

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

For

BLACK GRANITE QUARRY OVER AN EXTENT OF 166.92.0 Ha

At

Survey No: 917(P) & 921(P)

Villages: Mahimandalam

Taluk: Katpadi

District: Vellore

State: Tamil Nadu

By



M/s. Tamil Nadu Minerals Limited

**(Project termed under Schedule 1(a) Mining of Minerals 'B1' category as per EIA Notification
2006 and its Amendments thereafter and O.M issued vide F. No. L-11011/175/2018-IA-II (M),
dated: 12.12.2018)**

ToR : SEIAA-TN/F.No.10383/SEAC/1(a)/ToR-1620/2023 Dated: 06.11.2023

Baseline Period: March 2023- May 2023

Environmental Consultant

HUBERT ENVIRO CARE SYSTEMS (P) LTD, CHENNAI

NABET Certificate No & Validity: NABET/EIA/2224/SA0190, valid up to 27.07.2024.

NABL Certificate No: TC-5786 Dated: 30.04.2022 Valid Till 29.04.2024.

November 2023

ACKNOWLEDGEMENT

The following personnel are gratefully acknowledged for their fullest support in collection, compilation of needful data regarding the project and kind cooperation in fulfilling the Environmental Impact Assessment (EIA) report of Black Granite Quarry, over an extent of 166.92.0 Ha at S.F.917(P)&921(P) at Mahimandalam Village, Katpadi Taluk, Vellore District, Tamil Nadu State.

M/s Tamil Nadu Minerals Limited,

- Dr. E Ganesan- Deputy Manager (ML)

M/s Hubert Enviro Care System Private Limited

- 1) Dr. J R Moses (CEO)
- 2) Dr. Raj Kumar Samuel (Director- Technical)
- 3) Mr. Vamsee Krishna Navooru (Head-Consultancy& EIA Coordinator)

Declaration by the Project Proponent

I, E Ganesan, Deputy Manager (ML) of M/s Tamil Nadu Minerals Limited, declaration/ undertaking that owing the contents (information and data) of the EIA report preparation has been undertaken in the compliance with Terms of Reference (ToR) for the “**Black Granite Quarry over the extent of 166.92.0Hectares at S.F.917 (P) & 921(P) at Mahimandalam Village, Katpadi Taluk, Vellore District, Tamil Nadu State**”.and the information and content provided in the report are factually correct.

for Tamil Nadu Minerals Ltd,


**Authorised signatory
Deputy Manager (ML)
TAMIN - Chennai**

Declaration by the Head of the Accredited Consultant Organization

I, Dr.J.R. Moses, hereby, confirm that the below mentioned experts prepared the EIA/EMP report for “**Black Granite Quarry over the extent of 166.92.0 Hectares at S.F. 917(P)&921(P) at Mahimandalam Village, Katpadi Taluk, Vellore District, Tamil Nadu State**”. I also confirm that I shall be fully accountable for any misleading information mentioned in this statement.



Signature:

Date: 16.11.2023

Name: Dr. J. R. Moses

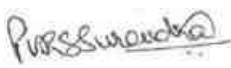
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Name of the EIA Consultant Organization: M/s. Hubert Enviro Care Systems (P) Ltd, Chennai

NABET Certificate No & Validity: NABET/EIA/2224/SA0190, valid up to 27.07.2024.

Declaration of Experts contributing to the EIA

I, hereby, certify that I was involved in the EIA report for the project titled “**Black Granite Quarry over the extent of 166.92.0 Hectares at S.F.917 (P) & 921(P) at Mahimandalam Village, Katpadi Taluk, Vellore District, and Tamil Nadu State**”. I was a part of the EIA team in the following capacity that developed the above EIA with the support of the following functional area experts.

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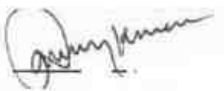


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Functional Area Experts (FAEs):

S. No.	Functional Areas	Name of the Expert	Period of Involvement	Signature
1.	WP	Mr. Vamsee Krishna Navooru	Period : March 2023 to May 2023 Task: Selection of water monitoring station, interpretation of analysis results, collection of inputs and development of EMP with respect to the wastewater treatment and produced water management.	
2.	SE	Mr. V. Dhivakar	Period : March 2023 to May 2023 Task: Site visit, Collection of secondary data, discussion with stake holders and Preparation of socio -economic status of	

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S. No.	Functional Areas	Name of the Expert	Period of Involvement	Signature
			the study area. Review of demographic characteristics, and supervision of baseline data collection. Collection and analysis of perception study carried out for the proposed project.	
3.	EB	Dr. Rajkumar Samuel	Period : March 2023 to May 2023 Task: Primary ecological survey and assessment of flora and fauna with respect to the core and buffer zone in study area and development of EMP. Collection of data from secondary sources and comparing with field data, compilation of Ecology and bio diversity data.	
4.	LU	Mr. Venkateswarlu	Period : March 2023 to May 2023 Task : Development of land use maps of study area using GIS / related tools, site visit for ground reality survey, finalization of land use maps and studying the ecologically sensitive details in the study area as per Topo map and Gazette notifications.	
5.	AP	Mr. Vamsee Krishna Navooru	Period: March 2023 to Upto EIA submission Task: Selection of air quality monitoring location, discussion with client on various air pollution control aspects, collection of inputs and development of EMP.	

S. No.	Functional Areas	Name of the Expert	Period of Involvement	Signature
6.	AQ	Dr. J R Moses	Period: January 2023-November 2023 Task: Collecting Micro metrological data from secondary sources and emission from the proposed DG with the modeling inputs data and development of EMP for the project.	
7.	N	Mr. Vamsee Krishna Navooru (N)	March 2023 to Upto EIA submission Task: Selection of noise sampling location for baseline monitoring, interpretation of results and development of EMP	
8.	GEO	B. Mallikarjuna Rao	Period : March 2023 to May 2023 Task: Studying the site topograpghy, existing available mineral resources. Studying ground profile.	
9.	HG	Mr. Mallikarjuna Rao	Period : March 2023 to May 2023 Task: Identification of ground water potential of the study area, Collection of secondary data and preparation of report with respect to Hydrogeological condition in and around the study area.	
10.	SC	Dr. B.C. Nagaraja	Period : March 2023 to May 2023 Task: Identification of soil quality monitoring locations for the project, study of soil nutrients in the study area., proposing the soil management practices during construction and operation phase of project, nutrients for green belt development	

S. No.	Functional Areas	Name of the Expert	Period of Involvement	Signature
11.	SHW	Mr. Vamsee Krishna Navooru	<p>Period: March 2023 to Upto EIA submission</p> <p>Task : Quantification of Municipal solid waste generation and management measures, quantification of hazardous waste generation with management measures.</p>	
12.	RH	Dr. J R Moses	<p>Period: May 2023- Upto EIA Submission</p> <p>Task: Identification of hazards materials, Fire accidents and & Disaster management plan along with the preparation of risk for the proposed project and development of EMP.</p>	

LU - Land Use

AP - Air Pollution monitoring, prevention and control

AQ - Meteorology, air quality modeling and prediction

WP - Water pollution monitoring, prevention and control

EB - Ecology and biodiversity

NV - Noise & Vibration

SE - Socio-economics

HG - Hydrology, ground water and water conservation

GEO - Geology

RH - Risk assessment and hazards management

SHW - Solid and hazardous waste management

SC - Soil Conservation

TABLE OF CONTENTS

TABLE OF CONTENTS	9
LIST OF TABLES	16
LIST OF FIGURE	18
LIST OF ANNEXURES.....	20
LIST OF ABBREVIATIONS.....	21
1 INTRODUCTION.....	22
1.1 Purpose of the report	22
1.2 Project back ground.....	22
1.3 Identification of Project & Project Proponent	23
1.3.1 Project.....	23
1.3.2 Project Proponent	24
1.4 Letter of Intent (LoI) & Mining Plan approval details.	24
1.5 Land Acquisition Status	25
1.6 Purpose and Status of the Report.....	25
1.7 Brief Description of the Project.....	25
1.7.1 Nature of the Project.....	25
1.7.2 Size of the Project.....	26
1.7.3 Location of the project.....	27
1.7.4 Connectivity of the Project.....	28
1.8 Need for the project and its importance to the country and or region	28
1.8.1 Demand –Supply Gap	29
1.8.2 Imports Vs Indigenous	29
1.8.3 Export possibility	29
1.8.4 Domestic/export markets.....	29
1.9 EIA Study.....	29
1.10 EIA Cost.....	29
1.11 Scope of the Study.....	30
1.11.1 Objectives of the Study	31
1.11.2 Methodology adopted for the Study	32
1.11.3 Applicable Regulatory Framework	32
1.11.4 Legal Complicability	32
1.11.5 Terms of Refernce Compliance	34
1.11.5.1 Standard Terms of Reference	52
1.11.5.2 In addition to the above the following shall be furnished:.....	69
1.11.5.3 Besides the above the below mentioned general points should also be followed:.....	71
2 PROJECT DESCRIPTION	72
2.1 Type of Project including interlinked and interdependent projects	72
2.2 Need of the Project	72
2.3 Location of the project.....	73
2.4 Nearest Human Settlement	87
2.5 Details of alternate sites considered	87
2.6 Size or Magnitude of operation	87

