DRAFT ENVIRONMENTAL IMPACT ASSESSMENT

&

ENVIRONMENT MANAGEMENT PLAN

"B1" CATEGORY – MINOR MINERAL – CLUSTER - NON FOREST LAND

Total Extent of Cluster – 11.51.5 Ha

M/s. GLOBLE ENTERPRISES BLACK GRANITE QUARRY

at

S.F. Nos	6/4A,
Extent	1.44.5 Ha
Village	Anumanthapuram
Taluk	Denkanikottai
District	Krishnagiri

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

Complied as per ToR Obtained Vide
Lr.No. SEIAA-TN/F.No.9215/SEAC/TOR-1246/2022 Dated: 05.09.2022

Project Proponent

M/s. GLOBLE ENTERPRISES,

Represented by – Thiru. Sudheesh Varadaraj – Managing Partner

Varaganapalli Village, Nagamangalam Post,
Denkanikottai Taluk,
Krishnagiri - 635 113.

Environmental Consultant

GEO EXPLORATION AND MINING SOLUTIONS

Old No. 260-B, New No. 17,
Advaitha Ashram Road, Alagapuram,
Salem – 636 004, Tamil Nadu, India
Accredited for sector 1 Category 'A', 31 Category 'B' & 38 Category 'B'
Certificate No : NABET/EIA/2225/RA 0276 Dated: 06.08.2025
Email: ifthiahmed@gmail.com, geothangam@gmail.com
Web: www.gemssalem.com

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

Baseline Monitoring Period - December 2022-February 2023

JUNE 2023

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

PROPOSED QUARRIES				
CODE	Name of the Owner	S.F. Nos	Extent	Status
P1	**M/s.Globle Enterprises** (Black Granite) Varaganapalli Village, Nagamangalam Post, Denkanikottai Taluk, Krishnagiri District – 635 113.	6/4A	**1.44.5**	Obtained ToR vide **Lr.No. SEIAA-TN/F.No.9215/SEAC/TOR-1246/2022 Dated: 05.09.2022**
Nearby Proposed Quarries				
P2	**M/s.Globle Enterprises** (Black Granite) Varaganapalli Village, Nagamangalam Post, Denkanikottai Taluk, Krishnagiri District – 635 113.	6/4B, 7/1B(Part), 7/1C(Part), 7/2, 12/1,12/2A(Part), 13/1A1B (Part), 13/1B(Part)	3.93.50	Public Hearing Conducted on 10.08.2021
P3	**M/s.Globle Enterprises** (Multi-colour granite) Varaganapalli Village, Nagamangalam Post, Denkanikottai Taluk, Krishnagiri District – 635 113.	7/1A2,7/1C(Part), 13/1A1B(Part), & 13/1A2	2.27.5	Public Hearing Conducted on 10.08.2021
		Total	**7.65.5**	
EXISTING QUARRIES				
CODE	Name of the Owner	S.F. Nos	Extent	Period of Lease
E1	**M/S.TAMIN**	14/1, 273/3	3.86.0	7.12.2005 to 06.12.2035
Total			**3.86.0 Ha**	
TOTAL CLUSTER EXTENT			**11.51.5 Ha**	

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

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

TERMS OF REFERENCE (ToR) COMPLIANCE

M/s. Globle Enterprises
"ToR issued vide Lr.No. SEIAA-TN/F.No.9215/SEAC/TOR-1246/2022 Dated: 05.09.2022"

	SPECIFIC CONDITIONS	
1	The Proposed site is located within 10km from Cauvery Wild Life Sanctuary; hence the pp shall remit Rs 5 lakt to DFO, Hosur 10 carry out the mitigation work.	Noted and agreed
2	In the case of proposed lease in an existing (or old) quarry where the benches are not formed (or) partially formed as per the approved Mining Plan, the Project Proponent (PP) shall prepare and submit an 'Action Plan' for carrying out the realignment of the benches in the proposed quarry lease after it is approved by the concerned Asst. Director of Geology and Mining during the time of appraisal for obtaining the EC.	Noted and agreed
3	The Proponent shall submit a conceptual 'Slope Stability Plan' for the proposed quarry during the appraisal while obtaining the EC, when the depth of the working is extended beyond 30 m below ground level.	Noted and agreed
4	The PP shall furnish the proposal to adapt SOP for wire saw cutting during the operation.	Noted and agreed
5	The EIA Coordinators shall obtain and furnish the details of quarry/quarries operated by the proponent ill the past, either in the same location or elsewhere in the State with video and photographic evidences.	Noted and agreed
6	If the proponent has already carried out the mining activity in the proposed mining lease area after 15.01.2016, then the proponent shall furnish the following details from AD/DD, mines a) what was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines? b) Quantity of minerals mined out c) Highest production achieved in any one year d) Detail of approved depth of mining e) Actual depth of the mining achieved earlier f) Name of the person already mined in that leases area g) If EC and CTO already obtained' the copy of the same shall be submitted h) whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches.	It is a Fresh Quarry
7	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	Noted and agreed. Project area boundary coordinates superimposed on Toposheet – Figure No. 1.3.

	proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	
8	The PP shall carry out Drone video survey covering the cluster, Green belt, fencing etc.,	Noted and agreed
9	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
10	The Project Proponent shall provide the details of mineral reserves and mineable reserves, planned production capacity, proposed working methodology with justifications, the anticipated impacts of the mining operations on the surrounding environment and the remedial measures for the same.	Details of Geological Resources and Proposed reserves are discussed under Chapter No. 2.
11	The Project Proponent shall provide the organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of Mines Act'1952 and the MMR, 1961 for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment.	Discussed about Organization chart in Chapter 6,
12	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 1km (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 are this regard may be provided.	The hydro-geological study was conducted to evaluate the possible impact on the ground water table. No significant impacts are anticipated on the water bodies around the project area. Details are discussed under Chapter No. 3.
13	The proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality & Flora/fauna including traffic/vehicular movement study.	Baseline Data were collected for One Season (Winter Season) Dec 2022 to Feb 2023 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. 3.
14	The Proponent shall carry out the Cumulative impact study due to mining operations carried out in the quarry specifically with reference to the specific environment in terms of soil, health, biodiversity, air pollution, water pollution, climate change and flood control & health impacts. Accordingly, the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind.	The Cumulative impact study due to mining operations is explained in chapter – 7

15	Rain water harvesting management with recharging details along with water balance (both monsoon & non-monsoon) be submitted.	Noted and agreed
16	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass pre operational, operational and post operational phases and submitted. Inpact, if any, of change of land use should be given.	Land use and land cover of the study area is discussed in Chapter No. 3. Land use plan of the project area showing pre-operational, operational and post-operational phases are discussed in Chapter No. 2, Table No 2.3.
17	Details of the land for storage of Overburden/Waste Dumps (or) Rejects outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be provided.	Not applicable
18	Proximity to Areas declared as 'Critically Polluted' (or) the Project areas which attracts the court restrictions for mining operations, should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the TNPCB (or) Dept. of Geology and Mining should be secured and furnished to the effect that the proposed mining activities could be considered.	Not Applicable. Project area / Study area is not declared in 'Critically Polluted' Area and does not come under 'Aravalli Range.
19	Description of water conservation measures proposed to be adopted itr the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	Mine Closure in Chapter -2
20	Impact on local transport infrastructure due to the Project should be indicated.	Transportation details mentioned in Chapter -2
21	A tree survey study shall be carried out (nos., name of the species, age, diameter etc.,) both within the mining lease applied area & 300m buffer zone and its management during mining activity.	Details of the trees in the buffer zone given in Chapter No.3.
22	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific.	Mine closure plan is detailed in Chapter:4.
23	Public Hearing points raised and commitments of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA,/EMP Report of the Project and to be submitted to SEIAA/SEAC with regard to the Office Momentum of MoEF& CC accordingly.	Noted and agreed
24	The Public hearing advertisement shall be published in one major National daily and one most circulated vernacular daily.	Noted and agreed
25	The PP shall produce/display the EIA report, Executive summary and other related information with respect to public hearing io Tamil Language also.	Noted and agreed

26	As a part of the study of flora and fauna around the vicinity of the proposed site, the EIA coordinator shall strive to educate the local students on the importance of preserving local flora and fauna by involving them in the study, wherever possible.	Noted and agreed
27	The purpose of green belt around the project is to capture the fugitive emissions. Carbon sequestration and to attenuate the noise generated, in addition to improving the aesthetics. A wide range of indigenous plant species should be planted as given in the appendix in consultation with the DFO, State Agriculture University. The plant species with dense/moderate canopy of native origin should be chosen. Species of Small medium/tall trees alternating with shrubs should be planted io a mixed manner.	Species are proposed to plant in the safety barrier as mentioned in the ToR appendix. Proposed species are given in the Chapter No 4
28	Taller/one year old Saplings raised in appropriate size of bags; preferably eco-friendly bags should be planted in proper emplacement as per the advice of local forest authorities / botanist / Horticulturist with regard to site specific choices. The proponent shall earmark the greenbelt area with GPS coordinates all along the boundary of the project site with at least 3 meters wide and in between blocks in an organized manner.	It is an Fresh Lease. Around 870 trees are proposed to plant
29	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	Disaster management Plan details in Chapter-7
30	A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report.	A Risk Assessment and management Plan Chapter- 7
31	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	Occupational Health impacts chapter- 10
32	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.	It is explained in Chapter -3
33	The Socio-economic studies should be carried out within a 5 km buffer zone from the mining activity. Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	Details are listed in Chapter:3.
34	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

35	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.	Noted and agreed
36	If any quarrying operations were carried out in the proposed quarrying site for which now the EC is sought, the Project Proponent shall furnish the detailed compliance to EC conditions given in the previous EC with the site photographs which shall duly be certified by MoEF&CC, Regional Office, Chennai (or) the concerned DEE/TNPCB.	It is a Fresh Lease
37	The PP shall prepare the EMP for the entire life of mine and also furnish the sworn affidavit stating to abide the EMP for the entire life of mine.	Noted and agreed
38	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
ADDITIONAL CONDITIONS		
1	Considering the environmental impacts due to Sustainable mining, Scientific and safety of the working personnel and following the principle of sustainable mining, the ultimate depth of mining is restricted to 25m below ground level@ XY-CD section and ROM - 17080 cu.m, Black Granite - 5124 cu.m and Granite waste - 11970 cu.m are permitted for mining over a period of five years as per the approved mining plan.	Noted and agreed
2	The scientific studies shall be carried out for any proposed quarry over the existing pit/quarry by the reputed Govemment Scientific Research / Academic Institutions such as Anna University, NlTs, IITs, NIRM, CISR laboratories where the depth of the proposed working (or) ultimate depth of working is extended beyond 40 m below ground level (BGL) in case of flat terrain and the excavation extends beyond 30 m above ground level (AGL) in case of out crop hilly terrains for evaluating the stability of slopes. A copy of the report shall be submitted to the SEIAA, the concerned ADDGM, the concemed DEE/TNPCB and the Director of Mines Safety, Chennai.	Noted and agreed
3	Detailed study shall be carried out in regard to impact of mining around the proposed mine lease area on the nearby Villages, Water-bodies/ Rivers. & Any ecological fragile areas.	Details is discussed in chapter no.2 and 4,
4	The project proponent shall furnish VAO certificate with reference to 300m radius regard to approved habitations, schools, Archaeological structures etc.	VAO certificate is Obtained
5	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	Noted and agreed

	concerns raised during the public consultation and all the activities proposed shall be part of the Environment Management Plan	
6	The Environmental Impact Assessment shall study in detail the carbon emission and also suggest the measures to mitigate carbon emission including development of carbon sinks and temperature reduction including control of other emission and climate mitigation activities.	Details of carbon emission and mitigation activities are given int the Chapter No.4
7	The Environmental Impact Assessment should study the biodiversity, the natural ecosystem, the soil micro flora, fauna and soil seed banks and suggest measures to maintain the natural Ecosystem.	Discussed in Chapter: 3.
8	Action should be specifically suggested for sustainable restoration of ecosystem for flow of goods and services.	The Eco System of the area will be retained during the mining operation by the way of planting trees in the boundary barrier and un utilized areas. After completion of mining operation, the quarried-out pit will be facilitated to collect the rainwater to pit act as temporary reservoir.
9	The project proponent shall study impact on fish habitats and food WEB/food chain in the water body and Reservoir.	Noted and agreed
10	The Terms of Reference should specifically study impact on soil health, soil erosion. the soil physical, chemical components and microbial components.	There is no Top soil in the project area, the overburden in the form of Gravel formation. The Gravel has been removed during the previous lease period. No proposal for the removal of Top soil in this plan period. Details of impact on soil environment is detailed in Chapter No.4.
11	The Environmental Impact Assessment should study impact on forest, vegetation, endemic, vulnerable and endangered indigenous flora and fauna.	The area is surrounded by quarries on the North, East, South side. Coconut plantation is the main agriculture activity in the study area. Details of flora and fauna studies given in the Chapter No.3.
12	The Environmental Impact Assessment should study impact on standing trees and the existing trees should be numbered and action suggested for protection.	About 900 trees is planted in safety and along roads
13	The Environmental Impact Assessment should study on wetlands, water bodies, rivers streams, lakes and farmer sites.	Details are discussed in the Chapter No 3.
14	The Environmental Impact Assessment should hold detailed study on EMP with budget for green belt development and mine closure plan including disaster management plan.	Detailed Environmental Management plan with budgetary allocations given in the Chapter No. 10,
15	The Environmental Impact Assessment should study impact on climate change, temperature rise, pollution and above soil & below soil carbon stock.	The project will not cause significant impact on climatic change. Description about the project and climatic changes is described in Chapter No.3.
16	The Environmental Impact Assessment should study impact on protected areas, Reserve Forests, National Parks, Corridors and Wildlife pathways, near project site.	Anticipated Environment Impact and Mitigation measures are detailed in Chapter No.4

17	The project proponent shall study and furnish the impact of project on plantations in adjoining patta lands, Horticulture, Agriculture and livestock.	The project area is bounded by existing quarries on the East side. Nearest dry agriculture land is situated North and East side of the area. Proponent proposed to e green mesh along with fencing on the East side besides, Budgetary allocation given in the Chapter No. 10.
18	The project proponent shall study and furnish the details on potential fragmentation impact of natural environment, by the activities.	Noted and agreed
19	detailed Environment Management Plan along with adaptation. mitigation & remedial strategies covering the entire mine lease period as per precise area communication order issued.	Noted and agreed
20	The project proponent shall study and furnish the impact on aquatic plants and animals in water bodies and possible scars on the landscape, damages to nearby caves, heritage site, and archaeological sites possible land form changes visual and aesthetic impacts.	Noted and agreed
21	The project proponent shall study and furnish the possible pollution due to plastic and microplastic on the environment. The ecological risks and impacts of plastic & microplastics on aquatic environment and fresh water systems due to activities, contemplated during mining may be investigated and reported.	Plastic waste management plan has been suggested in Chapter:7.
22	The project proponent shall detail study on impact of mining on Reserve forests free ranging wildlife.	Noted and agreed
23	Detailed study shall be caried out in regard to impact of mining around the proposed mine lease area covering the entire mine lease period as per precise arca communication order issued from reputed research institutions on the following a) Soil health & bio-diversity b) Climate change leading to Droughts, Floods etc. c) Pollution leading to release of Greenhouse gases (GHG), rise in Temperature' & Livelihood of the local people. d) Possibilities of water contamination and impact on aquatic ecosystem health' e) Agriculture, Forestry & Traditional practices. 1) Hydrothermal/Geothermal effect due to destruction in the Environment' g) Bio-geochemical processes and its foot prints including environmental stress' h) Sediment geochemistry in the surface steams.	Noted and agreed
24	Hydro-geological study considering the contour map of the water table derailing the number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within 1 km (radius) so as to assess the impacts on the nearby waterbodies due to mining activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in	Details given in Chapter:3

	this regard may be provided, covering the entire mine lease period.	
25	To furnish disaster management plan and disaster mitigation measures in regard to all aspects to avoid/reduce vulnerability to hazards & to cope with disaster/untoward accidents in & around the proposed mine lease area due to the proposed method of mining activity & its related activities covering the entire mine lease period as per precise area communication order issued.	Details given in Chapter:7
26	To furnish risk assessment and management plan including anticipated vulnerabilities during operational and post operational phases of Mining.	Details given in Chapter:7
27	Detailed Mine Closure Plan covering the entire mine lease period as per precise area communication order issued.	Details given in Chapter:2

STANDARD TERMS OF REFERENCE		
1	Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.	Not applicable. This is Not a violation category project. This proposal falls under B1 Category (Cluster Condition).
2	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	The applied land for quarrying is a Patta Land. Document is enclosed along with Approved Mining Plan as Annexure Volume 1.
3	All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.	Noted & agreed.
4	All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/ toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	Map showing – Project area is superimposed on Satellite imagery is enclosed in Figure No. 2.1 Project area boundary coordinates superimposed on Toposheet – Figure No. 1.3 Surface Features around the project area covering 10km radius – Figure No. 2.2 Geology map of the project area covering 10km radius - Figure No. 2.7. Geomorphology Map of the Study Area covering 10 km radius – Figure No. 2.8.
5	Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water	Map showing – Geology map of the project area covering 10km radius - Figure No. 2.7. Geomorphology Map of the Study Area covering 10 km radius – Figure No. 2.8.

	bodies, streams and rivers and soil characteristics.	
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 has framed their Environmental Policy and the same is discussed in the Chapter No 10.1.
8	Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.	It is an opencast quarrying operation proposed to operate in Mechanized method. The Granite formation is a hard, compact and homogeneous body. The height and width of the bench will be maintained as 5m with 90^0 bench angles. Quarrying activities will be carried out under the supervision of Competent Persons like Mines Manager, Mines Foreman and Mining Mate. Necessary permissions will be obtained from DGMS after obtaining Environmental Clearance.
9	The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc., should be for the life of the mine / lease period.	Noted & agreed. The study area considered for this study is 10 km radius and all data contained in the EIA report such as waste generation etc., is for the Life of the Mine / lease period.
10	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.	Land use and land cover of the study area is discussed in Chapter No. 3. Land use plan of the project area showing pre-operational, operational and post-operational phases are discussed in Chapter No. 2, Table No 2.3.
11	Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given	Not Applicable.

		There is no waste anticipated during this quarry operation. The entire quarried out Granite will be transported to the needy customers.
		No Dumps is proposed outside the lease area.
12	Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.	Not Applicable. There is no Forest Land involved in the proposed project area. The proposed project area is a patta land. Approved Mining Plan is enclosed as Annexure Volume 1.
13	Status of forestry clearance for the broken-up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	Not Applicable. The proposed project area does not involve any Forest Land.
14	Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.	Not Applicable. The project doesn't attract Recognition of Forest Rights Act, 2006.
15	The vegetation in the RF / PF areas in the study area, with necessary details, should be given.	No Reserve Forest within the Study Area.
16	A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.	Not Applicable. There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.
17	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/(existing as well as proposed), if any, within 10 KM of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished	Not Applicable. There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.
18	A detailed biological study of the study area [core zone and buffer zone (10 KM radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be	Detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] was carried out and discussed under Chapter No. 3. There is no schedule I species of animals observed within study area as per Wildlife Protection Act 1972

	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.	as well as no species is in vulnerable, endangered or threatened category as per IUCN. There is no endangered red list species found in the study area.
19	Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravalli Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.	Not Applicable. Project area / Study area is not declared in 'Critically Polluted' Area and does not come under 'Aravalli Range.
20	Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL. HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).	Not Applicable. The project doesn't attract The C. R. Z. Notification, 2018.
21	R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need-based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.	Not Applicable. There are no approved habitations within a radius of 300 meters. Therefore, R&R Plan / Compensation details for the Project Affected People (PAP) is not anticipated and Not Applicable for this project.
22	One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season) ; December-February (winter season)]primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the	Baseline Data were collected for One Season (Winter) Dec– Feb 2023 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. 3.

	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.	
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: 2.0 KLD Discussed under Chapter 2, Table No 2.15 .
25	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	Not Applicable. Water for dust suppression, greenbelt development and domestic use will be sourced from accumulated rainwater/seepage water in mine pits and purchased from local water vendors through water tankers on daily requirement basis. Drinking water will be sourced from the approved water vendors.
26	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	Part of the working pit will be allowed to collect rain water during the spell of rain will be used for greenbelt development and dust suppression. The Mine Closure Plan is prepared for converting the excavated pit into rain water harvesting structure and serve as water reservoir for the project village during draught season.
27	Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.	Impact Studies and Mitigation Measures of Water Environment including Surface Water and Ground Water are discussed in Chapter 4.
28	Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation 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	Not Applicable. The ground water table inferred 62-57m below ground level. The ultimate depth of quarry is 40m agl. This proposal of 30 m below ground level will not intersect the ground water table, which is inferred from the hydro-geological carried out at the project site.

	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.	Discussed under Chapter 3.
29	Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.	Not Applicable. There is no stream, seasonal or other water bodies passing within the project area. Therefore, no modification/ diversion of water bodies is anticipated.
30	Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and Bgl. A schematic diagram may also be provided for the same.	Highest elevation of the project area is 876-894m AMSL. Ultimate depth of the mine is 40m BGL Water level of the area is 62-57m BGL
31	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.	Greenbelt Development Plan is discussed under Chapter 4, Page No.123.
32	Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.	Traffic density survey was carried out to analyse the impact of Transportation in the study area as per IRC guidelines 1961 and it is inferred that there is no significant impact due to the proposed transportation from the project area. Details in Chapter 2, Page No.30-32.
33	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	Infrastructure & other facilities will be provided to the Mine Workers after the grant of quarry lease and the same has been discussed in the Chapter No.2 Page No.32.
34	Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.	Discussed under Chapter 2. Mine Closure Plan is a part of Approved Mining Plan enclosed as Annexure Volume – 1.
35	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules	Occupational Health Impacts of the project and preventive measures are detailed under Chapter 4, Page No.127.

	should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	
36	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	No Public Health Implications anticipated due to this project. Details of CER and CSR are discussed under Chapter 8, Page No. 148-149.
37	Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	No Negative Impact on Socio Economic Environment on the Study Area is anticipated and this project shall benefit the Socio-Economic Environment by ways of employment for 124 people directly and 30 people indirectly. Details in Chapter 2, Page No. 33.
38	Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.	Detailed Environment Management Plan for the project to mitigate the anticipated impacts described under Chapter 4 is discussed under Chapter 10, Page No. 151 – 156.
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.2,32,04,000/- CER Cost is Rs 5,00,000/-
42	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	Details in Chapter 7.
43	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.	Details in Chapter 8.
44	**Besides the above, the below mentioned general points are also to be followed: -**	
a	Executive Summary of the EIA/EMP Report	Enclosed as separate booklet.
b	All documents to be properly referenced with index and continuous page numbering.	All the documents are properly referenced with index and continuous page numbering.
c	Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.	List of Tables and source of the data collected are indicated.

d	Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF & CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project	Baseline monitoring reports are enclosed with This report in Chapter 3. Original Baseline monitoring reports will be submitted in the final EIA report during appraisal.
e	Where the documents provided are in a language other than English, an English translation should be provided.	Not Applicable.
f	The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.	Will be enclosed along with Final EIA EMP Report.
g	While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA. II(I) Dated: 4th August, 2009, which are available on the website of this Ministry, should be followed.	Noted & agreed. Instructions issued by MoEF & CC O.M. No. J-11013/41/2006-IA. II (I) Dated: 4th August, 2009 are followed.
h	Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation	Noted & agreed.
i	As per the circular no. J-11011/618/2010-IA. II(I) Dated: 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.	Not Applicable.
j	The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.	Surface Plan – Figure No. 2.2. Geological Plan – Figure No 2.9. Working Plan – Figure No 2.9. Closure Plan – Figure No.2.10.

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CHAPTER – 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.

　　　This EIA report is prepared by considering Cumulative load of all proposed & existing quarries around M/s. Globle Enterprises Black Granite Quarry lease at S.F.Nos. 6/4A over an extent of 1.44.5 ha in Anumanthapuram Village, Denkanikottai Taluk, Krishnagiri District, Tamil Nadu State, consisting of One Proposed & Two nearby proposed quarries and 1 (One) Existing Quarry with total extent of Cluster of. 11.51.50 ha. Cluster area calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016.

　　　This EIA Report is prepared in compliance with ToR obtained **Lr.No. SEIAA-TN/F.No.9215/SEAC/TOR-1246/2022 Dated: 05.09.2022.**

　　　The Baseline Monitoring study has been carried out during the period of Winter season Dec 2022 to February 2023 and this EIA / EMP report is prepared for considering cumulative impacts arising out of these projects, the Cumulative Environmental Impact Assessment study is undertaken, which is followed by preparation of a detailed Environmental Management Plan (EMP) individually to minimize those adverse impacts.

1.1　　　Purpose of the Report

　　　The Ministry of Environment and Forests, Govt. of India, through its EIA notification S.O. 1533(E) of 14th September 2006 and its subsequent amendments as per Gazette Notification S.O. 3977 (E) of 14th August 2018, Mining Projects are classified under two categories i.e., A (> 100 Ha) and B (≤ 100 Ha), and Schematic Presentation of Requirements on Environmental Clearance of Minor Minerals including cluster situation in Appendix–XI.

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

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

　　　Application to The Member Secretary of the Tamil Nadu Pollution Control Board (TNPCB) to conduct Public Hearing in a systematic, time bound and transparent manner ensuring widest possible public participation at the project site or in its close proximity in the district was submitted vide Ref: Nil, Dated: 09.06.2021.

　　　"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"

Figure1.0: Cluster Quarries Map(500m Radius)

ID	Owners Name	Extent (ha)
	Proposed Quarry	
P-1	M/s Globle Enterprises	1.44.5
P-2	M/s Globle Enterprises	3.93.5
P-3	M/s Globle Enterprises	2.27.5
	Existing Quarry	
E-1	M/s Tamis	3.86.0

Proposed Quarry : 7.65.5 ha (3 Nos)
Existing Quarry : 3.86.0 ha (1 No)
Cluster Extent   : 11.51.5 ha

Legend
Proposed Quarry
Existing Quarry
300m_Radius
500m_Radius

Extent	: 1.44.5 ha
Village	: Hanumanthapuram
Taluk	: Denkanikottai
District	: Krishnagiri
State	: Tamil Nadu

Graphic Scale

Software Used:
Arc Map 10.8

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

Source:
1. Geographical Information System

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

1.2　　Identification of Project and Project Proponent

1.2.1　Identification of Project –

- The Project area is located in S.F. Nos 6/4A, Anumanthapuram Village, Denkanikottai Taluk and Krishnagiri District.
- Proponent applied for Black Granite quarry lease Dated 20.02.2021.
- Precise Area Communication was issued by the Additional chief Secretary to Government, Industries (MME.2) Department, Secretariat, Chennai vide G.O.No.4809/MME.2/2021-1 dated: 31.01.2022 for a period of 20 years.
- Mining plan got approved from the Director of Geology and Mining Industrial Estate Guindy, Chennai Vide Rc. No. 1338/MM4/2021, dated: 21.03.2022.

1.2.2 Identification of Project Proponent

Name of the Project Proponent	:	M/s. Globle Enterprises
Address	:	Varaganapalli Village,
		Denkanikottai Taluk,
		Nagamangalam Post,
		Krishnagiri, Tamil Nadu
State	:	Tamil Nadu
Pin code	:	635 113
Mobile No	:	+919786594885

　　　　M/s.Globle Enterprises is a Partnership firm and Thiru Sudheesh Varadaraj S/o.Thiru.T. Varadaraj is the Managing Partner & authorized signatory for the firm.

Table 1.1: List of Partners

S.No	Name	Designation
1	Thiru Sudheesh Varadaraj S/o.Thiru.T. Varadaraj	Managing Partner
2	Thiru. T. Sadappa, S/o. Thiru. Thimmarayappa	Partner

Source: Partnership deed, Dated 01.01.2014

1.3　　Brief Description of the Project

1.3.1 Nature and Size of the Project

　　　　The quarrying operation is proposed to be carried out by Opencast Mechanized Mining method with 5.0m bench height and 5.0m bench width by deploying Hydraulic Excavator, Eco-friendly Diamond Wire Saw Cutting and minor amount of blasting only for removal of overburden and weathered portions.

On the basis of available reserves the life of the mine is computed and approved as 20 Years.

Proposed production for the Mining Plan Period (5 years) is described below–

Proposed Project

Total Mineable Recoverable Reserves of Granite @ 30%	=	20,790m^3
Average Production per year @ 30%	=	5,130m^3/5 Years = 1,026 m^3
Estimated Life of the quarry	=	20,790m^3/ 1,026m^3
Life of the quarry	=	20 Years

Table 1.2: Resources and Reserves of Project

Description	ROM in m^3	Granite recovery @30 % in m^3	Granite waste @70% recovery	Side Burden in m^3	Top Soil in m^3
Geological Resources	2,78,600	83,580	1,95,020	2,26,660	28,872
Mineable Reserves	69,300	20,790	48,510	39,165	18,726
Year wise Production for Five years	17,100	5,130	11,970	-	11,716

Table 1.3: Salient Features of the Proposed Projects

Name of the Quarry		M/s. Globle Enterprises – Black Granite quarry
Lease period		20 years
Mining Plan Period		5 Years
Life of the Mine		20 years
Existing Depth		NIL
Previous lease particulars		It is a Patta land registered name of the company vide patta no. 1694
Proposed Depth for five years plan period		40m (2m Topsoil + 3m Weathered Rock +35m Black Granite)
Ultimate Depth		117m(L) x 83m (W) x 40m (D)
Toposheet No		57 H/15
Latitude between		$12^0 27'34.7635''$ N to $12^0 27'39.2453''$ N
Longitude between		$77^0 50'04.8129''$ E to $77^0 50'09.9792''$ E
Topography		Elevated terrain with gradient towards Northwest side. The highest elevation is 876-894m AMSL
Machinery proposed	Jackhammer	6
	Compressor	2
	Hydraulic drilling machine	-
	Hydraulic/Crawler crane	1
	Mobile crane	-
	Excavator	1
	Tipper	2
	Diesel Generator	1
	Diamond wire saw	1
	Water pump	-
	Water tanker	-
Proposed manpower deployment		35
Project cost		Rs.2,32,04,000/-
EMP Cost		Rs. 3,80,800/-
CER cost		Rs. 5,00,000/-

1.3.2 Location of the Project

The Project area is located around 1Km north of Anumanthapuram hamlets and 2Km south west of Tippasandiram hamlets. The area is located on the western side of Anumanthapuram – Tippasandiram village road. The nearest town is Denkanikottai-9Km-North West of the area. The district headquarters Krishnagiri is located 42Km East of the project area.

Figure 1.1: Key Map Showing the Location of the Project Site
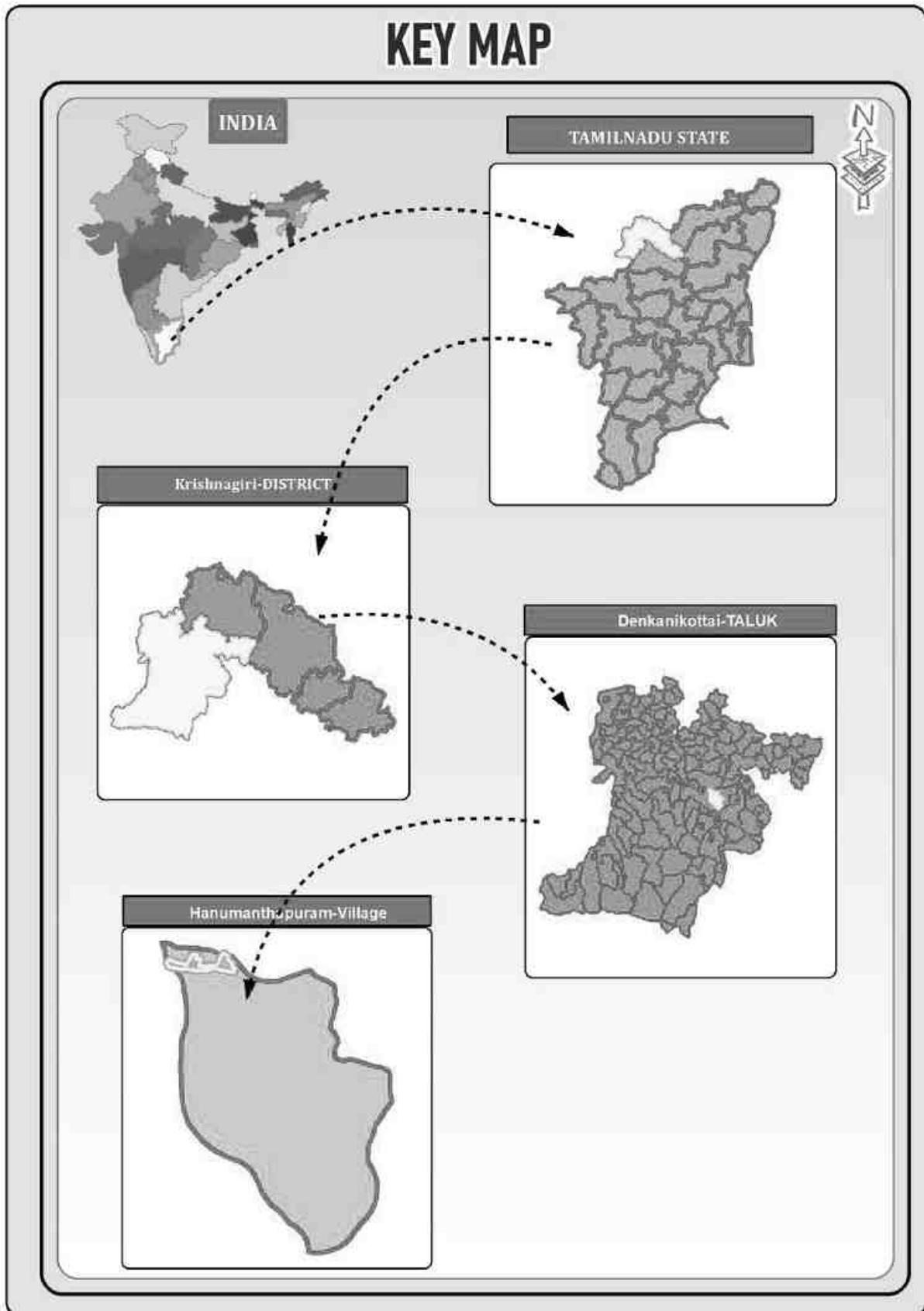
Figure 1.2: Toposheet Map of the Study Area 10 Km Radius
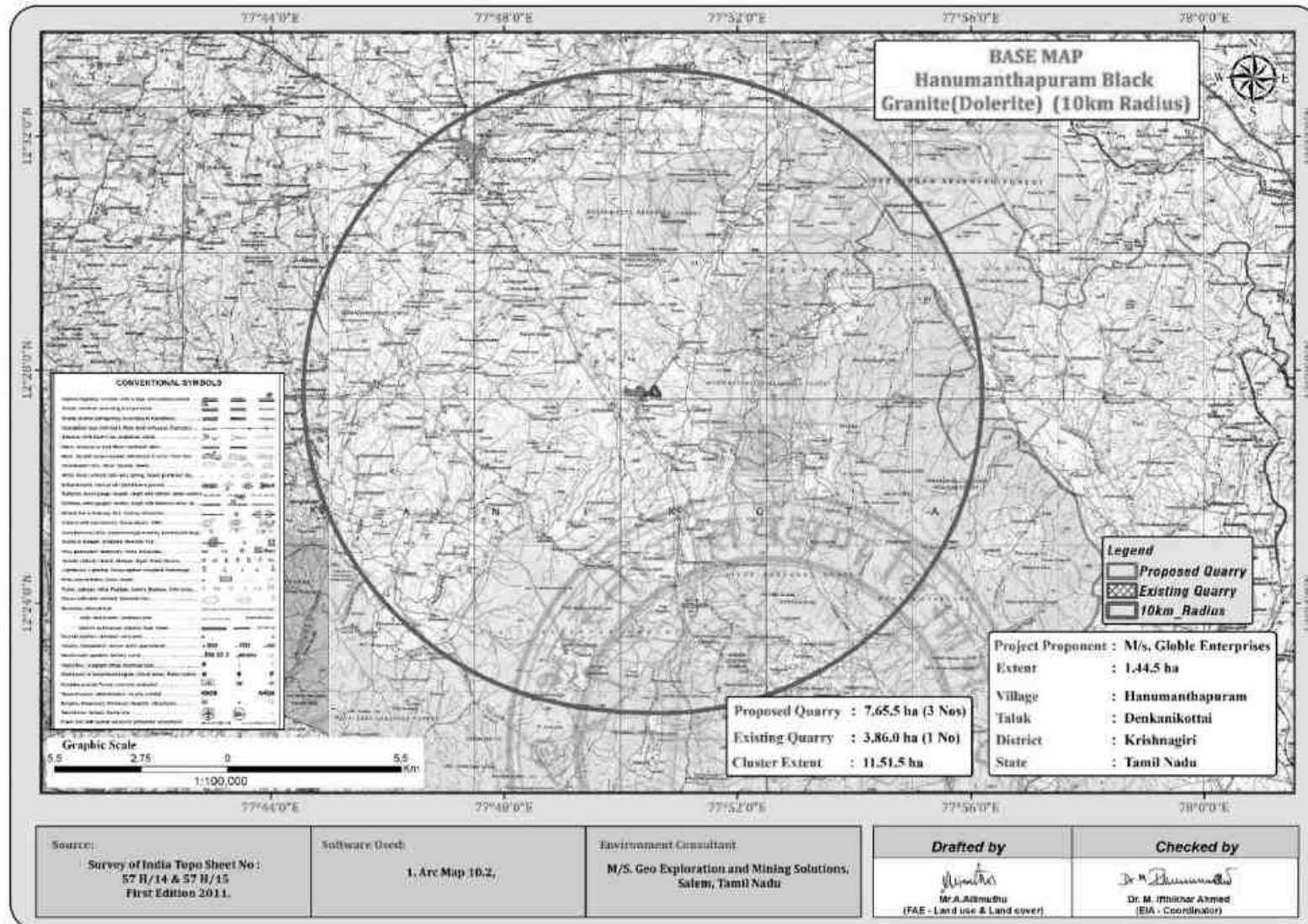
1.4   Environmental Clearance

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

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

SCREENING –

- The proponent applied for Granite Quarry Lease, Dated: 20.02.2021
- Precise Area Communication Letter was issued by Additional chief Secretary to Government, Industries (MME.2) Department, Secretariat, Chennai vide G.O.No.4809/MME.2/2021-1 dated: 31.01.2022 for a period of 20 years.
- Mining plan got approved from the Director of Geology and Mining Industrial Estate Guindy, Chennai Vide Rc. No. 1338/MM4/2021, dated: 21.03.2022.
- Proponent applied for ToR to get Environmental Clearance vide online Proposal No. SIA/TN/MIN/76134/2022 Dated: 25.04.2022.

SCOPING –

- The proposal was placed in 304th SEAC meeting held on 21.08.2022 and the committee recommended for issue of ToR.
- The proposal was considered in 549th SEIAA meeting held on 05.09.2022 and issued ToR vide Lr.No. SEIAA-TN/F.No.9215/SEAC/TOR-1246/2022 Dated: 05.09.2022

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, 14th September, 2006
- ToR vide Lr.No. SEIAA-TN/F.No.9215/SEAC/TOR-1246/2022 Dated: 05.09.2022
- Approved Mining Plan of this project
- In addition, other relevant standards for individual activities such as Sampling and Testing of Environmental attributes have been followed

1.5   Post Environment Clearance Monitoring

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

1.6   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.

1.7   Scope of the Study

The main scope of the EIA study is to quantify the cumulative impact in the study area due to cluster quarries and formulate the effective mitigation measures for each individual lease. A detailed account of the emission sources, emissions control equipment, background Air quality levels, Meteorological measurements, Dispersion model and all other aspects of pollution like effluent discharge, Dust generation etc., have been discussed in this report. The baseline monitoring study has been carried out during the Winter season Dec2022 to February 2023 for various environmental components so as to assess the anticipated impacts of the cluster quarry projects on the environment and suggest suitable mitigation measures for likely adverse impacts due to the proposed project.

<div align="center">Table 1.4: Environment Attributes</div>

Sl.No.	Attributes	Parameters	Source and Frequency
1	Ambient Air Quality	PM10, PM 2.5, SO2, NO2	Continuous 24-hourly samples twice a week for three months at 7 locations (1 Core & 6 Buffer)
2	Meteorology	Wind speed and direction, temperature, relative humidity and rainfall	Near project site continuous for three months with hourly recording and from secondary sources of IMD station
3	Water quality	Physical, Chemical and Bacteriological parameters	Grab samples were collected at 3 ground water and 3 surface water locations 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
5	Noise levels	Noise levels in dB(A)	7 locations – data monitored once for 24 hours during EIA study
6	Soil Characteristics	Physical and Chemical Parameters	Once at 5 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 EHS labs Pvt Ltd Laboratories

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

1.7.1 Regulatory Compliance & Applicable Laws/Regulations

- Application for Quarrying Lease as per Tamil Nadu Minor Mineral Concession Rules, 1959
- Obtained Precise Area Communication Letter as per Tamil Nadu Minor Mineral Concession Rules, 1959 for Preparation of Mining Plan and obtaining Environmental Clearance
- The Mining Plan of Granite quarry has been approved under Rule 41 & 42 as amended of Tamil Nadu Minor Mineral Concession Rules, 1959
- ToR vide Lr.No. SEIAA-TN/F.No.9215/SEAC/TOR-1246/2022 Dated: 05.09.2022.

2. PROJECT DESCRIPTION

2.0   General

Proposed Quarry in Anumanthapuram Village, Denkanikottai Taluk, Krishnagiri District and Tamil Nadu State falls under Cluster Situation as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016 and the total extent of cluster is 11.51.5 ha consisting of three quarries. As the extent of cluster is 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 located in S.F. Nos 6/4A in Anumanthapuram Village, Denkanikottai Taluk, Krishnagiri District and Tamil Nadu State. The precise area communication letter issued by Industries (MME.2) Department, Secretariat Chennai vide G.O.No.4809/MME.2/2021-1 dated: 31.01.2022, the mining plan has been prepared and got approved Director of Geology and Mining Guindy, Chennai, vide Rc. No. 1338/MM4/2021, dated: 21.03.2022.

The area over an extent of 1.44.5 Ha in S.F. No: 6/4A previously leased to M/s. Globle enterprises is a Partnership deed is executed on 01.01.2014 and duly registered on 30.09.2014. for a period of ten years until 10.12.1998. Four quarry pits were noticed in the project area.

Black Granite quarry operation will be carried out by opencast mechanized method involving Eco-friendly Diamond Wire Saw Cutting, Heavy earth moving machineries like Excavators Trucks for Granite exploitation. Shot hole drilling with controlled blasting using slurry explosives for removal of overburden and Weathered portions during initial stage of quarry operation.

2.2   Location of the Project

- The project area is located in Anumanthapuram Village, Denkanikottai Taluk & Krishnagiri District, and Tamil Nadu State.
- Toposheet No: 57 H/15
- The project areas fall in the Latitude between 12°27'34.7635" N to 12°27'39.2453" N and Longitude between 77°50'04.8129" E to 77°50'09.9792" E
- The project area is patta land (Non-Forest Land)
- Cauvery (North) Wild life sanctuary is about 2 km East side of the project area.

