

**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 CATEGORY – NON-  
FOREST LAND-**

**CLUSTER EXTENT = 9.94.85 ha**

**DHARAVENDIRAM ROUGH STONE QUARRY**

**At**

Dharavendiram Village, Denkanikottai Taluk, Krishnagiri District

ToR obtained vide

Lr No. SEIAA-TN/F.No.8707/SEAC/TOR-1070/2022 Dated: 01.03.2022

**Project Details**

Name and Address of the proponent	Project site Details	Project Details
M/s. AVS Tech Building Solutions, Proprietor S. Srinivasan, No. 112/B, ESI Back Side, Mookondapalli, Hosur Taluk, Krishnagiri District, Tamil Nadu State – 635 126.	S.F.No 315/1 (P), 334/1A (P) 334/1B (P), Extent : 4.35.85 Ha Dharavendiram Village, Denkanikottai Taluk, Krishnagiri District	Proposed Production 4,87,120 m <sup>3</sup> of Rough stone Depth 16m, Project Cost Rs. 1,41,66,000/- CER Cost: Rs. 5,00,000/-

**Environmental Consultant**

GEO EXPLORATION AND MINING SOLUTIONS 

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ENVIRONMENTAL LAB

**CHENNAI METTEX LAB PRIVATE LIMITED**

Baseline Monitoring Season – March to May 2022

**NOVEMBER 2022**

## Details of the quarries within 500m radius from the proposed project

PROPOSED QUARRIES				
CODE	Name of the Owner	S.F. Nos	Extent	Status
<b>P1</b>	M/s. AVS Tech Building Solutions, Proprietor S. Srinivasan, No. 112/B, ESI Back Side, Mookondapalli, Hosur Taluk, Krishnagiri District, Tamil Nadu State – 635 126.	315/1 (P), 334/1A (P) and 334/1B (P)	4.35.85	Received for TOR Vide <b>Lr No. SEIAA- TN/F.No.8707/SEAC/TOR- 1070/2022 Dated: 01.03.2022.</b>
EXISTING QUARRIES				
<b>E1</b>	Thiru. K.M.Gopaliah, S/o. Late Munisamy, Door No.18/A, Karupala Village, Semparasanapalli Post, Shoolagiri, Hosur, Krishnagiri District – 635 117.	316 (P-2)	2.70.00	25.01.2019 to 24.01.2024
<b>E2</b>	M/s. AVS Tech Building Solutions, Thiru. S. Srinivasan, No.112/1B, Mookandapalli, ESIC Back Side, Hosur Taluk, Krishnagiri District – 635 126.	316 (Part-1)	2.89.00	24.08.2016 to 23.08.2026
ABANDONED / OLD QUARRIES				
<b>A1</b>	Thiru. S. Sundraiah, Late. S/o. Subramanian, No.2/89A-1, Addraganapalli Village, Shoolagiri Tk, Krishnagiri Dt.	319/2B, 2C, 2D	0.85.00	20.03.2015 to 19.03.2020
<b>TOTAL CLUSTER EXTENT</b>			<b>9.94.85 ha</b>	

**Note: -**

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

## TERMS OF REFERENCE (ToR) COMPLIANCE

**Thiru. M/s. AVS Tech Building Solutions,**

**“ToR issued vide Lr No. SEIAA-TN/F.No.8707/SEAC/TOR-1070/2022 Dated: 01.03.2022”**

SPECIFIC CONDITIONS		
1	The Proponent shall carry out the cumulative & comprehensive impact study due to mining operations carried out in the quarry cluster specifically with reference to the environment in terms of air pollution, water pollution & health impacts, accordingly the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind	Noted and agreed
2	If the proponent has already carried out the mining activity in the proposed mining lease area after 15.01.2016, then the proponent shall furnish the following details from AD/DD, mines, a) What was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines? b) Quantity of minerals mined out c) Highest production achieved in any one year d) Detail of approved depth of mining e) Actual depth of the mining achieved earlier f) Name of the person already mined in that leases area g) If EC and CTO already obtained, the copy of the same shall be submitted h) Whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches.	It's a fresh area.
3	All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/Topo sheet, topographic sheet, geomorphology, lithology and geology of the mining lease area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone)	Noted and agreed
4	The proponent shall furnish photographs of adequate fencing, green belt along the periphery including replantation of existing trees & safety distance between the adjacent quarries & water bodies nearby provided as per the approved mining plan	Noted and agreed
5	The Project Proponent shall provide the details of mineral reserves and mineable reserves, planned production capacity, proposed working methodology with justifications, the anticipated impacts of the mining operations on the surrounding environment and the remedial measures for the same	Noted and agreed
6	The Project Proponent shall provide the Organization chart indicating the appointment of	Noted and agreed

	various statutory officials and other competent persons to be appointed as per the provisions of Mines Act' 1952 and the MMR, 1961 for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment	
7	The Project Proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within I 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	Noted and agreed
8	The proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality & flora./fauna including traffic/vehicular movement study	Noted and agreed
9	A tree survey study shall be carried out (nos., name of the species, age, diameter etc.) both within the mining lease applied area & 300m buffer zone and its management during mining activity.	Noted and agreed
10	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 disclosed in chapter-4 .pg.no:116.
11	The Public hearing advertisement shall be published in one major National daily and one most circulated vernacular daily	Noted, all the public hearing comments with project proponent response along with budgetary allocation will be submitted during the final EIA.
12	The recommendation for the issue of "Terms of Reference" is subjected to the outcome of the Hon'ble NGT, Principal Bench, New Delhi in O.A No. 186 of 2016 (M.A.No.350/2016) and O.A.No.200/2016 and O.A.No.580/2016 (M.A.No.1182/2016) and O.A.No. 102/2017 and O.A.No.404/2016 (M.A.No. 758/2016, M.A.No.920/2016, M.A.No.1122/2016, M.A.No.12/2017 & M.A. No. 843/2017) and O.A.No.405/2016 and O.A.No.520 of 2016 (M.A.No. 981/2016, M.A.No. 982/2016 & M.A.No. 384/2017).	Agreed & Noted
13	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 and local school/college authorities. The plant species with dense/moderate canopy of native origin should be	Noted. Greenbelt development will be carried out as per ToR recommendation. Details of Greenbelt development and recommended species for the plantation is described in Chapter No 4, Page No 112.

	chosen. Species of small/medium/tall trees alternating with shrubs should be planted in a mixed manner	
14	Taller/one year old Saplings raised in appropriate size of bags, preferably eco-friendly bags should be planted in proper spacing 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	Details of Greenbelt development and recommended species for the plantation is described in Chapter No 4, Page No 112.
15	A Disaster management Plan shall be prepared and included in the EIA/EMP Report	Disaster management Plan in page no.124
16	A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report	Risk Assessment and management Plan in page no 123
17	The Socio-economic studies should be carried out within a 5 km buffer zone from the mining activity. Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be. given with time frames for implementation	Noted and agreed
18	If any quarrying operations were carried out in the proposed quarrying site for which now the EC is sought, the Project Proponent shall furnish the detailed compliance to EC conditions given in the previous EC with the site photographs which shall duly be certified by MoEF&CC, Regional Office, Chennai (or) the concerned DEE/TNPCB.	It is a fresh quarry
19	Concealing any factual information or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this Terms of Reference besides attracting penal provisions in the Environment (Protection) Act, 1986.	Noted and agreed
<b>ADDITIONAL CONDITIONS</b>		
1	As per the MoEF& CC office memorandum F.No.22-6512017-IA.III dated:30.09.2020 and 20.10.2020 the proponent shall address the concerns raised during the public consultation and all the activities proposed shall be part of the Environment Management Plan	Noted and agreed
2	The Environmental Impact Assessment shall study in detail the carbon emission and also suggest the measures to mitigate carbon emission including development of carbon sinks and temperature reduction including control of other emission and climate mitigation activities.	Noted and agreed
3	The Environmental Impact Assessment should study the biodiversity, the natural ecosystem, the soil micro flora, fauna and soil seed banks and suggest measures to maintain the natural eco system.	Noted and agreed
4	Action should be specifically suggested for sustainable management of the area and restoration of ecosystem for flow of goods and services.	Noted and agreed

5	The project proponent shall impact on fish habitats and the food WEB/food chain in the water body and reservoir.	Noted and agreed
6	The Terms of Reference should specifically study impact on soil health, soil erosion, the soil physical, chemical components and microbial components	Noted and agreed
7	The Environmental Impact Assessment should study impact on biodiversity, vegetation. endemic, vulnerable and endangered indigenous flora and fauna	Noted and agreed
8	The Environmental Impact Assessment should study impact on standing trees and the trees should be numbered	Noted and agreed
9	The Environmental Impact Assessment should study on wetlands. water bodies' rivers streams, lakes and farmer sites	Noted and agreed
10	The Environmental Impact Assessment should hold detailed study on EMP with budget for Green belt development and mine closure plan including disaster management plan	Noted and agreed
11	The Environmental Impact Assessment should study impact on climate change, temperature rise, pollution and above soil & below soil carbon stock	Noted and agreed
12	The Environmental Impact Assessment should study impact on protected areas, Reserve Forests, National Parks, Corridors and Wildlife pathways	Noted and agreed
13	The project proponent shall furnish the details of trees in the project site with all trees numbered and protected	Noted and agreed
<b>STANDARD TERMS OF REFERENCE</b>		
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, with. the highest production achieved prior to 1994.	<b>Not applicable.</b> 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.	It is a patta land registered in the name of proponent
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 et., and should be in the name of the lessee.	All the Documents in the name of Project proponent and its compatible with one another.
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).	<b>Map showing –</b> Project area is superimposed on Satellite imagery is enclosed in Figure No. 2.1 Page No. 10. Project area boundary coordinates superimposed on Toposheet – Figure No. 2.2, Page No. 11. Surface Features around the project area covering 10km radius – Figure No. 2.4, Page No. 13

		Geology map of the project area covering 10km radius - Figure No. 2.7, Page No. 19 Geomorphology Map of the Study Area covering 10 km radius – Figure No. 2.8, Page No. 20.
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.	<b>Map showing –</b> Geology map of the project area covering 10km radius - Figure No. 2.7, Page No.19. Geomorphology Map of the Study Area covering 10 km radius – Figure No. 2.8, Page No.20.
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 stakeholders at large, may also be detailed in the EIA Report.	The proponent is an individual and framed Environmental Policy and the same is discussed in Chapter No .10. Page No. 138.
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° 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.	<b>Noted &amp; Agreed.</b> 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. Details are given in the Chapter No 3, Page No 33.
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,
11.	Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area,	<b>Not Applicable.</b>

	distance from mine lease, its land use, R&R issues, if any, should be given	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.	<b>Not Applicable.</b> There is no Forest Land involved in the proposed project area. The proposed project area is a Patta land. Approved Mining Plan is enclosed as Annexure Volume 1.
13.	Status of forestry clearance for the broken-up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	<b>Not Applicable.</b> 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.	<b>Not Applicable.</b> 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 project area. Jowlagiri RF 6.1 km Southwest Thalli RF 7.1 km Northwest
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.	<b>Not Applicable.</b> There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area. Cauvery North Wild life sanctuary -6.5km - SW
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.	<b>Not Applicable.</b> There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area. Cauvery North Wild life sanctuary -6.5km - SW
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	Detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] was carried out and discussed under Chapter No. 3, Page No. 74-91. 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.



	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.	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.	<b>Not Applicable.</b> 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).	<b>Not Applicable.</b> 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.	<b>Not Applicable.</b> 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 Season) March – May 2022 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. 3.

23.	Air quality modelling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modelling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.	Air Quality Modelling for prediction of incremental GLC's of pollutant was carried out using AERMOD view 9.6.1 Model. Details in Chapter No. 4,
24.	The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.	Total Water Requirement: 3.5 KLD Discussed under Chapter 2, Table No 2.15
25.	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	<b>Not Applicable.</b> 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.
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.	<b>Not Applicable.</b> The ground water table inferred 65-70m below ground level. The ultimate depth of quarry is 41 m. This proposal of 41 m will not intersect the ground water table, which is inferred from the hydro-geological study 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.	<b>Not Applicable.</b> 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 935m AMSL. Ultimate depth of the mine is 41m Water level of the area is 62-67m BGL
31.	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating	Greenbelt Development Plan is discussed under Chapter 4.

	<p>the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.</p>	
32.	<p>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.</p>	<p>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.</p>
33.	<p>Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.</p>	<p>Infrastructure &amp; 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.</p>
34.	<p>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.</p>	<p>Discussed under Chapter 2. Mine Closure Plan is a part of Approved Mining Plan enclosed as Annexure Volume – 1.</p>
35.	<p>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.</p>	<p>Occupational Health Impacts of the project and preventive measures are detailed under Chapter 4.</p>
36.	<p>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.</p>	<p>No Public Health Implications anticipated due to this project. Details of CER are discussed under Chapter 8</p>
37.	<p>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.</p>	<p>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 25 people directly and 10 people indirectly.</p>
38.	<p>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.</p>	<p>Detailed Environment Management Plan for the project to mitigate the anticipated impacts described under Chapter 10 is discussed under Chapter 10.</p>

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.1,41,66,000/- CER Cost is Rs. 10,00,000/- In order to implement the environmental protection measures.
42.	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	Details in Chapter 7.3.
43.	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.	Details in Chapter 8.
44.	<b>Besides the above, the below mentioned general points are also to be followed: -</b>	
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: 4 <sup>th</sup> August, 2009, which are available on the website of this Ministry, should be followed.	<b>Noted &amp; Agreed.</b> 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	<b>Noted &amp; Agreed.</b>
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	<b>Not Applicable.</b>

	the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.	
j)	The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.	Surface Plan – Figure No. 2.4 Page No. 10 Geological Plan – Figure No 2.9 Page No. 20 Working Plan – Figure No 2.9 Page No. 20 Closure Plan – Figure No.2.10 Page No. 21.

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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 of industry. This EIA report is prepared by considering the load of proposed and Existing quarries within the cluster over an extent of 9.94.85 ha (3 quarries) in Dharavendiram Village, Denkanikottai Taluk, Krishnagiri District and Tamil Nadu State, cluster area calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1<sup>st</sup> July 2016.

Baseline monitoring study was carried out during the period March – May 2022 in compliance with ToR obtained vide. This EIA Report is prepared in compliance with ToR obtained vide Lr No. SEIAA-TN/F.No.8707/SEAC/TOR-1070/2022 Dated: 01.03.2022.

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

### 1.1 PURPOSE OF THE REPORT

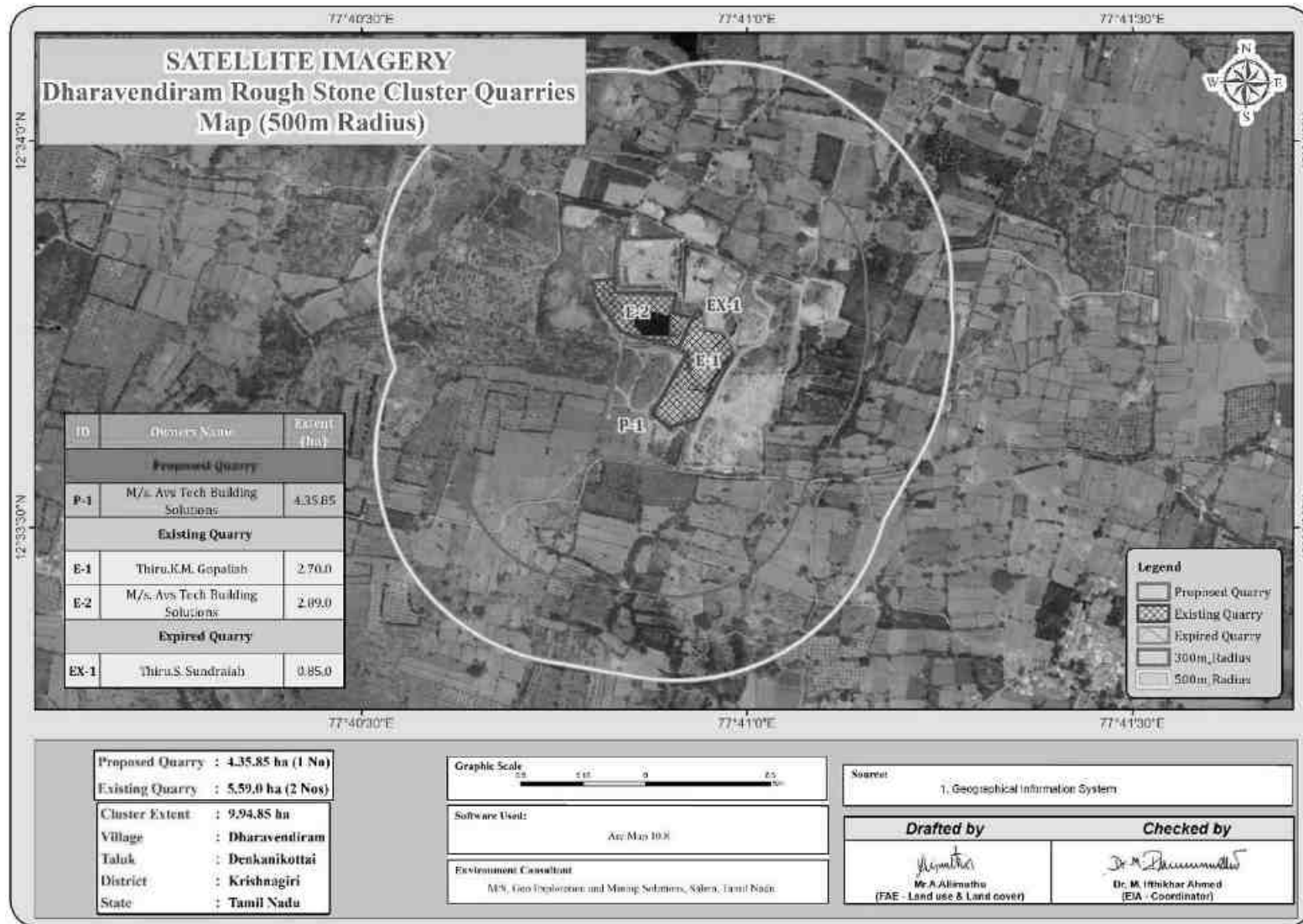
The Ministry of Environment and Forests, Govt. of India, through its EIA notification S.O. 1533(E) of 14<sup>th</sup>September 2006 and its subsequent amendments as per Gazette Notification S.O. 3977 (E) of 14<sup>th</sup>August 2018, Mining Projects are classified under two categories i.e., A (> 100 Ha) and B ( $\leq$  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.

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

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

**FIGURE1.1: SATELLITE IMAGERY CLUSTER QUARRIES**





## 1.2 IDENTIFICATION OF PROJECT AND PROJECT PROPONENT

### 1.2.1 Identification of Project

**TABLE 1.1: IDENTIFICATION OF PROPOSED PROJECT**

Name of the Project	M/s. AVS Tech Building Solutions Rough Stone Quarry
S.F. No.	315/1 (P), 334/1A (P), 334/1B (P)
Extent	4.35.85 ha
Land Type	Patta Land
Village Taluk and District	Dharavendiram Village, Denkanikottai Taluk, Krishnagiri District

Source: Approved Mining Plan

### 1.2.2 Identification of Project PropONENT

**TABLE 1.2: DETAILS OF PROJECT PROPONENT**

Name of the Project PropONENT	<b>M/s. AVS Tech Building Solutions</b>
Communication Address	M/s. AVS Tech Building Solutions, Proprietor S. Srinivasan, No. 112/B, ESI Back Side, Mookondapalli, Hosur Taluk, Krishnagiri District, Tamil Nadu State – 635 126.
Status	Company
Cell	98429 49998
Mail	srinivasavs99@gmail.com

Source: Approved Mining Plan

## 1.3 BRIEF DESCRIPTION OF THE PROJECT

### 1.3.1 Nature and Size of the Project

The Nature of the project is Opencast Rough stone quarrying operation. It is an existing quarry operating since 2016 by opencast mechanized mining method. The same method of mining will be followed by deploying Heavy Earth Moving Machineries without deep hole drilling. Blasting carried out in controlled blasting method using Slurry Explosive. The project area is hillock topography with altitude range from 886m to 854m above Mean sea level.

**TABLE 1.3: BRIEF DESCRIPTION OF THE PROPOSED PROJECT**

Name of the Quarry	M/s. AVS Tech Building Solutions, Rough Stone Quarry	
Toposheet No	57-H/10	
Latitude between	12°33'34.45"N to 12°33'44.96"N	
Longitude between	77°40'47.64"E to 77°40'55.77"E	
Highest Elevation	935 m AMSL	
Proposed Depth of Mining	16m	
Geological Resources	Rough Stone in m <sup>3</sup>	Topsoil m <sup>3</sup>
	17,43,400	43,585
Mineable Reserves	Rough Stone in m <sup>3</sup>	Topsoil m <sup>3</sup>
	9,50,820	37,626
Production as per the depth recommended in ToR	Rough Stone in m <sup>3</sup>	Topsoil m <sup>3</sup>
	4,87,120 m <sup>3</sup>	37,626
Existing Pit Dimension	-	
Ultimate Pit Dimension	273m (L) * 186m (W) * 41m (D)	
Water Level in the surrounding area	67-62m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease area is a plain terrain. The area has gentle slope towards Southern side. The altitude of the area is 935m (max) above mean sea level.	
Machinery proposal for this scheme period	Jack Hammer	6 Nos
	Compressor	2 Nos
	Wagon Drill	1 No
	Excavator with Bucket & Rock Breaker	2 Nos

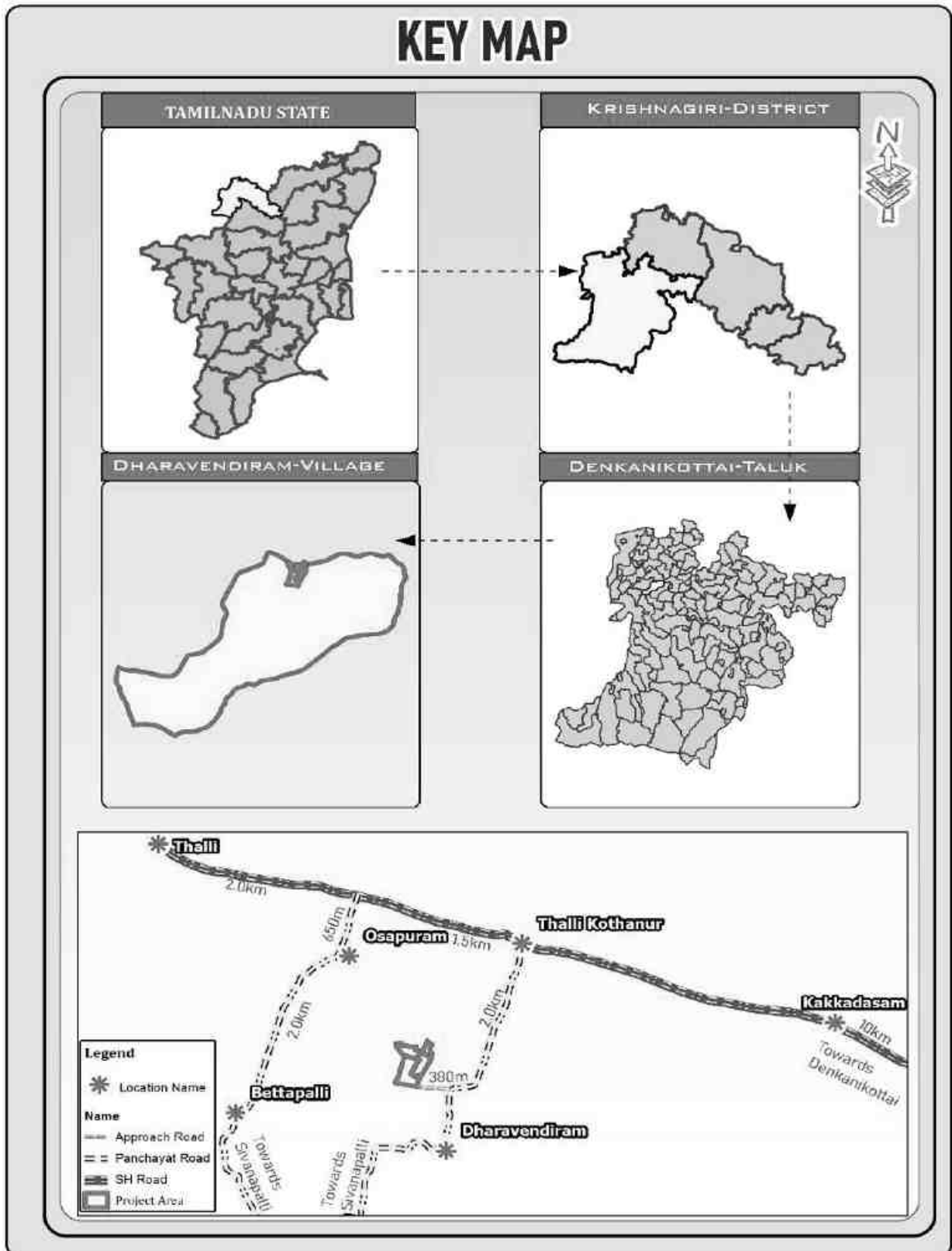
	Tippers	4 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	25 Nos	
Total Project Cost	Rs.1,34,06,000/-	
Proposed CER Cost	Rs.5,00,000/-	
Nearby Water Bodies	Soman Eri	530m South
	Tank Near Hosapuram	630m North
	Tank Near Kothanur	1.2km NE
	Sarandapalli Vannamma Lake	1.6km SE
	Thally Lake	3.2km NW
	Thoragari Agraharam Lake	6.0km NE
Greenbelt Development Plan	Proposed to plant about 1,500 Nos of trees in the safety barrier and village roads considering 500 Nos of Trees per hectare.	
Proposed Water Requirement	3.5 KLD	
Nearest Habitation	670m South East	

Source: Approved Mining Plan

### 1.3.2 Location of the Project

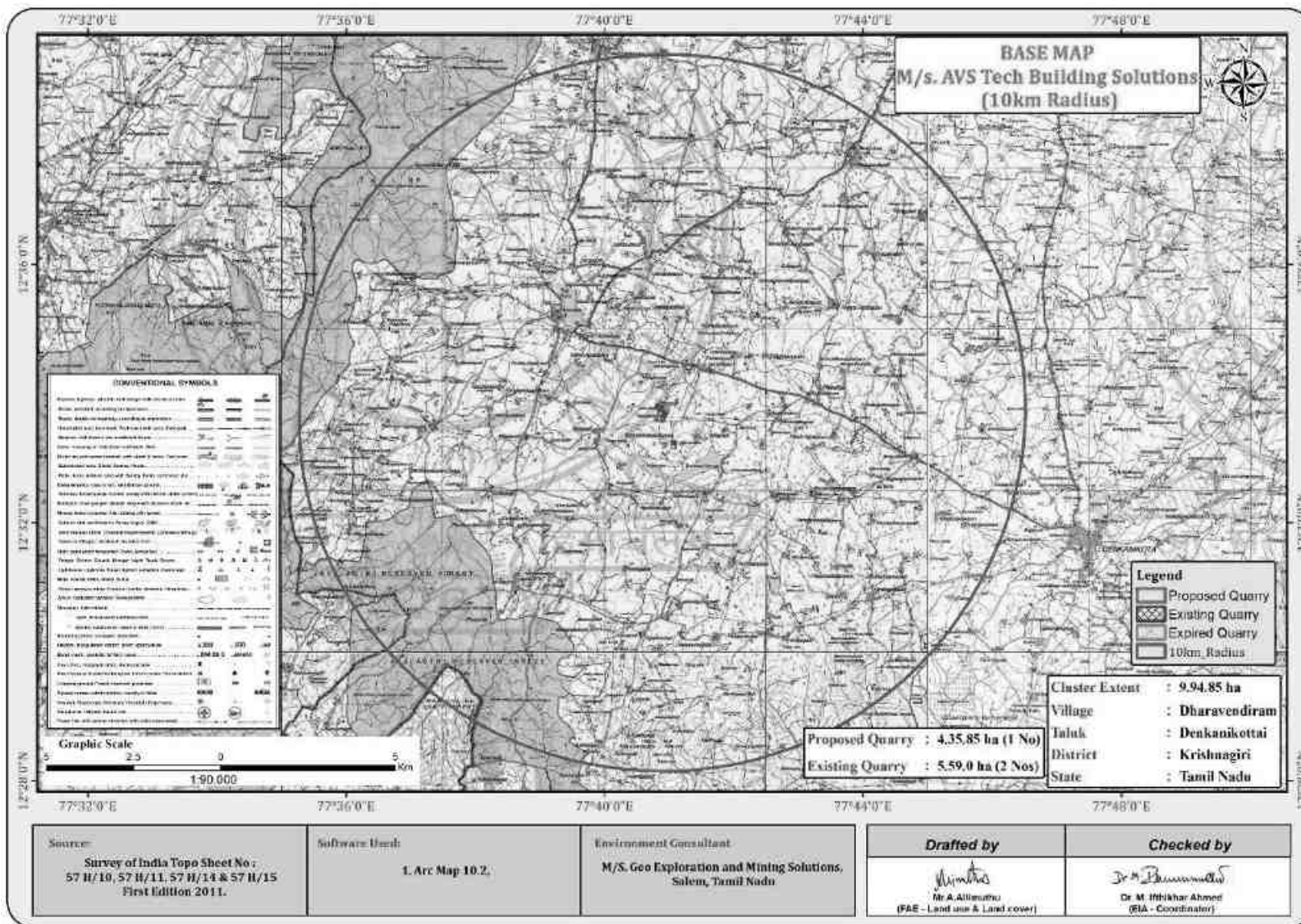
- The Lease area located about 1km SouthEast side of Dharavendiram village, Dharavendiram village is located 12km from Denkanikottai Taluk, Denkanikottai situated 46km West from Krishnagiri District.

**FIGURE 1.2: KEY MAP SHOWING THE LOCATION OF THE PROJECT SITE**



Source: Survey of India Toposheet 57-L/2

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



## **1.4 ENVIRONMENTAL CLEARANCE**

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

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

### **SCREENING –**

- The project proponent applied for Rough Stone Quarry Lease Dated: 27.11.2020.
- Precise Area Communication Letter was issued by the District Collector of Krishnagiri Vide Rc.No.1157/2020/Mines dated 25.02.2021.
- Mining Plan approved by Assistant Director, Krishnagiri Roc.No. 1157/2020/Mines Dated: 29.04.2021.
- The proposed project falls under “B1” Category as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018
- Proponent applied for ToR for Environmental Clearance vide online Proposal No. SIA/TN/MIN/64328/2021, Date: 30.06.2021.

### **SCOPING –**

- The proposal was placed in 245<sup>th</sup> SEAC meeting held on 11.02.2022 and the committee recommended for issue of ToR.
- The proposal was considered in 488<sup>th</sup> SEIAA meeting held on 28.02.2022 and issued ToR vide Letter No SEIAA-TN/F.No.8707/SEAC/ToR-1070/2022 Dated 01.03.2022.

### **PUBLIC CONSULTATION –**

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

### **APPRAISAL –**

Appraisal is the detailed scrutiny by the State Expert Appraisal Committee (SEAC) of the application and other documents like the final EIA & EMP Report, outcome of the Public Consultations including Public Hearing Proceedings, submitted by the proponent to the regulatory authority concerned for grant of environmental clearance. 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, 14<sup>th</sup>September, 2006.
- ToR Lr.No. SEIAA-TN/F.No.8707/SEAC/ToR-1070/2022 Dated 01.03.2022
- Approved Mining Plan of the Proposed Project.

## **1.5 TERMS OF REFERENCE (ToR)**

Compliance to ToR issued vide

Lr.No. SEIAA-TN/F.No.8707/SEAC/ToR-1070/2022 Dated 01.03.2022

## **1.6 POST ENVIRONMENT CLEARANCE MONITORING**

The 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 1<sup>st</sup> June and 1<sup>st</sup> 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 this applied project area. 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 to May 2022) for various environmental components so as to assess the anticipated impacts due the cluster quarry projects on the environment and suggest suitable mitigation measures for likely adverse impacts due to this proposed project.

**TABLE 1.4: ENVIRONMENT ATTRIBUTES**

Sl.No.	Attributes	Parameters	Source and Frequency
1	Ambient Air Quality	PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>2</sub>	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 – data monitored once for 24 hours during EIA study (2 Core & 6 Buffer)
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 CHENNAI METTEX LAB PRIVATE LIMITED 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

- 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 Scheme of Mining Plan has been approved under Rule 41 & 42 as amended of Tamil Nadu Minor Mineral Concession Rules, 1959.
- Obtained Terms of Reference vide Lr.No. SEIAA-TN/F.No.8707/SEAC/ToR-1070/2022 Dated 01.03.2022.

## 2. PROJECT DESCRIPTION

### 2.0 GENERAL

The Rough Stone quarry in Dharavendiram Village is an existing quarry falls in the cluster situation, (cluster extent of 9.94.85 ha) requires Environmental Clearance. The total cluster extent is calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1<sup>st</sup> July 2016.

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

### 2.1 DESCRIPTION OF THE PROJECT

The proposed project is site specific and there is no additional area required for this project. There is no effluent generation/discharge from the project site.

Rough Stone is proposed to be excavated by opencast mechanized method involving splitting of rock mass of considerable volume from the parent rock mass by jackhammer drilling and blasting, hydraulic excavators are used for loading the Rough Stone from pithead to the needy crushers and rock breakers to avoid secondary blasting.

### 2.2 LOCATION OF THE PROJECT

- The Lease area located about 1km Northwest side of Dharavendiram village, Dharavendiram village is located 12km Northwest of Denkanikottai Taluk and Denkanikottai is situated 46km West of Krishnagiri.
- The project does not fall within 10 km radius of any Eco – sensitive zone, National Park, Tiger Reserve, Elephant Corridor and Biosphere Reserves.

**TABLE 2.1: SITE CONNECTIVITY**

<b>Nearest Roadway</b>	Nearest National Highway (NH-7) Kanniyakumari – Bengaluru – 25km - NE State Highway (SH-17B) Thally – Hosur – 3.0Km Northwest
<b>Nearest Village</b>	Dharavendiram –1.0Km - SE
<b>Nearest Town</b>	Denkanikottai – 12.0Km- SE
<b>Nearest Railway Station</b>	Hosur Railway station - 25.0Kms -NE
<b>Nearest Airport</b>	Bengaluru Airport - 47.0Kms- NW
<b>Seaport</b>	Chennai - 287km – Northeast

Source: Survey of India Toposheet

**TABLE 2.2: BOUNDARY CO-ORDINATES OF PROJECT AREA**

<b>Boundary Pillar No.</b>	<b>Latitude</b>	<b>Longitude</b>
1	12°33'35.58"N	77°40'47.64"E
2	12°33'38.40"N	77°40'48.87"E
3	12°33'44.96"N	77°40'50.55"E
4	12°33'43.51"N	77°40'55.16"E
5	12°33'38.81"N	77°40'52.56"E
6	12°33'37.81"N	77°40'53.89"E
7	12°33'38.33"N	77°40'55.77"E
8	12°33'34.45"N	77°40'54.51"E
9	12°33'34.62"N	77°40'53.35"E

Source: Approved Mining Plan

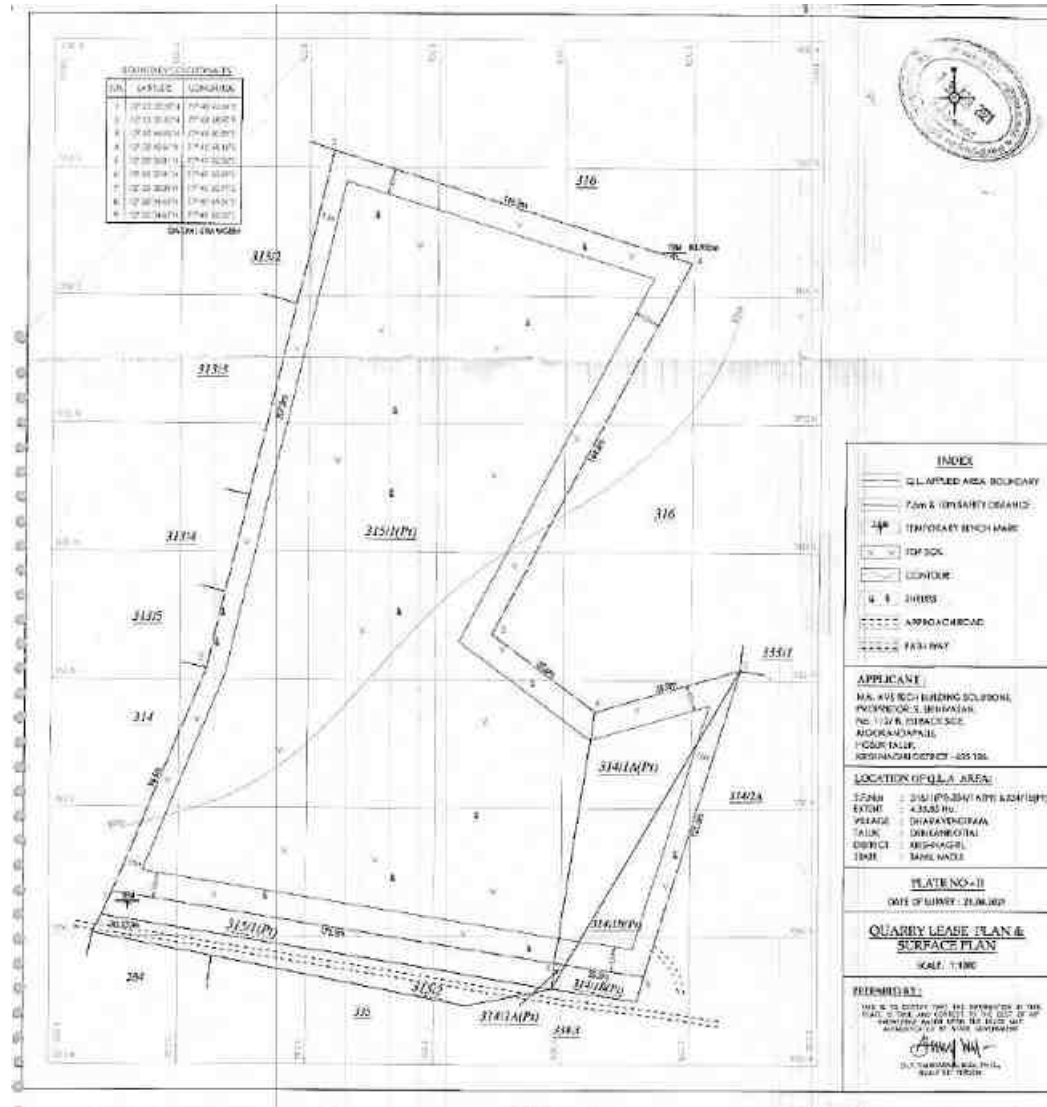
**FIGURE 2.1: GOOGLE IMAGE OF THE PROJECT AREA**



Source: Google Earth Imagery

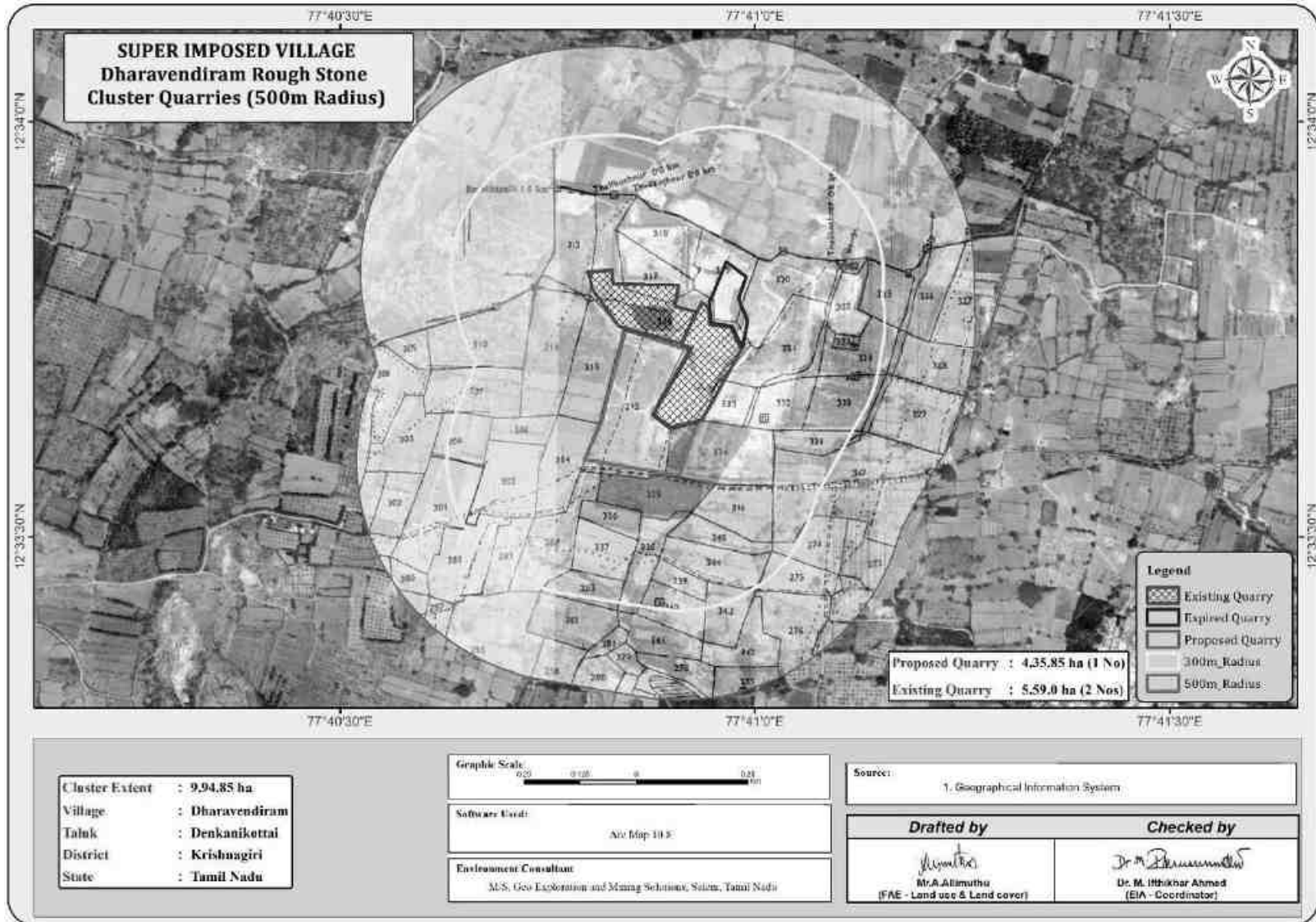


**FIGURE 2.2: QUARRY LEASE PLAN / SURFACE PLAN**



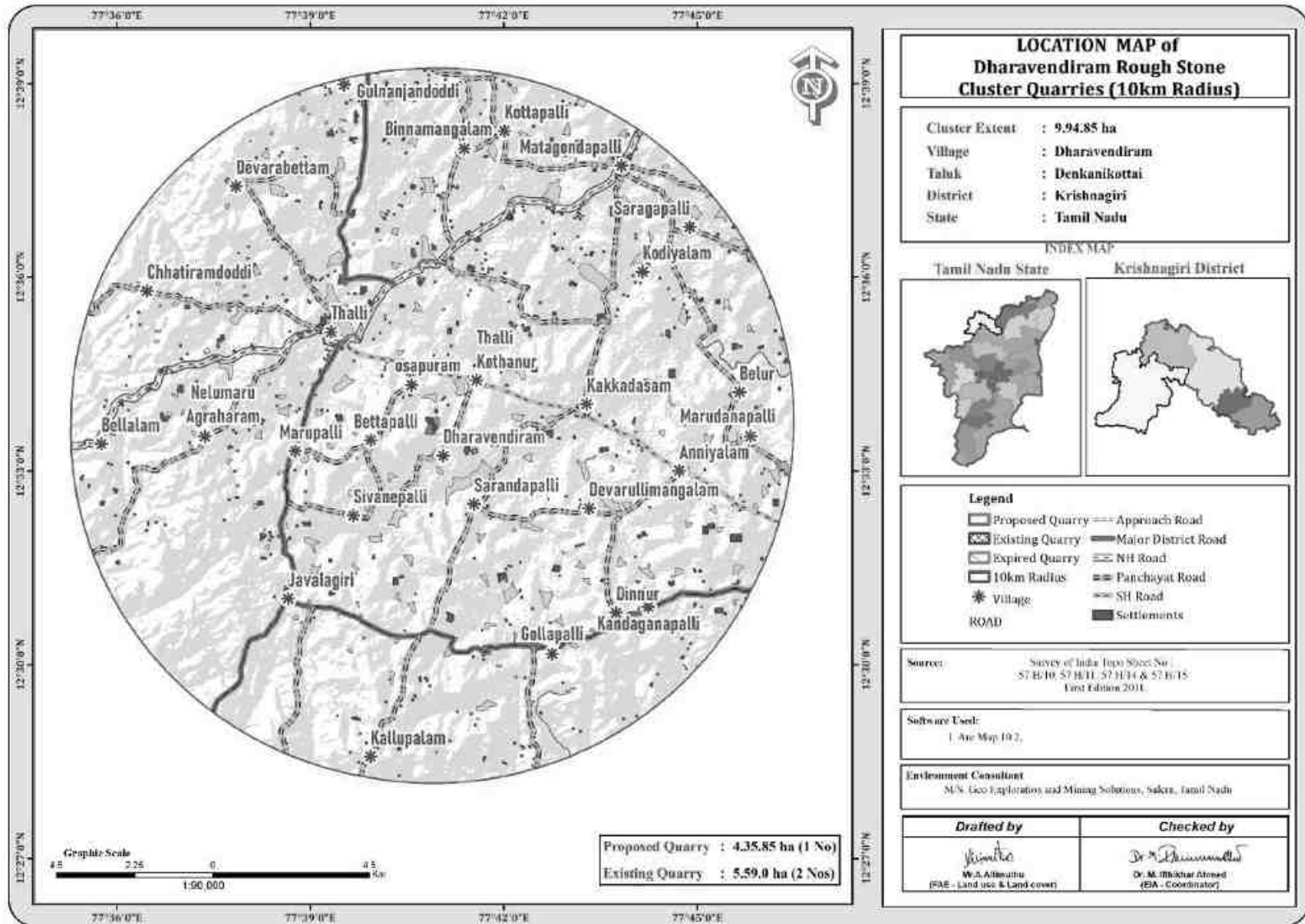
Source: Approved Mining Plan

**FIGURE 2.3: VILLAGE MAP SUPERIMPOSED ON GOOGLE EARTH IMAGE**

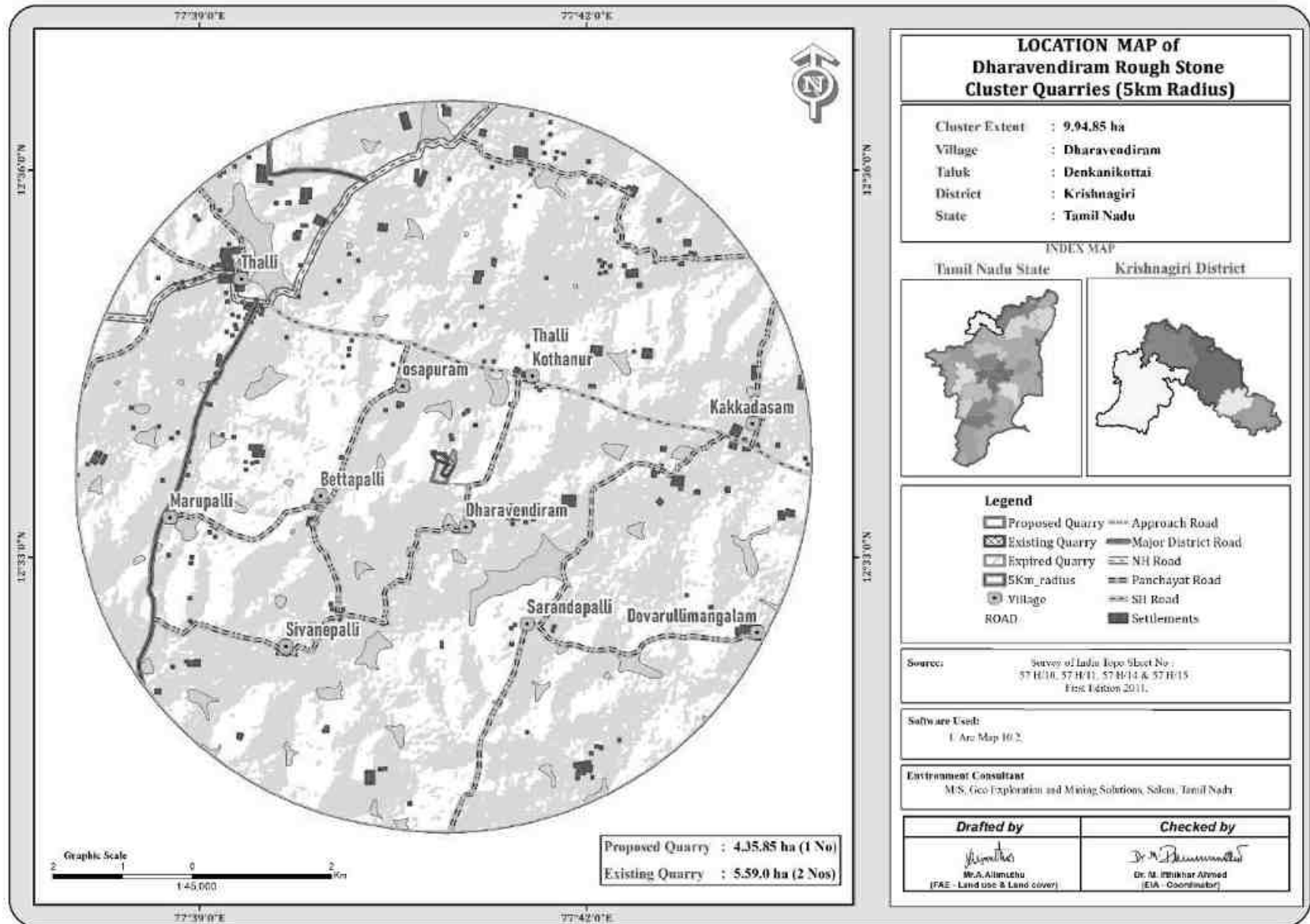


Source: Superimposed Village map.