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

2.7	Granite Reserves.....	88
2.7.1	Proposed schedule for approval and implementation	99
2.8	Project Cost	99
2.9	Technology & Process Description	100
2.9.1	Technology	100
2.9.2	Method of mining-Open Cast Working.....	100
2.10	Process Description	101
2.10.1	Mining	101
2.10.2	Blasting.....	102
2.10.3	Loading & Transportation	103
2.10.4	Exploration	103
2.10.5	Storage of Explosives	104
2.10.6	Mine Drainage	104
2.10.7	Disposal of Waste.....	104
2.10.8	Top Soil Management	104
2.10.9	Stabilization of Dump	104
2.11	Requirements.....	104
2.11.1	Land Requirement and Land Use Planning	104
2.11.2	Water Requirement.....	105
2.11.3	Power & Fuel Requirement	105
2.11.4	List of Equipments	106
2.11.5	Man power Requirement	106
2.11.6	Solid Waste Management.....	106
2.11.7	Hazardous waste Management	107
2.12	Infrastructure facilities.....	107
2.13	Resource optimization/recycling and reuse envisaged in the project	107
2.14	Availability of water its source, Energy/power requirement and source	107
2.16.1	Land Environment	109
2.16.2	Air Environment.....	109
2.16.3	Sources of Air Pollution	110
2.16.3.1	Point Source/Single Source	110
2.16.3.2	Drilling	110
2.16.3.3	Loading.....	110
2.16.3.4	Unloading	110
2.16.3.5	Linesources.....	110
2.16.3.6	Transportation	110
2.16.3.7	Area sources/multiple sources	110
2.16.3.8	Instantaneous Sources	111
2.16.4	Noise & Vibration environment	111
2.16.4.1	Noise Levels	111
2.16.4.2	Vibration.....	112
2.16.5	Water Environment	113
2.16.5.1	Impact on Existing Water Resources.....	113
2.16.5.2	Impacts on Surface Water Bodies	113
2.16.5.3	Impact on Ground Water	114
2.16.6	Biological Environment.....	114
2.16.7	Impact on migratory paths for wildlife and forest blocks.....	114
2.16.8	Solid Waste Management.....	114
2.16.8.1	Impact due to Solid Waste Generation	114

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

2.16.8.2	Solid Waste Management.....	115
2.16.9	Afforestation.....	115
2.16.10	Assessment of New and untested technology for the risk of technological failure	115
3	DESCRIPTION OF ENVIRONMENT	116
3.1	Study area and Period.....	116
3.2	Description of the Study Area, components & Methodologies	116
3.3	Environmentally/Ecologically Sensitive areas.....	119
3.4	Physical Conditions of PIA district.....	125
PIA	District Profile	125
3.4.1	Climatic Conditions.....	125
3.4.2	Natural Resources of PIA District.....	126
3.4.2.1	Flora & Fauna.....	126
3.4.2.2	Forest Resources.....	126
3.4.2.3	Irrigation.....	126
3.4.2.4	Agricultural Resources	127
3.4.2.5	Mineral Resources	127
3.4.3	Land Use & Land Cover.....	129
3.4.3.1	Land use land cover for the study area	132
3.4.4	Topography	135
3.4.5	Geomorphology of PIA District	138
3.4.5.1	Geomorphology of the study area	138
3.4.6	Hydrogeology of PIA District Profile	141
3.4.10	Soils in PIA District	148
3.4.11	Natural Hazards in PIA District.....	150
3.5	Establishment of Baseline for valued environmental components	152
3.5.1	Air Environment.....	152
3.5.2	Meteorological Conditions	152
3.5.3	Meteorological Data Collection	152
3.5.4	General Meteorological Scenario based on IMD Data	152
3.5.5	Meteorological data during Study Period	154
3.5.6	Atmospheric Inversion	155
3.6	Ambient Air Quality.....	156
3.6.1	Ambient Air Quality Monitoring Stations.....	156
3.6.2	Ambient Air Quality Monitoring Techniques and Frequency	159
3.6.2.1	Results and Discussions	159
3.6.2.2	Observations.....	164
3.7	Noise Environment.....	164
3.7.1	Results and Discussions	164
3.7.1.1	Observations.....	166
3.8	Water Environment	168
3.8.1	Surface Water Resources.....	168
3.8.2	Surface Water Quality Assessment	168
3.8.2.1	Results and Discussions	173
3.8.3	Groundwater resources.....	174
3.8.3.1	Groundwater Quality	176
3.8.3.2	Results and Discussions	180
3.9	Soil Quality	180
3.9.1	Results and Discussions	184
3.10	Biological Environment.....	184

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

3.10.1.1	Methodology	184
3.10.1.2	Floral Study	184
3.10.1.3	Faunal Study.....	185
3.10.1.4	Floristic composition within the study area.....	185
3.10.2	Fauna	186
3.10.2.2	Mammals:	188
3.10.3	Butterfly	189
3.10.3.1	Impact on Biological Environment.....	190
3.10.3.2	Impact on Wildlife.....	190
3.10.3.3	Impact on Flora	190
3.10.3.4	Impact on Fauna	191
3.10.3.5	Conservation Plan.....	191
3.11	Socio Economic profile	192
3.11.1	Socio Economic Aspects	193
3.11.1.1	Population and Household Size.....	194
3.11.1.2	SexRatio	194
3.11.1.3	Scheduled Caste (SC).....	195
3.11.1.4	Education & Literacy	195
3.11.1.5	Health Facilities.....	195
3.11.3	Social Economic Profile of the study area.....	197
3.11.4	Employment and Livelihood within study area.....	202
3.11.5	Educational Infrastructure within study area	209
3.11.6	Health facility within the study area.....	215
3.11.7	Summary	215
4	ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES	217
4.1	Land Environment	217
4.1.2	Land Degradation	217
4.1.3	Mitigation Measures	218
4.2	Air Environment.....	218
4.2.1	Mitigation measures	219
4.2.2	Meteorological Data	220
4.2.3	AERMET Process	220
4.2.4	AERMOD Process	221
4.2.5	Emission Calculations	221
4.2.5.1	Emission dispersion models	222
4.2.6	Conclusion.....	227
4.2.7	Impacts due to Transportation	228
4.2.7.1	Mitigation Measures	229
4.3	Water Environment	229
4.3.3	Wastewater Generation	229
4.3.4	Mitigation Measures	229
4.3.4.1	Surface Water Pollution Control Measures	229
4.3.4.2	Ground Water Pollution Control Measures	230
4.3.4.3	Rain Water Harvesting	230
4.3.4.4	Drainage pattern and Hydrogeology.....	230
4.3.4.5	Mitigation measures	230
4.4	Impact of Noise / Vibrations & Mitigation Measures	231
4.4.3	Impact of Noise on Working Environment	231
4.4.4	Noise due to Drilling, Excavation and Transportation	231

4.4.5	Noise Due to Blasting.....	231
4.4.5.1	Mitigate Measures	232
4.4.6	Impact of Vibration	232
4.4.6.1	Mitigation Measures	232
4.5	Impact on Human Settlement	232
4.6	Biological Environment.....	233
4.6.3	Mining activities and their impact on biodiversity	233
4.6.4	Existing Biological Scenario	233
4.6.4.1	Mitigate Measures	234
4.6.5	Flora and Fauna	234
4.6.5.1	Impact.....	240
4.6.5.2	Mitigation measures	240
4.7	Green Belt Development	241
4.7.3	Impacts on Occupational Health due to project operations	241
4.7.3.1	Mitigate Measures for Occupational Health.....	242
4.7.3.2	Mitigate Measures for Safety Aspects.....	242
4.8	Impacts on Social Environment.....	243
4.8.3	Corporate Environmental Responsibility	243
5	ANALYSIS OF ALTERNATIVES	245
5.1	Alternate Technology	245
5.2	Method of mining.....	245
5.2.1	Opencast Method.....	245
5.3	Alternate Site.....	245
5.4	Connectivity	245
6	ENVIRONMENTAL MONITORING PROGRAMME	246
6.1	General	246
6.2	Monitoring Schedules for Various Environmental Parameters	246
6.2.3	Ambient Air Quality.....	247
6.2.4	Water Environment	247
6.2.5	Noise Measurement.....	247
6.3	Post Project Environmental Monitoring	248
6.3.3	Occupational Health and Safety	249
6.4	Environmental Monitoring Programme.....	249
7	ADDITIONAL STUDIES	251
7.1	Introduction	251
7.2	Risk Identification & Management	251
7.2.1	Introduction	251
7.2.2	Identification of Hazards in Open Cast Mining.....	252
7.2.2.1	Drilling	253
7.2.2.2	Blasting.....	253
7.2.2.3	Precautionary Measures to Avoid Accidents Due to Blasting.....	254
7.2.2.4	Overburden Handling.....	254
7.2.2.5	Heavy Machinery	254
7.2.2.6	Precautionary Measures to Prevent Accidents due to Trucks and Dumpers	254
7.2.2.7	Storage of Explosives	255
7.2.2.8	Safety Measures at the quarry	255
7.2.3	Disaster Management Plan	255
7.2.3.1	Emergency Services	256
7.2.3.2	Fire Protection System	256