Table 2.1: Site Connectivity to the Project Area

Nearest Roadway	Village approach road – East District road – 0.7Km-SW Denkanikottai major district road – 2km-NE (SH-17A)– Mathigiri –Denkanikottai road -9Km-NW
Nearest Village	Anumanthapuram Village – 1 km- South
Nearest Town	Denkanikottai – 9 km - NW
Nearest Railway Station & Railway Line	Kelamangalam – 18 km - N Salem – Bangalore line 18 km - N
Nearest Airport	Bangalore Airport – 65 km – North West
Seaport	Chennai 270 km North East

Source: Survey of India Toposheet

Table 2.2: Boundary Co-Ordinates of Proposed Project

Boundary Pillar No.	Latitude	Longitude
1	$12^027'39.2453"$ N	$77^050'05.8012"$ E
2	$12^027'38.0321"$ N	$77^050'09.9792"$ E
3	$12^027'34.7635"$ N	$77^050'09.3737"$ E
4	$12^027'35.4326"$ N	$77^050'06.3659"$ E
5	$12^027'35.6615"$ N	$77^050'06.0044"$ E
6	$12^027'37.6286"$ N	$77^050'04.8129"$ E

Figure 2.1: Photographs of the Project Area

Figure 2.2: Google Image Showing Project Area

Figure 2.3: Quarry Lease Plan & Surface Plan
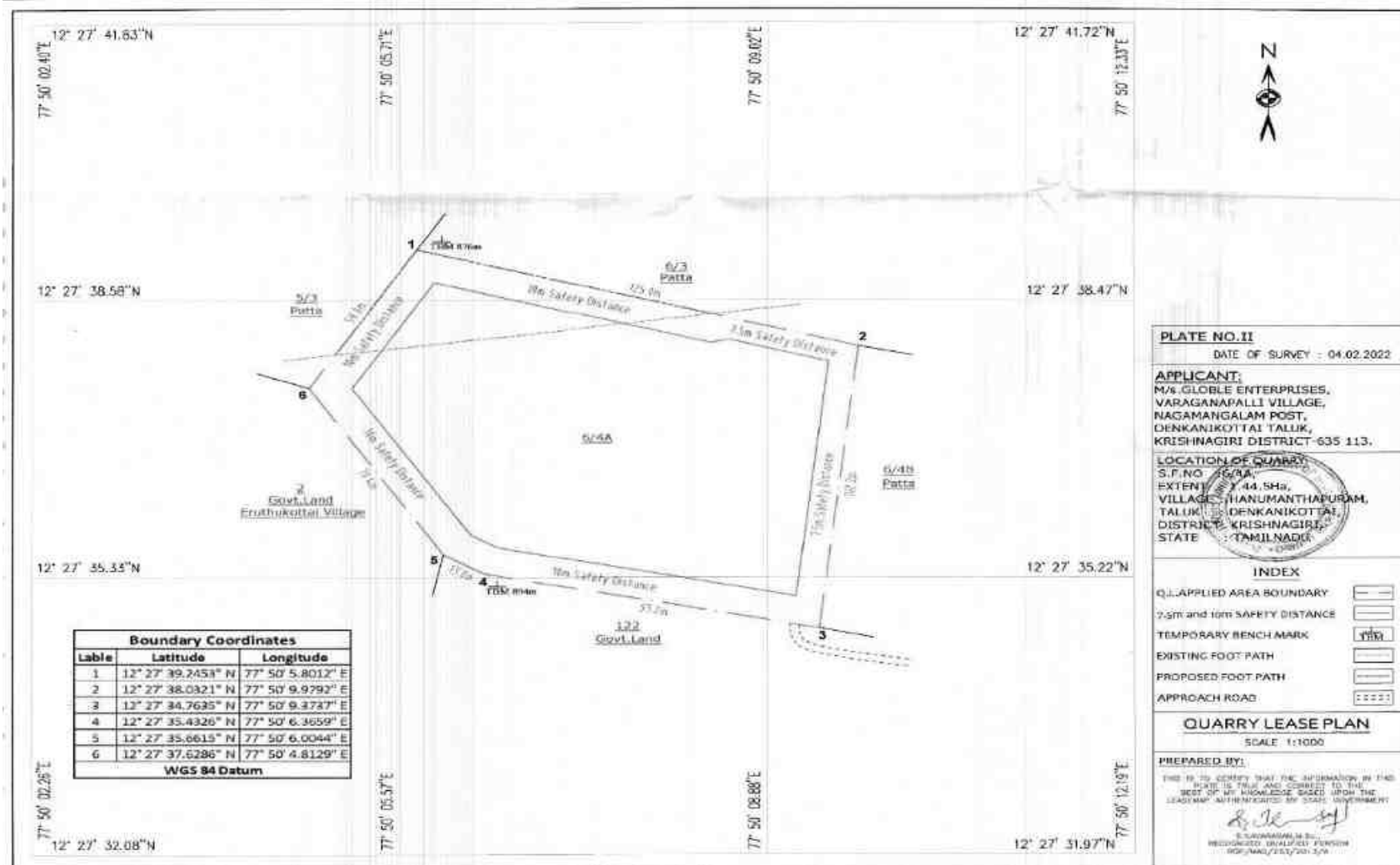
Figure 2.4: Image Showing Surface Features Around 10 Km Radius
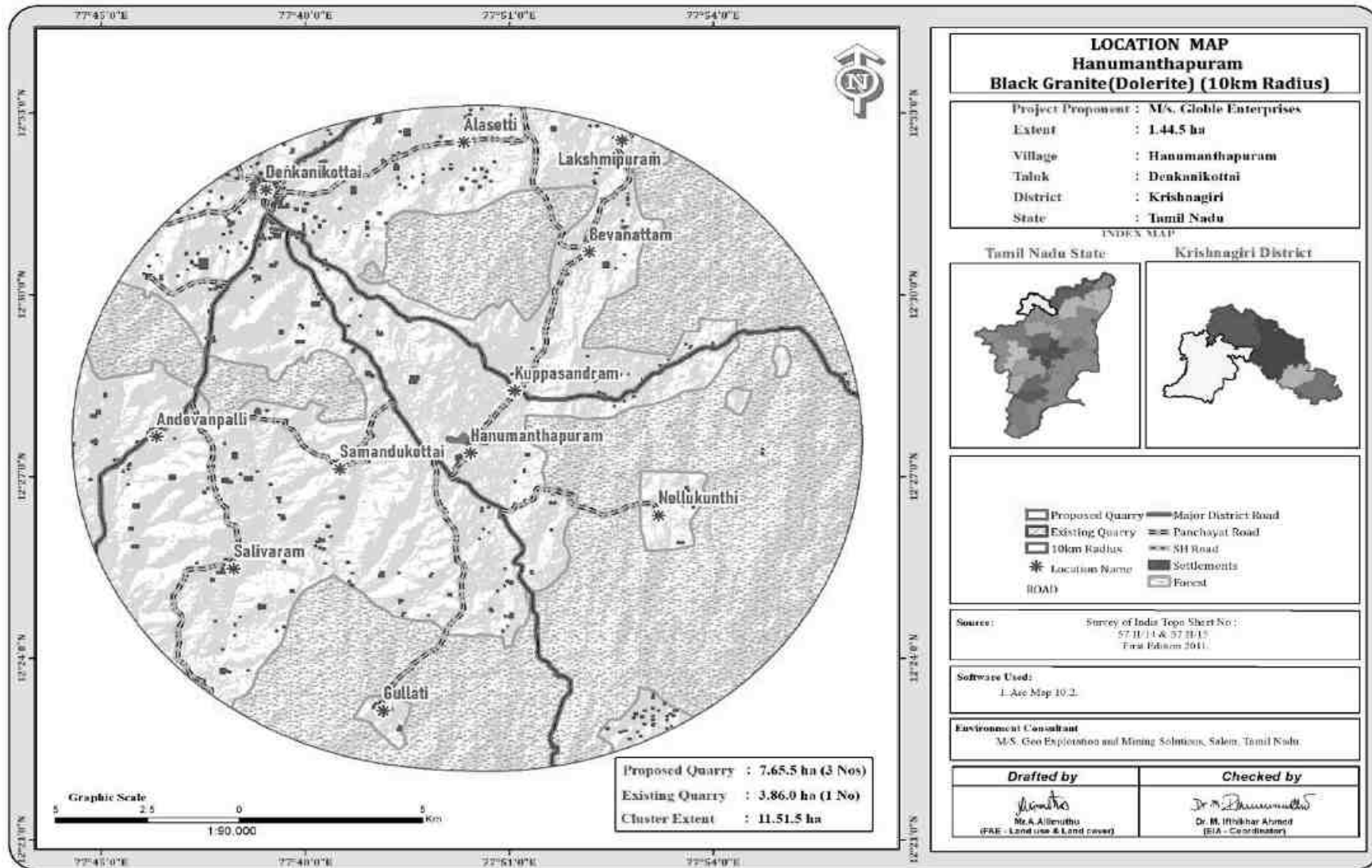
Figure 2.5: Image Showing Surface Features Around 5km Radius
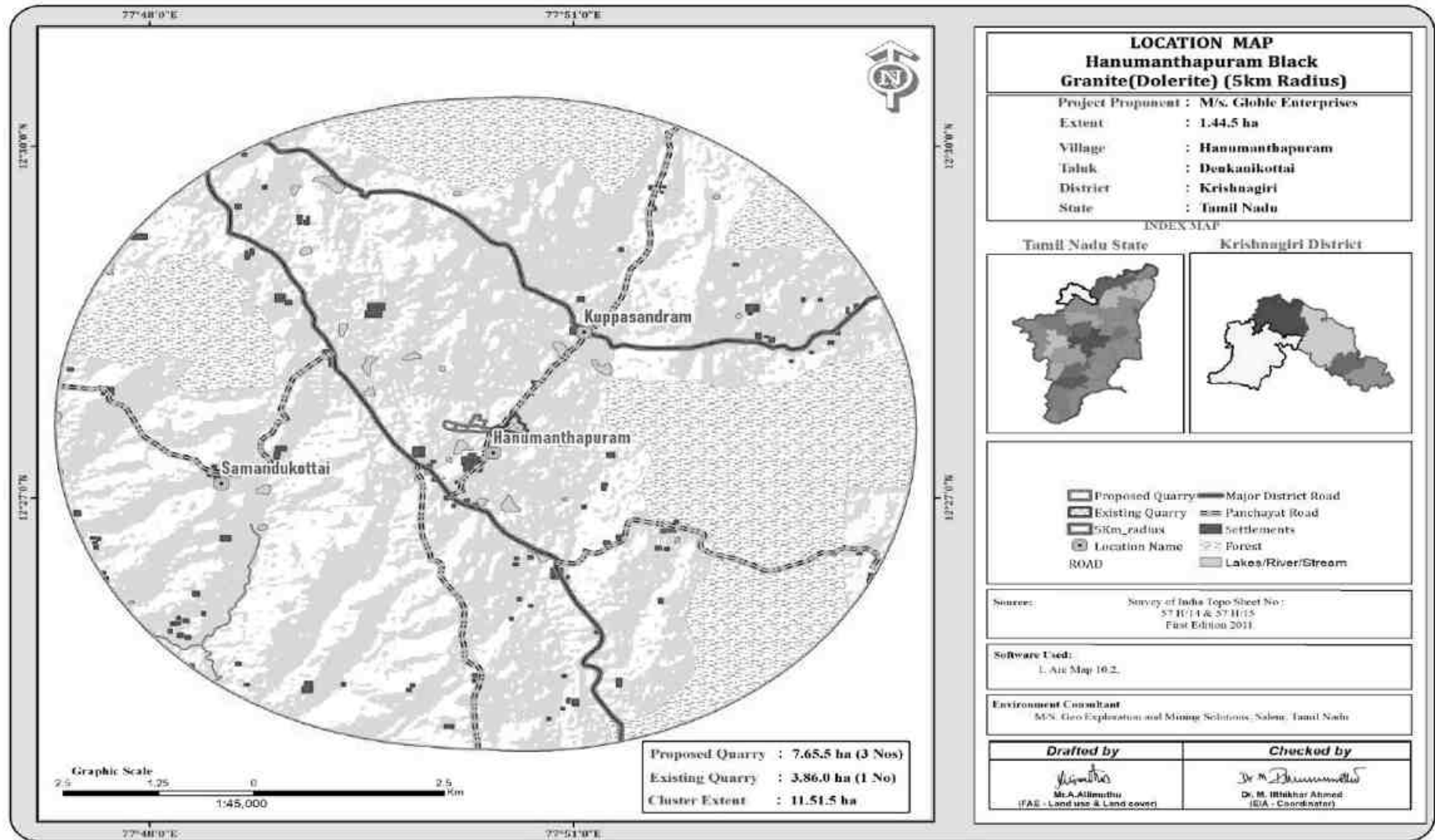
Figure 2.6: Image Showing Surface Features Around 1 Km Radius
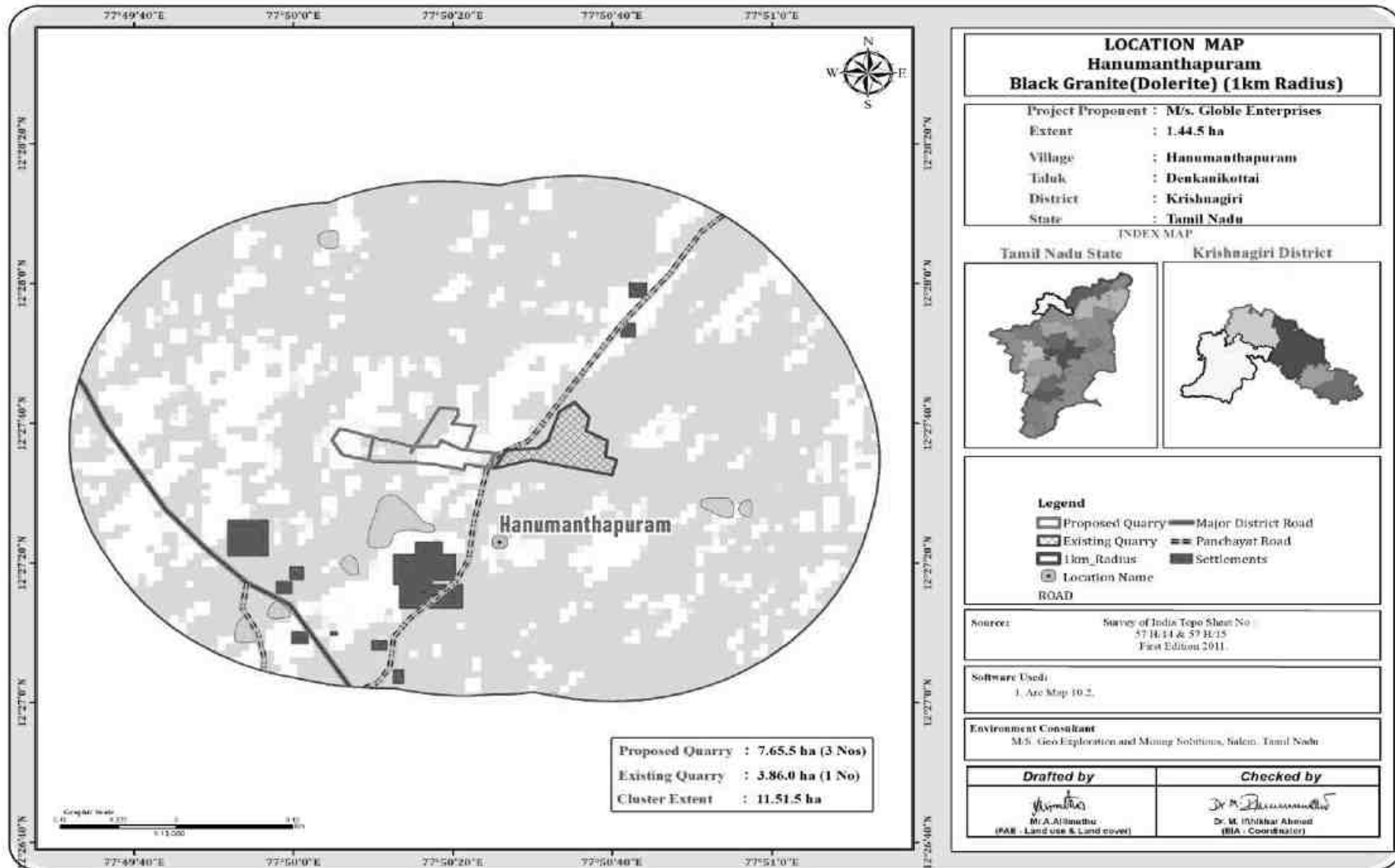
2.2.1 Project Area

- The Topography of the Proposed Project is undulated topography, with Granite outcrops, which is site specific, Non – Captive use, opencast Mechanized quarry.
- There is No beneficiation or processing proposed inside the project area.
- Elevation is 876m-894m above from MSL, showing gentle gradient towards Northwest
- There is no forest land involved in the proposed project area and the area is devoid of major vegetation.

Table 2.3: Land Use Pattern of the Proposed Projects

Description	Present area in Ha	Area to be required during the present plan period (ha)	Area at the end of Life of Quarry (Ha)
Area under quarry	Nil	0.62.0	0.97.3
Waste dump	Nil	0.25.0	Backfilled
Infrastructure	Nil	0.01.0	0.02.0
Roads	Nil	0.01.0	0.02.0
Green Belt	Nil	0.10.6	0.38.4
Stocking blocks	1.44.5	0.44.9	0.04.8
Total	**1.44.5**	**1.44.5**	**1.44.5**

Source: Approved Mining plan

2.2.2 Size or Magnitude of Operation

Table 2.4: Operational Details

Description	Details
Geological Resources ROM	2,78,600
Granite Recovery (30 % in m^3)	83,580
Granite Waste (70 % in m^3)	1,95,020
Weathered rock(m^3)	43,308
Side Burden(m^3)	2,26,660
Top Soil in m^3	28,872
Mineable Reserves ROM	69,300
Granite Recovery (30 % in m^3)	20.790
Granite Waste (70 % in m^3)	48,510
Weathered rock (m^3)	24,129
Side Burden (m^3)	39,165
Top Soil in m^3	18,726
Proposed Production for five years plan period ROM	17,100
Granite Recovery (30% in m^3)	5,130
Granite Waste (70 % in m^3)	11,970
Weathered rock(m^3)	14,592
Top Soil in m^3	11,716
Number of Working Days	300
Production of ROM per day in five-year plan period	11
Production of Granite per day	3
Total Waste per day (Granite waste+ Weathered Rock)	18
No of Lorry Loads per day for Transportation to Granite cutting units	1
No of Lorry loads for dump	1
Number of Working Days	300 Days

Source: Approved Mining Plan

2.3   Geology

2.3.1   Regional Geology

The hard rock terrain of Archaean to Late proterozoic comprises of predominantly Granite, Gneiss, Charnockite group of rocks and their magmatic derivatives, supracrustal sequences intruded by ultramafic complexes, basic dykes, granites.

The northern part of Tamilnadu, north of Noyil – Cauvery River is characterized by the occurrences of a number of Dolerite dykes in contrast to the areas south of Noyil – Cauvery River where the dykes are absent. The dolerite

dykes in general trending is in WNW- ESE and NNE – SSE directions and rarely in N-S and NNW – SSE directions.

In central part of Tamil Nadu, ENE – WNW to NE- SW trending dolerite dykes (Black granite) are seen transecting the Charnockite in Kalrayan & Kolli Hills. Palaeo magnetic studies of some of these dykes indicate Mid-Proterozoic age.

Due to emplacement of Dolerite Dykes along narrower plains of weakness, the rock on solidification develops cracks and fractures mostly along the contacts with the country rocks. The dolerite dykes are mostly emplaced as 'swarms" in an area.

Granites were formed from molten rock referred to as "Magma" formed at great depths within the crust of the earth. During the cooling process, some of the minerals grow into larger crystals of colours peculiar to those minerals or get aligned along certain preferred directions giving rise to beautiful colors and patterns. Such rocks that were formed at great depths during the Archaean age are now exposed at the surface of the earth as a result of the combined actions of wind, air, sun and water and weathering and denudation over the past several million years.

The granitic group ranges in composition from granite, through grandiorities to adamellite, augite-diorite, monzonite, etc., and contains inclusions of hornblendic rocks. To what extent they represent intrusive of different ages is yet to be determined, but their very complex nature is unquestionable since they include composite gneisses, migmatites, granitised older crystalline rocks and true granites with their aplitic and quartz vein systems.

The black granite is a basic igneous rock formed from ulltramafic magmas by partial melting. The composition of the rock is plagioclase (Labradorite) and pyroxene (Augite). The texture is ophitic i.e., large oligoclase of Augite enclose the laths of plagioclase feldspar. The colour is termed as Leucocratic. Free silica is rare or absent. The rock is holocrystalline, black colour, hardness-5 to 6, prismatic cleavage.

Geological succession of Krishnagiri District:

The Krishnagiri district is underlain by hard Crystalline rocks of Archaean age comprising of various rock types such as Gneiss, Charnockite, Migmatites, etc.,. The Gneissic type of Crystalline formation is found in the North and North Eastern part of the District Shoolagiri, Hosur, Mattur and Soolamalai areas covered by Granitic Gneiss (Migmatite).

In the Krishnagiri district of Tamil Nadu is characterized by the occurrences of Numerous Dolerite dykes. The dolerite dykes are general trending in NNW- SSE direction and rarely in NNE– SSW directions.

Order of superposition: -

STRUCTURAL SETTINGS OF THE AREA

AGE		FORMATION
Pleistocene to Recent	-	Soil
---------Unconformity--------		
Late Archaean to Proterozoic		Pegmatite, Dolerites, Migmatites, Hornblende Biotite Gneiss, Peninsular Gneissic Complex – II, Charnockite.
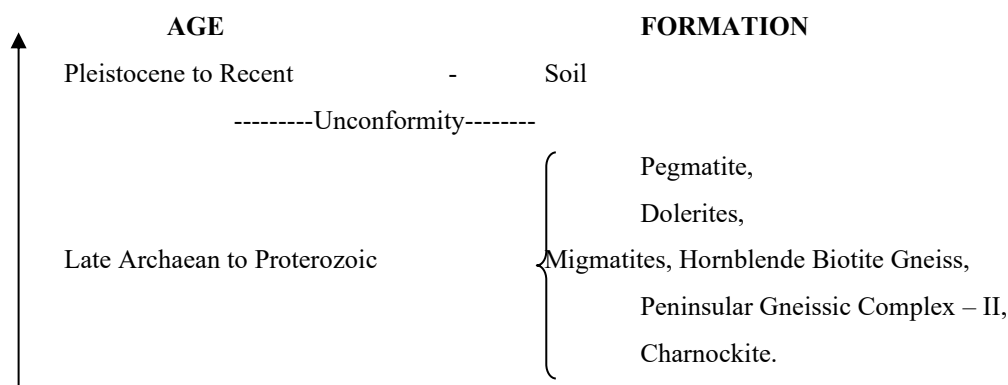
2.3.3. Geology of the lease applied area

The black granite is clearly visible right from the existing quarry pits and detached boulders are scattered within the lease area and remaining area concealed under reddish gravelly soil with an average thickness of 1m and followed by fresh black granite. The Granite Gneiss forms the country rock of the area with trending of NE-SW with almost vertical dipping and "Black Granite" (Dolerite) intruded between the batholithic formation of pre-existing country rock of Granite Gneiss discordantly with trending of East – West with Vertical dipping. The width of the black granite is varying from 22m to 68m which stretches about the entire area (Please refer Plate

No-III and IV of Approved Mining Plan). The black granite is clearly exposed in the existing quarry pit and few small detached boulders are scattered with linear strike direction of the dyke with spheroidal weathering and cuboidal and oblique joints.

The black granite (Dolerite dyke) rock is sub-ophitic, brownish black in color, equigranular, fine to medium grained texture. The color of the rock changes depending upon the texture of the rock. The Dykes is fine grained at the contact of country rock. The Dolerite is composed of laths of plagioclase embedded in the plates of Augite (Ophitic texture), Apatite, magnetite and pyrite forms the secondary mineral.

Strike, dip and oblique joints are observed at the surface level which is likely to decrease in deep seated condition. The recovery of black granite is 15%, taking in to consideration of the above geological factors, an average recovery of 15% up to 31m depth (1m Topsoil + 30m Black granite) has been computed as economically viable at present market scenario. This mining plan is discussed based on 15% recovery factor. If there is considerable increase or decrease in the recovery factor a modified mining plan will be prepared and will be submitted to relevant authorities for subsequent clearance and approval.

Exploration studies

State Geology and Mining Department has carried out the regional prospecting and exploration in these areas during 1992 to 1993 Geological survey of India has carried out detailed mapping in Krishnagiri District, besides the Functional Area Experts (FAE) in Geology and Hydrogeology carried out detailed Geological studies in the area. The Granite outcrops is clearly visible in some places within the study area.

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. 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).

Figure 2.7: Regional Geology Map
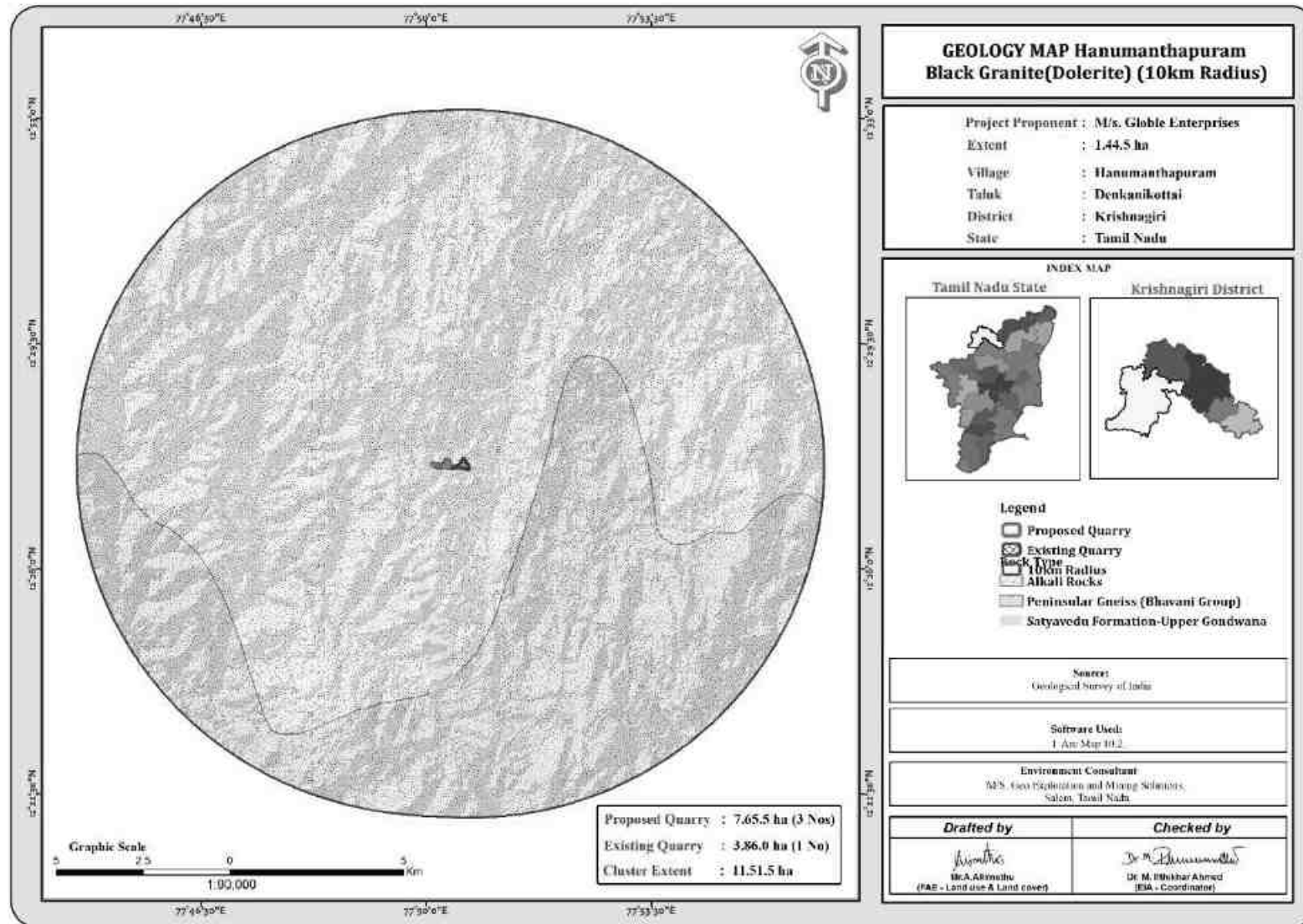
Figure 2.8: Geomorphology Map of The Study Area
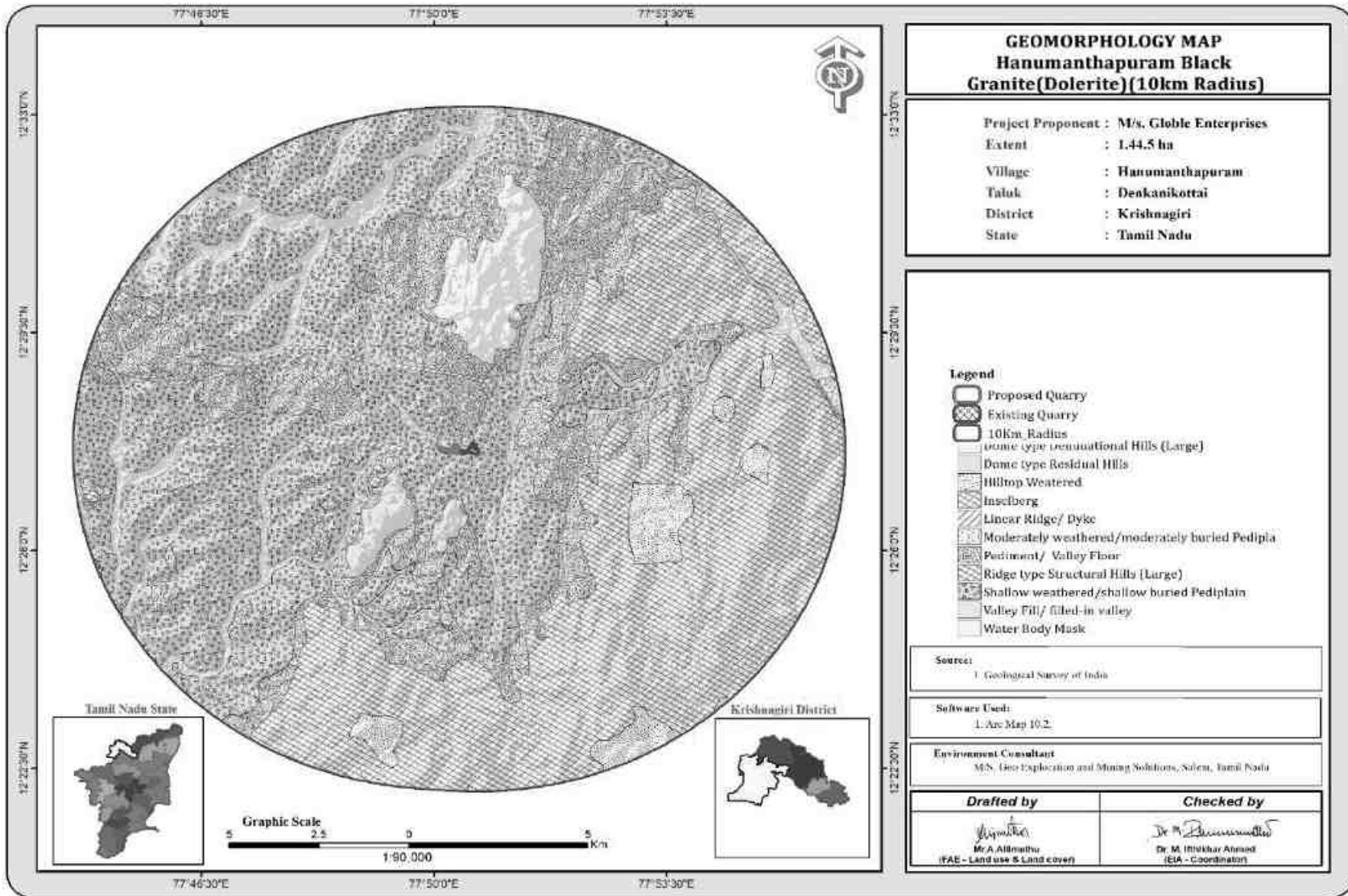
Figure 2.9: Topography, Geological Plan and Section

Source: Approved Mining plan

Figure 2.10: Year-Wise Development Production Plan and Section
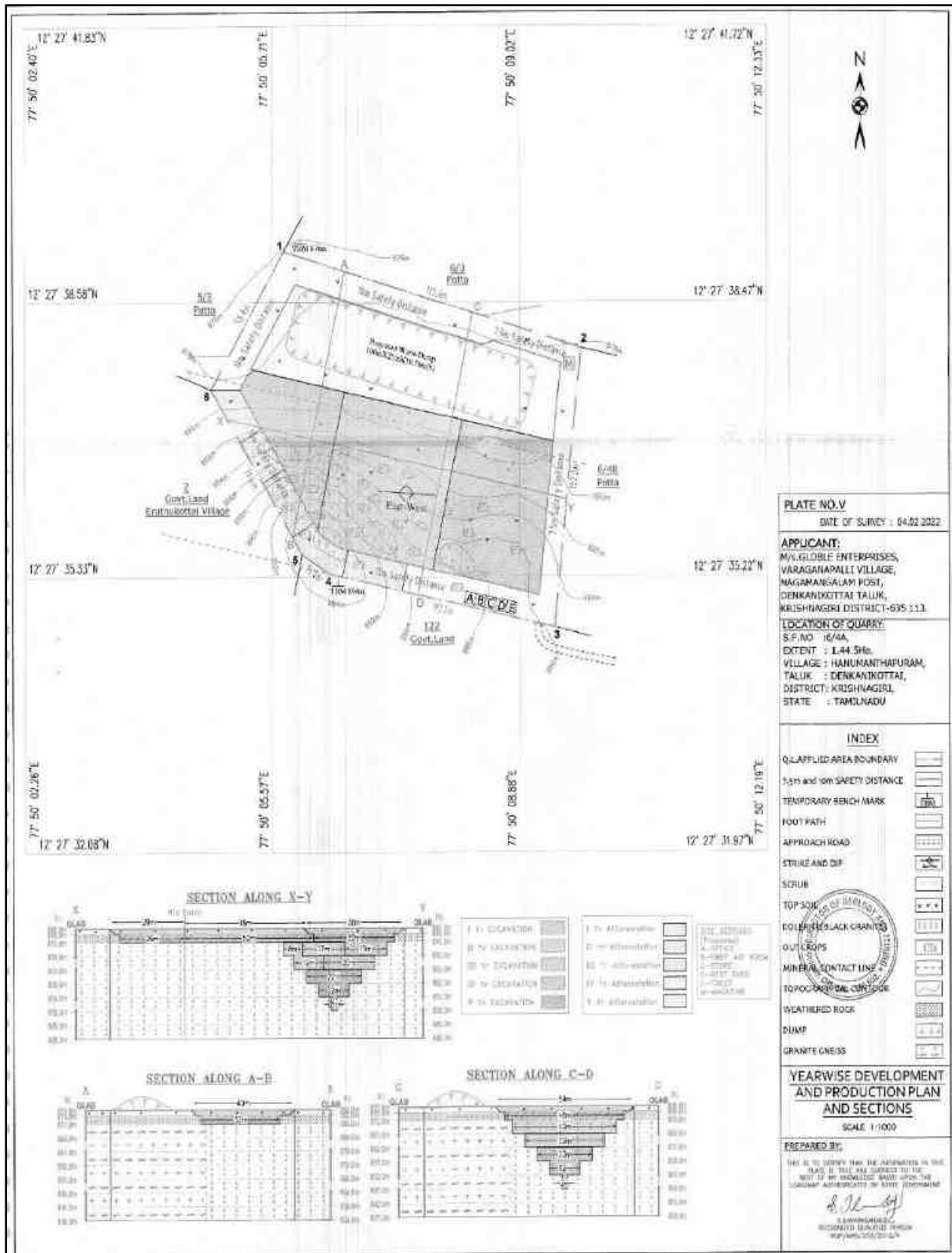
Source: Approved Mining plan

2.4   Resources and Reserves

Black Granite is occurring beneath the surface, Granite outcrops are visible in some places within the project area.

Table 2.5 Resources, Reserves

Description	ROM in m³	Granite recovery @30 % in m³	Granite waste @70% recovery	Side Burden in m³	Top Soil in m³
Geological Resources in m³	2,78,600	83,580	1,95,020	2,26,660	28,872
Mineable Reserves	69,300	20,790	48,510	39,165	18,726
Production for Five years mining plan period	17,100	5,130	11,970	-	11,716

Source: Approved Mining plan

Table 2.6 Year wise Production plan

Year	ROM in m³	Granite Recovery @ 30 % in m³	Granite Waste @ 70 % in m³	Weathered Rock in m³	Topsoil in m³
I	3,570	1071	2499	4608	4104
II	3,570	1071	2499	7488	5292
III	3,600	1080	2520	2496	2320
IV	3,200	960	2240	-	-
V	3,160	948	2212	-	-
Total	**17,100**	**5,130**	**11,970**	**14592**	**11716**

Source: Approved Mining plan

Stacking of Granite Rejects and Disposal of Waste

The excavated waste (26,562m³) will be proposed to dump in the Northern side with Maximum dimension of (L)100m x (W)25m x (H)10.18m for the first five years, which will act as temporary waste dump. The excavated topsoil will be spread out all along the safety barrier and will be utilized for construction of bund and afforestation purpose.

Conceptual Mining Plan/ Final Mine Closure Plan

Conceptual mining plan is prepared with an object of long-term systematic development of benches, lay outs, selection of permanent ultimate pit limit, depth of quarrying and ultimate pit, selection of sites for construction of infrastructure etc. The ultimate pit size is designed based on certain practical parameters such as economical depth of quarrying, safety zones, permissible area etc.,

Table 2.7 Ultimate Pit Dimension

Length In m	Width in m	Depth in m
117	83	40

Source: Approved Mining plan

2.5   Method of Mining

- The method of mining is Opencast mechanized method
- Eco-friendly dimensional wire saw cutting for liberation and splitting up of blocks from parent sheet rocks
- Splitting of rock body of considerable volume from the parent rock formation by carefully avoiding visibly seen defects such as patches veins, etc., is done by adopting the method of "Diamond wire cutting" along the horizontal as well as two vertical sides on the front face of the formation.
- Jackhammer drilling with 32mm dia, this huge portion is further split into several blocks of required dimensions, only slurry explosives are used for secondary fragmentation and handling of waste.
- Hydraulic Excavator coupled with tippers is deployed for the formation of benches and loading
- There is no mineral processing or ore beneficiation proposed
- Proposed bench height is 5m and 5m width with 60^0slope
- The waste material generated during quarrying activity includes rock fragments of different sizes, and waste chips during dressing of the blocks. The waste materials are taken in tippers and proposed to be

dumped in the respective approved places ear-marked for the purpose and the same will be utilized for backfilling in the northern side of the lease area during conceptual stage.

2.5.1   Drilling

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

Spacing - 1m, Burden - 0.8m, Depth of hole - 1.5m

2.5.2   Blasting

Blasting will be done as per details below:-

(i)   Controlled blasting parameter: -

        Spacing – 1m

        Burden – 0.8 m

        Depth of hole – 1.5 m

        Charge per hole – 125 gms

        Powder factor – 7.0 tonnes/kg

        Dia of hole – 32 mm

Details of blasting design and parameters are discussed in approved mining plan.

2.5.3   Extent of Mechanization

Table 2.8: Machinery Details Proposed

Drilling Equipment's					
Type	No of Unit	Dia of Hole mm	Size capacity	Make	Motive Power
Jack Hammer	6	32	1.2m to 6m	Atlas Copco	Compressed air
Compressor	2	-	140cfm/400psi	Atlas Copco	Diesel drive
Diamond Wire Saw	1	-	20m^3/day	optima	Diesel Generator
Diesel Generator	1	-	125kva	Powerica	Diesel
Loading Equipment					
Type	No of Unit	Capacity		Make	Motive Power
Crawler Crane	1	855		Tata P & H	Diesel Drive
Excavator	1	300		Tata Hitachi	Diesel Drive
Haulage within the Mine & Transport Equipment					
Type	No of Unit	Capacity		Make	Motive Power
Tipper	2	20 tonnes		Tata	Diesel Drive

2.6   General Features

2.6.1 Existing Infrastructures

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

2.6.2 Drainage Pattern

There are no streams, canals or water bodies crossing within the project area, hence there is no requirement of stream or canals diversion.

2.6.3 Traffic Density

The traffic survey conducted based on the transportation route of material, the Granite will be transported mainly through the Denkanikottai Major District Road located 1.80km North East side of the area and Irudukotta - Denkanikottai Village panchayat road 0.7km South West side.

Traffic density measurements were performed at Two locations
1. Denkanikottai Major District road - 1.80km North East
2. Irudukotta - Denkanikottai Village panchayat road - 0.7km South West side.

Traffic density measurement were made continuously for 24 hours by visual observation and counting of vehicles under three categories, viz., Heavy motor vehicles, light motor vehicles and two/three wheelers. As

traffic densities on the roads are high, two skilled persons were deployed simultaneously at each station during each shift- one person on either direction for counting the traffic. At the end of each hour, fresh counting and recording was undertaken.

Figure. 2.12: Mineral Transportation Route Map
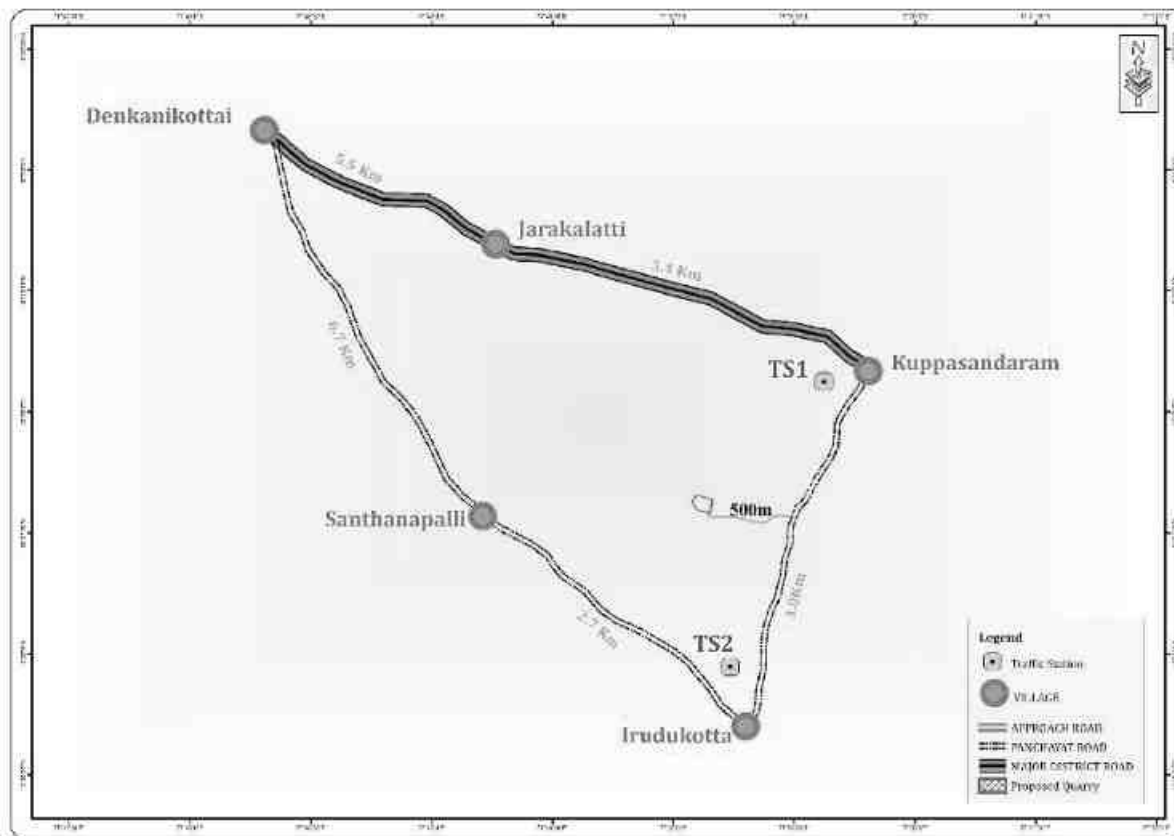
Table.2.9: Traffic Survey Locations

Station Code	Road Name	Distance and Direction	Type of Road
TS1	Kuppasandram-Denkanikottai-District Road	2.0km North East	Major District Road (Two Lane)
TS2	Irudhukotta Panchayat Road	1.0km South	Village road (Single Lane)

Source: On-site monitoring by GEMS FAE & TM

Table 2.10: Existing Traffic Volume

Station Code	HMV		LMV		2/3 Wheelers		Total PCU
	Number	PCU	Number	PCU	Number	PCU	
TS1	122	366	215	215	314	157	738
TS2	57	171	48	48	182	91	310

Source: On-site monitoring by GEMS FAE & TM

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

Table 2.11: Granite Hourly Transportation Requirement

Transportation of Granite per day			
Capacity of Trucks	No of trips per day	Volume in PCU	PCU considering 8 Hours
20Ts	1	3	3

Source: Data analysed from Approved Mining plan

Table 2.12: Summary of Traffic Volume

Route	Existing Traffic Volume in PCU	Incremental Traffic Due to the project in PCU	Total Traffic Volume in PCU	Hourly Capacity in PCU as per IRC - 1960
SH17A (Denkanikottai - Hosur)	738	3	741	1500
Village Road	310	3	313	1200

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

Due to this project 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 this project

2.7   Project Requirement

2.7.1 Water Source & Requirement

Detail of water requirements in KLD as given below:

Table 2.13 Water Requirement for the Project

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

Source: Prefeasibility report
* Drinking water will be sourced from Approved Water Vendors

2.7.2 Power and Other Infrastructure Requirement

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

The temporary infrastructures such as Mine Office, First Aid Room, Rest Shelter etc., will be constructed within the project area before commencing the quarry operation. No workshops are proposed inside the project area hence there will not be any process effluent generation from the proposed lease 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.