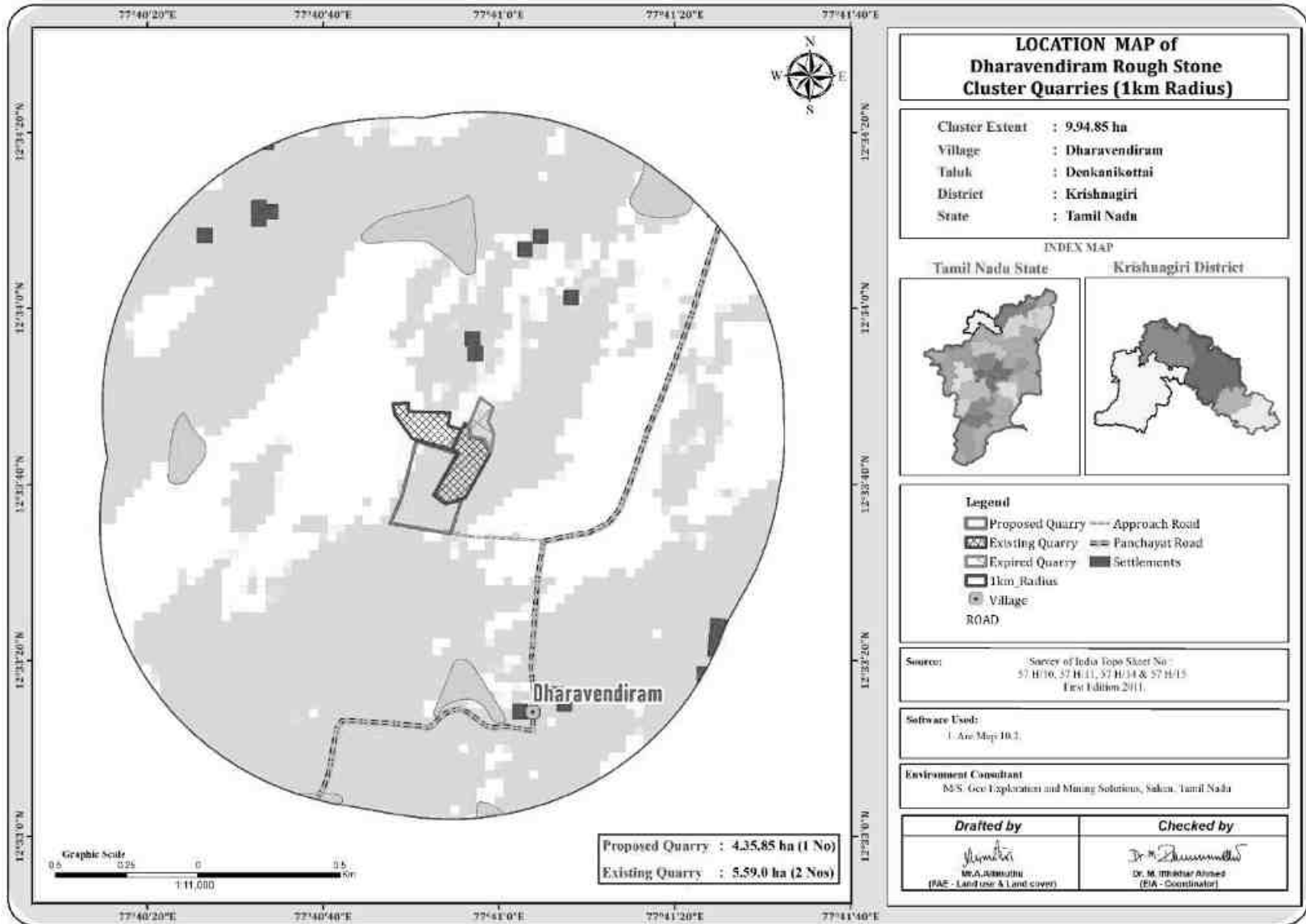
**FIGURE 2.4: IMAGE SHOWING SURFACE FEATURES AROUND 10 KM RADIUS**



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

**TABLE 2.3: LAND USE PATTERN OF THE LEASE AREA**

DESCRIPTION	PRESENT AREA IN (HA)	AREA AT THE END OF LIFE OF QUARRY (HA)
Area under quarry	Nil	3.57.55
Infrastructure	Nil	0.01.00
Roads	Nil	0.02.00
Green Belt	Nil	0.30.00
Un – utilized area	4.35.85	0.45.30
<b>TOTAL</b>	<b>4.35.85</b>	<b>4.35.85</b>

Source: Approved Mining Plan

### 2.2.2 Size or Magnitude of Operation

**TABLE 2.4: OPERATIONAL DETAILS OF LEASE AREA**

PARTICULARS	DETAILS	
	Rough Stone	Topsoil
Geological Resources in m <sup>3</sup>	17,43,400	43,585
Mineable Reserves in m <sup>3</sup>	9,50,820	37,626
<b>Proposed production as per depth recommended in ToR</b>	<b>4,87,120</b>	<b>37,626</b>
Yearwise Production for five years in m <sup>3</sup>	4,87,120	37,626
Mining plan period	10 Years	-
Number of Working Days	300 Days	300 Days
Production per day in m <sup>3</sup>	<b>325</b>	<b>42</b>
No of Lorry loads (12m <sup>3</sup> per load)	<b>27</b>	<b>4</b>
Total Depth of Mining	16m	

Source: Approved Mining Plan and as per recommendations given in TOR letter (Point-1).

## 2.3 GEOLOGY

### 2.3.1 Regional Geology

There are no major minerals observed in the vicinity of the project site. A brief description of the regional Geology is discussed below.

The peninsular gneiss is the widest spread group of rocks in many parts of Tamil Nadu. The southern domain of Tamil Nadu is characterized by the khondalite group of rocks (with subordinate amount of Charnockite) and marked by the absence of BMQ and Dolerite dyke systems.

The geological formations of the district belong mainly to Archaean age along with rock of Proterozoic age. The former is represented by Khondalite Group of rocks, Charnockite Group of rocks, Migmatites Complex, Sathyamangalam Group of rocks, while the latter is represented by alkaline rocks. The Khondalite Group includes garnet sillimanite gneiss and quartzite which occur as small patches. The migmatite complex includes garnetiferous quartzo feldspathic gneiss and hornblends biotite gneiss, the former exposed on the western part of the district. The Sathyamangalam Group includes fuchsite quartzite, sillimanite mica schist and amphibolites. The Bhavani Group in this area includes fissile hornblende-biotite gneiss, granitoid gneiss and pink migmatite. Amphibolites with barbed ferruginous quartzite and associated quartzo-feldspathic rocks (Champion Gneiss) represent the Kolar group and are found west and southwest of Veppanapalli. Following this there are basic intrusions occurring as dykes. The Charnockite Group occupies a major part of the south-west portion of this district with small bands of garnetiferous quartzo-feldspathic gneiss, Granite gneiss and dolerite dykes.

The North-East and Northern part of the district mainly consist of granite gneiss with small patches of Pink Migmatite, hornblende-biotite gneiss and dolerite dykes. The Eastern part of the district consists of Epidote-Hornblende Gneiss, Ultra Mafics, Syenite and Carbonatite.

The Alkaline Complex is represented by epidote-hornblende gneiss, ultramafics, syenite and carbonatite and these are distributed in the eastern part of the district. Innumerable basic dykes and felsites, quartz, barites and pegmatite veins form part of the Alkali Complex.

### 2.3.2 Structural Settings of Krishnagiri: –

The general geological sequence of the rock types in the area is: -

Order of super position: -	
ROCK TYPE	AGE
Topsoil	Pleistocene to Recent
----- Unconformity -----	
Quartz and Pegmatite vein	
Dolerite dykes	
Migmatite Complex	
Granite Gneiss	Archaean to Proterozoic
Charnockite group	
Peninsular Gneissic Complex	

### 2.3.3. Geology of the lease area

The study area follows the regional trend and mainly comprises of Hard Rock Formation as a homogeneous formation / Batholith formation of Charnockite. The project area is plain terrain, sloping toward Southern with an altitude of 935m AMSL. The project area is covered with topsoil formation of 1m thickness; Massive Charnockite formation is found after 1m topsoil formation which is clearly inferred from the existing nearby quarry pit.

Physical attitude of the Charnockite deposit of this area is given below:-

Strike Direction	-	N20 <sup>0</sup> E – S20 <sup>0</sup> W
Dip amount and direction	-	Vertical

### 2.3.4 Hydrogeology

Krishnagiri district is underlined by Archaean crystalline formations with Recent alluvial deposits of limited areal extent and thickness along the courses of major rivers. The occurrence and movement of ground water are controlled by various factors such as physiography, climate, geology and structural features. Weathered, and fractured crystalline rocks constitute the important aquifer systems in the district. Ground water generally occurs under phreatic conditions in the weathered mantle and under semi-confined conditions in the fractured zones at deeper levels. It is inferred that the entire cluster area is a Hard rock terrain and the low -resistance encountered at the depth between 65-80 m bgl, hence it is assumed that the possibility of Ground water occurrence will be below this level and it also proved that this hard batholith above 60 m will not encounter any subsurface water. The thickness of weathered zones in the district ranges from less than a meter to more than 15 m (Source Central Ground Water Board – Krishnagiri).

In the geophysical study it has been clearly inferred that the depth of the quarrying operation will not intersect the ground water table

### Hard Rock Formations

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

### **Granitic Gneiss**

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

### **Charnockite**

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

### **Aquifer Parameters**

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

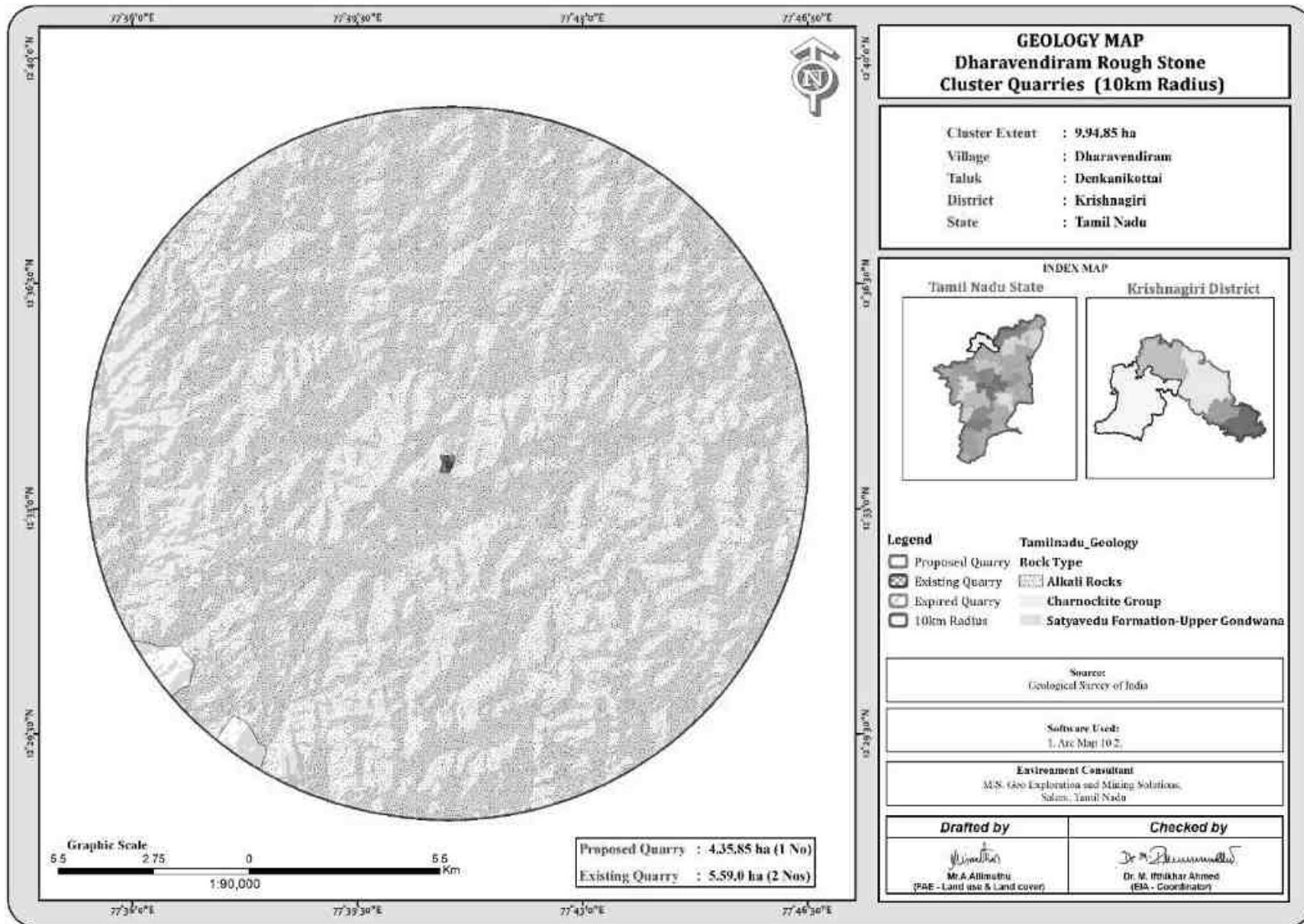
**TABLE 2.5: RANGE OF AQUIFER PARAMETERS**

<b>Aquifer paramters</b>	<b>Water Table conditions in hard rock areas</b>
Well yield	36 to 1125 lpm
Transmissivity (T) (m <sup>2</sup> /day)	8 to 73 m <sup>2</sup> /day
Permeability (K) (m/day)	0.78 to 23 m/day
Depth of water level in open well	8m to 25m

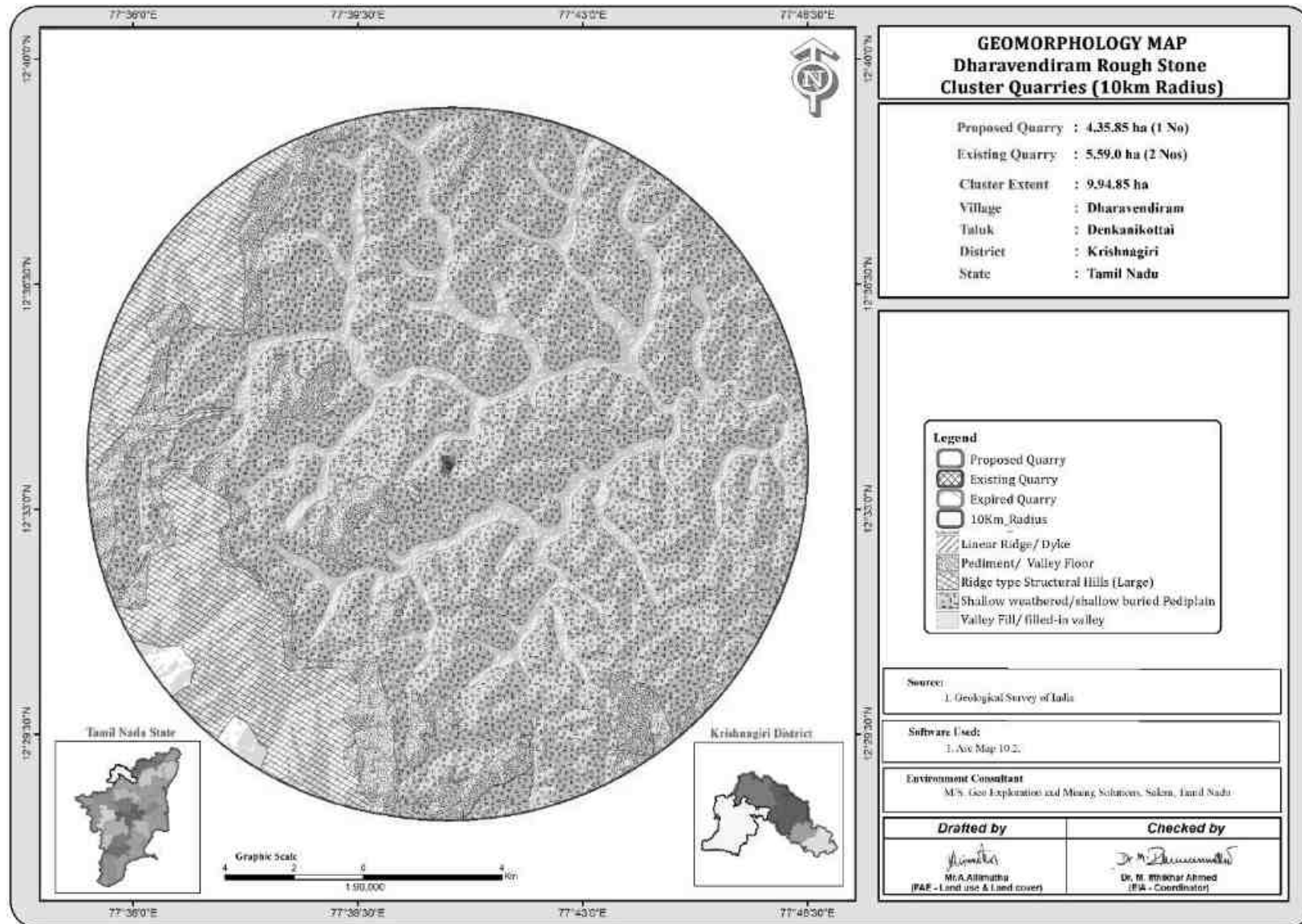
Source: <https://www.twadboard.tn.gov.in/content/krishnagiri>



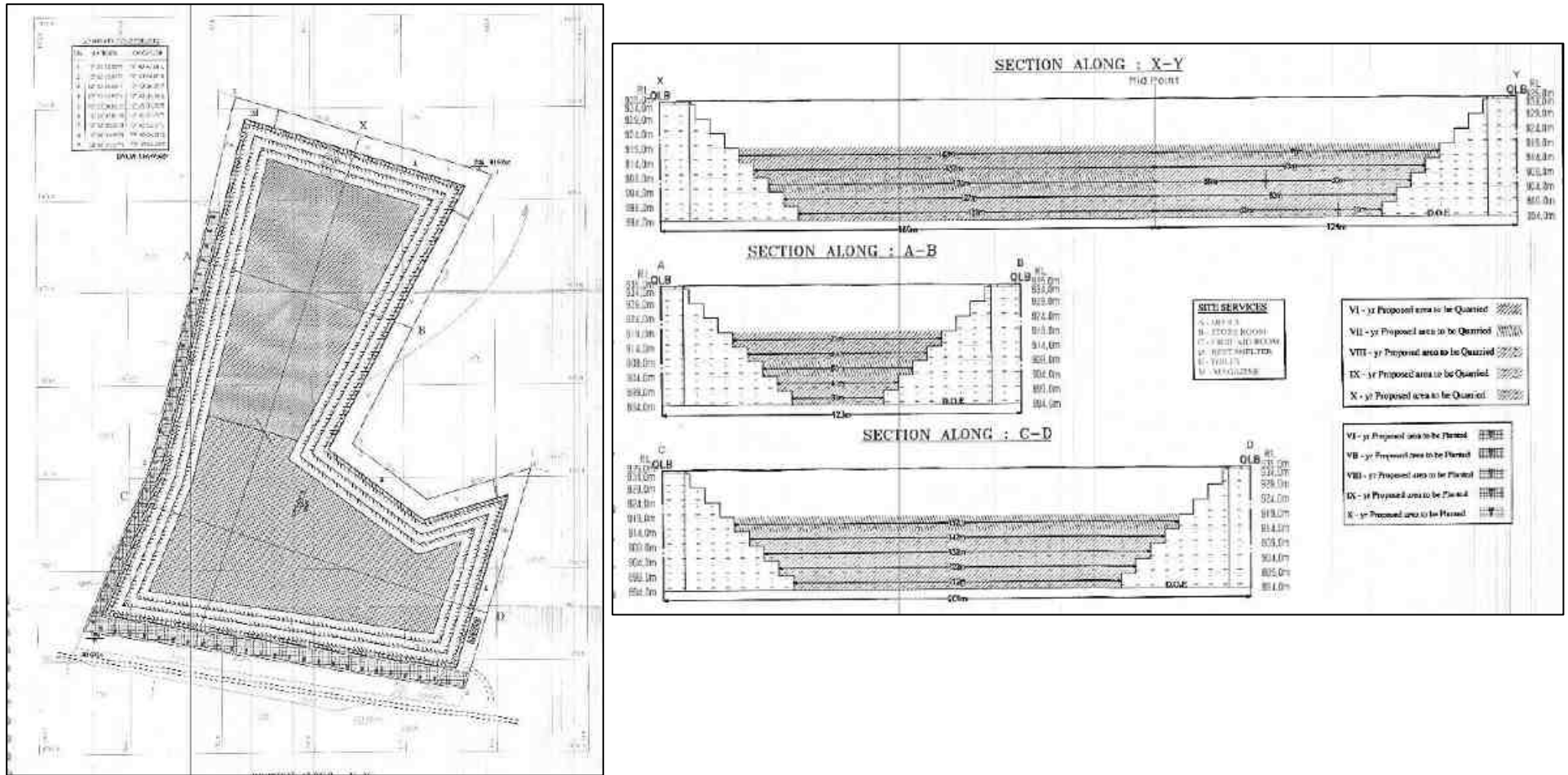
**FIGURE 2.7: REGIONAL GEOLOGY MAP**



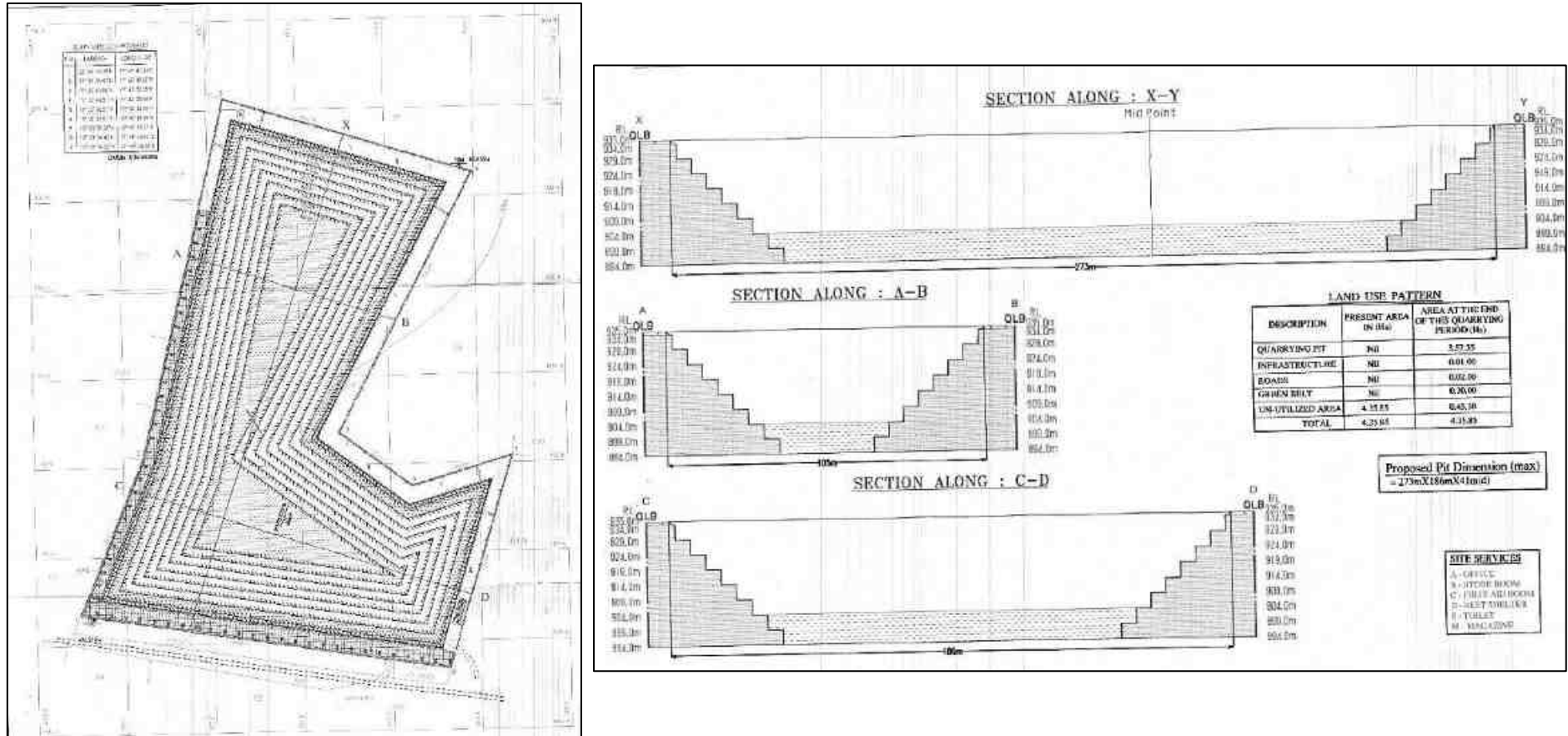
**FIGURE 2.8: GEOMORPHOLOGY MAP**



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



**FIGURE 2.10: CLOSURE PLAN AND SECTIONS**



## 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.

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 10 m (Safety Barrier all around the lease area) and safety distance as per precise area communication letter and deducting the locked up reserves during bench formation (Also called as Bench Loss) and the Mineable Reserves is calculated considering there is no waste / overburden / side burden (100% Recovery Anticipated) for this project.

Reserves calculated upto a depth of 16m as recommended in ToR.

**TABLE 2.6: AVAILABLE GEOLOGICAL RESOURCES**

	<b>Rough Stone</b>	<b>Topsoil</b>
Geological Resource in m <sup>3</sup>	17,43,400	43,585
Mineable Resource in m <sup>3</sup>	9,50,820	37,626
Proposed production of Rough stone as per depth recommended in ToR	4,87,120	37,626

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 Topsoil formation will be used for green belt development.

### Conceptual Mining Plan/ Final Mine Closure Plan

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

**TABLE 2.8: ULTIMATE PIT DIMENSION**

<b>Pit</b>	<b>Length (Max) (m)</b>	<b>Width (Max) (m)</b>	<b>Depth (Max)</b>
<b>I</b>	273	186	41

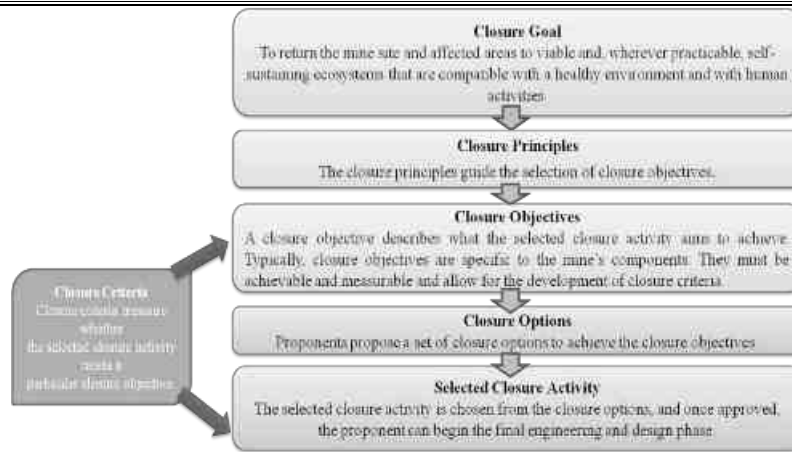
Source: Approved Mining Plans and as per recommendations given in respective TOR letter (Point-1)

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.

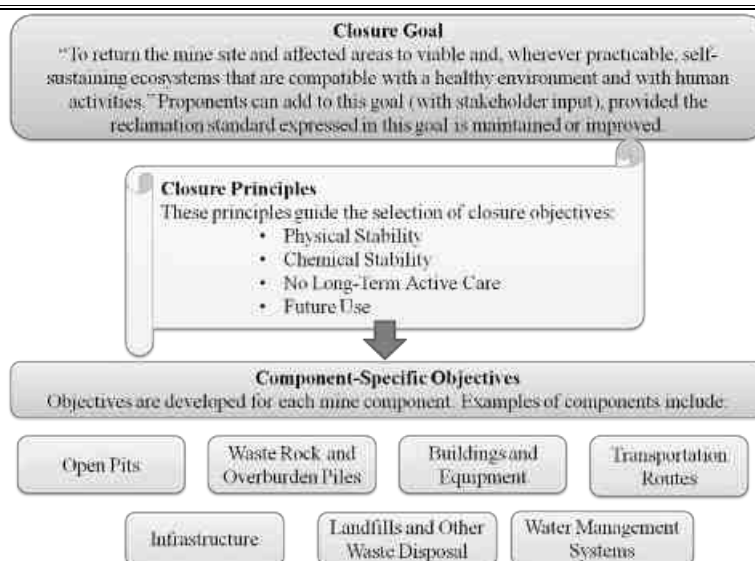
### Closure Objectives –

- 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 mine pits is safe for aquatic life.
- Discharge of contaminated drainage has been minimized and controlled.
- Original or desired new surface drainage patterns have been established.
- 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 1<sup>st</sup> 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.
- 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 is being achieved.
- Sample water quality and quantity at controlled pit discharge points.
- Identify and test unanticipated areas where water management is an issue.
- Inspect integrity of barriers such as berms & fences.
- Monitor wildlife interactions with barriers to determine effectiveness.
- Inspect aquatic habitat in flooded pits where applicable.
- Monitor dust levels.

**TABLE 2.9: MINE CLOSURE BUDGET**

Activity	Year					Cost	Total Cost	
	I	II	III	IV	V			
Plantation in Nos	250	250	250	250	250			
Plantation & Maintenance cost	25,000	25,000	25,000	25,000	25,000	@ 100 Rs/ Saplings	Rs.1,25,000	
Wire Fencing (1000m)	-	-	-	-	3,00,000	@ 300Rs per meter	Rs.3,00,000	
Garland Drain (900m)	-	-	-	-	2,70,000	@ 300Rs per meter	Rs.2,70,000	
Cost for plantation in worked out benches	250	250	250	250	250	@ 100 Rs/ Saplings	Rs.1,25,000	
	25,000	25,000	25,000	25,000	25,000	including maintenance		
<b>TOTAL</b>								<b>Rs.8,20,000/-</b>

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

Drilling & Blasting will be carried out as per parameters given below: -

Spacing	–	1.2m
Burden	–	1.0 m
Depth of hole	–	1.5 m
Charge per hole	–	0.50 – 0.75kg
Powder factor	–	6.0 tonnes/kg
Diameter of hole	–	32 mm

### Type of Explosives to be used –

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

### Storage of Explosives –

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

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

### 2.5.2 Extent of Mechanization

**TABLE 2.10 PROPOSED MACHINERY DEPLOYMENT**

S.NO.	TYPE	NOS	SIZE/CAPACITY	MOTIVE POWER
1	Jack hammers	6	1.2m to 2.0m	Compressed air
2	Compressor	2	400psi	Diesel Drive
3	Wagon Drill	1	60HP	Diesel Drive
4	Excavator with Bucket / Rock Breaker Unit 4	2	300 HP	Diesel Drive
5	Tippers / Dumpers	4	20 Tonnes	Diesel Drive

Source: Approved Mining Plans

## 2.6 GENERAL FEATURES

### 2.6.1 Existing Infrastructures

Infrastructures like Mine office, Temporary Rest shelters for workers, Latrine and Urinal Facilities already provided in the project area the same will be maintained in good condition.

### 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

Approach road to the project site is located south side of the area, this road connecting in the Thally Kothanur-Sivanapalli Panchayat Road at a distance of 340m.

This road again connecting in the Thally - Denkanikottai State Highway road at a distance of 2.0km. The traffic survey conducted based on the transportation route of material, the Rough Stone is proposed to be transported mainly through Thally - Denkanikottai district road on the North Western side. There are no villages or settlements along the route of mineral transport.

Traffic density measurements were performed at two locations

1. Thally Kothanur-Sivanapalli Panchayat Road 340m East
2. Thally - Denkanikottai State Highway 1.8Km NE

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

**TABLE.2.11: TRAFFIC SURVEY LOCATIONS**

Station Code	Road Name	Distance and Direction	Type of Road
TS1	Thally Kothanur-Sivanapalli	340m East	Panchayat Road
TS2	Thally - Denkanikottai	1.8km NE	State Highway

Source: On-site monitoring by GEMS FAE & TM

**TABLE 2.12: EXISTING TRAFFIC VOLUME**

Station code	HMV		LMV		2/3 Wheelers		Total PCU
	No	PCU	No	PCU	No	PCU	
TS1	160	480	210	210	450	225	915
TS2	15	45	24	24	30	15	84

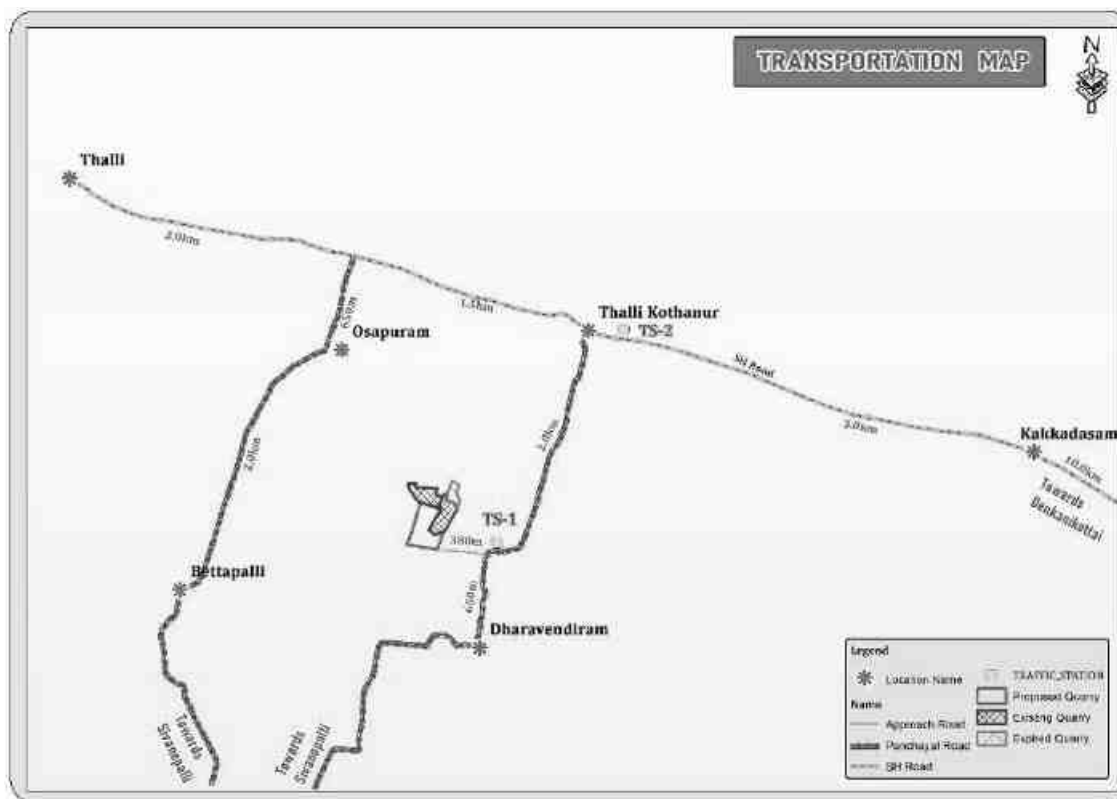
Source: On-site monitoring by GEMS FAE & TM

\* 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
12 tonnes	90	270

Source: Data analysed from Approved Mining Plan and as per recommendations given in TOR letter (Point -1).

**FIGURE.2.11: MINERAL TRANSPORTATION ROUTE MAP****TABLE 2.14: SUMMARY OF TRAFFIC VOLUME**

Route	Existing Traffic volume in PCU	Incremental traffic due to the project	Total traffic volume	Hourly Capacity in PCU as per IRC – 1960 guidelines
Thally Kothanur-Sivanapalli	915	270	1185	1500
Thally - Denkanikottai	84	270	354	1200

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

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

## 2.6.4 Mineral Beneficiation and Processing

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

## 2.7 PROJECT REQUIREMENT

### 2.7.1 Water Source & Requirement

Detail of water requirements in KLD as given below:

**TABLE 2.15: WATER REQUIREMENT FOR THE PROJECT**

*Purpose	Quantity	Source
Dust Suppression	2.0 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Green Belt development	1.0 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Domestic purpose	0.5 KLD	Water Tankers

<b>Total</b>	<b>3.5 KLD</b>	
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Source: Prefeasibility Report

\* Drinking water will be sourced from Approved Water Vendors

### 2.7.2 Power and Other Infrastructure Requirement

The proposed project requires power supply for the mining operations. The quarrying activity is proposed during day time only (General Shift 8 AM – 5 PM, Lunch Break 1 PM – 2 PM). Electricity for use in office and other internal infrastructure will be obtained from TNEB by respective project proponent.

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

### 2.7.3 Fuel Requirement

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

#### Topsoil:

Per hour Diesel consumption of excavator = 10 litres / hour

Per hour Average excavation of Topsoil = 60m<sup>3</sup>

**TABLE 2.16: FUEL REQUIREMENT FOR TOPSOIL EXCAVATION**

Topsoil reserves (m <sup>3</sup> )	Per hour excavation (Topsoil reserve / 60)	Diesel Consumption (in Liters) (No. of hours x 10 litres)
37,626	627	6,270

#### Rough stone

Per hour Diesel consumption of excavator = 16 litres / hour

Per hour Average excavation of Roughstone = 20m<sup>3</sup>

**TABLE 2.17: FUEL REQUIREMENT FOR ROUGHSTONE EXCAVATION**

Rough stone reserves (m <sup>3</sup> )	Per hour excavation (Rough stone reserve /20)	Diesel Consumption (in Liters) (No. of hours x 16 litres)
4,87,120	24,356	3,89,696

### 2.7.4 Project Cost

**TABLE 2.18: PROJECT COST FOR THE PROPOSED QUARRIES**

Proposed Quarry	Project Cost
P1	Rs.1,41,66,000/-

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 aimed at maintaining the proposed production target and also to comply with the statutory provisions of The Metalliferous Mines Regulations, 1961.

**TABLE 2.19: PROPOSED MANPOWER DEPLOYMENT**

Mines Manager/Mines Foreman	1
Mate/Blaster	1
Excavator – Operator & Driver	6
Jack Hammer Operator	8

Security	1
Labour & Helper	2
Co-Operator and Cleaner	6
<b>Total</b>	<b>25</b>

Source: Approved Mining Plan

## 2.9 PROJECT IMPLEMENTATION SCHEDULE

The commercial operation will commence after the grant of Environmental Clearance. CTO and CTE 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 2.20: EXPECTED TIME SCHEDULE**

Sl.No.	Particulars	Time Schedule (In Month)					Remarks if any
		1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	
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

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### 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 & May 2022 with CPCB guidelines. Environmental data has been collected with reference to cluster quarries by CHENNAI METTEX LAB PRIVATE LIMITED – Approved by AAI, AGMARK, APEDA, BIS, [IC, FSSAI, GAFTA, IOPEPC, MOEF Et TEA BOARD, for the below attributes –

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

#### Study Area

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

#### Study Period

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

#### Study Methodology

- The project area was surveyed in detail with the help of Total Station and the boundary pillars were picked up with the help of GPS. The boundary coordinates were superimposed on the satellite imagery to understand the relief of the area, besides Land use pattern of the area was studied through the Bhuvan (ISRO)
- Soil samples were collected and analysed for relevant physio-chemical characteristics, exchangeable Cations, nutrients & micro nutrients etc., in order to assess the impact due to mining activities and to recommend saplings for Greenbelt development
- Ground water samples were collected during the study period from the existing bore wells, while surface water was collected from ponds in the buffer zone. The samples were analysed for parameters necessary to determine water quality (based on IS: 10500:2012 criteria) and those which are relevant from the point of view of environmental impact of the proposed mines
- An onsite meteorological station was setup in cluster area, to collect data about wind speed, wind direction, temperature, relative humidity, rainfall and general weather conditions were recorded throughout the study period
- 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<sub>10</sub> and SO<sub>2</sub>, NO<sub>x</sub> with gaseous attachments & Fine Dust Samplers (FDS) for PM<sub>2.5</sub> 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 <sub>10</sub> PM <sub>2.5</sub> SO <sub>2</sub> NO <sub>x</sub> Fugitive Dust	24 hourly twice a week (March – May 2019)	8 (2 core & 6 buffer)	IS 5182 Part 1-23 National Ambient Air Quality Standards, CPCB
*Noise Levels	Ambient Noise	Hourly observation for 24 Hours per location	8 (2 core & 6 buffer zone)	IS 9989 As per CPCB Guidelines
Ecology	Existing Flora and Fauna	Through field visit during the study period	Study Area	Primary Survey by Quadrate & Transect Study Secondary Data – Forest Working Plan
Socio Economic Aspects	Socio-Economic Characteristics, Population Statistics and Existing Infrastructure in the study area	Site Visit & Census Handbook, 2011	Study Area	Primary Survey, census handbook & need based assessments.