7.2.3.3	Off-Site Emergency Plan.....	256
7.2.4	Mine Closure Plan	257
7.2.4.1	Progressive Mine Closure Plan	257
7.2.4.2	Water Quality Management	257
7.2.4.3	Mines Seepage Water	258
7.2.4.4	Air Quality Management.....	258
7.2.4.5	Solid waste Management.....	258
7.2.4.6	Stabilization of Dump	258
7.2.4.7	Mine Drainage.....	259
7.2.4.8	Disposal of Waste.....	259
7.2.4.9	Top Soil Management	259
7.2.4.10	Disposal of Mining Machinery.....	259
7.2.4.11	Other Infrastructure	259
7.2.4.12	Safety & Security	260
7.2.5	Social Impact Assessment R & R Action plan	260
8	PROJECT BENEFITS	261
8.1	Improvements in the physical infrastructure	261
8.2	Improvement in the Social infrastructure	261
8.3	Employment potential –skilled; semi-skilled and unskilled	261
9	ENVIRONMENTAL COST & BENEFIT ANALYSIS	262
10	ENVIRONMENTAL MANAGEMENT PLAN	263
10.1	Environmental Management Plan	263
10.2	Emission Source Identification.....	263
10.3	Air Quality Management.....	263
10.3.1	Measures for dust suppression.....	263
10.3.2	Emissions from Material Handling.....	263
10.4	Noise Pollution Control.....	264
10.5	Water Pollution Control Measures	265
10.5.1	Surface Water	265
10.5.2	Mine Drainage Water	265
10.6	Land Environment	265
10.6.1	Top soil management	265
10.7	Solid Waste Management.....	265
10.8	Stabilization of Dumps	266
10.9	Biological Environment.....	266
10.10	Granite Conservation and Development.....	266
10.11	Afforestation Plan.....	266
10.12	Occupational Health & Safety Measures.....	267
10.13	Socio-Economic Benefits	267
10.13.1	Employment potential	267
10.13.2	Care and Maintenance during Temporary Discontinuance	267
10.13.3	Safety and Security.....	268
10.14	Budget for Environmental Protection.....	268
11	SUMMARY & CONCLUSION.....	271
11.1	Background	271
11.2	Management Commitment	271
11.3	Environmental Sensitive Areas	271
11.4	Black Granite Quarry Reserves	272
11.5	Summary of the Magnitude of Operation.....	272

11.6	Requirements.....	272
11.6.1	Land requirement:	272
11.6.2	Water Requirement.....	272
11.6.3	Power & Fuel Requirement	273
11.6.4	Manpower.....	273
11.6.5	Solid Waste Generation & Management	273
11.7	Project Cost	273
11.7.1	Baseline Study	273
11.10	Disaster Management Plan	278
11.11	Corporate Environmental Responsibility	278
11.12	Benefits of the Proposed Project	278
12	DISCLOSURE OF CONSULTANTS.....	279
12.1	Brief Profile of HubertEnviro Care Systems (P) Limited (HECS).....	279
12.2	Strengths of HECS	279

LIST OF TABLES

Table 1-1 Land Use Description	25
Table 1-2 Ultimate Pit Dimensional Details	26
Table 1-3 Geological Reserves	26
Table 1-4 Boundary Coordinates of the project.....	27
Table 2-1 Summary of Project Reserves.....	72
Table 2-2 The Boundary Coordinates of the Site	73
Table 2-3 Salient Features	84
Table 2-4 Project summary	86
Table 2-5 Nearest Human Settlement	87
Table 2-6 Land use details of the quarry area.....	87
Table 2-7 Granite Quarry Reserves	88
Table 2-8 Yearwise Production details	88
Table 2-9 Project cost	99
Table 2-10 Quarry Land details	105
Table 2-11 Land Use Pattern of the lease area.....	105
Table 2-12 Water requirement breakup	105
Table 2-13 Power Requirements.....	105
Table 2-14 Lists of Machineries	106
Table 2-15 Manpower Details	106
Table 2-16 Municipal Solid Waste generation & Management.....	106
Table 2-17 Hazardous Waste Management	107
Table 2-18 Afforestation Plan details	115
Table 3-1 Environmentally Sensitive Areas within 15km from Project Boundary	119
Table 3-2 Land use pattern of the Study Area	132
Table 3-3 Geomorphology pattern of the study area	138
Table 3-4 Climatological Summary– Velloer (1991-2020).....	153
Table 3-5 Meteorology Data for the Study Period (March 2023 to May 2023)	154
Table 3-6 Details of Ambient Air Quality Monitoring Locations	156
Table 3-7 Analytical Methods for Analysis of Ambient Air Quality Parameters (NAAQ).....	159
Table 3-8 Summary of the average baseline concentrations of pollutants.....	161
Table 3-9 Day and Night Equivalent Noise Levels	165
Table 3-10 Test methods used for the analysis of water quality parameters	168
Table 3-11 Details of Surface water sampling locations.....	169
Table 3-12 Physicochemical Parameters of Surface water samples from the study area.....	171
Table 3-13 Surface water Standards (IS 2296:1992).....	173
Table 3-14 Details of Groundwater Quality Monitoring Locations.....	173
Table 3-15 Details of Groundwater Quality Monitoring Locations.....	176
Table 3-16 Physico chemical analysis of Ground water samples from study area	178
Table 3-17 Soil & Sediment Quality Monitoring Locations.....	180
Table 3-18 Physico Chemical parameters of soil samples from the study area.....	182
Table 3-19 Flora/Vegetation in the Study Area	185
Table 4-1 Land Use Pattern of the lease area.....	218

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

Table 4-2 Sources of air pollution at quarry	219
Table 4-3 Fugitive dust control in mine.....	219
Table 4-4 Dust control measures in quarry	219
Table 4-5 Overview of the Source Parameters	221
Table 4-6 Emission from Mining Equipment's	222
Table 4-7 Vehicular Source Emission details	222
Table 4-8 Emissions considered for mining	222
Table 4-9 Emission input for modelling	223
Table 4-10 Predicted Top 10 Highest Concentrations Particulate Matter PM10.....	224
Table 4-11 Predicted Top 10 Highest Concentrations Particulate Matter PM2.5.....	225
Table 4-12 Predicted Top 10 Highest Concentrations of Sulphur Dioxide	226
Table 4-13 Predicted Top 10 Highest Concentrations Nitrogen Oxide	227
Table 4-14 Total maximum GLCs from emissions	228
Table 4-15 Existing & proposed vehicular movement per Hour (Peak Hour) SH-61	228
Table 4-16 Traffic Volume after Implementation of the Project	228
Table 4-17 Permissible Exposure in Cases of Continuous Noise (OSHA, Govt. of India)	231
Table 4-18 Impacts on Biodiversity	233
Table 4-19 List of Birds Species in the Study Area.....	237
Table 4-20 List of Mammals in the Study Area.....	239
Table 4-21 List of Reptiles and Amphibians in the Study Area	239
Table 4-22 List of Butterfly species in the Study Area.....	239
Table 4-23 Mitigation for occupational health and safety	242
Table 4-24 Corporate Environmental Responsibility Plan	243
Table 6-1 Environment (Protection) Rules 1986	247
Table 6-2 Post Project Environmental Monitoring Program	248
Table 6-3 Environmental Management Plan.....	249
Table 10-1 Environmental Management Plan Cost	268
Table 11.8-1 Fugitive dust control in mine.....	276

LIST OF FIGURE

Figure 2-1 Project Location map	75
Figure 2-2 300m Google image of the lease area	76
Figure 2-3 500m radius Google imagery of the lease area	77
Figure 2-4 Google Imagery of 1 km radius of the lease area.....	78
Figure 2-5 5km Google Imagery of the project site.....	79
Figure 2-6 10km Google Imagery of the project site.....	80
Figure 2-7 Environmental Sensitive areas within 15km radius of the lease area demarcated on Google image.....	81
Figure 2-8 Surface Plan of the Quarry	90
Figure 2-9 Geological plan of the quarry.....	91
Figure 2-10 Geological Section of the quarry.....	92
Figure 2-11 Yearwise Production/Development Plan for 5 years.....	93
Figure 2-12 Yearwise Production/Development Section for 5 year	94
Figure 2-13 Land Use and Afforestation Plan	95
Figure 2-14 Conceptual Plan	96
Figure 2-15 Conceptual Section.....	97
Figure 2-16 Progressive Quarry Clousure Plan	98
Figure 2-17 Schematic Diagram of Mining Process.....	100
Figure 2-18 Feasibility & Environmental Assessment Process	108
Figure 2-19 Waste Management Concepts	115
Figure 3-1 Mapshowing the Satellite Image of the study area of Project.....	117
Figure 3-2 Topo Map of Study area.....	118
Figure 3-3 Environmental sensitive areas covering within 15 km from project boundary	123
Figure 3-4 Environmental sensitive areas covering within 15 km from project boundary	124
Figure 3-5 Mineral Map of Tamil Nadu	128
Figure 3-6 Land use/Land cover pattern for Vellore district	130
Figure 3-7 Land use/Land cover Map of Vellore district	131
Figure 3-8 Land use pattern of the Study Area.....	133
Figure 3-9 Land use/Land cover map of the Study Area	134
Figure 3-10 Physical Map of Tamilnadu	136
Figure 3-11 Contour map of the Study Area.....	137
Figure 3-12 Geomorphology pattern of the study area	139
Figure 3-13 Geomorphology Map of Study Area.....	140
Figure 3-14 Hydrogeology Map of Krishnagiri District.....	142
Figure 3-15 Drainage map of the study area.....	144
Figure 3-16 Geology Map of Tamilnadu	146
Figure 3-17 Seismicity Map of Tamil Nadu	147
Figure 3-18 Soil map of India.....	149
Figure 3-19 Natural Hazards Map of India.....	151
Figure 3-20 Wind Rose during March 2023 to May 2023.....	155
Figure 3-21 Atmospheric inversion level at the project site	156
Figure 3-22 Map showing the Ambient Air Quality monitoring locations.....	158