High speed Diesel (HSD) will be used for mining machineries. Diesel will be brought from nearby Fuel Stations.
One Hydraulic Excavator will excavate and loading into the tippers about 20m^3/Hour

Hydraulic Excavator will consume about 16 Ltrs per hour

Per hour Excavator will consume	=	16 liters / hour
Per hour Excavator will excavate	=	10m³
For 69,300m³ (for the entire life period)=		69,300/10
Diesel consume 6,930working hours	=	6,930hours x 16 liters
	=	1,10,880liters of HSD for entire project life
For 17,100m³ (for mining plan period)	=	17,100/10
Diesel consume 1710 working hours	=	1710 hours x 16 liters
	=	**27,360Ltrs** of HSD for mining plan period

The HSD (High Speed Diesel) will be obtained from nearby fuel station near the vicinity of the project site and will be transported in Fuel Barrel specified for transport of HSD (High Speed Diesel).

Source: Prefeasibility Report

2.8   Employment Requirement:

The skilled, competent qualified statutory persons will be engaged for quarrying operation, preference will be given to the local community.

Table 2.14: Employment Potential

S.No	Description	Numbers
	Skilled Labour	
1	Mines Manager	1
2	Mines Foreman	1
3	Machinery Operators	3
	Ordinary Employees	
4	Skilled labour	6
5	Semi-skilled	18
6	Unskilled	6
	Total	**35**

Source: Approved Mining Plan

2.9   Project Implementation Schedule

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

Table 2.15 Expected time Schedule

Sl.No	Particulars	Time Schedule (in month)					Remarks if any
		1st	2nd	3rd	4th	5th	
1	Environmental Clearance						
2	Consent to operate						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

Table 2.16 Capital Cost Estimation

S.No	Description	Cost
1	Fixed asset Cost	Rs. 12,34,000/-
2	Operational Cost	Rs. 2,32,04,000/-
2	EMP Cost	Rs. 3,80,000/-
	Total	Rs. 2,48,18,000/-

Source: Approved Mining Plan & Prefeasibility Report *

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 environment quality represents the background environmental scenario of various environmental components such as Land, Water, Air, Noise, Biological and Socio-economic status of the study area. Field monitoring studies to evaluate the base line status of the project site were carried out covering Dec 2022-Feb 2023 with CPCB guidelines. Environmental data has been collected with reference to cluster quarries by EHS 360 Labs Private Limited, – An accredited by ISO/IEC 17025:2017 (NABL) Laboratory, for the below attributes-

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 quarries area and buffer zone taken as 10km radius from the periphery of the Cluster quarries. Both Core zone and Buffer zone is taken as the study area.

Study Period

The baseline study was conducted during the Winter season i.e., Dec 2022-Feb 2023.

Study Methodology

- 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 project area, to collect data about wind speed, wind direction, temperature, relative humidity, rainfall and general weather conditions were recorded throughout the study period.
- In order to assess the Ambient Air Quality (AAQ), samples of ambient air were collected by installation of Respiratory Dust Samplers (RDS) for Fugitive dust, PM_{10} and SO_2, NO_x with gaseous attachments & Fine Dust Samplers (FDS) for $PM_{2.5}$ and other parameters as per NAAQ norms and analysed for primary air pollutants to work out the existing status of air quality.
- The Noise level measurements were also made at various locations in different intervals of time with the help of sound level meter to establish the baseline noise levels in the impact zone.
- Baseline biological studies were carried out to assess the ecology of the study area to study the existing flora and fauna pattern of the area.
- Socio-Economic survey was conducted at village and household level in the study area to understand the present socio-economic conditions and assess the extent of impact due to the proposed mining project.

The sampling methodologies for the various environmental parameters required for the study, frequency of sampling, method of samples analysis, etc., are given below Table 3.1.

Table 3.1: Monitoring Attributes and Frequency of Monitoring

Attribute	Parameters	Frequency of Monitoring	No. of Locations	Protocol
Land-use Land cover	Land-use Pattern within 10 km radius of the study area	Data from census handbook 2011 and from the satellite imagery	Study Area	Satellite Imagery Primary Survey
*Soil	Physio - Chemical Characteristics	Once during the study period	5 (1 core & 4 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 (3 surface water & 3 ground water)	IS 10500& CPCB Standards
Meteorology	Wind Speed Wind Direction Temperature Cloud cover Dry bulb temperature Rainfall	1 Hourly Continuous Mechanical/Automatic Weather Station	1	Site specific primary data & Secondary Data from IMD Station
*Ambient Air Quality	PM10 PM2.5 SO2 NOX Fugitive Dust	24 hourly twice a week (October – December 2020)	7 (1 core & 6 buffer)	IS 5182 Part 1-23 National Ambient Air Quality Standards, CPCB
*Noise Levels	Ambient Noise	Hourly observation for 24 Hours per location	7 (2 core & 5 buffer zone)	IS 9989 As per CPCB Guidelines
Ecology	Existing Flora and Fauna	Through field visit during the study period	Study Area	Primary Survey by Quadrate & Transect Study Secondary Data – Forest Working Plan
Socio Economic Aspects	Socio–Economic Characteristics, Population Statistics and Existing Infrastructure in the study area	Site Visit & Census Handbook, 2011	Study Area	Primary Survey, census handbook & need based assessments.

Source: On-site monitoring/sampling by EHS 360 Labs Private Limited,in association with GEMS
* All monitoring and testing are been carried out as per the Guidelines of CPCB and MoEF & CC.

3.1   Land Environment

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

3.1.1   LAND USE/ LAND COVER

        To study the land use pattern of the core as well as a buffer zone, land use/land cover details have been identified/ maps have been prepared in accordance with the **Standard ToR point no. 4 & 10 Stating**:
Point No. 4 All comer coordinates of the mine lease area, superimposed on a High-Resolution Imagery/ topo sheet. topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features ofthe study area (core and buffer zone).

Point No. 10. Lard use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary. national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted.

Current vintage data of Indian Remote Sensing Satellite ResourceSat-2A L4FMX (False Color Composite) has been used for Land Use / Land Cover study. Satellite image has been procured from National Remote Sensing Centre, Hyderabad.

3.1.2 OBJECTIVE

The objectives of the LULC study are as follow:

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

Technical specification of Satellite imagery Data Used:

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

Satellite Image   - Resourcesat1-LISSIII, 23.5m Resolution

Satellite Data Source   - NRSC, Hyderabad

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

SOI Toposheet No   -   57 H/ 15

Software Used   - ArcGIS 10.8

The satellite image (FCC color 3,2,1) of the buffer zone is given in 3.1
The spatial resolution and the spectral bands in which the sensor collects the remotely sensed data are two important parameters for any land use survey. Resourcesat1-LISSIII, 23m Resolution of 23.5m and a 141 km wide swath of the earth in 23.5m resolution covering wide areas the data is collected in 4 visible bands namely band number and Resolution.

TABLE 3.2: Resourcesat1-LISSIII SENSOR characteristics

Band Number	Description	Wavelength	Resolution
Band 1	Green	0.52-0.59 µm	23.5 meters
Band 2	Red	0.62-0.68 µm	23.5meters
Band 3	NIR	0.77-0.86 µm	23.5meters
Band 4	SWIR	1.55-1.70 µm	70meters

Source: NRSC, Hyderabad

3.1.3 METHODOLOGY

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

- Preliminary/primary data collection of the study area
- Satellite data procurement from NRSC
- Secondary data collection from authorized bodies
- Survey of India Toposheet (SOI)
- Mine Layout
- Cadastral / Khasra map
- GPS Coordinates of Lease Boundary

- Processing of satellite data using ArcGIS 10.8 and preparing the Land Use & Land cover maps (e.g. Mine area, Existing Quarries, Settlements, Agriculture land, Non agriculture land, water bodies, etc.) by Digital Image Processing (DIP) technique.

- Geo-Referencing of the Survey of India Toposheet
- Geo-Referencing of satellite Imagery with the help of Geo-Referenced Toposheets
- Enhancement of the Satellite Imagery
- Base Map layer creation (Roads, Railway, Village Names, and other Secondary data, etc.)
- Data analysis and Classification using Digital interpretation techniques.
- Ground truth studies or field Verification.
- Error fixing / Reclassification
- Final Map Generation.

The land use/Land cover Map of the buffer zone is given in 3.4(b).
Land Use Pattern of the Buffer Zone (Study area)
Details of the same are given in Table - 3.3 and the map is shown in Figure - 3.2

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

S.No	CLASSIFICATION	AREA_HA	AREA_%
	BUILTUP		
1	URBAN	348.60	1.03
2	RURAL	162.49	0.48
3	MINING	39.20	0.12
	AGRICULTURAL LAND		
4	CROP LAND	14680.41	43.27
5	PLANTATION	266.92	0.79
6	FALLOW LAND	908.75	2.68
	FOREST		
7	SCRUB FOREST	446.25	1.32
8	EVERGREEN/SEMI EVERGREEN	9651.62	28.45

9	FOREST DECIDUOUS	5454.89	16.08	
	BARREN/WASTE LANDS			
10	SCRUB LAND	1367.78	4.03	
11	BARREN ROCKY	117.89	0.35	
	WETLANDS/ WATER BODIES			
12	WATER BODIES/LAKE	479.31	1.41	
	TOTAL	33924.12	100.00	

Source: Bhuvan, NRSC.
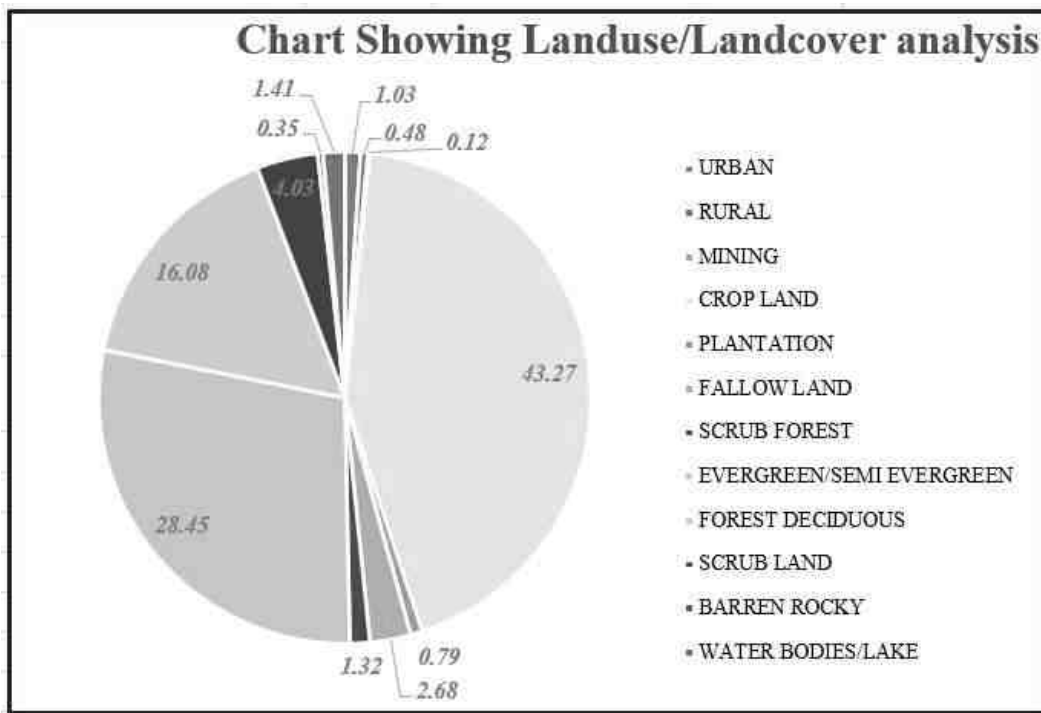
FIGURE 3.1: CHART SHOWING LANDUSE/LANDCOVER ANALYSIS USING LISS III Data
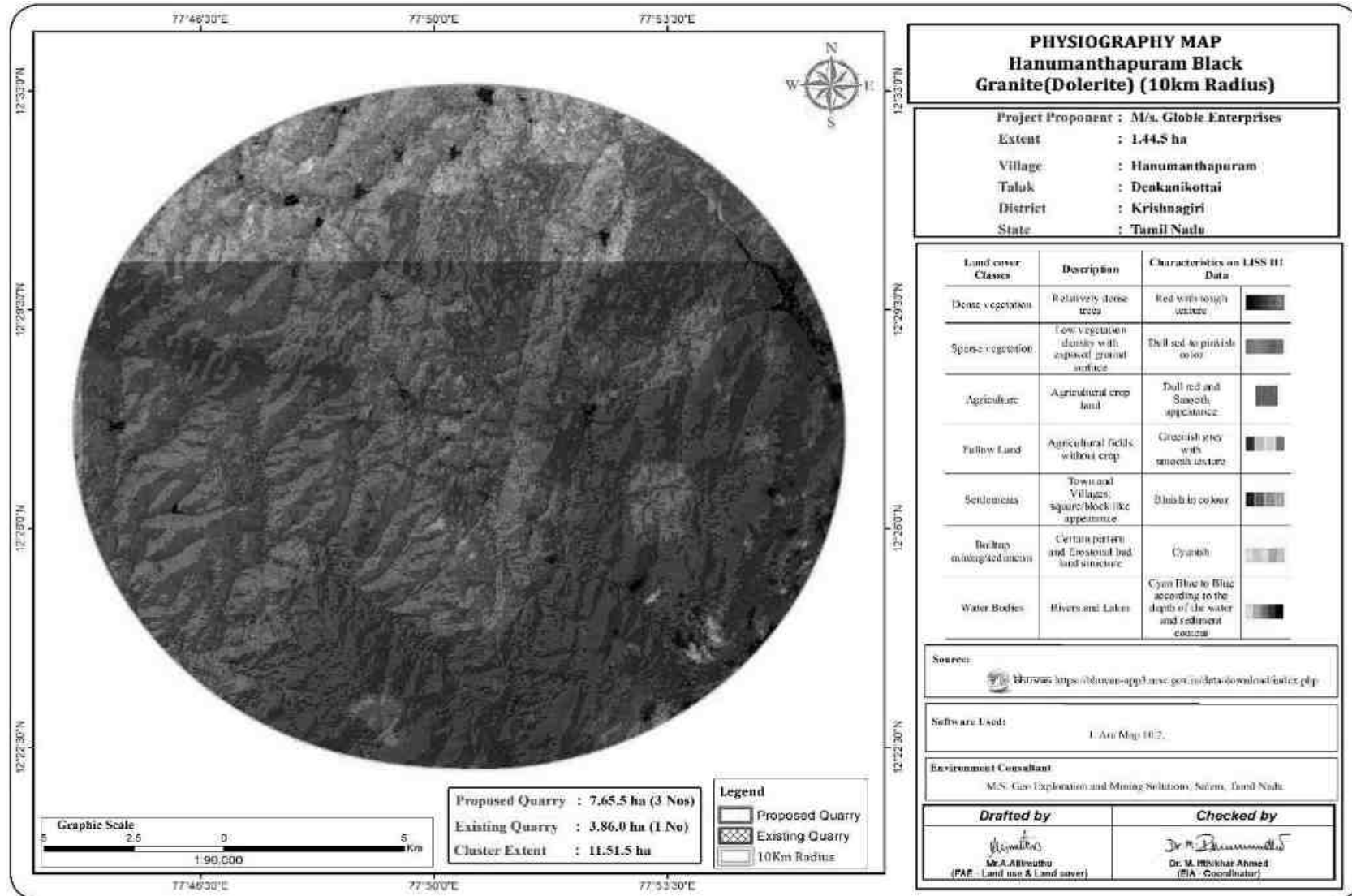
FIGURE 3.2: MAP SHOWING FALSE COLOR COMPOSITE (3,2,1) SATELLITE IMAGERY OF THE STUDY AREA
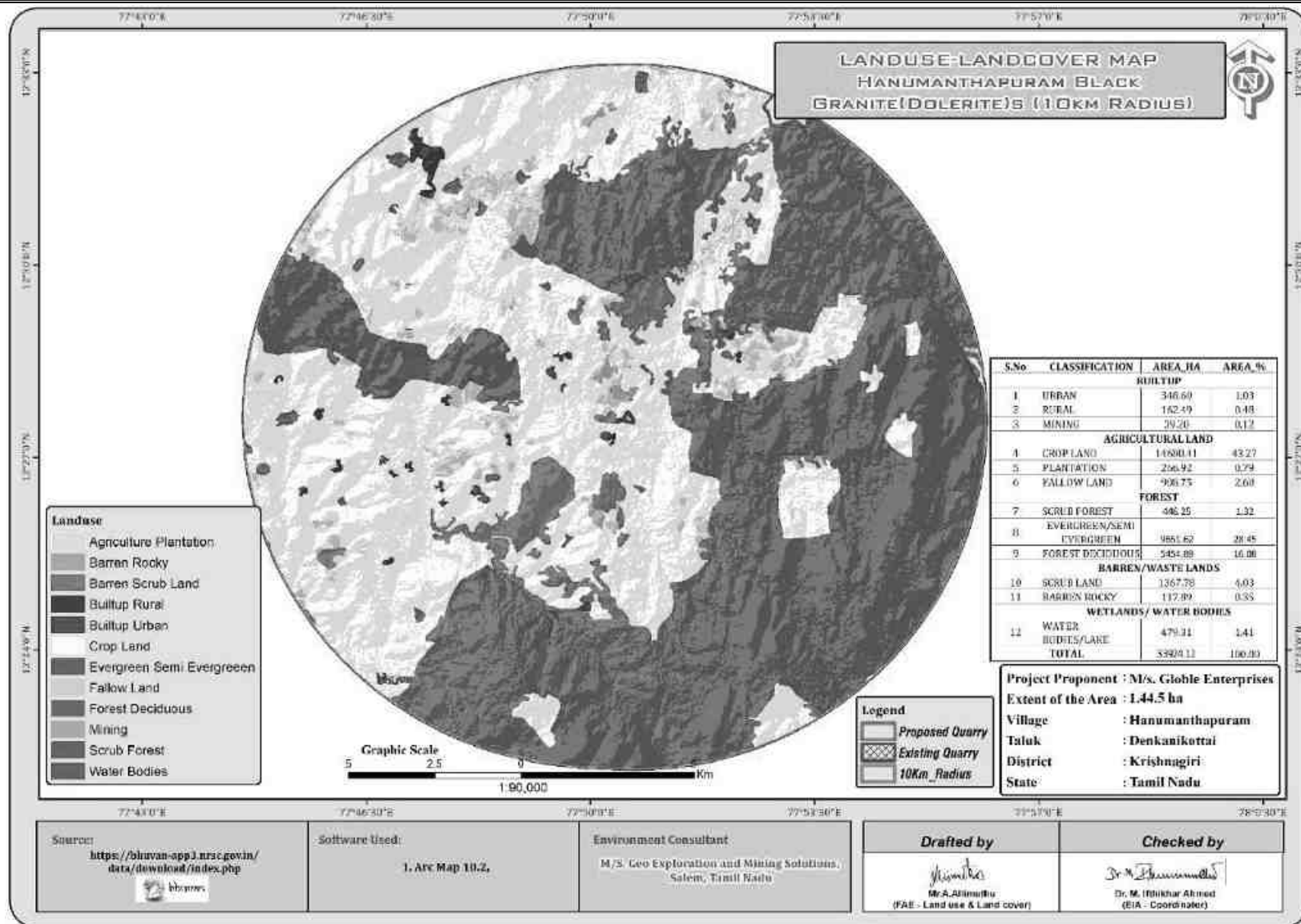
FIGURE 3.3: LAND USE LAND COVER MAP 10KM RADIUS

3.1.4 Interpretation

- The 10 km radius study area mainly comprises of crop land & Agriculture Plantation land accounting of 42.27% & 0.79% of the total study area. The study area also consists of fallow land of 2.68%.

- Water Bodies such as ponds/ lakes comprises of 1.4% of the core and buffer area. such as Odai, Kulam comprises at 200m and 190m in E direction, Nemileri kulam 2km in NE and Jarakalatti Tank at 4km in NW direction and Panchapali dam is about 9.5km-E of the total study area.

- The Scrub land accounts of 4%. As per the primary survey, it was observed the scrub land is mainly occupied by the stony waste and left-over domestic waste generated by the nearby areas.

- 0.12% of the total study area is occupied by the mine industries of captive mines. The area occupied by Mainly Black granite of the total buffer area. As also observed within the primary survey, the 10 km buffer area is also occupied by the medium scaled granite and marble and small Brick kiln industries also located in the study area.

- 1.51% of the area is covered under the human Settlement. The nearest village within the 3 km radius from the project site boundary is observed to be villages like Irudhukotai, Nemrelli, Santhanapalli and Hanumanthapuram etc.,

3.1.5 Cropping Pattern of the Buffer Zone

The productivity of Agriculture in the Southern and Northern part of the Tamil Nadu is comparatively like the Krishnagiri district has more favorable conditions for the agriculture. As observed, within the study area agriculture is the dominant occupation. Krishnagiri district is one of the potential districts for cultivation of horticultural crops. Total area under cultivation is 182888 ha. In that, Horticultural crops have been cultivated in about 80499 ha and the prominent crops under cultivation are Mango, Banana, Tomato, Beans, Cabbage, Cauliflower, Brinjal, Coriander, Potato, Carrot, Beetroot, Knol Khol, Turmeric, Rose, Gerbera, Carnation, Jasmine and Chrysanthemum. Mango is the major crop grown in this district.

3.1.6 Interpretation and Conclusion

- Hanumanthapuram Village Black granite quarries has proposed Project.

- Out of the total project area i.e., 33924 ha, 0.79% (i.e., 266.92 ha) will be developed under greenbelt development/ plantation.

- As new Proposed mine is coming in the area, percentage of human settlement will be increased in surrounding of project site and Infrastructure facilities also will be developed on the basis of requirement.

- The 10 km study area mostly covers of crop land 43%. As per current study 4.03% of the area is occupied by scrub land 1.38%, Barren rocky land 0.35% in 10 km radius from the study area land use into quarries purpose land for this proposed project.

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

3.1.7   TOPOGRAPHY

The lease applied area is exhibits flat terrain. The area has gentle sloping towards North side from Krishnagiri district. The altitude of the area is 876-894 m above Mean Sea level. proposed quarry area.

3.1.7 DIGITAL ELEVATION MODEL

Digital Elevation Model (DEM) has been prepared for the project at Hanumanthapuram Village, Denkanikottai Taluk, Krishnagiri District for a 10 km radius of study area.

Data Used

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

Methodology

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

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

1ˢᵗ Stage:

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

2ⁿᵈ Stage:

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

3ʳᵈ Stage:

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

4ᵗʰ Stage:

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

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

Slope

The slope map was derived from SRTM DEM data of the study area. The slope of the study area was classified into four classes: less than 3Percent/degree almost flat with gentle low speed ground motion sheet erosion and soil erosion, and no meaningful denudation process. 3^0 to 7^0, 7^0 to 12^0 more gentle the same as above but with a higher magnitude. Slope zone five class divide 0-3.5º, 3.5-7.2º, 7.2-12.8º, 12.8-20º and above 20º (Fig.3.5) it has very steep rock generally begins to unfold, a very intensive denudational process, have to begun to produce rework material.

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

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

Interpretation *& Conclusion*

It is very clear from the DEM that the elevation varies from 1280 m to 629m in the whole study area, thus having an elevation difference of 651 m. The areas in the Southern, and Southern eastern portion have higher elevation which is covered by undulated land while the It is also called as folded plain are generally used for agricultural purpose with builtup land. The contour over the DEM shows that the project site is 860-870m in the elevation range of 10 m interval present on the hilly land in the study area.

FIGURE 3.4: DIGITAL ELEVATION MODEL OF THE STUDY AREA WITH CONTOUR MAP
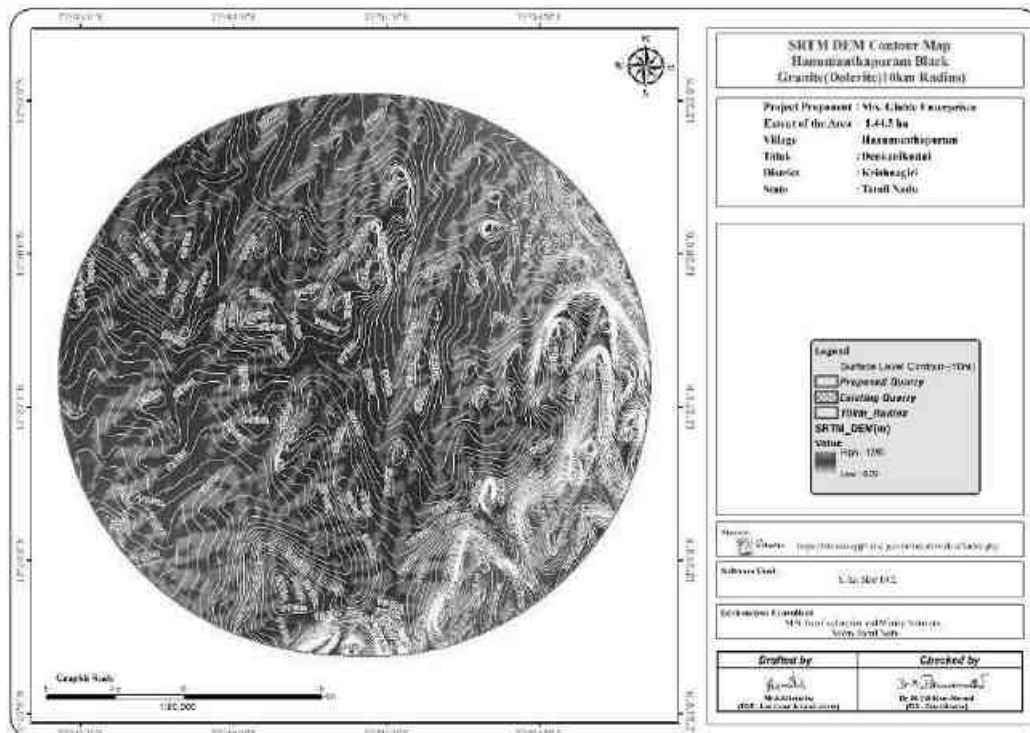
FIGURE 3.5: SLOPE MAP AROUND 10KM RADIUS
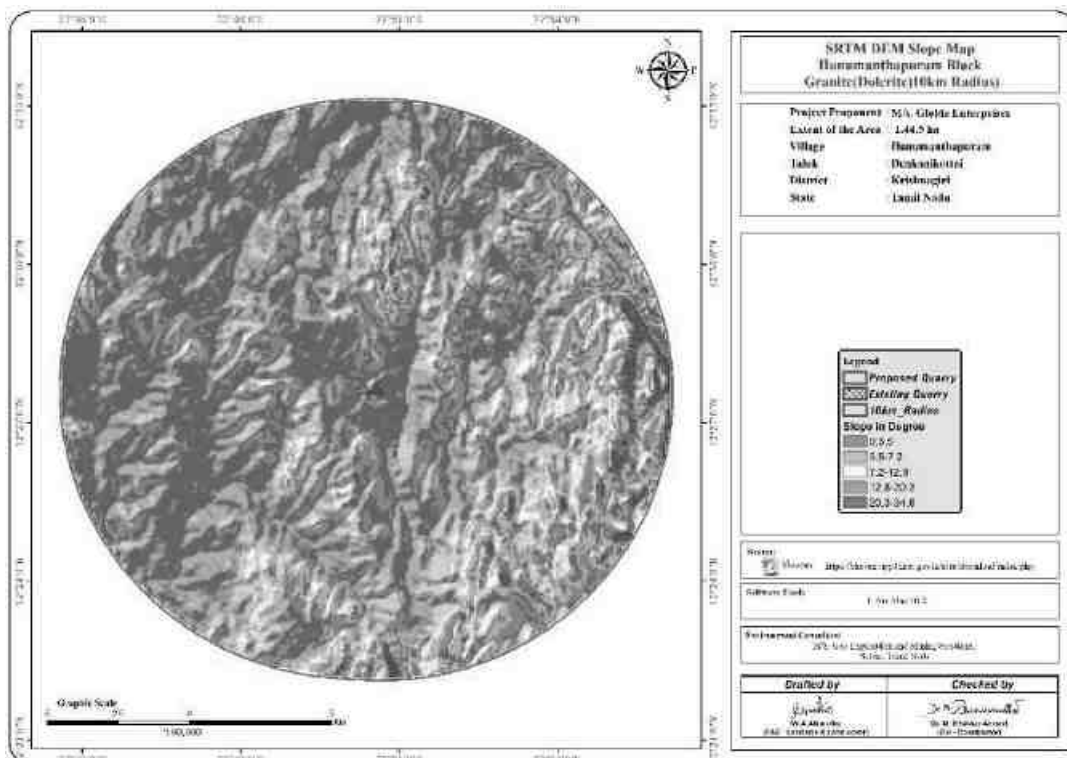
3.1.2   Topography

The project area is almost plain terrain with gentle gradient towards North –Easterm side, maximum elevation of the area is 876-894 m above Mean Sea level there are no hilly regions in and around the area.

3.1.3 Drainage Pattern of the Area

There are developed surface drainage channels in the study area. The drainage pattern of the area is dendritic it is inferred the rock-hard rock terrain.

The area is studded with few tanks that serve as the source of drinking water and also their surplus feeds adjoining tanks. The area is mostly dry in all seasons except rainy seasons.

During rainy season the surface runoff flows in NE to SW direction. The drainage pattern of the study area is given in Fig. 3.5. The quarrying activity will not hinder the natural flow of rainwater.

3.1.4 Seismic Sensitivity

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

3.1.5 Environmental Features in the Study Area

Cauvery North Wildlife Sanctuary is situated 1.65Km East. There are no other Wildlife Sanctuaries, National Park and Archaeological monuments within cluster area. No Protected and Reserved Forest area is involved in the cluster area. Therefore, there will be no need to acquisition/diversion of forest land. The details related to the environment sensitivity around the cluster area i.e., 10km radius, are given in the below Table 3.3.

Table 3.3: Details of Environment Sensitivity around the Cluster

No	Sensitive Ecological Features	Name	Arial Distance in km from Cluster
1	National Park / Wild life Sanctuaries	Cauvery North wild life sanctuary	1.65 km East
2	Reserve Forest	Denkanikottai R.F	3.5Km North
		Nooganoor R.F	2.35Km-NorthWest
		Ariyur R.F	5Km – South East
		Marandahalli R.F	8.5Km – South East
		Gullaty R.F	5.5Km- South
		Navasandiram R.F	7.5Km – South East
3	Lake Reservoir	Odai	200m East
		Kulam	190m SE
		Nemileri Kulam	2Km South East
		Jarakalatti Tank	4.0Km North West
		Panchapalli Dam	9.5Km East
4	Tiger Reserve/ Elephant Reserve/ Biosphere Reserve	None	Nil within 10KM 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

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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.

Table 3.4: Soil Sampling Locations

S. No	Location Code	Monitoring Locations	Distance (km) and Direction	Coordinates
1	S-1	Project Area	North East Corner	12°27'39.06"N 77°50'22.09"E
2	S-2	Giriyanahalli	4.5Km West	12°27'54.43"N 77°47'47.72"E
3	S-3	Bikkanapalli	5Km South West	12°26'18.96"N 77°47'47.01"E
4	S-4	Maarasandram	7Km North West	12°30'28.68"N 77°48'20.27"E
5	S-5	Kuppasandram	1.8Km North East	12°28'23.37"N 77°51'6.83"E

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

The objective of the soil sampling is -

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

Methodology –

For studying soil quality, sampling locations were selected to assess the existing soil conditions in and around the project site representing various land use conditions. The samples were collected by auger boring into the soil up to 90-cm depth. Five (5) 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 EHS 360 Labs Private Limited in association with GEMS

Soil Testing Result –

The samples were analysed as per the standard methods prescribed in "Soil Chemical Analysis (M.L. Jackson, 1967) & Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Government of India".

Figure 3.6: Soil Sampling Locations Around 10 Km Radius
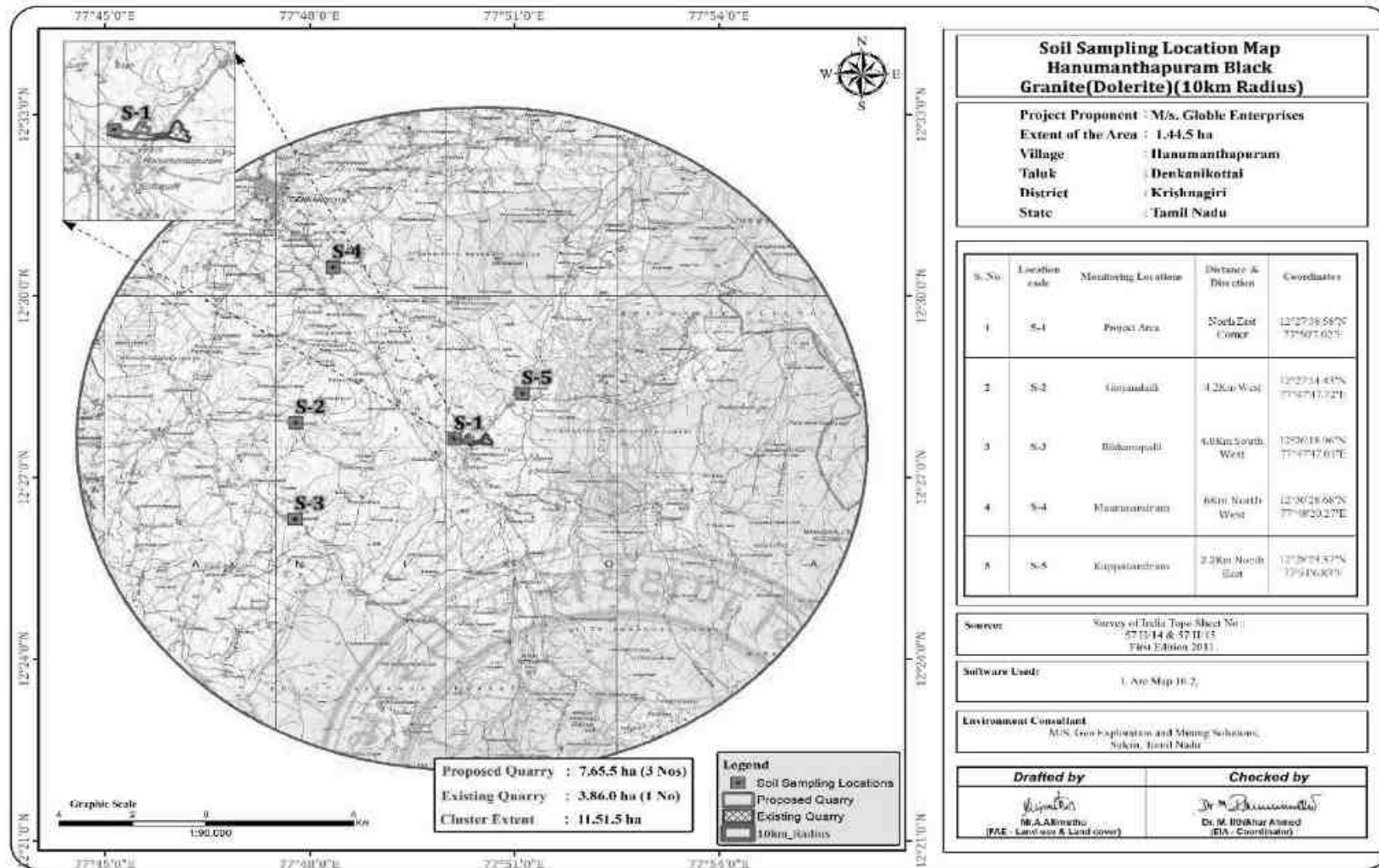
Figure 3.7: Soil Map
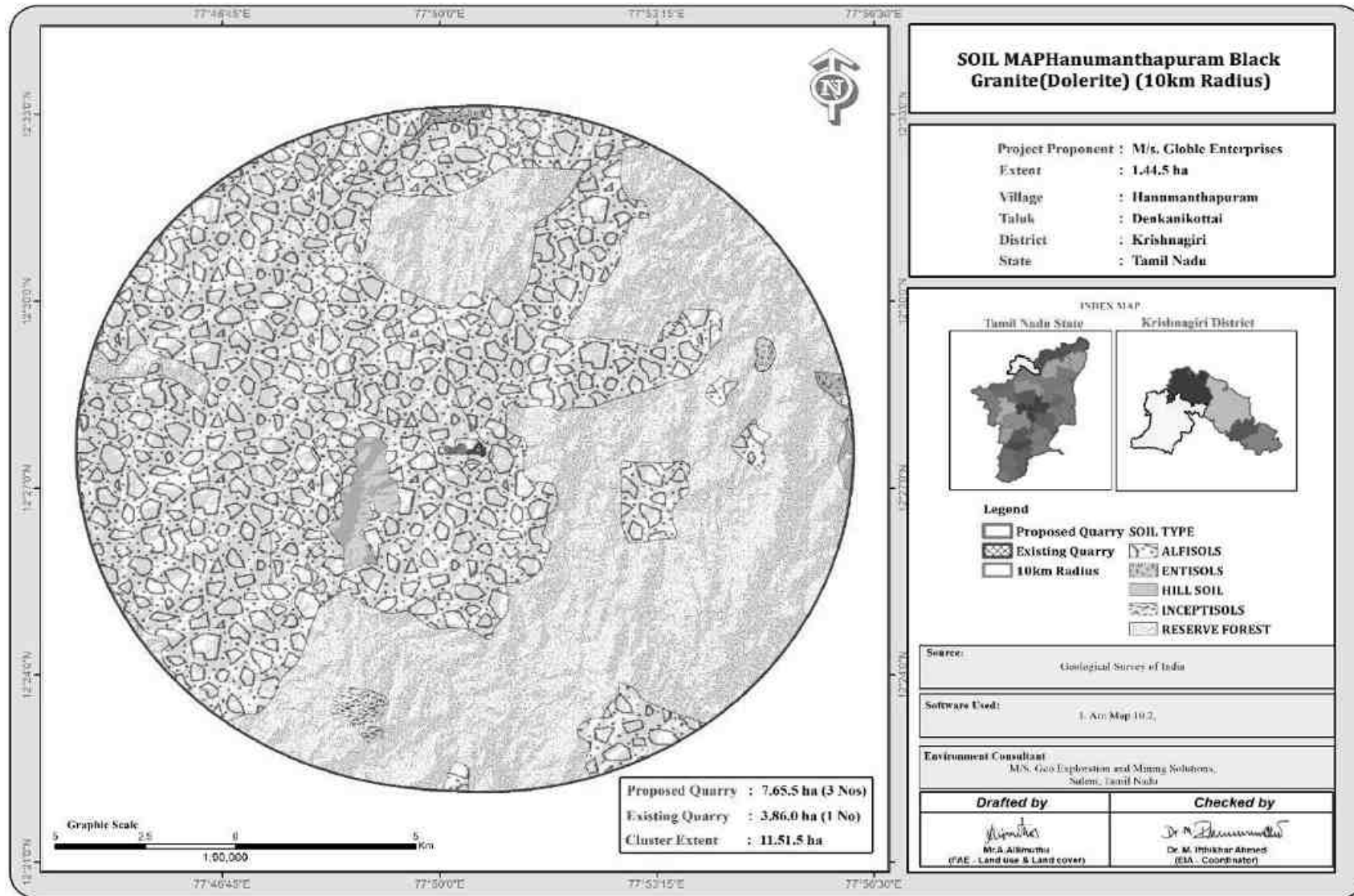
Table 3.6: Soil Quality of the Study Area

S.No	Test Parameters	Protocols	S1- Project Area	S2- Giriyanahalli	S3- Bikkanapalli	S4- Maarasandram	S5- Kuppasandram
1	pH @ 25°C	IS 2720 Part 26 - 1987 (Reaff:2016)	8.94	8.01	8.37	8.98	7.66
2	Conductivity @ 25°C	IS 14767 - 2000 (Reaff : 2016)	550 µmhos/cm	509 µmhos/cm	466 µmhos/cm	379 µmhos/cm	440 µmhos/cm
3	Water Holding Capacity	By Gravimetric Method	47.4 %	48.8 %	47.9 %	45.5. %	46.9 %
4	Bulk Density	By Cylindrical Method	1.09 g/cm^3	1.17 g/cm^3	1.05 g/cm^3	0.96 g/cm^3	1.05 g/cm^3
5	Porosity	By Gravimetric Method	44.5 %	44.7 %	42.2 %	43 %	40.5 %
6	Calcium as Ca	Food and Agriculture organization of the united Nation Rome 2007 : 2018	160 mg/kg	134.5 mg/kg	90.7 mg/kg	167 mg/kg	123 mg/kg
7	Magnesium as Mg		65.7 mg/kg	84.6 mg/kg	77.6 mg/kg	80.5 mg/kg	79.8 mg/kg
8	Chloride as Cl	APHA 23rd Edn 2019 4500 Cl B	115 mg/kg	120 mg/kg	115 mg/kg	98.4 mg/kg	102 mg/kg
9	Soluble Sulphate as SO$_4$	IS 2720 Part 27 : 1977 (Reaff:2015)	0.013 %	0.0008 %	0.016 %	0.0071 %	0.0039 %
10	Total Phosphorus as P	IS 10158 : 1982 (Reaff: 2019)	1.5 mg/kg	1.21 mg/kg	2.6 mg/kg	2.9 mg/kg	2.65 mg/kg
11	Total Nitrogen as N	IS 14684 : 1999 (Reaff:2019)	350 mg/kg	310 mg/kg	400 mg/kg	372 mg/kg	357 mg/kg
12	Organic Matter	IS : 2720 Part 22: 1972 (Reaff: 2015)	1.84 %	1.71 %	2.52 %	1.90 %	2.31 %
13	Organic Carbon	IS : 2720 Part 22: 1972 (Reaff: 2015)	1.07 %	0.99 %	1.46 %	1.10 %	1.34 %
14	Texture :						
	Clay		36.5 %	35.9 %	37.6 %	30.3 %	29.7 %
	Sand		35.4 %	36.7 %	35.7 %	32.5 %	35.2 %
	Silt	Gravimetric Method	28.1 %	27.4 %	26.7 %	37.2 %	35.1 %
15	Manganese as Mn	USEPA 3050 B – 1996 &	24.4 mg/kg	30.5 mg/kg	29.8 mg/kg	26 mg/kg	20.9 mg/kg
16	Zinc as Zn	USEPA 6010 C - 2000	1.22 mg/kg	2.8 mg/kg	2.32 mg/kg	1.26 mg/kg	1.21 mg/kg
17	Boron as B		2.9 mg/kg	1.56 mg/kg	1.58 mg/kg	1.55 mg/kg	1.36 mg/kg
18	Potassium as K		32 mg/kg	24 mg/kg	36 mg/kg	41.2 mg/kg	30.5 mg/kg
19	Cadmium as Cd		BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)
20	Total Chromium as Cr		BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)
21	Copper as Cu		BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)
22	Lead as Pb		0.96 mg/kg	0.6 mg/kg	0.9 mg/kg	0.88 mg/kg	1.2 mg/kg
23	Iron as Fe		2.54 mg/kg	2.75 mg/kg	2.50 mg/kg	2.03 mg/kg	2.35 mg/kg
24	Cation Exchange Capacity	USEPA 9080 – 1986	35.4 meq/100g of soil	35.3 meq/100g of soil	36.2 meq/100g of soil	40.6 meq/100g of soil	40 meq/100g of soil

Source: Sampling Results by EHS 360 Labs Private Limited,

Interpretation & Conclusion

- The physical properties of the soil samples were examined for texture, bulk density, porosity and water holding capacity. The soil texture found in the study area is
- Clay Loam Soil and Bulk Density of Soils in the study area varied between 0.96– 1.17 g/cc. The Water Holding Capacity and Porosity of the soil samples is found to be medium i.e. ranging from 45.5 – 48.8 %. And 40.5-44.7%
- The nature of soil is slightly alkaline to strongly alkaline with pH range 7.66 to 8.98
- The available Nitrogen content range between 310 to 400kg/ha
- The available Phosphorus content range between 1.21 to 2.9 kg/ha
- The available Potassium range between 24.0 to 41.2 mg/kg
- Whereas, the micronutrient as zinc (Zn) and iron (Fe) were found in the range of 1.21 to 2.32 mg/kg; 2.03 to 2.75 mg/kg.