Source: On-site monitoring/sampling by CHENNAI METTEX LAB PRIVATE LIMITED Laboratories in association with GEMS

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

### 3.1 LAND ENVIRONMENT

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

#### 3.1.1 Land Use/ Land Cover

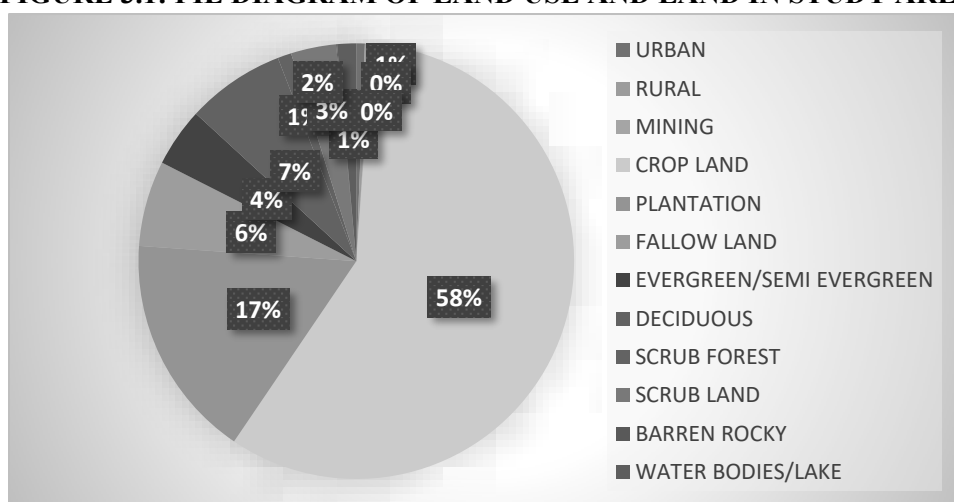
A visual interpretation technique has been adopted for land use classification based on the keys suggested in the chapter – V of the guidelines issued by NNRMS Bangalore & Level III classification with 1:50,000 scale for the preparation of land use mapping. Land use pattern of the area was studied through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

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

S.No	CLASSIFICATION	AREA_HA	AREA_%
<b>BUILTUP</b>			
1	URBAN	207.67	0.63
2	RURAL	142.17	0.43
3	MINING	31.68	0.10
<b>AGRICULTURAL LAND</b>			
4	CROP LAND	19205.62	58.32
5	PLANTATION	5475.36	16.63
6	FALLOW LAND	2090.74	6.35
<b>FOREST</b>			
7	EVERGREEN/SEMI EVERGREEN	1436.74	4.36
8	DECIDUOUS	2406.48	7.31
9	SCRUB FOREST	337.43	1.02
<b>BARREN/WASTE LANDS</b>			
10	SCRUB LAND	1107.57	3.36
11	BARREN ROCKY	22.71	0.07
<b>WETLANDS/ WATER BODIES</b>			
12	WATER BODIES/LAKE	464.52	1.41
<b>TOTAL</b>		<b>32928.70</b>	<b>100.00</b>

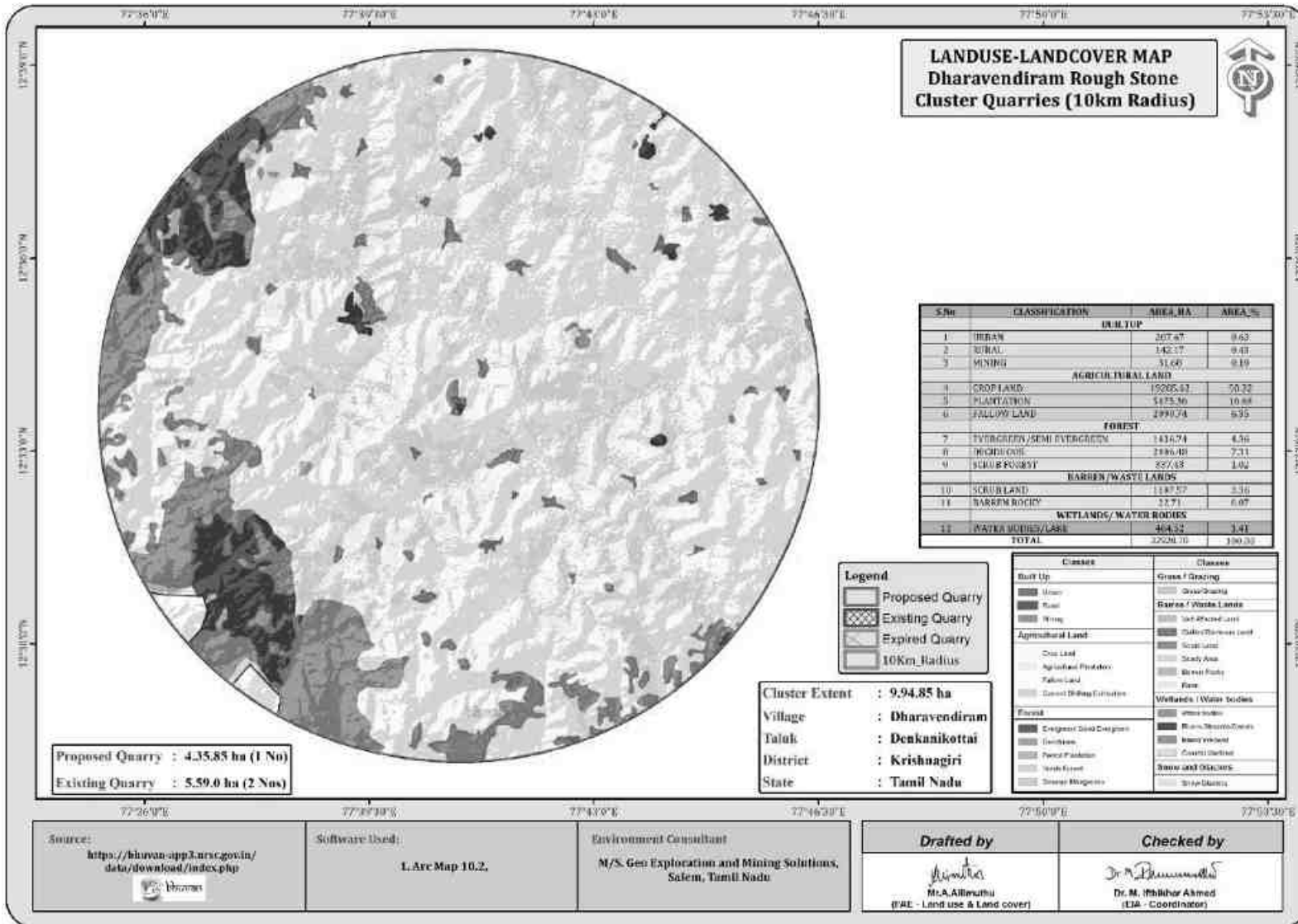
Source: Survey of India Toposheet and Landsat Satellite Imagery

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



Source: Table 3.2

**FIGURE 3.2: LAND USE LAND COVER MAP 10KM RADIUS**





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From the above table, pie diagram and land use map it is inferred that the majority of the land in the study area is Agriculture land (includes crop, Plantation and fallow land) 81.3% followed by Builtup land 1.16%, Forest area – 12.70%. Barren/Waste lands– 3.43% and Wet lands & water bodies 1.41%

The total mining area within the study area is 31.68 ha i.e., 0.10%. The cluster area of 9.94.85ha contributes about 31.40% of the total mining area within the study area. This small percentage of Mining Activities shall not have any significant impact on the environment.

### **3.1.2 Topography**

The project area is plain terrain, the gradient is gentle towards Southern Side and altitude of the area is 935m AMSL. The area is covered with topsoil formation of 1m thickness; Massive Charnockite formation is found after 1m topsoil formation which is clearly inferred from the existing nearby quarry pit.

### **3.1.3 Drainage Pattern of the Area**

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

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

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

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

### **3.1.4 Seismic Sensitivity**

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

(Source: [https://moes.gov.in/writereaddata/files/LS\\_EN\\_20032020\\_385.pdf](https://moes.gov.in/writereaddata/files/LS_EN_20032020_385.pdf))

### **3.1.5 Environmental Features in the Study Area**

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

**TABLE 3.3: DETAILS OF ENVIRONMENT SENSITIVITY AROUND THE CLUSTER**

Sl.No	Sensitive Ecological Features	Name	Arial Distance in km from Cluster
1	National Park / Wild life Sanctuaries	None	Cauvery North Wild life sanctuary -6.5km - SW
2	Reserve Forest	Jowlagiri RF Thalli RF	6.3 km Southwest 7.0 km Northwest
3	Lakes/Reservoir/ Dams/Stream/Rivers	Soman Eri Tank Near Hosapuram Tank Near Kothanur Sarandapalli Vannamma Lake Thally Lake Thoragari Agraharam Lake	530m South 630m North 1.2km NE 1.6km SE 3.2km NW 6.0km NE
4	Tiger Reserve/ Elephant Reserve/ Biosphere Reserve	None	Nil within 10 km Radius
5	Critically Polluted Areas	None	Nil within 10 km Radius
6	Mangroves	None	Nil within 10 km Radius
7	Mountains/Hills	None	Nil within 10 km Radius
8	Notified Archaeological Sites	None	Nil within 10 km Radius
9	Industries/Thermal Power Plants	None	Nil within 10 km Radius
10	Defence Installation	None	Nil within 10 km Radius

Source: Survey of India Toposheet, Village Cadastral Map and Field Survey

### 3.1.6 Soil Environment

Soil quality of the study area is one of the important components of the land environment. The composite soil samples were collected from the study area and analysed for different parameters. The locations of the monitoring sites are detailed in Table 3.4 and Figure 3.3.

#### The objective of the soil sampling is -

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

**TABLE 3.4: SOIL SAMPLING LOCATIONS**

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	S-1	Core Zone	West	12°33'37.67"N 77°40'50.27"E
2	S-2	Devarulimangalam	4.5km SE	12°32'29.29"N 77°43'09.33"E
3	S-3	Bettapalli	1.5km SW	12°33'18.74"N 77°39'52.20"E
4	S-4	Thogarai Ahraharam	5.5km NE	12°35'19.70"N 77°43'27.54"E
5	S-5	Arupalli	6.0km NW	12°36'18.55"N 77°38'45.95"E
6	S-6	Athalavadi	3.5km NW	12°34'28.86"N 77°39'11.95"E

Source: On-site monitoring/sampling by CHENNAI METTEX LAB PRIVATE LIMITED 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 3.5.

**TABLE 3.5: METHODOLOGY OF SAMPLING COLLECTION**

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

Source: On-site monitoring/sampling by CHENNAI METTEX LAB PRIVATE LIMITED Laboratories in association with GEMS

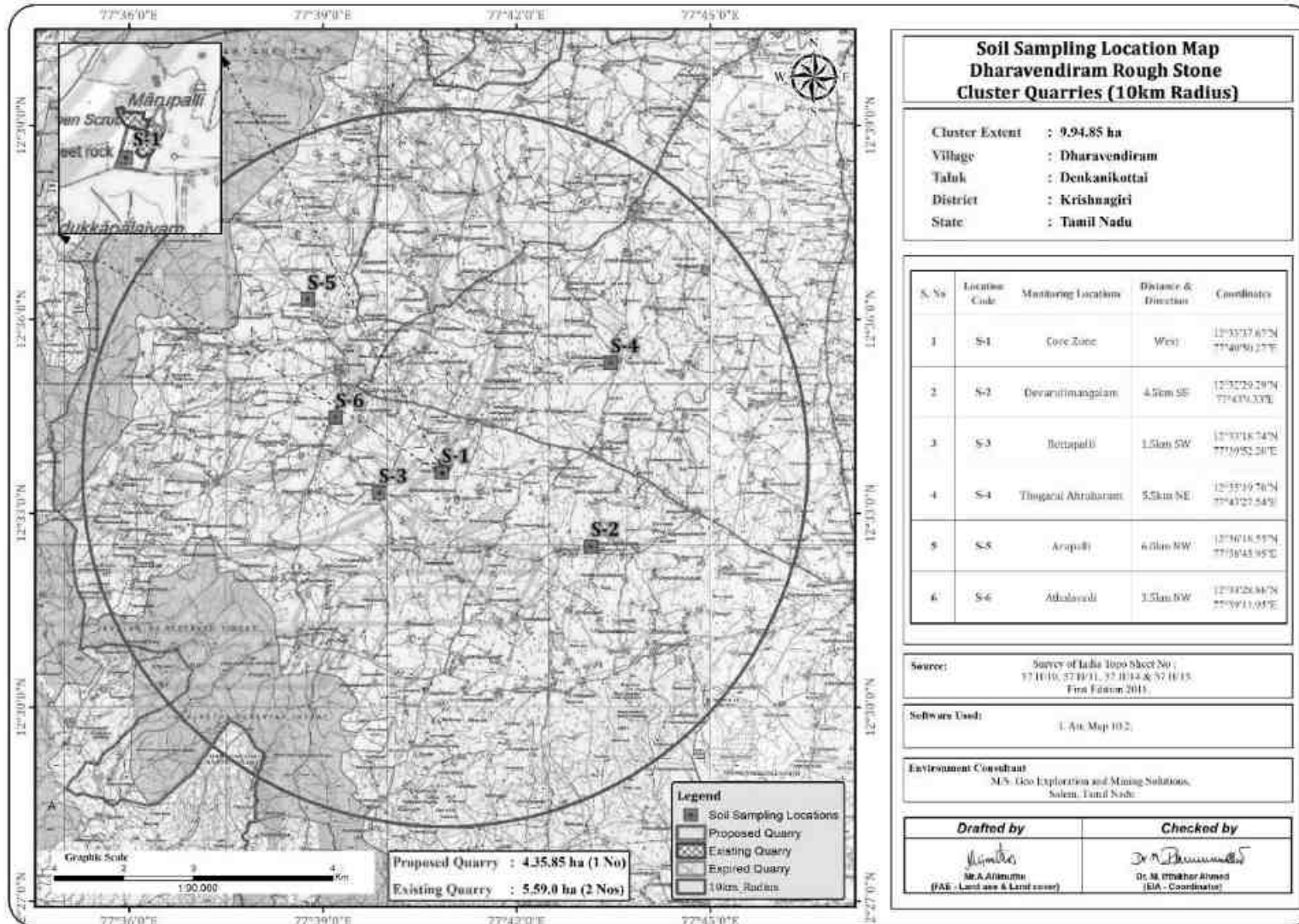
**Soil Testing Result –**

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, kjeldahi Nitrogen, Phosphorous and Potassium. The standard classifications of soil and physico-chemical characteristics of the soils are presented below in Table 3.6 & Test Results in Table 3.7.

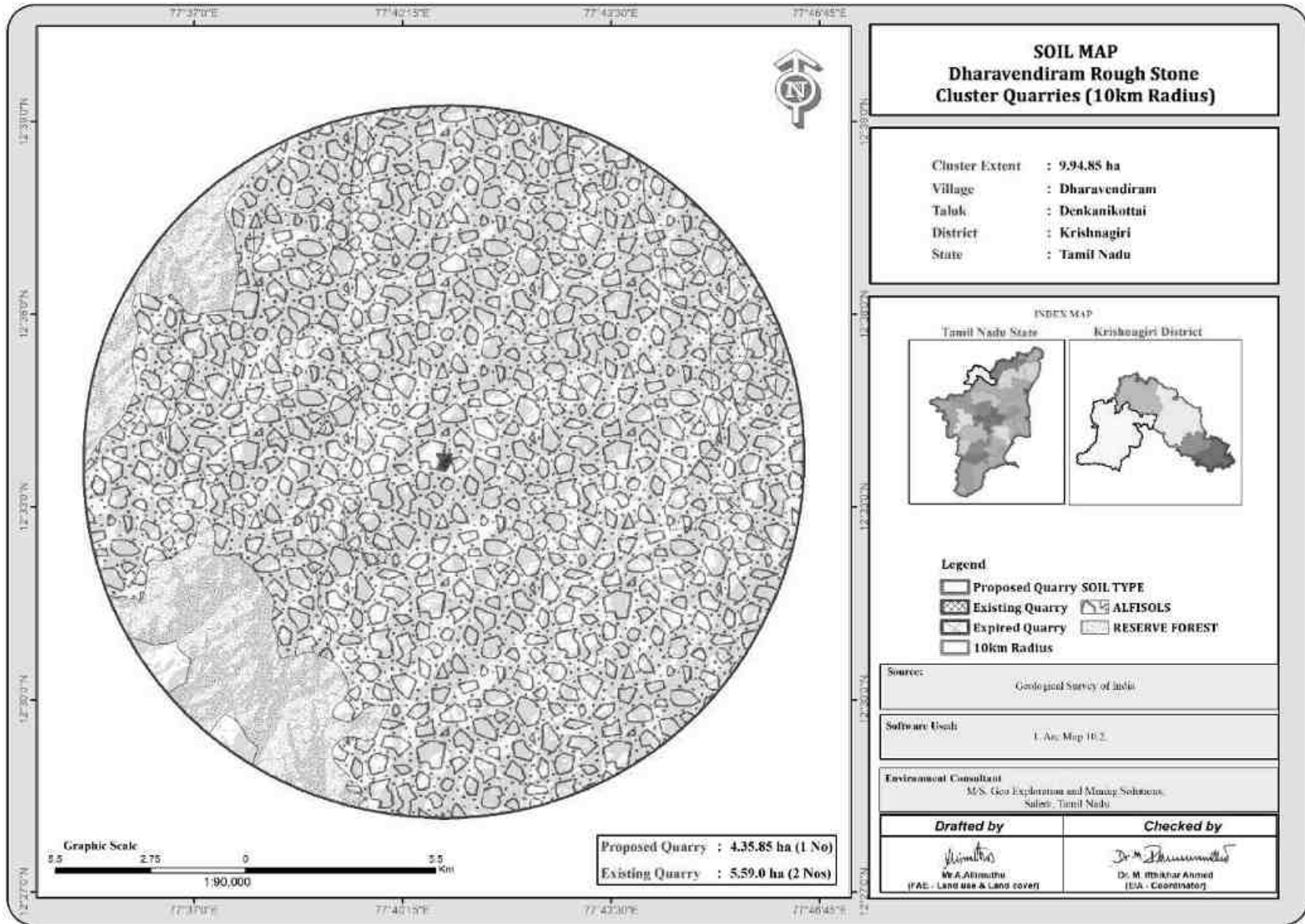
**TABLE 3.6: SOIL QUALITY STANDARD**

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

**FIGURE 3.3: SOIL SAMPLING LOCATIONS AROUND 10 KM RADIUS**



**FIGURE 3.4: SOIL MAP**



**TABLE 3.7: SOIL QUALITY OF THE STUDY AREA**

S.No	Parameters	Units	S1	S-2	S-3	S-4	S-5	S-6	Test Method
1	pH	...	8.51	8.30	8.16	8.18	8.28	8.28	IS 2720 (Part-26)
2	Electrical Conductivity (EC)	µs/cm	628	410	592	558	618	622	IS 14767
3	Texture	...	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	IS 2720 (Part-4)
4	Clay	%	46.2	33.6	44.6	38.4	35.4	38.6	IS 2720 (Part-4)
5	Sand	%	30.4	30.0	32.8	30.5	38.6	43.1	IS 2720 (Part-4)
6	Silt	%	23.4	36.4	22.6	31.1	26.0	18.3	IS 2720 (Part-4)
7	Water Holding Capacity (WHC)	%	50.6	42.0	48.6	52.1	46.8	47.2	IS 2720 (Part-2)
8	Bulk Density	g/cm <sup>3</sup>	1.18	1.20	1.18	1.18	1.20	1.18	IS 2386 (Part-4 )
9	Porosity	%	38.2	30.4	37.2	38.2	42.4	42.8	IS 13030
10	Calcium,(Ca)	mg/kg	186	180	178	221	240	240	IS 2720 (Part-23)
11	Magnesium,(Mg)	mg/kg	38	45.6	38	152	142	120	ETS/STP/SOIL-08
12	Manganese,(Mn)	mg/kg	34.6	29.8	32.8	40.2	28.6	32.4	ETS/STP/SOIL-18
13	Zinc,(Zn)	mg/kg	0.98	0.82	1.20	1.40	1.10	1.10	ETS/STP/SOIL-18
14	Boron (as B)	mg/kg	1.10	1.32	1.30	1.54	1.72	1.62	ETS/STP/SOIL-18
15	Chloride,(Cl)	mg/kg	184	162	196	182	186	188	BS 1377 -3
16	Total Soluble Sulphate	%	0.015	0.020	0.018	0.017	0.015	0.015	IS 2720 (Part-27 )
17	Potassium (K )	mg/kg	38.4	41.8	58.6	41.2	47.9	46.2	ETS/STP/SOIL-18
18	Phosphorus (PO4)	mg/kg	1.24	1.30	1.24	1.20	1.42	1.20	ETS/STP/SOIL-19
19	Total Nitrogen (N)	mg/kg	188	198	172	190	194	170	ETS/STP/SOIL-15
20	Cadmium,(Cd)	mg/kg	DL:1.0	DL:1.0	DL:1.0	DL:1.0	DL:1.0	DL:1.0	ETS/STP/SOIL-18
21	Chromium,(Cr)	mg/kg	DL:1.0	DL:1.0	DL:1.0	DL:1.0	DL:1.0	DL:1.0	ETS/STP/SOIL-18
22	Copper,(Cu)	mg/kg	DL:1.0	DL:1.0	DL:1.0	DL:1.0	DL:1.0	DL:1.0	ETS/STP/SOIL-18
23	Lead,(Pb)	mg/kg	0.62	0.80	0.78	0.92	0.75	0.74	ETS/STP/SOIL-18
24	Iron,(Fe)	mg/kg	3.5	3.6	1.98	2.9	3.90	3.85	ETS/STP/SOIL-18
25	Organic Matter,(OM)	%	3.2	2.9	2.8	3.18	2.90	3.53	IS 2720 (Part-22)
26	Organic Carbon,(OC)	%	1.86	1.68	1.62	1.84	1.68	2.03	BS 1377 -3
27	Cation Exchange Capacity (CEC)	meq/100g	49.8	49.8	46.8	48.2	45.7	46.2	IS 2720 (Part-24)

Source: Sampling Results by CHENNAI METTEX LAB PRIVATE LIMITED 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 and Bulk Density of Soils in the study area varied between 1.18 – 1.20 g/cc. The Water Holding Capacity and Porosity of the soil samples is found to be medium i.e. ranging from 42.0 – 52.1 %.

### Chemical Characteristics –

- The nature of soil is slightly alkaline to strongly alkaline with pH range 8.16 to 8.51
- The available Nitrogen content range between 170 to 198 mg/kg
- The available Phosphorus content range between 1.20 to 1.42 mg/kg
- The available Potassium range between 38.4 to 58.6 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:

Thally Lake is the major lake about 3.5km Northwest from the Project area. Water body in the study area and the rainfall over the area is moderate, the rainwater storage in open wells and trenches are in practice over the area and the stored water acts as source of drinking water for few months after rainy season.

### 3.2.2 Ground Water Resources:

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

Ground water is occurring in pheratic conditions in weathered and fractured gneiss rock formation. The weathering is controlled by the intensity of weathering and fracturing. Dug wells as wells as bore wells are more common ground water abstraction structures in the area. The diameter of the dug well is in the range of 7 to 10 m and depth of dug wells range from 10 to 17 m bgl. The dug wells yield up to 1 lps in summer months and few wells remains dry. The yield is adequate for irrigation for one or two crops in monsoon period.

### 3.2.3 Methodology

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

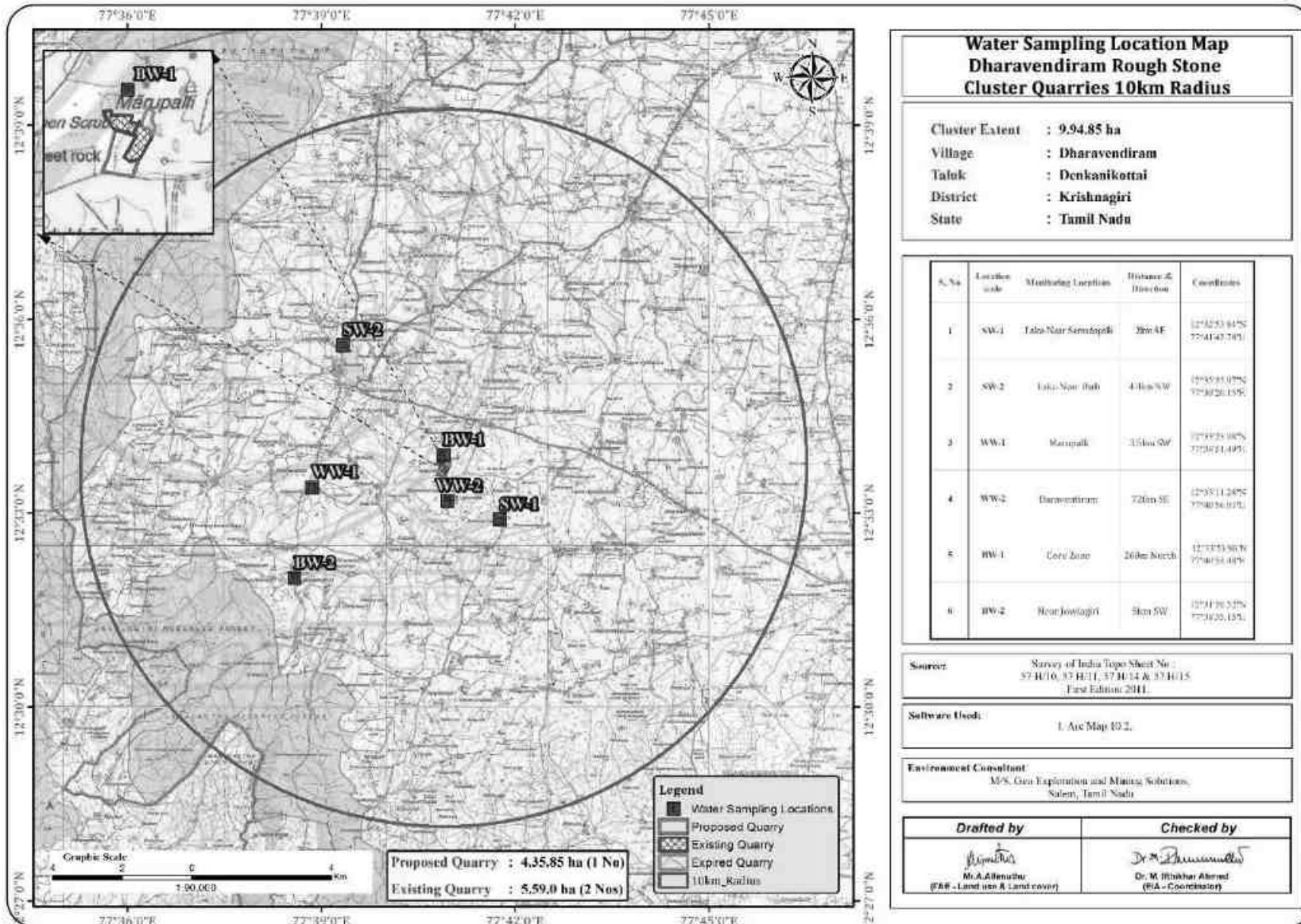
- Drainage pattern;
- Location of Residential areas representing different activities/likely impact areas; and
- Likely areas, which can represent baseline conditions

two (2) surface water and four (4) ground water samples were collected from the study area and were analysed for physio-chemical, heavy metals and bacteriological parameters in order to assess the effect of mining and other activities on surface and ground water. The samples were analysed as per the procedures specified by CPCB, IS-10500:2012 and ‘Standard methods for the Examination of Water and Wastewater’ published by American Public Health Association (APHA). The water sampling locations are given in Table 3.8 and shown as Figure 3.6.

**TABLE 3.8: WATER SAMPLING LOCATIONS**

S.NO	CODE	LOCATIONS	DISTANCE & DIRECTION	COORDINATES
<b>SURFACE WATER</b>				
1	SW-1	Lake Near Serandapalli	2km SE	12°32'53.84"N 77°41'45.78"E
2	SW-2	Lake Near Thalli	4.4km NW	12°35'35.97"N 77°39'20.15"E
<b>GROUND WATER</b>				
3	WW-1	Marupalli	3.5km SW	12°33'23.98"N 77°38'51.49"E
4	WW-2	Daraventiram	720m SE	12°33'11.28"N 77°40'56.91"E
5	BW-1	Core Zone	260m North	12°33'53.98"N 77°40'53.48"E
6	BW-2	Near Jowlagiri	5km SW	12°31'59.52"N 77°38'35.15"E

**FIGURE 3.5: WATER SAMPLING LOCATIONS AROUND 10 KM RADIUS**





**TABLE 3.9: GROUND WATER SAMPLING RESULTS**

S.No	Parameters	Units	RESULTS				Standards as Per IS 10500: 2012	
			WW-1	WW-2	BW-1	BW-2	Desirable Limit	Permissible limit
1	Colour	Hazen	< 5	< 10	< 5	< 5	5	5
2	Odour	...	Agreeable				Agreeable	Agreeable
3	pH	...	7.44	7.18	7.40	7.62	6.5 - 8.5	No Relaxation
4	Conductivity	µs/cm	962	980	894	910	Not Specified	Not Specified
5	Turbidity	NTU	< 0.5	< 0.5	< 0.5	< 0.5	1	5
6	Total Dissolved Solids,(TDS)	mg/L	580	588	540	532	500	2000
7	Total Hardness,(CaCO <sub>3</sub> )	mg/L	210	192	188	186	200	600
8	Calcium,(Ca)	mg/L	65	45	52	53	75	200
9	Magnesium,(Mg)	mg/L	11.5	19.5	14.0	13	30	100
10	Total Alkalinity,(CaCO <sub>3</sub> )	mg/L	188	155	172	172	200	600
11	Chloride,(Cl)	mg/L	192	172	170	190	250	1000
12	Sulphate,(SO <sub>4</sub> )	mg/L	44	44	41	42	200	400
13	Iron,(Fe)	mg/L	0.38	0.30	0.38	0.50	0.3	No relaxation
14	Chlorine (Residual)	mg/L	<0.1	<0.1	<0.1	<0.1	0.2	1
15	Fluoride,(F)	mg/L	0.54	0.70	0.54	0.58	1	1.5
16	Nitrate,(NO <sub>3</sub> )	mg/L	18.2	28.6	20.2	12.8	45	No relaxation
17	Copper,(Cu)	mg/L	<0.01	<0.01	<0.01	<0.01	0.05	1.5
18	Manganese,(Mn)	mg/L	<0.02	<0.02	<0.02	<0.02	0.1	0.3
19	Mercury,(Hg)	ug/L	<0.0005	<0.0005	<0.0005	<0.0005	0.001	No Relaxation
20	Cadmium,(Cd)	mg/L	<0.001	<0.001	<0.001	<0.001	0.003	No Relaxation
21	Selenium,(Se)	mg/L	<0.005	<0.005	<0.005	<0.005	0.01	No Relaxation
22	Aluminium,(Al)	mg/L	<0.005	<0.005	<0.005	<0.005	0.03	0.2
23	Lead,(Pb)	mg/L	<0.005	<0.005	<0.005	<0.005	0.01	No Relaxation
24	Zinc,(Zn)	mg/L	<0.05	<0.05	<0.05	<0.05	5	15
25	Total Chromium,(Cr)	mg/L	<0.02	<0.02	<0.02	<0.02	Not Specified	Not Specified
26	Boron,(B)	mg/L	<0.05	<0.05	<0.05	<0.05	0.5	1
27	Mineral Oil	mg/L	<0.01	<0.01	<0.01	<0.01	0.5	No Relaxation
28	Phenolic Compound,(C <sub>6</sub> H <sub>5</sub> OH)	mg/L	0.0005	0.0005	0.0005	0.0005	0.001	0.002
29	Anionic Detergent,(MBAS)	mg/L	<0.01	<0.01	<0.01	<0.01	0.2	1
30	Cyanide,(CN)*	mg/L	<0.01	<0.01	<0.01	<0.01	0.05	No Relaxation
31	Barium,(Ba)	mg/L	<0.05	<0.05	<0.05	<0.05	0.7	No Relaxation
32	Ammonia,(as Total NH <sub>3</sub> -N)*	mg/L	<0.01	<0.01	<0.01	<0.01	0.5	No Relaxation
33	Sulphide,(H <sub>2</sub> S)	mg/L	<0.01	<0.01	<0.01	<0.01	0.05	No Relaxation
34	Molybdenum,(Mo)	mg/L	<0.02	<0.02	<0.02	<0.02	0.07	No Relaxation
35	Arsenic,(As)	mg/L	<0.005	<0.005	<0.005	<0.005	0.01	0.05
36	Total Suspended Solids,(TSS)	mg/L	<1.0	<1.0	<1.0	<1.0	Not Specified	Not Specified
37	Total Coliform Count	MPN/100ml	120	140	150	110	Shall Not be Detectable	
38	Escherichia coli	MPN/100ml	<1.8	<1.8	<1.8	<1.8		

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

**TABLE 3.10: SURFACE WATER SAMPLING RESULTS**

Sl. No.	Parameter	Unit	RESULT		CPCB Designated Best Use
			SW1	SW2	
1	Color	Hazen	<10	<10	300
2	Odour	-	Agreeable		Not specified
3	Taste	-	Agreeable		Not specified
4	pH@ 25°C	-	7.28	7.71	6.5 – 8.5
5	Conductivity @ 25°C	µmhos/cm	1120	1010	
6	Turbidity	NTU	1.8	1.2	Not specified
7	Total Dissolved Solids	mg /l	672	606	1500
8	Total Hardness as CaCO <sub>3</sub>	mg/l	226	216	Not specified
9	Calcium as Ca	mg/l	68	65	Not specified
10	Magnesium as Mg	mg/l	13	13	Not specified
11	Total Alkalinity as CaCO <sub>3</sub>	mg /l	240	196	Not specified
12	Chloride as Cl-	mg/l	192	108	600
13	Sulphate as SO <sub>4</sub> -	mg/l	62	40	Not specified
14	Iron as Fe	mg/l	0.05	0.42	50
15	Free Residual Chlorine	mg /l	<0.1	<0.1	400
16	Fluoride as F	mg/l	0.90	0.48	Not specified
17	Nitrate	mg /l	28	22.4	Not specified
18	Copper (Cu)	mg /l	<0.01	<0.01	Not specified
19	Manganese (Mn)	mg /l	<0.02	<0.02	Not specified
20	Mercury (Hg)	mg /l	<0.0005	<0.0005	Not specified
21	Cadmium(Cd)	mg /l	<0.001	<0.001	0.01
22	Selenium as (Se)	mg /l	<0.005	<0.005	Not specified
23	Aluminium as Al	mg /l	<0.005	<0.005	Not specified
24	Lead(Pb)	mg /l	<0.005	<0.005	0.1
25	Zinc(Zn)	mg /l	<0.05	<0.05	15
26	Total chromium (Cr)	mg /l	<0.02	<0.02	0.05
27	Boron	mg /l	<0.05	<0.05	Not specified
28	Mineral Oil	mg /l	<0.01	<0.01	Not specified
29	Phenolic compounds as C <sub>6</sub> H <sub>5</sub> OH	mg /l	<0.0005	<0.0005	Not specified
30	Anionic Detergents (as MBAS)	mg /l	<0.01	<0.01	Not specified
31	Cyanide as CN	mg /l	<0.01	<0.01	Not specified
32	Biological Oxygen Demand (BOD at 27OC for 3 day)	mg /l	6.0	-	Not specified
33	Chemical Oxygen Demand (COD)	mg /l	25	-	Not specified
34	Dissolve Oxygen (DO)	mg /l	5.8	-	4
35	Barium as Ba	mg /l	<0.05	<0.05	Not specified
36	Ammonia (Total Ammonia-N)	mg /l	<0.01	<0.01	Not specified
37	Sulphide as H <sub>2</sub> S	mg /l	<0.01	<0.01	Not specified
38	Molybdenum as Mo	mg /l	<0.02	<0.02	Not specified
39	Total Arsenic (As)	mg /l	<0.005	<0.005	0.2
40	Total Suspended Solids	mg /l	10	<1.0	Not specified
41	Total Coliform	MPN/100ml	1600	170	5000
42	Escherichia coli	MPN/100ml	110	<1.8	Not specified

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### 3.2.4 Interpretation & Conclusion

#### Surface Water

**Ph:**

The pH is 7.28 to 7.71 while turbidity found within the standards (Optimal pH range for sustainable aquatic life is 6.5 to 8.5 pH).

**Total Dissolved Solids:**

Total Dissolved Solids is 606 to 672 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 108 to 192 mg/l. Nitrates is around 0.86 to 1.85 mg/l, while sulphates content is 40 to 62 mg/l.

#### Ground Water

The pH of the water samples collected ranged from 7.28 to 7.71 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 606 to 672 mg/l in all samples. The Total hardness varied between 216 to 226 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 of 65m. The maximum depth of this proposed project is 16m. 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 this proposed project.

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 3.11: WATER LEVEL OF OPEN WELLS 1 KM RADIUS**

S.No	Name	LATITUDE	LONGITUDE	MARCH	APRIL	MAY
1	OW1	77° 40' 41.13"E	12° 34' 03.85"N	11	11.4	11.7
2	OW2	77° 40' 56.87"E	12° 33' 11.27"N	11.3	11.7	12
3	OW3	77° 40' 37.73"E	12° 33' 35.98"N	10.8	11.2	11.5
4	OW4	77° 40' 41.85"E	12° 34' 22.32"N	10.5	10.9	11.2
5	OW5	77° 41' 12.62"E	12° 34' 31.09"N	11.1	11.5	11.8
6	OW6	77° 41' 35.16"E	12° 33' 12.42"N	11.8	12.2	12.5

Source: Onsite monitoring data

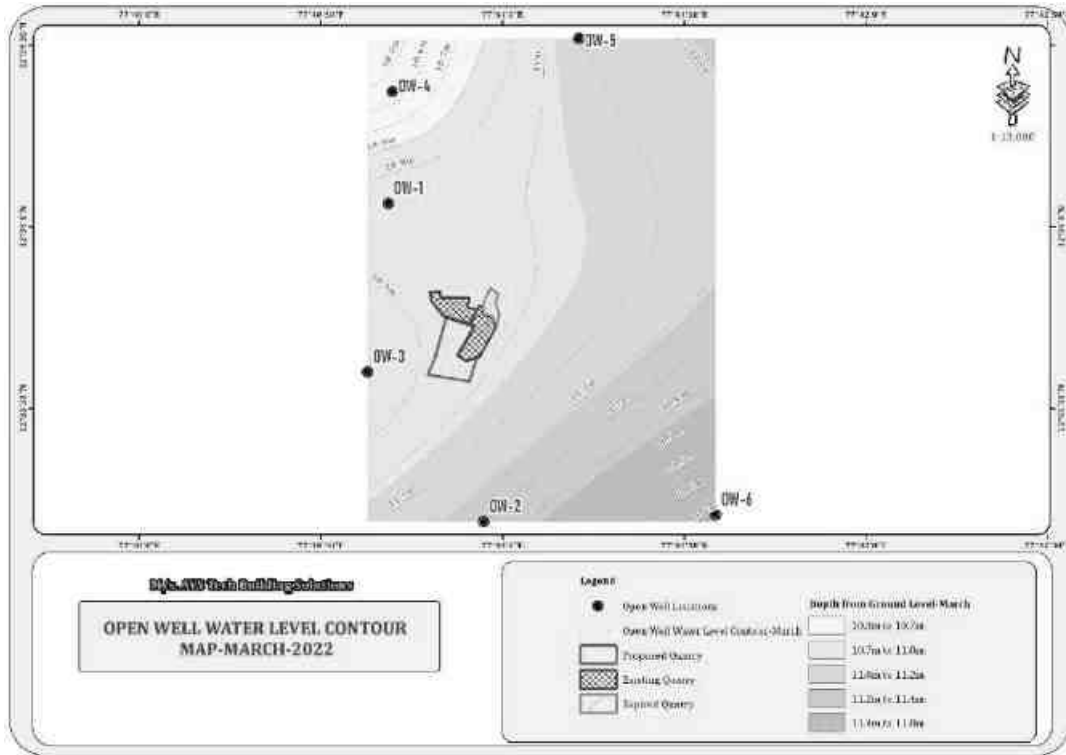
**TABLE 3.12: WATER LEVEL OF BOREWELLS 1 KM RADIUS**

S.No	Name	LATITUDE	LONGITUDE	MARCH	APRIL	MAY
1	BW1	77° 40' 53.51"E	12° 33' 54.17"N	65.2	65.6	66.2
2	BW2	77° 40' 34.29"E	12° 34' 11.66"N	65.8	66.2	66.8
3	BW3	77° 41' 16.65"E	12° 33' 40.76"N	66.5	66.9	67.5
4	BW4	77° 41' 05.72"E	12° 33' 15.67"N	66	66.4	67
5	BW5	77° 40' 49.96"E	12° 33' 11.79"N	65.5	65.9	66.5
6	BW6	77° 40' 26.85"E	12° 33' 30.50"N	66.2	66.6	67.2

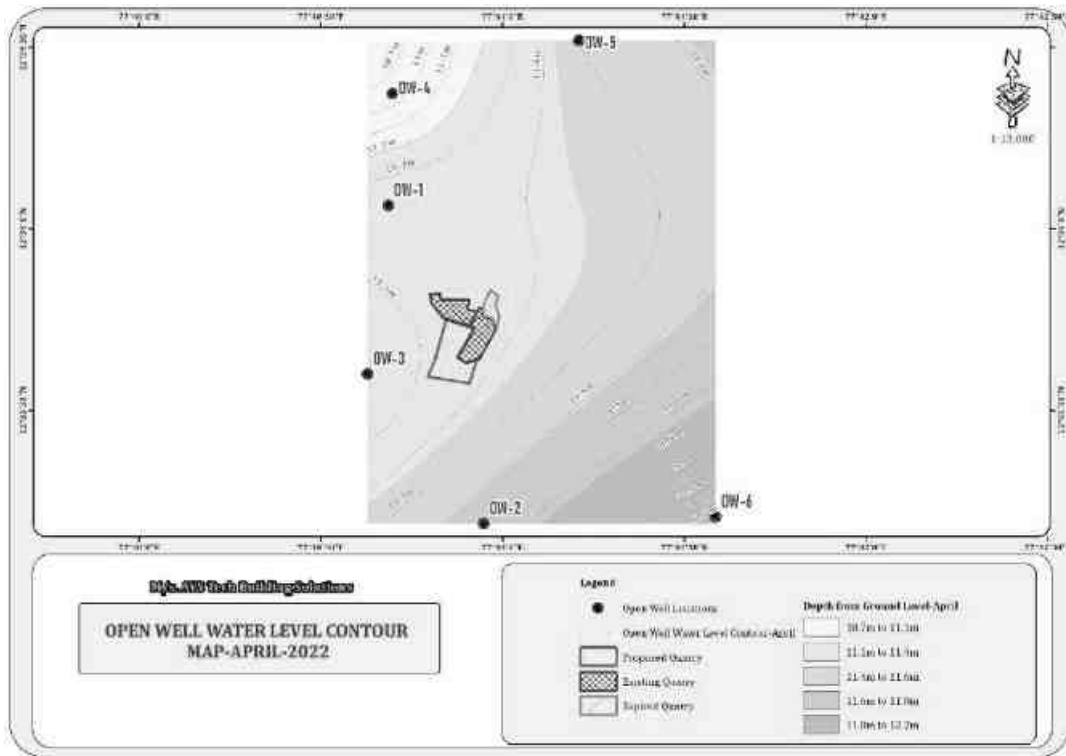
Source: Onsite monitoring data

It is observed from the borewell data the potential aquifer (Water table) in the area is about 65 – 70m bgl, the proposed quarrying depth will not intersect the Ground water table.