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

Figure 3-23 Trends of Measured Ambient Concentrations in the Study Area.....	163
Figure 3-24 Map showing the noise monitoring locations.....	167
Figure 3-26 Depth to water level during Pre-Monsoon & Post Monsoon in Vellore District	175
Figure 4-1 Wind rose diagram considered for dispersion modeling	220
Figure 4-2 Predicted 24 Hrs GLC's of PM10 within 10km radius of the study area.....	224
Figure 4-3 Predicted 24-Hrs GLC of Particulate matter PM2.5	225
Figure 4-4 Predicted 24-Hrs' GLC's of SO2within 10 km Radius of the Study Area.....	226
Figure 4-5 Predicted 24-Hrs' GLC's of NOX within 10 km Radius of the Study Area.....	227
Figure 7-1 Identification of hazards in opencast mine.....	253
Figure 10-1 Hierarchical System of the TAMIN	270

LIST OF ANNEXURES

Annexure No	Name of the Annexure
1	Terms of Reference
2	Precise Area Communication Letter
3	Mining Plan Approval Letter
4	Approved Mining Plan
5	Sectional Plates
6	Earlier EC
7	CCR
8	CTO
9	Permit Copy
10	VAO letter on TN- AP Boundary

LIST OF ABBREVIATIONS

AAQ	Ambient Air Quality
AAQM	Ambient Air Quality Monitoring
AGL	Above Ground Level
AMSL	Above Mean Sea Level
BGL	Below Ground Level
CPCB	Central Pollution Control Board
CER	Corporate Environmental Responsibility
DMP	Disaster Management Plan
EIA	Environmental Impact Assessment
EMC	Environmental Management Cell
EMP	Environmental Management Plan
GLC	Ground Level Concentration
GO	Government Order
HECS	Hubert Enviro Care Systems
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
O. B	Over Burden
S. B	Side Burden
kWh	Kilowatt Hour
MMR	Metalliferous Mines Regulations
MoEF&CC	Ministry of Environment, Forest and Climate Change
NAAQ	National Ambient Air Quality
NABET	National Accreditation Board for Education and Training
QCI	Quality Council of India
R & D	Research & Development
RA	Risk Assessment
ROM	Run of Mine
SOM	Scheme of Mining
SEIAA	State Environmental Impact Assessment Authority
SEAC	State Expert Appraisal Committee
TAMIN	Tamilnadu Minerals Limited
TWAD	Tamilnadu Water Supply and Drainage Board
TDS	Total Dissolved Solids
TNPCB	Tamil Nadu Pollution Control Board
TNSEAC	Tamil Nadu State Expert Appraisal Committee
TOR	Terms of Reference
TANGEDCO	Tamil Nadu Generation and Distribution Corporation
kVA	kilovolt-ampere

1 INTRODUCTION

1.1 Purpose of the report

The granite dimensional stone material by virtue of its pleasing colour and texture and its best ability to take polishing and appealing look in polished product has attracted the consumers TAMIN's Client to provide in the building construction and interior decoration industries. The domestic market capabilities have also been explored in recent periods. Bulk quantity of the blocks are produced and exported as raw blocks and some quantity is being processed at TAMIN's Granite polishing units and exported as value added finished products.

The earning source in the targeted area is limited, most of the people in and around the area depend upon the seasonal agriculture and much of the people migrate to nearby towns where good industries and factories are growing up.

Around 30 people directly employed including mining operations, outside workshops, unit supported industries. Local villages residing in the nearby villages shall be employed as semi-skilled workers.

1.2 Project back ground

M/s Tamil Nadu Minerals Ltd, (An undertaking of Government of Tamil Nadu) was established in the year 1978, to carry out systematic mining and development of different minerals all over the state. Ever since its inception TAMIN has developed expertise in the mining of granite dimensional stones of different varieties including Black Granite(Dolerite), Kashmir White(Leptynite), Paradiso(Migmatite Gneiss), Green Onyx(Syenite-porphyry), Red wave (Pink Feldspathic Gneiss) Colombo Juparana(Pegmatitic Granite Gneiss of magmatic origin), Raw silk (Yellow Feldspathic Leptynite) and a number of other coloured granite varieties apart from other industrial minerals viz., Quartz and Feldspar, Graphite, Limestone, Vermiculite etc.,

Precise area communication letter has been issued to grant lease for 20 years for extent of 166.92.0 Ha at S.F.No.917 (Part) & 921 (Part) at Mahimandalam Village, Katpadi Taluk, Vellore District, Tamil Nadu State.Tamil Nadu Minerals obtained lease vide 3865290/MME.1/2023-1, dated: 13.03.2023.Precise area communication letter enclosed as **Annexure –II**. Accordingly, mining plan has been submitted and approved by the Director of Geology and Mining, Chennai vide Lr.No.7040/MM4/2022, dated: 28.08.2023. Mining plan and approval letter is enclosed as **Annexure-III**.

The area lies in the Eastern Longitude from 79°12'00.57"E to 79°13'57.48"E and Northern latitude from 13° 04'57.45"N to 13°05'34.90"N enclosed sectional plates as **Annexure-V**

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

The area does not falls under forest land of any category. It is Government Poramboke land.

The Geological reserves of Black granite have been computed based on the Geological Plan & Sections up to the economically workable average depth of 30m from the top of the hill and the top surface of the granite body works out to 46,85,817 m³.

Mineable Reserves have been computed as 42,21,763 m³ after deleting the reserves locked up in safety barrier and benches based on the Conceptual Plan and sections, the effective(Saleable) Mineable Reserves have been worked out as 4,22,176 m³ by applying the recovery factor 10%. The annual peak production per year would be 15,000m³ of ROM during the five year of Mining plan period at the rate of 10% recovery. Open cast Semi mechanized method will be followed for proposed mining as per Mining plan. Sectional plates are enclosed as **Annexure-V**.

Total waste to be generated during the five years of Mining Plan period will be around 2,61,000 m³ at 90% of ROM. These wastes are proposed to be dumped on the South eastern side of lease area. The total water requirement is 1.5KLD (Drinking & Domestic purpose-0.5 KLD, Wire Saw cutting -0.3 KLD, Dust suppression -0.3 KLD & Greenbelt-0.4KLD). The total water requirement will be met from private tankers. Power requirement 60 kVA will be met through 125 kVA DG Set. Diesel consumption will be 200 L/day. Man power requirement will be 30 Nos directly. Municipal Solid waste will be disposed into local municipal bins. Hazardous waste like waste oil will be disposed through TNPCB authorized dealers. Sewage will be disposed through septic tank followed by soak pit. Septic Tank will be cleaned periodically.

The project cost is Rs. 99.97 Lakhs. (Fixed Cost Rs. 2, 25,000/-, Operational Cost Rs. 95,67,000/- and EMP Cost Rs. 2,05,000/-).

1.3 Identification of Project & Project Proponent

1.3.1 Project

The proposed Black Granite Mine is over an extent of 166.92.0Ha located at S.F.917 (Part) &921(Part), Mahimandalam village, Katpadi Taluk, Vellore District, TamilNadu State. TAMIN is obtaining Environmental Clearance from SEIAA-Tamil Nadu. Since, the project falls under B1 Category, Schedule 1(a) Mining of Minerals as per MoEF&CC Notification and its amendment vide S. O. 1886(E) dated; 20th April 2022. The land use classification of the project site is government poramboke land. TAMIN obtained precise area communication letter vide Government letter No. 3865290/MME.1/2023-1, dated: 13.03.2023. Precise area communication letter is enclosed as **Annexure-II**.

The Mining Plan has been prepared for quarrying Black Granite (Dolerite) over an extent of 166.92.0 Ha. in S.F. 917(P)&921(P) of Mahimandalam Village, Katpadi Taluk, Vellore District, Tamil Nadu State. Tamil Nadu obtained lease for 20 years. Mining plan and approval letter is enclosed as **Annexure-III**.