3.2   Water Environment

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

3.2.1 Surface Water Resources:

The study area is studded with few tanks that serve as the source of drinking water and also their surplus feeds adjoining tanks. The rainfall over the area is moderate, the rainwater storage in open wells and trenches are in practice over the area and the stored water acts as source of freshwater for couple of months after rainy season.

Table 3.7: Water Bodies in the Buffer Zone

Sl.No.	Water Bodies	Distance
1	Odai	Lease Either Side
2	Kulam	160m South
3	Nemileri Kulam	1.8Km South East
4	Jarakalatti Tank	3.8Km North West
5	Panchapalli Dam	9.5Km East

Source: Survey of India Toposheet

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

Three (3) surface water and Three (3) ground water samples were collected from the study area and were analysed for physio-chemical, heavy metals and bacteriological parameters in order to assess the effect of mining and other activities on surface and ground water. The samples were analysed as per the procedures specified by CPCB, IS-10500:2012 and 'Standard methods for the Examination of Water and Wastewater' published by American Public Health Association (APHA). The water sampling locations are given in Table 3.8 and shown as Figure 3.5.

Table 3.8: Water Sampling Locations

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
Surface Water				
1	SW-1	Anumanthapuram	300m South	12°27'26.15"N
2	SW-2	Nemileri	2.5Km South East	12°26'30.52"N
3	SW-3	Denkanikottai Lake	7.8Km North West	12°31'12.77"N
Ground Water				

1	WW-1	Bikkanapalli	5Km South West	12°26'13.14"N
2	WW-2	Giriyanahalli	4.5Km West	12°27'57.52"N
3	BW-3	Kuppasandram	1.8Km North East	12°28'27.88"N 77°51'3.61"E

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

Table 3.9: Ground Water Sampling Results

S.NO	Parameter	Unit	WW1 Bikkanapalli	BW1 Giriyanahalli	BW2 Kuppasandram
1	Color	Hazen	5	5	5
2	Odour	-	Agreeable	Agreeable	Agreeable
3	pH@ 25°C	-	7.99	7.05	7.36
4	Electrical Conductivity	μs/cm	788 μmhos/cm	964 μmhos/cm	898 μmhos/cm
5	Turbidity	NTU	1.0 NTU	1.6 NTU	1.26 NTU
6	Total Dissolved Solids	mg /l	465 mg/l	569 mg/l	529 mg/l
7	Total Hardness as $CaCO_3$	mg/l	140.51 mg/l	207.60 mg/l	176.24 mg/l
8	Calcium as Ca	mg/l	25.5 mg/l	39.7 mg/l	30.1 mg/l
9	Magnesium as Mg	mg/l	18.7 mg/l	26.4 mg/l	24.6 mg/l
10	Total Alkalinity	mg/l	145.2 mg/l	194 mg/l	168.5 mg/l
11	Chloride as Cl^-	mg/l	120 mg/l	155 mg/l	145 mg/l
12	Sulphate as SO_4^-	mg/l	50.1 mg/l	65.5 mg/l	62.2 mg/l
13	Iron as Fe	mg/l	0.13 mg/l	0.16 mg/l	0.19 mg/l
14	Free Residual Chlorine	mg/l	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)
15	Fluoride as F	mg/l	0.11 mg/l	0.14 mg/l	0.15 mg/l
16	Nitrates as NO_3	mg/l	5.8 mg/l	5 mg/l	4.7 mg/l
17	Copper as Cu	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
18	Manganese as Mn	mg/l	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)
19	Mercury as Hg	mg/l	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)
20	Cadmium as Cd	mg/l	BDL (DL:0.001 mg/l)	BDL (DL:0.001 mg/l)	BDL (DL:0.001 mg/l)
21	Selenium as Se	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
22	Aluminium as Al	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
23	Lead as Pb	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
24	Zinc as Zn	mg/l	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)
25	Total Chromium	mg/l	BDL(DL : 0.02 mg/l)	BDL(DL : 0.02 mg/l)	BDL(DL : 0.02 mg/l)
26	Boron as B	mg/l	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)
27	Mineral Oil	mg/l	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)
28	Phenolic Compunds	mg/l	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)
29	Anionic Detergents	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
30	Cynaide as CN	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
31	Total Coliform	Per 100ml	140 MPN/100ml	180 MPN/100ml	100 MPN/100ml
32	E-Coli	Per 100ml	< 1.8 MPN/100ml	< 1.8 MPN/100ml	< 1.8 MPN/100ml
33	Barium as Ba	mg/l	BDL(DL:0.05 mg/l)	BDL(DL:0.05 mg/l)	BDL(DL:0.05 mg/l)
34	Ammonia (as Total	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
35	Sulphide as H_2S	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
36	Molybdenum as Mo	mg/l	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)
37	Total Arsenic as	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
38	Total Suspended Solids	mg/l	BDL (DL:1.0 mg/l)	BDL (DL:1.0 mg/l)	BDL (DL:1.0 mg/l)

Source: Sampling Results by EHS 360 Labs Private Limited,

Table 3.10: Surface Water Sampling Results

S.NO	Parameter	UNIT	SW1 Anumanthapuram	SW2 -Nemileri	SW3 - Denkanikottai Lake
1	Color	Hazen	10 Hazen	5 Hazen	10 Hazen
2	Odour	-	Agreeable	Agreeable	Agreeable
3	pH@ 25ºC	-	7.11	7.52	7.27
4	Electrical Conductivity @ 25ºC	µs/cm	1173 µmhos/cm	1021 µmhos/cm	1349 µmhos/cm
5	Turbidity	NTU	2.3 NTU	2.1 NTU	2.7 NTU
6	Total Dissolved Solids	mg /l	692 mg/l	602 mg/l	796 mg/l
7	Total Hardness as $CaCO_3$	mg/l	215.19 mg/l	186.75 mg/l	256.27 mg/l
8	Calcium as Ca	mg/l	37.8 mg/l	32.5 mg/l	42.4 mg/l
9	Magnesium as Mg	mg/l	29.4 mg/l	25.7 mg/l	36.6 mg/l
10	Total Alkalinity as $CaCO_3$	mg/l	255 mg/l	202 mg/l	288 mg/l
11	Chloride as Cl^-	mg/l	188 mg/l	160 mg/l	210 mg/l
12	Sulphate as SO_4^-	mg/l	65.1 mg/l	68.5 mg/l	80.4 mg/l
13	Iron as Fe	mg/l	0.13 mg/l	0.3 mg/l	0.3 mg/l
14	Free Residual Chlorine	mg/l	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)
15	Fluoride as F	mg/l	0.2 mg/l	0.24 mg/l	0.23 mg/l
16	Nitrates as NO_3	mg/l	8.5 mg/l	15.2 mg/l	7.6 mg/l
17	Copper as Cu	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
18	Manganese as Mn	mg/l	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)
19	Mercury as Hg	mg/l	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)
20	Cadmium as Cd	mg/l	BDL (DL:0.001 mg/l)	BDL (DL:0.001 mg/l)	BDL (DL:0.001 mg/l)
21	Selenium as Se	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
22	Aluminium as Al	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
23	Lead as Pb	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
24	Zinc as Zn	mg/l	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)
25	Total Chromium	mg/l	BDL(DL : 0.02 mg/l)	BDL(DL : 0.02 mg/l)	BDL(DL : 0.02 mg/l)
26	Boron as B	mg/l	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)
27	Mineral Oil	mg/l	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)
28	Phenolic Compunds as	mg/l	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)
29	Anionic Detergents as	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
30	Cynaide as CN	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
31	Biological Oxygen	mg/l	6.3 mg/l	7.0 mg/l	6.5 mg/l
32	Chemical Oxygen	mg/l	40 mg/l	36 mg/l	28 mg/l
33	Dissolved Oxygen	mg/l	5.5 mg/l	5.2 mg/l	5.2 mg/l
34	Total Coliform	Per 100ml	980 MPN/100ml	880 MPN/100ml	1010 MPN/100ml
35	E-Coli	Per 100ml	150 MPN/100ml	200 MPN/100ml	290 MPN/100ml
36	Barium as Ba	mg/l	BDL(DL:0.05 mg/l)	BDL(DL:0.05 mg/l)	BDL(DL:0.05 mg/l)
37	Ammonia-n (as Total	mg/l	1.3 mg/l	1.11 mg/l	1.9 mg/l
38	Sulphide as H_2S	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
39	Molybdenum as Mo	mg/l	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)
40	Total Arsenic as As	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
41	Total Suspended Solids	mg/l	14.7 mg/l	18.4 mg/l	23.8 mg/l

3.2.4 Interpretation & Conclusion

Surface Water
Ph:
The pH varied from 7.11 to 7.52 while turbidity found within the standards (Optimal pH range for sustainable aquatic life is 6.5 to 8.5 pH).

Total Dissolved Solids:
Total Dissolved Solids varied from 602 to 796 mg/l, the TDS mainly composed of carbonates, bicarbonates, Chlorides, phosphates and nitrates of calcium, magnesium, sodium and other organic matter.

Other parameters:
Chloride varied between 160 mg/l and 210 mg/l. Nitrates varied from 7.6 to 15.2 mg/l, while sulphates varied from 65.1 to 80.4 mg/l.

Ground Water

The pH of the water samples collected ranged from 7.05 to 7.99 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 465-569 mg/l in all samples. The Total hardness varied between 140.5–207.60 mg/l. On Microbiological parameters, the water samples from all the locations meet the requirement. The parameters thus analysed were compared with IS 10500:2012 and are well within the prescribed limits.

3.2.5 Hydrology and Hydrogeological studies

The district is underlain by hard rock formation fissured and fractured crystalline rocks constitute the important aquifer systems in the district. Geophysical prospecting was carried out in that area by SSRMP-80 Instrument by qualified Geo physicist with the help of IGIS software and it was inferred that the low resistance encountered at the depth between 62- 57m. The maximum depth proposed out of proposed projects is 40 m BGL for the entire period. Hence there is no possibilities of water table intersection during the entire mine life period besides it is also inferred topographically that there are no major water bodies intersecting the project area. There is no necessity of stream, channel diversion due to these proposed projects.

During the rainy season there is a possibility of collection of seepage water from the subsurface levels this is due to the high intensity of fracture and weathered portion up to a depth of 40m thus the collected seepage water will be 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.

Figure 3.8: Water Sample Collections Photographs

3.2.6 Ground Water Resources:

Krishnagiri district is underlain entirely by Archaean Crystalline formations with Recent alluvial deposits occurring along the river and streams courses and colluvium of valley-fills. The important aquifer systems in the district are constituted by weathered, fissured and fractured crystalline rocks and the recent alluvial deposits. Ground water occurs under phreatic conditions. The maximum saturated thickness of these aquifers is upto 5 m depending upon the topographic conditions. The study area falls in the Denkanikottai which is categorized as Safe (< 70%) as per G.O (MS) No 113 dated 09.06.2016.

There are Seven open wells within the radius of 1km Most of the wells are almost in dry conditions: - The details of the well and depth in monsoon and non-monsoon is described below:

Table 3.11: Details of Borewell & Water Level In 1km Radius

S.No	Name	LONGITUDE	LATITUDE	Dec-22	Jan-23	Feb-23
1	BW1	77° 50' 16.91"E	12° 27' 22.28"N	58.5	59.1	59.8
2	BW2	77° 49' 52.32"E	12° 27' 22.95"N	59	59.6	60.3
3	BW3	77° 50' 43.75"E	12° 27' 54.52"N	59.6	60.2	60.9
4	BW4	77° 50' 46.17"E	12° 27' 37.34"N	58.8	59.4	60.1
5	BW5	77° 50' 18.29"E	12° 27' 06.92"N	59.2	59.8	60.5
6	BW6	77° 50' 10.49"E	12° 27' 52.25"N	58.6	59.2	59.9
7	BW7	77° 49' 38.48"E	12° 27' 43.28"N	58.4	59	59.7
8	BW8	77° 49' 48.58"E	12° 28' 13.34"N	59.4	60	60.7

Source: Data obtained by the FAE & Team Members

Table 3.12: Details of Open well & Water Level in 1km Radius

S.No	Name	LONGITUDE	LATITUDE	Dec-22	Jan-23	Feb-23
1	OW1	77° 50' 05.11"E	12° 27' 54.50"N	11.5	12.1	12.8
2	OW2	77° 50' 51.43"E	12° 27' 29.66"N	12.8	13.4	14.1
3	OW3	77° 50' 29.93"E	12° 27' 05.61"N	11.8	12.4	13.1
4	OW4	77° 50' 16.76"E	12° 27' 45.58"N	12	12.6	13.3
5	OW5	77° 49' 59.24"E	12° 27' 51.18"N	12.5	13.1	13.8
6	OW6	77° 49' 14.19"E	12° 27' 52.30"N	11.6	12.2	12.9

Figure 3.9: Post Monsoon Water Level of Open Well 1 Km Radius

DECEMBER– 2022　　　　　　　　　　　　　　　　　　**JANUARY -2023**
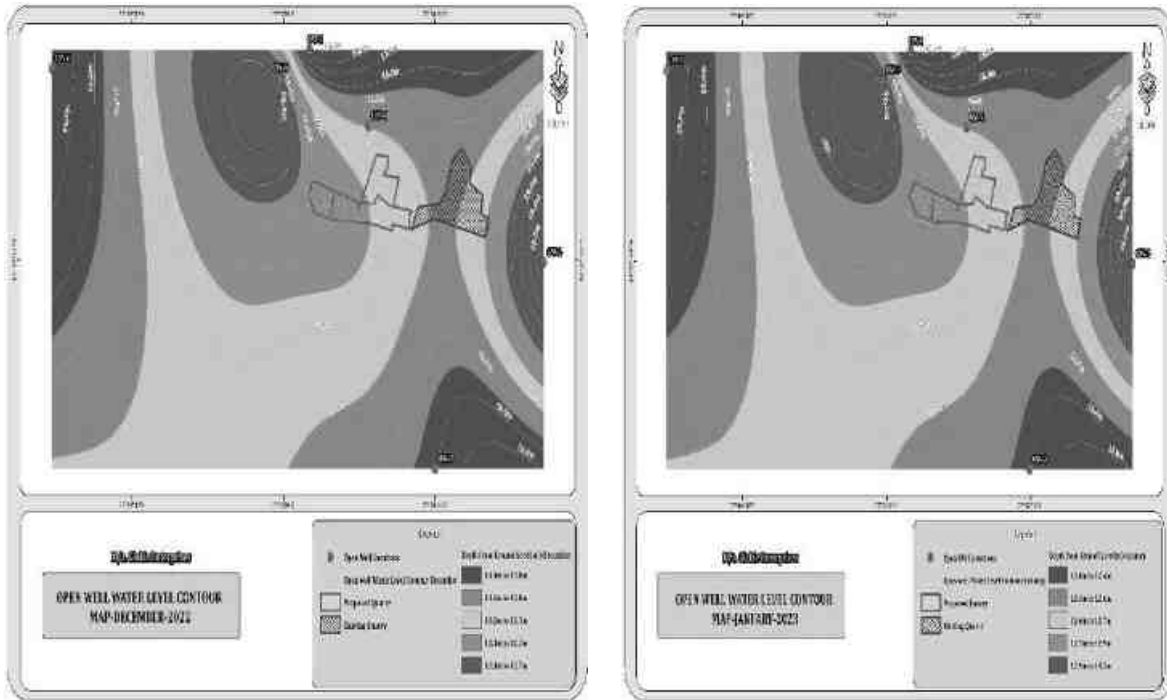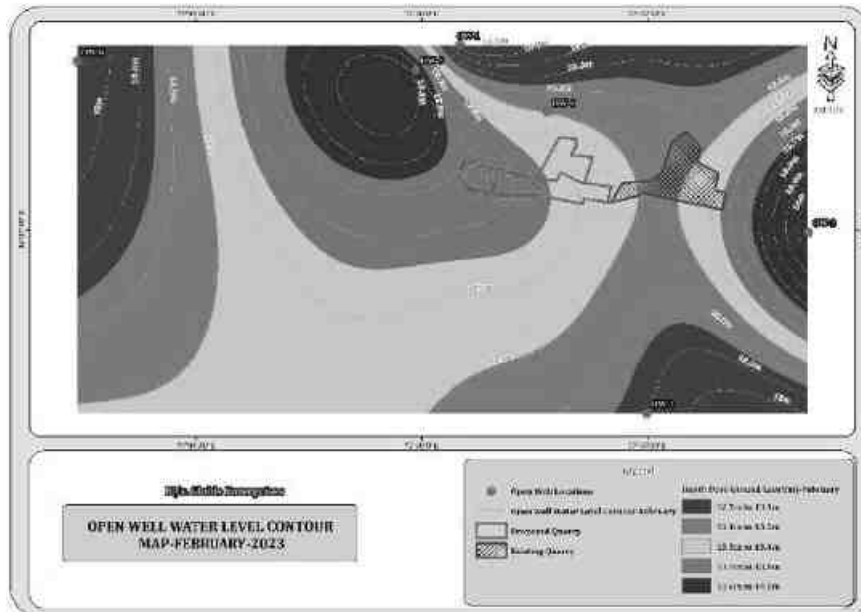
FEBRUARY - 2023

Figure 3.10: Post Monsoon Water Level of Bore Well 1 Km Radius

DECEMBER– 2022   **JANUARY - 2023**
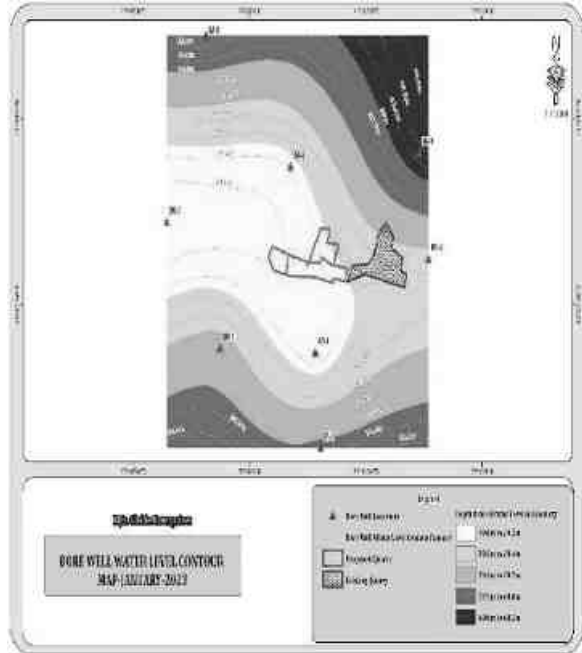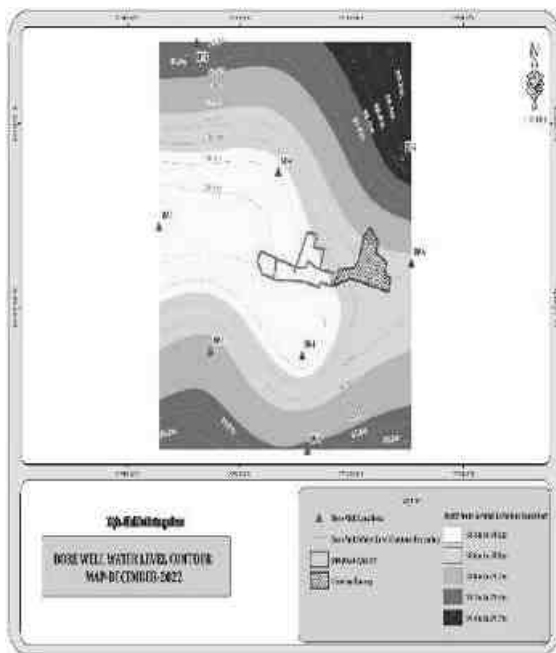
FEBRUARY– 2023
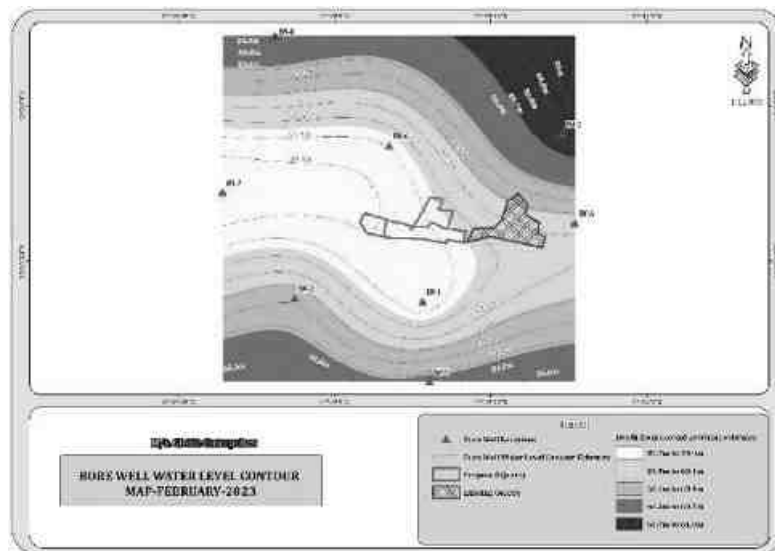
Figure 3.11: Drainage Map Around 10 Km Radius from Project Site
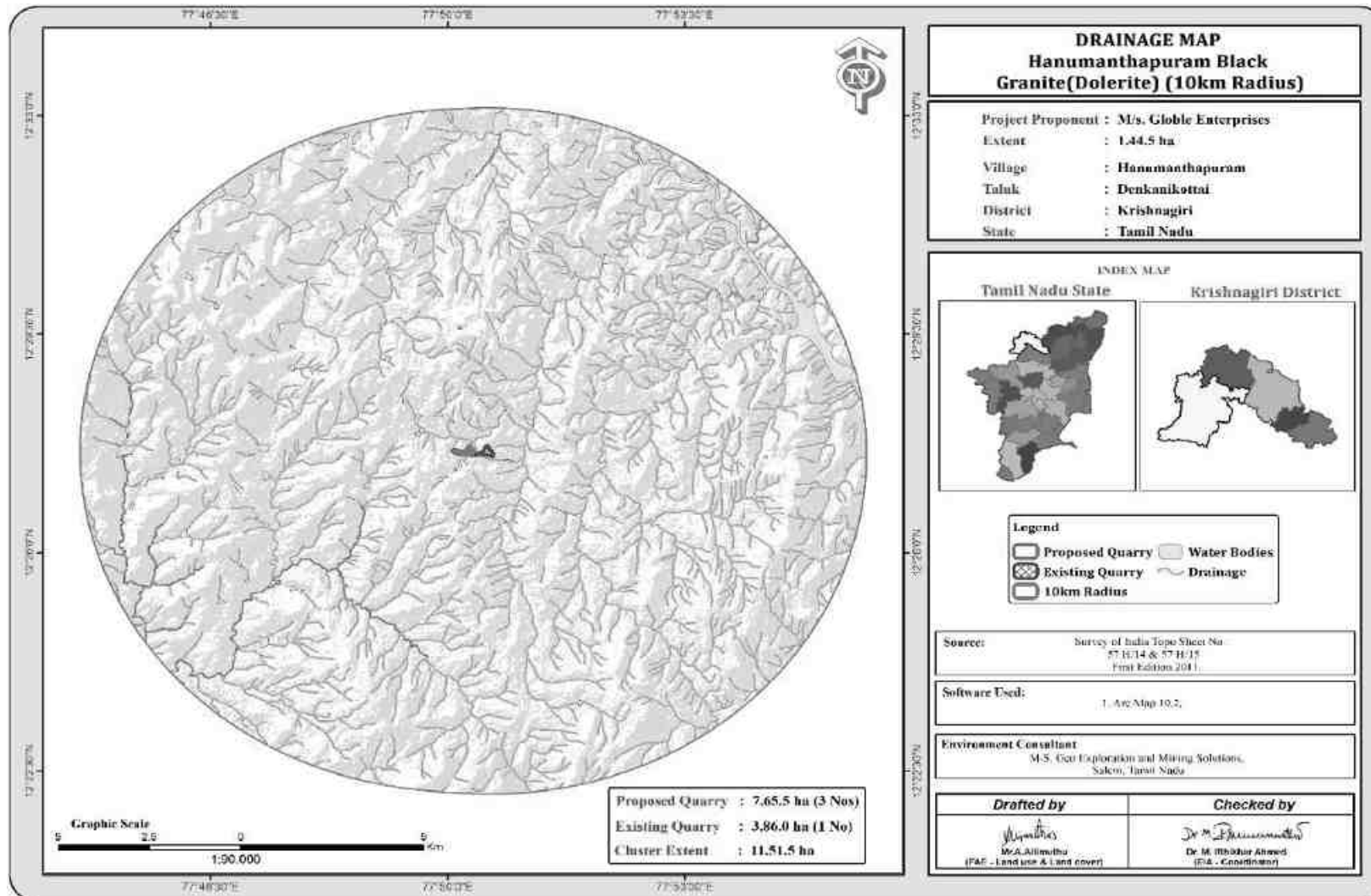
Figure 3.12: Ground Water Prospect Map
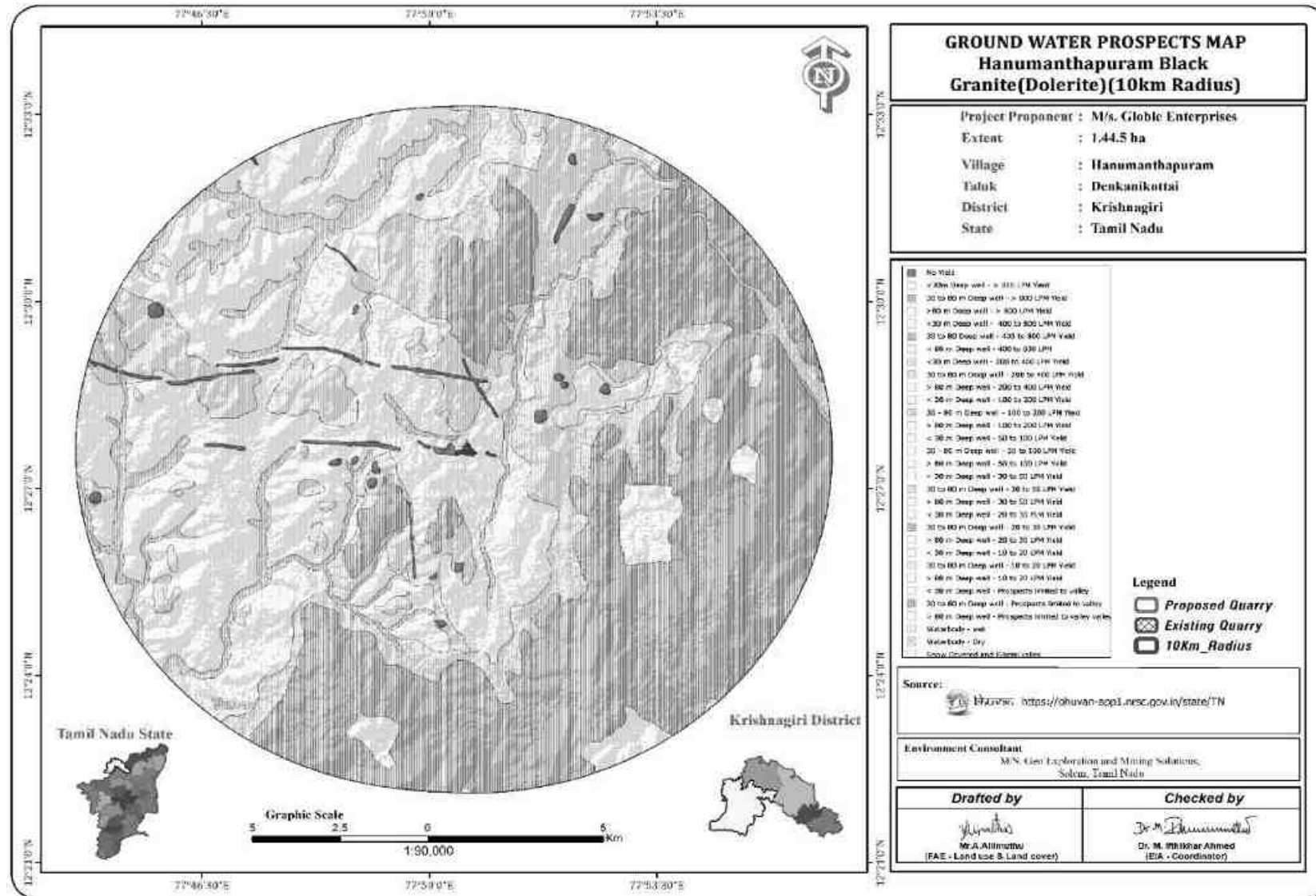
3.3   Air Environment

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

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

3.3.1 Meteorology & Climate

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

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

Climate –

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

➢ The average annual temperature is 26.5 °C | 79.7 °F.

➢ The Precipitation here is around 789 mm |31.1 inch per year.

➢ The driest month is February, with 4 mm |0.2 Precipitation in February. The greatest amount of precipitation occurs in October, with an average of 189 mm | 7.4 inch.

➢ The warmest month of the year is May, with an average temperature of 30.5°C | 86.2 °F.
The lowest average temperatures in the year occur in December, when it is around 22.8°C | 73.0°F.

➢ The difference in precipitation between the driest month and the wettest month is 185 mm | 7inch. The variation in temperatures throughout the year is 7.3°C | 45.1 °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
2017	2018	2019	2020	2021	
1145.6	510.4	730.0	798.6	985.4	985

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

Table 3.14: Meteorological Data Recorded at Site

S.No	Parameters		Dec– 2022	Jan – 2023	Feb - 2023
1	Temperature (^{0}C)	Max	31.4	30.0	29.5

		Min	27.0	24.8	25.8
		Avg	29.2	27.4	27.65
2	Relative Humidity (%)	Avg	89.6	89.4	67.1
3	Wind Speed (m/s)	Max	6.542	4.000	4.700
		Min	0.500	0.875	0.811
		Avg	3.521	2.437	2.755
4	Cloud Cover (OKTAS)		0-8	0-8	0-8
5	Wind Direction		NW,WNW	E,ESE	ENE,E

Correlation between Secondary and Primary Data

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

Wind rose diagram of the study site is depicted in Figure. 3.8. Predominant downwind direction of the area during study season is North - East to South West.

Figure 3.13: Windrose Diagram
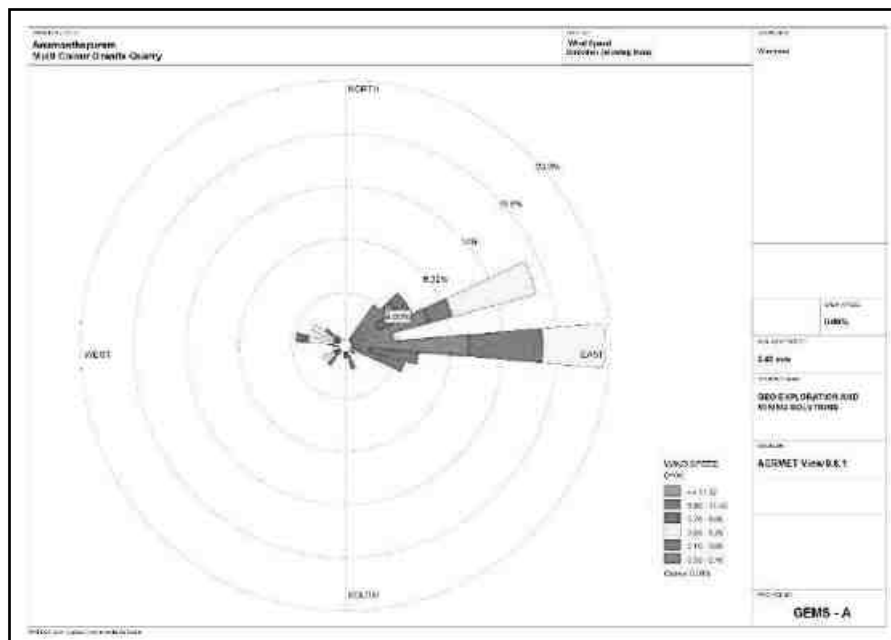
Source: Wind Rose plot view, Lake Environmental Software

In the abstract of collected data wind rose were drawn on presented in figure No.3.8 during the monitoring period in the study area

- Predominant winds were from NE- SW
- Wind velocity readings were recorded between 0.50 to 11.10 m/s
- Temperature readings ranging from 24.8 to 31.4 °C

- Relative humidity ranging from 67.1 to 89.6 %

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

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

Source: Sampling Methodology followed by EHS labs Pvt Ltd Laboratories & CPCB Notification

Table 3.15: National Ambient Air Quality Standards

Sl. No.	Pollutant	Time Weighted Average	Concentration in ambient air	
			Industrial, Residential, Rural & other areas	Ecologically Sensitive area (Notified by Central Govt.)
1	Sulphur Dioxide ($\mu g/m^3$)	Annual Avg.* 24 hours**	50.0 80.0	20.0 80.0
2	Nitrogen Dioxide ($\mu g/m^3$)	Annual Avg. 24 hours	40.0 80.0	30.0 80.0
3	Particulate matter (size less than 10μm) PM_{10} ($\mu g/m^3$)	Annual Avg. 24 hours	60.0 100.0	60.0 100.0
4	Particulate matter (size less than 2.5 μm $PM_{2.5}$ ($\mu g/m^3$)	Annual Avg. 24 hours	40.0 60.0	40.0 60.0

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

*Annual Arithmetic mean of minimum 104 measurements in a year taken twice a Week 24 hourly at uniform interval
** 24 hourly / 8 hourly or 1 hourly monitored value as applicable shall be complied with 98 % of the time in a year. However, 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

3.3.4   Frequency & Parameters for Sampling

Ambient air quality monitoring has been carried out with a frequency of two samples per week at seven (7) locations, adopting a continuous 24 hourly (3 shift of 8-hour) schedule for the period October to December, 2020. The baseline data of ambient air has been generated for PM_{10}, $PM_{2.5}$, Sulphur Dioxide (SO_2) & Nitrogen Dioxide (NO_2) Monitoring has been carried out as per the CPCB, MoEF guidelines and notifications.

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

3.3.5   Ambient Air Quality Monitoring Stations

Seven (7) monitoring stations were set up in the study area as depicted in Figure 3.6.1 for assessment of the existing ambient air quality. Details of the sampling locations are as per given below.

Table 3.16: Ambient Air Quality (AAQ) Monitoring Locations

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	AAQ-1	Project Area	North East Corner	12°27'37.54"N 77°50'8.57"E
2	AAQ-2	Irudhukottai	630m South West	12°27'26.23"N 77°49'46.92"E
3	AAQ-3	Kuppasandram	2.0Km North East	12°28'23.36"N 77°51'04.61"E
4	AAQ-4	Jarakalatti	3.7Km North West	12°29'36.30"N 77°49'37.30"E
5	AAQ-5	Nemileri	2.5Km South East	12°26'25.58"N 77°50'53.25"E
6	AAQ-6	Bikkanapally	4.8Km South West	12°26'19.09"N 77°47'44.48"E
7	AAQ-7	Giriyanahalli	4.2Km West	12°27'55.15"N 77°47'46.62"E

Source: On-site monitoring/sampling by EHS labs Pvt Ltd Laboratories in association with GEMS

Figure 3.14: Site Photographs of Ambient Air Quality MonitoringF

Source: Field Photos

Figure 3.15: Ambient Air Quality Locations Around 10 Km Radius
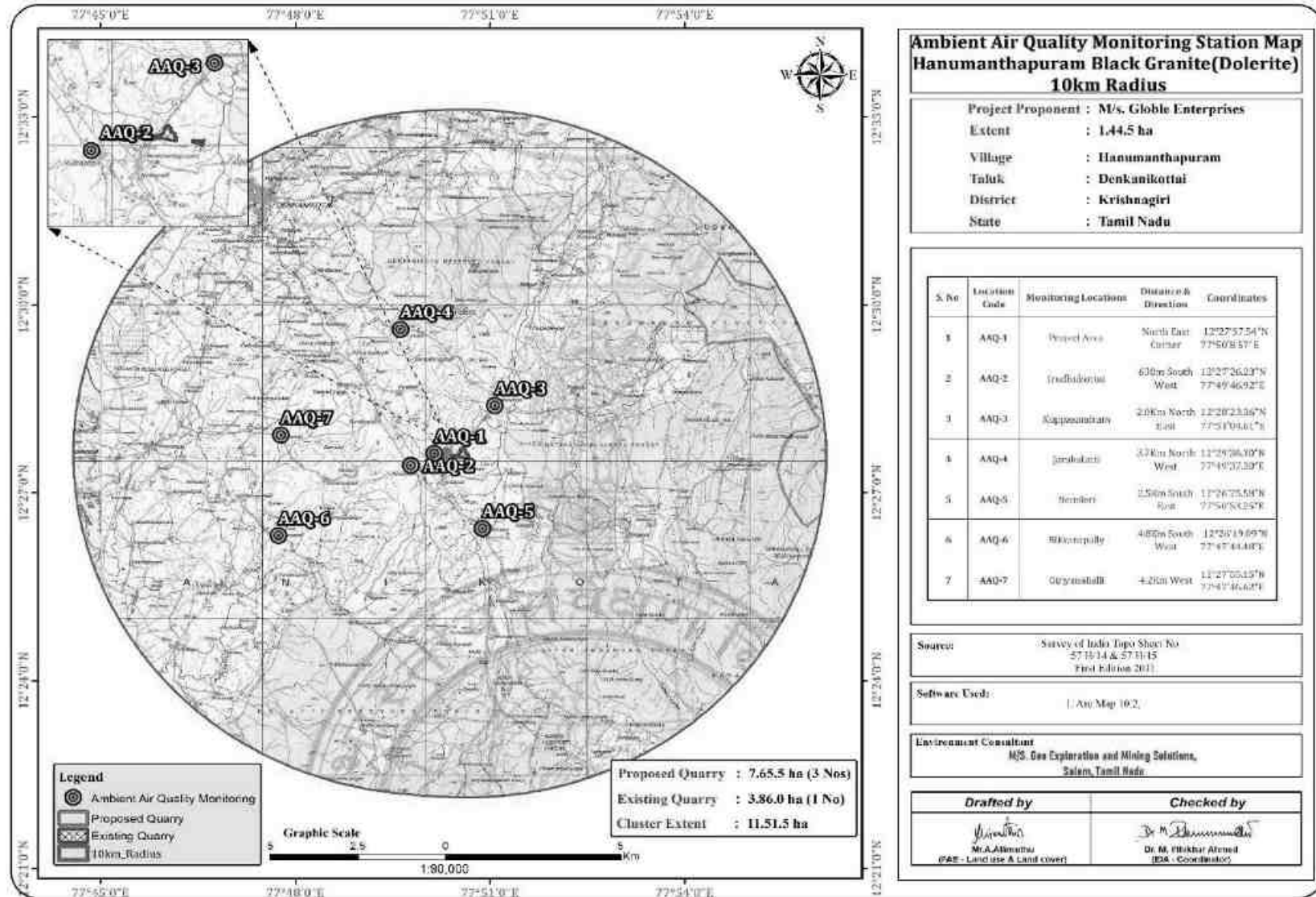
Table 3.17: AAQ1 – Project Area

Monitoring			Particulates, µg/m³			Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM$_{2.5}$	PM$_{10}$	SO$_2$	NO$_2$	NH$_3$	O$_3$ (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C$_6$H$_6$, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
01.12.2022	7:00-7:00	65.2	22.5	43.5	6.2	27.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
02.12.2022	7:15-7:15	68.3	21.5	44.5	7.2	24.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
08.12.2022	7:00-7:00	60.2	23.4	45.3	6.5	27.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
09.12.2022	7:15-7:15	66.3	23.5	46.1	7.0	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
15.12.2022	7:00-7:00	65.1	21.4	47.2	6.8	24.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
16.12.2022	7:15-7:15	64.2	23.5	46.3	7.1	25.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
22.12.2022	7:00-7:00	65.1	22.1	44.2	6.3	24.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
23.12.2022	7:15-7:15	66.3	23.0	43.1	7.3	25.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
29.12.2022	7:00-7:00	67.2	21.2	42.0	6.0	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
30.12.2022	7:15-7:15	68.1	25.2	43.5	7.2	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
05.01.2023	7:00-7:00	60.2	22.6	44.6	6.2	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
06.01.2023	7:15-7:15	66.2	22.1	45.1	6.8	24.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
12.01.2023	7:00-7:00	67.2	24.3	46.8	7.3	24.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
13.01.2023	7:15-7:15	69.3	25.1	47.1	7.0	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
19.01.2023	7:00-7:00	60.3	23.6	45.0	6.8	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
20.01.2023	7:15-7:15	68.2	22.1	46.3	7.3	23.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
26.01.2023	7:00-7:00	69.3	23.0	44.1	6.3	23.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
27.01.2023	7:15-7:15	67.1	25.1	46.0	7.4	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
02.02.2023	7:00-7:00	68.3	23.1	47.2	6.4	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
03.02.2023	7:15-7:15	65.6	22.1	45.2	7.8	24.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
09.02.2023	7:00-7:00	68.0	25.1	43.1	6.3	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
10.02.2023	7:15-7:15	66.3	24.3	42.3	5.2	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
16.02.2023	7:00-7:00	65.0	22.6	45.1	5.1	25.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
17.02.2023	7:15-7:15	66.0	23.6	46.1	5.4	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
23.02.2023	7:00-7:00	65.8	24.3	43.2	5.8	25.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
24.02.2023	7:15-7:15	67.6	22.0	47.2	5.6	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5

Table 3.18: AAQ2 – Irudhukottai

Monitoring			Particulates, µg/m³		Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM₂.₅	PM₁₀	SO₂	NO₂	NH₃	O₃ (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C₆H₆, ng/m³	BaP, ng/m³
NAAQ Norms*		60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
01.12.2022	7:00-7:00	62.5	26.3	46.3	5.9	24.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
02.12.2022	7:15-7:15	61.3	24.1	45.2	6.2	25.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
08.12.2022	7:00-7:00	60.3	25.1	46.1	8.2	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
09.12.2022	7:15-7:15	63.4	27.3	47.3	6.0	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
15.12.2022	7:00-7:00	64.5	26.1	46.2	7.3	22.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
16.12.2022	7:15-7:15	65.2	24.3	48.3	6.5	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
22.12.2022	7:00-7:00	64.3	26.6	47.3	6.4	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
23.12.2022	7:15-7:15	63.2	26.0	49.2	6.3	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
29.12.2022	7:00-7:00	62.0	27.1	45.0	8.6	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
30.12.2022	7:15-7:15	61.2	25.3	46.3	6.0	25.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
05.01.2023	7:00-7:00	63.2	25.0	46.0	7.4	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
06.01.2023	7:15-7:15	64.1	24.3	45.2	6.5	21.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
12.01.2023	7:00-7:00	65.0	26.3	47.2	5.3	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
13.01.2023	7:15-7:15	63.5	27.2	47.0	5.0	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
19.01.2023	7:00-7:00	62.5	26.0	48.3	6.2	24.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
20.01.2023	7:15-7:15	61.0	27.1	48.6	8.3	25.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
26.01.2023	7:00-7:00	62.0	26.3	45.2	5.4	25.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
27.01.2023	7:15-7:15	65.3	27.3	48.0	5.4	22.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
02.02.2023	7:00-7:00	64.2	28.1	46.3	7.2	22.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
03.02.2023	7:15-7:15	63.1	26.1	45.2	6.8	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
09.02.2023	7:00-7:00	62.1	22.4	44.3	8.0	25.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
10.02.2023	7:15-7:15	63.3	26.2	46.1	8.2	25.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
16.02.2023	7:00-7:00	62.1	25.3	48.9	7.5	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
17.02.2023	7:15-7:15	62.0	26.4	49.2	7.4	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
23.02.2023	7:00-7:00	63.4	24.3	49.3	6.8	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
24.02.2023	7:15-7:15	64.5	28.3	46.0	6.9	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5