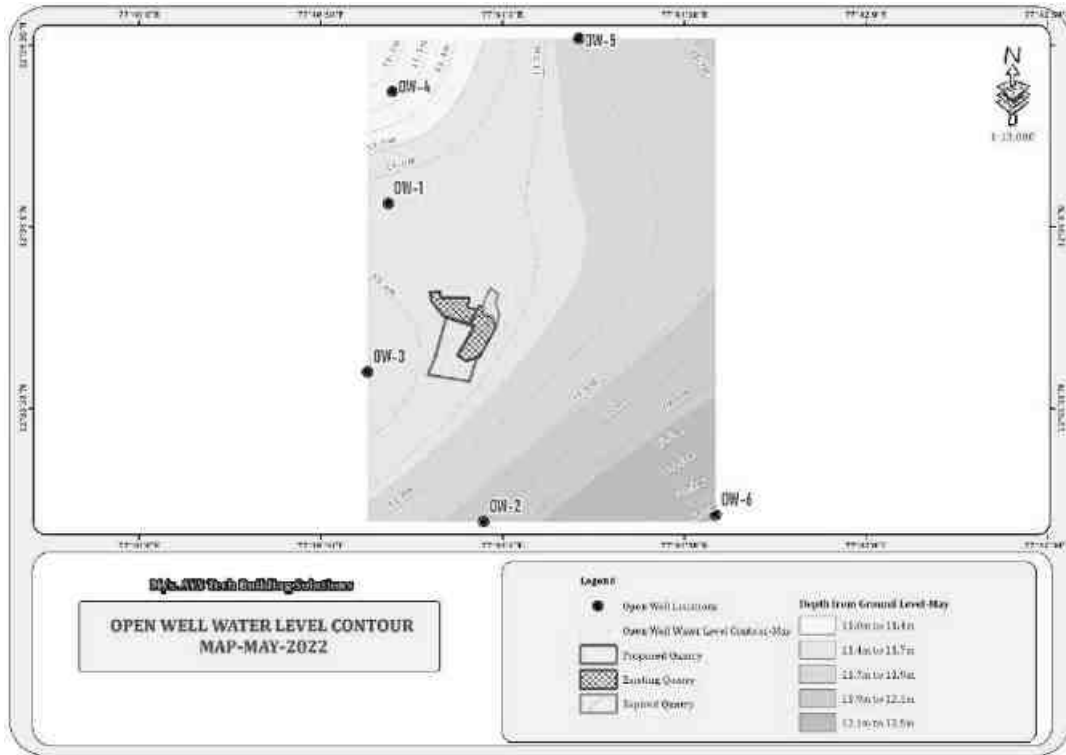
**FIGURE 3.6: OPEN WELL CONTOUR MAP – MARCH 2022**



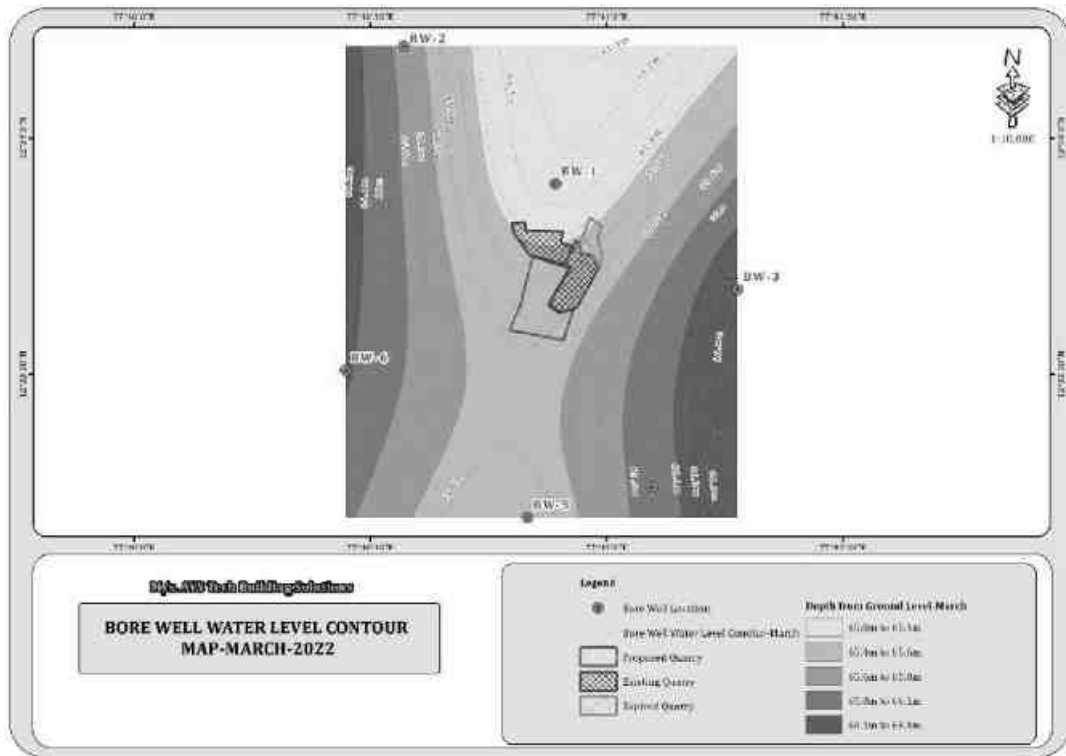
**FIGURE 3.7: OPEN WELL CONTOUR MAP – APRIL 2022**



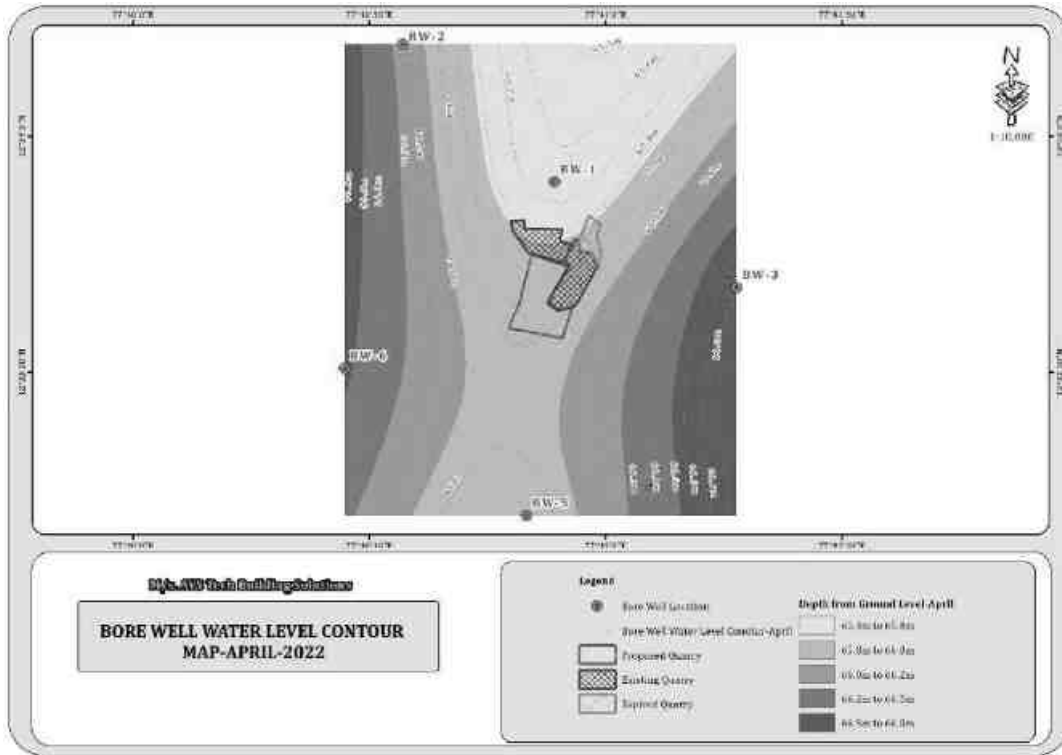
**FIGURE 3.8: OPEN WELL CONTOUR MAP – MAY 2022**



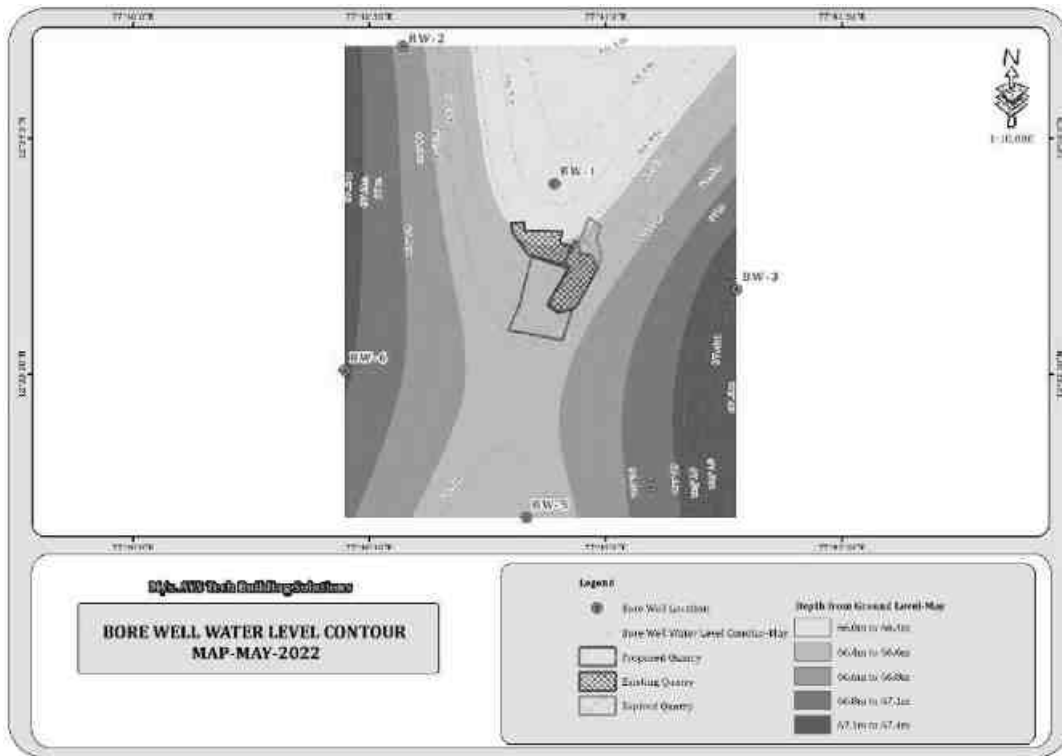
**FIGURE 3.9: BORE WELL CONTOUR MAP – MARCH 2022**



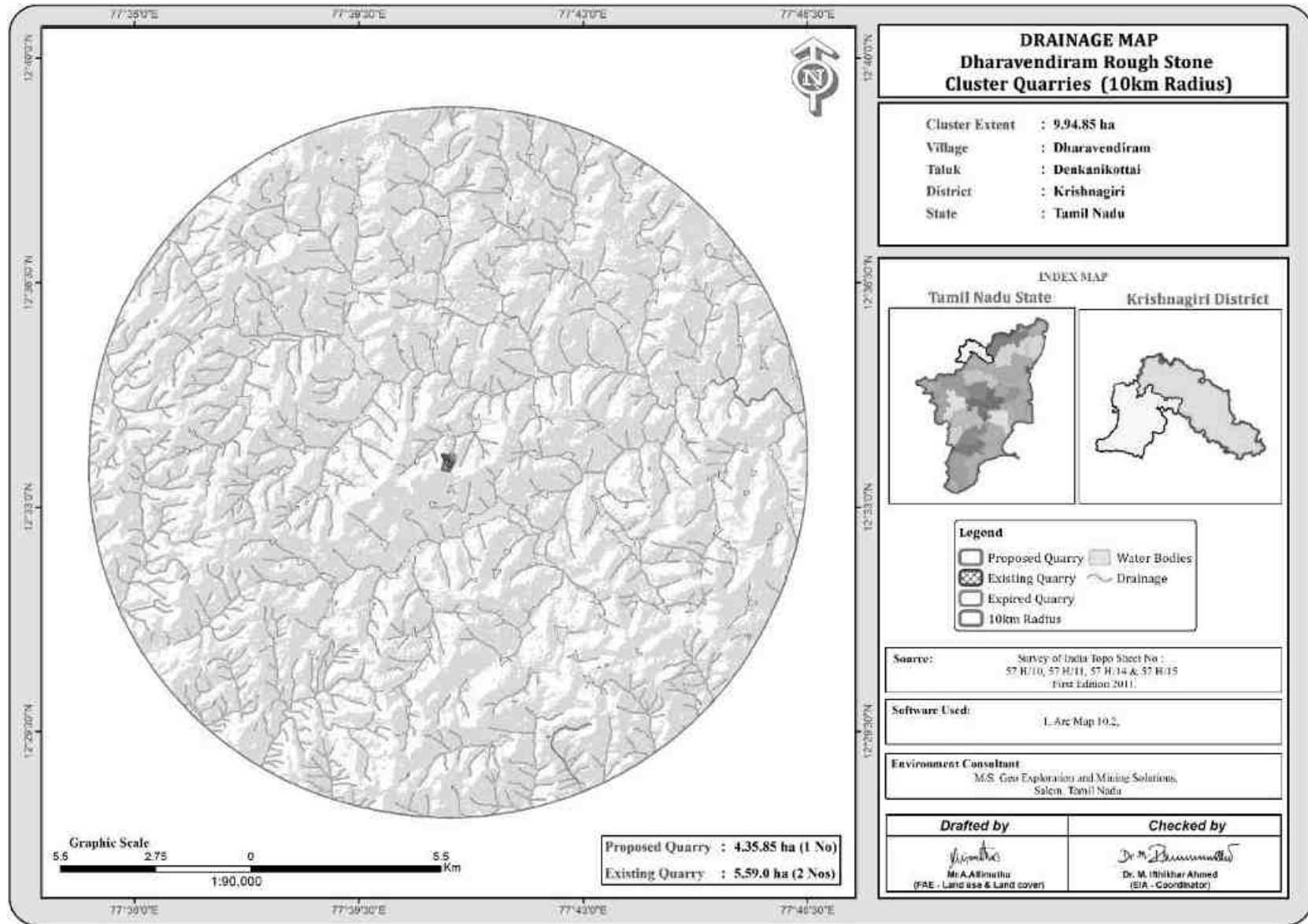
**FIGURE 3.10: BORE WELL CONTOUR MAP – APRIL 2022**



**FIGURE 3.11: BORE WELL CONTOUR MAP – MAY 2022**

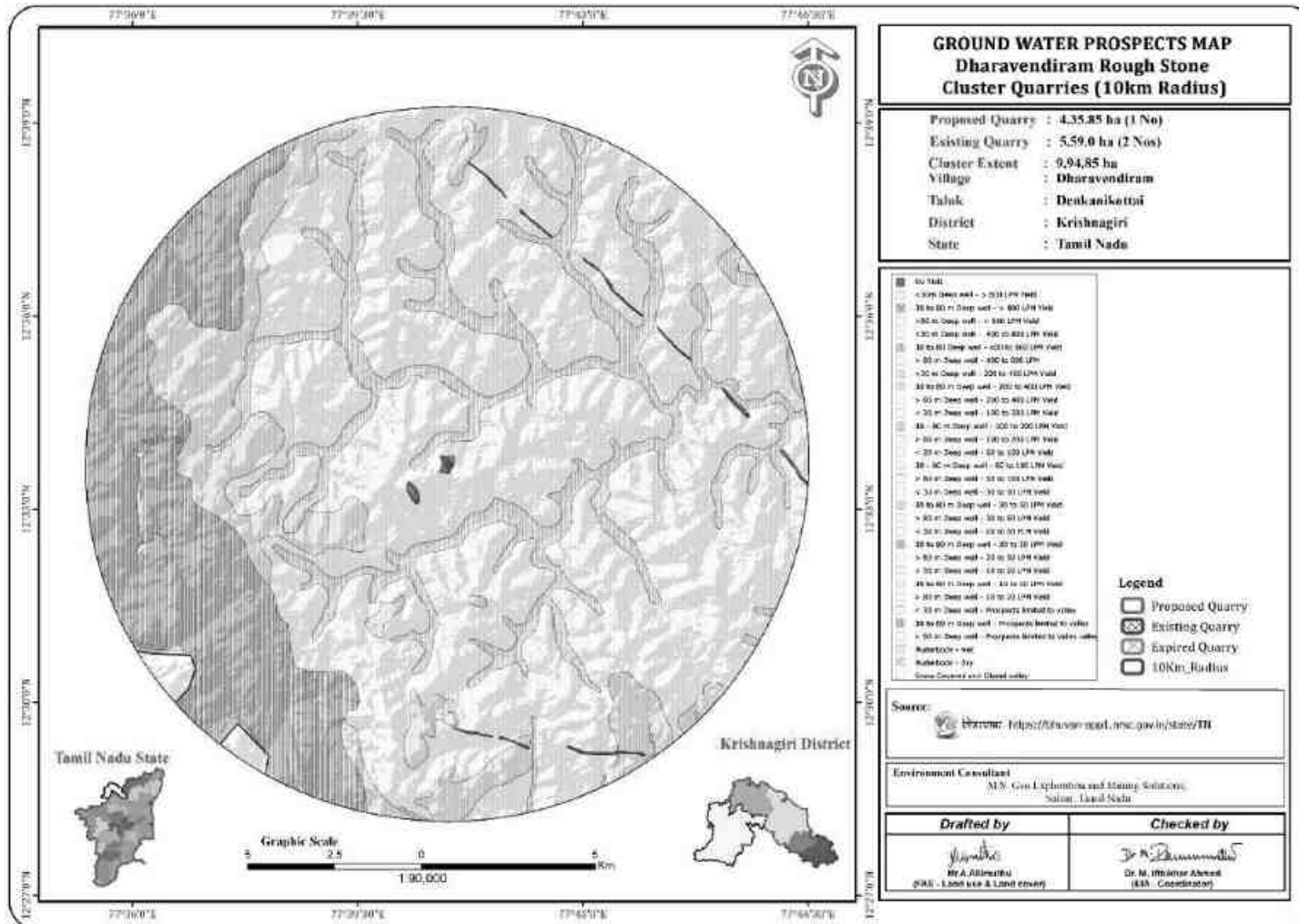


**FIGURE 3.12: DRAINAGE MAP AROUND 10 KM RADIUS FROM PROJECT SITE**





**FIGURE 3.13: 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 inhomogeneities and is capable of providing higher depth of investigation. This is four electrodes collinear set up where in the outer electrodes send current into the ground and the inner electrodes measure the potential difference.

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

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

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

$\Delta V$  = 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,

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

$\rho_r$  = Resistivity of Rocks

$\rho_w$  = Resistivity of water in pores of rock

$F$  = Formation Factor

$\emptyset$  = Fractional pore volume

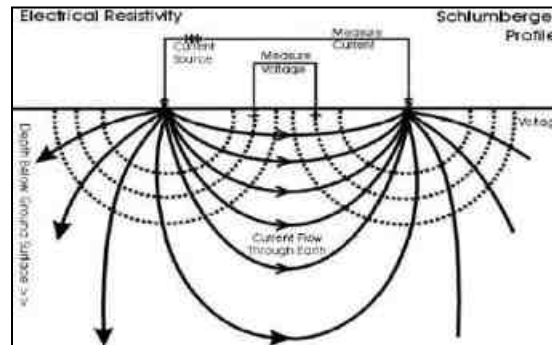
$A$  = Constants with values ranging from 0.5 to 2.5

### 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 noise ratio can be enhanced by  $\sqrt{N}$  where  $N$  is the number of stacked readings. This SSR meter in which running averages of measurements  $[1, (1+2)/2, (1+2+3)/3 \dots (1+2\dots+16/16)]$  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 of 70m. The maximum depth of the proposed project **16m**. Hence there is no possibilities of water table intersection during the entire mine life period besides it is also inferred topographically that there are no major water bodies intersecting the project area.

### 3.2.5.4 Geophysical Data Interpretation

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

## 3.3 AIR ENVIRONMENT

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

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

Krishnagiri lies on 489m above sea level. The climate is tropical in Krishnagiri. The Summers are much rainier than the winter. This climate is considered to be Aw according to the Köppen-Geiger climate classification.

- The average annual temperature is 25.5°C | 77.9 °F.
- The precipitation here is around 773 mm | 30.4 inch per year.
- The driest month is February, with 6 mm | 0.2 inch. The greatest amount of precipitation occurs in October, with an average of 144 mm | 5.7 inch.
- The warmest month of the year is April, with an average temperature of 29.0°C | 84.2°F.
- The lowest average temperatures in the year occur in January, when it is around 21.9°C | 71.4°F.
- The difference in precipitation between the driest month and the wettest month is 265 mm | 6inch. The variation in temperatures throughout the year is 4.6°C | 40.2°F.

Source: <https://en.climate-data.org/asia/india/tamil-nadu/krishnagiri-34157/>

**Rainfall –****TABLE 3.13: RAINFALL DATA**

Actual Rainfall in mm					Normal Rainfall in mm
2013	2014	2015	2016	2017	
766.0	757.6	1049.7	590.6	1145.9	850.58

Source: [Krishnagiri | TWAD \(tn.gov.in\)](#)

**TABLE 3.14: METEOROLOGICAL DATA RECORDED AT SITE**

S.No	Parameters		Mar–2022	Apr–2022	May–2022
1	Temperature (0C)	Max	27.9	30.73	29.38
		Min	20.85	25.5	23.55
		Avg	24.375	28.115	26.465
2	Relative Humidity (%)	Avg	63.875	62.84	74.345
3	Wind Speed (m/s)	Max	4.09	3.91	6.45
		Min	1.62	1.42	2.09
		Avg	2.855	2.665	4.27
4	Cloud Cover (OKTAS)		0-8	0-8	0-8
5	Wind Direction		E,SE	SE,ESE	W,WNW

Source: On-site monitoring/sampling by CHENNAI METTEX LAB PRIVATE LIMITED Laboratories in association with GEMS

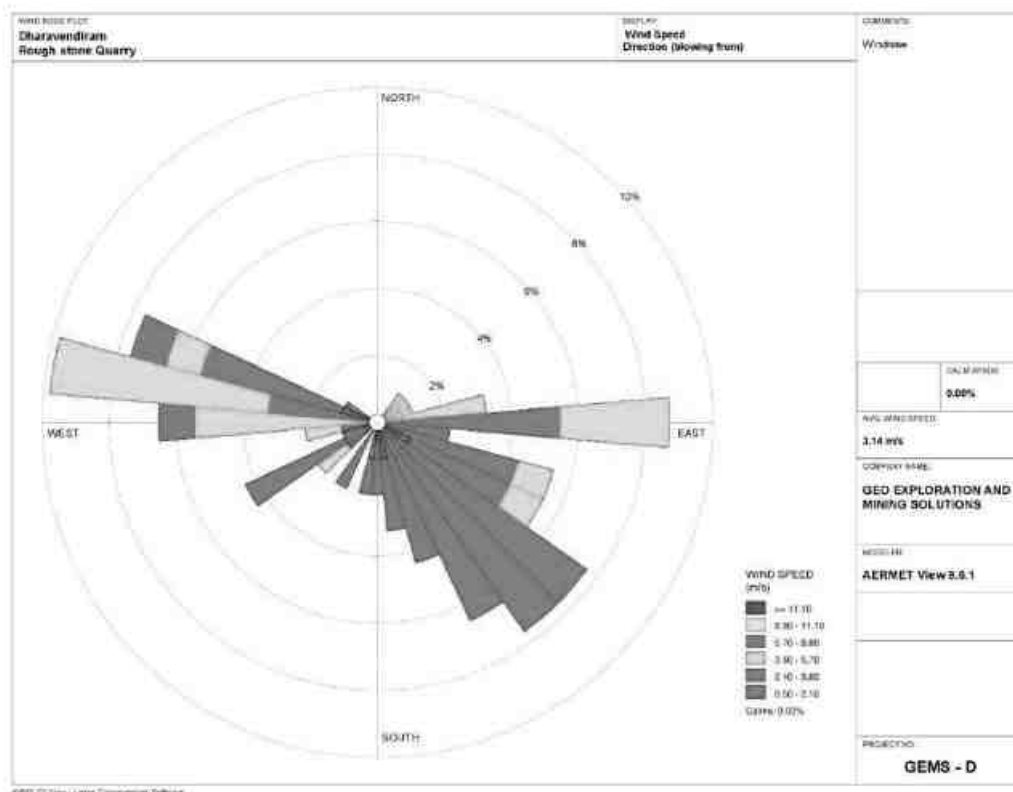
**Correlation between Secondary and Primary Data**

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

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

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

**FIGURE 3.14: WINDROSE DIAGRAM**



Source: Wind Rose plot view, Lake Environmental Software

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

- Predominant winds were from East – West direction
- Wind velocity readings were recorded between 0.50 to 11.10 m/s
- Calm conditions prevail of about 0.00 % of the monitoring period
- At an average temperature of 26.9 °C | 80.4 °F, April is the hottest month of the year. The lowest average temperatures in the year occur in December, when it is around 20.3 °C | 68.5 °F
- 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 3.15: METHODOLOGY AND INSTRUMENT USED FOR AAQ MONITORING**

Parameter	Method	Instrument
PM <sub>2.5</sub>	Gravimetric Method Beta attenuation Method	Fine Particulate Sampler Make – Thermo Environmental Instruments – TEI 121
PM <sub>10</sub>	Gravimetric Method Beta attenuation Method	Respirable Dust Sampler Make – Thermo Environmental Instruments – TEI 108
SO <sub>2</sub>	IS-5182 Part II (Improved West & Gaeke method)	Respirable Dust Sampler with gaseous attachment
NO <sub>x</sub>	IS-5182 Part II (Jacob & Hochheiser modified method)	Respirable Dust Sampler with gaseous attachment
Free Silica	NIOSH – 7601	Visible Spectrophotometry

Source: Sampling Methodology followed by CHENNAI METTEX LAB PRIVATE LIMITED Laboratories & CPCB Notification

**TABLE 3.16: 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 <sup>3</sup> )	Annual Avg.* 24 hours**	50.0 80.0	20.0 80.0
2	Nitrogen Dioxide (µg/m <sup>3</sup> )	Annual Avg. 24 hours	40.0 80.0	30.0 80.0
3	Particulate matter (size less than 10µm) PM <sub>10</sub> (µg/m <sup>3</sup> )	Annual Avg. 24 hours	60.0 100.0	60.0 100.0
4	Particulate matter (size less than 2.5 µm) PM <sub>2.5</sub> (µg/m <sup>3</sup> )	Annual Avg. 24 hours	40.0 60.0	40.0 60.0

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

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

\*\* 24 hourly / 8 hourly or 1 hourly monitored value as applicable shall be complied with 98 % of the time in a year. However, 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

### 3.3.4 Frequency & Parameters for Sampling

Ambient air quality monitoring has been carried out with a frequency of two samples per week at Eight (8) locations, adopting a continuous 24 hourly (3 shift of 8-hour) schedule for the period March to May, 2022. The baseline data of ambient air has been generated for PM<sub>10</sub>, PM<sub>2.5</sub>, Sulphur Dioxide (SO<sub>2</sub>) & Nitrogen Dioxide (NO<sub>2</sub>) 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

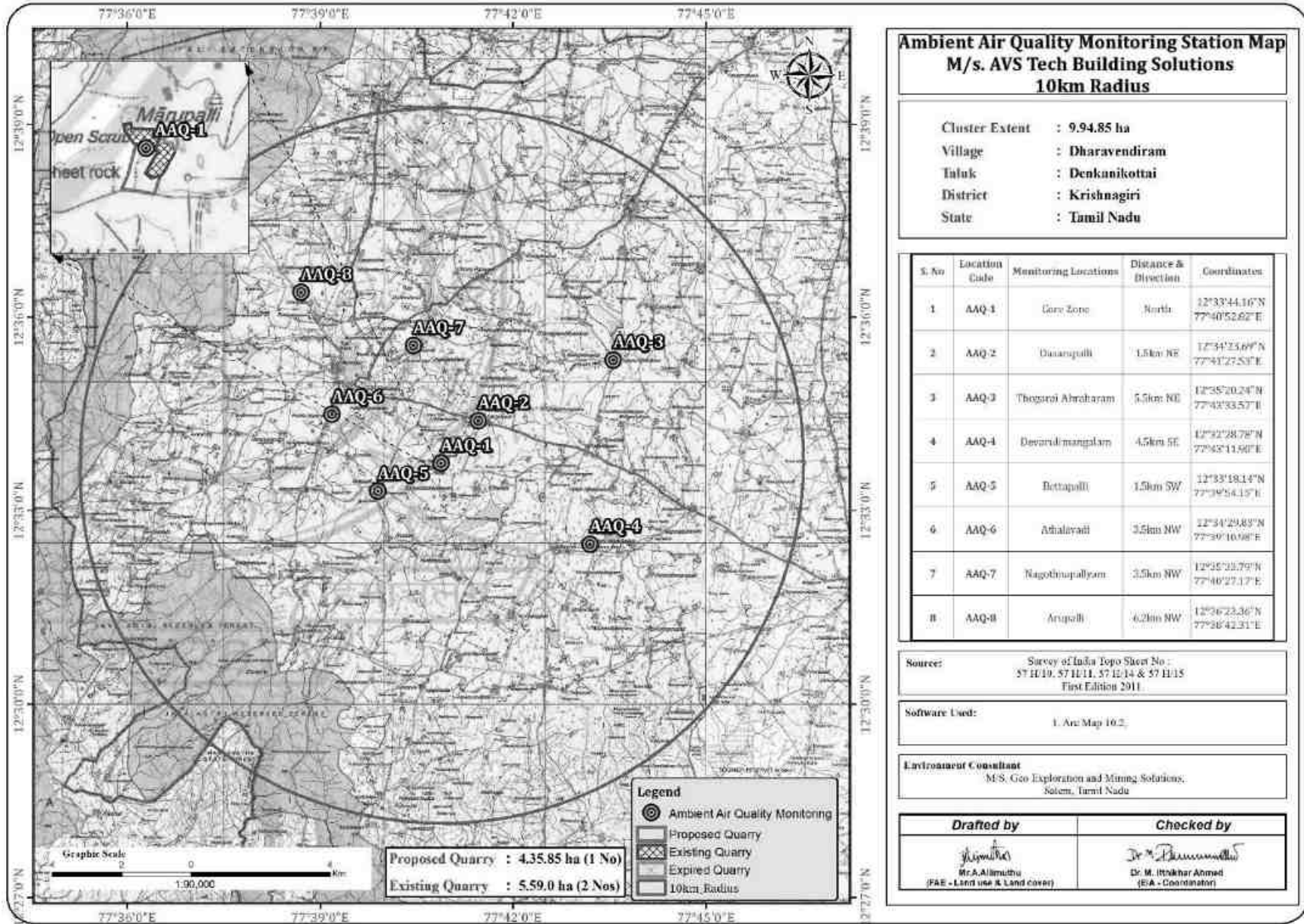
Eight (8) monitoring stations were set up in the study area as depicted in Figure 3.17 for assessment of the existing ambient air quality. Details of the sampling locations are as per given below.

**TABLE 3.17: AMBIENT AIR QUALITY (AAQ) MONITORING LOCATIONS**

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	AAQ1	Core zone	North	12°33'44.16"N 77°40'52.82"E
2	AAQ2	Dasarapalli	1.5km NE	12°34'23.69"N 77°41'27.53"E
3	AAQ3	Thogarai ahraram	5.5 km NE	12°35'20.24"N 77°43'33.57"E
4	AAQ4	Devarulimangalam	4.5 km SE	12°32'28.78"N 77°43'11.90"E
5	AAQ5	Bettapalli	1.5 km SW	12°33'18.14"N 77°39'54.15"E
6	AAQ6	Athalavadi	3.5 km NW	12°34'29.83"N 77°39'10.98"E
7	AAQ7	Nagothnapallyam	3.5 km NW	12°35'33.79"N 77°40'27.17"E
8	AAQ8	Arupalli	6.2 km NW	12°36'23.36"N 77°38'42.31"E

Source: On-site monitoring/sampling by CHENNAI METTEX LAB PRIVATE LIMITED Laboratories in association with GEMS

**FIGURE 3.15: AMBIENT AIR QUALITY LOCATIONS AROUND 10 KM RADIUS**



**TABLE 3.18: AMBIENT AIR QUALITY DATA LOCATION AAQ1**

Period: March – May-2022

Location: AAQ1- Core Zone (Project site)

Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>2</sub>	NH <sub>3</sub>	O <sub>3</sub>	CO	Pb	Ni	As	C <sub>6</sub> H <sub>6</sub>	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	mg/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>	ng/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
04.03.2022	5:30-5:30	120	59.8	26.3	5.4	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.03.2022	5:45-5:45	115	63.5	31.4	6.0	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2022	5:30-5:30	110	60.2	30.2	7.1	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2022	5:45-5:45	113	64.0	29.1	5.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2022	5:30-5:30	106	65.7	28.4	8.7	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2022	5:45-5:45	108	58.2	26.2	5.4	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2022	5:30-5:30	114	59.5	31.6	7.6	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2022	5:45-5:45	120	65.0	34.0	5.4	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.03.2022	5:30-5:30	118	63.6	30.3	7.1	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2022	5:45-5:45	115	62.3	28.8	6.5	19.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2022	5:30-5:30	102	56.8	31.1	6.0	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
02.04.2022	5:45-5:45	113	57.1	29.2	8.2	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2022	5:30-5:30	108	59.2	31.0	6.5	23.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.04.2022	5:45-5:45	106	56.4	25.1	7.6	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2022	5:30-5:30	114	58.2	28.3	5.4	19.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2022	5:45-5:45	120	62.0	30.6	6.5	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2022	5:30-5:30	121	61.3	32.4	8.7	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23.04.2022	5:45-5:45	105	57.8	26.1	6.5	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2022	5:30-5:30	113	60.2	32.3	6.0	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2022	5:45-5:45	112	62.4	34.0	7.6	23.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2022	5:30-5:30	105	55.7	25.6	8.7	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2022	5:45-5:45	104	59.1	28.2	7.1	19.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2022	5:30-5:30	114	63.8	32.4	8.2	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2022	5:45-5:45	112	64.2	30.9	5.4	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2022	5:30-5:30	113	60.5	32.0	7.6	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2022	5:45-5:45	106	65.6	33.1	8.2	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2022	5:30-5:30	113	61.3	30.2	6.0	19.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2022	5:45-5:45	117	58.4	29.4	7.1	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

**Note:** BDL: Below Detection Limit ;DL: Detection Limit ; NH<sub>3</sub>: BDL (DL:20); O<sub>3</sub>: BDL (DL:20); CO: BDL (DL:1.0); Pb: BDL (DL:0.1); Ni: BDL (DL:1.0); As: BDL (DL:1.0); C<sub>6</sub>H<sub>6</sub>: BDL (DL:1.0); BaP: BDL (DL:0.1)

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



**TABLE 3.19: AMBIENT AIR QUALITY DATA LOCATION AAQ2**

Period: March – May-2022

Location: AAQ2- Dasarapalli

Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>2</sub>	NH <sub>3</sub>	O <sub>3</sub>	CO	Pb	Ni	As	C <sub>6</sub> H <sub>6</sub>	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	mg/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>	ng/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
04.03.2022	5:30-5:30	116	58.4	27.4	7.1	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.03.2022	5:45-5:45	110	55.2	25.2	6.0	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2022	5:30-5:30	118	59.6	28.8	7.6	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2022	5:45-5:45	114	60.3	32.5	8.7	23.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2022	5:30-5:30	103	61.0	29.2	8.1	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2022	5:45-5:45	106	57.2	30.7	7.6	19.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2022	5:30-5:30	108	59.1	32.0	6.5	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2022	5:45-5:45	107	56.3	30.6	8.7	19.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.03.2022	5:30-5:30	118	60.4	34.3	8.1	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2022	5:45-5:45	114	62.7	30.2	6.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2022	5:30-5:30	117	61.9	32.1	5.4	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
02.04.2022	5:45-5:45	110	59.0	30.8	7.1	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2022	5:30-5:30	119	62.3	29.3	6.0	19.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.04.2022	5:45-5:45	107	56.1	24.0	8.1	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2022	5:30-5:30	120	64.4	35.2	5.4	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2022	5:45-5:45	108	56.2	29.1	7.6	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2022	5:30-5:30	106	58.6	27.5	7.1	19.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23.04.2022	5:45-5:45	117	65.5	30.5	8.1	19.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2022	5:30-5:30	114	58.7	35.0	8.7	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2022	5:45-5:45	106	56.3	26.3	7.1	19.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2022	5:30-5:30	120	65.0	33.4	6.0	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2022	5:45-5:45	119	54.2	34.5	7.6	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2022	5:30-5:30	120	64.9	28.0	6.0	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2022	5:45-5:45	115	58.1	27.7	7.1	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2022	5:30-5:30	105	55.0	25.4	5.4	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2022	5:45-5:45	106	57.4	26.5	6.0	19.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2022	5:30-5:30	118	63.2	28.9	8.2	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2022	5:45-5:45	109	59.1	27.2	6.5	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

**Note:** BDL: Below Detection Limit ;DL: Detection Limit ; NH<sub>3</sub>: BDL (DL:20); O<sub>3</sub>: BDL (DL:20); CO: BDL (DL:1.0); Pb: BDL (DL:0.1); Ni: BDL (DL:1.0); As: BDL (DL:1.0); C<sub>6</sub>H<sub>6</sub>: BDL (DL:1.0); BaP: BDL (DL:0.1)

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

**TABLE 3.20: AMBIENT AIR QUALITY DATA LOCATION AAQ3**

Period: March – May-2022

: AAQ3- Thogarai Ahraharam

Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>2</sub>	NH <sub>3</sub>	O <sub>3</sub>	CO	Pb	Ni	As	C <sub>6</sub> H <sub>6</sub>	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	mg/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>	ng/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
04.03.2022	5:30-5:30	113	57.6	25.1	8.2	19.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.03.2022	5:45-5:45	108	60.2	30.3	5.4	19.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2022	5:30-5:30	118	59.1	31.7	8.7	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2022	5:45-5:45	114	55.6	28.5	6.0	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2022	5:30-5:30	110	58.3	27.8	6.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2022	5:45-5:45	119	55.0	29.1	5.4	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2022	5:30-5:30	109	58.8	25.7	6.0	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2022	5:45-5:45	114	60.2	31.4	5.4	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.03.2022	5:30-5:30	120	63.9	30.0	8.2	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2022	5:45-5:45	121	64.9	34.2	7.1	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2022	5:30-5:30	106	60.3	26.6	8.2	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
02.04.2022	5:45-5:45	120	62.1	29.5	7.6	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2022	5:30-5:30	114	61.5	28.2	6.5	19.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.04.2022	5:45-5:45	106	58.1	29.0	7.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2022	5:30-5:30	120	57.5	28.1	6.0	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2022	5:45-5:45	106	62.8	30.8	6.5	19.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2022	5:30-5:30	113	60.2	31.1	7.6	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23.04.2022	5:45-5:45	110	63.6	34.3	6.0	19.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2022	5:30-5:30	105	59.4	30.7	8.2	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2022	5:45-5:45	103	56.5	26.6	7.6	19.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2022	5:30-5:30	109	58.9	25.7	7.1	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2022	5:45-5:45	116	56.2	29.8	5.4	19.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2022	5:30-5:30	122	61.0	27.1	6.0	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2022	5:45-5:45	120	63.0	28.2	8.7	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2022	5:30-5:30	109	56.2	26.0	8.2	19.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2022	5:45-5:45	112	58.4	25.6	6.0	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2022	5:30-5:30	118	59.4	27.0	5.4	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2022	5:45-5:45	119	60.2	29.7	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

**Note:** BDL: Below Detection Limit ;DL: Detection Limit ; NH<sub>3</sub>: BDL (DL:20); O<sub>3</sub>: BDL (DL:20); CO: BDL (DL:1.0); Pb: BDL (DL:0.1); Ni: BDL (DL:1.0); As: BDL (DL:1.0); C<sub>6</sub>H<sub>6</sub>: BDL (DL:1.0); BaP: BDL (DL:0.1)

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

**TABLE 3.21: AMBIENT AIR QUALITY DATA LOCATION AAQ4**

Period: March – May-2022

Location: AAQ4 – Devarulimangalam

Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>2</sub>	NH <sub>3</sub>	O <sub>3</sub>	CO	Pb	Ni	As	C <sub>6</sub> H <sub>6</sub>	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	mg/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>	ng/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
04.03.2022	5:30-5:30	118	57.4	27.4	7.1	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.03.2022	5:45-5:45	106	55.2	29.5	6.5	17.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2022	5:30-5:30	120	59.0	26.6	5.4	19.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2022	5:45-5:45	113	58.0	28.2	6.0	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2022	5:30-5:30	115	55.2	29.7	5.4	19.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2022	5:45-5:45	116	59.1	29.0	6.5	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2022	5:30-5:30	115	58.3	30.5	6.0	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2022	5:45-5:45	120	56.6	31.2	5.4	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.03.2022	5:30-5:30	121	60.2	34.5	7.1	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2022	5:45-5:45	108	62.4	32.4	7.6	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2022	5:30-5:30	117	57.5	31.0	6.0	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
02.04.2022	5:45-5:45	113	56.2	25.6	7.1	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2022	5:30-5:30	120	62.0	27.3	5.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.04.2022	5:45-5:45	119	58.2	28.4	7.6	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2022	5:30-5:30	115	60.1	31.8	6.0	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2022	5:45-5:45	109	59.6	32.1	7.1	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2022	5:30-5:30	114	57.1	30.3	8.7	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23.04.2022	5:45-5:45	120	61.9	31.5	7.1	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2022	5:30-5:30	113	58.2	30.7	6.0	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2022	5:45-5:45	110	56.1	32.2	8.2	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2022	5:30-5:30	102	59.0	30.8	8.7	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2022	5:45-5:45	115	62.2	28.1	5.4	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2022	5:30-5:30	105	54.6	25.6	6.0	19.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2022	5:45-5:45	106	60.3	30.4	6.0	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2022	5:30-5:30	119	58.1	27.5	6.5	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2022	5:45-5:45	121	60.8	28.2	8.2	19.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2022	5:30-5:30	120	64.4	29.1	6.0	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2022	5:45-5:45	109	58.3	30.4	5.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

**Note:** BDL: Below Detection Limit ;DL: Detection Limit ; NH<sub>3</sub>: BDL (DL:20); O<sub>3</sub>: BDL (DL:20); CO: BDL (DL:1.0); Pb: BDL (DL:0.1); Ni: BDL (DL:1.0); As: BDL (DL:1.0); C<sub>6</sub>H<sub>6</sub>: BDL (DL:1.0); BaP: BDL (DL:0.1)

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

**TABLE 3.22: AMBIENT AIR QUALITY DATA LOCATION AAQ5**

Period: March – May-2022

: AAQ5- Bettapalli

Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>2</sub>	NH <sub>3</sub>	O <sub>3</sub>	CO	Pb	Ni	As	C <sub>6</sub> H <sub>6</sub>	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	mg/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>	ng/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
04.03.2022	5:30-5:30	117	54.2	27.1	7.1	19.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.03.2022	5:45-5:45	110	55.5	26.5	6.0	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2022	5:30-5:30	112	56.7	28.3	5.4	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2022	5:45-5:45	106	58.2	30.5	7.6	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2022	5:30-5:30	120	64.3	32.7	6.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2022	5:45-5:45	121	62.1	33.5	6.0	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2022	5:30-5:30	109	56.6	25.4	7.1	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2022	5:45-5:45	120	58.2	30.1	5.4	17.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.03.2022	5:30-5:30	120	55.6	25.5	7.6	19.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2022	5:45-5:45	118	55.0	26.7	6.0	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2022	5:30-5:30	115	59.6	31.8	6.5	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
02.04.2022	5:45-5:45	113	57.0	29.1	7.1	19.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2022	5:30-5:30	115	56.5	25.3	7.6	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.04.2022	5:45-5:45	120	59.2	30.6	5.4	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2022	5:30-5:30	119	57.1	28.0	8.7	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2022	5:45-5:45	117	60.3	33.2	6.5	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2022	5:30-5:30	120	65.4	34.7	7.1	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23.04.2022	5:45-5:45	109	54.6	27.3	7.6	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2022	5:30-5:30	120	62.3	20.2	6.0	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2022	5:45-5:45	116	60.0	31.0	8.2	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2022	5:30-5:30	115	59.1	26.2	5.4	19.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2022	5:45-5:45	120	54.3	25.3	7.6	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2022	5:30-5:30	107	58.4	28.5	7.1	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2022	5:45-5:45	114	56.5	27.6	8.2	19.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2022	5:30-5:30	108	57.1	26.6	7.6	19.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2022	5:45-5:45	105	60.6	31.3	6.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2022	5:30-5:30	109	55.2	25.7	6.0	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2022	5:45-5:45	114	56.5	30.5	5.4	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

**Note:** BDL: Below Detection Limit ;DL: Detection Limit ; NH<sub>3</sub>: BDL (DL:20); O<sub>3</sub>: BDL (DL:20); CO: BDL (DL:1.0); Pb: BDL (DL:0.1); Ni: BDL (DL:1.0); As: BDL (DL:1.0); C<sub>6</sub>H<sub>6</sub>: BDL (DL:1.0); BaP: BDL (DL:0.1)

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

**TABLE 3.23: AMBIENT AIR QUALITY DATA LOCATION AAQ6**

Period: March – May-2022

Location: AAQ6 – Athalavadi

Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>2</sub>	NH <sub>3</sub>	O <sub>3</sub>	CO	Pb	Ni	As	C <sub>6</sub> H <sub>6</sub>	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	mg/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>	ng/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
04.03.2022	5:30-5:30	112	60.1	26.2	6.5	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.03.2022	5:45-5:45	114	59.3	30.1	7.6	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2022	5:30-5:30	120	62.1	34.5	8.2	16.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2022	5:45-5:45	116	59.4	25.1	5.4	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2022	5:30-5:30	107	56.2	26.9	6.0	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2022	5:45-5:45	113	65.8	32.7	7.1	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2022	5:30-5:30	108	55.6	26.0	8.2	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2022	5:45-5:45	114	59.2	30.1	7.6	17.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.03.2022	5:30-5:30	117	57.0	30.5	6.5	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2022	5:45-5:45	114	62.8	32.6	6.0	19.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2022	5:30-5:30	118	60.6	59.1	8.2	16.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
02.04.2022	5:45-5:45	120	55.3	31.0	5.4	19.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2022	5:30-5:30	111	58.4	29.2	8.2	17.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.04.2022	5:45-5:45	109	64.5	31.7	5.4	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2022	5:30-5:30	116	60.3	32.1	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2022	5:45-5:45	117	57.4	27.5	8.2	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2022	5:30-5:30	115	58.3	29.2	6.0	19.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23.04.2022	5:45-5:45	119	61.0	30.4	7.5	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2022	5:30-5:30	108	60.1	27.0	6.5	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2022	5:45-5:45	121	64.2	28.3	8.7	16.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2022	5:30-5:30	111	56.8	26.2	7.1	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2022	5:45-5:45	120	59.9	28.7	8.2	16.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2022	5:30-5:30	118	62.2	33.0	7.6	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2022	5:45-5:45	115	60.6	31.2	6.5	17.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2022	5:30-5:30	114	60.9	27.3	5.4	19.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2022	5:45-5:45	105	58.1	29.8	6.0	19.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2022	5:30-5:30	120	59.2	30.1	8.2	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2022	5:45-5:45	116	57.5	27.5	7.1	16.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

**Note:** BDL: Below Detection Limit ;DL: Detection Limit ; NH<sub>3</sub>: BDL (DL:20); O<sub>3</sub>: BDL (DL:20); CO: BDL (DL:1.0); Pb: BDL (DL:0.1); Ni: BDL (DL:1.0); As: BDL (DL:1.0); C<sub>6</sub>H<sub>6</sub>: BDL (DL:1.0); BaP: BDL (DL:0.1)

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

**TABLE 3.24: AMBIENT AIR QUALITY DATA LOCATION AAQ7**

Period: March – May-2022

Location: AAQ7– Nagothnapallyam

Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>2</sub>	NH <sub>3</sub>	O <sub>3</sub>	CO	Pb	Ni	As	C <sub>6</sub> H <sub>6</sub>	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	mg/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>	ng/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
04.03.2022	5:30-5:30	118	59.1	25.6	6.5	19.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.03.2022	5:45-5:45	110	55.2	28.3	6.0	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2022	5:30-5:30	118	60.8	27.4	7.6	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2022	5:45-5:45	113	57.3	29.5	6.5	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2022	5:30-5:30	115	58.5	30.1	5.4	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2022	5:45-5:45	114	56.1	26.8	7.1	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2022	5:30-5:30	117	57.6	25.3	7.6	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2022	5:45-5:45	123	59.0	34.1	8.2	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.03.2022	5:30-5:30	115	58.1	30.4	5.4	19.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2022	5:45-5:45	106	59.8	28.9	7.6	17.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2022	5:30-5:30	114	55.6	26.0	6.0	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
02.04.2022	5:45-5:45	108	64.2	29.7	5.4	19.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2022	5:30-5:30	119	55.3	26.5	7.1	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.04.2022	5:45-5:45	117	60.6	29.2	5.4	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2022	5:30-5:30	121	62.4	34.0	6.5	19.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2022	5:45-5:45	113	62.2	31.6	8.2	17.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2022	5:30-5:30	102	55.5	30.1	6.0	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23.04.2022	5:45-5:45	109	51.7	27.4	7.6	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2022	5:30-5:30	110	54.4	27.2	5.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2022	5:45-5:45	115	57.5	29.5	7.1	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2022	5:30-5:30	116	59.5	30.2	8.2	19.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2022	5:45-5:45	120	62.4	27.8	6.5	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2022	5:30-5:30	122	61.9	29.0	6.0	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2022	5:45-5:45	106	55.9	26.3	8.2	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2022	5:30-5:30	110	61.3	32.5	7.1	19.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2022	5:45-5:45	120	62.2	31.4	5.4	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2022	5:30-5:30	112	56.9	27.3	7.6	22.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2022	5:45-5:45	116	58.4	30.1	8.7	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

**Note:** BDL: Below Detection Limit ;DL: Detection Limit ; NH<sub>3</sub>: BDL (DL:20); O<sub>3</sub>: BDL (DL:20); CO: BDL (DL:1.0); Pb: BDL (DL:0.1); Ni: BDL (DL:1.0); As: BDL (DL:1.0); C<sub>6</sub>H<sub>6</sub>: BDL (DL:1.0); BaP: BDL (DL:0.1)