The area applied for quarry lease exhibits hillock with height of about (~445m AMSL), The lease area generally manifests undulating topography with low lying plain agricultural lands. Geologically, the lease applied area is a Dolerite dyke intruded into the Gneissic formation. The area lies in the Eastern Longitude from 79°12'00.57"E to 79°13'57.48"E and Northern latitude from 13°04'57.45"N to 13°05'34.90"N enclosed sectional plates as **Annexure-V**. The area is marked in the survey of India Topo sheet No D 44N4 & 8, D44T 1&5

1.3.2 Project Proponent

Tamil Nadu Minerals Limited (TAMIN) (An Undertaking of Government of Tamil Nadu) has been established in the year 1978. It entered the international granite market in the year 1979 and has secured a steady market for dimensional blocks of black and other color materials in countries like Japan, Germany, Italy, Australia, UK, Switzerland, Holland, USA etc. TAMIN had started the Captive Graphite Mine in the year 1986.

TAMIN is only organization recognized by Bureau of Indian Standard for manufacture and supply of I.S. Sand all over the country. TAMIN has also been marketing granite cubes with sides measuring 6cm to 12cm. TAMIN has developed expertise in the mining of granite dimensional stones of different varieties including black granite (Dolerite), Kashmir white (Leptynite), Paradiso (Migmatite gneiss), Green onyx (Syenite - porphyry) Red wave (Pink Feldspathic gneiss) Colombo Juparana (Pegmatitic granite gneiss of migmatitic origin), Raw silk (Yellow Feldspathic Leptynite) and a number of other color granite varieties apart from other industrial minerals viz. quartz and feldspar, graphite, lime stone, silica sand, vermiculite, etc.

TAMIN has also set up industrial units for polishing processing the granite stones one each at Manali (Chennai), Madhepalli at Krishnagiri District and Melur at Madurai District. A Beneficiation plant for the beneficiation of graphite ore has been established close to Sivaganga Graphite mine. An exfoliation plant for the processing of vermiculite mineral at Sevathur village Tirupathur district has also been established.

1.4 Letter of Intent (LoI) & Mining Plan approval details.

- i. TAMIN obtained precise area communication letter vide Letter.No. 38652920/MME.1/2023-1, dated: 13.03.2023. Precise area communication letter is enclosed as **Annexure-II**.
- ii. The Mining Plan has been prepared for quarrying Black Granite (Dolerite) over an extent of

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

166.92.0 Ha. in S.F.917(P)&921(P) of Mahimandalam Village, Katpadi Taluk, Vellore District, Tamil Nadu State, for 20 years. Mining plan was approved by the Director of Geology and Mining, Chennai vide Letter No.7040/MM4/2022, dated: 28.08.2023 and letter is enclosed as **Annexure-III**.

1.5 Land Acquisition Status

The entire mine lease area of 166.92.0Ha is Government land which is leased by TAMIN. TAMIN obtained precise area communication letter vide Lr.No.3865290/MME.1/2023-1, dated: 13.03.2023. Precise area communication letter is enclosed as **Annexure-II**.

Table 1-1 Land Use Description

District and State	Taluk	Village	S.F. No	Area in (Ha)	Land Classification
Vellore District, Tamil Nadu	Katpadi	Mahimandalam	S.F.No.917(P) &921(P)	166.92.0	Government Land

1.6 Purpose and Status of the Report

The Mahimandalam Black Granite Quarry is over an extent of 166.92.0 Ha. The project falls under B1 Category, Schedule 1(a) Mining of Minerals as per EIA Notification dated 14th September 2006 and its subsequent amendments. The EC application was submitted to TN SEIAA vide File No.10383/2023. The proposal was appraised during 416th SEAC meeting held on 13.10.2023, and 670th SEIAA meeting held on 06.11.2023 and ToR was issued vide Lr No. SEIAA-TN/F.No.10383/SEAC/1(a)/ToR-1610/2023, Dated: 06.11.2023 for the preparation of EIA/EMP report. The draft EIA/EMP report will be submitted for Public Hearing (PH). After completion of Public Hearing, the minutes issued will be incorporated in the EIA report along with proponent action plan. Final EIA report will be submitted to TN-SEAC for further appraisal of the project and obtaining Environmental Clearance.

1.7 Brief Description of the Project

1.7.1 Nature of the Project

The project falls under B1 Category, Schedule 1(a) Mining of Minerals as per EIA Notification and its amendment. Hence, the project will appraise for Environmental Clearance from State Expert Appraisal Committee, Tamil Nadu. The EC application was submitted to TN SEIAA vide File No.10383/2023 & Proposal No. SIA/TN/MIN/442625/2023 dated 04.09.2023.

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

The TAMIN has obtained precise area communication letter vide Lr.No.3865290/MME.1/2023-1, dated: 13.03.2023. Precise area communication letter is enclosed as **Annexure-II**. The mining plan has been submitted and approved by the Director of Geology and Mining, Chennai vide Letter No.7040/MM4/2022, dated: 28.08.2023. Mining approval letter is enclosed as **Annexure-III**.

The proposal was appraised during 416th SEAC meeting held on 13.10.2023, and 670th SEIAA meeting held on 06.11.2023 and ToR was issued vide Lr No. SEIAA- TN/F.No. -10383/SEAC/1(a) ToR- 1610/2023, Dated: 06.11.2023.

1.7.2 Size of the Project

The Proposed Black Granite Quarry over an extent of 166.92.0 Ha is located at SF.No.917 (P) &921(P), Mahimandalam Village, Katpadi Taluk, Vellore District, Tamil Nadu State.

Black Granite Quarry area is over an extent of 166.92.0 Ha with the Geological reserves of Black granite have been computed based on the Geological Plan & Sections up to the economically workable average depth of 30m from the surface level and the top surface of the granite body works out to 46,85,817 m³.

Mineable Reserves have been computed as 42,21,763 m³ after deleting the reserves locked up in safety barrier and benches based on the Conceptual Plan and sections, the effective (Saleable) Mineable Reserves have been worked out as 4,22,176 m³ by applying the recovery factor 10%. The average annual production per year would be 29,000m³ of ROM during the five year of Mining plan period at the rate of 10% recovery. Open cast Semi mechanized method will be followed for proposed mining as per mining plan. Sectional plates are enclosed as **Annexure-IV**.

Total waste (GraniteWaste+SideBurden) to be generated during the five years of Mining Plan period will be around 2,61,000m³. These wastes are proposed to be dumped on the South eastern side of lease area. The method of mining is Open cast semi mechanized.

Table 1-2 Ultimate Pit Dimensional Details

S. No	Description	Average Ultimate Pit Dimensional(m)		
		Length	Width	Depth
1	Top	2482	100	30
2	Bottom	2434	52.096	

Table 1-3 Geological Reserves

Sl.No	Geological Reserves	Mineable Reserves	Mineable Saleable Reserves @10% Recovery
1.	46,85,817	42,21,763	4,22,176

1.7.3 Location of the project

Mahimandalam Black Granite Quarry area is over an extent of 166.92.0 Ha, the lease area is located at S.F.No.917(P)&921(P) of Mahimandalam Village, Katpadi Taluk, Vellore District, Tamil Nadu State. The boundary co-ordinates of the mine lease area are tabulated in **Table 1-4**.

Table 1-4 Boundary Coordinates of the project

S. No	Bourndary mark point	Latitude (N)	Longitude(E)
1	TM1	13° 5' 13.69"	79° 12' 0.57"
2	TM2	13° 5' 20.74"	79° 12' 3.44"
3	TM3	13° 5' 26.55"	79° 12' 38.95"
4	TM4	13° 5' 32.59"	79° 12' 37.84"
5	TM5	13° 5' 31.34"	79° 12' 53.42"
6	TM6	13° 5' 33.3"	79° 13' 9.31"
7	TM7	13° 5' 34.9"	79° 13' 28.75"
8	TM8	13° 5' 24.65"	79° 13' 29.58"
9	TM9	13° 5' 19.35"	79° 13' 29.12"
10	TM10	13° 5' 13.65"	79° 13' 56.52"
11	TM11	13° 5' 9.13"	79° 13' 57.48"
12	TM12	13° 5' 8.11"	79° 13' 56.43"
13	TM13	13° 5' 7.88"	79° 13' 55.86"
14	TM14	13° 5' 7.55"	79° 13' 54.4"
15	TM15	13° 5' 6.71"	79° 13' 50.53"
16	TM16	13° 5' 6.51"	79° 13' 50.06"
17	TM17	13° 5' 6.36"	79° 13' 47.11"
18	TM18	13° 5' 6.72"	79° 13' 47.04"
19	TM19	13° 5' 6.18"	79° 13' 44.69"
20	TM20	13° 5' 5.35"	79° 13' 42.01"
21	TM21	13° 5' 5.15"	79° 13' 41.41"
22	TM22	13° 5' 3.65"	79° 13' 41.02"
23	TM23	13° 5' 2.77"	79° 13' 41.09"
24	TM24	13° 5' 1.18"	79° 13' 36.76"
25	TM25	13° 5' 0.98"	79° 13' 36.19"
26	TM26	13° 4' 59.94"	79° 13' 36.33"
27	TM27	13° 4' 59.18"	79° 13' 34.65"
28	TM28	13° 4' 59.36"	79° 13' 32.59"
29	TM29	13° 4' 59.0"	79° 13' 31.73"
30	TM30	13° 4' 57.5"	79° 13' 31.54"
31	TM31	13° 4' 57.45"	79° 13' 29.71"
32	TM32	13° 4' 58.38"	79° 13' 27.35"
33	TM33	13° 4' 59.15"	79° 13' 26.18"
34	TM34	13° 4' 59.69"	79° 13' 24.45"
35	TM35	13° 5' 0.21"	79° 13' 24.35"
36	TM36	13° 5' 2.02"	79° 13' 21.78"
37	TM37	13° 5' 2.92"	79° 13' 20.98"
38	TM38	13° 5' 3.44"	79° 13' 19.91"