Table 3.19: AAQ3 – Kuppasandram

Monitoring			Particulates, µg/m³		Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM$_{2.5}$	PM$_{10}$	SO$_2$	NO$_2$	NH$_3$	O$_3$ (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C$_6$H$_6$, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
05.12.2022	7:00-7:00	62.5	23.1	44.5	6.2	25.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
06.12.2022	7:15-7:15	63.2	24.3	45.2	7.0	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
12.12.2022	7:00-7:00	64.2	25.3	43.1	5.8	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
13.12.2022	7:15-7:15	61.0	24.0	46.3	6.3	25.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
19.12.2022	7:00-7:00	62.3	23.6	47.2	6.4	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
20.12.2022	7:15-7:15	64.5	24.1	48.0	5.2	29.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
26.12.2022	7:00-7:00	63.2	25.6	46.3	7.1	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
27.12.2022	7:15-7:15	61.2	24.0	45.2	6.1	25.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
02.01.2023	7:00-7:00	62.5	23.6	46.1	5.8	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
03.01.2023	7:15-7:15	63.1	22.5	47.1	6.0	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
09.01.2023	7:00-7:00	64.0	22.0	47.5	5.2	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
10.01.2023	7:15-7:15	62.3	23.1	48.3	7.2	25.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
16.01.2023	7:00-7:00	63.4	24.5	43.2	6.4	24.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
17.01.2023	7:15-7:15	64.1	25.6	44.5	5.3	23.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
23.01.2023	7:00-7:00	63.0	24.3	46.1	6.2	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
24.01.2023	7:15-7:15	64.5	25.6	47.2	5.1	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
30.01.2023	7:00-7:00	62.0	24.1	48.2	6.4	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
31.01.2023	7:15-7:15	61.4	25.3	46.3	7.2	24.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
06.02.2023	7:00-7:00	62.3	24.8	47.1	6.5	26.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
07.02.2023	7:15-7:15	63.5	23.5	44.2	7.8	25.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
13.02.2023	7:00-7:00	64.8	24.1	46.3	6.3	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
14.02.2023	7:15-7:15	63.5	25.3	45.2	6.4	24.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
20.02.2023	7:00-7:00	64.2	24.5	46.1	7.5	26.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
21.02.2023	7:15-7:15	64.0	22.3	47.0	7.3	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
27.02.2023	7:00-7:00	63.1	23.4	48.3	6.0	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
28.02.2023	7:15-7:15	63.5	22.0	48.5	7.8	26.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5

Table 3.20: AAQ4 –Jarakalatti

Monitoring		Particulates, µg/m³			Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM2.5	PM10	SO2	NO2	NH3	O3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C6H6, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
05.12.2022	7:00-7:00	64.2	23.5	43.5	6.5	20.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
06.12.2022	7:15-7:15	65.2	22.1	42.0	6.3	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
12.12.2022	7:00-7:00	66.3	24.3	44.3	5.1	21.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
13.12.2022	7:15-7:15	67.2	25.1	45.2	7.2	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
19.12.2022	7:00-7:00	65.3	23.0	46.1	6.8	20.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
20.12.2022	7:15-7:15	64.0	24.1	43.0	7.0	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
26.12.2022	7:00-7:00	66.3	25.6	44.2	5.2	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
27.12.2022	7:15-7:15	65.1	26.1	45.1	6.8	21.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
02.01.2023	7:00-7:00	66.0	27.2	46.2	7.1	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
03.01.2023	7:15-7:15	66.2	23.5	45.2	6.3	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
09.01.2023	7:00-7:00	65.4	24.3	44.1	7.4	21.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
10.01.2023	7:15-7:15	64.0	25.6	42.3	6.2	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
16.01.2023	7:00-7:00	65.2	26.1	41.6	7.0	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
17.01.2023	7:15-7:15	65.8	27.3	42.3	6.8	23.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
23.01.2023	7:00-7:00	66.0	24.3	42.0	6.4	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
24.01.2023	7:15-7:15	65.8	25.1	43.6	7.5	21.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
30.01.2023	7:00-7:00	64.3	26.5	44.5	7.3	20.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
31.01.2023	7:15-7:15	65.7	25.0	45.2	6.5	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
06.02.2023	7:00-7:00	66.5	25.3	46.2	7.8	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
07.02.2023	7:15-7:15	67.0	24.1	44.1	6.3	23.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
13.02.2023	7:00-7:00	66.4	26.3	43.2	7.2	23.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
14.02.2023	7:15-7:15	66.8	24.2	45.3	6.4	22.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
20.02.2023	7:00-7:00	64.2	25.3	46.1	7.3	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
21.02.2023	7:15-7:15	65.3	21.2	43.0	6.9	21.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
27.02.2023	7:00-7:00	67.2	22.3	43.6	7.2	22.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
28.02.2023	7:15-7:15	66.4	25.6	42.3	7.1	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5

Table 3.21: AAQ5 – Nemileri

Monitoring			Particulates, µg/m³		Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM$_{2.5}$	PM$_{10}$	SO$_2$	NO$_2$	NH$_3$	O$_3$ (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C$_6$H$_6$, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
05.12.2022	7:00-7:00	62.3	21.5	44.5	6.2	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
06.12.2022	7:15-7:15	63.4	22.3	46.2	7.2	25.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
12.12.2022	7:00-7:00	64.2	23.5	47.1	8.2	23.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
13.12.2022	7:15-7:15	66.2	24.5	46.2	6.0	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
19.12.2022	7:00-7:00	62.1	25.3	43.1	6.2	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
20.12.2022	7:15-7:15	63.0	22.3	43.0	7.2	21.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
26.12.2022	7:00-7:00	64.1	24.5	44.6	8.3	22.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
27.12.2022	7:15-7:15	66.2	20.0	45.1	7.8	21.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
02.01.2023	7:00-7:00	64.2	22.3	44.0	6.0	21.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
03.01.2023	7:15-7:15	66.3	23.4	46.3	7.2	19.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
09.01.2023	7:00-7:00	64.0	25.6	47.1	8.3	22.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
10.01.2023	7:15-7:15	63.2	22.4	44.2	7.0	23.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
16.01.2023	7:00-7:00	62.1	23.5	45.3	8.6	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
17.01.2023	7:15-7:15	65.3	24.1	44.1	8.1	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
23.01.2023	7:00-7:00	64.2	26.5	42.3	7.2	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
24.01.2023	7:15-7:15	66.1	25.0	45.1	7.3	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
30.01.2023	7:00-7:00	64.3	24.0	46.7	6.5	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
31.01.2023	7:15-7:15	63.2	23.5	44.1	7.8	22.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
06.02.2023	7:00-7:00	64.1	25.1	46.0	7.2	20.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
07.02.2023	7:15-7:15	65.2	24.0	45.3	6.3	21.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
13.02.2023	7:00-7:00	66.5	23.5	47.0	7.4	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
14.02.2023	7:15-7:15	63.1	22.1	46.0	6.8	21.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
20.02.2023	7:00-7:00	64.2	23.4	44.2	7.2	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
21.02.2023	7:15-7:15	62.3	24.1	46.3	6.5	20.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
27.02.2023	7:00-7:00	65.0	25.3	47.2	7.3	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
28.02.2023	7:15-7:15	64.3	22.1	45.3	6.1	21.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5

Table 3.22: AAQ6 – Near Bogasandiram

Monitoring			Particulates, µg/m³		Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM₂.₅	PM₁₀	SO₂	NO₂	NH₃	O₃ (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C₆H₆, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
05.12.2022	7:00-7:00	62.5	22.5	44.5	5.2	27.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
06.12.2022	7:15-7:15	64.3	23.5	45.3	6.3	27.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
12.12.2022	7:00-7:00	65.2	24.3	46.1	7.2	25.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
13.12.2022	7:15-7:15	62.0	25.6	45.0	5.6	24.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
19.12.2022	7:00-7:00	64.1	26.0	46.2	6.4	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
20.12.2022	7:15-7:15	62.3	24.2	45.3	5.3	24.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
26.12.2022	7:00-7:00	64.5	25.3	46.1	6.2	25.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
27.12.2022	7:15-7:15	61.2	26.1	45.0	5.8	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
02.01.2023	7:00-7:00	63.2	24.3	46.3	6.3	23.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
03.01.2023	7:15-7:15	65.5	22.0	45.1	5.0	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
09.01.2023	7:00-7:00	62.1	25.3	46.2	5.3	23.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
10.01.2023	7:15-7:15	63.5	24.1	44.0	6.8	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
16.01.2023	7:00-7:00	62.1	26.0	45.2	6.4	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
17.01.2023	7:15-7:15	60.2	23.1	46.3	6.2	24.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
23.01.2023	7:00-7:00	62.5	25.3	45.2	7.2	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
24.01.2023	7:15-7:15	63.5	22.6	46.1	5.6	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
30.01.2023	7:00-7:00	64.2	22.0	44.0	6.8	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
31.01.2023	7:15-7:15	65.5	22.1	44.2	5.4	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
06.02.2023	7:00-7:00	61.3	23.0	45.3	6.3	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
07.02.2023	7:15-7:15	62.3	24.3	46.1	5.0	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
13.02.2023	7:00-7:00	64.0	25.3	45.0	6.2	23.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
14.02.2023	7:15-7:15	63.2	26.1	44.6	5.7	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
20.02.2023	7:00-7:00	64.5	24.3	45.8	6.1	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
21.02.2023	7:15-7:15	65.5	25.2	46.2	5.8	22.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
27.02.2023	7:00-7:00	62.1	24.3	44.1	6.2	21.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
28.02.2023	7:15-7:15	62.3	22.3	45.3	5.5	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5

Table 3.23: AAQ7 – Giriyanahalli

Monitoring			Particulates, µg/m³		Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM$_{2.5}$	PM$_{10}$	SO$_2$	NO$_2$	NH$_3$	O$_3$ (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C$_6$H$_6$, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
05.12.2022	7:00-7:00	63.5	23.3	44.5	6.2	26.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
06.12.2022	7:15-7:15	62.1	26.1	43.2	7.3	27.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
12.12.2022	7:00-7:00	64.3	27.2	46.2	8.8	28.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
13.12.2022	7:15-7:15	65.2	28.1	47.1	6.3	29.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
19.12.2022	7:00-7:00	66.3	24.3	43.1	7.5	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
20.12.2022	7:15-7:15	67.3	25.1	44.2	6.4	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
26.12.2022	7:00-7:00	66.5	27.1	45.6	7.3	22.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
27.12.2022	7:15-7:15	63.0	28.6	47.1	7.2	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
02.01.2023	7:00-7:00	64.3	29.1	44.0	6.0	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
03.01.2023	7:15-7:15	65.1	24.2	45.3	7.4	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
09.01.2023	7:00-7:00	64.0	25.1	46.1	7.2	28.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
10.01.2023	7:15-7:15	63.2	26.3	47.1	6.0	26.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
16.01.2023	7:00-7:00	66.5	27.1	46.0	7.5	27.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
17.01.2023	7:15-7:15	67.3	28.5	47.2	6.3	25.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
23.01.2023	7:00-7:00	62.4	26.3	45.2	7.2	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
24.01.2023	7:15-7:15	65.3	25.0	46.3	6.4	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
30.01.2023	7:00-7:00	64.1	24.0	47.2	7.3	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
31.01.2023	7:15-7:15	63.5	23.1	43.2	6.8	26.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
06.02.2023	7:00-7:00	62.1	27.6	44.2	7.4	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
07.02.2023	7:15-7:15	65.0	28.1	43.0	6.3	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
13.02.2023	7:00-7:00	66.3	29.4	46.0	7.2	26.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
14.02.2023	7:15-7:15	67.1	26.1	45.1	7.3	27.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
20.02.2023	7:00-7:00	64.3	27.3	47.3	6.0	28.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
21.02.2023	7:15-7:15	65.3	28.1	46.1	7.2	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
27.02.2023	7:00-7:00	66.1	29.4	45.2	6.3	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5
28.02.2023	7:15-7:15	67.3	26.3	43.6	7.1	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<0.5

Table 3.24: Abstract of Ambient Air Quality Data

1	Parameter	PM2.5	PM10	SO₂	NO₂
2	No. of Observations	260	260	260	260
3	10th Percentile Value	22.1	43.1	5.4	21.6
4	20th Percentile Value	23.0	44.1	6.0	22.4
5	30th Percentile Value	23.5	44.5	6.2	22.6
6	40th Percentile Value	24.1	45.2	6.3	23.5
7	50th Percentile Value	24.3	45.3	6.5	24.0
8	60th Percentile Value	25.1	46.1	7.0	24.3
9	70th Percentile Value	25.6	46.2	7.2	24.5
10	80th Percentile Value	26.1	47.0	7.3	25.4
11	90th Percentile Value	27.2	47.3	7.8	26.0
12	95th Percentile Value	28.1	48.3	8.2	27.2
13	98th Percentile Value	29.2	49.2	8.6	28.8
14	Arithmetic Mean	25.3	46.0	7.0	24.6
15	Geometric Mean	25.2	46.0	6.9	24.5
16	Standard Deviation	2.2	1.8	1.0	2.2
17	Minimum	22.1	43.1	5.4	21.6
18	Maximum	29.2	49.2	8.6	28.8
19	**NAAQ Norms***	**100.0**	**60.0**	**80.0**	**80.0**
	% Values exceeding Norms*	0.0	0.0	0.0	0.0

Legend: $PM_{2.5}$-Particulate Matter size less than 2.5 μm; PM_{10}-Respirable Particulate Matter size less than 10 μm; SO_2-Sulphur dioxide; NO_2-Nitrogen Dioxide; CO-Carbon monoxide; O_3-Ozone; NH_3-Ammonia; Pb-Particulate Lead; As-Particulate Arsenic; Ni-Particulate Nickel; C_6H_6-Benzene & BaP- Benzo (a) pyrene in particulate phase levels were monitored below their respective detectable limits.

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

Table 3.25: Summary of Ambient Air Quality Data (AAQ1-AAQ7)

PM2.5	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	23.2	26.0	24.0	24.7	23.6	24.2	26.6
Minimum	21.2	22.4	22.0	21.2	20.0	22.0	23.1
Maximum	25.2	28.3	25.6	27.3	26.5	26.1	29.4
NAAQ Norms	60.0	60.0	60.0	60.0	60.0	60.0	60.0

PM10	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	45.0	46.8	46.3	44.0	45.2	45.3	45.4
Minimum	42.0	44.3	43.1	41.6	42.3	44.0	43.0
Maximum	47.2	49.3	48.5	46.2	47.2	46.3	47.3
NAAQ Norms	100.0	100.0	100.0	100.0	100.0	100.0	100.0

SO₂	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	6.6	6.8	6.4	6.8	7.2	6.0	6.9
Minimum	5.1	5.0	5.1	5.1	6.0	5.0	6.0
Maximum	27.3	8.6	7.8	7.8	8.6	7.2	8.8

NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0

NO₂	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	24.5	23.9	25.2	22.3	22.4	24.0	25.2
Minimum	22.5	21.6	23.3	20.3	19.5	21.2	22.1
Maximum	27.3	25.8	29.5	23.6	25.3	27.5	29.4
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0

FIGURE 3.16: BAR DIAGRAM OF SUMMARY OF AIR QUALITY MODEL(AAQ1-AAQ8)

Summary of Ambient Air Quality Data (AAQ 1 - AAQ8)

	PM10	PM2.5	SO2	NO2
98th Percentile Value	29.2	49.2	8.6	28.8
Arithmetic Mean	25.3	46.0	7.0	24.6
Minimum	22.1	43.1	5.4	21.6
Maximum	29.2	49.2	8.6	28.8
NAAQ Norms*	60.0	100.0	80.0	80.0
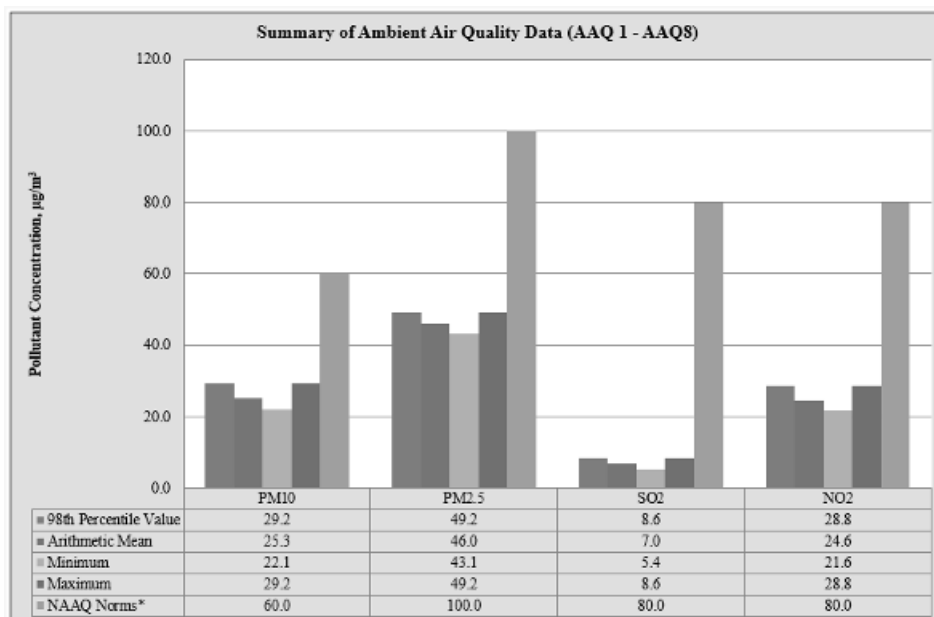
FIGURE 3.17-A : BAR DIAGRAM OF PARTICULATE MATTER (PM2.5)

Particulate Matter (PM₂.₅, µg/m³)

	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	23.2	26.0	24.0	24.7	23.6	24.2	26.6
Minimum	21.2	22.4	22.0	21.2	20.0	22.0	23.1
Maximum	25.2	28.3	25.6	27.3	26.5	26.1	29.4
NAAQ Norms	60.0	60.0	60.0	60.0	60.0	60.0	60.0
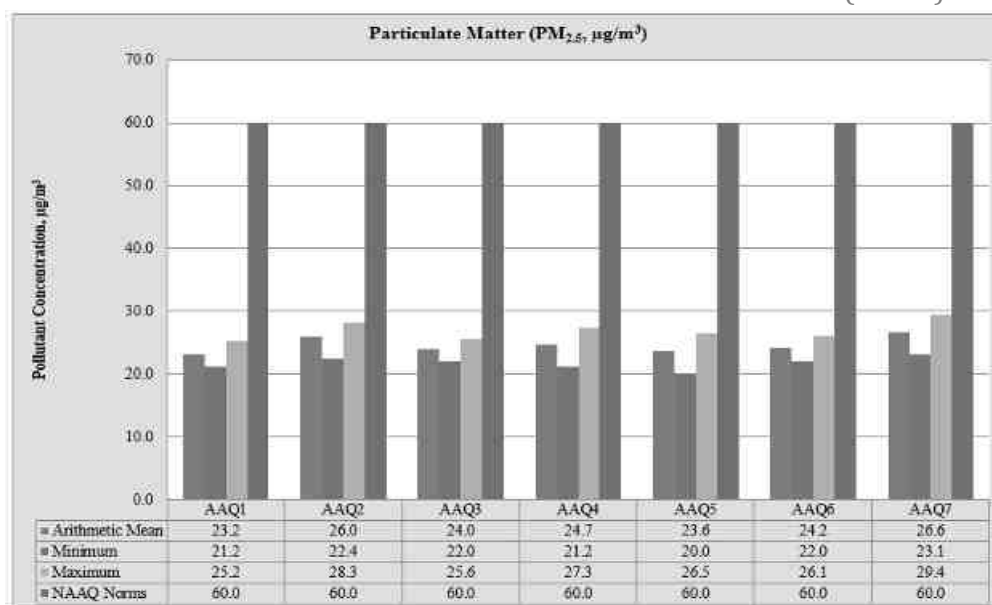
FIGURE 3.17-B: BAR DIAGRAM OF PARTICULATE MATTER (PM$_{10}$)

Particulate Matter (PM$_{10}$, µg/m³)

	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
▪ Arithmetic Mean	45.0	46.8	46.3	44.0	45.2	45.3	45.4
▪ Minimum	42.0	44.3	43.1	41.6	42.3	44.0	43.0
▪ Maximum	47.2	49.3	48.5	46.2	47.2	46.3	47.3
▪ NAAQ Norms	100.0	100.0	100.0	100.0	100.0	100.0	100.0
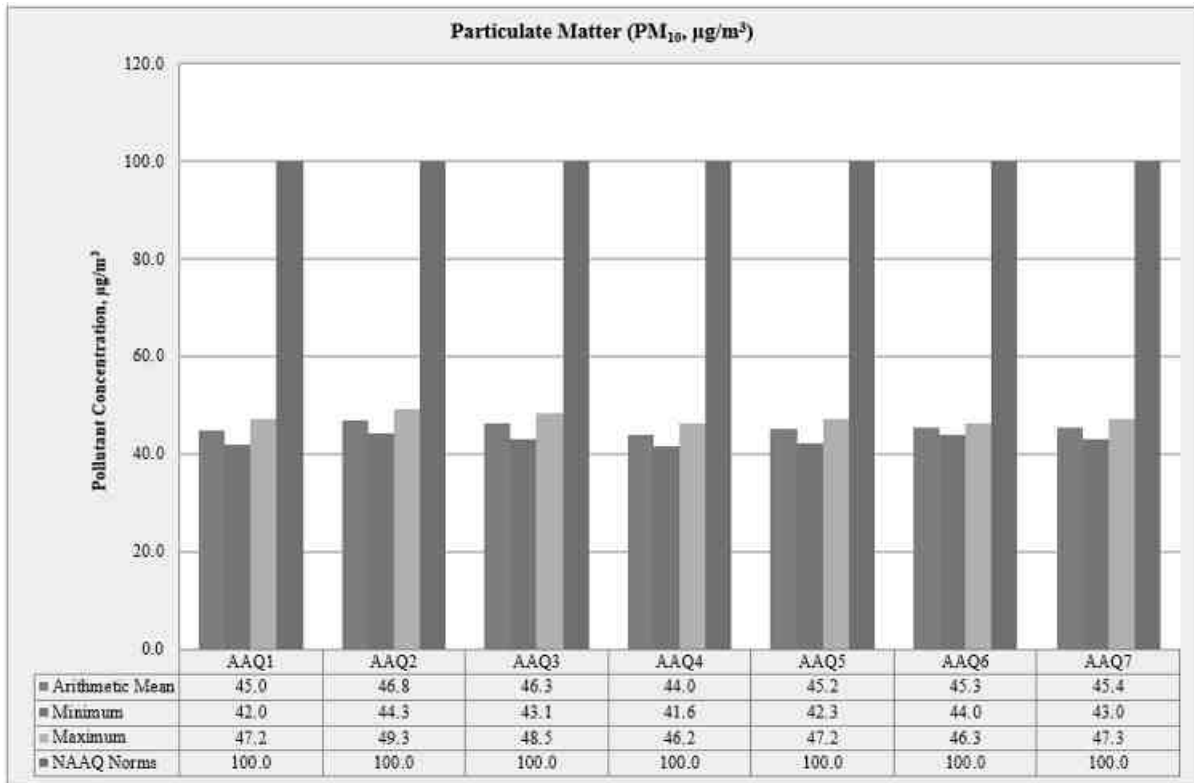
FIGURE 3.18-A: BAR DIAGRAM OF PARTICULATE MATTER (SO$_2$)

Gaseous Pollutant (SO$_2$, µg/m³)

	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
▪ Arithmetic Mean	6.6	6.8	6.4	6.8	7.2	6.0	6.9
▪ Minimum	5.1	5.0	5.1	5.1	6.0	5.0	6.0
▪ Maximum	27.3	8.6	7.8	7.8	8.6	7.2	8.8
▪ NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0
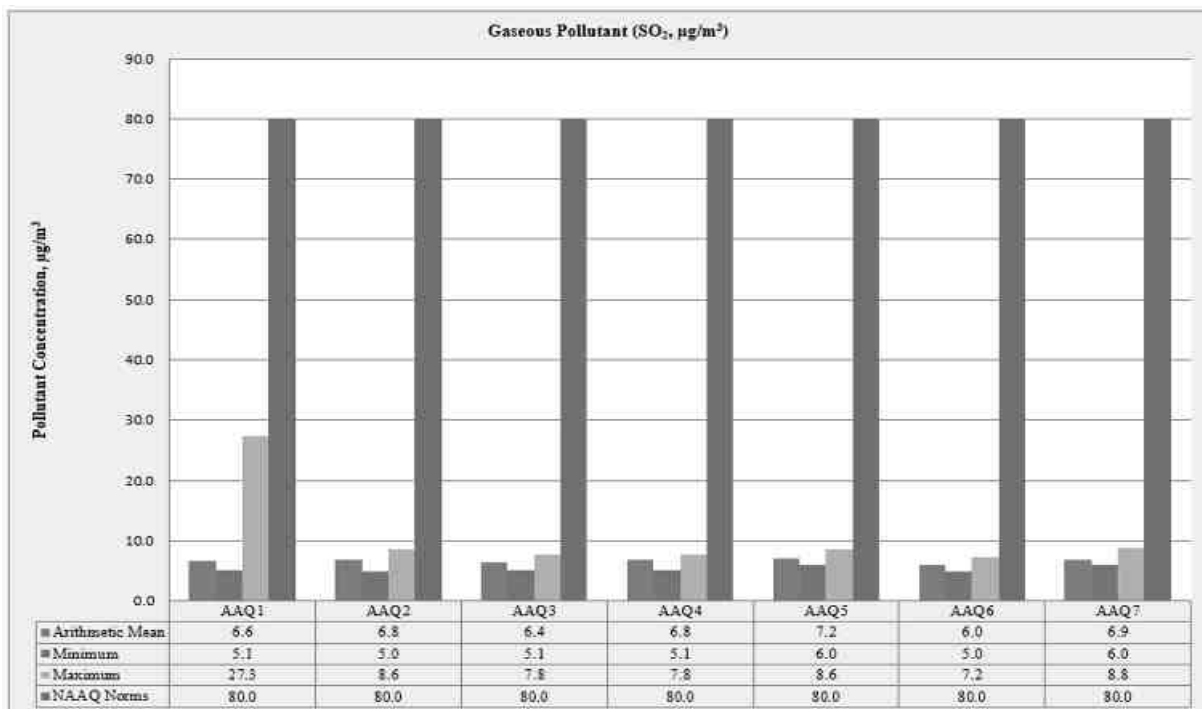
FIGURE 3.18-B: BAR DIAGRAM OF PARTICULATE MATTER (SO₂)

Gaseous Pollutant (NOx, µg/m³)

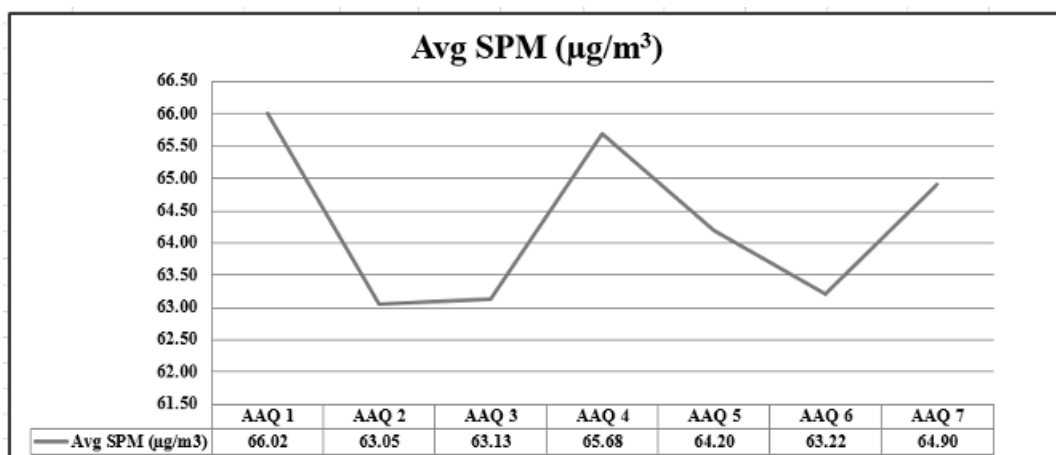|	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	24.5	23.9	25.2	22.3	22.4	24.0	25.2
Minimum	22.5	21.6	23.3	20.3	19.5	21.2	22.1
Maximum	27.3	25.8	29.5	23.6	25.3	27.5	29.4
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0
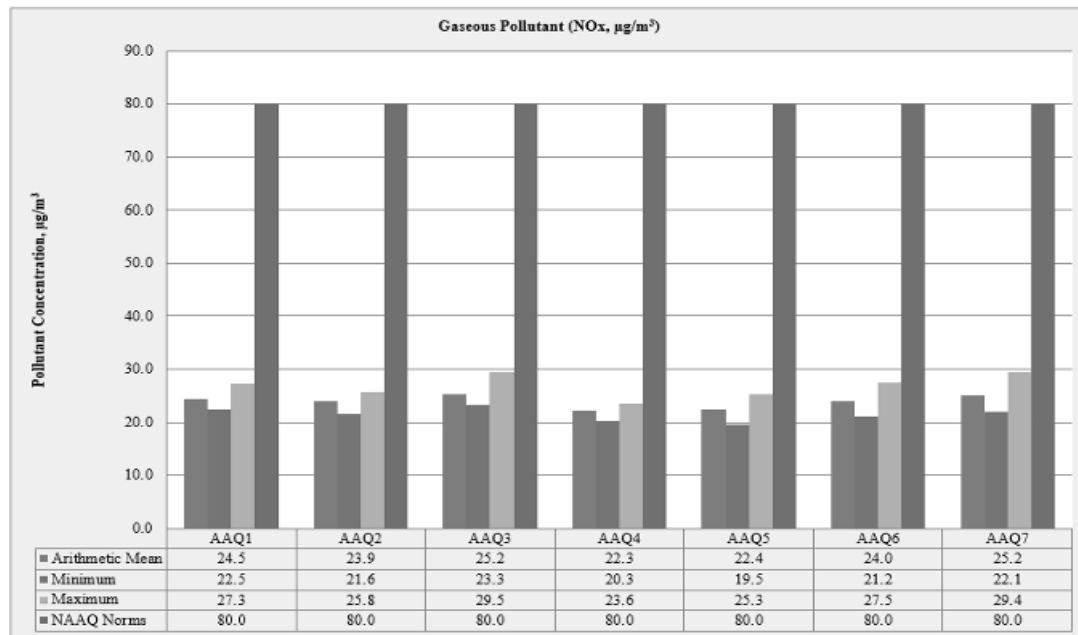
3.3.7   FUGITIVE DUST EMISSION –

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

Table 3.25: Average Fugitive Dust Sample Values In mg/m³

AAQ Locations	Avg SPM (µg/m³)
AAQ 1	66.02
AAQ 2	63.05
AAQ 3	63.13
AAQ 4	65.68
AAQ 5	64.20
AAQ 6	63.22
AAQ 7	64.90

Source: Onsite monitoring/ sampling by EHS360 Labs Private Limited

Avg SPM (µg/m³)

	AAQ 1	AAQ 2	AAQ 3	AAQ 4	AAQ 5	AAQ 6	AAQ 7
Avg SPM (µg/m3)	66.02	63.05	63.13	65.68	64.20	63.22	64.90

Source: Line Diagram of Table 3.25

Table 3.26 : Fugitive Dust sample values in µg/m³ –

SPM (µg/m3)	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Average	66.02	63.05	63.13	65.68	64.20	63.22	64.90
Min	60.2	60.3	61	64	62.1	60.2	62.1
Max	69.3	65.3	64.8	67.2	66.5	65.5	67.3

Source: Field Data's
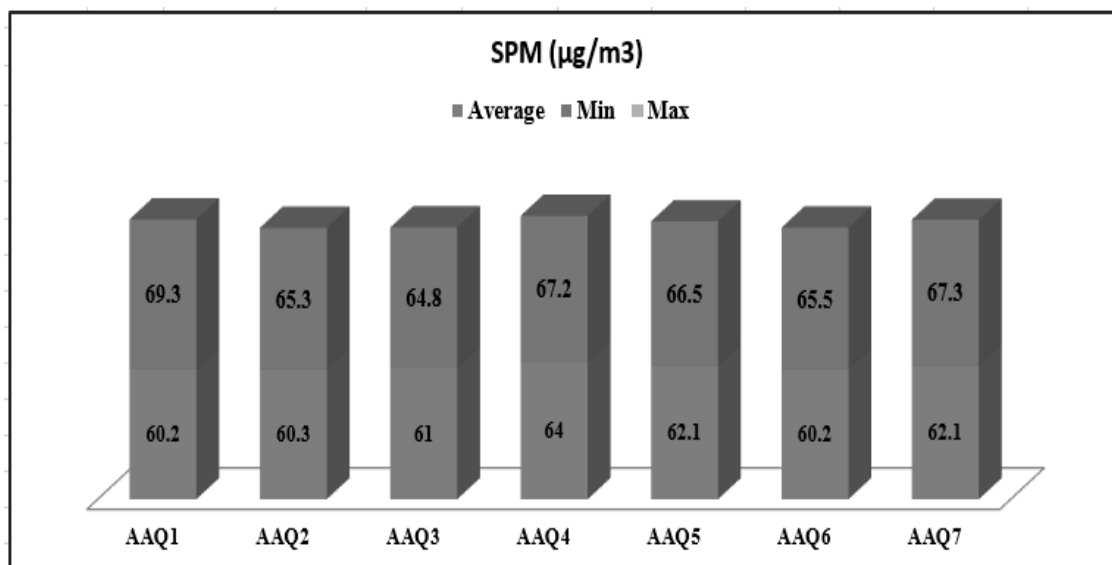
Source: Bar Diagram of table 3.26

3.3.6 Interpretations & Conclusion

From the above datas, the concentration of main criteria pollutants has been observed that maximum concentration of PM10 is 47.2 µg/m³ recorded at Project area and minimum is 41.6 µg/m³ recorded at Jarakalatti Village. The concentration of PM2.5 varies from 20.0 – 21.2µg/m³ Minimum concentration was recorded at Nemileri Village and Maximum concentration of $PM_{2.5}$ recorded at Project area. SO2 concentration level ranged from 5.0 – 6.0 µg/m³ and NO² concentration ranged from 19.5– 23.3 µg/m³ in the study area. The concentration levels of the above criteria pollutants were observed to be well within the limits of NAAQS prescribed by CPCB.

Toxic Metals (Lead, Nickel & Arsenic): Representative samples from all sampling stations were collected and analysed for Toxic Metals i.e. Lead, Arsenic & Nickel. The concentrations of Toxic Metals were below detectable limit at all sampling stations.

Overall Ambient Air Quality of proposed project area and its buffer zone is good during monitoring period and there are no any abnormal values recorded. The maximum concentration in the core zone is due to the quarrying activity of the cluster of quarries situated within 500m radius. The concentration levels of the above criteria pollutants were observed to be well within the limits of NAAQS prescribed by CPCB.

The ambient air quality of different locations has been compared with the respective NAAQS. The air quality has been categorized into four broad categories based on an Exceedance Factor (the ratio of average concentration of a pollutant with that of a respective standard).

The four air quality categories are:

i. Critical pollution (C): when EF is > 1.5

ii. High pollution (H): when the EF is between 1.0 < 1.5

iii. Moderate pollution (M): when the EF between 0.5 < 1.0

iv. Low pollution (L): when the EF is < 0.5

The Exceedance Factor (EF) is calculated for major pollutants as follows:

3.4   Noise Environment

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

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

3.4.1 Identification of Sampling Locations

In order to assess the ambient noise levels within the study area, noise monitoring was carried out at Seven (7) locations. The noise level monitoring locations were carried out by covering commercial, residential, rural areas within the radius of 10 km. A noise monitoring methodology was chosen such that it best suited the purpose and objectives of the study.

Table 3.27: Details of Noise Monitoring Locations

S. No	Location code	Monitoring Locations	Distance & Direction	Coordinates
1	**N-1**	Project Area	North East Corner	12°27'37.61"N 77°50'9.03"E
2	**N-2**	Adjacent Quarry	North East Corner	12°27'41.76"N 77°50'20.10"E
3	**N-3**	Kuppasandram	2.2Km North East	12°28'24.21"N 77°51'4.35"E
4	**N-4**	Nemileri	2.5Km South East	12°26'27.31"N 77°50'53.26"E
5	**N-5**	Andevanapalli	7.7Km West	12°27'45.22"N 77°45'50.17"E
6	**N-6**	Bikkanapalli	4.8Km South West	12°26'18.99"N 77°47'44.84"E
7	**N-7**	Maarasandram	6.2Km North West	12°30'29.14"N 77°48'20.03"E

Source: On-site monitoring/sampling by EHS360 Labs Private Limited in association with GEMS

3.4.2 Method of Monitoring

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

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

Leq = 10 Log L / TΣ (10Ln/10)
Where L = Sound pressure level at function of time dB (A)
T = Time interval of observation

Figure 3.19: Noise Monitoring Stations Around 10 Km Radius
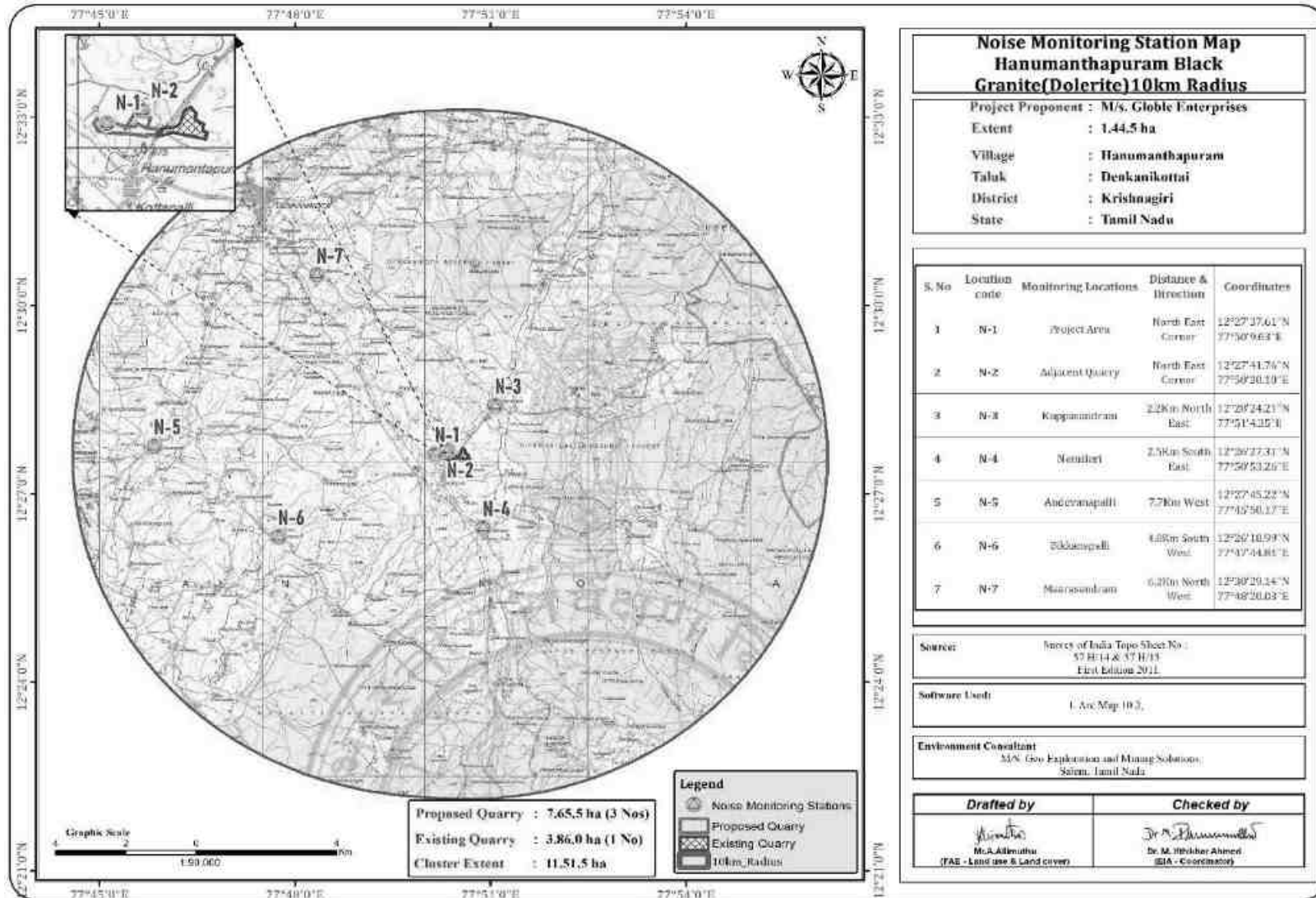
3.4.3 Analysis of Ambient Noise Level in the Study Area

The Digital Sound pressure level have 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 3.6

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

Table 3.28: Ambient Noise Quality Result

S. No	Locations	Noise level (dB (A) Leq)		Ambient Noise Standards
		Day Time	**Night Time**	
1	Project Area	43.0	35.9	**Industrial**
2	Adjacent Quarry	41.6	35.7	**Day Time- 75 dB (A)**
3	Kuppasandram	40.0	35.0	**Night Time- 70 dB (A)**
4	Nemileri	39.3	35.1	**Residential**
5	Andevanapalli	38.6	35.2	**Day Time– 55 dB (A)**
6	Bikkanapalli	39.1	37.4	**Night Time- 45 dB (A)**
7	Maarasandram	37.3	35.3	

Source: On-site monitoring/sampling by EHS360 Labs Private Limited in association with GEMS

Figure 3.20: Day and Night Time Noise Levels In Core And Buffer
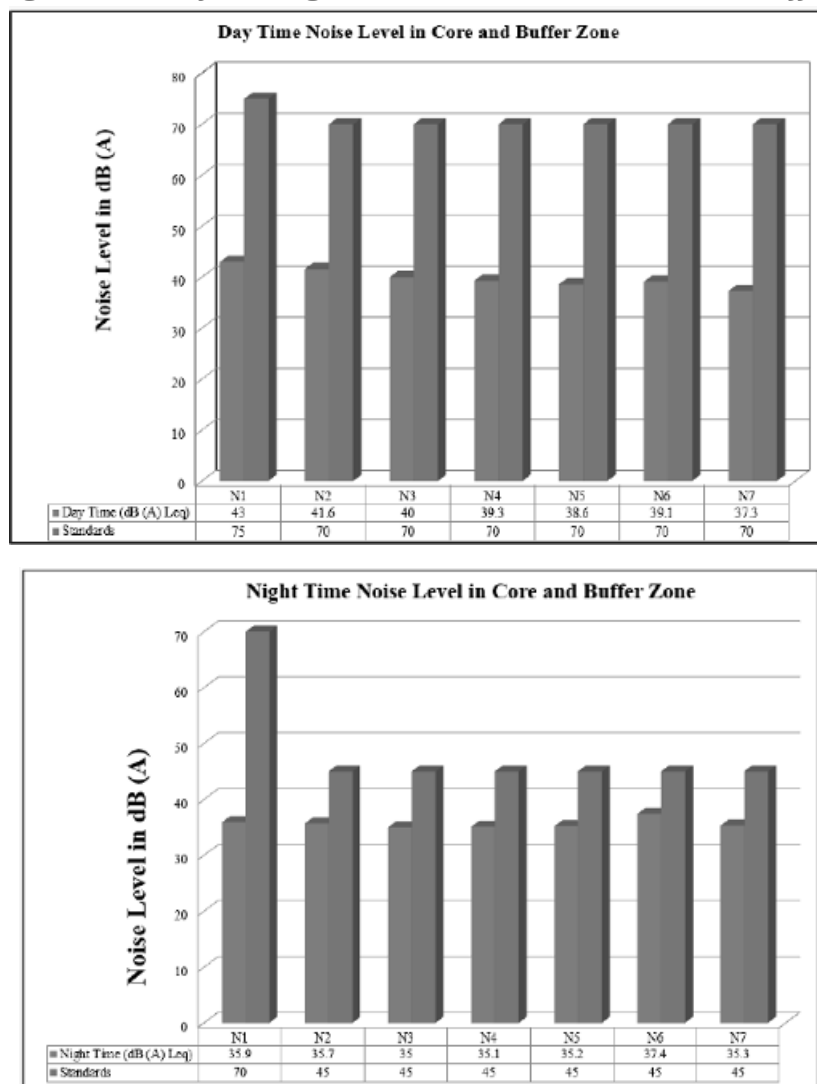
3.4.4 Interpretation & Conclusion:

Ambient noise levels were measured at 7 (Seven) locations around the proposed project area. Noise levels recorded in core zone during day time were from 41.6 – 43 dB (A) Leq and during night time were from 35.7 – 35.9 dB (A) Leq. Noise levels recorded in buffer zone during day time were from 37.3– 41.6 dB (A) Leq and during night time were from 35.1 – 37.4 dB (A) Leq.