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

**TABLE 3.25: AMBIENT AIR QUALITY DATA LOCATION AAQ8**

Period: March – May-2022

Location: AAQ8– Arupalli

Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>2</sub>	NH <sub>3</sub>	O <sub>3</sub>	CO	Pb	Ni	As	C <sub>6</sub> H <sub>6</sub>	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	mg/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>	ng/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
04.03.2022	5:30-5:30	109	56.0	27.5	7.1	19.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.03.2022	5:45-5:45	117	60.2	26.1	5.4	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2022	5:30-5:30	107	57.6	28.1	6.5	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2022	5:45-5:45	118	62.3	30.2	8.2	19.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2022	5:30-5:30	120	30.2	31.5	6.0	17.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2022	5:45-5:45	121	60.9	34.1	7.6	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2022	5:30-5:30	105	63.1	32.0	8.2	19.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2022	5:45-5:45	108	61.2	26.6	5.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.03.2022	5:30-5:30	112	56.3	29.2	7.6	19.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2022	5:45-5:45	103	62.2	31.1	8.2	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2022	5:30-5:30	114	56.1	27.9	6.0	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
02.04.2022	5:45-5:45	109	56.8	30.3	7.5	19.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2022	5:30-5:30	118	59.4	27.1	6.5	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.04.2022	5:45-5:45	105	58.0	29.8	8.2	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2022	5:30-5:30	117	57.4	25.6	6.0	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2022	5:45-5:45	108	59.5	28.2	5.4	19.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2022	5:30-5:30	115	56.3	32.0	7.6	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23.04.2022	5:45-5:45	113	61.9	29.7	8.2	19.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2022	5:30-5:30	107	56.0	26.1	6.0	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2022	5:45-5:45	116	60.7	30.8	7.6	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2022	5:30-5:30	105	56.6	25.2	6.5	19.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2022	5:45-5:45	116	63.2	28.3	7.1	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2022	5:30-5:30	118	61.6	29.7	6.0	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2022	5:45-5:45	110	60.7	33.6	5.4	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2022	5:30-5:30	113	57.1	25.0	7.1	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2022	5:45-5:45	107	55.2	26.2	6.0	19.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2022	5:30-5:30	118	59.0	27.4	7.6	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2022	5:45-5:45	116	58.2	25.2	5.4	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

**Note:** BDL: Below Detection Limit ;DL: Detection Limit ; NH<sub>3</sub>: BDL (DL:20); O<sub>3</sub>: BDL (DL:20); CO: BDL (DL:1.0); Pb: BDL (DL:0.1); Ni: BDL (DL:1.0); As: BDL (DL:1.0); C<sub>6</sub>H<sub>6</sub>: BDL (DL:1.0); BaP: BDL (DL:0.1)

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

**TABLE 3.26: ABSTRACT OF AMBIENT AIR QUALITY DATA**

Sl. No.	Parameter	Pollutant Concentration, $\mu\text{g}/\text{m}^3$			
		PM <sub>2.5</sub>	PM <sub>10</sub>	SO <sub>2</sub>	NO <sub>2</sub>
1	No. of Observations	260	260	260	260
2	10th Percentile Value	25.7	55.6	5.4	18.1
3	20th Percentile Value	26.6	56.5	6.0	18.6
4	30th Percentile Value	27.5	57.4	6.0	19.0
5	40th Percentile Value	28.3	58.2	6.5	19.4
6	50th Percentile Value	29.2	59.1	7.1	20.3
7	60th Percentile Value	30.1	59.8	7.1	20.7
8	70th Percentile Value	30.7	60.6	7.6	20.7
9	80th Percentile Value	31.6	62.0	8.2	21.2
10	90th Percentile Value	32.8	63.1	8.2	22.0
11	95th Percentile Value	34.2	64.4	8.7	22.5
12	98th Percentile Value	34.9	65.5	8.7	23.2
13	Arithmetic Mean	30.1	60.2	7.2	20.5
14	Geometric Mean	30.0	60.1	7.1	20.5
15	Standard Deviation	3.0	3.2	1.2	1.6
16	NAAQ Norms*	25.7	55.6	5.4	18.1
17	% Values exceeding Norms*	34.9	65.5	8.7	23.2

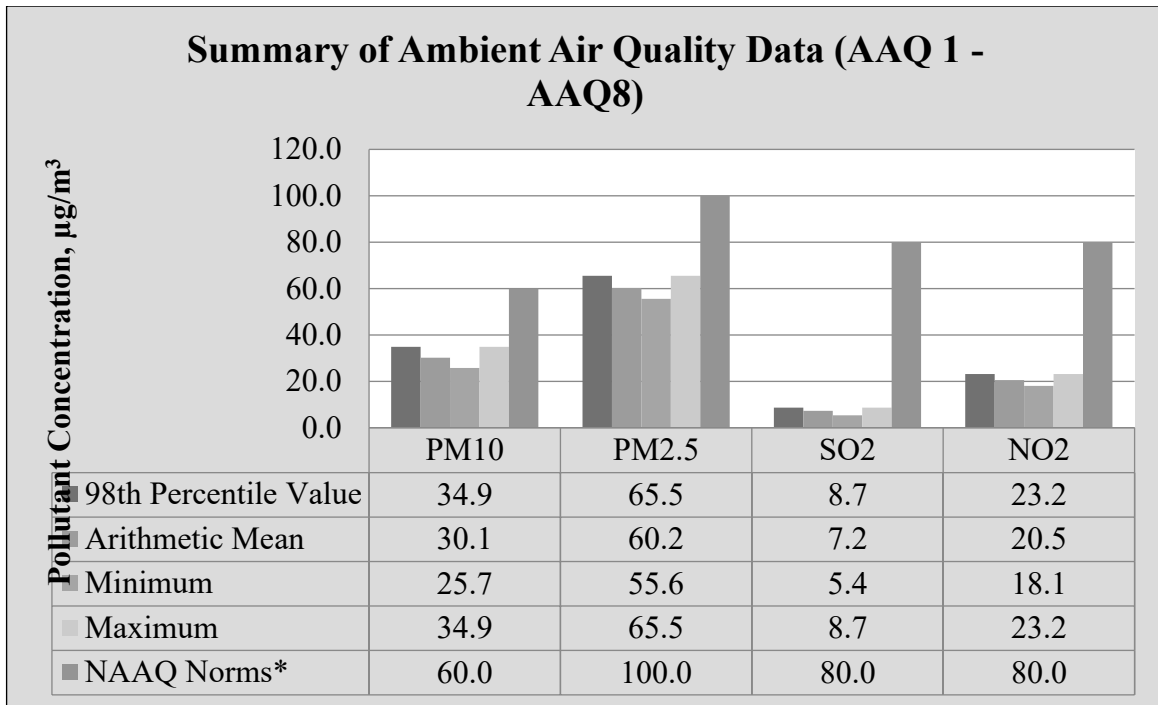
**Legend:** PM<sub>2.5</sub>-Particulate Matter size less than 2.5  $\mu\text{m}$ ; PM<sub>10</sub>-Respirable Particulate Matter size less than 10  $\mu\text{m}$ ; SO<sub>2</sub>-Sulphur dioxide; NO<sub>x</sub>-Oxides of Nitrogen; CO-Carbon monoxide; O<sub>3</sub>-Ozone; NH<sub>3</sub>-Ammonia;

Pb-Particulate Lead; As-Particulate Arsenic; Ni-Particulate Nickel; C<sub>6</sub>H<sub>6</sub>-Benzene & BaP- Benzo (a) pyrene in particulate phase levels were monitored below their respective detectable limits

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

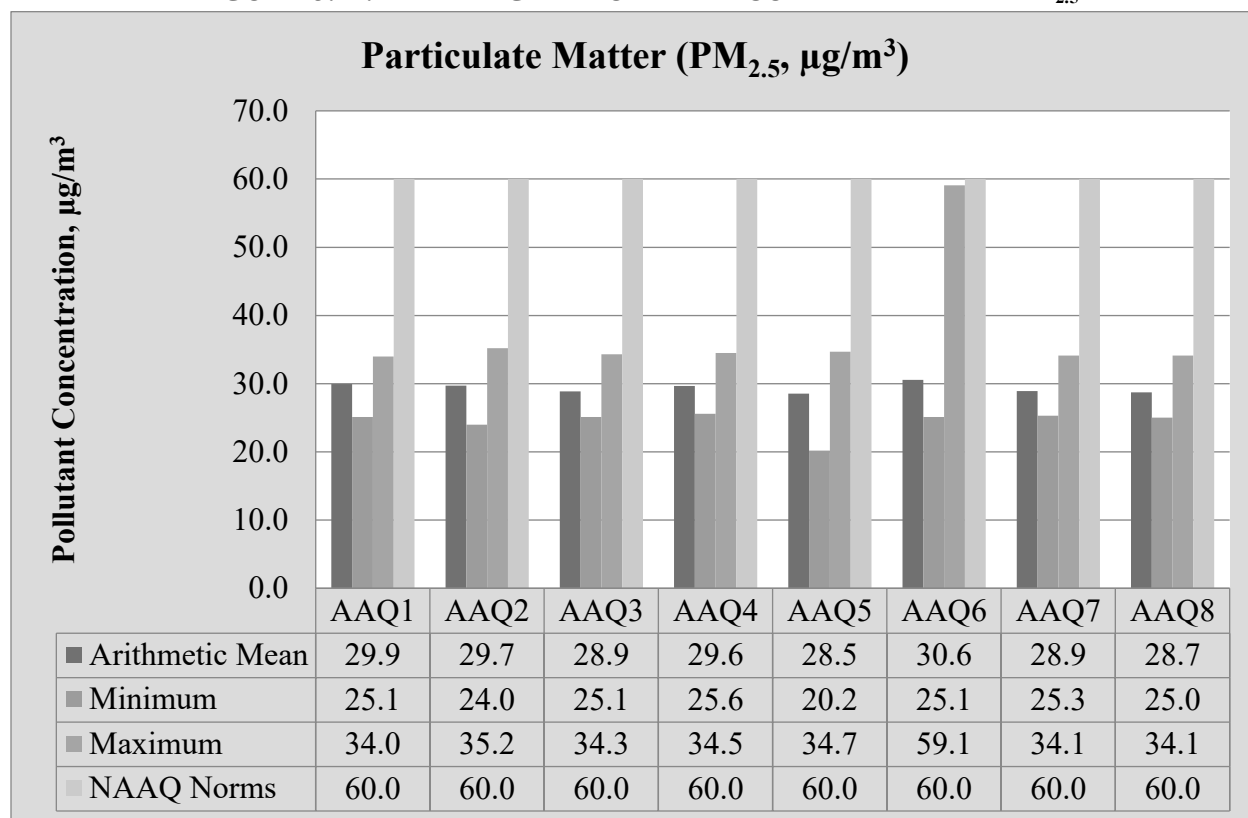


**FIGURE 3.16: BAR DIAGRAM OF SUMMARY OF AAQ 1 – AAQ 8**



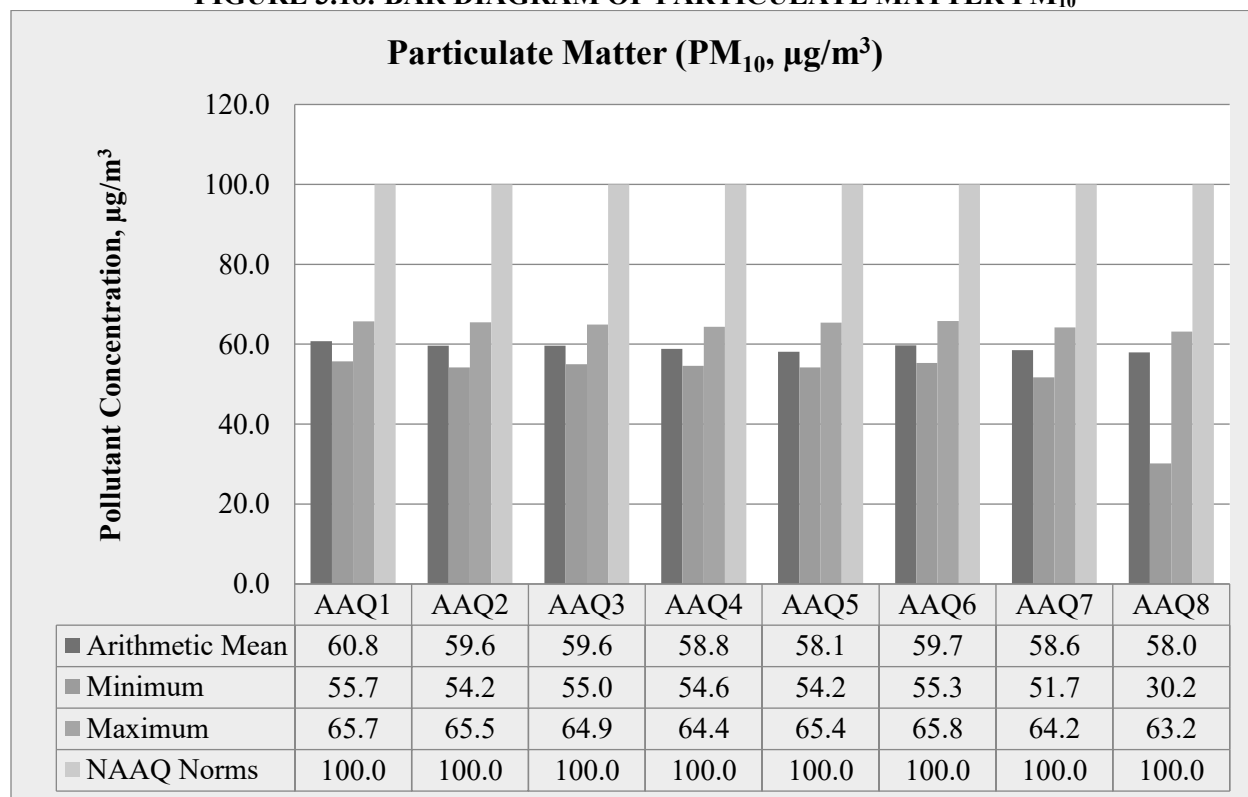
Source: Table 3.17 to 3.27

**FIGURE 3.17: BAR DIAGRAM OF PARTICULATE MATTER PM<sub>2.5</sub>**



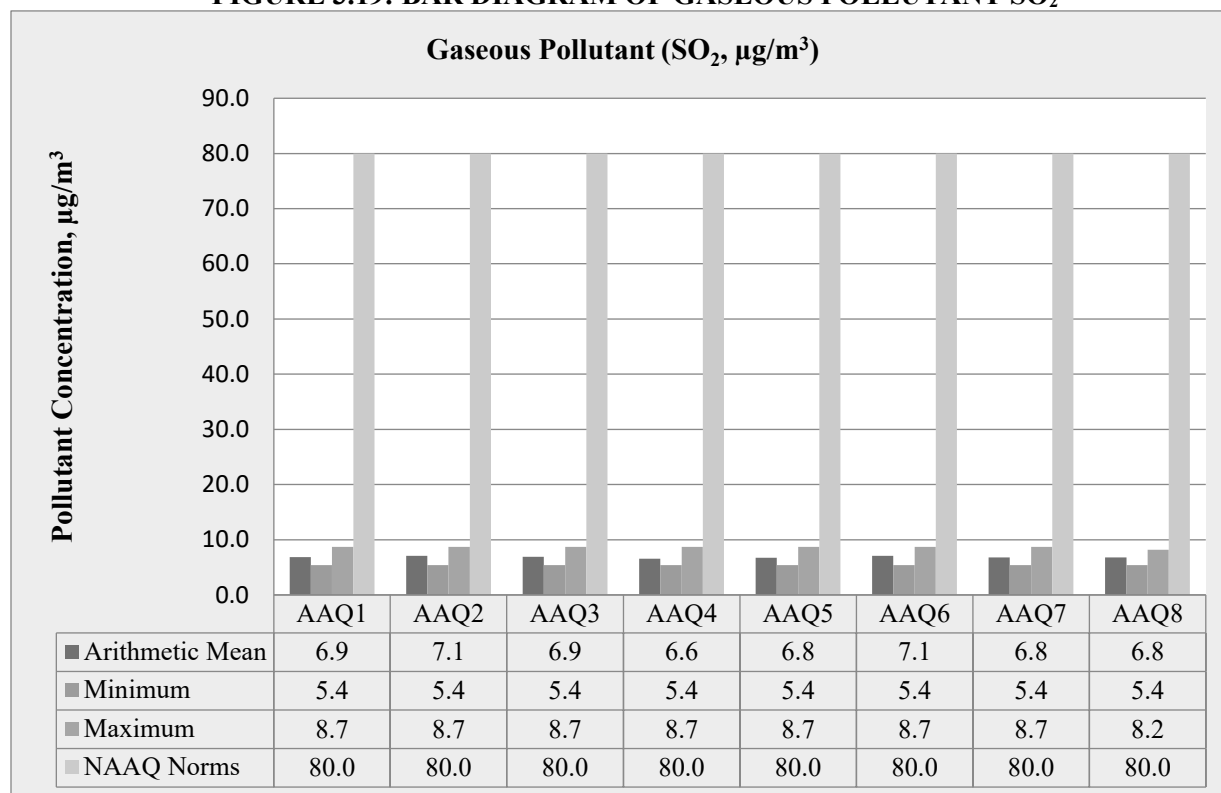
Source: Table 3.17 to 3.27

**FIGURE 3.18: BAR DIAGRAM OF PARTICULATE MATTER PM<sub>10</sub>**



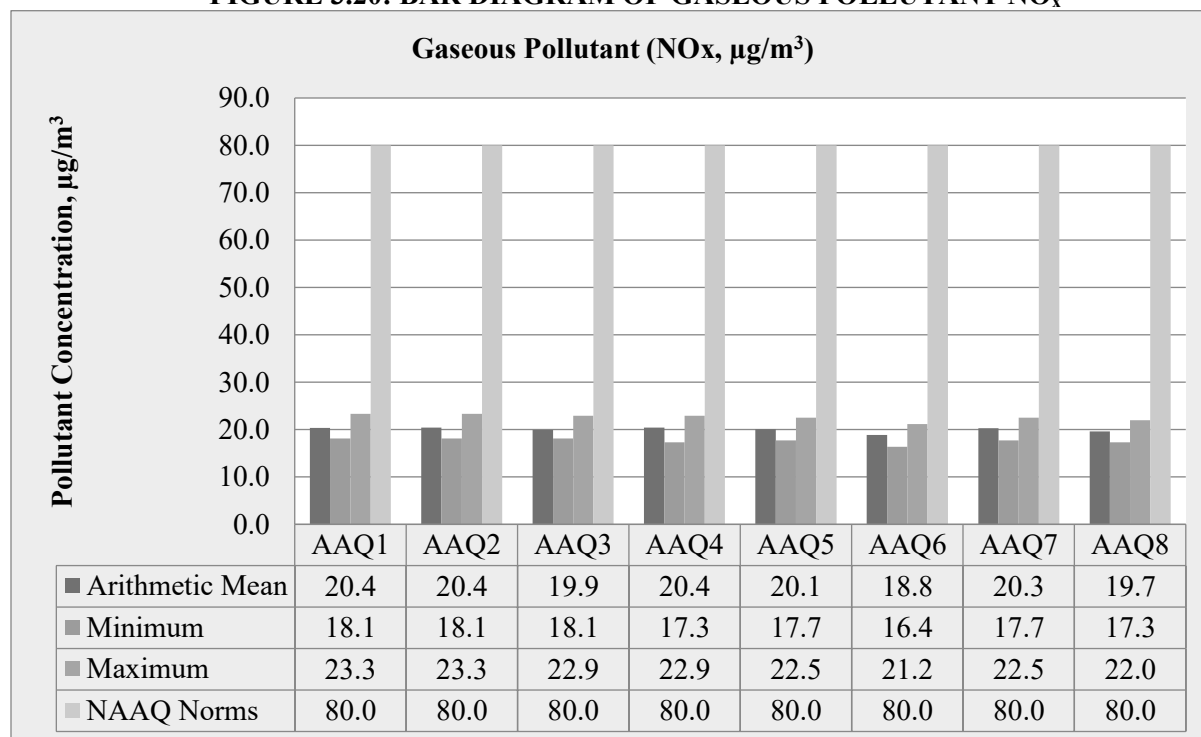
Source: Table 3.17 to 3.27

**FIGURE 3.19: BAR DIAGRAM OF GASEOUS POLLUTANT SO<sub>2</sub>**



Source: Table 3.17 to 3.27

**FIGURE 3.20: BAR DIAGRAM OF GASEOUS POLLUTANT NO<sub>x</sub>**



Source: Table 3.17 to 3.27

### 3.3.6 Interpretations & Conclusion

As per monitoring data, PM<sub>10</sub> ranges from 55.6 µg/m<sup>3</sup> to 65.5 µg/m<sup>3</sup>, PM<sub>2.5</sub> data ranges from 25.7 µg/m<sup>3</sup> to 34.9 µg/m<sup>3</sup>, SO<sub>2</sub> ranges from 5.4 µg/m<sup>3</sup> to 8.7 µg/m<sup>3</sup> and NO<sub>2</sub> data ranges from 18.1 µg/m<sup>3</sup> to 23.2 µg/m<sup>3</sup>. 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 8AAQ monitoring stations for 30 days average during the study period.

**TABLE 3.27: AVERAGE FUGITIVE DUST SAMPLE VALUES**

AAQ Locations	Avg SPM (µg/m <sup>3</sup> )
AAQ 1	111.81
AAQ 2	112.42
AAQ 3	112.96
AAQ 4	114.23
AAQ 5	114.85
AAQ 6	114.31
AAQ7	114.27
AAQ8	111.96

Source: Onsite monitoring/ sampling by CHENNAI METTEX LAB PRIVATE LIMITED Laboratories

**TABLE 3.28: FUGITIVE DUST SAMPLE VALUES IN µg/m<sup>3</sup>**

SPM (µg/m <sup>3</sup> )	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
<b>Average</b>	111.81	112.42	112.96	114.23	114.85	114.31	114.27	111.96
<b>Min</b>	102.00	103.00	103.00	102.00	105.00	105.00	102.00	103.00
<b>Max</b>	121.00	120.00	122.00	121.00	121.00	121.00	123.00	121.00

Source: Calculations from Lab Analysis Reports

### 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 3.29: DETAILS OF SURFACE NOISE MONITORING LOCATIONS**

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	N1	Core zone	West	12°33'40.65"N 77°40'50.08"E
2	N2	Dasarapalli	1.5km NE	12°34'22.02"N 77°41'26.70"E
3	N3	Thogarai ahraharam	5.5km NE	12°35'20.07"N 77°43'29.13"E
4	N4	Devarulimangalam	4.5km SE	12°32'28.00"N 77°43'10.28"E
5	N5	Bettapalli	1.5km SW	12°33'18.69"N 77°39'54.31"E
6	N6	Athalavadi	3.5km NW	12°34'29.58"N 77°39'11.06"E
7	N7	Nagothnapallyam	3.5km NW	12°35'33.50"N 77°40'27.11"E
8	N8	Arupalli	6.0km NW	12°36'18.77"N 77°38'44.77"E

Source: On-site monitoring/sampling by CHENNAI METTEX LAB PRIVATE LIMITED 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  $L_{eq}$ , 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

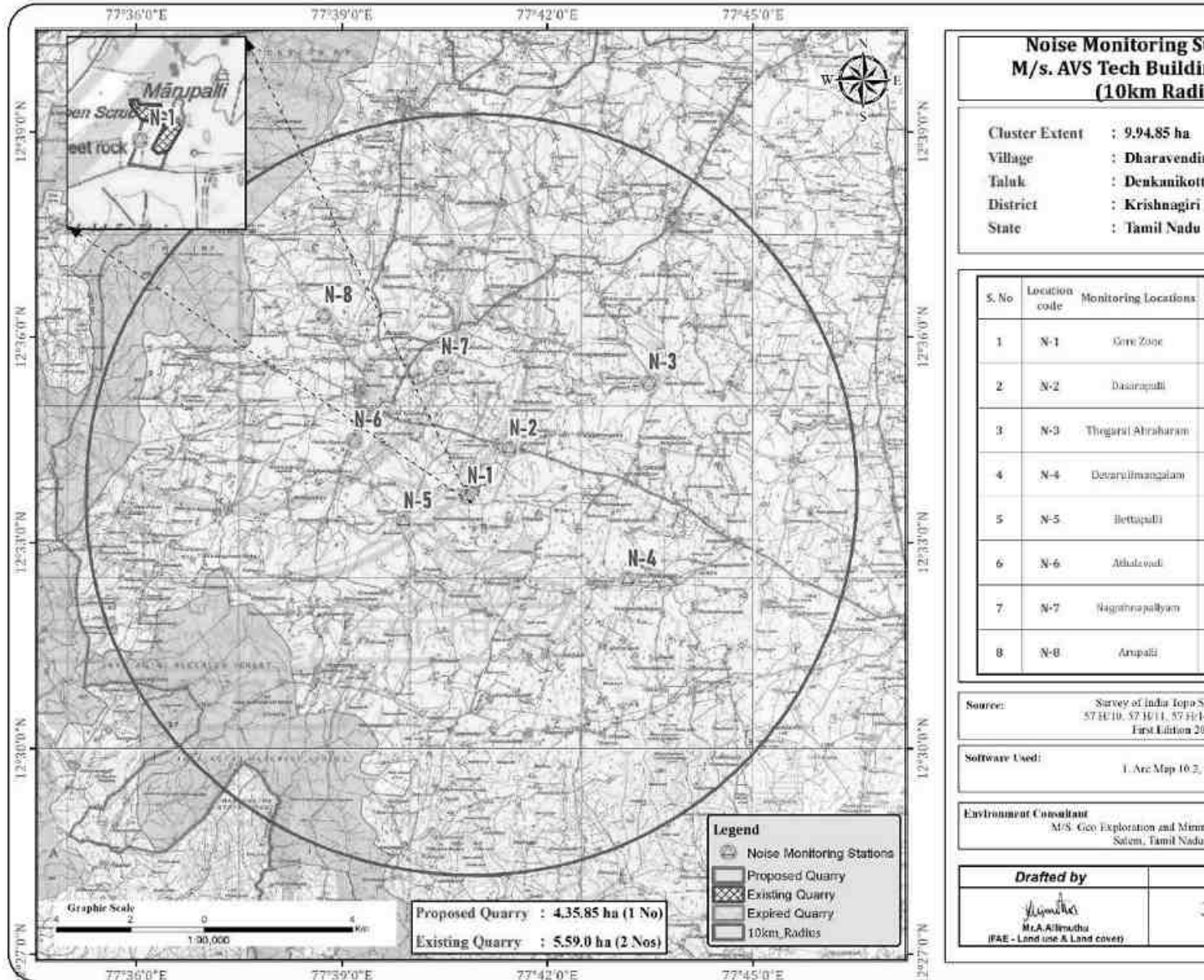
Measured noise levels, displayed as a function of time, is useful for describing the acoustical climate of the community. Noise levels recorded at each station with a time interval of about 60 minutes are computed for equivalent noise levels. Equivalent noise level is a single number descriptor for describing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

$$L_{eq} = 10 \log L / T \sum (10L_n/10)$$

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

T = Time interval of observation

**FIGURE 3.21: NOISE MONITORING STATIONS AROUND 10 KM RADIUS**



**3.4.3 Analysis of Ambient Noise Level in the Study Area**

The Digital Sound pressure level has been measured by a sound level meter (Model: HTC SL-1352)

An analysis of the different Leq data obtained during the study period has been made. Variation was noted during the day-time as well as night-time. The results are presented in below Table 3.31

Day time: 6:00 hours to 22.00 hours. Night time: 22:00 hours to 6.00 hours.

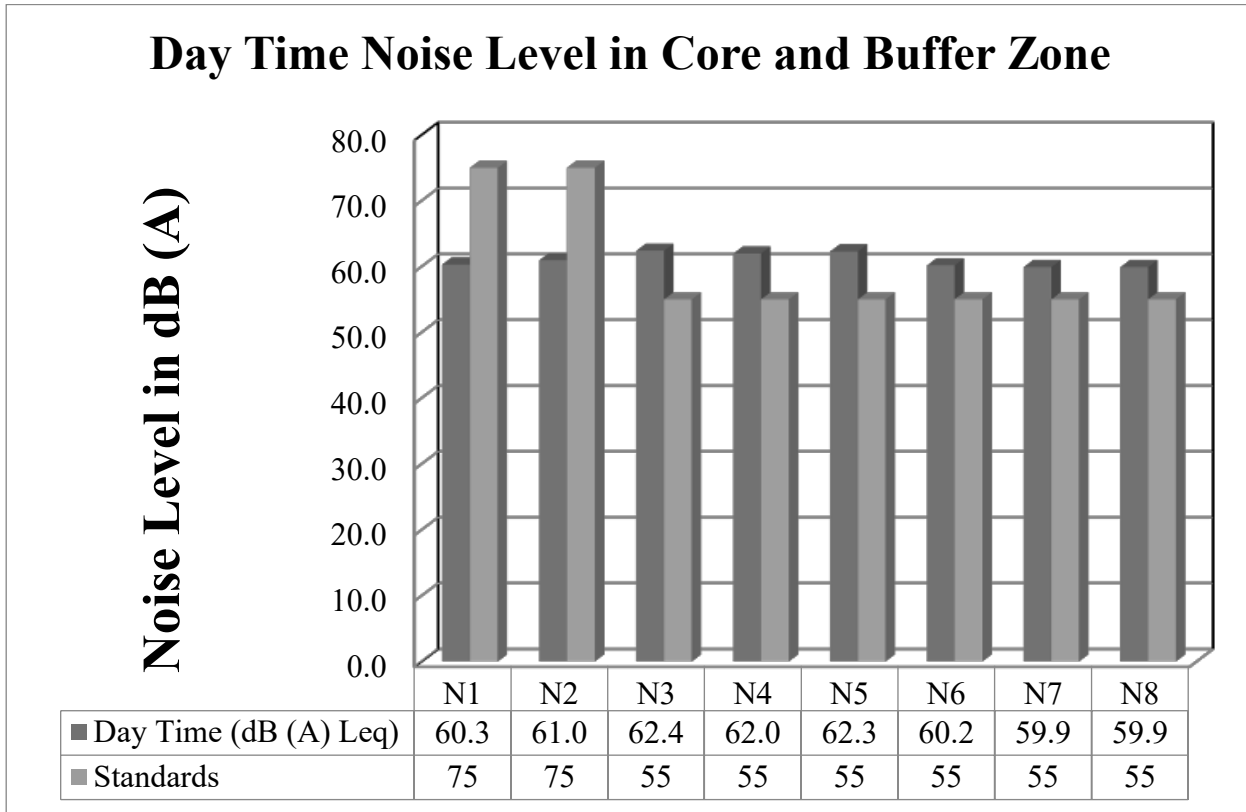
**TABLE 3.30: AMBIENT NOISE QUALITY RESULT**

S. No	Locations	Noise level (dB (A) Leq)		Ambient Noise Standards
		Day Time	Night Time	
1	Core zone	60.3	51.5	<b>Industrial</b> Day Time- 75 dB (A) Night Time- 70 dB (A)
2	Dasarapalli	61.2	49.8	<b>Residential</b>

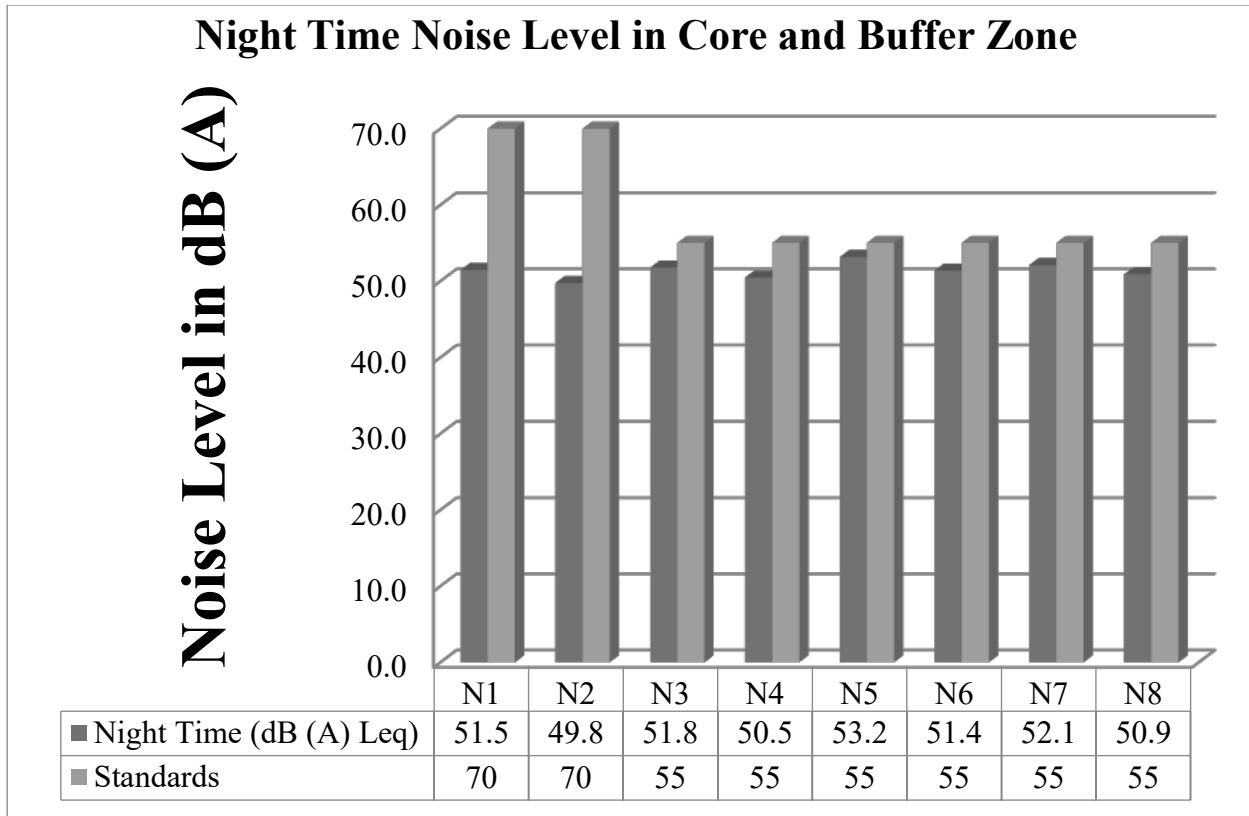
3	Thogarai ahracharam	62.4	51.8	<b>Day Time– 55 dB (A) Night Time- 45 dB (A)</b>
4	Devarulimangalam	62.0	50.5	
5	Bettapalli	62.3	53.2	
6	Athalavadi	60.2	51.4	
7	Nagothnapallyam	59.9	52.1	
8	Arupalli	59.9	50.9	

Source: On-site monitoring/sampling by CHENNAI METTEX LAB PRIVATE LIMITED Laboratories in association with GEMS

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



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



**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 is 60.3 dB (A) Leq and during night time it is 51.5 dB (A) Leq. Noise levels recorded in buffer zone during day time were from 59.9 to 62.4 dB (A) Leq and during night time were from 49.8 to 53.2 dB (A) Leq.

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

**3.5 ECOLOGICAL ENVIRONMENT**

The core area extent of 4.35.85 Ha of Rough stone quarry has an impact on diversity of flora and fauna of the surrounding area. But present work was carried out on detailed study of the impacts of Rough stone quarry on the ecology and biodiversity of the core lease area with the proper mitigation and sustainable management plan. The Core mining area is situated with exhibit flat topography. whereas in buffer zone some places agricultural land is dominated. The following methods were applied during the baseline study of flora, fauna and diversity assessment.

**3.5.1 Scope of Work**

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

The study involved assessment of general habitat type, vegetation pattern, preparation of inventory of flora and fauna of terrestrial ecosystem within 10 km radius from the boundary of all the Proposed Mine site. Biological assessment of the site was done to identify ecologically sensitive areas and whether there are any rare, endangered,



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endemic or threatened (REET) species of flora & fauna in the core area as well its buffer zone to be impacted. The study also designed to suggest suitable mitigation measures, if necessary, for protection of wildlife habitats and conservation of REET species if any.

### 3.5.2 Objectives of Biological Studies

The present study was undertaken with the following objectives:

- 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) To assess the nature and distribution of vegetation Terrestrial in and around the mining activity.
- c) To identify the impacts of mining on agricultural lands and how it affects.
- d) Detail of flora and fauna, Endemic, Rare, Endangered and Threatened (RET Species) separately for core and buffer area based on such primary field survey and clearly indicating the Schedule of fauna present. In case of any schedule- I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished.
- e) Proper collection of information about wildlife Sanctuaries/ national parks/ biosphere reserves of the project area.
- f) Devise management & conservation measures for biodiversity.

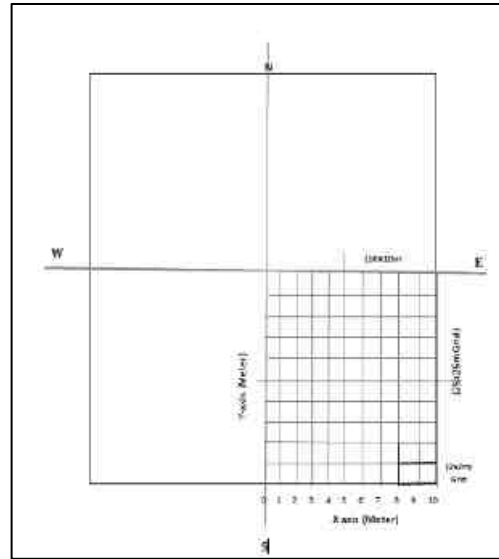
### 3.5.3 Methodology of Sampling

The present study was carried out in given steps

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

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

In order to provide representative ecological status for the study area, the 10-km buffer zone has been divided into four quartiles for biodiversity sampling, i.e., NE (Quartile-1), NW (Quartile-2) SW (Quartile-3) and SE (Quartile-4). Each of the quartiles have been examined for representative flora on randomly sampled quadrats for trees (10x10-m), shrubs (5x5-m) and herbs (1x1-m) depending upon prevailing geographical conditions and biodiversity aspects of the study area.

**FIGURE 3.24: A SCHEMATIC DIAGRAM FOR FLORAL RANDOM SAMPLING**

### Phyto-sociological Survey method

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

### Quadrats method

Quadrats of 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.

### FLORA IN CORE ZONE

Taxonomically a total of 16 species belonging to 12 families have been recorded from the core mining lease area. The lease applied area is exhibit plain topography. The area has gentle sloping towards Southern side. Based on the habitat classification of the enumerated plants the majority of species were Herbs 6 (38%) followed by Trees 4 (25%), Shrubs 4 (25%), Creeper 1 (6%), Grass 1 (6%). Details of flora with the scientific name were mentioned in Table No. 3.1. The result of the core zone of flora studies shows that Fabaceae and Poaceae are the main dominating species in the study area mentioned in Table No.3.1 and the details of the diversity of flora family's patterns are given in Fig No.3.2. No species were found as a threatened category (Table No. 3.1).

### FLORA IN BUFFER ZONE

A similar type of environment is also in the buffer area but with more flora diversity compared to the core zone area because of the vegetation in all the directions. The lease applied area is exhibit elevated terrain. It contains a total of 77 species belonging to 33 families that have been recorded from the buffer zone. The floral 77) varieties among them Thirty Trees 30 (39%) twenty-three herbs 23 (30%) and twelve shrubs 12 (16%) and eight Climbers 8 (10%), four Grasses 2 (3%), one Creepers 1 (1%) and one Cactus 1 (1%) were identified. The result of the buffer zone of flora studies

shows that Fabaceae and Solanaceae, Euphorbiaceae is the main dominating species in the study area mentioned in Table No.3.2. 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. Details of flora with the scientific name were mentioned in Table No.3.2. The diversity of flora families is given in Fig No.3.4..

**However, the information required as per the Standard Terms of Reference (ToR)**

**Tor No: 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.**

The lease applied area exhibits plain topography. The area has gentle sloping towards Southern side. Cauvery Wild life sanctuary is located at 6.1 km on the Southwest side of the applied area. Thally R.F is located about 7.1km on the Northwest followed by Jowlagiri R.F is located about 6.1km on the Southwest. 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. Even in the 10 Km buffer zone around the 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. There are no impacts due to this mining activity.

**Tor No: 12) A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.**

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.

**Tor No: 13) Status of forestry clearance for the broken-up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.**

As stated earlier, no forest land is involved in the proposed project in any manner. Hence no forest clearance is required.

**Tor No: 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.**

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.

**Tor No: 15) The vegetation in the RF / PF areas in the study area, with necessary details, should be given.**

Thally R.F is located about 7.1km on the Northwest followed by Jowlagiri R.F is located about 6.1km on the Southwest. There are no Protected Forests (PF) in the study area. Detailed list of flora found in the mine lease area and the buffer zone have been collected during May 2022 based on primary survey. 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. But no quadrat analysis was done in seasonal croplands. Vegetation and flora of the Mine lease area is given in below Table No.3.1

**TABLE 3.31: FLORA IN CORE ZONE**

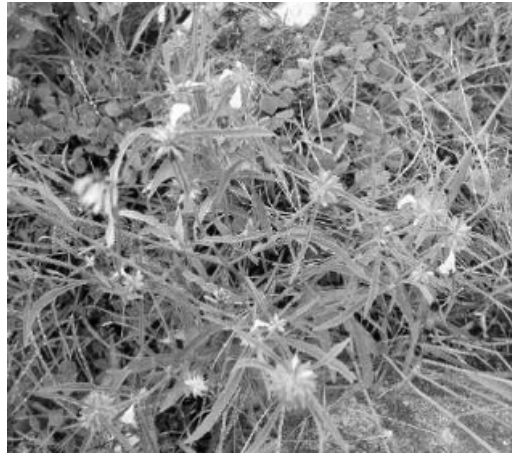
SI. No	English Name	Vernacular Name	Scientific Name	Family Name
<b>Trees</b>				
1.	Neem	Vembu	<i>Azadirachta indica</i>	Meliaceae
2.	Mesquite	Mullu maram	<i>Prosopis juliflora</i>	Fabaceae
3.	Millettia pinnata	Pongam oiltree	<i>Pongamia pinnata</i>	Fabaceae
4.	Blue gum	Thayala maram	<i>Eucalyptus</i>	Myrtaceae
<b>Shrubs</b>				
1.	Milk Weed	Erukku	<i>Calotropis gigantea</i>	Apocynaceae
2.	Tanner's cassia	Avaram	<i>Senna auriculata</i>	Fabaceae
3.	Lantana	Unni chedi	<i>Lantana camara</i>	Verbenaceae
4.	Night shade plan	Sundaika	<i>Solanum torvum</i>	Solanaceae
<b>Herbs</b>				
1.	Common leucas	Thumbai	<i>Leucas aspera</i>	Lamiaceae
2.	Indian doab	Arugampul	<i>Cynodon dactylon</i>	Poaceae
3.	Coat buttons	Thatha poo	<i>Tridax procumbens</i>	Asteraceae
4.	Bindii	Nerunji mullu	<i>Tribulus terrestris</i>	Zygophyllaceae
5.	Dog Mustard	Nai kadugu plant	<i>Cleome viscosa</i>	Cleomaceae
6.	Prickly chaff flower	Nayuruv	<i>Achyranthes aspera</i>	Amaranthaceae
7.	Carrot grass	Parttiniyam	<i>Parthenium hysterothorus</i>	Asteraceae
8.	Indian mint	Karpura valli	<i>Coleus amboinicus</i>	Lamiaceae
9.	Holy basil	Thulasi	<i>Ocimum tenuiflorum</i>	Lamiaceae
10.	Ban Tulsi	Melakai poondu	<i>Croton bonplandianus</i>	Euphorbiaceae
<b>Creeper</b>				
1.	Nut grass	Korai	<i>Cyperus rotandus</i>	Poaceae
<b>Grass</b>				
1.	Eragrostis	Pullu	<i>Eragrostis ferruginea</i>	Poaceae

(Sources: Species observation in the field study)