39	TM39	13° 5' 5.36"	79° 13' 19.83"
40	TM40	13° 5' 5.71"	79° 13' 19.2"
41	TM41	13° 5' 5.5"	79° 13' 16.34"
42	TM42	13° 5' 9.97"	79° 13' 14.12"
43	TM43	13° 5' 10.81"	79° 13' 13.68"
44	TM44	13° 5' 16.77"	79° 13' 9.59"
45	TM45	13° 5' 16.22"	79° 13' 9.6"
46	TM46	13° 5' 15.62"	79° 13' 8.27"
47	TM47	13° 5' 16.1"	79° 13' 6.31"
48	TM48	13° 5' 15.3"	79° 13' 3.36"
49	TM49	13° 5' 15.57"	79° 13' 0.87"
50	TM50	13° 5' 16.03"	79° 12' 55.79"
51	TM51	13° 5' 15.6"	79° 12' 50.65"
52	TM52	13° 5' 12.23"	79° 12' 52.06"
53	TM53	13° 5' 11.54"	79° 12' 51.9"
54	TM54	13° 5' 10.21"	79° 12' 52.01"
55	TM55	13° 5' 9.82"	79° 12' 52.15"
56	TM56	13° 5' 9.3"	79° 12' 53.11"
57	TM57	13° 5' 8.53"	79° 12' 53.32"
58	TM58	13° 5' 4.77"	79° 12' 47.34"
59	TM59	13° 5' 17.4"	79° 12' 47.91"
60	TM60	13° 5' 16.68"	79° 12' 28.33"
61	TM61	13° 5' 12.49"	79° 12' 24.08"
62	TM62	13° 5' 12.12"	79° 12' 17.54"
63	TM63	13° 5' 12.29"	79° 12' 10.3"

1.7.4 Connectivity of the Project

The project is situated at a distance of one approach road is running from SH 124(Ponnai-Thiruvallam) ~3.36 km towards (NE) side of the lease area. The project site has well established connection facilities. The nearest railway station is Ramapuram Railway station located at \approx 2.46Km towards WNW direction. NH-40 (Ranipettai-Kurnool) situated at distance of \approx 4.75 Km (SW).

1.8 Need for the project and its importance to the country and or region

The granite dimensional stone material by virtue of its pleasing colour and texture and its best ability to take polishing and appealing look in polished product has attracted the consumers in the building construction and interior decoration industries. The domestic market capabilities have also been explored in recent periods. Bulk quantity of the blocks is produced and exported as raw blocks and some quantity is being processed at TAMIN's Granite polishing units and exported as value added finished products.

The earning source in the targeted area is limited, most of the people in and around the area depend upon the seasonal agriculture and much of the people migrate to nearby towns where good industries and factories are growing up.

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

Around 30 people directly employed including mining operations, outside workshops, unit supported industries. Local villagers residing in the nearby villages shall be employed as semi-skilled workers.

1.8.1 Demand –Supply Gap

As of now there is good demand for this granite blocks in foreign as well as local market. The quarried granite blocks are either exported as raw blocks or processed at TAMIN's factories as value added products such as slabs, tiles, fancy items, monuments, sawn slabs or local sales as raw block etc.

1.8.2 Imports Vs Indigenous

There is no import of this granite material at present in India as we are having huge resources of this granite material particularly in South India.

1.8.3 Export possibility

The quarried granite blocks are either exported as raw blocks or processed at TAMIN's factories as value added products such as slabs, tiles, fancy items, monuments, sawn slabs etc. Apart from TAMIN so many private enterprises are exporting the granite material as raw blocks, polished slab and monuments etc.

1.8.4 Domestic/export markets

As of now there is good demand for this granite blocks in foreign as well as local market. The granite blocks are either exported as raw blocks or processed at TAMIN's as factories as value added products such as slabs, tiles, fancy items, monuments, sawn slabs etc. Apart from TAMIN so many private enterprises are exporting the granite material as raw blocks, polished slab and monuments etc.

1.9 EIA Study

As a part of compliance to the regulatory requirement i.e., to obtain Environmental Clearance from SEIAA-TN, TAMIN has appointed Environmental Consultant accredited by National Accreditation Board for Education and Training (NABET)-Quality Council of India (QCI), New Delhi. The work of undertaking field studies and preparation of EIA/EMP report under B1 category as obtained Terms of Reference from SEIAA-TN was assigned to M/s Hubert Enviro Care Systems (P) Ltd. (HECS) Chennai by the project proponent. HECS is accredited by NABET, vide possession of Certificate No. NABET/EIA/2224/SA0190, valid up to 27.07.2024.

1.10 EIA Cost

EIA study was undertaken by HECS for an amount of Rs.1, 72,000/- Lakhs. The base line monitoring was done by M/s. HECS lab, Chennai, an NABL and MoEF& CC Accredited Laboratory.

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

1.11 Scope of the Study

The scope of the work mentioned includes an assessment study of proposed black Granite Quarry project and their impact on the region. This study puts forward the most effective ways to protect the environment from increasing pollution caused by the mining activities and recommendations for environmental-friendly development initiatives in the region.

An Environmental Impact Assessment (EIA) is an assessment of the possible impact, whether positive or negative that, the mining activities may have on the environment, together consisting of the natural, social and economic aspects, i.e., aiming at “Sustainable Development” due to the project activities.

This EIA report presents the existing baseline scenario and the assessment and evaluation of the environmental impacts that may arise during mining. This report also highlights the Environmental Monitoring Program during the operation phase of the project and the post mined management program. The generic structure of the EIA document will be as per the EIA Notification of the MoEF&CC dated 14th September 2006 and subsequent amendments. The basic structure of the report will be as under:

Chapter 1: Introduction

Introductory information is presented in this Chapter. The introduction chapter provides background to the project, project proponent and describes the objective of this document. The purpose and organization of the report is also presented in this chapter.

Chapter 2: Project Description

This chapter includes project description and infrastructure facilities delineating all the quarry operations and environmental aspect of the quarry activities.

Chapter 3: Description of the Environment

This chapter provides baseline environmental status of Environmental Components (Primary data) delineating meteorological details of the project site and surrounding area.

Chapter 4: Anticipated Environmental Impacts & Mitigation Measures

This chapter presents the analysis of impacts on the environmental and social aspects of the project as a result of establishment of plan and thereby suggesting the mitigation measures.

Chapter 5: Analysis of Alternatives (Technology and Sites)

This chapter includes the justification for the selection of the project site from Environmental point of view as well as from economic point of view.

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

Chapter 6: Environmental Monitoring Programme

This chapter will include the technical aspects of monitoring, the effectiveness of mitigation measures which will include the measurement methodologies, frequency, location, data analysis, reporting schedules etc,

Chapter 7: Additional Studies

This chapter will detail about the public consultation sought regarding the project. It will also identify the risks of the project in relation to the general public and the surrounding environment during quarry operation phase and thereby presents Disaster Management Plan, Social impact assessment and R&R action plans.

Chapter 8: Project Benefits

This chapter deals with improvement in physical and social infrastructures, employment potential and other tangible benefits.

Chapter 9: Environmental Cost Benefit analysis

Not recommended during scoping

Chapter 10: Environmental Management Plan

This is the key chapter of the report and presents the mitigation plan, covers the institutional and monitoring requirements to implement environmental mitigation measures and to assess their adequacy during project implementation.

Chapter 11: Summary and Conclusion

This chapter summarizes the information given in Chapters in this EIA/EMP report and the conclusion based on the environmental study, impact identification, mitigation measures and the environmental management plan.

Chapter 12: Disclosure of the Consultant

Names of consultants engaged in the preparation of the EIA/EMP report along with their brief resume and nature of consultancy rendered are included in this chapter.

1.11.1 Objectives of the Study

- To ensure environmental considerations are explicitly addressed and incorporated into the development decision-making process.
- To anticipate and avoid, minimize or offset the adverse significant biophysical, social and other relevant effects of the above project proposal.

- To protect the productivity and capacity of natural systems and the ecological processes which maintain their respective functions
- To promote development that is sustainable and optimizes resource use as well as management opportunities.
- To fully recognize the scope and requirements of the ToR and comply with the same.
- The major objective of this study is to prepare a detailed Environmental Impact Assessment study within the study area i.e 10 km radius from the project.