The values of noise observed in some of the areas are primarily owing to quarrying activities due to cluster of quarries within 500m radius, movement of vehicles and other anthropogenic activities. Noise monitoring results reveal that the maximum & minimum noise levels at day time were recorded in the range of 48.3 dB(A) Leq in core zone and 37.2 dB(A) Leq in minimum core zone area and 41.2 dB(A) in Bikkanapalli Village & 31.2 dB(A) in Marasandram Village at night time. Thus, the noise level for Industrial and Residential area meets the requirements of CPCB.

3.5   Ecological Environment

3.5.1 Methodology Adopted & Objective

To achieve the above objective, a detailed study of the area was undertaken in 10 km radius from the proposed project area. The different methods adopted were as follows:

- Primary field surveys to establish primary baseline of the study area; and
- Compilation of information available in published literatures and as obtained from Forest survey of India, Environmental Information Centre, Botanical Survey of India and Zoological Survey of India.

The present report gives the review of published secondary data and the results of field sampling conducted during Post Monsoon Season i.e. Dec to Feb 2023 and there are no forest blocks in study area. The detailed ecological assessment of the study area has been carried out with the following objectives:

- Identification of flora and fauna within the study area;
- Preparation of checklist of species which also include endangered, endemic and protected (both floral and faunal categories); and
- Evaluation of impact of proposed expansion on flora and fauna of the area.

3.5.2. Study area Ecology

The core area extent of 1.44.5. Ha of the Black Granite quarry has an impact on the diversity of flora and fauna of the surrounding area. But present work was carried out on detailed study of the impacts of the Black Granite quarry on the ecology and biodiversity of the core lease area with the proper mitigation and sustainable management plan. The proposed area is situated in an undulated terrain. The following methods were applied during the baseline study of flora, fauna, and diversity assessment.

3.5.3. Objectives of Biological Studies

a) To study the likely impact of the proposed mining project on the local biodiversity and to suggest mitigation measures, if required, for vulnerable biota.

b) Undertake an intensive field survey to assess the status of floral & faunal components in different habitats in the core and buffer areas of the project site.

c) Identification and listing of flora and fauna are important as per the Wildlife (Protection) Act 1972.

d) Suggest Wildlife conservation (species-specific/habitat-specific) and management plan for the threatened (critically endangered & endangered species - schedule I) faunal species if any reported within the study area.

e) To identify the impacts of mining on agricultural lands and how it affects.

f) Proper collection of information about wildlife Sanctuaries/ national parks/ biosphere reserves of the project area.

g) Devise management & conservation measures for biodiversity.

3.5.4 Methodology of Sampling

Identification of vegetation in relation to the natural flora and crops was conducted through reconnaissance field surveys and onsite observations in the core and buffer zone. The plant species identification was done based on the reference materials and also by examining the morphological characteristics and

reproductive materials i.e. flowers, fruits, and seeds. Land use patterns in relation to agriculture crop varieties were identified through physical verification of land and interaction with local villagers.

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

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

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

3.5.4.1 Sampling

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

3.5.4.2 Sampling Size

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

3.5.4.3 Timing of Study

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

3.5.4.4 Observations from Sampling

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

3.5.4.5 Equipment/ References

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

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

3.5.5 Part I Field Sampling Techniques

3.5.5 .1 Transect walk – Birds

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

3.5.5.2 Modified Pollard Walk – for Butterflies

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

3.5.5.3 Visual Encounter Survey (VES) - reptiles and amphibians

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

3.5.5.4 Observational methods- Mammals

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

3.5.5.5 Multiple Stage Quadrat – Vegetation

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

3.5.5.6 Flora

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

3.5.5.7 Flora Composition in the Core Zone

Taxonomically a total of 29 species belonging to 18 families have been recorded from the core zone mining lease area. The area is situated in an undulated terrain. The gradient is 1 in 3 towards the Northwest side. Based on the habitat classification of the enumerated plants the majority of species were Herbs 10, followed by Trees 9, Shrubs 5, Grass 3, Creeper 1, and Cactus 1. Details of flora with the scientific name were mentioned in Table No. 3.29 The result of the core zone of flora studies shows that Fabaceae and Poaceae, Euphorbiaceae are the main dominating species in the study area mentioned in Table No.3.29 No species were found as threatened category (Table No. 3.29).

Table No: 3.29. Flora in the Core zone of Hanumanthapuram Village, Black Granite quarry

SI. No	English Name	Vernacular Name	Scientific Name	Family Name
Trees				
1.	Neem	Vembu	*Azadirachta indica*	Meliaceae
2.	Mesquite	Mullu maram	*Prosopis juliflora*	Fabaceae
3.	Chinese chaste tree	Nochi	*Vitex negundo*	Verbenaceae
4.	Mango	Manga	*Mangifera indica*	Anacardiaceae
5.	Jackfruit	Palamaram	*Artocarpus heterophyllus*	Moraceae
6.	Millettia pinnata	Pongam oiltree	*Pongamia pinnata*	Fabaceae
7.	Pala indigo	Pala maram	*Wrightia tinctoria*	Apocynaeceae

8.	Bitter Albizia	Arappu Tree	*Albizia amara*	Fabaceae
9.	Papaya	Pappali maram	*Carica papaya L*	Caricaceae
Shrubs				
1.	Milk Weed	Erukku	*Calotropis gigantea*	Apocynaceae
2.	Hopbush	Virali	*Dodonaea viscosa*	Soapberry
3.	Lantana	Unni chedi	*Lantana camara*	Verbenaceae
4.	Tanner's cassia	Avaram	*Senna auriculata*	Fabaceae
5.	Night shade plan	Sundaika	*Solanum torvum*	Solanaceae
Herbs				
1.	Ban Tulsi	Melakai poondu	*Croton bonplandianus*	Euphorbiaceae
2.	Common leucas	Thumbai	*Leucas aspera*	Lamiaceae
3.	Asparagaceae	Anai katrazhai	*Agave*	Asparagaceae
4.	Asthma-plant	Amman pacharisi	*Euphorbia hirta*	Euphorbiaceae
5.	Indian doab	Arugampul	*Cynodon dactylon*	Poaceae
6.	Carrot grass	Parttiniyam	*Parthenium hysterophorus*	Asteraceae
7.	Coat buttons	Thatha poo	*Tridax procumbens*	Asteraceae
8.	Bindii	Nerunji mullu	*Tribulus terrestris*	Zygophyllaceae
9.	Prickly chaff flower	Nayuruv	*Achyranthes aspera*	Amaranthaceae
10.	Touch-me-not	Thottalchinungi	*Mimosa pudica*	Mimosaceae
Creeper /Climbers				
1.	Stemmed vine	Perandai	*Cissus quadrangularis*	Vitaceae
Grass				
1.	Eragrostis	Pullu	*Eragrostis ferruginea*	Poaceae
2.	Great brome	Thodappam	*Bromus diandrus*	Poaceae
3.	Nut grass	Korai	*Cyperus rotandus*	Poaceae
Cactus				
1.	Triangular spruge	Chaturakalli	*Euphorbia antiquorum*	Euphorbiaceae

(**Sources**: Species observation in the field study)

Mangifera indica   Parthenium hysterophorus

Lantana camara

Vitex negundo

Calotropis gigantea

Croton bonplandianus

Euphorbia hirta

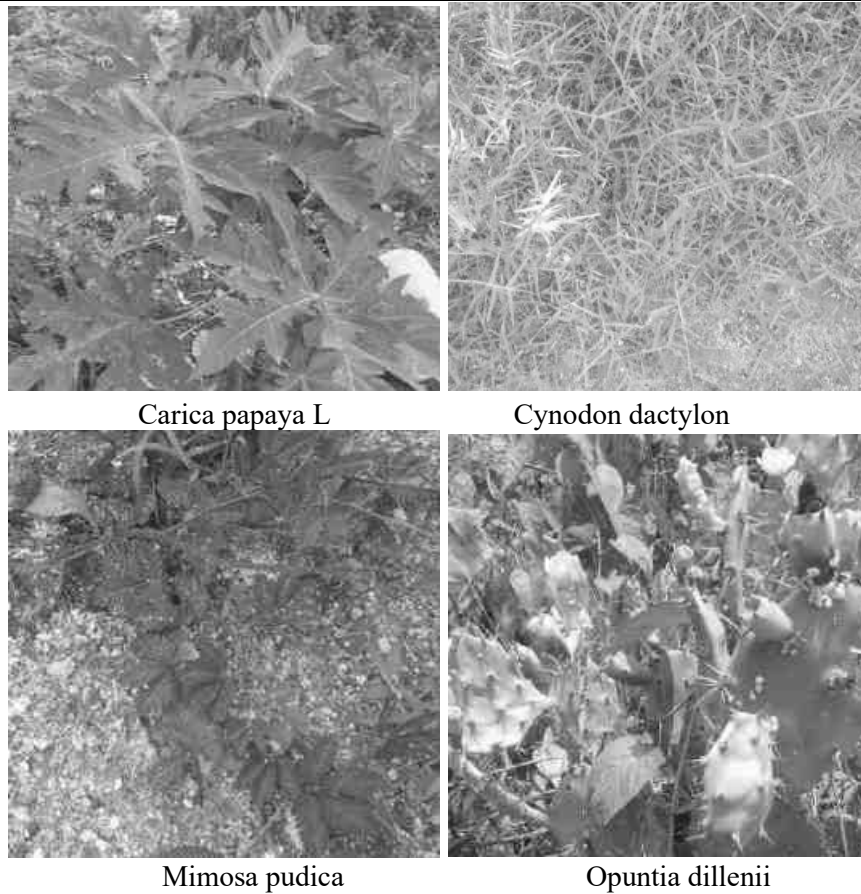Senna auriculata

Agave

Solanum torvum

Carica papaya L

Cynodon dactylon

Mimosa pudica

Opuntia dillenii

Fig No: 3.21Flora species observation in the Core zone area

Table No: 3.30 Flora in Buffer Zone of Hanumanthapuram Village, Black Granite quarry

S.No.	English Name	Vernacular Name	Scientific Name	Family Name
Trees				
1.	Mango	Manga	*Mangifera indica*	Anacardiaceae
2.	Blue gum	Thayala maram	*Eucalyptus*	Myrtaceae
3.	Indian ash tree	Odiya maram	*Lannea coromandelica*	Anacardiaceae
4.	Neem	Vembu	*Azadirachta indica*	Meliaceae
5.	Tamarind	Puliyamaram	*Tamarindus indica*	Legumes
6.	Jackfruit	Palamaram	*Artocarpus heterophyllus*	Moraceae
7.	Mesquite	Mullu maram	*Prosopis juliflora*	Fabaceae
8.	Asian Palmyra palm	Panai maram	*Borassus flabellifer*	Arecaceae
9.	Bamboo	Moonghil	*Bambusa bambo*	Poaceae
10.	Indian almond	Padam maram	*Terminalia catappa*	Combretaceae
11.	Banana tree	Vazhaimaram	*Musa acuminata*	Musaceae
12.	Indian ash tree	Odiya maram	**Lannea coromandelica**	Anacardiaceae
13.	Curry leaves	Karuveppali	*Murraya koenigii*	Rutaceae
14.	Lemon	Ezhumuchaipalam	*Citrus lemon*	Rutaceae

15.	Bidi leaf tree	Thiruvathi Plant	*Bauhinia racemosa*	Fabaceae
16.	Bitter Albizia	Arappu Tree	*Albizia amara*	Fabaceae
17.	Peepal	Arasanmaram	*Ficus religiosa*	Moraceae
18.	Yellow flame tree	Perunkondrai	*Peltophorum pterocarpum*	Fabaceae
19.	Custard apple	Seethapazham	*Annona reticulata*	Annonaceae
20.	Flamboyant	Cemmayir-konrai	*Delonix regia*	Fabaceae
21.	Chinaberry	Malai vembu	*Melia azedarach L.*	Meliaceae
22.	Monkey pod tree	Thungumoonchi	*Samanea saman*	Fabaceae
23.	Yellow Flame	Iyalvagai	*Peltophorumpterocarpum*	Fabaceae
24.	Teak	Thekku	*Tectona grandis*	Verbenaceae
25.	Indian gooseberry	Nelli	*Emblica officinalis*	Phyllanthaceae
26.	Wild Date Palm	Icham	*Phoenix sylvestris*	Arecaceae
27.	Henna	Marudaani	*Lawsonia inermis*	Lythraceae
28.	Madras thorn	Kudukapuli	*Pithecellobium dulce*	Fabaceae
29.	Malayan Cherry	Ten Pazham	*Muntingia calabura*	Muntingiaceae
30.	Pomegranate	Mathulai	*Punica granatum*	Lythraceae
31.	Jamun Fruit Plant	Naval maram	*Syzygium cumini*	Myrtaceae
32.	Banyan tree	Alamaram	*Ficus benghalensis*	Moraceae
33.	Chinese chaste tree	Nochi	*Vitex negundo*	Verbenaceae
34.	Millettia pinnata	Pongam oiltree	*Pongamia pinnata*	Fabaceae
35.	Coconut	Thennai maram	*Cocos nucifera*	Arecaceae
36.	Guava	Koyya	*Psidium guajava*	Myrtaceae
37.	Pala indigo	Pala maram	*Wrightia tinctoria*	Apocynaeceae
38.	River tamarind	Savundal maram	*leucaena leucocephala*	Fabaceae
39.	Portia tree	Poovarasan	*Thespesia populnea*	Malvaceae
40.	Drumstick tree	Murunga maram	*Moringa oleifera*	Moringaceae
41.	Sacred Tree	Porasu	*Butea monosperma*	Fabaceae
42.	Mesquite	Mullu maram	*Prosopis juliflora*	Fabaceae
43.	Papaya	Pappali maram	*Carica papaya L*	Caricaceae
44.	White Bark Acacia	Vela maram	*Vachellia leucophloea*	Fabaceae
Shrubs				
1.	Tanner's cassia	Avaram	*Senna auriculata*	Fabaceae
2.	Milk Weed	Erukku	*Calotropis gigantea*	Apocynaceae
3.	Lantana	Unni chedi	*Lantana camara*	Verbenaceae
4.	Triangular spruge	Chaturakalli	*Euphorbia antiquorum*	Euphorbiaceae
5.	Night shade plan	Sundaika	*Solanum torvum*	Solanaceae
6.	Broom creeper	Kattukodi	*Cocculus hirsutus*	Menispermaceae
7.	Solanum pubescens	Malaisundai	*Solanum pubescens Willd*	Solanaceae

8.	Indian Oleander	Arali	*Nerium indicum*	Apocynaceae
9.	Shoe flower	Chemparuthi	*Hibiscu rosa-sinensis*	Malvaceae
10.	Puriging nut	Kattamanakku	*Jatropha curcas*	Euphorbiaceae
11.	Touch-me-not	Thottalchinungi	*Mimosa pudica*	Mimosaceae
12.	Thorn apple	Oomathai	*Datura stramonium*	Solanaceae
13.	Malabar catmint	Pei veratti	*Anisomeles malabarica*	Lamiaceae
14.	Indian mallow	Thuthi	*Abutilon indicum*	Meliaceae
15.	Bush Morning Glory	Neiveli Kattamani	*Ipomoea carnea*	Convolvulaceae
16.	Carray Cheddle	Kaarai	*Canthiumparviflorum*	Rubiaceae
17.	Castor oil plant	Amanakku	*Ricinus communis*	Euphorbiaceae
18.	Flame of the Woods	Idlipoo	*Xoracoc cinea*	Rubiaceae
Herbs				
1.	Eggplant	Kathrikkai	*Solanum melongena*	Solanaceae
2.	Aloe barbadensis	Katrazhai	*Aloe vera*	Asphodelaceae
3.	Commelina benghalensis	Kanavazha	*Commelina benghalensis*	Commelinaceae
4.	Coat buttons	Thatha poo	*Tridax procumbens*	Asteraceae
5.	Indian doab	Arugampul	*Cynodon dactylon*	Poaceae
6.	Chilli	Milakai	*Capsicum annuum*	Solanaceae
7.	Indian Copperleaf	Kuppaimeni	*Acalypha indica*	Euphorbiaceae
8.	Asthma-plant	Amman pacharisi	*Euphorbia hirta*	Euphorbiaceae
9.	Tomato	Thakkali	*Solanum lycopersicum*	Solanaceae
10.	Cleome viscosa	Nai kadugu	*Celome viscosa*	Capparidaceae
11.	Bindii	Nerunji mullu	*Tribulus terrestris*	Zygophyllaceae
12.	Prickly chaff flower	Nayuruv	*Achyranthes aspera*	Amaranthaceae
13.	Field beans	Avarai	*Hyacinth Beans*	Fabaceae
14.	Common leucas	Thumbai	*Leucas aspera*	Lamiaceae
15.	Spiny amaranth	Mullu keerai	*Amaranthus spinosus*	Amaranthaceae
16.	Holy basil	Thulasi	*Ocimum tenuiflorum*	Lamiaceae
17.	Ban Tulsi	Melakai poondu	*Croton bonplandianus*	Euphorbiaceae
18.	Europeanblack nightshade	Manathakkali	*Solanumnigrum*	Solanaceae
19.	ladies' fingers	Vendakkai	*Abelmoschus esculentus*	Malvaceae
20.	Vigna mungo	Ulunthu	*Vigna mungo*	Fabaceae
21.	Bright eyes	Nithiyakalyani	*Catharanthus roseus*	Apocynaceae
22.	Carrot grass	Parttiniyam	*Parthenium hysterophorus*	Asteraceae
23.	Indian mint	Karpura valli	*Coleus amboinicus*	Lamiaceae
Climber				
1.	Stemmed vine	Perandai	*Cissus quadrangularis*	Vitaceae

2.	Ivy gourd	Kovai	*Coccinia grandis*	Cucurbitaceae
3.	Bitter apple	Peikkumatti	*Citrullus colocynthis*	Cucurbitaceae
4.	Butterfly pea	Sangu poo	*Clitoria ternatea*	Fabaceae
5.	Wild jasmine	Malli	*Jasminum augustifolium*	Oleaceae
6.	Betel	Vetrilai	*Piper betle*	Piperaceae
7.	Pointed gourd	Kovakkai	*Trichosanthes dioica*	Cucurbitaceae
8.	Wild bitter	Pavarkai	*Momordica charantia*	Cucurbitaceae
9.	Bottle Guard	Sorakkai	*Lagenaria siceraria*	Cucurbitaceae
10.	White pumpkin	Poosanaikkaai	*Cucurbitaceae*	Cucurbitaceae
11.	Rosary Pea	Gundumani	*Abrus precatorius*	Fabaceae
Creeper				
1.	Nut grass	Korai	*Cyperus rotandus*	Poaceae
2.	Cucumis maderaspatanus	Musumusukkai	*Mukia maderaspatana*	Cucurbitaceae
Grass				
1.	Eragrostis	Pullu	*Eragrostis ferruginea*	Poaceae
2.	Windmill grass	Chevvarakupul	*Chloris barbata*	Amaranthaceae
3.	Great brome	Thodappam	*Bromus diandrus*	Poaceae
Cactus				
1.	Prickly pear	Nagathali	*Opuntia dillenii*	Cactaceae
2.	Triangular spruge	Chaturakalli	*Euphorbia antiquorum*	Euphorbiaceae

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

(Sources: Species observation in the field study)

3.5.5.8 Phyto-sociological Survey method

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.

3.5.5.9Quadrats method

Quadrats of 25 × 25-m were laid down randomly within core and 5-km buffer area; each quadrat was laid to assess the trees (>5 cm GBH) and one, 10 × 10-m sub-quadrat nested within the quadrat for shrubs. The quadrats were laid randomly to cover the area to maximize the sampling efforts and minimize the species homogeneity, such as small stream area, trees in agricultural bunds, tank bunds, farm forestry plantations, wildlife areas, natural forest area, avenue plantations, house backyards, etc. In each quadrat individuals belonging to tree (25 × 25-m) and shrub (10 × 10-m) were recorded separately and have been identified on the field.quadrates sampling methods is given in Fig no.3.13.

3.6   Study of Flora

3.6.1 Flora in Core Zone

Taxonomically a total of 37 species belonging to 20 families have been recorded from the core mining lease area. Based on habitat classification of the enumerated plants the majority of species were tree 14 (38%) followed by shrubs 12 (32.43%), herbs 8 (21.62%) and Climber 3 (8.10%). Details of flora with the scientific name were mentioned in Table No. 3.1. The result of core zone of flora studies shows that Fabaceae and Arecaceae, Lamiaceae, are the main dominating species in the study area it mentioned in Table No.3.29 and the details of diversity of flora family's pattern are given in Fig No.3.14. No species found as threatened category (Table No. 3.29).

3.6.2 Flora in Buffer Zone

Similar habitats may be found in the buffer area as well, although there is a wider variety of plants there than in the core zone area. The buffer zone study area contains a total of 94 species that have been recorded from the buffer zone. The floral (103) varieties among them Trees 44, herbs 23, shrubs 18, Climbers 11, Grasses 3, Creepers 2, and Cactus 2 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.3.31 There are no impacts due to this mining activity. There are no Rare, Endangered, and Threatened Flora species in the mining area and their surrounding study area. Apart from the proposed project area, there is agricultural land. Horticulture and agricultural land are untouched. There are no Rare, Endangered, and Threatened Flora species in the mining area and their surrounding study area. A list of floral species has been prepared based on primary survey (site observations) and discussion with local people. The total number of different plant life forms under trees, shrubs, herbs, and climbers is shown in Table 3.31 and their % distribution is shown in Figure 3.19

Table 3.31: Number of floral life forms in the Study Area

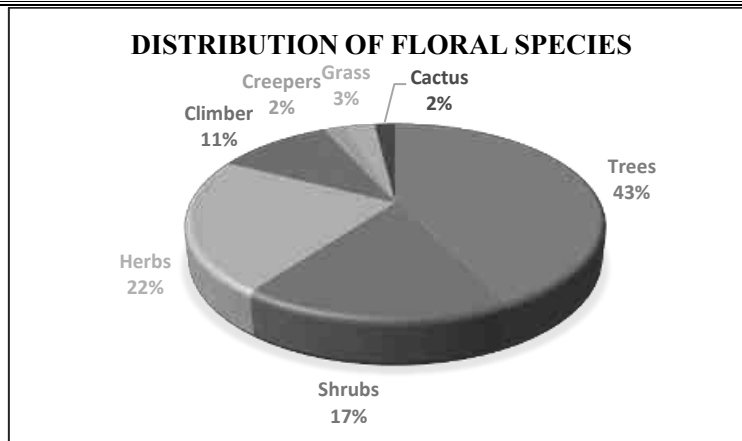| S. No	Plant Life Form	Number of Species
1	Trees	44
2	Shrubs	18
3	Herbs	23
4	Climber	11
5	Creepers	2
6	Grass	3
7	Cactus	2
Total No. of Species		**103**

DISTRIBUTION OF FLORAL SPECIES

Fig No. 3.22 Pie diagram showing % distribution of floral life forms

Table 3.32: List of medicinal plants recorded from the nearby forest area

S.No	Botanical Name	Family	Local name(s)	Habit	Part(s) used	Uses
1.	Abrus precatorius L.	Fabaceae	Kundumani	*CL*	Leaves, Seeds	Skin diseases, Eye disease and tooth ache.
2.	Abutilon indicum (L.) Swee	Malvaceae	Thuthi	S	Seed, Root, Barks and Leaves	Urinary troubles, Nervous disorders, Leprosy and Leucorrhoea
3.	Acacia catechu (L.f.) Willd	Mimosaceae	Karungaali	T	Wood	Skin diseases, mouth ulcer, dysentery and Leprosy.
4.	Acacia nilotica (L.) Willd. ex Del. subsp. indica (Benth) Brenan	Mimosaceae	Karuvelam	T	Bark, heartwood, Leaves, Seeds and gum	Urino-genital diseases, wounds, haemorrhage, ulcers, cough and tooth ache.
5.	Acalypha indica L	Euphorbiaceae	Kuppaimeni	H	Whole plant	Eczema, skin diseases, cough and bronchitis, Wounds and ulcer
6.	Achyranthes aspera L	Amaranthaceae	Nayurivi	H	Whole plant	Diuretic, astringent, skin diseases and piles
7.	Albizia lebbeck (L.) Willd	Mimosaceae	Vaagai	T	Seeds, Leaves, Bark, Flowers and Pod	Eczema,Ulcer, rheumatism, leprosy
8.	Aloe vera (L.) Burm.f.	Asphodelaceae	Chotthukathazhai	H	Leaf juice	Dysentry, leucorrhoea, amenorrhoea, menstrual problems, intestinal worms and skin tonics
9.	Azadirachta indica A. Juss	Meliaceae	Vaembu	T	Bark, Leaves, Flower, Seeds and Oil	Antiviral, anthelmintic, insecticide, antiseptic, skin diseases, small pox and clean teeth.
10.	Calotropis gigantea (L.) R.Br	Asclepiadaceae	Erukku	S	Whole plant	Anthelmintic, skin diseases, leprosy, snake bite, ulcers, piles, cough and asthma
11.	Cissus quadrangularis L.	Vitaceae	Pirandai	CL	Stem	Rheumatoid arthritis, appetizer, bone fracture and nervine tonic.
12.	Ormocarpum cochinchinense (Lour.) Merr.	Fabaceae	Elumbotti	S	Bark	Fever, rheumatism and bone setting.
13.	Phyllanthus urinaria L	Euphorbiaceae	Malai Kizhanelli	H	Whole plant	Jaundice, gonorrhea, urinary diseases, indigestion, bleeding piles and menstrual problems.

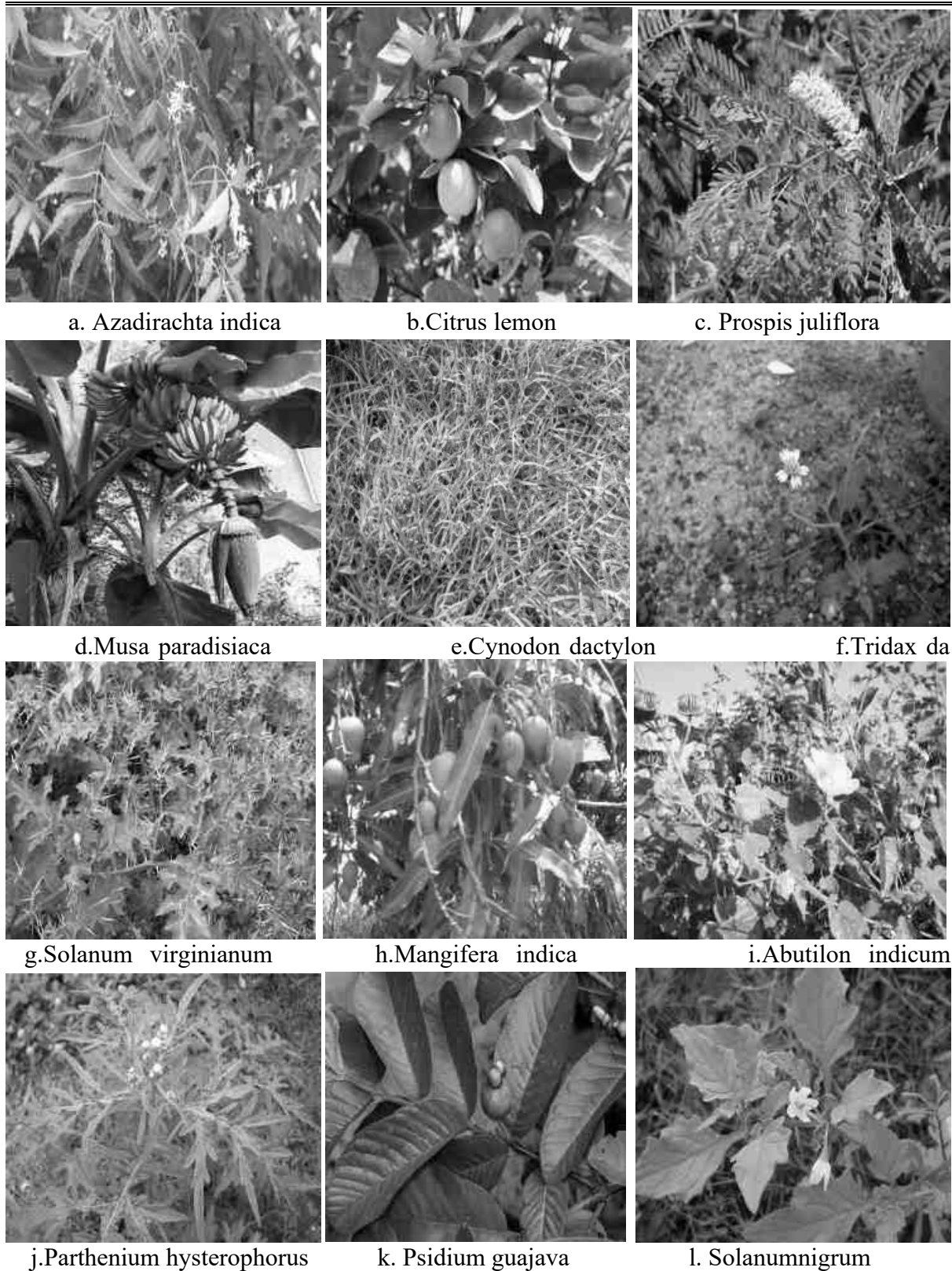*Note: Mark '+' indicates the presence of species and '-' absence of specie*

a. Azadirachta indica	b.Citrus lemon	c. Prospis juliflora
d.Musa paradisiaca	e.Cynodon dactylon	f.Tridax da
g.Solanum virginianum	h.Mangifera indica	i.Abutilon indicum
j.Parthenium hysterophorus	k. Psidium guajava	l. Solanumnigrum

Fig No: 3.23 Flora species observation in the Core zone area

3.7.   Study of Fauna

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

3.7.1. Fauna Composition in the Core Zone

A total of 22 varieties of species were observed in the Core zone of Hanumanthapuram Village, Black Granite quarry (Table No.3.5) among them numbers of Insects 5, Reptiles 4, Mammals 2, and Avian 11. A total of 22 species 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 11 species are under Schedule IV according to the Indian Wildlife Act 1972. A total of 11 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. 3.33

Table No: 3.33 Fauna in the Core zone of Hanumanthapuram Village, Black Granite quarry

SI. No	Common name/English Name	Family Name	Scientific Name	Schedule list wildlife Protection act 1972	IUCN Red List data
Insects					
1	Striped tiger	Nymphalidae	*Danaus plexippus*	Schedule IV	LC
2	Grasshopper	Acrididae	*Hieroglyphus sp*	NL	LC
3	Common Tiger	Nymphalidae	*Danaus genutia*	NL	NL
4	Termite	Blattodea	*Hamitermes silvestri*	NE	LC
5	Red-veined darter	Libellulidae	*Sympetrum fonscolombii*	NL	LC
Reptiles					
1	Garden lizard	Agamidae	*Calotes versicolor*	NL	LC
2	Common skink	Scincidae	*Mabuya carinatus*	NL	LC
3	Rat snake	Colubridae	*Ptyas mucosa*	Sch II (Part II)	LC
4	Green vine snake	Colubridae	*Ahaetulla nasuta*	Schedule IV	NL
Mammals					
1	Indian Field Mouse	Muridae	*Mus booduga*	Schedule IV	NL
2	Common rat	Muridae	*Rattus rattus*	Schedule IV	LC
Aves					
1.	Common myna	Sturnidae	*Acridotheres tristis*	NL	LC
2.	Shikra	Laniidae	*Laniusexcubitor*	Schedule IV	LC
3.	House crow	Corvidae	*Corvussplendens*	NL	LC
4.	Sunbird	Nectariniidae	*Cinnyrisasiaticus*	Schedule IV	LC
5.	Koel	Cucalidae	*Eudynamys*	Schedule IV	LC
6.	Rose-ringed parkeet	Psittaculidae	*Psittacula krameri*	NL	LC
7.	Common quail	Phasianidae	*Coturnix coturnix*	Schedule IV	LC
8.	Black drongo	Dicruridae	*Dicrurus macrocercus*	Schedule IV	LC

9.	Cattle egret	Ardeidae	*Bubulcus ibis*	NE	LC
10.	Rock pigeon	Columba livi	*Columbidae*	Schedule IV	LC
11.	Indian Robin	Turdinae	*Saxicoloides fulicata*	Schedule IV	LC

NL- Not listed, LC- Least Concern

3.7.2. Fauna Composition in the Buffer Zone

As the animals, especially vertebrates move from place to place in search of food, shelter, mate or other biological needs, separate lists for core and buffer areas are not feasible however, a separate list of fauna pertaining to core and buffer zone are listed separately. The following Reserved Forest is situated within 10km radius. Noganoor R.F. 2.2 km west, Aiyur Extn R.F. 2 km east, and Denkanikottai R.F. 3.6 km on the North side. As such there are no chances of occurrence of any rare or endangered or endemic or threatened (REET) species within the core or buffer area.

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

The list of bird species recorded during the field survey and literature from the study area is given in Table 3.7. The list of reptilian species recorded during the field survey and literature from the study area are given in Table 3.8. The list of insect species recorded during the field survey and literature from the study area are given in Table 3.9. the list of Mammals: (*directly sighted animals & Secondary data) is given in table 3.10. The list of Amphibian species recorded during the field survey and literature from the study area are given in Table 3.11. It is apparent from the list that none of the species either spotted or reported is included in Schedule I of the Wildlife Protection Act. Similarly, none of them comes under the REET category.

Taxonomically a total of 57 species were recorded from the buffer zone area. Based on habitat classification the majority of species were Insects 3, followed by birds 28, Reptiles 8, Mammals 5, amphibians 3, and Butterflies 10. There are four Schedule II species, and 35 fo species are under Schedule IV according to the Indian Wildlife Act 1972. A total of 28 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 amphibian was observed during the extensive field visit Sphaerotheca breviceps, Euphlyctis hexadactylus, and Bufomelanostictus, There is no schedule I Species in the study area. There are no critically endangered, endangered, vulnerable, and endemic species were observed.

Table 3.34 Mammals: (*directly sighted animals & Secondary data)

SI. No	Common Name	Scientific Name	WLPA, 1972
1.	Indian Grey Mongoose	*Herpestes edwardsii*	Schedule II
2.	Indian Palm squirrel	*Funambuus palmarum*	Schedule IV
3.	Rabbit	*Lepus nigricollis*	Schedule IV
4.	Indian hare	*Lepus nigricollis*	Schedule (Part II)
5.	Brown rat	*Rattus norwegicus*	Schedule IV

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

Table 3.35 List of Avian Species Recorded in the Study Area

Avian

(*directly sighted species & Secondary data)

SI. No	Common Name	Scientific Name	Schedule list WLPA, 1972	IUCN Red List data
1.	Small blue Kingfisher	*Alcedo atthis*	Schedule IV	LC
2.	Koel	*Eudynamys*	Schedule IV	LC
3.	Grey Francolin	*Francolinus pondicerianus*	Schedule IV	LC
4.	House crow	*Corvus splendens*	Schedule IV	LC
5.	Rose Ringed parakeet	*Psittacula krameri*	Schedule IV	LC
6.	Black drongo	*Dicrurus macrocercus*	Schedule IV	LC
7.	Indian blue robin	*Muscicapidae*	Schedule IV	LC
8.	Indian Roller	*Coracias benghalensis*	Schedule IV	LC
9.	Jungle crow	*Corvus levaillantii*	Schedule IV	LC
10.	Cattle egret	*Bubulcus ibis*	Schedule IV	LC
11.	Indian Robin	*Saxicoloides fulicatus*	Schedule IV	LC
12.	Common Sandpiper	*Actitis hypoleucos*	Schedule IV	LC
13.	Jungle babbler	*Turdoides striata*	Schedule IV	LC
14.	House sparrow	*Passer domesticus*	Schedule IV	LC
15.	Common Babbler	*Turdoides caudata*	Schedule IV	LC
16.	Black-headed Munia	*Lonchuramalacca*	Schedule IV	LC
17.	Asian green bee-eater	*Meropsorientalis*	NL	LC
18.	Rock pigeon	*Columbidae*	Schedule IV	LC
19.	Common myna	*Acridotheres tristis*	Schedule IV	LC
20.	Sunbird	*Nectariniidae*	NL	LC
21.	White Breasted king fisher	*Halcyon smyrnensis*	Schedule IV	LC
22.	House Sparrow	*Passer domesticus*	Schedule IV	LC
23.	Hoopoe	*Upupaepops*	Schedule IV	LC
24.	Red Vented Bulbul	*Pycnonotus cafer*	Schedule IV	LC
25.	Little Egret	*Egretta garzetta*	Schedule IV	LC
26.	Common quail	*Coturnix coturnix*	Schedule IV	LC
27.	Woodpecker bird	*Picidae*	Schedule IV	LC
28.	Two-tailed Sparrow	*Dicrurus macrocercus*	Schedule IV	LC

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

Table 3.36 List of Reptiles either spotted or reported from the study area.

(*indicates direct observations & Secondary data)

SI. No	Common Name/English Name	Scientific Name	Schedule list wildlife Protection act 1972	IUCN Red List data
1.	Rat snake	*Ptyas mucosa*	Sch IV (Part II)	LC
2.	House lizards	*Hemidactylus flaviviridis*	Schedule IV	NL
3.	Common skink	*Mabuya carinatus*	NL	LC
4.	Green vine snake	*Ahaetulla nasuta*	Schedule IV	NL
5.	Indian cobra	*Naja naja*	Sch II (Part II)	LC
6.	Common krait	*Bungarus caeruleus*	Schedule IV	NL
7.	Oriental garden lizard	*Calotes versicolor*	NL	LC
8.	Russell's viper	*Vipera russseli*	Sch II (Part II)	LC

Table.3.37 List of Butterflies and insect reported from the study area

SI. No	Common Name	Scientific Name	WLPA, 1972
1.	Blue tiger	*Tirumala limniacae*	-
2.	Common emigrant	*Catopsilia pomona*	-

3.	Common grass yellow	*Eurema hecabe*	-
4.	Dark grass blue	*Zizeera knysna*	-
5.	Indian cabbage white	*Pieris canidae*	-
6.	Common grass dart	*Taractrocera maevius*	-
7.	Common jezebel	*Delias eucharis*	-
8.	Common mormon	*Papilio polytes*	-
9.	Common sailor	*Neptis hylas*	-
10.	Common tiger	*Danaus genutia*	-
Insect-Odonates (dragon flies)			
1.	Common Club tail	*Ictinogomphus rapax*	-
2.	Green Marsh Hawk	*Orthetrum sabina*	-
3.	Ground Skimmer	*Diplacodes trivialis*	-

3.7.3. Aquatic Ecology

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

3.7.4 Objectives of Aquatic Studies

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

3.7.5 Macrophytes

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

Table No.3.38 Description of Macrophytes

S.No	Scientific Name	Common Name	Type
1.	*Typha angustifolia*	Lesser Bulrush	Emergent hydrophytes
2.	*Ipomea aquatica*	Water Morning Glory	Marshy amphibious hydrophytes
3.	*Hydrilla verticillata*	Hydrilla	Submerged hydrophytes
4.	*Pistia stratiotes*	Water lettuce	Free floating hydrophytes
5.	*Cyperus articulates*	Jointed flatsedge	Emergent Hydrophytes
6.	*Eichhornia crassipes*	Common water hyacinth	Free floating hydrophytes

3.7.6 Aquatic Faunal Diversity

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

Table no. 3.39 Amphibians Observed/Recorded from the Study Area

SI. No	Common Name	Zoological Name	WLPA, 1972	IUCN Red List data
1.	Indian Skipper Frog	*Euphlyctis cyanophlyctis*	Schedule IV	LC
2.	Indian Pond Frog	*Euphlyctis hexadactylus*	Schedule IV	LC
3.	Indian Toad	*Bufomelanostictus*	Schedule IV	LC

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

3.7.7 Findings/Results

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

Records of threatened species in the area

No threatened species were observed

Endangered Species as per Wildlife (Protection) Act

No Endangered fauna was recorded in the project area.

Endemic Species of the Project areas

No endemic species were observed in the project area.

Migratory species of the Project areas

No migratory fauna observed in the project area.

Migratory corridors and Flight paths

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

Breeding and spawning grounds

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

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

There are no National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar sites, Tiger/Elephant Reserves/(existing as well as proposed) within 10 km of the mine lease area. The following Reserved Forest is situated within 10 km radius. Noganoor R.F. 2.2 km west, Aiyur Extn R.F. 2 km east, and Denkanikottai R.F. 3.6 km on the North side. There are no protected forests within the project area. Hence submission of clearance from the National Board of Wildlife does not arise. There are no endangered, endemic, and RET Species. There is no Schedule I species in the study area core zone and buffer zone (10 km radius of the periphery of the mine lease)] The proposed project is not going to have any direct or indirect adverse impact on the species mentioned above.

3.7.8 Conclusion

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

3.8   Socio Economic Environment

There is no habitation/ village within the radius of 1km from the project area. Socio-economic study is an essential part of environmental study. It includes demographic structure of the area, provision of basic amenities viz., housing, education, health and medical services, occupation, water supply, sanitation, communication, transportation, prevailing diseases pattern as well as feature like temples, historical monuments etc., at the baseline level. This will help in visualizing and predicting the possible impact depending upon the nature and magnitude of the project.

It is expected that the Socio-Economic Status of the area will 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.

3.8.1 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.

3.8.2 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

3.8.3 Administrative Setup of Krishnagiri District

Krishnagiri district includes 2 Revenue Divisions, 8 Taluks, 7 Town Panchayats. There are 874 Revenue Villages, 352 Village panchayats in this district.

In 2011, Krishnagiri district had population of 18,79,809 with a sex-ratio of 963 females for every 1,000 males.

3.8.4 Study area

As per the Population Census 2011, there are total 1125 families residing in the village Anumanthapuram Village. The total population of Anumanthapuram is 5241 out of which 2712 are males and 2529 are females thus the Average Sex Ratio of Anumanthapuram is 999.

Table 3.32: Population Characteristics Around 10km Radius

Total No of Villages	No. of Households	Total Population	Population Male	Population female	SC Population Male	SC Population female	Total Literates Male	Total Literates Female	Total Illiterates Male	Total Illiterates Female
18	15,501	69,731	36,055	33,676	4,251	4,106	20,681	14,597	15,374	19,079

Table 3.33: Occupational Characteristics Around 10km Radius

Total Worker Population Male	Total Worker Population Female	Main Working Population Male	Main Working Population Female	Main Cultivator Population Male	Main Cultivator Population Female	Main Agricultural Labourers Population Male	Main Agricultural Labourers Population Female	Non Working Population Male	Non Working Population Female
22,146	15,877	19,812	13,195	11,167	7,202	4,964	4,590	13,909	17,799

3.8.5 Basic Amenities

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

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

All basic amenities Education (higher education, colleges, universities, Medical college, Transport facilities, Railway station, Bus station area available in the district headquarters Krishnagiri at a distance of 42 km –East)

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.

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

4.1.1 Anticipated Impact

The main anticipated impact on the Land Environment due to quarrying operation is change in Landscape, change in Land – use Pattern. The total area applied for quarry lease is 1.44.5 Ha, the total extent of the cluster is 11.51.50 Ha (Cluster area is calculated as per MoEF & CC Notification – S.O. 2269 (E) Dated: 01.07.2016) including existing and proposed quarries. The proposed project area is proponent own patta land, No forest land involved in this lease applied area. The ultimate depth of the proposed project is quarrying is varying from 38m below the ground level and will not intersect the ground water table. The project is site specific.