**FIGURE 3.25: FLORA AND SURVEY PHOTOGRAPHS IN CORE ZONE**



a. *Calotropis gigantea*



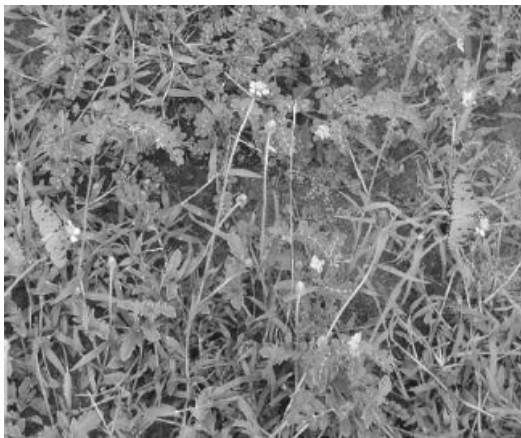
b. *Leucas aspera*



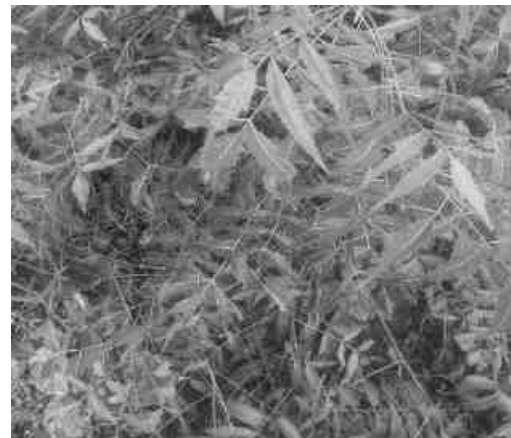
c. *Senna auriculata*



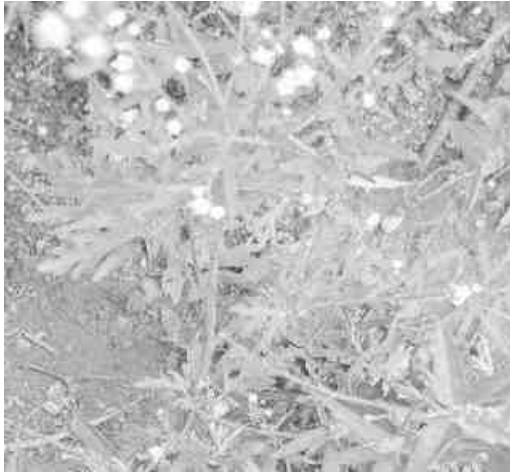
d. *Coleus amboinicus*



e. *Tridax procumbens*



f. *Azadirachta indica*

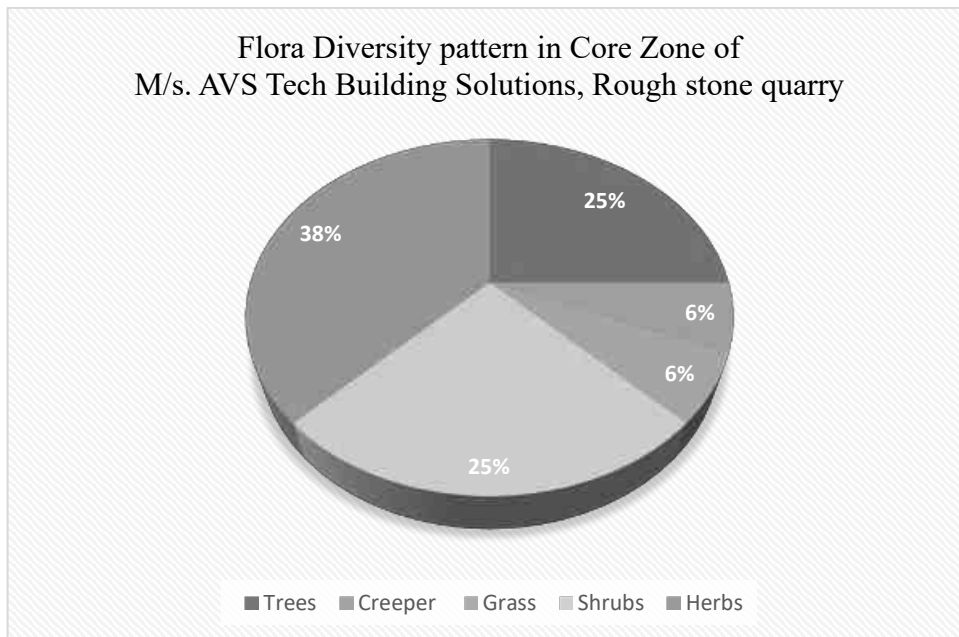


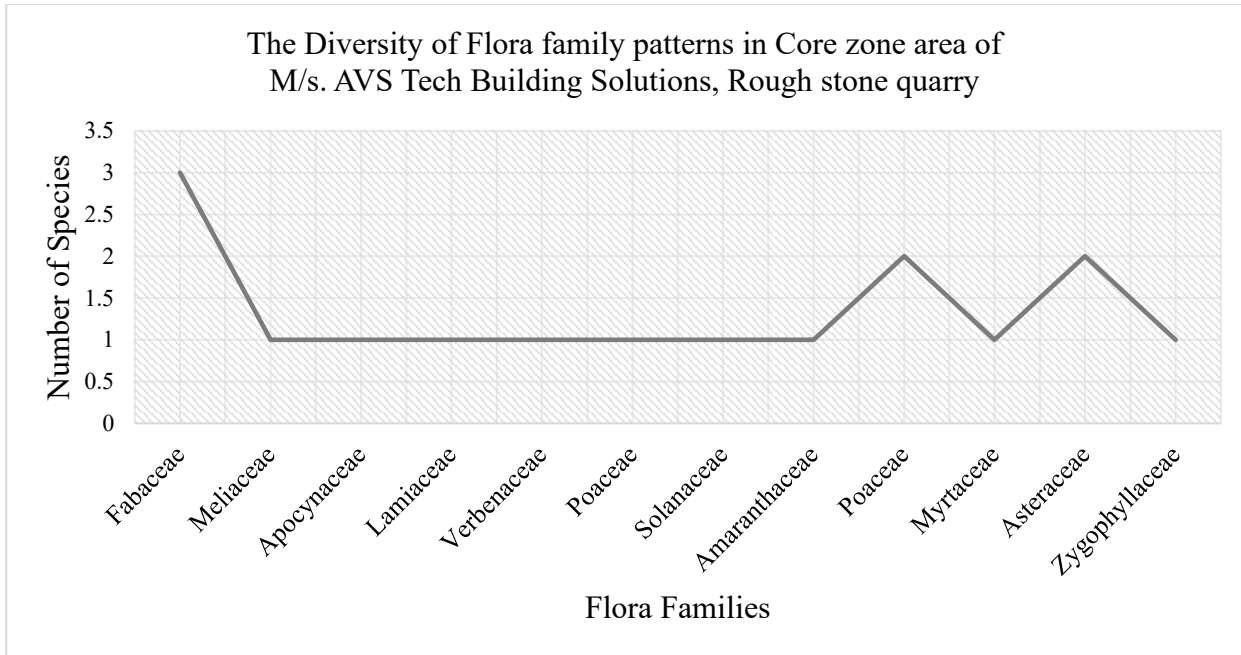
g. Parthenium hysterophorus



h. Lanatana Camara

**FIGURE 3.26: FLORA DIVERSITY PATTERN IN CORE ZONE**





**TABLE 3.32: FLORA IN BUFFER ZONE**

S.No.	English Name	Vernacular Name	Scientific Name	Family Name	Resource use type *(E,M,EM)
<b>Trees</b>					
1.	Mango	Manga	<i>Mangifera indica</i>	Anacardiaceae	E
2.	Blue gum	Thayala maram	<i>Eucalyptus</i>	Myrtaceae	
3.	Indian ash tree	Odiya maram	<i>Lannea coromandelica</i>	Anacardiaceae	E
4.	Neem	Vembu	<i>Azadirachta indica</i>	Meliaceae	M
5.	Tamarind	Puliyamaram	<i>Tamarindus indica</i>	Legumes	EM
6.	Asian Palmyra palm	Panai maram	<i>Borassus flabellifer</i>	Arecaceae	E
7.	Bamboo	Moonghil	<i>Bambusa bambo</i>	Poaceae	E
8.	Indian almond	Padam maram	<i>Terminalia catappa</i>	Combretaceae	EM
9.	Indian ash tree	Odiya maram	<i>Lannea coromandelica</i>	Anacardiaceae	E
10.	Curry leaves	Karuveppali	<i>Murraya koenigii</i>	Rutaceae	EM
11.	Lemon	Ezhumuchaipalam	<i>Citrus lemon</i>	Rutaceae	EM
12.	Bidi leaf tree	Thiruvathi Plant	<i>Bauhinia racemosa</i>	Fabaceae	EM
13.	Peepal	Arasanmaram	<i>Ficus religiosa</i>	Moraceae	M
14.	Custard apple	Seethapazham	<i>Annona reticulata</i>	Annonaceae	E
15.	Flamboyant	Cemmayir-konrai	<i>Delonix regia</i>	Fabaceae	E
16.	Teak	Thekku	<i>Tectona grandis</i>	Verbenaceae	E
17.	Indian gooseberry	Nelli	<i>Emblica officinalis</i>	Phyllanthaceae	EM
18.	Henna	Marudaani	<i>Lawsonia inermis</i>	Lythraceae	EM
19.	Pomegranate	Mathulai	<i>Punica granatum</i>	Lythraceae	EM
20.	Banyan tree	Alamaram	<i>Ficus benghalensis</i>	Moraceae	E
21.	Chinese chaste tree	Nochi	<i>Vitex negundo</i>	Verbenaceae	E
22.	Millettia pinnata	Pongam oiltree	<i>Pongamia pinnata</i>	Fabaceae	E
23.	Coconut	Thennai maram	<i>Cocos nucifera</i>	Arecaceae	EM
24.	Guava	Koyya	<i>Psidium guajava</i>	Myrtaceae	EM
25.	River tamarind	Savundal maram	<i>leucaena leucocephala</i>	Fabaceae	E
26.	Portia tree	Poovarasana	<i>Thespesia populnea</i>	Malvaceae	E
27.	Drumstick tree	Murunga maram	<i>Moringa oleifera</i>	Moringaceae	EM
28.	Mesquite	Mullu maram	<i>Prosopis juliflora</i>	Fabaceae	M
29.	Papaya	Pappali maram	<i>Carica papaya L</i>	Caricaceae	EM
30.	White Bark Acacia	Vela maram	<i>Vachellia leucophloea</i>	Fabaceae	
<b>Shrubs</b>					
1.	Tanner's cassia	Avaram	<i>Senna auriculata</i>	Fabaceae	M
2.	Milk Weed	Erukku	<i>Calotropis gigantea</i>	Apocynaceae	M
3.	Lantana	Unni chedi	<i>Lantana camara</i>	Verbenaceae	M
4.	Triangular spruce	Chaturakalli	<i>Euphorbia antiquorum</i>	Euphorbiaceae	NE
5.	Night shade plan	Sundaika	<i>Solanum torvum</i>	Solanaceae	EM
6.	Indian Oleander	Arali	<i>Nerium indicum</i>	Apocynaceae	M
7.	Shoe flower	Chemparuthi	<i>Hibiscu rosa-sinensis</i>	Malvaceae	EM
8.	Yellow elder	Manjarali	<i>Tecoma stans</i>	Bignoniaceae	M
9.	Puriging nut	Kattamanakku	<i>Jatropha curcas</i>	Euphorbiaceae	EM
10.	Touch-me-not	Thottalchinungi	<i>Mimosa pudica</i>	Mimosaceae	
11.	Thorn apple	Oomathai	<i>Datura stramonium</i>	Solanaceae	E
12.	Castor oil plant	Amanakku	<i>Ricinus communis</i>	Euphorbiaceae	EM
13.	Flame of the Woods	Idlipoo	<i>Xoracoc cineia</i>	Rubiaceae	M
<b>Herbs</b>					
1.	Eggplant	Kathrikkai	<i>Solanum melongena</i>	Solanaceae	EM



2.	Aloe barbadensis	Katrazhai	<i>Aloe vera</i>	Asphodelaceae	EM
3.	Commelina benghalensis	Kanavazha	<i>Commelina benghalensis</i>	Commelinaceae	M
4.	Coat buttons	Thatha poo	<i>Tridax procumbens</i>	Asteraceae	M
5.	Indian doab	Arugampul	<i>Cynodon dactylon</i>	Poaceae	E
6.	Chilli	Milakai	<i>Capsicum annuum</i>	Solanaceae	EM
7.	Indian Copperleaf	Kuppaimeni	<i>Acalypha indica</i>	Euphorbiaceae	M
8.	Asthma-plant	Amman pacharisi	<i>Euphorbia hirta</i>	Euphorbiaceae	M
9.	Tomato	Thakkali	<i>Solanum lycopersicum</i>	Solanaceae	EM
10.	Cleome viscosa	Nai kadugu	<i>Celome viscosa</i>	Capparidaceae	M
11.	Bindii	Nerunji mullu	<i>Tribulus terrestris</i>	Zygophyllaceae	M
12.	Prickly chaff flower	Nayuruv	<i>Achyranthes aspera</i>	Amaranthaceae	M
13.	Field beans	Avarai	<i>Hyacinth Beans</i>	Fabaceae	EM
14.	Common leucas	Thumbai	<i>Leucas aspera</i>	Lamiaceae	M
15.	Spiny amaranth	Mullu keerai	<i>Amaranthus spinosus</i>	Amaranthaceae	M
16.	Holy basil	Thulasi	<i>Ocimum tenuiflorum</i>	Lamiaceae	M
17.	Ban Tulsi	Melakai poondu	<i>Croton bonplandianus</i>	Euphorbiaceae	M
18.	Europeanblack nightshade	Manathakkali	<i>Solanumnigrum</i>	Solanaceae	EM
19.	ladies' fingers	Vendakkai	<i>Abelmoschus esculentus</i>	Malvaceae	EM
20.	Vigna mungo	Ulunthu	<i>Vigna mungo</i>	Fabaceae	EM
21.	Bright eyes	Nithiyakalyani	<i>Catharanthus roseus</i>	Apocynaceae	EM
22.	Carrot grass	Partiniyam	<i>Parthenium hysterophorus</i>	Asteraceae	NE
23.	Indian mint	Karpura valli	<i>Coleus amboinicus</i>	Lamiaceae	EM
<b>Climber</b>					
1.	Stemmed vine	Perandai	<i>Cissus quadrangularis</i>	Vitaceae	M
2.	Wild jasmine	Malli	<i>Jasminum augustifolium</i>	Oleaceae	EM
3.	Betel	Vettilai	<i>Piper betle</i>	Piperaceae	EM
4.	Pointed gourd	Kovakkai	<i>Trichosanthes dioica</i>	Cucurbitaceae	EM
5.	Wild bitter	Pavarkai	<i>Momordica charantia</i>	Cucurbitaceae	EM
6.	Bottle Guard	Sorakkai	<i>Lagenaria siceraria</i>	Cucurbitaceae	EM
7.	White pumpkin	Poosanaikkaai	<i>Cucurbitaceae</i>	Cucurbitaceae	EM
8.	Rosary Pea	Gundumani	<i>Abrus precatorius</i>	Fabaceae	M
<b>Creeper</b>					
1.	Nut grass	Korai	<i>Cyperus rotandus</i>	Poaceae	M
<b>Grass</b>					
1.	Eragrostis	Pullu	<i>Eragrostis ferruginea</i>	Poaceae	E
2.	Asian rice	Nellu	<i>Oryza sativa</i>	Poaceae	E
<b>Cactus</b>					
1.	Prickly pear	Nagathali	<i>Opuntia dillenii</i>	Cactaceae	M

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

(Sources: Species observation in the field study)

**FIGURE 3.27: FLORA AND SURVEY PHOTOGRAPHS IN BUFFER ZONE**



a.  
Tridax

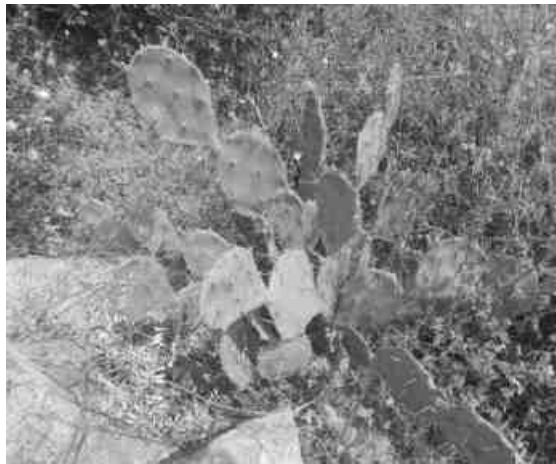
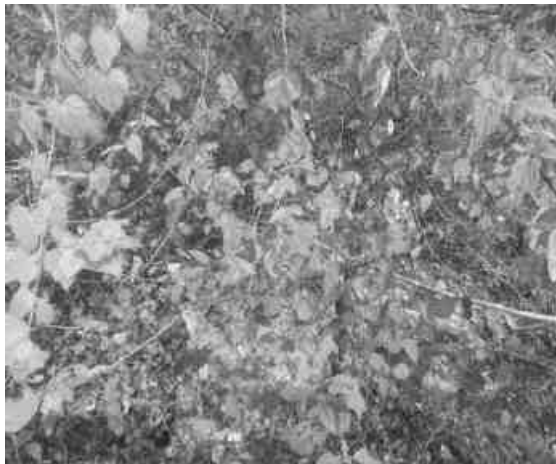
procumbens

b. *Carica papaya* L



c. *Leucas aspera*

d. *Bauhinia racemosa*



e. *Lantana camara*

f. *Opuntia dillenii*



g. Eucalyptus



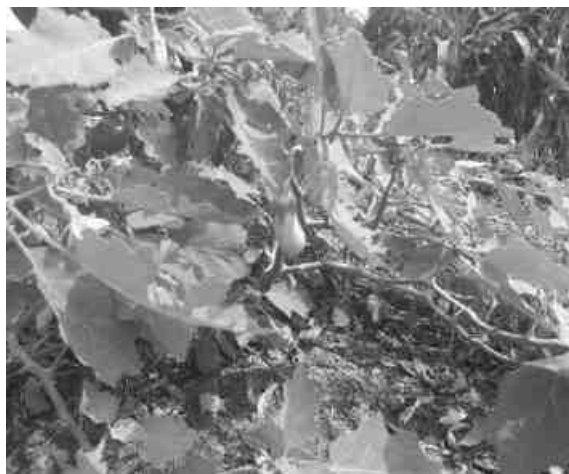
h. Aloe vera



i. Tribulus terrestris



j. Parthenium hysterophorus



k. Solanum melongena



l. Cyperus rotundus



m. *Solanum nigrum*



n. *Chrysanthemum*

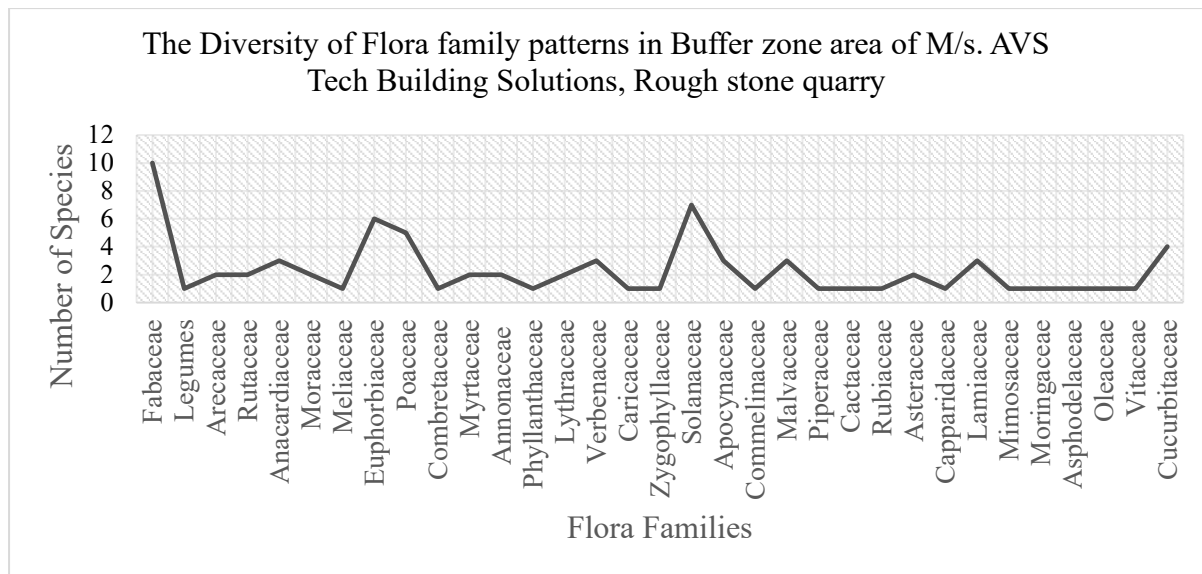
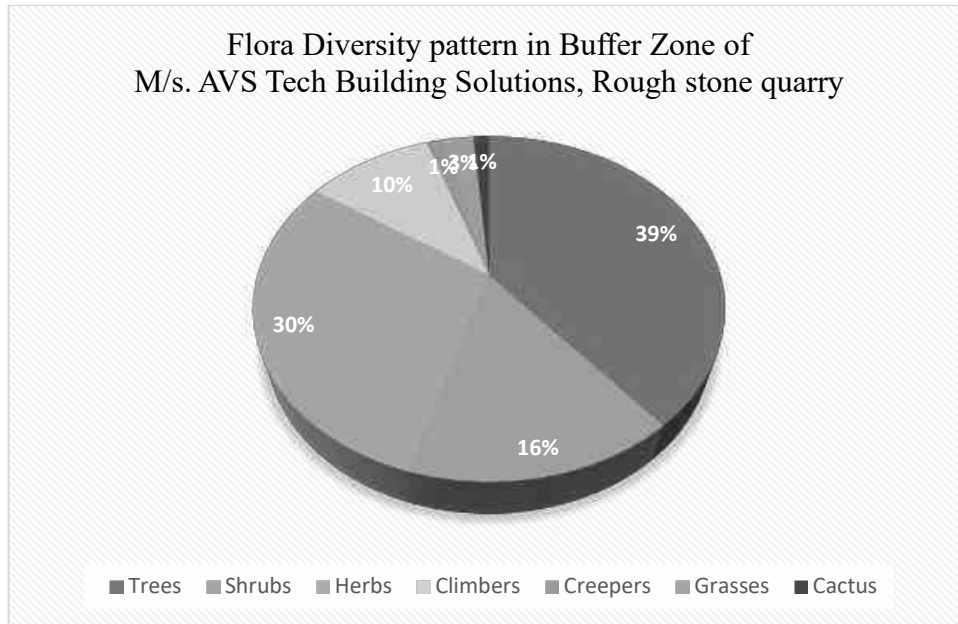


o. *Solanum lycopersicum*



p. *Lawsonia inermis*

**FIGURE 3.28: FLORA DIVERSITY PATTERN IN BUFFER ZONE**



**FAUNA**

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

**FAUNA METHODOLOGY****TABLE NO: 3.33. METHODOLOGY APPLIED DURING THE SURVEY OF FAUNA**

S.No	Taxa	Method of Sampling	References
1	Insects	Random walk, Opportunistic observations	Pollard (1977); Kunte (2000)
2	Reptiles	Visual encounter survey (Direct Search)	Daniel J.C (2002)
3	Amphibians	Visual encounter survey (Direct Search)	
4	Mammals	Tracks and Signs	Menon V (2014)
5	Avian	Random walk, Opportunistic observations	Grimmett R (2011); Ali S (1941)

**Survey and Monitoring of Mammals**

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

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

**Survey and Monitoring of Birds**

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

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

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

**Survey and Monitoring of reptiles**

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

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

**FAUNA IN CORE ZONE**

A total of 17 varieties of species were observed in the Core zone of Dharavendiram Village, Rough stone quarry (Table No.3.7) among them numbers of Insects 5 (28%), Reptiles 4 (12%), Mammals 2 (11%) and Avian 7 (39%). A total of 17 species belonging to 14 families have been recorded from the core mining lease area. None of these species

are threatened or endemic in the study area and surroundings. There is no Schedule I species and six species are under schedule IV according to the Indian wildlife Act 1972. A total of 7 species of bird were sighted in the mining lease area.

There are no critically endangered, endangered, vulnerable, and endemic species were observed. Details of fauna in the core zone with the scientific name were mentioned in Table No. 3.4.

**TABLE 3.34: FAUNA IN CORE ZONE**

SI. No	Common name/English Name	Family Name	Scientific Name	Schedule list wildlife Protection act 1972	IUCN Red List data
<b>Insects</b>					
1	Striped tiger	Nymphalidae	<i>Danaus plexippus</i>	Schedule IV	LC
2	Grasshopper	Acrididae	<i>Hieroglyphus sp</i>	NL	LC
3	Common Tiger	Nymphalidae	<i>Danaus genutia</i>	NL	NL
4	Termite	Blattodea	<i>Hamitermes silvestri</i>	NE	LC
5	Red-veined darter	Libellulidae	<i>Sympetrum fonscolombii</i>	NL	LC
<b>Reptiles</b>					
1	Garden lizard	Agamidae	<i>Calotes versicolor</i>	NL	LC
2	Common skink	Scincidae	<i>Mabuya carinatus</i>	NL	LC
3	Rat snake	Colubridae	<i>Ptyas mucosa</i>	Sch II (Part II)	LC
4	Green vine snake	Colubridae	<i>Ahaetulla nasuta</i>	Schedule IV	NL
<b>Mammals</b>					
1	Indian Field Mouse	Muridae	<i>Mus booduga</i>	Schedule IV	NL
2	Common rat	Muridae	<i>Rattus rattus</i>	Schedule IV	LC
<b>Aves</b>					
1	Common myna	Sturnidae	<i>Acridotheres tristis</i>	NL	LC
2	House crow	Corvidae	<i>Corvus splendens</i>	NL	LC
3	Koel	Cuculidae	<i>Eudynamis</i>	Schedule IV	LC
4	Asian green bee-eater	Meropidae	<i>Merops orientalis</i>	NL	LC
5	Rose-ringed parakeet	Psittaculidae	<i>Psittacula krameri</i>	NL	LC
6	Black drongo	Dicruridae	<i>Dicrurus macrocercus</i>	Schedule IV	LC
7	Cattle egret	Ardeidae	<i>Bubulcus ibis</i>	NE	LC

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

#### **FAUNA IN BUFFER ZONE**

Taxonomically a total of 38 species belonging to 30 families have been recorded from the buffer zone area. Based on habitat classification the majority of species were Birds 12 (31%), followed by Insects 11 (29%), Reptiles 9 (24%), Mammals 5 (13%), and amphibians 1 (3%). There are six Schedule II species and twenty species are under schedule IV according to the Indian wildlife Act 1972. A total of 12 species of bird were sighted in the study area. There are no critically endangered, endangered, vulnerable, and endemic species were observed. There are no impacts on nearby fauna species.

Dominant species are mostly birds and insects, and two amphibian was observed during the extensive field visit *Sphaerotheca breviceps*. The result of core & Buffer zone of fauna studies shows that Nymphalidae, Colubridae, and Scincidae are the main dominating species in the study area; it is mentioned in Table No.3.5. There is no schedule I Species in the study area. A detail of fauna diversity of family's pattern is given in Fig No.3.9. There are no critically endangered, endangered, vulnerable, and endemic species were observed. Details of faunal diversity in the buffer zone are given in Table No.3.5.

**TABLE 3.35: FAUNA IN BUFFER ZONE**

SI. No	Common Name/English Name	Family Name	Scientific Name	Schedule list wildlife Protection act 1972	IUCN Red List data
<b>Insects</b>					
1	Indian honey bee	Apidae	<i>Apis cerana</i>	Schedule IV	LC
2	Common Tiger	Nymphalidae	<i>Danaus genutia</i>	Schedule IV	LC
3	Striped tiger	Nymphalidae	<i>Danaus plexippus</i>	Schedule IV	LC
4	Milkweed butterfly	Nymphalidae	<i>Danainae</i>	NL	LC
5	Termite	Blattodea	<i>Hamitermes silvestri</i>	NE	LC
6	Grasshopper	Acrididae	<i>Hieroglyphus sp</i>	NL	LC
7	Red-veined darter	Libellulidae	<i>Sympetrum fonscolombii</i>	NL	LC
8	Ant	Formicidae	<i>Camponotus Vicinus</i>	NL	NL
9	Tawny coster	Nymphalidae	<i>Danaus chrysippus</i>	Schedule IV	LC
10	Dragonfly	Gomphidae	<i>Ceratogomphus pictus</i>	Schedule IV	LC
11	Common Indian crow	Nymphalidae	<i>Euploea core</i>	Schedule IV	LC
12	Grass yellow	Pieridae	<i>Eurema hecabe</i>	NL	LC
13	Lesser grass blue	Lycaenidae	<i>Zizina Otis indica</i>	Schedule IV	LC
14	Chocolate pansy	Nymphalidae	<i>Junonia iphita</i>	NL	LC
<b>Reptiles</b>					
1	Chameleon	Chamaelenidae	<i>Chameleon zeylanicus</i>	Sch II (Part II)	LC
2	Fan-Throated Lizard	Agamidae	<i>Sitanaponticeriana</i>	NL	LC
3	Indian cobra	Elapid snakes	<i>Naja naja</i>	Sch II (Part II)	LC
4	Green vine snake	Colubridae	<i>Ahaetulla nasuta</i>	Schedule IV	NL
5	Rat snake	Colubridae	<i>Ptyas mucosa</i>	Sch II (Part II)	LC
6	Common krait	Elapid snakes	<i>Bungarus caeruleus</i>	Schedule IV	NL
7	Indian wall lizard	Gekkonidae	<i>Hemidactylus flaviviridis</i>	Schedule IV	NL
8	Garden lizard	Agamidae	<i>Calotes versicolor</i>	NL	LC
9	Russell's viper	Viperidae	<i>Vipera russseli</i>	Sch II (Part II)	LC
<b>Mammals</b>					
1	Indian palm squirrel	Sciuridae	<i>Funambulus palmarum</i>	Schedule IV	LC
2	Asian Small Mongoose	Herpestidae	<i>Herpestes javanicus</i>	Schedule (Part II)	LC
3	Indian Field Mouse	Muridae	<i>Mus booduga</i>	Schedule IV	LC
4	Brown rat	Muridae	<i>Rattus norvegicus</i>	Schedule IV	LC
5	Indian hare	Leporidae	<i>Lepus nigricollis</i>	Schedule (Part II)	LC
<b>Aves</b>					
1	Koel	Cuculidae	<i>Eudynamys</i>	Schedule IV	LC



2	Cattle egret	Ardeidae	<i>Bubulcus ibis</i>	NL	LC
3	Common myna	Sturnidae	<i>Acridotheres tristis</i>	NL	LC
4	House crow	Corvidae	<i>Corvus splendens</i>	NL	LC
5	Asian green bee-eater	Meropidae	<i>Merops orientalis</i>	NL	LC
6	Small blue Kingfisher	Alcedinidae	<i>Alcedo atthis</i>	Schedule IV	LC
7	Rose-ringed parakeet	Psittaculidae	<i>Psittacula krameri</i>	NL	LC
8	Common quail	Phasianidae	<i>Coturnix coturnix</i>	Schedule IV	LC
9	Small Sunbird	Nectariniidae	<i>Nectarinia asiatica</i>	Schedule IV	LC
10	Black drongo	Dicruridae	<i>Dicrurus macrocercus</i>	Schedule IV	LC
11	Woodpecker bird	Picidae	<i>Picidae</i>	Schedule IV	LC
12	Two-tailed Sparrow	Dicruridae	<i>Dicrurus macrocercus</i>	Schedule IV	LC
<b>Amphibians</b>					
1	Indian Burrowing frog	Dicroglossidae	<i>Sphaerotheca breviceps</i>	Schedule IV	LC

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

### Aquatic Vegetation

The field survey for assessing the aquatic vegetation was also undertaken during the study period. The list of aquatic plants observed in the study area is given in Table No 3.6.

**Table No: 3.6. List of aquatic plants observed in the study area**

Sl. No	Scientific name	Common Name	Vernacular Name (Tamil)	IUCN Red List of Threatened Species
1	<i>Nymphaea nauchali</i>	Blue lotus	Alli	LC
2	<i>Cyperus exaltatus</i>	Tall Flat Sedge	Koraikizhangu	LC
3	<i>Aponogeton natans</i>	Floating laceplant	Kottikizhangu	NA
4	<i>Colocassia esculenta</i>	Taro	Seppakizhangu	LC
5	<i>Carex cruciata</i>	Cross Grass	Koraipullu	NA
6	<i>Cynodon dactylon</i>	Scutch grass	Arugampul	LC
7	<i>Eichornia crassipe</i>	Water hyacinth	Agayatamarai	NA
8	<i>Nymphaea nouchali</i>	Blue waterlily	Nellambal	LC

\*LC- Least Concern, NA-Not yet assessed

### 3.8.Cropping Pattern

A variety of fruits and vegetables are cultivated in Krishnagiri. The important crops of this district are Paddy, Maize, Ragi, Banana, Sugarcane, Cotton, Tamarind, Coconut, Mango, Groundnut, Vegetables and Flowers. The land is very fertile and there is significant access to fresh water. Roses are also grown in large numbers. Hosur is popular for cultivation of a variety of roses.

#### 3.8.1.Agriculture

Agriculture development is the key to poverty alleviation and development of rural areas. The district has an excellent scope for agri-business. Regional Agricultural Research Centre of Tamil Nadu Agricultural University is functioning efficiently at Paiyur in Kaveripattinam union since 1973 AD. This centre is functioning in 18.5 hectares of land. It helps the peasants to develop and adopt the modern technique of cultivation. It has developed hybrid seeds by research which yields more with good quality this district is the largest producer of mango and get first place in production of mango. With 40% share, the district is the top producer of ‘ragi’ in Tamil Nadu. The following table gives the area under different crops.

(Source District Statistical Handbook 2010- 11).

**Table No: 3.4. Different crops in Krishnagiri district**

S.No	Crop	Scientific Name	Family
1	Paddy	<i>Oryza sativa</i>	Poaceae
2	Cholam	<i>Sorghum</i>	Poaceae
3	Bajra	<i>Pennisetum glaucum</i>	Poaceae
4	Ragi	<i>Eleusine coracana</i>	Poaceae
5	Samai	<i>Panicum sumatrense</i>	Poaceae
6	Maize	<i>Zea mays</i>	Poaceae
7	Redgram	<i>Cajanus cajan</i>	Fabaceae
8	Bengalgram	<i>Cicer arietinum</i>	Fabaceae
9	Greengram	<i>Vigna radiata</i>	Fabaceae
10	Blackgram	<i>Vigna mungo</i>	Fabaceae
11	Horsegram	<i>Macrotyloma uniflorum</i>	Fabaceae
12	Ground Nut	<i>Arachis hypogaea</i>	Fabaceae
13	Gingelly	<i>Sesamum indicum</i>	Pedaliaceae
14	Sunflower	<i>Helianthus</i>	Asteraceae
15	Cotton	<i>Gossypium</i>	Malvaceae
16	Sugar cane	<i>Saccharum officinarum</i>	Poaceae
17	Tapioca	<i>Manihot esculenta</i>	Spurges
18	Banana	<i>Musa</i>	Musaceae
19	Coriander	<i>Coriandrum sativum</i>	Apiaceae
20	Chilles	<i>Capsicum frutescens</i>	Solanaceae
21	Onion	<i>Allium cepa</i>	Amaryllidaceae

(Source : District Statistical Handbook 2010-11)

### 3.8.2. Horticulture

Krishnagiri district is more suitable for cultivation of horticulture crops, because of its moderate climate, high altitude and fertility of the soil. This district produces 300000 tonnes of mangoes annually, cultivating in 300.17 km<sup>2</sup> area of land. Mango varieties like ‘Thothapuri’ and ‘Alphonso’ are produced in this district and they are processed into pulp.

There are about 150 mango nurseries which produce mango saplings in and around Santhur village. The district exports mango based products worth over 8 billion. Under the horticulture

development program, government owned horticulture farms are functioning here. Through these farms, about 300,000 fruit saplings are produced and distributed under different schemes. Majority of the people in the district is employed through mango cultivation and work in labourer. Almost 20% of the industries located in this district are engaged in mango processing

**Table No: 3.5. List of Horticulture cultivation**

S.No	Name of the crop	Scientific name	Family
1	Banana	<i>Musa</i>	Musaceae
2	Mango	<i>Mangifera indica</i>	Anacardiaceae
3	Onion	<i>Allium cepa</i>	Amaryllidaceae
4	Chilies	<i>Capsicum frutescens</i>	Solanaceae
5	Tapioca	<i>Manihot esculenta</i>	Spurges

(Source: District Survey Report for minor Minerals Rough stone-2018)

### 3.8.3. Drainage of Irrigation pattern

Krishnagiri district basically has a mountainous terrain. The General regional slop is towards east. The various land for occurring in the districts such as structural hills, erosional plains residual hills, rolling uplands of different facies belonging to the denudation land structural land forms. Cauvery River forms the south western boundary of the district. Pennaiyar is the major river draining the district and is ephemeral in nature. The major reservoirs are KRP dam, Kelavarapalli Dam and Barur Lake.

The prominent dams in the district namely KRP dam has a present water level at 39.05ft as against the full capacity of 52ft with command area of 9012 acre, Kelavarapalli dam water level 41.50ft against the full capacity of 44.28 feet with command area of 9083 acre and Barur Lake 12.900 feet with command area 2400 acre. The other major reservoirs are Pambar and Shoolagiri Chinnar with storage 280 Million Cubic feet and 112 Million cubic feet. It originates from Nandhi hills in Karnataka, enters Tamil Nadu west of Bagalur and flows almost in a south easterly direction till it reaches Manjamedu from where it flows along the district boundary before entering the district, again near Hanuman Tirtham. After flowing for a short distance in an easterly direction, it again follows the district boundary before entering the neighbouring Dharmapuri district. Pambar and Burgur are among the important tributaries of Pennaiyar draining part of the district.

(\*Source: District Survey Report for minor Minerals Rough stone-2018).

**Tor No: 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.**

Out of the total mine lease area of 4.35.85 Ha, just about 3.57.55. Ha is proposed to be used for mining activity during the first five years as per the mining plan. Blasting, noise and vibrations and other disturbances including dust generation are likely to have an adverse impact on wildlife. But these impacts are unlikely to extend beyond 500 m from the actual mine area. There are six Schedule II species and twenty are under schedule IV according to Indian wildlife Act 1972. A total 12 species

of bird were sighted in the buffer zone area. There are no critically endangered, endangered, vulnerable and endemic species were observed. As the rainfall in the area is scanty and as no toxic wastes are produced or discharged on account of mining, the proposed mining activity is not going to have any additional and adverse impacts on these RET species. There are no ecologically sensitive areas or protected areas within the 10 Km radius. Hence no specific conservation for conservation of any RET species or Wildlife is envisaged.

**Tor No: 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.**

There are no National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar sites, Tiger/Elephant Reserves/(existing as well as proposed) within 10 km of the mine lease area. There are no reserved or even protected forests within the project area. Hence submission of clearance from the National Board of Wildlife does not arise.

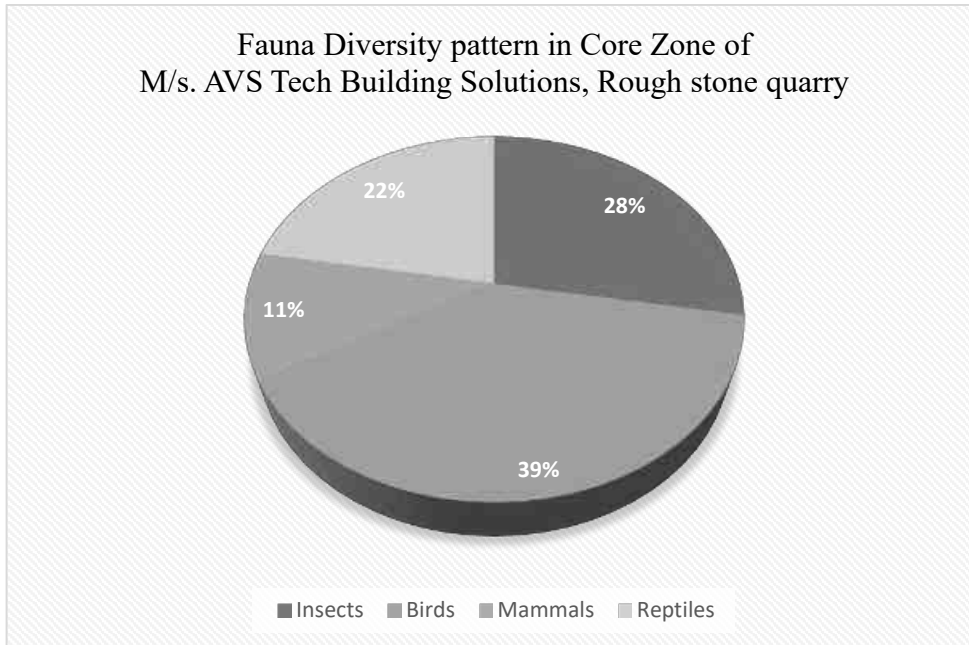
**Tor No: 18) A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based 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.**

A detailed biological study of the study area [core zone and buffer zone of 10 km radius of the periphery of the mine lease] has been carried out and the results are presented under in Tables 3.4 to 3.5. There are six Schedule II species, and twenty species are under schedule IV according to Indian wild life Act 1972. A total 12 species of bird were sighted in the study area. The main threat to the bird is the use of pesticides in agriculture. There is no endangered, endemic and RET Species. There is no Schedule I species in study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] The proposed project is not going to have any direct or indirect adverse impact on the species mentioned above.

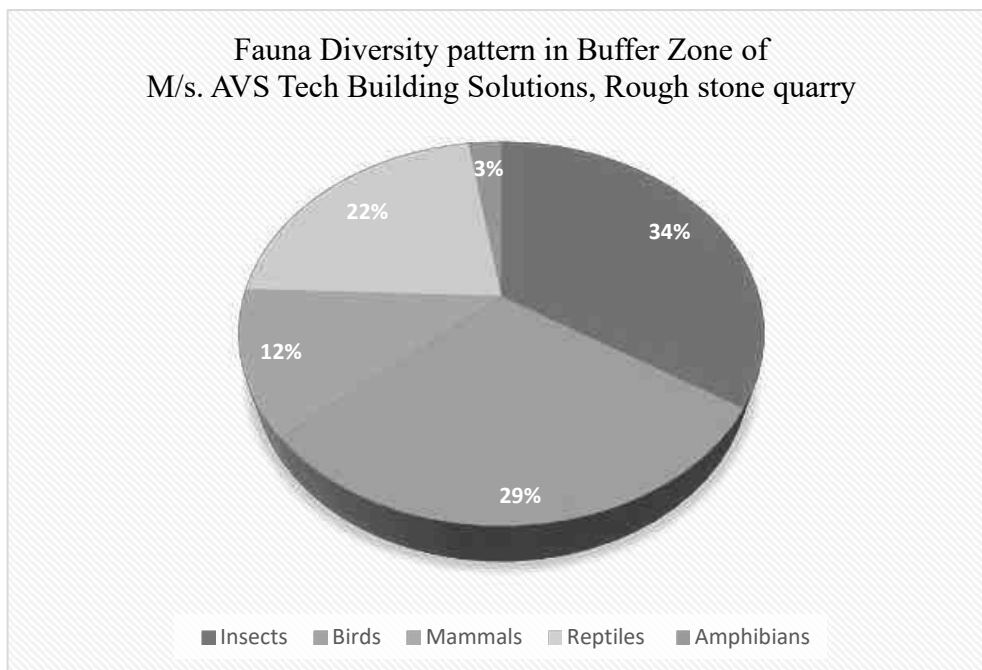
**Tor No: 31) A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species, and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.**

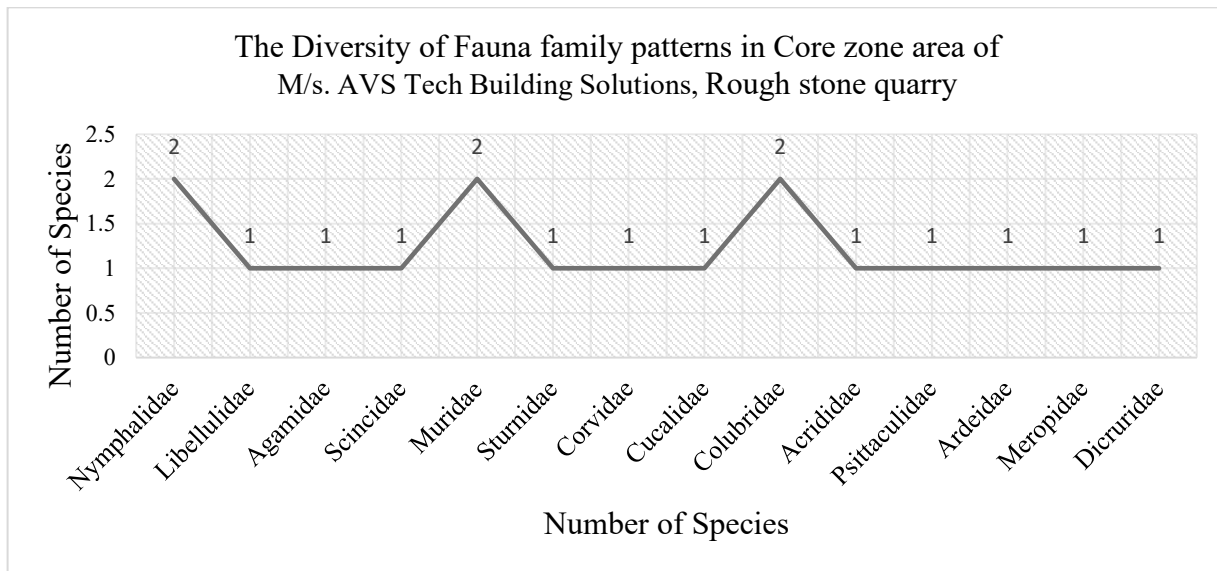
Only about 0.30.0 Ha of the mine lease area is going to be used for Greenbelt Development during the first five years. Regional trees are mentioned in the Table No.4.1 will be planted along the Lease boundary and avenues as well as over non-active dumps and preparation of green belt details are given in Table No.4.2

**FIGURE 3.29: FAUNA DIVERSITY PATTERN**

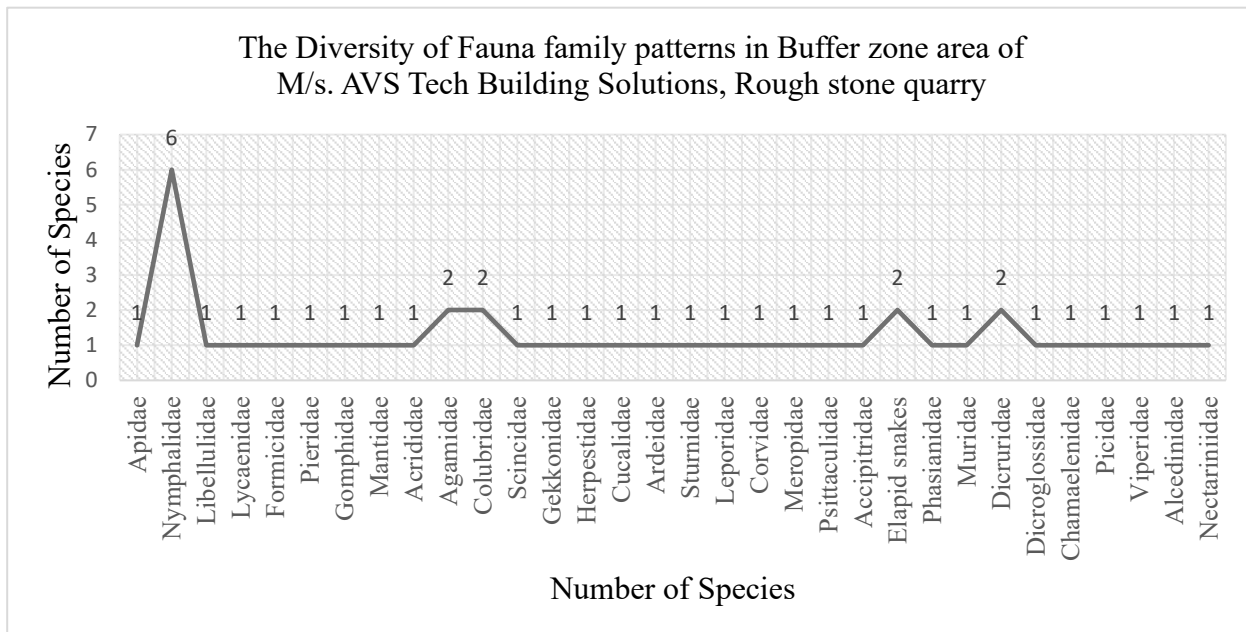


**Fig No: 3.30. Fauna Diversity pattern in buffer Zone**





**The Diversity of Fauna family patterns in Core zone area of M/s. AVS Tech Building Solutions**



**The Diversity of Fauna family patterns in Buffer zone area of M/s. AVS Tech Building Solutions**

**3.5.4 Interpretation& 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

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understanding of the situation and overall ecological importance of the area. This baseline information viewed against proposed project activities help in predicting their impacts on the wildlife and their habitats in the region. Data collected and information gathered from secondary literature on flora, fauna, protected area, natural habitats, and wildlife species etc., and Consulted and discussed with local people, from the villages, herders and farmers who inhabit close to the proposed project area.

### **3.6 SOCIO ECONOMIC ENVIRONMENT**

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

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

#### **3.6.1 Objectives of the Study**

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

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

### 3.6.2 Scope of Work

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

### 3.6.3 District Profile

‘Krishna’ refers to ‘black’ and ‘giri’ refers to ‘hill’. This district is gifted with black granite hillocks and named as “krishnagiri”. The region came under the rule of Krishna Deva Raya and hence it might have been named after this king. Its the holy land of wise scholars, men of valour and courage, blessed with the green valleys, hills and hillocks and inhabited by people known for innovative farming was divided, for the formation of Krishnagiri district, carved out of Dharmapuri district as 30th district of Tamil Nadu.

