rajapalayam Taluk, Virudhunagar District of Tamil Nadu. It is also certified that information furnished in the EIA study are true and correct to the best of our knowledge.

Signature& Date:

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

Designation: **Managing Partner**

Name of the EIA Consultant Organization: **M/s. Geo Exploration and Mining Solutions**

NABET Certificate No & Issue Date: **NABET/EIA/2225/RA0276 Dated: 20.2.2023**

Validity: **August 06, 2025**