4.1.2 Mitigation measures

Due to the quarrying activities in the project the land use pattern will be altered. In order to minimize the adverse effects, the following control measures will be implemented:

- In the Opencast Method of Mining the degradation of land is insignificant, after completion of the quarrying operation the land, the land will be partially backfilled with dumped material and part of the area will be allowed to collect rainwater which will act as temporary reservoir, this Granite waste, overburden not produce any toxic effluents in the form of solid, liquid or gas
- Top Soil will be removed and utilized for greenbelt development in the safety barrier
- The periphery of the mining lease area will be converted to a greenbelt to prevent Noise and sound propagation to the nearby lands
- Construction of garland drains all around the quarry pit and construction of check dam at strategic location in lower elevations to prevent soil erosion due to surface runoff during rainfall and also to collect the storm water for various uses within the proposed area
- Barbed wire fencing will be re constructed at the conceptual stage, Security will be posted round the clock, to prevent inherent entry of the public and cattle.

4.1.1.2 Soil Environment

4.1.1.3 Impact 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).

4.1.1.4 Mitigation measures for Soil Conservation

- The top soil will be preserved in the safety barrier and kept in moisture condition. The preserved top soil will be utilized for greenbelt development in the safety barrier and utilized for plantation on the top bench
- Garland drains will be constructed around the project area to arrest any soil from the quarry area being carried away by the rainwater. This will also avoid the soil erosion and siltation in the mining pits and maintaining the stability of the benches

4.1.1.5 Waste Dump Management
4.1.1.6 Anticipated Impact

Solid waste is in the form of Granite waste which does not produce any toxic effluent during dumping. Garland drains will be constructed around the waste dump to prevent the rainwater entering into the quarrying pit besides this garland drain will also help in facilitating the rainwater to the natural gradient.

There is generation of topsoil is about 18,726m^3 for the entire period and 11,716m^3 during this five-year mining plan period. The top soil will be preserved all along the safety barrier and utilized for construction of bund and afforestation purpose. The total waste to be produced during this Mining plan period is around 11,970 m^3 (Granite waste 70%) the same will be temporarily dump on the southwestern side with Dimensions of 117m(L) x 83m (W) x 40m (D). As and when there is accumulation of waste, the same is loaded into the tipper by loading machines and dumped in the respective places ear-marked for the purpose.

4.1.1.7 Mitigation measures

- Retaining wall with weep hole, Garland drain will be provided around the dump areas
- Proper angle of repose to be maintained
- Grasses to be done over the dump areas for stability.
- Soil erosion may also be accelerated on areas where the overburden from the ore excavation operation will be dumped. As there is neither a toxic effluent nor solid waste from the mine, quality of soil is not expected to be adversely affected.

4.2   Water Environment (Impact & Mitigation Measures)

4.2.1 Anticipated Impact on Surface and ground water

The impact due to mining on the water quality is expected to be insignificant because of no use of chemicals or hazardous substances during quarrying process. For the quarrying activity water will be utilized for wire saw cutting (which will be recycled), water sprinkling on haul roads and greenbelt development. The quarrying activity will not intersect ground water table as ultimate depth of the quarry is 40m and water table is found at a depth of 62m summer and 57m rainy season BGL.

4.2.2 Mitigation measures

The following mitigation measures are suggested for water management

The quarrying operation will be carried out well above the water table. There is no intersection of surface water bodies (Streams, Canal, Odai etc.,) in the proposed project area. During rainy season rain water will be collected in the quarry pit and later used for greenbelt development and for the water sprinkling in the haul roads. There is no proposal for discharging of quarry pit water outside the project area.

There is no proposal Granite processing or workshop within the project area thus there is no effluent anticipated in the mine.

Detail of water requirements in KLD as given below:

Table 4.1 Water Requirement for the Project

Purpose	Quantity	Source
Dust Suppression	0.5 KLD	For Drinking purpose Packaged drinking water will be brought from nearby approved water vendors
		For domestic purpose Bore well water will be utilized
Green Belt development	0.5 KLD	From existing bore well on nearby quarry
*Drinking and Domestic purpose	1.0 KLD	From existing bore well on nearby quarry
Total	**2.0 KLD**	

Source: Prefeasibility report

- With respect to Turbidity, Total Iron and Silica, Pre-treatment methods like settling or filtration, Water Softening (Ion Exchange) shall be adopted to make it fit for drinking purposes. But it can be used for other domestic purposes
- Rainwater will be collected in sump in the mining pit 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 onwards and such sites where dust likely to be generated and for developing green belt. The proponent will collect and judicially utilize the rainwater as part of rainwater harvesting
- Construction of garland drains to divert surface run-off into the quarrying area
- Retaining walls with weep hole will be constructed around the dump to arrest silt wash off
- Periodic 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
- Wastewater 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 and analysing the quality of water in open well, bore wells and surface water

4.3   Air Environment (Impact & Mitigation Measures)

The air borne particulate matter is the main air pollutant in this opencast mining. The mining operation will be carried out by Diamond wire saw cutting, jackhammer drilling (35mm dia) and Hydraulic Excavators will be utilized for handling of Granite waste.

4.3.1. Anticipated Impact

The air borne particulate matter generated by quarrying operation, and transportation. The emissions of Sulphur dioxide (SO_2), Oxides of Nitrogen (NOx) due to excavation/loading equipment and vehicles plying on haul roads are marginal. Loading - unloading and transportation of Granite and overburden, wind erosion of the exposed area and movement of light vehicles will be the main polluting source in the mining activities releasing Particulate Matter (PM_{10}) affecting Ambient Air of the area. Prediction of impacts on air environment has been carried out taking into consideration proposed production of 69,300 cbm (ROM) on air environment and net increase in emissions by Open pit source modelling in AERMOD Software.

4.3.2 AERMOD Frame work of Computation & 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. PM_{10} was the major pollutant occurred during quarrying activities. The prediction included the impact of Excavation, Drilling, Blasting (Occasionally), loading and movement of vehicles during transportation and meteorological parameters such as wind speed, wind direction, temperature, rainfall, humidity and Cloud cover.

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

4.3.2.1 Emission Rate

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 x EF x (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 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 4-2.

Table 4.2: Estimated Emission Rate for PM_{10}

Activity	Source type	Value	Unit
Drilling	Point Source	0.037533756	g/s
Blasting	Point Source	0.000018019	g/s
Mineral Loading	Point Source	0.034175679	g/s
Haul Road	Line Source	0.002483296	g/s/m
Overall Mine	Area Source	0.044251808	g/s

Table 4.3: Estimated Emission Rate for So_2

Activity	Source type	Value	Unit
Drilling	Point Source	7.00596E-05	g/s

Table 4.4: Estimated Emission Rate for No_x

Activity	Source type	Value	Unit
Overall Mine	Area Source	0.000002328	g/s

4.3.2 Frame work of Computation & Model details

By using the above-mentioned inputs, ground level concentrations due to the quarrying activities have been estimated to know the incremental concentration in ambient air quality and impact in the study area. The effect of air pollutants upon receptors are influenced by concentration of pollutants and their dispersion in the atmosphere. Air quality modelling is an important tool for prediction, planning and evaluation of air pollution control activities besides identifying the requirements for emission control to meet the regulatory standards and to apply mitigation measures to reduce impact caused by quarrying activities. PM_{10} was the major pollutant occurred during quarrying activities. The prediction included the impact of Excavation, Drilling, Blasting, loading and movement of vehicles during transportation and meteorological parameters such as wind speed, wind direction, temperature, rainfall, humidity and Cloud cover.

Impact was predicted over the distance of 10 km around the source to assess the impact at each receptor separately at the various locations and maximum incremental GLC value at the project site. Maximum impact of PM_{10} was observed close to the source due to low to moderate wind speeds. Incremental value of PM_{10} was superimposed on the base line data monitored at the proposed site to predict total GLC of PM_{10} due to combined impacts.
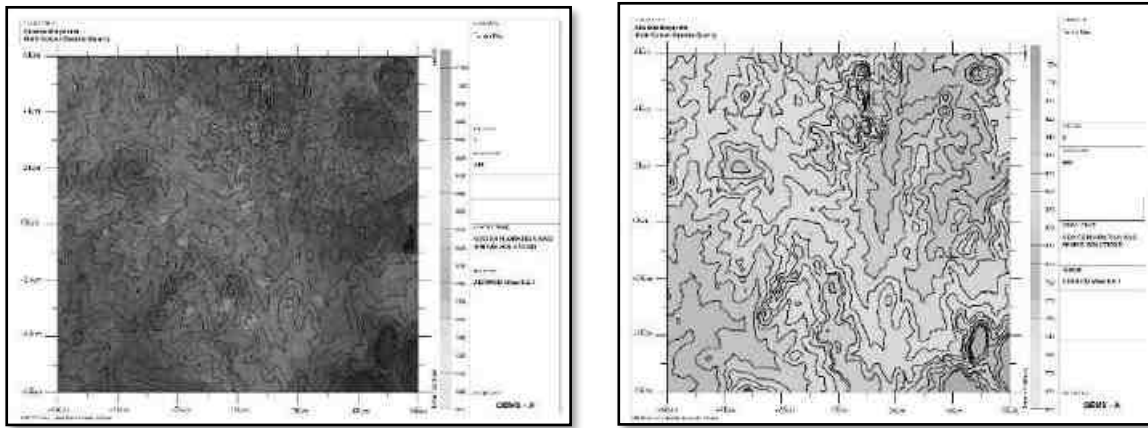
Figure 4.1: AERMOD Terrain Map

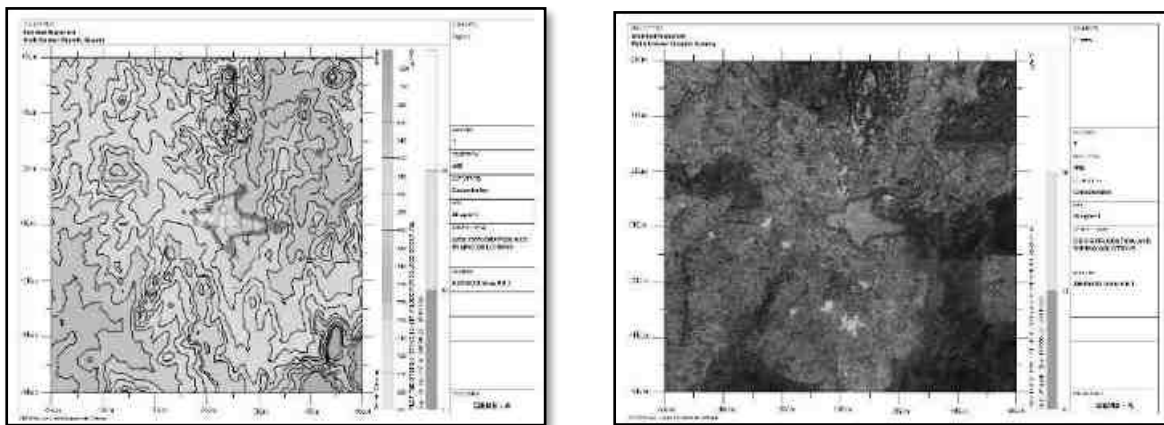*Figure 4.2: Predicted Incremental Concentration of Fugitive Dust*

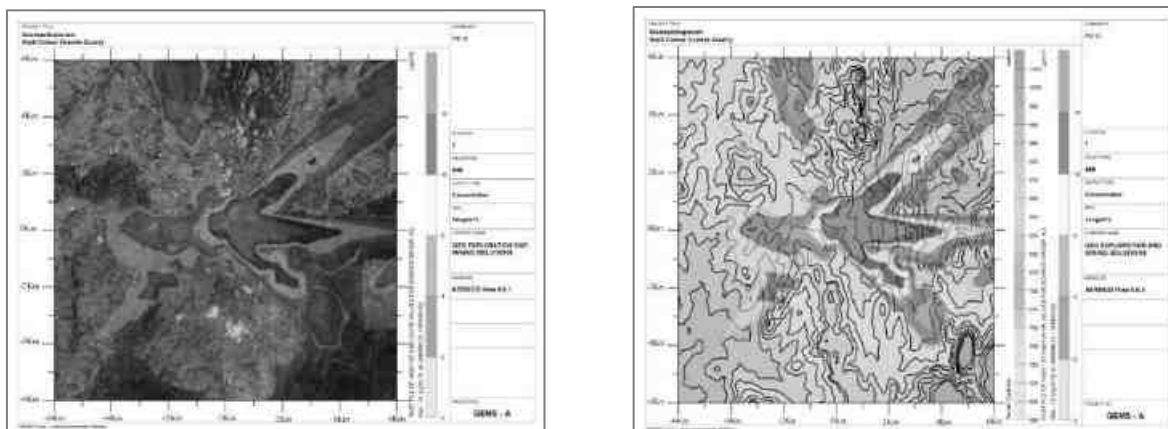
Figure 4.3: Predicted Incremental Concentration of PM$_{10}$
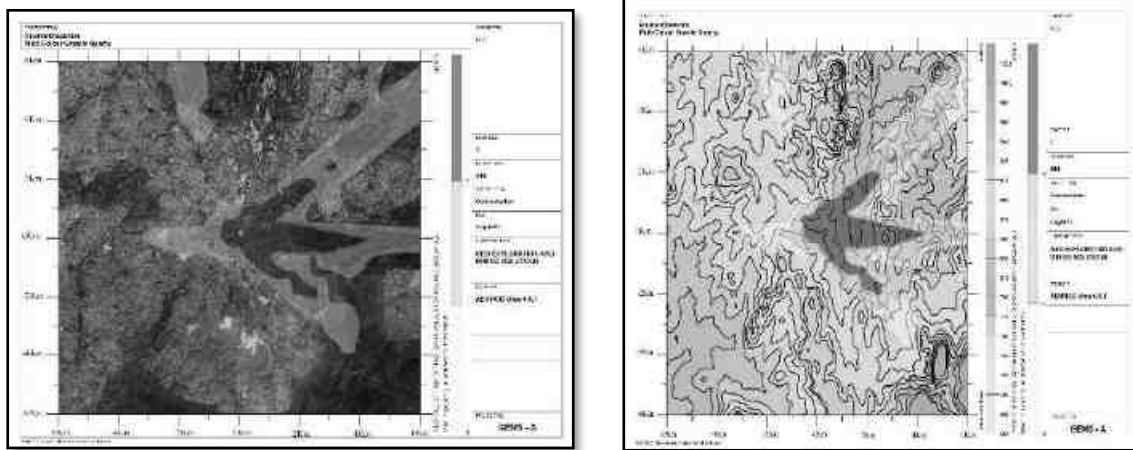
Figure No 4.4: Predicted Incremental Concentration Of PM$_{2.5}$

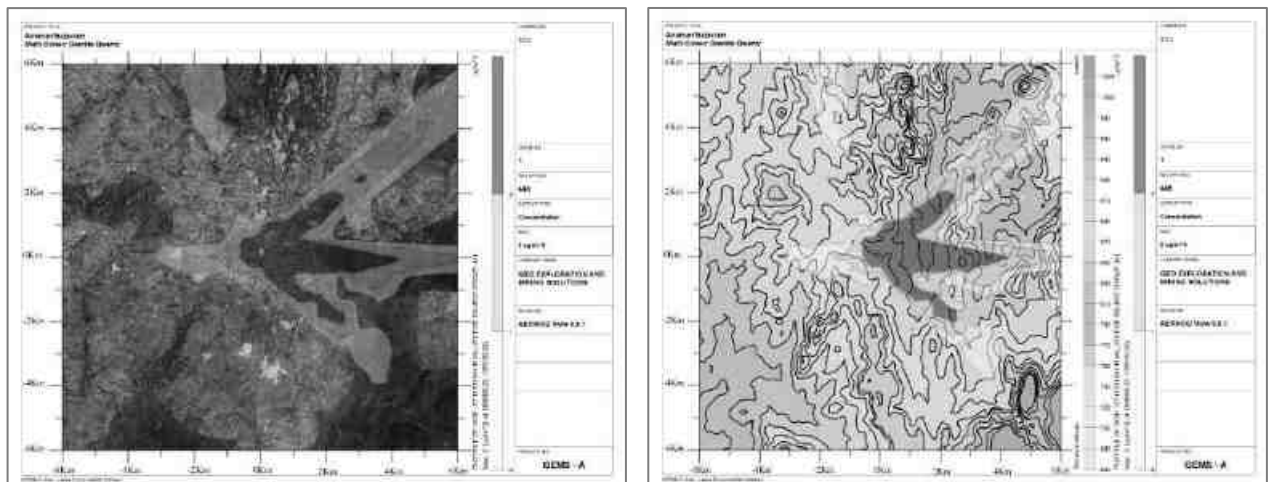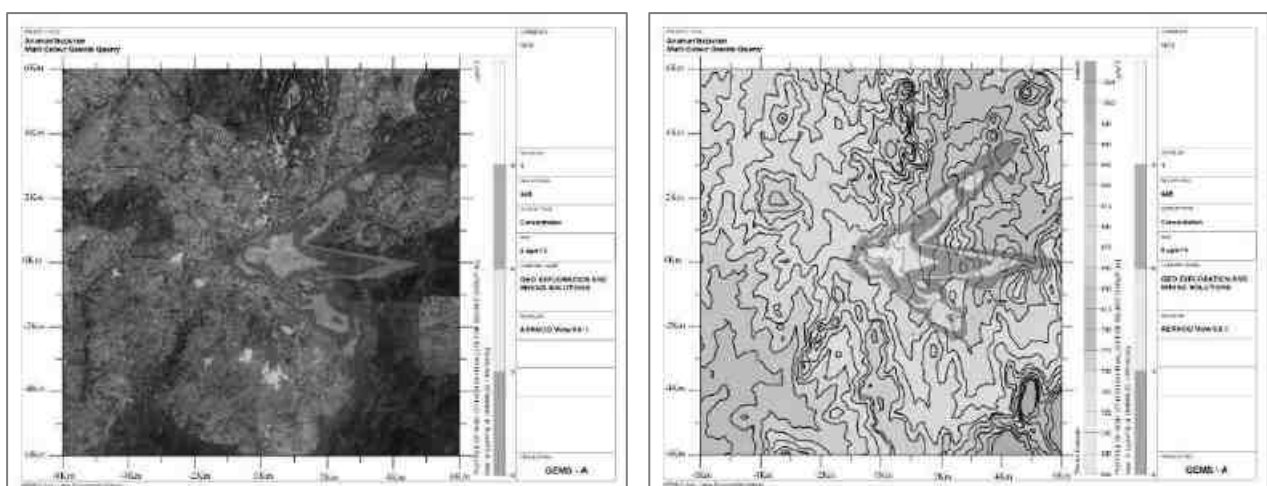*Figure No 4.5: Predicted Incremental Concentration Of So$_2$*

Figure No 4.6: Predicted Incremental Concentration of No$_x$

4.3.2.1 Model Results

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

Table 4.5: Incremental & Resultant GLC of Fugitive Dust

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline Fugitive ($\mu g/m^3$)	Incremental value of Fugitive due to mining ($\mu g/m^3$)	Total Fugitive ($\mu g/m^3$) (5+6)
AAQ1	12°27'36.65"N 77°50'20.83"E	47	-74	66.02	25.47	91.49
AAQ2	12°27'26.23"N 77°49'46.92"E	-989	-399	63.05	0	63.05
AAQ3	12°28'23.36"N 77°51'04.61"E	1384	1373	63.13	6.49	69.62
AAQ4	12°29'36.30"N 77°49'37.30"E	-1283	3637	65.68	0	65.68
AAQ5	12°26'25.58"N 77°50'53.25"E	1035	-2285	64.20	0	64.2
AAQ6	12°26'48.25"N 77°48'57.82"E	-2490	-1581	63.22	0	63.22
AAQ7	12°27'55.15"N 77°47'46.62"E	-4663	493	64.90	0	64.9

Table 4.6: Incremental & Resultant GLC OF PM_{10}

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline PM_{10} ($\mu g/m^3$)	Incremental value of PM_{10} due to mining ($\mu g/m^3$)	Total PM_{10} ($\mu g/m^3$) (5+6)
AAQ1	12°27'36.65"N 77°50'20.83"E	47	-74	45.0	14.79	59.79
AAQ2	12°27'26.23"N 77°49'46.92"E	-989	-399	46.8	5.63	52.43
AAQ3	12°28'23.36"N 77°51'04.61"E	1384	1373	46.3	11.64	57.94
AAQ4	12°29'36.30"N 77°49'37.30"E	-1283	3637	44.0	4.27	48.27
AAQ5	12°26'25.58"N 77°50'53.25"E	1035	-2285	45.2	0	45.2
AAQ6	12°26'48.25"N 77°48'57.82"E	-2490	-1581	45.3	3.61	48.91
AAQ7	12°27'55.15"N 77°47'46.62"E	-4663	493	45.4	0	45.4

Table 4.7: Incremental & Resultant GLC OF $PM_{2.5}$

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline $PM_{2.5}$ ($\mu g/m^3$)	Incremental value of $PM_{2.5}$ due to mining ($\mu g/m^3$)	Total $PM_{2.5}$ ($\mu g/m^3$) (5+6)
AAQ1	12°27'36.65"N 77°50'20.83"E	47	-74	23.2	8.91	32.11
AAQ2	12°27'26.23"N 77°49'46.92"E	-989	-399	26.0	5.81	31.81
AAQ3	12°28'23.36"N 77°51'04.61"E	1384	1373	24.0	8.06	32.06
AAQ4	12°29'36.30"N 77°49'37.30"E	-1283	3637	24.7	4.13	28.83
AAQ5	12°26'25.58"N 77°50'53.25"E	1035	-2285	23.6	0	23.6
AAQ6	12°26'48.25"N 77°48'57.82"E	-2490	-1581	24.2	3.61	27.81
AAQ7	12°27'55.15"N 77°47'46.62"E	-4663	493	26.6	1.47	28.07

Table 4.8: Incremental & Resultant GLC OF SO_2

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline SO_2 ($\mu g/m^3$)	Incremental value of SO_2 due to mining ($\mu g/m^3$)	Total SO_2 ($\mu g/m^3$)
AAQ1	12°27'36.65"N 77°50'20.83"E	47	-74	6.55	2.48	9.03
AAQ2	12°27'26.23"N 77°49'46.92"E	-989	-399	6.76	0.52	7.28
AAQ3	12°28'23.36"N 77°51'04.61"E	1384	1373	6.40	2.21	8.61
AAQ4	12°29'36.30"N 77°49'37.30"E	-1283	3637	6.75	0.13	6.88
AAQ5	12°26'25.58"N 77°50'53.25"E	1035	-2285	7.15	0	7.15
AAQ6	12°26'48.25"N 77°48'57.82"E	-2490	-1581	5.99	0	5.99
AAQ7	12°27'55.15"N 77°47'46.62"E	-4663	493	6.92	0	6.92

Table 4.9: Incremental & Resultant GLC OF NO$_X$

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline Nox (µg/m³)	Incremental value of Nox due to mining (µg/m³)	Total Nox (µg/m³) (5+6)
AAQ1	12°27'36.65"N 77°50'20.83"E	47	-74	24.53	9.58	34.11
AAQ2	12°27'26.23"N 77°49'46.92"E	-989	-399	23.88	0	23.88
AAQ3	12°28'23.36"N 77°51'04.61"E	1384	1373	25.22	7.28	32.5
AAQ4	12°29'36.30"N 77°49'37.30"E	-1283	3637	22.27	0	22.27
AAQ5	12°26'25.58"N 77°50'53.25"E	1035	-2285	22.35	0	22.35
AAQ6	12°26'48.25"N 77°48'57.82"E	-2490	-1581	23.97	0	23.97
AAQ7	12°27'55.15"N 77°47'46.62"E	-4663	493	25.16	0	25.16

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, 60, 80 & 80 µg/m³ for PM$_{10}$, PM$_{2.5}$, SO$_2$ & NO$_X$ respectively. By adopting suitable mitigation measures, the pollutant levels in the atmosphere can be further being controlled.

4.3.3. 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 –
- Blasting will be carried out only to remove the overburden and weathered portion
- Establish time of blasting to suit the local conditions and water sprinkling on blasting face
- Controlled blasting include 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

Haul Road & Transportation –
- Water will be sprinkled on haul roads, Loading Points twice a day to avoid dust generation during transportation
- Transportation of material will be carried out during day time and material will be covered with taurpaulin
- The speed of tippers plying on the haul road will be limited below 20 km/hr to avoid generation of dust.
- 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 road 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 check-ups, 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 (Occasionally) 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 at a point generates spherical waves, which are propagated outwards from the source through the air at a speed of 1,100 ft/sec, with the first wave making an ever-increasing sphere with time. As the wave spreads the intensity of noise diminishes as the fixed amount of energy is spread over an increasing surface area of the sphere. The assumption of the model is based on point source relationship i.e., for every doubling of the distance the noise levels are decreased by 6 dB (A).

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

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

Where:
Lp_1 & Lp_2 are sound levels at points located at distances r_1 & r_2 from the source.
$Ae_{1,2}$ is the excess attenuation due to environmental conditions. Combined effect of all sources can be determined at various locations by logarithmic addition.

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

4.4.1 Anticipated Impact

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

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

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

Table 4.10: Predicted Noise Incremental Values

Location ID	N1	N2	N3	N4	N5	N6	N7
Maximum Monitored Value (Day) dB(A)	43	41.6	40	39.3	38.6	39.1	37.3
Incremental Value dB(A)	66.1	60.1	33.3	32.1	22.4	26.5	24.3
Total Predicted Noise level dB(A)	66.14	60.16	40.83	40.06	38.70	39.33	37.51
NAAQ Standards	Industrial Day Time- 75 dB (A) & Night Time- 70 dB (A) Residential Day Time– 55 dB (A) & Night Time- 45 dB (A)						

The incremental noise level is found within the range of 60.1 – 66.1 dB (A) in Core Zone and 22.4-33.3dB (A) in Buffer zone. The noise level at different receptors in buffer zone is lower due to the distance 33.3 involved and other topographical features adding to the noise attenuation. The resultant Noise level due to monitored values and calculated values at the receptors are based on the mathematical formula considering attenuation due to Green Belt as 4.9 dB (A) the barrier effect. From the above table, it can be seen that the ambient noise levels at all the locations are within permissible limits of Industrial area (core zone) & Residential area (buffer zone) as per THE NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 (The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended vide S.O. 1046(E), dated 22.11.2000, S.O. 1088(E), dated 11.10.2002, S.O. 1569 (E), dated 19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment (Protection) Act, 1986.).

4.4.2   Mitigation measures for Control of Noise
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 are utilized for breaking boulders;
- Controlled blasting with proper spacing, burden, stemming and optimum charge/delay will reduce noise;
- 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 will be developed around the project areas and along the haul roads. The plantation minimizes propagation of noise;
- Personal Protective Equipment (PPE) like ear muffs/ear plugs will be provided to the operators of HEMM and persons working near HEMM and their use will be ensured though training and awareness.
- Regular medical check–up and proper training to personnel to create awareness about adverse noise level effects

4.4.3   Ground Vibrations
Ground vibrations due to mining activities in the project area 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 proposed mine is moving of Heavy Earth Moving Machineries vibration due to blasting is very minimal since the blasting will not carried out frequently in this type of Granite quarry operation. 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 project area is located 350 m South East. The ground vibrations due to the blasting in proposed mine are calculated using the empirical equation.

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

$$V = K \left[R/Q_{0.5} \right]^{-B}$$

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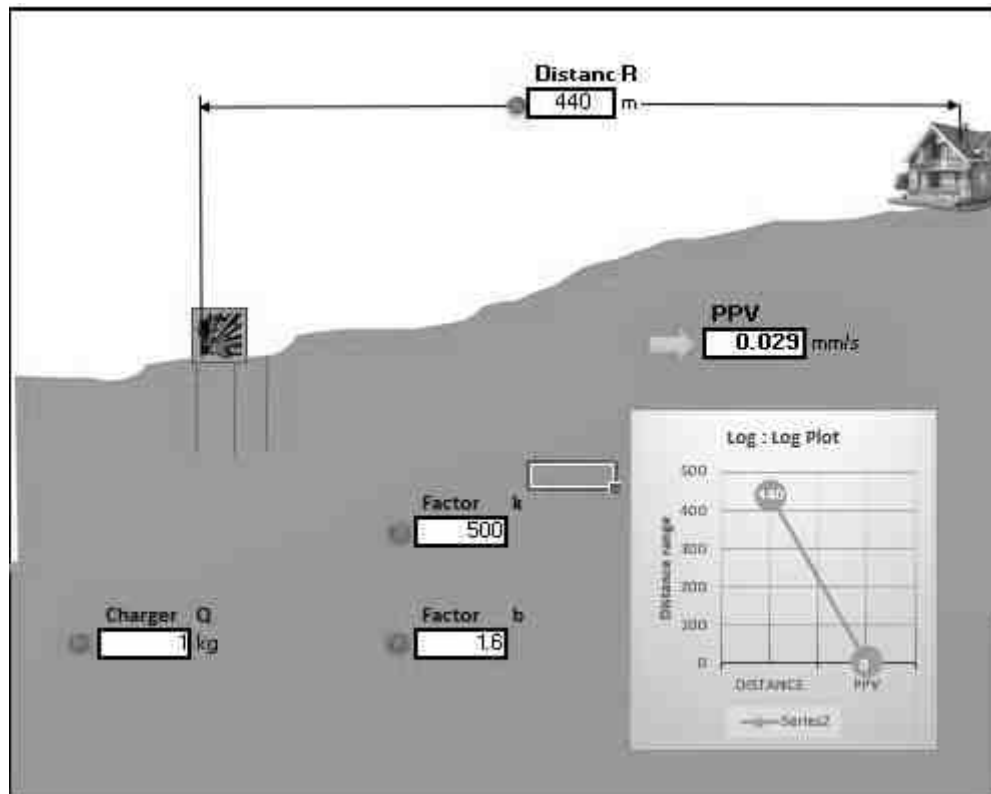V = peak particle velocity (mm/s)
K = site and rock factor constant
Q = maximum instantaneous charge (kg)
B = constant related to the rock and site (usually 1.6)
R = distance from charge (m)

Figure No 4.7: Ground Vibration Prediction

From the above graph, the charge per blast of 1 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. It should be ensured that the explosives used for blasting at one blast should not exceed more than 100kg at any point of time. 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 for Control of Vibration
- The blasting operations in the mine are proposed to be carried out by jackhammer drilling and blasting using delay detonators, which reduces the ground vibrations;
- Proper quantity of explosive, suitable stemming materials and appropriate delay system should be adopted to avoid overcharging and for safe blasting;
- Adequate safe distance from blasting should be maintained as per DGMS guidelines;
- Blasting shelter will be provided as per DGMS guidelines;
- Blasting operations will be carried out only during day time;
- The charge per delay will be minimized and preferably a greater number of delays will be used per blasts;
- During blasting, other activities in the immediate vicinity shall 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_{nd} Class Mines Manager/ 1st Class Mines Manager) will be appointed.

4.5   Ecology and Biodiversity

4.5.1. Anticipated Impact on Flora
- None of the plants will be cut during operational phase of the mine.
- 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.
- 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

4.5.2.1. Green Belt Development

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

- Plants that grow fast will be preferred.
- Preference for high canopy covers plants with local varieties.
- Perennial and evergreen plants will be preferred.
- The development of Green Belt is an important aspect for any plant because:
- It helps in noise abatement for the surrounding area.
- It maintains the ecological balance.
- It increases the aesthetic value of site.

Table No 4.5.2.1 List of plant species proposed for Greenbelt development

S. No	Scientific name	Tamil Name
1	*Aegle marmelos*	Vilva Maram
2	*Albizia lebbeck*	Vaagai maram
3	*Cassia fistula*	Konrai tree
4	*Lannea coromandelica*	Othiyam
5	*Limonia acidissima*	Vila maram
6	*Syzygium cumini*	Naval maram
7	*Toona ciliata*	Santhana Vembu
8	*Ficus hispida*	Aththi maram
9	*Borassus flabellifer*	Panai-maram
Species suitable for abatement of noise and dust pollution		
1	*Azadirachta indica*	Vembhu maram
2	*Ficus religiosa*	Arasan maram
3	*Ficus hispida*	Aththi maram
4	*Bombax ceiba*	Mul Elavu
5	*Syzygium cumini*	Naval maram
6	*Tamarindus indica*	Puliyamaram
7	*Mangifera indica*	Manga maram
8	*Harwickia binata*	Anjan maram

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

4.5.2. Anticipated Impact on Fauna

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

4.5.2.1. Mitigation Measures

- A suitable plan for the conservation of Schedule-I Species have been prepared and the necessary fund for implementation for the same will be made.
- All the preventive measures will be taken for the growth & development of fauna.
- Creating and developing awareness for nature and wildlife in the adjoining villages.
- The workers shall be trained to not harm any wildlife, should it come near the project site. No work shall be carried out after 6.00 pm.
- Topsoil has a large number of seeds of native plant species in the mining area.
- Checks and controls the movement of vehicles in and out of the mine.
- Undertaking mitigative measures for a conducive environment for the flora and fauna in consultation with Forest Department.
- A dust suppression system will be installed within the mine and periphery of the mine.

4.5.2.2. Afforestation

More number of trees has been observed along the approach road to the lease area, the trees will be maintained in good condition. The 7.5m and 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, Mango, Casuarina will be planted along the Lease boundary and avenues as well as over non-active dumps at a rate of 50 trees per annum with interval 3m in between. A retaining wall will be constructed around the dumping yard. The rate of survival expected to be 80% in this area. Afforestation Plan is given in Table No.4.11 and preparation of green belt details are given in Table No.4.11.

Table 4.11: Greenbelt development plan

Year	No.of trees proposed to be planted	Survival %	Name of the species	No. of trees expected to be grown
I	870	80%	Neem, Pongamia	700

Table 4.12: Preparation of green belt details

ACTIVITY	YEAR					RATE	AMOUNT (Rs.)
	I						
Plantation (In Nos.)	870					@100 Rs Per sapling	87,000/-
Barbed Wire Fencing (In Mtrs) 450 Mtrs	1,35,000	-	-	-	-	@300 Rs Per Meter	1,35,000/-
Garland drain (In Mtrs) 350 Mtrs	1,05,000	-	-	-	-	@300 Rs Per Meter	1,05,000/-
TOTAL							3,27,000/-

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 to Plant in the Greenbelt

SI.No	Name of the plant (Botanical)	Family Name	Common Name	Habit
1	*Azadirachta indica*	Meliaceae	Neem, Vembu	Tree
2	*Albiziafalcatoria*	Fabaceae	Tamarind, Puliyamaram	Tree
3	*Polyalthialongifolia*	Annonaceae	Kattumaram	Tree
4	*Borassus Flabellifer*	Arecaceae	Palmyra Palm	Tree

Table 4.14: Ecological Impact Assessments

SI.No	Attributes	Assessment
1	Impact of mining activity on agricultural land nearby the proposed project site.	Agricultural land is located away from the proposed project site. There are no impacts on the agricultural land & Horticulture. Kindly refer to the conclusion.
2	Activities of the project affect the breeding/nesting sites of birds and animals	No breeding and nesting site was identified in the mining lease site. The fauna sighted mostly migrated from the buffer area.
3	Located near an area populated by rare or endangered species	No Endangered, Critically Endangered, or vulnerable species were sighted in the core mining lease area.
4	Proximity to national park/wildlife sanctuary/reserve forest /mangroves/ coastline/estuary/sea	The following Reserved forest is situated within 10km radius. Noganoor R.F. 2.2 km west, Aiyur Extn R.F. 2 km east, and Denkanikottai R.F. 3.6 km on the North side. There is no Eco Sensitive zone/ Critically polluted area/ HACA/CRZ located within 10 km radius of the area.
5	The proposed project restricts access to waterholes for wildlife	'No '
6	Proposed mining project impact surface water quality that also provides water to wildlife	'No 'scheduled or threatened wildlife animals sighted regularly core in the core area.
7	Proposed mining project increase siltation that would affect nearby biodiversity areas.	Surface runoff management such as drains is constructed properly so there will be no siltation effect in the nearby mining area.
8	Risk of fall/slip or cause death to wild animals due to project activities.	'No'
9	The project release effluents into a water body that also supplies water to a wildlife.	No water body near to core zone so the chances of water becoming polluted is low.
10	Mining projects affect the forest-based livelihood/ any specific forest product on which local livelihood depended.	'No'
11	The project likely to affect migration routes.	'No 'migration route observed during the monitoring period.
12	The project is likely to affect the flora of an area, which have medicinal value	'No'
13	Forestland is to be diverted, has carbon high sequestration.	'No 'There was no forest land diverted.

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

4.6   Socio Economic

The socio-economic impacts of mining are many. Impacts of a mine project may be positive or Negative. The adverse impacts attribute to physical displacement due to land acquisition, which is followed by loss of livelihood, mental agony, changes in social structure, and risk to food security etc., People are also directly affected due to pollution. Social Impact Assessment (SIA) is a process of analysis, monitoring and managing the social consequences of a project. Study on Socio-economic status has already been carried out using primary socio-economic survey for generating the baseline data of Socio-economic status.

4.6.1 Anticipated Impact

From the primary Socio-economic survey & through secondary data available from established literature and census data 2011, it is found that there would be positive impact on Socio-economic condition of the nearby area. There is no habitation within 300 m of the proposed mining lease area. Therefore, no major impact is anticipated on the nearby habitation during the entire life of the mine.

4.6.2 Mitigation Measures

- Good maintenance practices will be adopted for plant 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 will 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
- 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)
- 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
- Ear muffs provided will be capable of reducing sound levels at the ear to at least 85 dB(A)
- Periodic medical hearing checks will be performed on workers exposed to high noise levels

4.7.3 Physical Hazards

The following measures are proposed for control of physical hazards
- Specific personnel training on work-site safety management will be taken up;
- Work site assessment will be done by rock scaling of each surface exposed to workers to prevent accidental rock falling and / or landslide, especially after blasting activities;
- Natural barriers, temporary railing, or specific danger signals will be provided along rock benches or other pit areas where work is performed at heights more than 2m from ground level;
- Maintenance of yards, roads and footpaths, providing sufficient water drainage and preventing slippery surfaces with an all-weather surface, such as coarse gravel will be taken up

4.7.4 Occupational Health Survey

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

- General physical tests
- Audiometric tests, Full chest, X-ray, Lung function tests, Spirometric tests
- Periodic medical examination – yearly, Lung function/ Silicosis 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.

4.7.5 Post COVID Health Management Plan for Workers

The following Health Management plan will be strictly implemented in the Mines, Mine officials like Mines Manager and Foreman will be Act as a Controller of Health Management of the workers.
- Temperature will be checked to all the workers while arriving to work on each day
- If any persons/employees have fever of 100.4 or higher, chills, shortness of breath will be sent to Hospital and the persons will be employed after fourteen days
- All the persons inside the mine area instructed to wear fabric or disposable pleated masks covering Nose and Mouth
- Social distancing of 6 feet will be maintained all the time
- Temporary Hand washing points will be installed near the working places, workers will be initiated to Wash hands frequently with soap and water for a minimum of 20 seconds and advised to avoid touching face. This is an essential contagion-control mechanism

4.7.6 Plastic Waste Management

As per the Tamil Nadu Government Order (Ms) No. 84 Environment and Forest (EC.2) Department Dated 25.06.2018 following kind of plastics will not be used in the mines area.

- Use and throw away plastics such as carry bags, plastic bags, plastic sheets used for food wrapping, spreading, plastic plates, plastic coated tea cups and plastic tumblers will not be used in the mines

Action Plan:

Action Plan	Responsibility
All the employees will be checked for plastics before entering the quarry.	Watchman
Every week or month a meeting of workers under the chairmanship of the mine manager will be held to explain the disadvantages of plastic use.	Mine Foreman & Mining Mate
They will be advised not to bring plastic materials into the mines and those who are involved in such activities will not be allowed to work on the day of the snow.	Mines Manager
The miners will be provided with areca nut plates and mugs to help reduce the use of plastics.	Mines owner

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

Objective of Mine closure

- 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.

4.8.1 Mine Closure criteria

The criteria involved in mine closure are discussed below:

4.8.1.1 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.,

4.8.1.2 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.

4.8.1.3 Biological Stability

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

A vegetation cover over the disturbed site is usually one of the main objectives of the rehabilitation programme, as vegetation cover is the best long-term method of stabilizing the site. When the major earthwork components of the rehabilitation programme have been completed, the process of establishing a stable vegetation community begins. For re-vegetation, management of soil nutrient levels is an important consideration. Additions of nutrients are useful under three situations.

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

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

5. ANALYSIS OF ALTERNATIVES (TECHNOLOGY AND SITE)

5.1   Introduction

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

The quarrying operation like drilling, blasting, excavation, loading & transportation are being carried out. The site has been selected based on geological investigation and exploration as below:

- Transportation facility for materials & manpower
- Overall impact on environment and mitigation feasibility
- Socio – economic background.

Enough infrastructures exists and lesser resources are required to be deployed. Since, any further construction for infrastructure is not required and hence does not affect the environment considerably. The mineral deposits are site specific in nature; hence question of seeking alternate site does not arise for this project.

6. ENVIRONMENTAL MONITORING PROGRAMME

6.0   General

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

The main objective of environmental monitoring is to ensure that the obtained results in respect of environmental attributes and prevailing conditions during operation stage are in conformity with the prediction during the planning stage. In case of substantial deviation from the earlier prediction of results, this forms as base data to identify the cause and suggest remedial measures. Environmental monitoring is mandatory to meet compliance of statutory provisions under the Environment (Protection) Act, 1986, relevant conditions regarding monitoring covered under EC orders issued by the SEIAA as well as the conditions set forth under the order issued by Tamil Nadu Pollution Control Board while granting CTE/CTO.

6.1   Methodology of Monitoring Mechanism

Implementation of EMP and periodic monitoring will be carried out by Project Proponent. A comprehensive monitoring mechanism has been devised for monitoring of impacts due to proposed 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 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 Mine Management.

An Environment monitoring cell (EMC) will be constituted to monitor the implementation of EMP and other environmental protection measures.
The responsibilities of this cell will be:
- Implementation of pollution control measures
- Monitoring programme implementation
- Post-plantation care
- To check the efficiency of pollution control measures taken
- Any other activity as may be related to environment
- Seeking expert's advice when needed

The environmental monitoring cell will co-ordinate all monitoring programs at site and data thus generated will be regularly furnished to the State regulatory agencies as compliance status reports.
The sampling and analysis report of the monitored environmental attributes will be submitted to the Tamil Nadu Pollution Control Board (TNPCB) at a frequency of half-yearly and yearly. 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).

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

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

6.3   Monitoring Schedule and Frequency

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

The environmental monitoring will be conducted in the mine operations as follows:
- Air quality;
- Water and wastewater quality;
- Noise levels;
- Soil Quality; and
- Greenbelt Development

The details of monitoring is detailed in Table 6.2

Table 6.2: Monitoring Schedule for the Project Area

S. No.	Environment Attributes	Location	Monitoring		Parameters
			Duration	Frequency	
1	Air Quality	2 Locations (1 Core & 1 Buffer)	24 hours	Once in 6 months	Fugitive Dust, PM2.5, PM10, SO2 and NOx.
2	Meteorology	At mine site before start of Air Quality Monitoring & IMD Secondary Data	Hourly / Daily	Continuous online monitoring	Wind speed, Wind direction, Temperature, Relative humidity and Rainfall
3	Water Quality Monitoring	2 Locations (1SW & 1 GW)	-	Once in 6 months	Parameters specified under IS:10500, 1993 & CPCB Norms
4	Hydrology	Water level in open wells in buffer zone around 1 km at specific wells	-	Once in 6 months	Depth in bgl
5	Noise	2 Locations (1 Core & 1 Buffer)	Hourly – 1 Day	Once in 6 months	Leq, Lmax, Lmin, Leq Day & Leq Night
6	Vibration	At the nearest habitation (in case of reporting)	–	During blasting Operation	Peak Particle Velocity
7	Soil	2 Locations (1 Core & 1 Buffer)	–	Once in six months	Physical and Chemical Characteristics
8	Greenbelt	Within the Project Area	Daily	Monthly	Maintenance

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

6.4   Budgetary Provision for EMP

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

The proposed capital cost for Environmental Monitoring Programme for M/s. Globle Enterprises is Rs. 3,25,000 for conducting Air Quality, Meteorology, Water Quality, Hydrology, Soil Quality, Noise Quality Vibration Study, Greenbelt.