Krishnagiri district is bounded by Vellore and Thiruvannamalai districts in the East, Karnataka state in the west, State of Andhra Pradesh in the North Dharmapuri District in the south. Its area is 5143 Sq. Kms. This district is elevated from 300m to 1400m above the mean sea level. It is located between 11° 12’N to 12° 49’N Latitude, 77° 27’E to 78° 38’E Longitude.

### 3.6.4 Study area:

#### PANCHACHIPURAM VILLAGE

Daravendram village is situated in Teshil Denkanikottai, District Krishnagiri and in State of Tamil Nadu India. Village has population of 2140 as per census data of 2011, in which male population is 1095 and female population is 1045. Total geographical area of Daravendram village is 878.29 Hectares. Population density of Daravendram is 2 persons per Hectares. Total number of house hold in village is 493.

**TABLE 3.36: VILLAGE POPULATION FACTS**

<b>DHARAVENDIRAM VILLAGE</b>	
Number of Households	493
Population	2140
Male Population	1095
Female Population	1045
Sex-ratio	954
Literacy	1156
Male Literacy	674
Female Literacy	482

Gram Panchayat name of the Daravendram village is Daravendram. CD Block name is Thally and Teshil/Taluk or sub-district is Denkanikottai. Data Reference year is 2009 of Census 2011. Sub District HQ Name is DENKANIKOTTAI and Sub District HQ Distance is 15 Km from the village. District Head Quarter name is KRISHNAGIRI and it’s distance from the village is 75KM. Nearest Town of the Daravendram village is DENKANIKOTTAI and nearest town distance is 15 km. Pincode of Daravendram village is 635107. As per census 2011 village code of village Daravendram is 644058.



**TABLE 3.38: POPULATION AND LITERACY DATA 10 Km RADIUS**

Sl.No.	Village Name	NO HH	Total Population	Male	Female	Total SC Population	Male SC	Female SC	Total ST Population	Male ST	Female ST	Total Literate Population	Male Literate	Female Literate	Total Illiterate Population	Male Illiterate	Female Illiterate
1	Achubalu	762	3435	1787	1648	1000	511	489	753	408	345	1863	1085	778	1572	702	870
2	Agalakotta	1026	4435	2286	2149	595	329	266	427	237	190	2408	1404	1004	2027	882	1145
3	Anniyalam	614	2558	1308	1250	823	412	411	0	0	0	1561	890	671	997	418	579
4	Arasakuppam	988	4196	2148	2048	313	156	157	87	43	44	2405	1378	1027	1791	770	1021
5	Arupalli	194	731	356	375	89	47	42	0	0	0	403	222	181	328	134	194
6	Averupally Agraharam	104	467	243	224	22	10	12	0	0	0	140	76	64	327	167	160
7	Ballapalli	522	2146	1116	1030	240	127	113	0	0	0	1083	641	442	1063	475	588
8	Bilalam	154	774	414	360	6	3	3	0	0	0	256	174	82	518	240	278
9	Binnamangalam	590	2463	1246	1217	641	320	321	0	0	0	1423	803	620	1040	443	597
10	Chikkaveripalli	90	409	212	197	160	85	75	0	0	0	167	97	70	242	115	127
11	Chudasandiram	393	1727	882	845	487	253	234	0	0	0	812	472	340	915	410	505
12	Daravendram	493	2140	1095	1045	435	223	212	10	3	7	1156	674	482	984	421	563
13	Devaganapalli	591	2937	1516	1421	756	385	371	7	3	4	2019	1125	894	918	391	527
14	Doddaubbanur	707	2951	1486	1465	739	368	371	11	6	5	1906	1057	849	1045	429	616
15	Gumlapuram	723	3331	1714	1617	748	397	351	379	205	174	2020	1126	894	1311	588	723
16	Jowlagiri	871	3863	1983	1880	320	159	161	24	13	11	2044	1209	835	1819	774	1045
17	Kakkadasam	881	3748	1943	1805	626	329	297	0	0	0	2355	1379	976	1393	564	829
18	Karandapalli	863	3678	1934	1744	283	146	137	6	5	1	1806	1145	661	1872	789	1083
19	Kasi Agraharam	3	14	9	5	0	0	0	0	0	0	14	9	5	0	0	0
20	Kodiyalam	446	1806	934	872	391	203	188	74	37	37	1082	635	447	724	299	425
21	Kottamadagu	370	1521	804	717	258	133	125	9	6	3	918	541	377	603	263	340
22	Kottur	637	2712	1415	1297	458	248	210	6	4	2	1534	904	630	1178	511	667
23	Kunchena Agraharam	35	144	72	72	0	0	0	0	0	0	82	47	35	62	25	37
24	Kuppatti	714	2645	1388	1257	337	180	157	0	0	0	1755	1036	719	890	352	538
25	Madagondapalli	1148	4979	2414	2565	498	247	251	0	0	0	3324	1696	1628	1655	718	937
26	Marudanapalli	736	2898	1496	1402	143	76	67	397	213	184	1813	1035	778	1085	461	624

27	Marupalli	575	2588	1317	1271	308	163	145	18	6	12	1364	746	618	1224	571	653
28	Nellamaru Agraharam	200	854	452	402	185	96	89	151	81	70	390	241	149	464	211	253
29	Palayamkotta	734	3292	1738	1554	309	171	138	369	193	176	1791	1073	718	1501	665	836
30	Panchakshipuram	442	1882	973	909	477	257	220	0	0	0	1166	664	502	716	309	407
31	Periamadakondapalli	416	1680	866	814	252	124	128	0	0	0	1023	594	429	657	272	385
32	Sangitha Agraharam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Saragapalli	709	2862	1451	1411	778	393	385	0	0	0	1712	964	748	1150	487	663
34	Sathanur	508	2330	1221	1109	691	356	335	0	0	0	1415	822	593	915	399	516
35	Serandapalli	480	2004	1022	982	281	149	132	55	25	30	1074	625	449	930	397	533
36	Settipalli	401	1696	879	817	533	277	256	3	2	1	983	602	381	713	277	436
37	Thalikothanur	666	2769	1419	1350	348	169	179	0	0	0	1611	925	686	1158	494	664
38	Thalli	1510	6915	3438	3477	1522	755	767	8	2	6	4325	2321	2004	2590	1117	1473
39	Thavarakarai	541	2382	1247	1135	173	87	86	0	0	0	1309	779	530	1073	468	605
40	Thogarai Agraharam	114	484	253	231	179	92	87	0	0	0	303	183	120	181	70	111
41	Ulimangalam	341	1779	954	825	331	161	170	0	0	0	1154	772	382	625	182	443
42	Ulimaranapalli	194	870	448	422	136	75	61	8	3	5	502	275	227	368	173	195
43	Unisenatham	408	1934	1004	930	139	72	67	536	275	261	1051	610	441	883	394	489
		22894	99029	50883	48146	17010	8744	8266	3338	1770	1568	57522	33056	24466	41507	17827	23680

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

**TABLE 3.39: WORKERS PROFILE OF STUDY AREA**

Sl.No.	Village Name	Total Workers Population	Male Workers	Female Workers	Total Main Workers	Main Cultivation Workers	Main Agriculture Workers	Main Other Workers	Total Margin Workers	Margin Cultivation Workers	Margin House Hold Workers	Margin Other Workers	Non Worker Population
1	Achubalu	1419	1121	298	1360	1081	195	79	59	10	2	6	2016
2	Agalakotta	2156	1396	760	1798	1144	396	231	358	23	1	169	2279
3	Anniyalam	1486	892	594	1423	1120	92	201	63	2	5	29	1072
4	Arasakuppam	2251	1332	919	2169	1112	484	569	82	5	0	23	1945
5	Arupalli	371	252	119	41	33	1	6	330	0	3	29	360
6	Averupally Agraharam	260	130	130	43	15	4	24	217	17	1	199	207
7	Ballapalli	1227	722	505	862	630	94	121	365	235	6	24	919
8	Bilalam	423	223	200	333	184	15	123	90	26	0	63	351
9	Binnamangalam	1241	823	418	1238	608	370	259	3	2	0	0	1222
10	Chikkaveripalli	301	157	144	286	223	14	37	15	7	0	8	108
11	Chudasandiram	852	562	290	554	328	107	115	298	112	1	28	875
12	Daravendram	1333	731	602	1138	1007	51	70	195	28	4	33	807
13	Devaganapalli	1227	807	420	557	283	95	149	670	185	43	99	1710
14	Doddaubbanur	1445	996	449	1406	663	470	271	39	3	0	29	1506
15	Gumlapuram	1528	1025	503	903	478	175	225	625	46	15	388	1803
16	Jowlagiri	2120	1237	883	1892	853	558	399	228	16	11	61	1743
17	Kakkadasam	2089	1309	780	1919	1305	216	357	170	69	2	40	1659
18	Karandapalli	1857	1095	762	1836	1402	310	116	21	11	0	4	1821
19	Kasi Agraharam	7	5	2	7	6	0	1	0	0	0	0	7
20	Kodiyalam	948	583	365	835	320	428	69	113	37	3	30	858
21	Kottamadagu	686	531	155	655	514	121	15	31	8	2	10	835
22	Kottur	1194	906	288	862	593	122	147	332	39	3	57	1518
23	Kunchena Agraharam	71	48	23	71	49	2	18	0	0	0	0	73
24	Kuppatti	1420	944	476	1052	576	229	241	368	2	2	36	1225
25	Madagondapalli	2201	1475	726	1888	639	418	786	313	22	7	152	2778
26	Marudanapalli	1803	998	805	1776	1405	191	175	27	11	0	13	1095

27	Marupalli	1262	831	431	1196	589	216	307	66	10	7	27	1326
28	Nellamaru Agraharam	373	265	108	354	221	122	7	19	2	0	17	481
29	Palayamkotta	1502	1050	452	1383	1116	78	178	119	22	2	89	1790
30	Panchakshipuram	824	611	213	801	521	172	97	23	4	1	7	1058
31	Periamadakondapalli	817	562	255	771	436	74	239	46	2	7	33	863
32	Sangitha Agraharam	0	0	0	0	0	0	0	0	0	0	0	0
33	Saragapalli	1270	888	382	824	476	231	104	446	142	8	42	1592
34	Sathanur	1148	751	397	934	418	352	162	214	12	0	109	1182
35	Serandapalli	1349	741	608	1211	998	140	62	138	92	2	6	655
36	Settipalli	859	593	266	824	389	295	133	35	5	0	16	837
37	Thalikoathanur	1218	881	337	732	435	93	197	486	33	3	99	1551
38	Thalli	2611	1937	674	2322	480	409	1373	289	49	7	148	4304
39	Thavarakarai	1309	785	524	1293	796	328	163	16	1	0	2	1073
40	Thogarai Agraharam	168	165	3	168	70	45	52	0	0	0	0	316
41	Ulimangalam	518	413	105	386	207	84	77	132	1	0	1	1261
42	Ulimaranapalli	442	261	181	207	188	12	6	235	2	72	90	428
43	Unisenatham	1114	682	432	717	667	38	5	397	96	2	19	820
	<b>Total</b>	<b>23680</b>	<b>48700</b>	<b>31716</b>	<b>16984</b>	<b>41027</b>	<b>24578</b>	<b>7847</b>	<b>7966</b>	<b>7673</b>	<b>1389</b>	<b>222</b>	<b>2235</b>

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

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**3.6.6 Recommendation and Suggestion**

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

**3.6.7 Summary & Conclusion**

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

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

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## **4. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES**

### **4.0 GENERAL**

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

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

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

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

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

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

### **4.1 LAND ENVIRONMENT:**

#### **4.1.2 Anticipated Impacts**

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

#### **4.1.2 Mitigation Measures**

- The mining activity will be gradual confined in blocks and excavation will be undertaken progressively along with other mitigative measures like phase wise development of greenbelt etc.,
- Construction of garland drains all around the quarry pits and construction of check dam at strategic location in lower elevations to prevent erosion due to surface runoff during rainfall and also to collect the storm water for various uses within the proposed area
- Green belt development along the boundary within safety zone. The small quantity of water stored in the mined-out pit will be used for greenbelt

- 
- Thick plantation will be carried out on unutilized area, top benches of mined out pits, on safety barrier, etc.,
  - At conceptual stage, the land use pattern of the quarry will be changed into Greenbelt area and temporary reservoir
  - In terms of aesthetics, natural vegetation surrounding the quarry will be retained (such as in a buffer area i.e., 10 m safety barrier and other safety provided) so as to help minimise dust emissions.
  - Proper fencing will be carried out at the conceptual stage, Security will be posted round the clock, to prevent inherent entry of the public and cattle

#### 4.1.3 Soil Environment

The proposed project area is covered by thin layer of Topsoil formation of about 2 m, the excavated topsoil will be used for green belt development.

#### 4.1.4 Impacts on Soil Environment

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

#### 4.1.5 Mitigation Measures

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

#### 4.1.6 Waste Dump Management

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

### 4.2 WATER ENVIRONMENT

#### 4.2.1 Anticipated Impacts

- 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 REQUIREMENT**

<b>*Purpose</b>	<b>Quantity</b>	<b>Source</b>
Dust Suppression	2.0 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Green Belt development	1.0 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Domestic purpose	0.5 KLD	Water Tankers
<b>Total</b>	<b>3.5 KLD</b>	

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

Source: Approved Mining Plan Pre-Feasibility Report

#### 4.2.2 Mitigation Measures

- Garland drain, settling tank will be constructed along the proposed mining lease area. The Garland drain will be connected to settling tank and sediments will be trapped in the settling traps and only clear water will be discharged out to the natural drainage
- Rainwater will be collected in sump in the mining pits and will be allowed to store and pumped out to surface setting tank of 15 m x 10m x 3m to remove suspended solids if any. This collected water will be judiciously used for dust suppression and such sites where dust likely to be generated and for developing green belt. The proponent will collect and judiciously 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;
- 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 Impacts

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



#### 4.3.1.1. Modelling of Incremental Concentration

Wind erosion of the exposed areas and the air borne particulate matter generated by quarrying operation, and transportation are mainly PM<sub>10</sub> & PM<sub>2.5</sub> and emissions of Sulphur dioxide (SO<sub>2</sub>) & Oxides of Nitrogen (NO<sub>x</sub>) 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<sub>2</sub>), Oxides of Nitrogen (NO<sub>x</sub>) 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<sub>10</sub>) affecting Ambient Air of the area. Prediction of impacts on air environment has been carried out taking into consideration cumulative production the proposed quarries. Air environment and net increase in emissions by Open pit source modelling in AERMOD Software.

#### 4.3.2.1 Emission Estimation

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

The general equation for emissions estimation is:

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

Where:

E = emissions;

A = activity rate;

EF = emission factor, and

ER = overall emission reduction efficiency, %

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

#### 4.3.2 Frame work of Computation & Model details

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

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

**TABLE 4.2: ESTIMATED EMISSION RATE FOR PM<sub>10</sub>**

Activity	Source type	Value	Unit
Drilling	Point Source	0.102862787	g/s
Blasting	Point Source	0.002785517	g/s
Mineral Loading	Point Source	0.045011505	g/s
Haul Road	Line Source	0.002500014	g/s/m
Overall Mine	Area Source	0.073326942	g/s

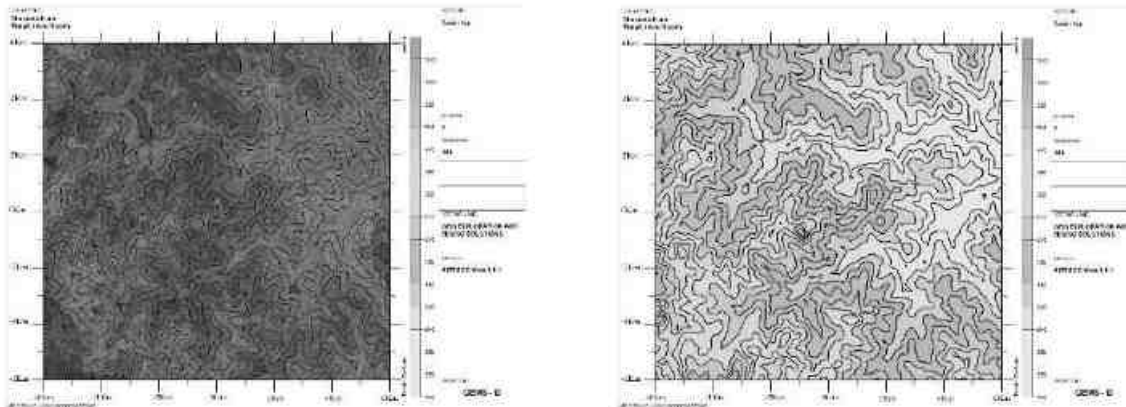
**TABLE 4.3: ESTIMATED EMISSION RATE FOR SO<sub>2</sub>**

Activity	Source type	Value	Unit
Overall Mine	Area Source	0.001281576	g/s

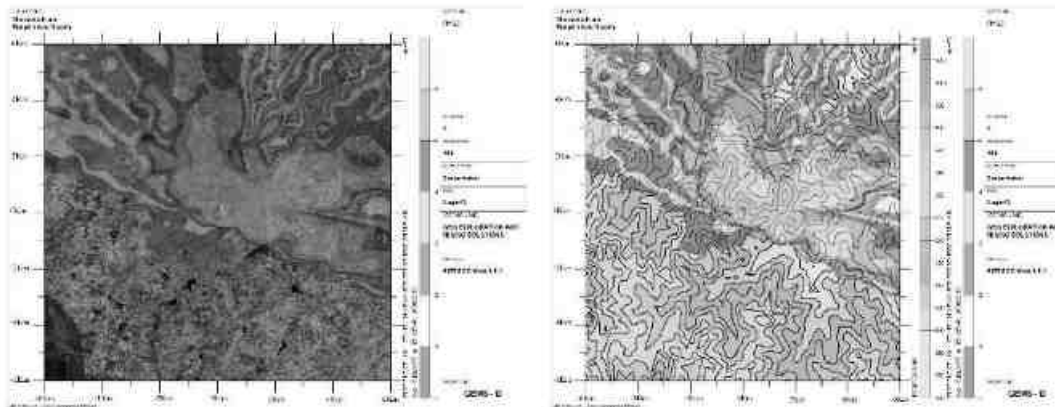
**TABLE 4.4: ESTIMATED EMISSION RATE FOR NO<sub>x</sub>**

Activity	Source type	Value	Unit
Overall Mine	Area Source	0.000119883	g/s

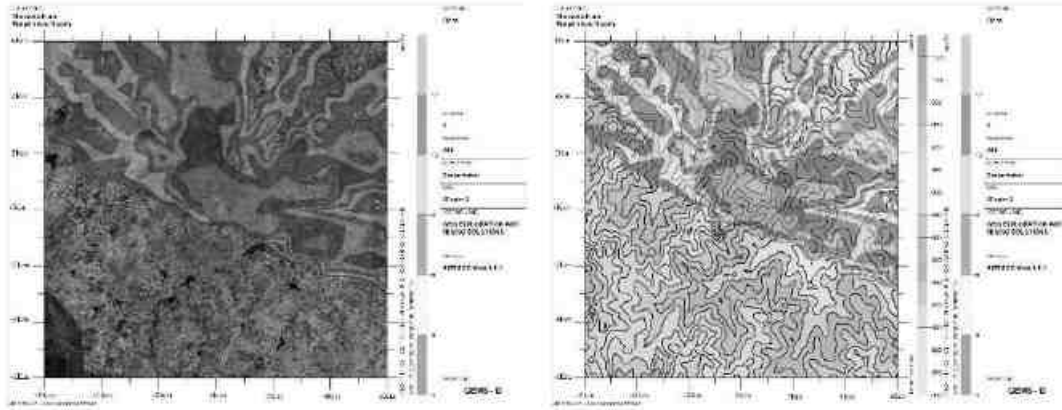
**FIGURE 4.1: AERMOD TERRAIN MAP**



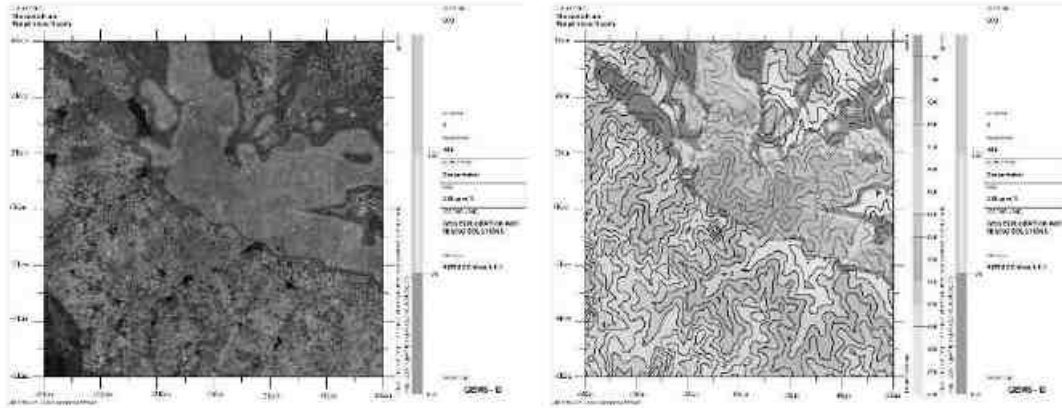
**FIGURE 4.2: PREDICTED INCREMENTAL CONCENTRATION OF PM<sub>2.5</sub>**



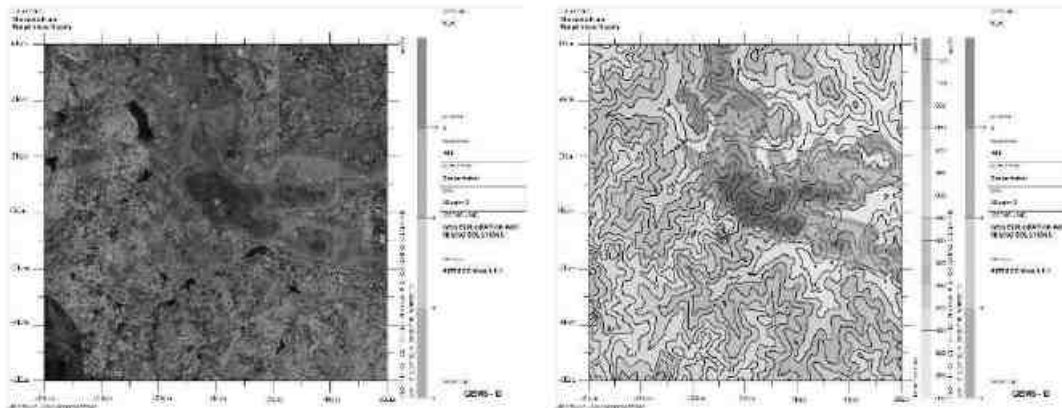
**FIGURE 4.3: PREDICTED INCREMENTAL CONCENTRATION OF PM<sub>10</sub>**



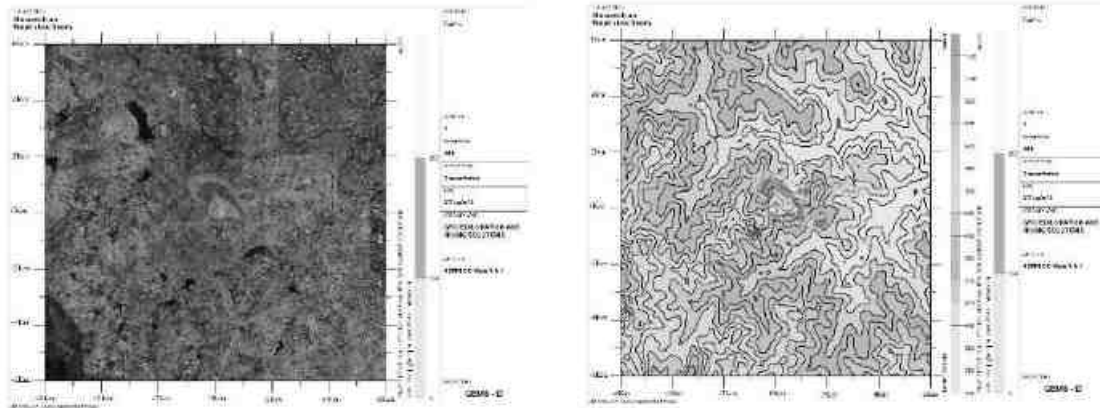
**FIGURE 4.4: PREDICTED INCREMENTAL CONCENTRATION OF SO<sub>2</sub>**



**FIGURE 4.5: PREDICTED INCREMENTAL CONCENTRATION OF NO<sub>x</sub>**



**FIGURE 4.6: PREDICTED INCREMENTAL CONCENTRATION OF FUGITIVE DUST**



**4.3.2.1 Model Results**

The post project Resultant Concentrations of PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>& NO<sub>x</sub> (GLC) is given in Table below:

**TABLE 4.5: INCREMENTAL & RESULTANT GLC OF PM<sub>10</sub>**

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline PM <sub>10</sub> (µg/m <sup>3</sup> )	Incremental value of PM <sub>10</sub> due to mining (µg/m <sup>3</sup> )	Total PM <sub>10</sub> (µg/m <sup>3</sup> ) (5+6)
AAQ1	12°33'44.16"N 77°40'52.82"E	30	130	60.8	17.64	78.44
AAQ2	12°34'23.69"N 77°41'27.53"E	1092	1347	59.5	11.94	71.44
AAQ3	12°35'20.24"N 77°43'33.57"E	4941	3107	59.6	8.26	67.86
AAQ4	12°32'28.78"N 77°43'11.90"E	4281	-2207	58.8	6.11	64.91
AAQ5	12°33'18.14"N 77°39'54.15"E	-1763	-676	58.1	0	58.1
AAQ6	12°34'29.83"N 77°39'10.98"E	-3078	1549	59.7	5.00	64.7
AAQ7	12°35'33.79"N 77°40'27.17"E	-753	3547	58.6	15.95	74.55
AAQ8	12°36'23.36"N 77°38'42.31"E	-3953	5065	58.0	1.50	59.5

**TABLE 4.6: INCREMENTAL & RESULTANT GLC OF PM<sub>2.5</sub>**

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline PM <sub>2.5</sub> (µg/m <sup>3</sup> )	Incremental value of PM <sub>2.5</sub> due to mining (µg/m <sup>3</sup> )	Total PM <sub>2.5</sub> (µg/m <sup>3</sup> ) (5+6)
AAQ1	12°33'44.16"N 77°40'52.82"E	30	130	29.9	8.91	38.81
AAQ2	12°34'23.69"N 77°41'27.53"E	1092	1347	29.7	6.55	36.25
AAQ3	12°35'20.24"N 77°43'33.57"E	4941	3107	28.9	5.08	33.98
AAQ4	12°32'28.78"N 77°43'11.90"E	4281	-2207	29.6	3.24	32.84
AAQ5	12°33'18.14"N 77°39'54.15"E	-1763	-676	28.5	0.41	28.91
AAQ6	12°34'29.83"N 77°39'10.98"E	-3078	1549	30.6	2.56	33.16
AAQ7	12°35'33.79"N 77°40'27.17"E	-753	3547	28.9	7.15	36.05
AAQ8	12°36'23.36"N 77°38'42.31"E	-3953	5065	28.7	1.39	30.09

**TABLE 4.7: INCREMENTAL & RESULTANT GLC OF SO<sub>2</sub>**

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline So <sub>2</sub> (µg/m <sup>3</sup> )	Incremental value of So <sub>2</sub> due to mining (µg/m <sup>3</sup> )	Total So <sub>2</sub> (µg/m <sup>3</sup> ) (5+6)
AAQ1	12°33'44.16"N 77°40'52.82"E	30	130	6.9	3.59	10.49
AAQ2	12°34'23.69"N 77°41'27.53"E	1092	1347	7.1	2.62	9.72
AAQ3	12°35'20.24"N 77°43'33.57"E	4941	3107	6.9	1.44	8.34
AAQ4	12°32'28.78"N 77°43'11.90"E	4281	-2207	6.6	0.56	7.16
AAQ5	12°33'18.14"N 77°39'54.15"E	-1763	-676	6.8	0	6.8
AAQ6	12°34'29.83"N 77°39'10.98"E	-3078	1549	7.1	0	7.1
AAQ7	12°35'33.79"N 77°40'27.17"E	-753	3547	6.8	3.50	10.3
AAQ8	12°36'23.36"N 77°38'42.31"E	-3953	5065	6.8	0	6.8

**TABLE 4.8: INCREMENTAL & RESULTANT GLC OF NO<sub>x</sub>**

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline No <sub>x</sub> (µg/m <sup>3</sup> )	Incremental value of No <sub>x</sub> due to mining (µg/m <sup>3</sup> )	Total No <sub>x</sub> (µg/m <sup>3</sup> ) (5+6)
AAQ1	12°33'44.16"N 77°40'52.82"E	30	130	20.4	12.79	33.19
AAQ2	12°34'23.69"N 77°41'27.53"E	1092	1347	20.4	2.55	22.95
AAQ3	12°35'20.24"N 77°43'33.57"E	4941	3107	19.9	0	19.9
AAQ4	12°32'28.78"N 77°43'11.90"E	4281	-2207	20.4	0	20.4
AAQ5	12°33'18.14"N 77°39'54.15"E	-1763	-676	20.1	0	20.1
AAQ6	12°34'29.83"N 77°39'10.98"E	-3078	1549	18.8	0	18.8
AAQ7	12°35'33.79"N 77°40'27.17"E	-753	3547	20.3	6.87	27.17
AAQ8	12°36'23.36"N 77°38'42.31"E	-3953	5065	19.7	0	19.7

**TABLE 4.9: INCREMENTAL & RESULTANT GLC OF FUGITIVE DUST**

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline Fugitive (µg/m <sup>3</sup> )	Incremental value of Fugitive due to mining (µg/m <sup>3</sup> )	Total Fugitive (µg/m <sup>3</sup> ) (5+6)
AAQ1	12°33'44.16"N 77°40'52.82"E	30	130	112.04	217	329.04
AAQ2	12°34'23.69"N 77°41'27.53"E	1092	1347	112.50	0	112.5
AAQ3	12°35'20.24"N 77°43'33.57"E	4941	3107	113.36	0	113.36
AAQ4	12°32'28.78"N 77°43'11.90"E	4281	-2207	114.25	0	114.25
AAQ5	12°33'18.14"N 77°39'54.15"E	-1763	-676	114.61	0	114.61
AAQ6	12°34'29.83"N 77°39'10.98"E	-3078	1549	114.57	0	114.57
AAQ7	12°35'33.79"N 77°40'27.17"E	-753	3547	114.25	0	114.25
AAQ8	12°36'23.36"N 77°38'42.31"E	-3953	5065	112.32	0	112.32

From the resultant of cumulative concentration i.e., Background + Incremental Concentration of pollutant in all the receptor locations without effective mitigation measures are still within the prescribed NAAQ limits of 100, 80 & 80 µg/m<sup>3</sup> for PM<sub>10</sub>, SO<sub>2</sub> & NO<sub>x</sub> respectively. By adopting suitable mitigation measures, the pollutant levels in the atmosphere can be further being controlled.

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#### 4.3.4. Mitigation Measures

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

##### **Advantages of Wet Drilling: -**

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

##### **Blasting –**

- Establish time of blasting to suit the local conditions and water sprinkling on blasting face
- Avoid blasting i.e., when temperature inversion is likely to occur and strong wind blows towards residential areas
- Controlled blasting includes Adoption of suitable explosive charge and short delay detonators, adequate stemming of holes at collar zone and restricting blasting to a particular time of the day i.e. at the time lunch hours, controlled charge per hole as well as charge per round of hole
- Before loading of material water will be sprayed on blasted material
- Dust mask will be provided to the workers and their use will be strictly monitored

##### **Haul Road & Transportation –**

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

##### **Green Belt –**

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

##### **Occupational Health –**

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

## 4.4 NOISE ENVIRONMENT

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

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

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

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

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

Where:

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

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

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

### 4.4.1 Anticipated Impacts

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	104
2	Jack Hammer	Yes	89
3	Compressor	No	80
4	Excavator	No	87
5	Tipper	No	79
Total Noise Produced			87.8

\*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 87.8 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 noise 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)	73.3	74.7	74.3	74.7	74.7	74.5	72.4	72.4
Incremental Value dB(A)	52.1	36.6	25.3	27.0	36.6	29.2	29.2	24.5
Total Predicted Noise level dB(A)	125.4	111.3	99.6	101.7	111.3	103.7	101.6	96.9

The incremental noise level is found to be 125 dB (A) in Core Zone and between the range of 96 - 111dB (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€, dated 14.2.2000 and subsequently amended vide S.O. 1046€, dated 22.11.2000, S.O. 1088€, dated 11.10.2002, S.O. 1569 €, dated 19.09.2006 and S.O. 50 € dated 11.01.2010 under the Environment (Protection) Act, 1986.).

### 3.4.3 Mitigation Measures

The following noise mitigation measures are proposed for control of Noise

- Usage of sharp drill bits while drilling which will help in reducing noise;
- Secondary blasting will be totally avoided and hydraulic rock breaker will be used for breaking boulders;
- Controlled blasting with proper spacing, burden, stemming and optimum charge/delay will be maintained;
- The blasting will be carried out during favourable atmospheric condition and less human activity timings by using nonelectrical initiation system;
- Proper maintenance, oiling and greasing of machines will be done every week to reduce generation of noise;
- Provision of sound insulated chambers for the workers working on machines (HEMM) producing higher levels of noise;
- Silencers / mufflers will be installed in all machineries;
- Green Belt/Plantation will be developed around the project area and along the haul roads. The plantation minimizes propagation of noise;
- Personal Protective Equipment (PPE) like ear muffs/ear plugs will be provided to the operators of HEMM and persons working near HEMM and their use will be ensured through training and awareness.
- Regular medical check-up and proper training to personnel to create awareness about adverse noise level effects.

### 3.4.4 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 area 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

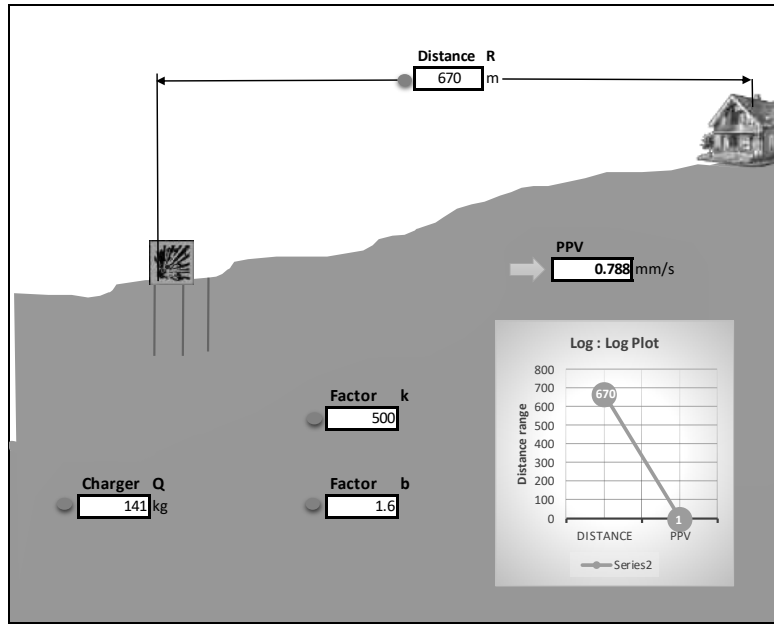


Q = maximum instantaneous charge (kg)  
 B = constant related to the rock and site (usually 1.6)  
 R = distance from charge (m)

**TABLE 4.12: PREDICTED PPV VALUES DUE TO BLASTING**

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
P1	141	670m -SE	0.788

**FIGURE 4.7: GROUND VIBRATION PREDICTION**



From the above graph, the charge per blast of **141 kg** is well below the Peak Particle Velocity of 8 mm/s as per Directorate General of Mines Safety for safe level criteria through Circular No. 7 dated 29/8/1997. But the project proponent ensures that the charge per blast shall be less than 141 kg and carry out blasting twice or thrice a day based on the onsite conditions under the supervision of competent person employed. However, as per statutory requirement control measures will be adopted to avoid the impacts due to ground vibrations and fly rocks due to blasting.

**4.4.3.1 Mitigation Measures**

- The blasting operations in the project are carried out without deep hole drilling and blasting using delay detonators, which reduces the ground vibrations;
- Proper quantity of explosive, suitable stemming materials and appropriate delay system will be adopted to avoid overcharging and for safe blasting;
- Adequate safe distance from blasting will be maintained as per DGMS guidelines;
- Blasting shelter will be provided as per DGMS guidelines;
- Blasting operations will be carried out only during day time;
- The charge per delay will be minimized and preferably more number of delays will be used per blasts;
- During blasting, other activities in the immediate vicinity will be temporarily stopped;
- Drilling parameters like depth, diameter and spacing will be properly designed to give proper blast;
- A fully trained explosives blast man (Mining Mate, Mines Foreman, 2<sup>nd</sup> Class Mines Manager/ 1<sup>st</sup> 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

### 4.5.1 Impact on Ecology and Biodiversity

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

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

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

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

### 4.5.2 Mitigation Measures

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

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

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

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

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

**4.5.2.2.1. Species Recommendation for Plantation granted in the district**

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

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

**TABLE 4.13: RECOMMENDED SPECIES FOR GREENBELT DEVELOPMENT PLAN**

S. No	Name of the plant (Botanical)	Family Name	Common Name	Habit
1	Borassus flabellifer	Arecaceae	Panai	T
2	Morinda pubescens	Rubiaceae	Nuna	T
3	Pongamia pinnata	Fabaceae	Pungam	T
4	Thespesia Populnea	Malvaceae	Puvarasu	T
5	Syrygium cumini	Myrtaceae	Naval	T
6	Saraca asoca	Fabaceae	Asoca	T
7	Limonia acidissima	Rutaceae	Odhiam	T
8	Lannea coromandelica	Anacardiaceae	Vila maram	T
9	Cassia roxburghii	Fabaceae	Sengondrai	T
10	Pterocarpus marsupium	Fabaceae	Vengai	T

The 10m Safety distance along the boundary has been identified to be utilized for subsequent Afforestation. However, the afforestation should always be carried out in a systematic and scientific manner. Regional trees like Neem, Pongamia, Pinnata will be planted along the Lease boundary and avenue plantation will be carried out in project area. The rate of survival expected to be 80% in this area. Afforestation Plan is given in Table No.4.13 and budget of green belt development plan are given in Table No.4.14.

**TABLE 4.14: GREENBELT DEVELOPMENT PLAN**

PROPOSAL				
Year	No. of trees proposed to be planted	Survival %	Area to be planted	Name of the species
I	It is proposed to plant 2,500 Nos of trees in the 1 <sup>st</sup> year	85%	Safety barrier, Un utilized area's and nearby village roads	Neem, Pungam,Sengondrai, Panai

**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	1 <sup>st</sup> year 2,500 Nos of trees	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant and maintenance	Rs 5,00,000/-

After complete extraction of mineral, the excavated pits will be allowed to collect rainwater and seepage water to serve as a reservoir to charge the nearby wells. Fish culture will also be attempted. A bund will be constructed around the pits. In order to minimize the impact of mining on the vegetation outside the mine lease area, it is recommended that adequate

protection measures must be implemented. As mining involves movement of vehicles and increased anthropogenic activities, some of the areas can be fenced by involving local people and educating them about increased benefits of such activities.

#### 4.5.3. Anticipated Impact on Fauna

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

##### 4.5.3.1. Measures for protection and conservation of wildlife species

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

##### 4.5.3.2. Mitigation Measures

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

#### 4.5.4. Impact on Aquatic Biodiversity

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

#### 4.5.5. Impact Assessment on Biological Environment

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

**TABLE 4.16: ECOLOGICAL IMPACT ASSESSMENTS**

Sl.No	Attributes	Assessment
1	Activities of the project affects the breeding/nesting sites of birds and animals	No breeding and nesting site was identified in mining lease site. The fauna sighted mostly migrated from buffer area.
2	Located near an area populated by rare or endangered species	No endangered, critically endangered, vulnerable species sighted in core mining lease area.
3	Proximity to national park/wildlife sanctuary/reserve forest /mangroves/ coastline/estuary/sea	No national park or eco-sensitive zone around 10km radius.
4	Proposed project restricts access to waterholes for wildlife	'NO'
5	Proposed mining project impact surface water quality that also provide water to wildlife	'NO' scheduled or threatened wildlife animal sighted regularly core in core area.

6	Proposed mining project increase siltation that would affect nearby biodiversity area.	Surface runoff management such as drains is constructed properly so there will be no siltation affect in nearby mining area.
7	Risk of fall/slip or cause death to wild animals due to project activities	'NO'
8	The project release effluents into a water body that also supplies water to a wildlife	No water body near to core zone so chances of water become polluted is low.
9	Mining project effect the forest based livelihood/ any specific forest product on which local livelihood depended	'NO'
10	Project likely to affect migration routes	'NO' 'migration route observed during monitoring period.
11	Project likely to affect flora of an area, which have medicinal value	'NO'
12	Forestland is to be diverted, has carbon high sequestration	NO. There was no forest land diverted.
13	The project likely to affect wetlands, Fish breeding grounds, marine ecology	'NO' Wetland was not present in near core Mining lease area. No breeding and nesting ground present in core mining area.

**TABLE 4.17: ANTICIPATED IMPACT OF ECOLOGY AND BIODIVERSITY**

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

	roads and emission of SO <sub>2</sub> , NO <sub>2</sub> , CO etc.	of dust and Emission of CO. (Indirect impact)			Upgrade the vehicles with alternative fuel such biodiesel, methanol and biofuel around the mining area.
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**4.6 SOCIO ECONOMIC**

**4.6.1 Anticipated Impacts**

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

**4.6.2 Mitigation Measures**

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

**4.7 OCCUPATIONAL HEALTH AND SAFETY**

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

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

**4.7.1 Respiratory Hazards**

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

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

**4.7.2 Noise**

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

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

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### 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 this project, the entire excavated material will be utilized in different purpose.

## 4.9 MINE CLOSURE

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

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**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 Scheme of Mining plan and activities of closure shall be carried out as per the process described in mine closure plan.



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## **5. ANALYSIS OF ALTERNATIVES (TECHNOLOGY AND SITE)**

### **5.0 INTRODUCTION**

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

### **5.1 FACTORS BEHIND THE SELECTION OF PROJECT SITE**

Dharavendiram Rough Stone Quarry Project at Dharavendiram Village is an Existing quarry, Proponent obtained quarry lease by Tender cum auction for excavation of Rough Stone, which is site specific. The project area has following advantages: -

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

### **5.2 ANALYSIS OF ALTERNATIVE SITE**

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

### **5.3 FACTORS BEHIND SELECTION OF PROPOSED TECHNOLOGY**

Mechanized open cast mining operation with drilling and blasting method will be used to extract Rough Stone in the area. The lease areas have following advantages –

- As the mineral deposition is homogeneous and batholith formation, therefore opencast method of working is preferred over underground method
- The material will be loaded with the help of excavators into dumpers / trippers and transported to the needy customers.
- Blasting and availability of drills along with controlled blasting technology gives desired fragmentation so that the mineral is handled safely and used without secondary blasting.
- Semi-skilled labours fit for quarrying operations are easily available around the nearby villages

### **5.4 ANALYSIS OF ALTERNATIVE TECHNOLOGY**

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

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## **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 FOR PROJECT**

Implementation of EMP and periodic monitoring will be carried out by respective Project Proponent. A comprehensive monitoring mechanism has been devised for monitoring of impacts due to this project; Environmental protection measures like dust suppression, control of noise and blast vibrations, maintenance of machinery and vehicles, housekeeping in the mine premises, plantation, implementation of Environmental Management Plan and environmental clearance conditions will be monitored by 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 the proposed project.

The responsibilities of this cell will be:

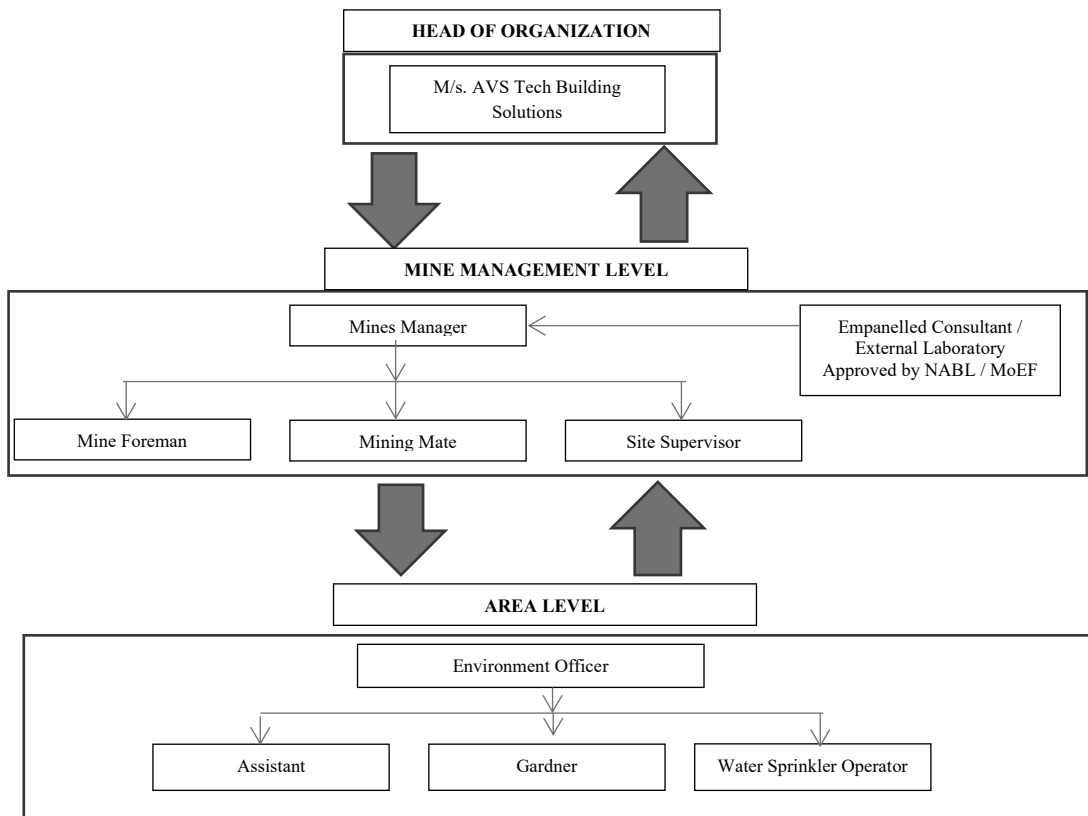
- Implementation of pollution control measures
- Monitoring programme implementation
- Post-plantation care
- To check the efficiency of pollution control measures taken
- Any other activity as may be related to environment
- Seeking expert's advice when needed.