1.11.2 Methodology adopted for the Study

An Environmental Impact Assessment (EIA) is an assessment of the possible impact, whether positive or negative, that a proposed project may have on the environment, together consisting of the natural, social and economic aspects, i.e., aiming at “Sustainable Development” due to the project activities.

1.11.3 Applicable Regulatory Framework

The EIA process followed for this EIA report is composed of the following stages:

1. Study of project information.
2. Screening & Scoping.
3. Environmental pre-feasibility study & application for approval of ToR.
4. Collection of detailed project management plan/report.
5. Baseline data collection.
6. Impact identification, Prediction & Evaluation.
7. Mitigation measures & delineation of EMP.
8. Risk assessment and safety & disaster management plan.
9. Review & finalization of EIA Report based on the ToR requirements.
10. Submission of EIA report for implementation of mitigation measures & EMP as well as necessary clearances from relevant Authority.

1.11.4 Legal Complicability

The establishment and functioning of mining industry will be governed by Tamin Client to provide the following environmental acts/regulations besides the local zoning and landuse laws of the States.

- The Water (Prevention and Control of Pollution) Act, 1974 as amended
- The Water (Prevention and Control of Pollution) Cess Act, 1977, as amended
- The Air (Prevention and Control of Pollution) Act, 1981 as amended (Air Act)
- The Noise Pollution and Regulation Act: 2000as amended
- The Environment (Protection) Act, 1986 (EPA)as amended
- The Wildlife (Protection) Act, 1972
- The Forest (Conservation) Act, 1980

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

- The Public Liability Insurance Act, 1991
- The Mines and Minerals (Regulation and Development) Act, 1957 as amended
- Circulars issued by the Director-General Mines Safety (DGMS) as amended
- Contract Labor Regulation and Abolition Act 1970as amended
- The Motor Vehicles Act – 1989as amended
- PESO – Explosives and handling of Hazardous Material: 1934

1.11.5 Terms of Reference Compliance

The Terms of Reference (ToR) issued by SEIAA-Tamil Nadu compliance is given as below table

S. No	Terms of Reference	Compliance
1	The project proponent shall submit a Certified Compliance Report as per the MoEF&CC O.M dated 08.06.2022 for the previous EC obtained from MoEF&CC dated.09.04.2021.	Noted.CCR will be submitted along with final EIA.
2	The proponent shall develop greenbelt in the entire lease area except the ridge where the mining activity is proposed and shall submit photographs/videographs proof for the same.	The proponent will be submitting the greenbelt photographs/videographs along with final EIA.
3	As a part of Corporate Environment Responsibility, the proponent shall explore the possibilities of developing auditoriums, science labs, smart classrooms, toilets, greenbelt, etc. towards Government Schools in the locality.	CER activity is given in the Chapter 4, Section 4.8.3 and Table 4-29 .
4	The PP shall mark the DGPS reference pillars painted with blue & white colour indicating the safety barrier of 7.5 m to be left under the Rule 13 (1) of MCDR, 1988 within the lease boundary and protective bunds.	Noted will be followed.
5	The PP shall develop Green belt/plantation all along the mining lease boundary in a safety barrier.	Noted. The Greenbelt with native species along the mining lease boundary will be developed before the final EC appraisal of the proposed project.
6	The PP shall furnish the total manpower required for the proposed mining project including Statutory officials, Geologist, Supervisory staff, Skilled, Semi-skilled & Unskilled staff with showing the representation of the local people as per their eligibility and experience.	Noted. Will be followed.

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

ANNEXURE-I		
1	<p>In the case of existing/operating mines, a letter obtained from the concerned AD (Mines) shall be submitted and it shall include the following:</p> <p>(i) Original pit dimension</p> <p>(ii)Quantity achieved Vs EC Approved Quantity</p> <p>(ii)Balance Quantity as per Mineable Reserve calculated.</p> <p>(iv)Mined out Depth as on date Vs EC Permitted depth</p> <p>(V) Details of illegal/illicit mining</p> <p>(vi) Violation in the quarry during the past working.</p> <p>(vii) Quantity of material mined out outside the mine lease area</p> <p>(viii)Condition of Safety zone/benches</p> <p>(ix) Revised/Modified Mining Plan showing the benches of not exceeding 6 m height and ultimate depth of not exceeding 50m.</p>	Noted. A letter from AD(Mines) will be submitted along with final EIA submission.
2	<p>Details of habitations around the proposed mining area and latest VAO certificate regarding the location of habitations within 300m radi from the periphery of the site.</p>	Noted. VAO letter will be submitted along with final EIA .
3	<p>The proponent is requested to carry out a survey</p>	Environmental Sensitive Areas within 15km from Project Boundary is given in Chapter 3 ,

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

	and enumerate on the structures located within the radius of (i) 50 m. (ii) 100m, (iii) 200 m and (iv) 300m (v) 500m shall be enumerated with details such as dwelling houses with number of occupants. Whether it belongs to the owner (or) not, places of worship. industries, factories sheds, etc with indicating the owner of the building, nature of construction, age of the building, number of residents, their profession and income, etc.	Section 3.3 and Table 3-1.
4	The PP shall submit a detailed hydrogeological report indicating the impact of proposed quarrying operations on the waterbodies like lake, water tanks, etc are located within 1km of the proposed quarry.	The Hydrogeological report will be submitted along with final EIA.
5	The proponent shall carry out Bio diversity study through reputed Institution and the same shall be included in EIA report.	Biodiversity study has been conducted and the details of study has been discussed in Chapter 3 Section 3.5.2.1
6	The DFO letter stating that the proximity distance of Reserve forests,protected area,Sanctuaries, Tiger reserve etc., up to a radius of 25km from the proposed site.	Noted DFO letter will be submitted along with final EIA.
7	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 the PP shall carry out the scientific studies to assess the slope stability of the working benches to be constructed and existing quarry wall, by involving any one of the reputed Research and Academic Institutions -	The slope stability report will be submitted along with final EIA report

	CSIR-Central Institute of Mining & Fuel Research / Dhanbad, NIRM/Bangalore, Division of Geotechnical Engineering-IIT-Madras, NIT-Dept of Mining Engg. Surathkal, and Anna University Chennai-CEG Campus. The PP shall submit a copy of the aforesaid report indicating the stability status of the quarry wall and possible mitigation measures during the time of appraisal for obtaining the EC.	
8	However, in case of fresh/virgin quarries, 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 30m below ground level.	The slope stability report will be submitted along with final EIA report.
9	The proponent shall furnish affidavit stating that the blasting operation in the proposed quarry is carried out by the statutory component person as per the MMR 1961 such as blaster, mining mate, mine foremen, II/I class mines manager appointed by the proponent.	The Blasting affidavit will be submitted along with final EIA report.
10	The PP shall present a conceptual design for carrying out only controlled blasting operation involving line drilling and muffle blasting in the proposed quarry such that the blast induced ground vibrations are controlled as well as no fly rock travel beyond 30m from the blast site.	The conceptual design of blasting operation will be submitted along with final EIA
11	The EIA Coordinators shall obtain and furnish the details of quarry/quarries operated by the proponent in the past, either in the same location or elsewhere in the State with video and	Noted will be followed.

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

	photographic evidences.	
12	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.	Noted will be sunbmitted along with final EIA report.
13	What was the period of operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines?	The last work Permit was obtained form AD Mines and Attached as Annexure 9.
14	Quantity of minerals mined out. a) Highest production achieved in any one year b) Detail of approved depth of mining c) Actual depth of mining achieved earlier d) Name of the person already minded out in that lease area e) If EC and CTO already obtained, the copy of the same shall be submitted f) Whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches	EC is enclosed as Annexure-7 and CTO is enclosed as Annexure-8 .
15	All corner coordinates of the mine lease area superimposed on a high resolution Imagery/Topo sheet, topographic sheet, geomorphology, lithology and geology of the mining lease area should be provided. Such an imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone)	All corners co-ordinates of the mine lease area are given in Chapter 1 and Section 1.7.3, Table 1-4, Topo map in Figure 2-9. Geology and Geomorphology of the area is provided in Chapter 3 Section 3.4.5 & 3.4.8, Figure 3.13 and Figure 3.16.
16	The PP shall carry out Drone video survey covering the cluster, green belt, fencing, etc.,	The entire Cluster of mine lease area along with green belt shall be video graphed through Drone will be submitted in the Final EC presentation.
17	The proponent shall furnish photographs of	Photographs of adequate fencing, green belt along the periphery including replantation of