Table 6.3: Environmental Monitoring Budget

Sl.No.	Parameter	Capital Cost	Recurring Cost per annum
1	Air Quality	-	Rs 25,000/-
2	Meteorology	-	Rs 5,000/-
3	Water Quality	-	Rs 15,000/-
4	Hydrology	-	Rs 25,000/-
5	Soil Quality	-	Rs 25,000/-
6	Noise Quality	-	Rs 25,000/-
7	Vibration Study	-	Rs 1,50,000/-
8	Greenbelt	Rs 40,000/-	Rs 55,000/-
	Total	**Rs 40,000/-**	**Rs 3,25,000**

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 level and Head of Organization for taking necessary corrective measures. The monitoring data will be submitted to Tamil Nadu State Pollution Control Board in the Compliance to CTO Conditions & environmental audit statements every year to MoEF & CC and Half-Yearly Compliance Monitoring Reports to MoEF & CC Regional Office and SEIAA.

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

Besides the Mines Manager/Agent will submit the periodical reports to
- Director of mines safety,
- Labour enforcement officer,
- Controller of explosives as per the norms stipulated by the department.

CHAPTER – 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 are incorporated after Public Hearing.

- Public Consultation
- Risk Assessment
- Disaster Management Plan

7.1   Public Consultation:

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

7.2   Risk Assessment

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

The whole quarry operation will be carried out under the direction of a qualified Competent Mine manager holding certificate of competency to manage a metalliferous mine granted by the DGMS, Dhanbad. 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 mining & allied activities with detailed analysis of causes and control measures for the mine is given in below Table 7.4.

Table 7.4 Risk Assessment

S. No	Risk factors	Causes of risk	Control measures
1	Accidents due to explosives and heavy mining machineries	Improper handling and unsafe working practice	- All safety precautions and provisions of Mine Act, 1952, Metalliferrous Mines Regulation, 1961 and Mines Rules, 1955 will be strictly followed during all mining operations; - Entry of unauthorized persons will be prohibited; - Fire fighting and first-aid provisions in the mine office complex and mining area; - Provisions of all the safety appliances such as safety boot, helmets, goggles etc. will be made available to the employees and regular check for their use - Working of quarry, as per approved plans and regularly updating the mine plans; - Cleaning of mine faces shall be daily done in order to avoid any overhang or undercut; - Handling of explosives, charging and firing shall be carried out by competent persons only under the supervision of a Mine Manager; - Maintenance and testing of all mining equipment as per manufacturer guidelines.

2	OB / Waste Dump	Sliding of benches Height and slope of the benches Drainage facilities	- Dumps benches are maintained with proper 3 m height and 37° slope to prevent slope failure and terraced. - Dumping in the waste dump in layers and dozing daily. - Vegetation of the top and slopes of the dump to prevent erosion and providing water drainage channels - Providing proper drainage facilities in mine and dump area. - Construction of retaining wall around dump area to stop sliding of material. - Garland drain to be made around OB dump area
3	Drilling& Wire Saw Cutting	Due to improper and unsafe practices Due to high pressure of compressed air, hoses may burst Drill Rod may break	- Safe operating procedure established for drilling (SOP) will be strictly followed. - Only trained operators will be deployed. - No drilling shall be commenced in an area where shots have been fired until the blaster/blasting foreman has made a thorough Examination of all places, - Drill& Wire saw operator shall examine the drilling and wire saw equipment and satisfy himself - Drilling & cutting operations shall not be carried on simultaneously on the benches at places directly one above the other. - Periodical preventive maintenance and replacement of worn out accessories in the compressor and drill equipment and wire saw equipment as per operator manual. - All drills and wire saw unit shall be provided with wet drilling and cutting arrangement and it shall be maintained in efficient working in condition. - Operator shall regularly use all the personal protective equipment.
4	Blasting	Fly rock, ground vibration, Noise and dust. Improper charging, stemming & Blasting/ fining of blast holes Vibration due to movement of vehicles	- The maximum charge per delay and by optimum blast hole pattern, vibrations will be controlled within the permissible limit and blast can be conducted safely. - SOP for Charging, Stemming & Blasting/Firing of Blast Holes will be followed by blasting crew during initial stage of operation - Shots are fired during daytime only. - All holes charged on any one day shall be fired on the same day. - The danger zone is and will be distinctly demarcated (by means of red flags)
5	Transportation	Potential hazards and unsafe workings contributing to accident and injuries Overloading of material While reversal & overtaking of vehicle	Before commencing work, drivers personally check the dumper/truck/tipper for oil(s), fuel and water levels, tyre inflation, general cleanliness and inspect the brakes, steering system, warning devices including automatically operated audio visual reversing alarm, rear view mirrors , side indicator lights etc., are in good condition.

		Operator of truck leaving his cabin when it is loaded.	▪ Not allow any unauthorized person to ride on the vehicle nor allow any unauthorized person to operate the vehicle. ▪ Concave mirrors should be kept at all corners ▪ All vehicles should be fitted with reverse horn with one spotter at every tipping point ▪ Loading according to the vehicle capacity ▪ Periodical maintenance of vehicles as per operator manual
6	Natural calamities	Unexpected happenings	▪ Escape Routes will be provided to prevent inundation of storm water ▪ Garland drains will be provided at the toe of dump ▪ Fire Extinguishers & Sand Buckets
7	Failure of Mine Benches and Pit Slope	Slope geometry, Geological structure	Ultimate or over all pit slope shall be below 60° and each bench height shall be 5m height.

7.3   Disaster Management Plan

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:

- Effect the 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

It is to optimize operational efficiency to rescue rehabilitation and render medical help and to restore normalcy. To tackle the consequences of a major emergency inside the mines or immediate vicinity of the mines, a Disaster Management Plan must be formulated, and this planned emergency document is called "Disaster Management Plan".

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 below –
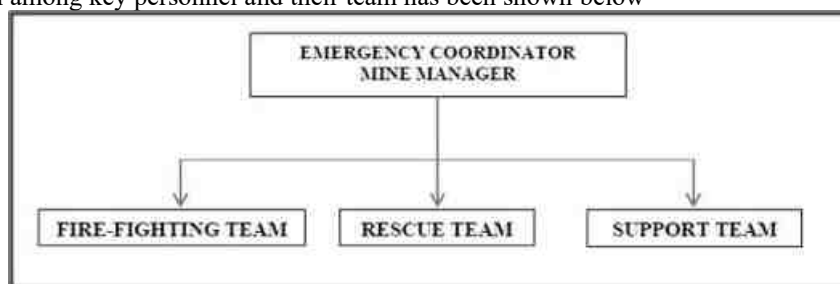
The emergency organization shall be headed by emergency coordinator who will be qualified competent mine manager. In his absence senior most people available at the mine shall be emergency coordinator till arrival of mine manager. There would be three teams for taking care of emergency situations – Fire-Fighting Team, Rescue Team and Support Team. The proposed composition of the teams is given in Table 7.5.

Table 7.5: Proposed Teams to Deal with Emergency Situation

Designation	Qualification
Fire-Fighting Team	
Team Leader	Mines Manager
Team Member	Mines Foreman
Team Member	Mining Mate
Rescue Team	
Team Leader	Mines Manager
Team Member	Environment Officer
Team Member	Mining Foreman
Support Team	
Team Leader	Mines Manager
Assistant Team Leader	Environment Officer
Team Member	Mining Mate
Security Team	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 neighboring industrial units/mines.

Roles and responsibilities of emergency team –

(a) Emergency coordinator (EC)

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

(b) Incident controller (IC)

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

(c) Communication and advisory team

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

(d) Roll call coordinator

The Mine Foreman shall be Rollcall 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 7.6: Proposed Type of Fire Extinguishers

Location	Type of Fire Extinguishers
Electrical Equipment"s	CO_2 type, foam type, dry chemical powder type
Fuel Storage Area	CO_2 type, foam type, dry chemical powder type, Sand bucket
Office Area	Dry chemical type, foam type
Location	Type of Fire Extinguishers

Alarm system to be followed during disaster –
On receiving the message of disaster from Site Controller, fire-fighting team, the mine control room attendant will sound siren wailing for 5 minutes. Incident controller will arrange to broadcast disaster message through public address system.

On receiving the message of "Emergency Over" from Incident Controller the emergency control room attendant will give "All Clear Signal", by sounding alarm straight for 2 minutes.

The features of alarm system will be explained to one and all to avoid panic or misunderstanding during disaster.

In order to prevent or take care of hazard / disasters if any the following control measures have been adopted.

- All safety precautions and provisions of Metalliferous Mines Regulations (MMR), 1961 is strictly followed during all mining operations.
- Observance of all safety precautions for blasting and storage of explosives as per MMR 1961.
- Entry of unauthorized persons into mine & allied areas is completely prohibited.
- Firefighting 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.
- Checking of blasting area for any un-blasted hole or material.
- 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

There are 1 existing quarries within a radius of 500 meters from the proposed project area. The list of quarries is as below –

Table 7.7: List of Quarries within 500 Meter Radius from this Proposal

CODE	Name of the Owner	S.F. Nos	Extent	Status
PROPOSED QUARRIES				
P1	**M/s.Globle Enterprises** (Black Granite) Varaganapalli Village, Nagamangalam Post, Denkanikottai Taluk, Krishnagiri District – 635 113.	6/4A	**1.44.5**	Obtained ToR vide **Lr.No. SEIAA-TN/F.No.9215/SEAC/TOR-1246/2022 Dated: 05.09.2022**
Nearby Proposed Quarries				
P2	**M/s.Globle Enterprises** (Black Granite) Varaganapalli Village, Nagamangalam Post, Denkanikottai Taluk, Krishnagiri District – 635 113.	6/4B, 7/1B(Part), 7/1C(Part), 7/2, 12/1,12/2A(Part), 13/1A1B (Part), 13/1B(Part)	3.93.50	Public Hearing Conducted on 10.08.2021
P3	**M/s.Globle Enterprises** (Multi-colour granite) Varaganapalli Village, Nagamangalam Post, Denkanikottai Taluk, Krishnagiri District – 635 113.	7/1A2,7/1C(Part), 13/1A1B(Part), & 13/1A2	2.27.5	Public Hearing Conducted on 10.08.2021
		Total	**7.65.5**	
EXISTING QUARRY				
CODE	Name of the Owner	S.F. Nos	Extent	Period of Lease
E1	**M/S.TAMIN**	14/1, 273/3	3.86.0	7.12.2005 to 06.12.2035
	Total		**3.86.0 Ha**	
TOTAL CLUSTER EXTENT			**11.51.5 Ha**	

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

Table 7.8: Salient Features of Proposed Projects

SALIENT FEATURES OF PROPOSAL "P1"	
Name of the Quarry	Black Granite quarry belongs to M/s.Globle Enterprises -P1
Lease period	20 years
Mining Plan Period	5 Years
Life of the Mine	20 years
Extent	1.44.5 Ha
Existing Depth	NIL
Previous lease particulars	It is a Patta land registered name of the company vide patta no. 1694
Proposed Depth for five years plan period	40m (2m Topsoil + 3m Weathered Rock +35m Black Granite)
Ultimate Depth	117m(L) x 83m (W) x 40m (D)
Toposheet No	57 H/15
Latitude between	$12^0 27'34.7635"$ N to $12^0 27'39.2453"$ N
Longitude between	$77^0 50'04.8129"$ E to $77^0 50'09.9792"$ E
Topography	Elevated terrain with gradient towards Northwest side. The highest elevation is 876-894m AMSL
Machinery proposed	Jackhammer	6
	Compressor	2

	Hydraulic drilling machine	-
	Hydraulic/Crawler crane	1
	Mobile crane	-
	Excavator	1
	Tipper	2
	Diesel Generator	1
	Diamond wire saw	1
	Water pump	-
	Water tanker	-
Proposed manpower deployment		35
Project cost		Rs.2,32,04,000/-
EMP Cost		Rs. 3,80,800/-
CER cost		Rs. 5,00,000/-

SALIENT FEATURES OF PROPOSAL "P2"		
Name of the Mine	Black Granite quarry belongs to M/s.Globle Enterprises.	
Survey Nos	6/4B, 7/1B, 1C(Part), 7/21, 12/1, 2A, 13/1A1B(Part) & 13/1B	
Land Type	Patta land vide Patta.No: 1314	
Extent	3.93.5Ha	
Mining Plan Period / Lease Period	20 years	
Ultimate Pit Dimension	Pit-I	194m (L) x 77m(W) x 31(D)
	Pit-II	228m (L) x 83m(W) x 31(D)
Latitude between	12°27'33.32''N to12°27'37.92''N	
Longitude between	77°50'09.37''E to 77°50'25.41''E	
Highest Elevation	872m to 882m AMSL	
Machinery Proposed	Jack Hammer	6
	Compressor	2
	Diamond wire saw	1
	Diesel Generator	1
	Crawler Crane	1
	Excavator	2
	Tippers	2
Proposed Blasting Method	Water tanker	
Manpower Proposed	35	
Total Project Cost	Rs.3,07,65,000/-	

SALIENT FEATURES OF PROPOSAL "P3"		
Name of the Mine	Multicolour Granite quarry belongs to M/s.Globle Enterprises.	
Survey Nos	7/1A2, 1C(P), 13/1A1B(P) & 13/1A2	
Land Type	Patta land vide Patta.No: 1314	
Extent	2.27.5Ha	
Mining Plan Period / Lease Period	20 years	
Ultimate Pit Dimension	Pit-I	175m (L) x 31m(W) x 18(D)
	Pit-II	82m (L) x 102m(W) x 38(D)
Latitude between	12°27'36.14''N to12°27'42.14''N	
Longitude between	77°50'15.17''E to 77°50'22.78''E	
Highest Elevation	872m to 866m AMSL	
Machinery Proposed	Jack Hammer	10
	Compressor	3
	Hydraulic drilling Machine	2
	Tippers	2
	Hydraulic Crane	2
	Mobile Crane	1

	Excavator	2
	Tippers	2
	Generator	2
	Wire saw	4
	Water pump	2
	Water tanker	1
Proposed Blasting Method	Controlled blasting	
Manpower Proposed	35	
Total Project Cost	Rs.2,85,87,500/-	

Table 7.9: Salient Features of Existing Quarry "E1"

SALIENT FEATURES OF PROPOSAL "E1"		
Name of the Mine	**M/S.TAMIN**	
Survey Nos	14/1, 273/3	
Extent	3.86.0 ha	
Mining Plan Period / Lease Period	20 years	
Highest Elevation	875m AMSL	
Machinery Proposed	Jack Hammer	8
	Compressor	3
	Hydraulic Excavator	1
	Tippers	3
Proposed Blasting Method	Controlled blasting	
Manpower Proposed	40	
Total Project Cost	Rs.3,48,51,000/-	

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 Movement of HEMM and operating of machineries in the cluster.

Air Environment –

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

Table 7.10: Cumulative Production Load of Granite

Quarry	Mineable Reserves ROM In m³	Mineable Reserves of Granite	Proposed production for five year period	Production of ROM Per Day	Production of Granite Per day in m³	Weathered rock per day in m³	Topsoil per day in m³	Number of Lorry loads per day (ROM)
P1	69,300	20,790	17,100	46	11	16	20	1
P2	267315	40097	11719	52	8	-		9
P3	148460	44538	20100	45	13	26	15	8
E1	284350	48158	21150	48	16	-	-	11
Total	**7,69,425**	**1,53,583**	**70,069**	**191**	**48**	**42**	**35**	**29**

Source: Approved Mining plan of Respective mines

On a cumulative basis considering all the 4 quarries (1 Existing and 3 Proposed) it can be seen that the overall production of Granite ROM per day is 191 m³ and overall production of Granite is 48 m³ per day (recovery percentage is vary from one quarry to another), No of Lorry loads per day is 29.

Based on the above production quantities the emissions due to various activities in all the 4 mines includes various activities like ground preparation, excavation, handling and transport of ore. These activities have been analysed systematically basing on USEPA-Emission Estimation Technique Manual, for Mining AP-42, to arrive at possible emissions to the atmosphere and estimated emissions are given in Table 7.11.

Table 7.11: Emission Estimation from Quarries within 500 Meter Radius

	Activity	Source type	Value	Unit
Emission Estimation for quarry P1				
	Activity	Source type	Value	Unit
Estimated Emission Rate for PM_{10}	Drilling	Point Source	0.037533756	g/s
	Blasting	Point Source	0.000018019	g/s
	Mineral Loading	Point Source	0.034175679	g/s
	Haul Road	Line Source	0.002483296	g/s/m
	Overall Mine	Area Source	0.044251808	g/s
Estimated Emission rate for SO_2	Overall Mine	Area Source	7.00596E-05	g/s
Estimated Emission rate for NO_X	Overall Mine	Area Source	0.000002328	g/s
Emission Estimation for quarry P2				
	Activity	Source type	Value	Unit
Estimated Emission Rate for PM_{10}	Drilling	Point Source	0.059616809	g/s
	Blasting	Point Source	0.000182162	g/s
	Mineral Loading	Point Source	0.037701614	g/s
	Haul Road	Line Source	0.002485194	g/s/m
	Overall Mine	Area Source	0.066569210	g/s
Estimated Emission rate for SO_2	Overall Mine	Area Source	0.000221867	g/s
Estimated Emission rate for NO_X	Overall Mine	Area Source	0.000018250	g/s
Emission Estimation for quarry P3				
	Activity	Source type	Value	Unit
Estimated Emission Rate for PM_{10}	Drilling	Point Source	0.039574209	g/s
	Blasting	Point Source	0.000023479	g/s
	Mineral Loading	Point Source	0.036405551	g/s
	Haul Road	Line Source	0.002484298	g/s/m
	Overall Mine	Area Source	0.053236094	g/s

Estimated Emission rate for SO_2	Overall Mine	Area Source	0.000132379	g/s
Estimated Emission rate for NO_X	Overall Mine	Area Source	0.000006631	g/s
Emission Estimation for quarry E1				
	Activity	**Source type**	**Value**	**Unit**
Estimated Emission Rate for PM_{10}	Drilling	Point Source	0.098470883	g/s
	Blasting	Point Source	0.002239513	g/s
	Mineral Loading	Point Source	0.043807076	g/s
	Haul Road	Line Source	0.002495772	g/s/m
	Overall Mine	Area Source	0.046473670	g/s
Estimated Emission rate for SO_2	Overall Mine	Area Source	0.000904247	g/s
Estimated Emission rate for NO_X	Overall Mine	Area Source	0.000031020	g/s

Source: Emission Calculations

Table 7.12: Incremental & Resultant GLC within Cluster

PM_{10} in $\mu g/m^3$	
Location	CORE
Background	45.0
Highest Incremental	14.79
Resultant	59.79
NAAQ standard	100 $\mu g/m^3$
$PM_{2.5}$ in $\mu g/m^3$	
Location	CORE
Background	23.2
Highest Incremental	8.91
Resultant	32.11
NAAQ standard	60 $\mu g/m^3$
SO_2 in $\mu g/m^3$	
Location	CORE
Background	6.55
Highest Incremental	2.48
Resultant	9.03
NAAQ standard	80 $\mu g/m^3$
NO_x in $\mu g/m^3$	
Location	CORE
Background	24.53
Incremental	9.58
Resultant	34.11
NAAQ standard	80 $\mu g/m^3$

Noise Environment –

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

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

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

Where:

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

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

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

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

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

Table 7.13: Predicted Noise Incremental Values from Cluster

Location ID	Background Value (Day) dB(A)	Incremental Value dB(A)	Total Predicted dB(A)	Residential Area Standards dB(A)
Habitation Near P1	43.0	46.8	48.3	
Habitation Near P2	43.2	48.1	49.3	55
Habitation Near P3	43.7	47.2	48.8	
Habitation Near E1	43.8	47.5	49.6	

The incremental noise level is found within the range of 46.8 – 48.1 dB (A) in Core 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.).

Socio Economic Environment –

The 4 mines shall create employment to 145 people and revenue will be created to government

<div align="center">Table 7.14: Socio Economic Benefits from 4 Quarries</div>

Location code	Employment	Project Cost	CER
P1	**35**	2,32,04,000/-	5,00,000
P2	35	3,07,65,000/-	5,00,000
P3	35	2,85,87,500/-	5,00,000
E1	40	3,48,51,000/-	5,00,000
Total	**145**	**11,74,07,500 /-**	**20,00,000/-**

A total of 145 people getting and will get employment from these cluster quarries. Allocation for Corporate Environment Responsibility (CER) shall be made as per Government of India, MoEF & CC Office Memorandum F.No.22-65/2017-IA.III, Dated: 01.05.2018 by all the mines

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 and the total CER amount from the 4 mines is Rs 20,00,000/-.

CHAPTER – 8: PROJECT BENEFITS

8.0   General

Black Granite Quarry of M/s. Globle Enterprises 20,790 m^3 of Granite @ 30% recovery (ROM 69,300m^3 for the entire period- Life of the mine) for Life of Mine of 20 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
- To meet out the demand supply gap of Granite and enhance the foreign exports

8.1   Employment Potential

It is proposed to provide employment to about 35 persons for carrying out mining operations and give preference to the local people in providing employment. In addition, there will be opportunity for indirect employment to many people in the form of contractual jobs, business opportunities, service facilities etc., the economic status of the local people will be enhanced due to mining project.

8.2   Socio-Economic Welfare Measures Proposed

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

8.3   Improvement in Physical Infrastructure

The proposed mine is located in Anumanthapuram 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.,

8.5.1 Corporate Social Responsibility

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

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

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

8.5.2 CSR Cost Estimation

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

8.5.3 Corporate Environment Responsibility–

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

As per para 6 (II) of the office memorandum, being a green field project & Capital Investment is ≤ 100 crores, M/s.Globle Enterprises shall contribute 2% of Capital Investment towards CER as per directions of EAC/SEAC. Capital cost is Rs.2,32,04,000/- and 2% of the same works out to Rs.4,64,080/-.

Table 8.1: CER – Action Plan

Activity	Beneficiaries	Total in Rs
Water Management – Construction of rainwater harvesting structures	Anumanthapuram village	
Sanitation – Maintenance & repairs of toilets in nearby schools	One school in Anumanthapuram village	5,00,000
Solar Power – Installation of Solar Street Lamps	Anumanthapuram village roads	
Total		**5,00,000**

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

CHAPTER – 9: ENVIRONMENTAL COST BENEFIT ANALYSIS

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

CHAPTER - 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 committed to conduct all its operations and activities in an environmentally responsible manner and to continually improve environmental performance.

The Proponent will –

- Allocate necessary resources to ensure the implementation of the environmental policy
- 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
- 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

10.1.1 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 the proposed quarry.

The said team will be responsible for:
- Analysis of the water and air samples collected through external laboratory
- Monitoring of the water/ waste water quality, air quality and solid waste generated
- 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
Designing vehicle wash-down system so that all washed water is captured and passed through grease and oil separators.	Mines Manager
Refueling will be carried out in a safe location, away from vehicle movement pathways	Mine Foreman & Mining Mate
No external dumping i.e., outside the project area	Mine Foreman
Greenbelt on dumps and its maintenance	Environment Officer
Garland drains with catch pits to be provided all around the project area to prevent run off affecting the surrounding lands.	Environment Officer
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
Thick plantation using native flora spices will be carried out on the backfilled area.	Mines Manager
There will be formation of a small surface water body in the mined-out area, which can be used for watering the greenbelt at the conceptual stages.	Environment Officer

10.3   Soil Management

10.3.1 Top Soil Management –

It is anticipated to remove 18,726m^3 of topsoil and preserve it to facilitate greenbelt development on the backfilled area during mine closure.

10.3.2 Overburden / Waste and Side Burden Management –

- It is anticipating to remove 48,510m^3 of waste (Granite waste@ 70%) which will temporarily store at predetermined places as per mining plan and will be backfilled during mine closure.

Table 10.2: Proposed Controls for Soil Management

Control	Responsibility
backfilling process during mine closure as per mining plan	Mines Manager
The dump slopes will be planted with deep rooting shrubs, grasses and creepers for stabilizing them	Environment Officer
Garland drains are to be paved around the dump area to arrest possible wash off in the rainy seasons	Mines Manager
Surface run-off from the surface dumps via garland drains will be diverted to the mine pits	Mine Foreman & Mining Mate
The backfilled area shall be covered with the soil for green belt development	Environment Officer
Design haul roads and other access roads with drainage systems to minimize concentration of flow and erosion risk	Environment Officer
keeping records of mitigation of erosion events, to improve on management techniques	Environment Officer
The overall slope of the dump is maintained at angle of repose not exceeding 37° from horizontal	Mines Manager
The retaining wall has to be made to arrest the waste dump spills	Mines Manager
A monitoring map with information including their GPS coordinates, erosion type, intensity, and the extent of the affected area, as well as existing control measures and assessment of their performance	Environment Officer
Empty sediment from sediment traps Maintain, repair or upgrade garland drain system	Environment Officer
Test soils for pH, EC, chloride, exchangeable cations, particle size and water holding capacity	Mines Manager

10.4   Water Management

Water is a key component in mining projects as it is required for, and affected by, mining activities. Effective water management is important for a variety of reasons including: uninterrupted operation of the mine, compliance with operational permissions and applicable legislation, and minimization of effects on the receiving environment.

This section focuses on actions for avoidance, mitigation, and control, as well as a water management monitoring program –

- To protect water-related resources, and avoid harmful impacts;
- To supply and retain water for mine operations;
- to Define water-related environmental control structures; and
- To manage water to ensure that any discharges are following the applicable water quality levels and guidelines.

Table 10.3: Proposed Controls for Water Environment

Control	Responsibility
To maximize the reuse of pit water for water supply	Mines Manager
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	Environment Officer
Natural drains/nallahs/brooklets outside the project area should not be disturbed at any point of mining operations Safety distance of 50m will be always maintained from the odai and oorani	Mines Manager
Mine pit water is used for dust suppression and greenbelt development utilization of mine pit water is optimal and effective ways	Environment Officer
Ensure there is no process effluent generation or discharge from the project area into water bodies	Environment Officer
Domestic sewage generated from the project area will be disposed in septic tank and soak pit system	Mines Manager
Fast growing grasses, small plants and bushes will be grown on the overburden dumps to control soil erosion and siltation	Mines Manager
Retention walls and garland drains will be constructed around toe of waste dumps to arrest silt wash off from dumps during monsoon	Environment Officer
Rainwater harvesting measures will be adopted in the project area and in nearby villages to maintain and enhance the ground water table of the area	Environment Officer
Regularly assess and modify Water Management Plan to adapt to changing work plans and site conditions	Environment Officer
Familiarize all site personnel with the purpose and content of the Water Management Plan, and their responsibilities in its implementation	Environment Officer
Water management and sediment control structures and facilities will be regularly inspected and maintained according to the monitoring schedules	Environment Officer
Monthly or after rainfall, inspection for performance of water management structures and systems	Environment Officer
Conduct ground water and surface water monitoring for parameters specified by State Pollution Control Board (SPCB)	Mines Manager

Source: Proposed by FAE‟s & EIA Coordinator

10.5   Air Quality Management

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

Table 10.4: Proposed Controls for Air Environment

Control	Responsibility
Generation of dust during excavation is minimized by water sprinkling on working face	Mines Manager
Develop thick Greenbelt with tall growing trees and thick foliage cover all along the boundary of the project (7.5 Meter Buffer Zone) to arrest dust spreading outside the project area and to be maintained. This plantation cover will also act as an acoustic barrier	Environment Officer
Daily maintenance of haul roads and daily water sprinkling to minimize the generation of fugitive dust due to movement of heavy earth moving machineries on it	Mines Manager
Handle the waste from the mine pit to respective dumps and backfilling during closure process, fugitive dust is anticipated. this fugitive emission can be controlled by well-maintained machineries, well maintained haul roads water sprinkling on haul roads twice a day. Besides it is also advised not to handle the waste during high windy periods	Mines Manager & Environment Officer
Wet drilling procedure /drills with dust extractor system to control dust generation during drilling at source itself to be implemented	Environment Officer
Plantation will be carried out on surface dumps, backfilled area and top benches of the mined out area	Environment Officer
Water reservoir will be developed in the left over mined out pit, which will serve as additional surface water resources for the nearby villages	Environment Officer
Maintenance as per operator manual of the equipment and machinery in the mines to minimizing air pollution and noise generation	Mines Manager
Over loading of trucks should be avoided	Mines Manager
All the mining equipment and trucks has been controlled with emission norms	Environment Officer
The village roads used for mineral transport will be maintained weekly and monthly basis to avoid fugitive dust emissions	Mines Manager
Dust mask are provided to the workers working in high dust generating areas and continue to provide the same	Mines Manager
Weekly and Monthly maintenance of deployed machineries, to reduce gaseous emission	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	Environment Officer
Monitor meteorological conditions (temperature, wind, rainfall)	Environment Office

Source: Proposed by FAE"s & EIA Coordinator

10.6   Noise Management

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

Table 10.5: Proposed Controls for Noise Environment

Control	Responsibility
A thick greenbelt to be developed all along the Buffer Zone (7.5 Meters) of the project area to attenuate the noise and the same will be maintained	Mines Manager
Plantation activities to be carried out on surface dumps and infrastructure facilities, these plantations will help in attenuating the noise levels	Environment Officer
Preventive maintenance of mining machinery and replacement of worn-out accessories to control noise generation	Mines Manager
Deployment of mining equipment with an inbuilt mechanism to reduce noise	Environment Officer
Provision of earmuff / ear plugs to workers working in noise prone zones in the mines	Environment Officer
Provision of effective silencers for mining machinery and transport vehicles	Environment Officer
Provision of sound proof AC operator cabins to HEMM	Environment Officer
Sharp drill bits are used to minimize noise from drilling	Environment Officer
Controlled blasting technologies are adopted by using delay detonators to minimize noise from blasting	Mines Manager
Annual ambient noise level monitoring to be carried out in the project area and in surrounding villages to access the impact due to the mining activities and the efficacy of the adopted noise control measures. Additional noise control measures will be adopted if required as per the observations during monitoring	Environment Officer
Undertake noise or vibration monitoring in response to a complaint (from any sensitive receptor).	Mines Manager
Change the burden and spacing by altering the drilling pattern and/or delay layout, or altering the hole inclination during initial stage of operation	Mines Manager
If a noise or vibration complaint is received, follow the complaints and inquiries	Environment Officer
Undertake noise or vibration monitoring half yearly	Environment Officer

Source: Proposed by FAE‟s & EIA Coordinator

10.7   Ground Vibration and Fly Rock Control

Table 10.6: Proposed Controls for Ground vibration & Fly rocks

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 during initial stage 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
Prior to blasting within 500 meters of the lease boundary, establish a fly rock exclusion zone within adjacent properties and check with landholders that the area is not occupied by humans, blast clearance zones are applied for all blasts.	Environment Officer
Undertake vibration monitoring	Environment Officer

Source: Proposed by FAE‟s & EIA Coordinator

10.8   **Biological Environment Management**

The mine management 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 mined out area, backfilled area, etc., the water reservoir will be developed in lower benches of the mined-out area at conceptual stage will be used for the maintenance of green belt after the closure of mine.

Following control measures are proposed for its management and will be the responsibility of the environment officer.

- Greenbelt development all along the safety barrier of the project area
- 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 constructing a sprinkler near the newly planted area.
- Year wise plantation should 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.

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.

10.8.1 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 10.7: Recommended Species to Plant in the Greenbelt

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

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 in mines are fugitive dust and noise. Safety of employees during mining operation and maintenance of mining equipment will be taken care as per Mines Act 1952 and Rule 29 of Mines Rules 1955. To avoid any adverse effect on the health of workers due to dust, noise and vibration sufficient measures have been provided.

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

The health status of workers in the mine shall be regularly monitored under an occupational surveillance program. Under this program, all the employees are subjected to a detail's 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 above tests keep upgrading the database of medical history of the employees.

10.9.2 Proposed Occupational Health and Safety Measures –

- Providing a clean working environment that is conductive to safety & health annually
- Employee involvement and commitment in the implementation of health and safety guidelines
- Implementing safety and health management system and assessing the effectiveness through periodic audits
- Setting of safety and health objectives based on comprehensive strategic plans and measure performance against these plans
- Provision of necessary standard personal protective equipment's (PPE)
- Ensuring that all employees at all levels receive appropriate training and are competent to carry out their duties and responsibilities.
- Provision of rest shelters for mine workers with amenities like drinking water, fans, toilets urinals, canteen etc.,
- Rotation of workers exposed to noisy areas.
- Daily dust suppression on haul roads to prevent fugitive dust emission into the air.
- First-aid facility at the mine office.

10.9.3 Health and Safety Training Programme

The company shall 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 an Environmental Consultants to provide periodical training to all the employ to carry out the mining operation in and eco-friendly manner.

Table 10.8: List of Periodical Trainings Proposed for employees

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

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

Budgetary Provision for Environmental Management –

Adequate budgetary provision has been made by the Company for execution of Environmental Management Plan. The Table 5.2 and 5.3 give overall investment on the environmental safeguards and recurring expenditure for successful monitoring and implementation of control measures (including reclamation).

Table 10.9: Capital and Recurring Cost of EMP

	Mitigation Measure	Provision for Implementation	Capital	Recurring
Air Environment	Compaction, gradation and drainage on both sides for Haulage Road	Rental Dozer & drainage construction on haul road @ Rs. 10,000/- per hectare; and yearly maintenance @ Rs. 10,000/- per hectare	14450	14450
	Fixed Water Sprinkling Arrangements + Water sprinkling by own water tankers	Fixed Sprinkler Installation and New Water Tanker Cost for Capital; and Water Sprinkling (thrice a day) Cost for recurring	800000	50000
	Muffle blasting – To control fly rocks during blasting	Blasting face will be covered with sand bags / steel mesh / old tyres / used conveyor belts	0	5000
	Wet drilling procedure / latest eco-friendly drill machine with separate dust extractor unit	Dust extractor @ Rs. 25,000/- per unit deployed as capital & @ Rs. 2500 per unit recurring cost for maintenance - 6 Units	150000	15000
	No overloading of trucks/tippers/tractors	Manual Monitoring through Security guard	0	5000
	Stone carrying trucks will be covered by tarpaulin	Monitoring if trucks will be covered by tarpaulin	0	10000
	Enforcing speed limits of 20 km/hr within ML area	Installation of Speed Governers @ Rs. 5000/- per Tipper/Dumper deployed - 2 Units	10000	500
	Regular monitoring of exhaust fumes as per RTO norms	Monitoring of Exhaust Fumes by Manual Labour	0	5000
	Regular sweeping and maintenance of approach roads for at least about 200 m from ML Area	Provision for 2 labours @ Rs.10,000/labour (Contractual) per Hectare	0	28900

	Installing wheel wash system near gate of quarry	Installation + Maintenance + Supervision	50000	20000
Noise Environment	Source of noise will be during operation of transportation vehicles, HEMM for this proper maintenance will be done at regular intervals.	Provision made in Operating Cost	0	0
	Oiling & greasing of Transport vehicles and HEMM at regular interval will be done	Provision made in Operating Cost	0	0
	Adequate silencers will be provided in all the diesel engines of vehicles.	Provision made in Operating Cost	0	0
	It will be ensured that all transportation vehicles carry a fitness certificate.	Provision made in Operating Cost	0	0
	Safety tools and implements that are required will be kept adequately near blasting site at the time of charging.	Provision made in OHS part	0	0
	Line Drilling all along the boundary to reduce the PPV from blasting activity and implementing controlled blasting.	Provision made in Operating Cost	0	0
	Proper warning system before blasting will be adopted and clearance of the area before blasting will be ensured.	Blowing Whistle by Mining Mate / Blaster / Compentent Person	0	0
	Provision for Portable blaster shed	Installation of Portable blasting shelter	50000	2000
	NONEL Blasting will be practiced to control Ground vibration and fly rocks	Rs. 30/- per 6 Tonnes of Blasted Material	0	37939
Waste Management	Waste management (Spent Oil, Grease etc.,)	Provision for domestic waste collection and disposal through authorized agency	5000	20000
		Installation of dust bins	5000	2000

	Bio toilets will be made available outside mine lease on the land of owner itself	Provision made in Operating Cost	0	0
Mine Closure	1. Progressive Closure Activity - Surface Runoff managent	Provision for garland drain @ Rs. 10,000/- per Hectare with maintenance of Rs. 5,000/- per annum	14450	5000
	2. Progressive Closure Activity Barbed Wire Fencing to quarry area will be provisioned.	Per Hectare fencing Cost @ Rs. 2,00,000/- with Maintenance of Rs 10,000/- per annum	289000	10000
	3. Progressive Closure Activity Green belt development - 500 trees per one hectare - Proposal for 870 Trees - (320 Inside Lease Area & 550 Outside Lease Area)	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant (capital) for plantation inside the lease area and @ 30 per plant maintenance (recurring)	64000	9600
		Avenue Plantation @ 300 per plant (capital) for plantation outside the lease area and @ 30 per plant maintenance (recurring)	165000	16500
	4. Implementation of Final Mine Closure Actity as per Approved Mining Plan on Last Year	Few activities already covered as progressive closure activities as greenbelt development, wire fencing, garland drain. *For Final Closure Activities 15% of the proposed closure cost will be spent during the final mine closure stage - Last Year	38250	0
	5. Contribution towards Green Fund. As per TNMMCR 1959, Rule 35 A	The Contribution towards Green Funds @ 10% of Seigniorage fee are indicated as part of EMP	1190673	0

		Budge and not necessarily implemented in the Project Site		
Implementation of EC, Mining Plan & DGMS Condition	Size 6' X 5' with blue background and white letters as mentioned in MoM Appendix II by the SEAC TN	Fixed Display Board at the Quarry Entrance as permanent structure mentioning Environmental Conditions	10000	1000
	Air, Water, Noise and Soil Quality Sampling every 6 Months for Compliance Report of EC Conditions	Submission of 2 Half Yearly Compliance - Lab Monitoring Report as per CPCB norms	0	50000
	Workers will be provided with Personal Protective Equipment's	Provision of PPE @ Rs. 4000/- per employee with recurring based on wear and tear (say, @ Rs. 1000/- per employee) - 35 Employees	140000	35000
	Health check up for workers will be provisioned	IME & PME Health check up @ Rs. 1000/- per employee	0	35000
	First aid facility will be provided	Provision of 2 Kits per Hectare @ Rs. 2000/-	0	2890
	Mine will have safety precaution signages, boards.	Provision for signages and boards made	10000	2000
	No parking will be provided on the transport routes. Separate provision on the south side of the hill will be made for vehicles /HEMMs. Flaggers will be deployed for traffic management	Parking area with shelter and flags @ Rs. 50,000/- per hectare project and Rs. 10,000/- as maintenance cost	72250	10000
	Installation of CCTV cameras in the mines and mine entrance	Camera 4 Nos, DVR, Monitor with internet facility	30000	5000

	Anna university Star rating	Star Rating @ Rs.1,00,000/-Per year	500000	
	Monitoring of Granite Quarrying Operation by Anna University	Mines Manager (1st Class / 2nd Class / Mine Foreman) under regulation 34 / 34 (6) of MMR, 1961 and Mining Mate under regulation 116 of MMR,1961 @ 40,000/- for Manager & @ 25,000/- for Foreman / Mate	0	780000
CER	As per MoEF &CC OM 22-65/2017-IA.III Dated 25.02.2021	Detailed Description in following slides and Budget allocation is included as per MoeEF & CC OM	500000	
	TOTAL		**2879150**	**1177779**

In order to implement the environmental protection measures, an amount of Rs. 28.79 lakhs as capital cost and recurring cost as Rs. 11.77 lakhs as recurring cost is proposed considering present market price considering present market scenario.

Year Wise Break Up	
1st Year	Rs. 4056929
2nd Year	Rs. 1236668
3rd Year	Rs. 1298502
4th Year	Rs. 1363427
5th Year	Rs. 1469848
Total	Rs. 94 lakhs

CHAPTER – 11: SUMMARY AND CONCLUSIONS

M/s. Globle Enterprises Black Granite Quarry (Cluster Extent 11.51.50 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 December 2022 to February 2023 for various environmental components so as to assess the anticipated impacts of the cluster quarry projects on the environment and suitable mitigation measures for likely adverse impacts due to the proposed project is suggested individually for the respective proposed project under Chapter 10.

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

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

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

Sustainable and modern mining leads us to see positive impact of mining operation and providing consistent employment for nearly 35 people directly in the cluster and indirectly around 100 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. Globle Enterprises Black Granite Quarry (Cluster Extent 11.51.50 ha).

12. DISCLOSURE OF CONSULTANTS

M/s. Globle Enterprises 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, Advaitha Ashram Road,
Alagapuram, Salem – 636 004
Tamil Nadu, India
Email: infogeoexploration@gmail.com
Web: www.gemssalem.com
Phone: 0427 2431989.

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

Sl.No.	Name of the expert	In house/ Empanelled	EIA Coordinator		FAE	
			Sector	Category	Sector	Category
1	**Dr. M. Ifthikhar Ahmed**	**In-house**	**1**	**A**	WP	B
					GEO	A
					SC	A
2	Dr. P. Thangaraju	In-house	-	-	HG	A
					GEO	A
3	Mr. A. Jagannathan	In-house	-	-	AP	B
					NV	A
					SHW	B
4	Mr. N. Senthilkumar	Empanelled	38	B	AQ	B
			28	B	WP	B
					RH	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	A
					RH	A

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

DECLARATION BY EXPERTS CONTRIBUTING TO THE EIA/EMP

Declaration by experts contributing to the EIA/EMP for Black Granite Quarry M/s. Globle Enterprises over an Extent of 1.44.5 ha in Anumanthapuram 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:
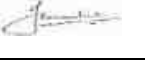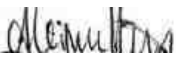
Period of Involvement: **Dec 2022 to till date**

Associated Team Member with EIA Coordinator:
1. **Mr.S.Nagamani**
2. **Mr. P.Viswanathan**
3. **Mr. Santhoshkumar**
4. **Mr. S. Ilavarasan**
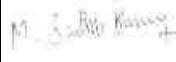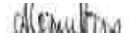
FUNCTIONAL AREA EXPERTS ENGAGED IN THE PROJECT

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

Sl.No.		Involvement	Name	Signature
		▪ Identification of species labelled as Rare, Endangered and threatened as per IUCN list. ▪ Impact of the project on flora and fauna. ▪ Suggesting species for greenbelt development.	Mr. Alagappa Moses	
7	RH	▪ Identification of hazards and hazardous substances ▪ Risks and consequences analysis ▪ Vulnerability assessment ▪ Preparation of Emergency Preparedness Plan ▪ Management plan for safety.	Mr. N. Senthilkumar	
			Mr. S. Pavel	
			Mr. J. R. Vikram Krishna	
8	LU	▪ Construction of Land use Map ▪ Impact of project on surrounding land use ▪ Suggesting post closure sustainable land use and mitigative measures.	Mr. A. Allimuthu	
9	NV	▪ Identify impacts due to noise and vibrations ▪ Suggesting appropriate mitigation measures for EMP.	Mr. A. Jagannathan	
10	AQ	▪ Identifying different source of emissions and propose predictions of incremental GLC using AERMOD. ▪ Recommending mitigations measures for EMP	Mr. N. Senthilkumar	
11	SC	▪ Assessing the impact on soil environment and proposed mitigation measures for soil conservation	Dr. M. Ifthikhar Ahmed	
12	SHW	▪ Identify source of generation of non-hazardous solid waste and hazardous waste. ▪ Suggesting measures for minimization of generation of waste and how it can be reused or recycled.	Mr. A. Jagannathan	
			Mr. J. R. Vikram Krishna	

LIST OF TEAM MEMBERS ENGAGED IN THIS PROJECT

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

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

DECLARATION BY THE HEAD OF THE ACCREDITED CONSULTANT ORGANIZATION

I, Dr. M. Ifthikhar Ahmed, Managing Partner, Geo Exploration and Mining Solutions, hereby, confirm that the above-mentioned Functional Area Experts and Team Members prepared the EIA/EMP for Black Granite Quarry M/s. Globle Enterprises over an Extent of 1.44.5 ha in Anumanthapuram 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/2225/RA0276 Dated: 20-02-2023**

Validity: **Valid till 06.08.2025**