The environmental monitoring cell will co-ordinate all monitoring program 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 FOR PROJECT**



\* The Environmental Monitoring Cell will be formed in all 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**

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**

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 <sub>2.5</sub> , PM <sub>10</sub> , SO <sub>2</sub> and NO <sub>x</sub> .
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 ENVIRONMENTAL MONITORING

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 3,80,000/- and the recurring cost is Rs 70,000/- per annum

**TABLE 6.3 ENVIRONMENT MONITORING BUDGET**

<b>PROPOSAL - P-1</b>			
<b>Sl.No.</b>	<b>Parameter</b>	<b>Capital Cost</b>	<b>Recurring Cost per annum</b>
1	Air Quality	Rs. 3,80,000/-	Rs. 70,000/-
2	Meteorology		
3	Water Quality		
4	Hydrology		
5	Soil Quality		
6	Noise Quality		
7	Vibration Study		
<b>Total</b>		<b>Rs 3,80,000/-</b>	<b>Rs 70,000/-</b>

Source: Approved Mining Plan

### **6.5 REPORTING SCHEDULES OF MONITORED DATA**

The monitored data on air quality, water quality, noise levels and other environmental attributes will be periodically examined by the Mine Management Coordinator and 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 31<sup>st</sup> 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. 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	<ul style="list-style-type: none"> <li>▪ 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;</li> <li>▪ Workers will be sent to the Training in the nearby Group Vocational Training Centre</li> <li>▪ Entry of unauthorized persons will be prohibited;</li> <li>▪ Fire-fighting and first-aid provisions in the mine office complex and mining area;</li> <li>▪ 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</li> <li>▪ Working of quarry, as per approved plans and regularly updating the mine plans;</li> <li>▪ Cleaning of mine faces on daily basis shall be daily done in order to avoid any overhang or undercut;</li> <li>▪ Handling of explosives, charging and firing shall be carried out by competent persons only under the supervision of a Mine Manager;</li> <li>▪ Maintenance and testing of all mining equipment as per manufacturer's guidelines.</li> </ul>

2	Drilling	<p>Improper and unsafe practices</p> <p>Due to high pressure of compressed air, hoses may burst</p> <p>Drill Rod may break</p>	<ul style="list-style-type: none"> <li>▪ Safe operating procedure established for drilling (SOP) will be strictly followed.</li> <li>▪ Only trained operators will be deployed.</li> <li>▪ 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,</li> <li>▪ Drilling shall not be carried on simultaneously on the benches at places directly one above the other.</li> <li>▪ Periodical preventive maintenance and replacement of worn-out accessories in the compressor and drill equipment as per operator manual.</li> <li>▪ All drills unit shall be provided with wet drilling shall be maintained in efficient working in condition.</li> <li>▪ Operator shall regularly use all the personal protective equipment.</li> </ul>
4	Blasting	<p>Fly rock, ground vibration, Noise and dust.</p> <p>Improper charging, stemming &amp; Blasting/fining of blast holes</p> <p>Vibration due to movement of vehicles</p>	<ul style="list-style-type: none"> <li>▪ 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.</li> <li>▪ SOP for Charging, Stemming &amp; Blasting/Firing of Blast Holes will be followed by blasting crew during initial stage of operation</li> <li>▪ Shots are fired during daytime only.</li> <li>▪ All holes charged on any one day shall be fired on the same day.</li> <li>▪ The danger zone will be distinctly demarcated (by means of red flags)</li> </ul>
5	Transportation	<p>Potential hazards and unsafe workings contributing to accident and injuries</p> <p>Overloading of material</p> <p>While reversal &amp; overtaking of vehicle</p> <p>Operator of truck leaving his cabin when it is loaded.</p>	<ul style="list-style-type: none"> <li>▪ 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.</li> <li>▪ Not allow any unauthorized person to ride on the vehicle nor allow any unauthorized person to operate the vehicle.</li> <li>▪ Concave mirrors should be kept at all corners</li> <li>▪ All vehicles should be fitted with reverse horn with one spotter at every tipping point</li> <li>▪ Loading according to the vehicle capacity</li> <li>▪ Periodical maintenance of vehicles as per operator manual</li> </ul>
6	Natural calamities	Unexpected happenings	<ul style="list-style-type: none"> <li>▪ Escape Routes will be provided to prevent inundation of storm water</li> <li>▪ Fire Extinguishers &amp; Sand Buckets</li> </ul>
7	Failure of Mine Benches and Pit Slope	Slope geometry, Geological structure	<ul style="list-style-type: none"> <li>▪ Ultimate or over all pit slope shall be below 60° and each bench height shall be 5m height.</li> </ul>

Source: Analysed and Proposed by FAE & EC

### 7.3 DISASTER MANAGEMENT PLAN

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

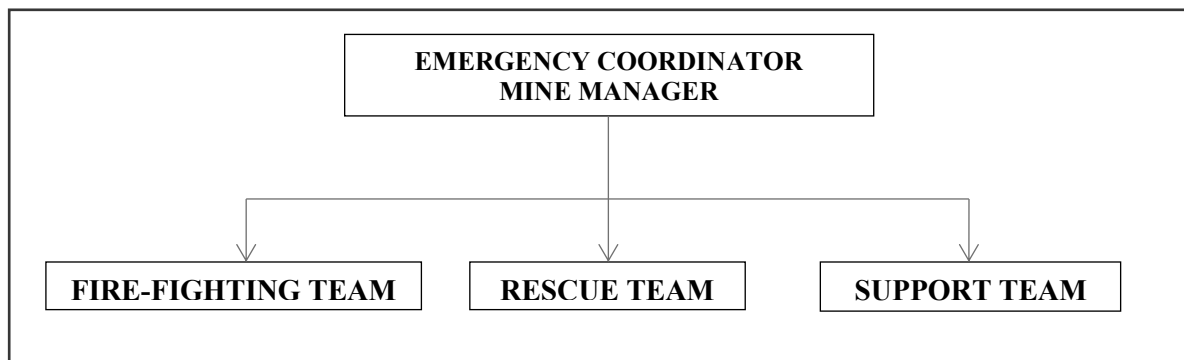
The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities.

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

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

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

**FIGURE 7.1: DISASTER MANAGEMENT TEAM LAYOUT**



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

**TABLE 7.2: PROPOSED TEAMS TO DEAL WITH EMERGENCY SITUATION**

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

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

**Roles and responsibilities of emergency team –**

(a) Emergency coordinator (EC)



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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 <sub>2</sub> type, foam type, dry chemical powder type
Fuel Storage Area	CO <sub>2</sub> type, foam type, dry chemical powder type, Sand bucket
Office Area	Dry chemical type, foam type

### Alarm system to be followed during disaster –

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

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

- All safety precautions and provisions of Metalliferous Mines Regulations (MMR), 1961 is strictly followed during all mining operations.
- Observance of all safety precautions for blasting and storage of explosives as per MMR 1961.
- Entry of unauthorized persons into mine & allied areas is completely prohibited.
- Fire-fighting and first-aid provisions in the mines office complex and mining area are provided.
- Provisions of all the safety appliances such as safety boot, helmets, goggles, dust masks, ear plugs and ear muffs etc. are made available to the employees and the use of same is strictly adhered to through regular monitoring.
- Training and refresher courses for all the employees working in hazardous premises.
- Working of mine, as per approved plans and regularly updating the mine plans.
- Cleaning of mine faces is regularly done.
- Handling of explosives, charging and blasting are carried out only by qualified persons following SOP.
- Checking and regular maintenance of garland drains and earthen bunds to avoid any inflow of surface water in the mine pit.
- Provision of high-capacity standby pumps with generator sets with enough quantity of diesel for emergency pumping especially during monsoon.
- A blasting SIREN is used at the time of blasting for audio signal.
- Before blasting and after blasting, red and green flags are displayed as visual signals.
- Warning notice boards indicating the time of blasting and NOT TO TRESPASS are displayed at prominent places.
- Regular maintenance and testing of all mining equipment were carried out as per manufacturer's guidelines.

**7.4 CUMULATIVE IMPACT STUDY**

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

**TABLE 7.4: LIST OF QUARRIES WITHIN 500 METER RADIUS**

<b>PROPOSED QUARRIES</b>				
<b>CODE</b>	<b>Name of the Owner</b>	<b>S.F. Nos</b>	<b>Extent</b>	<b>Status</b>
<b>P1</b>	M/s. AVS Tech Building Solutions, Proprietor S. Srinivasan, No. 112/B, ESI Back Side, Mookondapalli, Hosur Taluk, Krishnagiri District, Tamil Nadu State – 635 126.	315/1 (P), 334/1A (P) and 334/1B (P)	4.35.85	Received for TOR Vide <b>Lr No. SEIAA- TN/F.No.8707/SEAC/TOR- 1070/2022 Dated: 01.03.2022.</b>
<b>EXISTING QUARRIES</b>				
<b>E1</b>	Thiru. K.M.Gopaliah, S/o. Late Munisamy, Door No.18/A, Karupala Village, Semparasanapalli Post, Shoolagiri, Hosur, Krishnagiri District – 635 117.	316 (P-2)	2.70.00	25.01.2019 to 24.01.2024
<b>E2</b>	M/s. AVS Tech Building Solutions, Thiru. S. Srinivasan, No.112/1B, Mookandapalli, ESIC Back Side, Hosur Taluk, Krishnagiri District – 635 126.	316 (Part-1)	2.89.00	24.08.2016 to 23.08.2026
<b>ABANDONED / OLD QUARRIES</b>				
<b>A1</b>	Thiru. S. Sundraiah, Late. S/o. Subramanian, No.2/89A-1, Addraganapalli Village, Shoolagiri Tk, Krishnagiri Dt.	319/2B, 2C, 2D	0.85.00	20.03.2015 to 19.03.2020
<b>TOTAL CLUSTER EXTENT P1+E1+E2</b>			<b>9.94.85 ha</b>	

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	M/s. AVS Tech Building Solutions, Rough Stone Quarry	
Toposheet No	57-H/10	
Latitude between	12°33'34.45"N to 12°33'44.96"N	
Longitude between	77°40'47.64"E to 77°40'55.77"E	
Highest Elevation	935 m AMSL	
Proposed Depth of Mining	16m	
Geological Resources	Rough Stone in m <sup>3</sup>	Topsoil m <sup>3</sup>
	17,43,400	43,585
Mineable Reserves	Rough Stone in m <sup>3</sup>	Topsoil m <sup>3</sup>
	9,50,820	37,626
Production as per the depth recommended in ToR	Rough Stone in m <sup>3</sup>	Topsoil m <sup>3</sup>
	4,87,120 m <sup>3</sup>	37,626
Existing Pit Dimension	-	
Ultimate Pit Dimension	273m (L) * 186m (W) * 41m (D)	
Water Level in the surrounding area	67-62m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease area is a plain terrain. The area has gentle slope towards Southern side. The altitude of the area is 935m (max) above mean sea level.	
Machinery proposal for this scheme period	Jack Hammer	6 Nos
	Compressor	2 Nos
	Wagon Drill	1 No
	Excavator with Bucket & Rock Breaker	2 Nos
	Tipplers	4 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	25 Nos	
Total Project Cost	Rs. 1,34,06,000/-	
Proposed CER Cost	Rs.10,00,000/-	
Nearby Water Bodies	Soman Eri	530m South
	Tank Near Hosapuram	630m North
	Tank Near Kothanur	1.2km NE
	Sarandapalli Vannamma Lake	1.6km SE
	Thally Lake	3.2km NW
	Thoragari Agraharam Lake	6.0km NE
Greenbelt Development Plan	Proposed to plant about 2,500 Nos of trees in the safety barrier and village roads considering 500 Nos of Trees per hectare.	
Proposed Water Requirement	3.5 KLD	
Nearest Habitation	670m South East	

Source: Approved Mining Plan and as per recommendations given in TOR letter (Point -1).

**TABLE 7.6: SALIENT FEATURES OF PROPOSAL “E1”**

Name of the Quarry	Thiru. K.M.Gopaliah Rough Stone Quarry	
Toposheet No	57-H/10	
Latitude between	12°33'38.00" N- 12°36'43.18" N	
Longitude between	77°40'55.76" E- 77°40'59.40" E	
Proposed Production as per EC	Rough Stone in m <sup>3</sup>	
	3,17,129	
Ultimate Depth	42m	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Machinery proposed	Jack Hammer	6 Nos

	Compressor	2 Nos
	Hydraulic Excavator	1 Nos
	Tippers	3 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	18 Nos	
Project Cost	Rs. 53,30,000/-	

**TABLE 7.7: SALIENT FEATURES OF PROPOSAL “E2”**

Name of the Quarry	M/s. AVS Tech Building Solutions Rough Stone Quarry	
Toposheet No	57-H/10	
Latitude between	12°33'54.37" N- 12°33'43.88" N	
Longitude between	77°40'55.27" E- 77°40'47.58" E	
Geological Resources	Rough stone in m <sup>3</sup>	Top soil in m <sup>3</sup>
	10,53,984	14,936
Mineable Reserves	Rough stone in m <sup>3</sup>	Top soil in m <sup>3</sup>
	4,87,618	9,320
Year Wise Production for 5 Years	Rough stone in m <sup>3</sup>	Top soil in m <sup>3</sup>
	4,87,618	9,320
Depth granted	42m	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Machinery proposed	Jack Hammer	6 Nos
	Compressor	2 Nos
	Hydraulic Excavator	1 Nos
	Tippers	3 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is practiced.	
Proposed Manpower Deployment	18 Nos	
Project Cost	Rs. 1.14 Crore	

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

#### Air Environment –

Calculating the Cumulative Load of Mining within the cluster is as shown in table 7.9 & 7.10.

**TABLE 7.8: CUMULATIVE PRODUCTION LOAD OF ROUGH STONE**

Quarry	PROPOSED PRODUCTION DETAILS			
	5 Years in m <sup>3</sup>	Per Year in m <sup>3</sup>	Per Day in m <sup>3</sup>	Number of Lorry Load Per Day @ 12m <sup>3</sup> per load
P1	4,87,120	97,424	325	27
E1	3,17,129	63,426	211	18
E2	4,87,618	1,62,539	542	45
<b>Total</b>	<b>12,91,867</b>	<b>3,23,389</b>	<b>1,078</b>	<b>90</b>

On a cumulative basis considering all the 3 quarries it can be seen that the overall production of Rough Stone is **1,078m<sup>3</sup>** per day with a capacity of **90 trips** of Rough Stone per day (@12m<sup>3</sup> per load) from the cluster quarries.

The excavated topsoil will be stored within the project premises and it will be used for green belt development.

Note: Per day production of Rough Stone is calculated for 5 Years Lease of production period.

Based on the above production quantities the emissions due to various activities in all the 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 7.11.

**TABLE 7.9: EMISSION ESTIMATION FROM QUARRIES WITHIN 500 METER RADIUS**

<b>EMISSION ESTIMATION FOR QUARRY “P1”</b>				
	<b>Activity</b>	<b>Source type</b>	<b>Value</b>	<b>Unit</b>
Estimated Emission Rate for PM <sub>10</sub>	Drilling	Point Source	0.102862787	g/s
	Blasting	Point Source	0.002785517	g/s
	Mineral Loading	Point Source	0.045011505	g/s
	Haul Road	Line Source	0.002500014	g/s/m
	Overall Mine	Area Source	0.073326942	g/s
Estimated Emission Rate for SO <sub>2</sub>	Overall Mine	Area Source	0.001281576	g/s
Estimated Emission Rate for NO <sub>x</sub>	Overall Mine	Area Source	0.000119883	g/s
<b>EMISSION ESTIMATION FOR QUARRY “E1”</b>				
	<b>Activity</b>	<b>Source type</b>	<b>Value</b>	<b>Unit</b>
Estimated Emission Rate for PM <sub>10</sub>	Drilling	Point Source	0.090166727	g/s
	Blasting	Point Source	0.001441604	g/s
	Mineral Loading	Point Source	0.042788272	g/s
	Haul Road	Line Source	0.002492918	g/s/m
	Overall Mine	Area Source	0.059003023	g/s
Estimated Emission Rate for SO <sub>2</sub>	Overall Mine	Area Source	0.000757961	g/s
Estimated Emission Rate for NO <sub>x</sub>	Overall Mine	Area Source	0.000045301	g/s
<b>EMISSION ESTIMATION FOR QUARRY “E2”</b>				
	<b>Activity</b>	<b>Source type</b>	<b>Value</b>	<b>Unit</b>
Estimated Emission Rate for PM <sub>10</sub>	Drilling	Point Source	0.122766767	g/s
	Blasting	Point Source	0.006745568	g/s
	Mineral Loading	Point Source	0.047251179	g/s
	Haul Road	Line Source	0.002511176	g/s/m
	Overall Mine	Area Source	0.064880387	g/s
Estimated Emission Rate for SO <sub>2</sub>	Overall Mine	Area Source	0.001981353	g/s
Estimated Emission Rate for NO <sub>x</sub>	Overall Mine	Area Source	0.000131682	g/s

Source: Emission Calculations

**Noise Environment –**

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

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

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

Where:

L<sub>p1</sub> & L<sub>p2</sub> are sound levels at points located at distances r<sub>1</sub> & r<sub>2</sub> from the source.

Ae<sub>1,2</sub> is the excess attenuation due to environmental conditions. Combined effect of all sources can be determined at various locations by logarithmic addition.

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

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

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

**TABLE 7.10: PREDICTED NOISE INCREMENTAL VALUES FROM CLUSTER**

Location Code	Background Value (Day) dB(A)	Incremental Value dB(A)	Total Predicted dB(A)	Residential Area Standards dB(A)
Habitation Near P1	49.1	49.2	52	55
Habitation Near E1	44.2	48.1	49.6	55
Habitation Near E2	49.0	49.3	51.3	55

Source: Lab Monitoring Data

The incremental noise level is found within the range of 48.1 – 49.3 dB (A) in Buffer zone. The noise level at different receptors in buffer zone is lower due to the distance involved and other topographical features adding to the noise attenuation. The resultant Noise level due to monitored values and calculated values at the receptors are based on the mathematical formula considering attenuation due to Green Belt as 4.9 dB (A) the barrier effect. From the above table, it can be seen that the ambient noise levels at all the locations near habitations are within permissible limits of Residential Area (buffer zone) as per THE NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 (The Principal Rules were published in the Gazette of India, vide S.O.123(E), dated 14.2.2000 and subsequently amended vide S.O. 1046(E), dated 22.11.2000, S.O. 1088(E), dated 11.10.2002, S.O. 1569 (E), dated 19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment(Protection) Act, 1986.).

### Ground Vibrations

Ground vibrations due to mining activities in the all the 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 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.

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

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 7.11: GROUND VIBRATIONS IN THE CLUSTER**

Location Code	Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
P1	141	670m – SE	0.788
E1	92	740m – SE	0.478
E2	140	980m – SE	0.426

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

**TABLE 7.12: SOCIO ECONOMIC BENEFITS FROM THE CLUSTER**

Location Code	Project Cost	CER
P1	Rs.1,41,66,000	Rs.10,00,000

E1	Rs.53,30,000	Rs.5,00,000
E2	Rs.1,14,00,000	Rs.10,00,000
<b>Total</b>	<b>Rs. 3,08,96,000</b>	<b>Rs. 25,00,000</b>

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.

- The Projects shall fund towards CER – Rs 6,88,200/-

**TABLE 7.13: EMPLOYMENT BENEFITS FROM 2 MINES IN THE CLUSTER**

Location Code	Employment
P1	25
E1	18
E2	18
<b>Total</b>	<b>61</b>

A total of 86 people will get employment due to the cluster quarries.

**TABLE 7.14: GREENBELT DEVELOPMENT BENEFITS FROM 2 MINE IN THE CLUSTER**

CODE	No of Trees proposed to be planted	Survival %	Name of the Species
P1	2,500	80%	Neem, Pongamia pinnata, Panai
E1	1,500	80%	Neem, Pongamia pinnata
E2	1,500	80%	Neem, Pongamia pinnata
<b>Total</b>	<b>5,500</b>	<b>80%</b>	

Based on the Proposed Mining Plan, it is anticipated that they shall grow native species of Neem, Pungamia pinnata, etc in the Cluster at a rate of 1,700 Trees Planted over a period of 5 Years with Survival Rate of 80%.

## 7.5 PLASTIC WASTE MANAGEMENT PLAN

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

### Objective –

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

**TABLE 7.15: ACTION PLAN TO MANAGE PLASTIC WASTE IN THE CLUSTER QUARRIES**

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
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Source: Proposed by FAE's and EC

## 7.6 POST COVID HEALTH MANAGEMENT PLAN

COVID – 19 disease caused by SARS-CoV-2 Coronavirus is relatively a new disease, with fresh information being known on a dynamic basis about the natural history of the disease, especially in terms of post-recovery events.

After acute COVID-19 illness, recovered patients may continue to report wide variety of signs and symptoms including fatigue, body ache, cough, sore throat, difficulty in breathing, etc. As of now there is limited evidence of post-COVID sequelae and further research is required and is being actively pursued. A holistic approach is required for follow up care and well-being of all post COVID recovering patients.

### Post-COVID Follow Up Protocol –

- Continue COVID appropriate behaviour (use of mask, hand & respiratory hygiene, physical distancing).
- Drink adequate amount of warm water (if not contra-indicated).
- Make sure your workplaces are clean and hygienic
- Surfaces (e.g., desks and tables) and objects (e.g., telephones, helmet) need to be wiped with disinfectant regularly
- Put sanitizing hand rub dispensers in prominent places around the workplace. Make sure these dispensers are regularly refilled
- Display posters promoting hand-washing
- Make sure that staff, contractors and customers have access to places where they can wash their hands with soap and water
- Display posters promoting respiratory hygiene.
- Brief your employees, contractors and customers that if COVID-19 starts spreading in your community anyone with even a mild cough or low-grade fever (37.3°C or more) need to stay at home. They should also stay home (or work from home) if they have had to take simple medications, such as paracetamol/acetaminophen, ibuprofen or aspirin, which may mask symptoms of infection
- Keep communicating and promoting the message that people need to stay at home even if they have just mild symptoms of COVID-19.
- It is also suggested by the Ministry of AYUSH that the use of Chyawanprash in the morning (1 teaspoonful) with luke warm water/milk is highly recommended (under the direction of Registered Ayurveda physician) as in the clinical practice Chyawanprash is believed to be effective in post-recovery period.
- If there is persistent dry cough / sore throat, do saline gargles and take steam inhalation. The addition of herbs/spices for gargling/steam inhalation. Cough medications, should be taken on advice of medical doctor or qualified practitioner of Ayush.
- Look for early warning signs like high grade fever, breathlessness, SpO<sub>2</sub> < 95%, unexplained chest pain, new onset of confusion, focal weakness.
- Avoid smoking and consumption of alcohol.
- Communicate to your employees and contractors about the plan and make sure they are aware of what they need to do – or not do – under the plan. Emphasize key points such as the importance of staying away from work even if they have only mild symptoms or have had to take simple medications (e.g. paracetamol, ibuprofen) which may mask the symptoms
- The plan should address how to keep your business running even if a significant number of employees, contractors and suppliers cannot come to your place of business - either due to local restrictions on travel or because they are ill.

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## **8. PROJECT BENEFITS**

### **8.0 GENERAL**

The Rough stone quarry project at Dharavendiram Village aims to produce 4,87,120m<sup>3</sup> Rough Stone over a Scheme period of 10 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 an existing quarry about 50 persons will get employment opportunity for carrying out mining operations and preference will be given to the local people. In addition, there will be opportunity for indirect employment to many people in the form of contractual jobs, business opportunities, service facilities etc. the economic status of the local people will be enhanced due to mining project.

### **8.2 SOCIO-ECONOMIC WELFARE MEASURES PROPOSED**

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

### **8.3 IMPROVEMENT IN PHYSICAL INFRASTRUCTURE**

The project area is located in Dharavendiram Village, Denkanikottai Taluk and Krishnagiri 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.,

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**CORPORATE ENVIRONMENT RESPONSIBILITY**


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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  $\leq$  100 crores, This project shall contribute 2% of Capital Investment towards CER as per directions of EAC/SEAC. Cumulative Capital cost is Rs.1,41,66,000/- and 2% of the same works out to Rs.1,69,000/-

**TABLE 8.1: CER – ACTION PLAN**

Activity	Beneficiaries	Total
Renovation/ Re construction of Existing toilets	Nearby Government School	Rs 5,00,000/-
Providing books to the School library		
Carrying out plantation in the school compound wall		
<b>TOTAL</b>		<b>Rs 5,00,000/-</b>

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

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**9. ENVIRONMENTAL COST BENEFIT ANALYSIS**

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

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## 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 M/s. AVS Tech Building Solutions–

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

Source: Proposed by FAE's & EIA Coordinator

## 10.3 SOIL MANAGEMENT

There is no overburden or waste anticipated from proposed project.

**TABLE 10.2: PROPOSED CONTROLS FOR SOIL MANAGEMENT**

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

Source: Proposed by FAE's & EIA Coordinator

## 10.4 WATER MANAGEMENT

In the Rough stone quarry 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 **16m**, the water table in the area is 70 m below ground level, hence the proposed project will not intersect the Ground water table during entire quarry period.

**TABLE 10.3: PROPOSED CONTROLS FOR WATER ENVIRONMENT**

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

**TABLE 10.4: PROPOSED CONTROLS FOR AIR ENVIRONMENT**

<b>CONTROL</b>	<b>RESPONSIBILITY</b>
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**

<b>CONTROL</b>	<b>RESPONSIBILITY</b>
Development of thick greenbelt all along the Buffer Zone (7.5 Meters) of the project area to attenuate the noise and the same will be maintained	Mines Manager
Preventive maintenance of mining machinery and replacement of worn-out accessories to control noise generation	Mines Foreman
Deployment of mining equipment with an inbuilt mechanism to reduce noise	Mines Manager
Provision of earmuff / ear plugs to workers working in noise prone zones in the mines	Mining Mate
Provision of effective silencers for mining machinery and transport vehicles	Mines Manager
Provision of sound proof AC operator cabins to HEMM	Mines Manager

Sharp drill bits are used to minimize noise from drilling	Mines Foreman
Controlled blasting technologies are adopted by using delay detonators to minimize noise from blasting	Mines Manager
Annual ambient noise level monitoring are carried out in the project area and in surrounding villages to assess 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 2,500 nos. of saplings is proposed to be planted for the Mining plan period in safety barrier of lease area and panchayat roads 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 planted	Name of the species
I	It is proposed to plant 2,500 Nos of trees in the 1 <sup>st</sup> year	85%	Safety barrier, Un utilized area's and nearby village roads	Neem, Pungam, Sengondrai, Panai, Kattuma

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 detailed medical examination at the time of employment. The medical examination covers the following tests under mines act 1952.

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

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

**TABLE 10.9: MEDICAL EXAMINATION SCHEDULE**

Sl.No	Activities	1 <sup>st</sup> Year	2 <sup>nd</sup> Year	3 <sup>rd</sup> Year	4 <sup>th</sup> Year	5 <sup>th</sup> 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 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 Proponent will provide special induction program along with machinery manufacturers for the operators and co-operators to run and maintain the machinery effectively and efficiently. The training program for the supervisors and office staffs will be arranged in the Group Vocational Training Centres in the State and engage Environmental Consultants to provide periodical training to all the employees to carry out the mining operation in and eco-friendly manner.

**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 &amp; EIA Coordinator as per DGMS Norms

**10.9.4A 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**

Activity	Mitigation measure	Provision for Implementation	Cost of EMP INR	
			Capital Cost INR	Recurring Cost INR
Haul Road Dust Suppression	Compaction, gradation and drainage on both sides	Rental Dozer & drainage construction on haul road length 200 m @ 300/ Meter	60,000/-	40,000/-
	Fixed Water Sprinkling Arrangements + thrice a day water sprinkling by own water tankers	Water @ Rs 200/- per tanker	7,00,000/-	1,80,000/-
	Air Quality will be regularly monitored as per norms within ML area & Ambient Area	Yearly Compliance as per CPCB norms	0	76,000/-
Mine Pit Operations	Muffle blasting to control fly rocks during blasting	Blasting face will be covered with sand bags/ steel mesh/ old tyres used conveyor belts	0	5,000/-
	Wet drilling procedure/ latest eco friendly drill machine with separate dust extractor unit (6 Jack hammer proposed)	drill machine with separate dust extractor unit @ Rs. 25,000/- per unit (6 Jack hammer proposed)	1,50,000/-	50,000

Truck Loading		No overloading of trucks/tippers/tractors	Manual Monitoring through Security guard	0	5,000/-
		Stone carrying trucks will be covered by tarpaulin to avoid escape of fines to the atmosphere	Monitoring if trucks will be covered by tarpaulin	0	10,000/-
		Enforcing speed limits of 20 km/hr within ML area	Installation of Speed Governors @ Rs. 5000/- per Tipper deployed	20,000/-	5,000/-
		Regular monitoring of exhaust fumes as per RTO norms	Monitoring of Exhaust Fumes	0	5,000/-
Transportation over roads		Regular sweeping and maintenance of roads for at least about 200 m from quarry entrance	Provision for 4 labours @ Rs.20,000/labour (Contractual)	0	80,000/-
		Installing wheel wash system near exit gate of quarry	Installation + Maintenance + Supervision	30,000/-	10,000/-
Noise Management	Mine Pit Operations	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
		Plantation along periphery of lease area will act as attenuation.	Provision made in Operating Cost	0	0
<b>Vibrations</b>	Drilling & Blasting	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 in opposite side of bench face to reduce vibration during 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.	Installation of Warning System	25,000/-	2,000/
		Provision for Portable blaster shed	Installation of Portable blasting shelter	50,000/-	2,000/-
		Occasionally NONEL Blasting to control Fly rocks & ground vibration	Provision made in Operating Cost	0	7,00,000
Attribute	Activity	Mitigation measure	Provision for Implementation	Cost of EMP INR	
				Capital Cost INR	Recurring Cost INR



<p><b>Surface Water</b></p>	<p>Water collected during Monsoon period</p>	<p>During monsoon period surface runoff around the quarry will follow the garland drains/storm water drains as per natural drain pattern. Eroded sediments, through a garland drain will be entrapped before being discharged to the natural drainage system. Otherwise the water from garland drains shall be collected in temporary pit reservoirs, after settling and this collected water shall be used for a plantation and dust suppression.</p>	<p>Provision for garland drain drains @ Rs. 300/Running Meter (Provision for Peripheral Length 770m) + Recurring for maintenance</p>	<p>*2,70,000/-</p>	<p>30,000/-</p>
<p><b>Solid Waste</b></p>	<p>Mine Pit Operations</p>	<p>Any domestic waste generated due to human activity will be collected and handed over to solid waste handling agency.</p>	<p>Provision for domestic waste collection and disposal through authorized agency (Capital Cost Member ship fee + Recurring for collection /disposal charges)</p>	<p>5,000/-</p>	<p>20,000/-</p>

		Provision for dust bins etc.	Installation of dust bins	10,000/-	1000/-
<b>Toilets/ Sanitation</b>	Mine Pit Operations	Bio toilets will be made available outside mine lease on the land of owner itself	Provision made in Operating Cost	0	0
<b>EC Condition</b>	Display Board	Size 6’ X 5’ with blue background and white letters mentioning detailing as per Appendix – II in SEAC, Minutes	Fixed Display Board at the Quarry Entrance as permanent structure	30,000/-	1,000/-
<b>Attribute</b>	<b>Activity</b>	<b>Mitigation measure</b>	<b>Provision for Implementation</b>	<b>Cost of EMP INR</b>	
				<b>Capital Cost INR</b>	<b>Recurring Cost INR</b>
<b>Occupational Health and Safety</b>	Mine Pit Operations	Workers will be provided with Personal Protective Equipment's	Provision of 25 kits	0	1,00,000/-
		Health check up for workers will be provisioned	IME & PME Health check up	0	25,000/-
		First aid facility will be provided	Provision of 5 kits	0	20,000/-
		Mine will have safety precaution signages, boards.	Provision for signages and boards made	20,000/-	2,000/-
		Barbed Wire Fencing to quarry area will be provisioned.	Wire Fencing @ 300 per Meter for 1000m	*.3,00,000/-	30,000/-

<b>Development of Green Belt</b>	Mine Pit Operations Transportation over roads	About 2,500 trees along peripheral length within 7.5m safety zone	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant and maintenance	5,00,000/-	30,000/-
<b>Mine Closure Activity</b>	Mine Pit Operations	Closure includes Greenbelt development, wire fencing, garland drains	Provision made in Closure Cost	*5,62,000/-	0
<b>Traffic Management</b>	Mine Pit Operations Transportation over roads	No parking will be provided on the transport routes. Separate provision within ML will be made for vehicles /HEMMs. Flaggers will be deployed for traffic management	Parking area with shelter and flags	1,00,000/-	10,000/-
<b>Monitoring System</b>	Mine pit, & Operation Vehicle movement	Installation of CCTV cameras in the mines and mine entrance	Camera 6 Nos, DVR, Monitor with internet facility	30,000/-	8,000/-
<b>Attribute</b>	<b>Activity</b>	<b>Mitigation measure</b>	<b>Provision for Implementation</b>	<b>Cost of EMP INR</b>	
				<b>Capital Cost INR</b>	<b>Recurring Cost INR</b>

<b>Employment of Statutory / Competent Personnel</b>	Supervision of Quarrying activities	Implementation as per Mining Plan and ensure safe quarry working	Mines Manager (1 <sup>st</sup> Class / 2 <sup>nd</sup> Class / Mine Foreman) under regulation 34 / 34 (6) of MMR, 1961 and Mining Mate under regulation 116 of MMR,1961	0	7,80,000/-
<b>TOTAL EMP BUDGET</b>				<b>17,30,000/-</b>	<b>22,27,000/-</b>

\* Marked cost is already discussed in the mining plan hence that is not included in the total Environmental Management plan cost

**Total Cost for the Ten years**

Year	Total Cost	Year	Total Cost
1 <sup>st</sup>	₹ 39,57,000	6 <sup>th</sup>	₹ 37,07,279
2 <sup>nd</sup>	₹ 23,38,350	7 <sup>th</sup>	₹ 28,42,279
3 <sup>rd</sup>	₹ 24,55,268	8 <sup>th</sup>	₹ 29,84,393
4 <sup>th</sup>	₹ 25,78,031	9 <sup>th</sup>	₹ 31,33,613
5 <sup>th</sup>	₹ 27,06,932	10 <sup>th</sup>	₹ 32,90,293

Cost inflation 5% per annum

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

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**10.10 CONCLUSION –**

Various aspects of mining activities were considered and related impacts were evaluated. Considering all the possible ways to mitigate the environmental concerns Environmental Management Plan was prepared and fund has been allocated for the same. The EMP is dynamic, flexible and subjected to periodic review. For project where the major environmental impacts are associated, EMP will be under regular review. Senior Management responsible for the project will conduct a review of EMP and its implementation to ensure that the EMP remains effective and appropriate. Thus, the proper steps will be taken to accomplish all the goals mentioned in the EMP and the project will bring the positive impact in the study area.

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## 11. SUMMARY AND CONCLUSION

M/s. AVS Tech Building Solutions having Rough stone quarry lease (Over an Extent of : 4.35.85 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 March to May 2022 for various environmental components so as to assess the anticipated impacts of the cluster quarry projects on the environment and suitable mitigation measures for likely adverse impacts due to the proposed project is suggested individually for the respective proposed project under Chapter 10.

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

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

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

Sustainable and modern mining leads us to see positive impact of mining operation and providing consistent employment for nearly 25 people directly in the cluster and indirectly around 10 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 M/s. AVS Tech Building Solutions, Rough Stone (Extent: 4.35.85 ha).

## 12. DISCLOSURE OF CONSULTANT

M/s. AVS Tech Building Solutions, 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.

Name and address of the consultancy:

### **GEO EXPLORATION AND MINING SOLUTIONS**

No 17, Advaita Ashram Road,

Alagapuram, Salem – 636 004

Tamil Nadu, India

Email: [infogeoexploration@gmail.com](mailto:infogeoexploration@gmail.com)

Web: [www.gemssalem.com](http://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	<b>Dr. M. Ifthikhar Ahmed</b>	<b>In-house</b>	<b>1</b>	<b>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	Mr. N. Senthilkumar	Empanelled	38 28	B B	AQ WP RH	B B A
5	Mrs. Jisha parameswaran	In-house	-	-	SW	B
6	Mr. Govindasamy	In-house	-	-	WP	B
7	Mrs. K. Anitha	In-house	-	-	SE	A
8	Mrs. Amirtham	In-house	-	-	EB	B
9	Mr. Alagappa Moses	Empanelled	-	-	EB	A
10	Mr. A. Allimuthu	In-house	-	-	LU	B
11	Mr. S. Pavel	Empanelled	-	-	RH	B
12	Mr. J. R. Vikram Krishna	Empanelled	-	-	SHW RH	A A

Abbreviations			
EC	EIA Coordinator	EB	Ecology and bio-diversity
AEC	Associate EIA Coordinator	NV	Noise and vibration
FAE	Functional Area Expert	SE	Socio economics
FAA	Functional Area Associates	HG	Hydrology, ground water and water conservation
TM	Team Member	SC	Soil conservation
GEO	Geology	RH	Risk assessment and hazard management
WP	Water pollution monitoring, prevention and control	SHW	Solid and hazardous wastes
AP	Air pollution monitoring, prevention and control	MSW	Municipal Solid Wastes
LU	Land Use	ISW	Industrial Solid Wastes
AQ	Meteorology, air quality modeling, and prediction	HW	Hazardous Wastes

**DECLARATION BY EXPERTS CONTRIBUTING TO THE EIA/EMP**

Declaration by experts contributing to the EIA/EMP of Dharavendiram Rough Stone Quarry Project over a Cluster Extent of 9.94.85 ha at Dharavendiram Village of Denkanikottai Taluk, Krishnagiri 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:




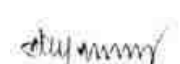

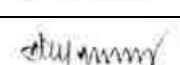

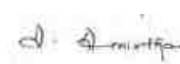



Period of Involvement: **January 2019 to till date**




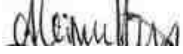





**Associated Team Member with EIA Coordinator:**

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

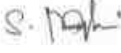
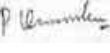


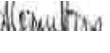

**FUNCTIONAL AREA EXPERTS ENGAGED IN THE PROJECT**

Sl. No.	Functional Area	Involvement	Name of the Expert/s	Signature
1	AP	<ul style="list-style-type: none"> <li>▪ Identification of different sources of air pollution due to the proposed mine activity</li> <li>▪ Prediction of air pollution and propose mitigation measures / control measures</li> </ul>	Mr. A. Jagannathan	
2	WP	<ul style="list-style-type: none"> <li>▪ Suggesting water treatment systems, drainage facilities</li> <li>▪ Evaluating probable impacts of effluent/waste water discharges into the receiving environment/water bodies and suggesting control measures.</li> </ul>	Dr. M. Ifthikhar Ahmed	
			Mr. N. Senthilkumar	
3	HG	<ul style="list-style-type: none"> <li>▪ Interpretation of ground water table and predict impact and propose mitigation measures.</li> <li>▪ Analysis and description of aquifer Characteristics</li> </ul>	Dr. P. Thangaraju	
4	GEO	<ul style="list-style-type: none"> <li>▪ Field Survey for assessing the regional and localgeology of the area.</li> <li>▪ Preparation of mineral and geological maps.</li> <li>▪ Geology and Geo morphological analysis/description and Stratigraphy/Lithology.</li> </ul>	Dr. M. Ifthikhar Ahmed	
			Dr. P. Thangaraju	
5	SE	<ul style="list-style-type: none"> <li>▪ Revision in secondary data as per Census ofIndia, 2011.</li> <li>▪ Impact Assessment &amp; Preventive ManagementPlan</li> <li>▪ Corporate Environment Responsibility.</li> </ul>	Mrs. K. Anitha	
6	EB	<ul style="list-style-type: none"> <li>▪ Collection of Baseline data of Flora and Fauna.</li> <li>▪ Identification of species labelled as Rare, Endangered and threatened as per IUCN list.</li> <li>▪ Impact of the project on flora and fauna.</li> <li>▪ Suggesting species for greenbelt development.</li> </ul>	Mrs. Amirtham	
			Mr. Alagappa Moses	



7	RH	<ul style="list-style-type: none"> <li>▪ Identification of hazards and hazardous substances</li> <li>▪ Risks and consequences analysis</li> <li>▪ Vulnerability assessment</li> <li>▪ Preparation of Emergency Preparedness Plan</li> <li>▪ Management plan for safety.</li> </ul>	Mr. N. Senthilkumar	
			Mr. S. Pavel	
			Mr. J. R. Vikram Krishna	
8	LU	<ul style="list-style-type: none"> <li>▪ Construction of Land use Map</li> <li>▪ Impact of project on surrounding land use</li> <li>▪ Suggesting post closure sustainable land use and mitigative measures.</li> </ul>	Mr. A. Allimuthu	
9	NV	<ul style="list-style-type: none"> <li>▪ Identify impacts due to noise and vibrations</li> <li>▪ Suggesting appropriate mitigation measures for EMP.</li> </ul>	Mr. A. Jagannathan	
10	AQ	<ul style="list-style-type: none"> <li>▪ Identifying different source of emissions and propose predictions of incremental GLC using AERMOD.</li> <li>▪ Recommending mitigations measures for EMP</li> </ul>	Mr. N. Senthilkumar	
11	SC	<ul style="list-style-type: none"> <li>▪ Assessing the impact on soil environment and proposed mitigation measures for soil conservation</li> </ul>	Dr. M. Ifthikhar Ahmed	
12	SHW	<ul style="list-style-type: none"> <li>▪ Identify source of generation of non-hazardous solid waste and hazardous waste.</li> <li>▪ Suggesting measures for minimization of generation of waste and how it can be reused or recycled.</li> </ul>	Mr. A. Jagannathan	
			Mr. J. R. Vikram Krishna	

**LIST OF TEAM MEMBERS ENGAGED IN THIS PROJECT**

Sl.No.	Name	Functional Area	Involvement	Signature
1	Mr. S. Nagamani	AP; GEO; AQ	<ul style="list-style-type: none"> <li>▪ Site Visit with FAE</li> <li>▪ Provide inputs &amp; Assisting FAE with sources of Air Pollution, its impact and suggest control measures</li> <li>▪ Provide inputs on Geological Aspects</li> <li>▪ Analyse &amp; provide inputs and assist FAE with meteorological data, emission estimation, AERMOD modelling and suggesting control measures</li> </ul>	
2	Mr. Viswanathan	AP; WP; LU	<ul style="list-style-type: none"> <li>▪ Site Visit with FAE</li> <li>▪ Provide inputs &amp; Assisting FAE with sources of Air Pollution, its impact and suggest control measures</li> <li>▪ Assisting FAE on sources of water pollution, its impacts and suggest control measures</li> <li>▪ Assisting FAE in preparation of land use maps</li> </ul>	
3	Mr. Santhoshkumar	GEO; SC	<ul style="list-style-type: none"> <li>▪ Site Visit with FAE</li> <li>▪ Provide inputs on Geological Aspects</li> <li>▪ Assist in Resources &amp; Reserve Calculation and preparation of Production Plan &amp; Conceptual Plan</li> <li>▪ Provide inputs &amp; Assisting FAE with soil conservation methods and identifying impacts</li> </ul>	
4	Mr. Umamahesvaran	GEO	<ul style="list-style-type: none"> <li>▪ Site Visit with FAE</li> <li>▪ Provide inputs on Geological Aspects</li> <li>▪ Assist in Resources &amp; Reserve Calculation and preparation of Production Plan &amp; Conceptual Plan</li> </ul>	
5	Mr. A. Allimuthu	SE	<ul style="list-style-type: none"> <li>▪ Site Visit with FAE</li> <li>▪ Assist FAE with collection of data's</li> <li>▪ Provide inputs by analysing primary and secondary data</li> </ul>	
6	Mr. S. Ilavarasan	LU; SC	<ul style="list-style-type: none"> <li>▪ Site Visit with FAE</li> <li>▪ Assisting FAE in preparation of land use maps</li> </ul>	

			<ul style="list-style-type: none"> <li>▪ Provide inputs &amp; Assisting FAE with soil conservation methods and identifying impacts</li> </ul>	
7	Mr. E. Vadivel	HG	<ul style="list-style-type: none"> <li>▪ Site Visit with FAE</li> <li>▪ Assist FAE &amp; provide inputs on aquifer characteristics, ground water level/table</li> <li>▪ Assist with methods of ground water recharge and conduct pump test, flow rate</li> </ul>	<i>E. Vadivel</i>
8	Mr. D. Dinesh	NV	<ul style="list-style-type: none"> <li>▪ Site Visit with FAE</li> <li>▪ Assist FAE and provide inputs on impacts due to proposed mine activity and suggest mitigation measures</li> <li>▪ Assist FAE with prediction modelling</li> </ul>	<i>D. Dinesh</i>
9	Mr. Panneer Selvam	EB	<ul style="list-style-type: none"> <li>▪ Site Visit with FAE</li> <li>▪ Assist FAE with collection of baseline data</li> <li>▪ Provide inputs and assist with labelling of Flora and Fauna</li> </ul>	<i>P. Panneer Selvam</i>
10	Mrs. Nathiya	EB	<ul style="list-style-type: none"> <li>▪ Site Visit with FAE</li> <li>▪ Assist FAE with collection of baseline data</li> <li>▪ Provide inputs and assist with labelling of Flora and Fauna</li> </ul>	<i>T. Annap</i>

**DECLARATION BY THE HEAD OF THE ACCREDITED CONSULTANT ORGANIZATION**

I, Dr. M. Ifthikhar Ahmed, Managing Partner, Geo Exploration and Mining Solutions, hereby, confirm that the above-mentioned Functional Area Experts and Team Members prepared the cluster EIA/EMP for Dharavendiram Rough Stone Quarry Project over an Extent of 9.94.85 ha at Dharavendiram Village of Denkanikottai Taluk, Krishnagiri District of Tamil Nadu. It is also certified that information furnished in the EIA study are true and correct to the best of our Knowledge.

Signature & Date:



Name:

**Dr. M. Ifthikhar Ahmed**

Designation:

**Managing Partner**

Name of the EIA Consultant Organization:

**M/s. Geo Exploration and Mining Solutions**

NABET Certificate No & Issue Date:

**NABET/EIA/1922/SA0139 Dated: 11.10.2021**

Validity:

**Valid till 29.01.2023**