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

	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	existing trees will be submitted in the final EC presentation.																																																		
18	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.	<p>Geological Reserves</p> <table border="1"> <thead> <tr> <th>S. No</th> <th>Description</th> <th>Granite (m³)</th> <th>Recovery 10% (m³)</th> <th>Granite waste 90% (m³)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Geological Resource</td> <td>46,85,817</td> <td>4,68,581</td> <td>-</td> </tr> <tr> <td>2</td> <td>Mineable Reserves</td> <td>42,21,763</td> <td>4,22,176</td> <td>2,61,000</td> </tr> </tbody> </table> <p>Yearwise Production</p> <table border="1"> <thead> <tr> <th>S.No</th> <th>Year</th> <th>ROM (m³)</th> <th>Recovery@10% (m³)</th> <th>Granite Waste @ 90 % (m³)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1stYear</td> <td>50000</td> <td>5000</td> <td>45000</td> </tr> <tr> <td>2</td> <td>2ndYear</td> <td>150000</td> <td>15000</td> <td>135000</td> </tr> <tr> <td>3</td> <td>3rdYear</td> <td>30000</td> <td>3000</td> <td>27000</td> </tr> <tr> <td>4</td> <td>4thYear</td> <td>30000</td> <td>3000</td> <td>27000</td> </tr> <tr> <td>5</td> <td>5thYear</td> <td>30000</td> <td>3000</td> <td>27000</td> </tr> <tr> <td colspan="2">Total</td> <td>2,90,000</td> <td>29,000</td> <td>2,61,000</td> </tr> </tbody> </table> <p>Method of mining is given in Chapter 2, Section 2.9.2. & 2.10 Mitigation of measures are given in Chapter 4.</p>	S. No	Description	Granite (m ³)	Recovery 10% (m ³)	Granite waste 90% (m ³)	1	Geological Resource	46,85,817	4,68,581	-	2	Mineable Reserves	42,21,763	4,22,176	2,61,000	S.No	Year	ROM (m ³)	Recovery@10% (m ³)	Granite Waste @ 90 % (m ³)	1	1 st Year	50000	5000	45000	2	2 nd Year	150000	15000	135000	3	3 rd Year	30000	3000	27000	4	4 th Year	30000	3000	27000	5	5 th Year	30000	3000	27000	Total		2,90,000	29,000	2,61,000
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19	The Project Proponent shall provide the Organization chart indicating the appointment of various statutory officials and other competent	The organization chart hierarchy is discussed in Chapter 10 and given in Figure 10-1																																																		

	persons to be appointed as per the provisions of the 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.	
20	The Project Proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of groundwater pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds, etc. within 1 km (radius) along with the collected water level data for both monsoon and non-monsoon seasons from the PWD / TWAD so as to assess the impacts on the wells due to mining activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided.	Hydrogeological Study report will be submitted along with final EIA report.
21	The proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality & flora/fauna including traffic/vehicular movement study.	The baseline data for the environmental and ecological parameters with regard to surface water / groundwater quality, air quality, soil quality & flora / fauna including traffic / vehicular movement study are discussed in Chapter 3 .
22	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 quantity and the surrounding habitations in the mind.	Noted. Impacts and mitigation measures are given in Chapter 4.
23	Rain water harvesting management with recharging details along with water balance (both	Rain water Harvesting provided in chapter 4, section 4.3.2.3

	monsoon & non-monsoon) be submitted.																			
24	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 pattern is given in Chapter 3 and Section 3.4.3, Figure 3-6, Figure3-7, Table3-2, Table 3-3, Figure 3-8 & Figure 3-9.																		
25	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.	Land use pattern is given in Chapter 3 and Section 3.4.4, Figure 3-6, Figure3-7, Table3-2, Table 3-3, Figure 3-8 & Figure 3-9.																		
26	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.	There is no critical polluted area within 10km radius of the project site.																		
27	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.	<table border="1"> <thead> <tr> <th>S. No</th> <th>Description</th> <th>Water Requirement(KLD)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Drinking & Domestic purpose</td> <td>0.5</td> </tr> <tr> <td>2</td> <td>Wire Saw Cutting</td> <td>0.3</td> </tr> <tr> <td>3</td> <td>Dust suppression</td> <td>0.3</td> </tr> <tr> <td>4</td> <td>Green Belt</td> <td>0.4</td> </tr> <tr> <td colspan="2" style="text-align: right;">Total</td> <td>1.5</td> </tr> </tbody> </table>	S. No	Description	Water Requirement(KLD)	1	Drinking & Domestic purpose	0.5	2	Wire Saw Cutting	0.3	3	Dust suppression	0.3	4	Green Belt	0.4	Total		1.5
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		The water requirement for the project is 1.5 KLD and breakup is addressed in Chapter 2 and Section 2.11.2 & Table 2-12.
28	Impact on local transport infrastructure due to the Project should be indicated.	Impact on local transport infrastructure due to the Project discussed in Chapter 7
29	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.	A tree survey study will 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 will be provided in final EIA report.
30	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific.	The detailed Mine closure plan is attached along with Mining Plan as Annexure 4 . Mine closure plan is given in Chapter 7,Section 7.2.4
31	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 will be followed.
32	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-I 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 in a mixed manner.	Noted will be followed.
33	Taller/one year old Saplings raised in appropriate size of bags, preferably ecofriendly bags should be planted as per the advice of local forest authorities/botanist/Horticulturist with regard to	As per committee recommendations, taller / one year old saplings raised in eco-friendly bags, will be planted in proper espacement as per the advice of local forest authorities / botanist / horticulturist with regard to sites specific choices

	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	The proposed quarry is fresh lease within the existing quarry. The total area for proposed green belt is 0.10.0 Ha out of 166.92.0 Ha during 5 years of the proposed quarrying activity and it is proposed to plant 20 nos of trees per year and Rs.30,000/- will spend for proposed greenbelt development and maintenance. The details are given in Chapter 4 Section 4.7.
34	A Disaster management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period.	A detailed Disaster management plan is discussed in Chapter 7, Section 7.2.3
35	A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period.	A detailed Risk assessment and management plan is discussed in Chapter 7, Section 7.3.1.
36	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 & mitigation measures are provided in Chapter 10, Section 10.12
37	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.	Public health implications of the Project and related activities are provided in Chapter 10, Section 10.13
38	The Socio-economic studies should be carried out within a 5km 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	The socio-economic study was carried out within a 10 km buffer zone from the mining activity. The detailed measures of socio-economic significance is discussed in Chapter 3, Section 3.12

	indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	
39	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.	Nil
40	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.	<p>Benefits of the Proposed Project</p> <ul style="list-style-type: none"> ➤ The quarrying activities in this belt will benefit to the local people directly 30persons and indirectly 20 persons. ➤ The direct beneficiaries will be those who get employed in the mines as skilled and unskilled workers. ➤ Improvement in Per Capita Income. ➤ The socio - Economic conditions of the village and distance will enhance due to the project, hence the project should be allowed after considering all the parameters. ➤ It can thus be concluded that the project is environmentally compatible, financially viable and would be in the interest of construction industry thereby indirectly benefiting the masses.
41	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 with the site photographs which shall duly be certified by MoEF&CC, Regional Office, Chennai (or) the concerned DEE/TNPCB.	Noted.
42	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.	EMP is provided in Chapter 10 .
43	Concealing any factual information or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this Terms of Conditions besides attracting penal provisions in the Environment (Protection) Act, 1986.	Noted.

Remarks by SEIAA		
Annexure B		
1	Cluster Management Committee, which must include all the proponents in the cluster as members including the existing as well as proposed quarry.	Noted
2	The members must coordinate among themselves for the effective implementation of EMP as committed including Green Belt Development, Water sprinkling, tree plantation, blasting etc...	Noted
3	The List of members of the committee formed shall be submitted to AD Mines before the execution of mining lease and the same shall be updated every year to the AD/Mines	Noted
4	Detailed Operational Plan must be submitted which must include the blasting frequency with respect to the nearby quarry situated in the quarry in the form of route map and network.	Noted
5	The committee shall deliberate on risk management plan pertaining to the cluster in a holistic inner especially during natural calamities like intense rain and the mitigation measures Considering the inundation of the cluster and evacuation plan.	Noted.Risk management given in Chapter 7, Section 7.3.1
6	The Cluster Management Committee shall forms Environmental Policy to practice sustainable mining in a scientific and the ccordance with the law. The role played by in implementing the ronmental policy devised shall be given in detail.	The Environment Policy of TAMIN is discussed in Chapter 10 in section 10.15
7	The committee shall furnish action plan regarding the restoration strategy with respect to the individual quarry falling under the cluster in a holistic manner.	Noted
8	The committee shall furnish the Emergency Management plan within the cluster.	Noted. The Emergency management plan with in the cluster will be provided along with final EIA
9	The committee shall deliberate on the health of the workers/staff involved in the mining as well as the health of the public.	Discussed in Chapter 10 in Section 10.13
10	The committee shall furnish an action plan to achieve sustainable development goals with reference to water, sanitation & safety	Discussed in Chapter 10

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

11	The committee shall furnish the fire safety and evacuation plan in the case of fire accidents	Risk management given in Chapter 7, Section 7.3.1
Impact study of mining		
12	<p>Detailed study shall be carried out in regard to impact of mining around the proposed mine lease area covering the entire mine lease period as per precise area communication order issued from reputed research institutions on the following</p> <p>a) Soil health & bio-diversity.</p> <p>b) Climate change leading to Droughts. Floods etc.</p> <p>c) Pollution leading to release of Greenhouse gases (GHG), rise in Temperature. &</p> <p>Livelihood of the local people.</p> <p>d) Possibilities of water contamination and impact on aquatic ecosystem health</p> <p>e) Agriculture, Forestry & Traditional practices</p> <p>f) Hydrothermal Geothermal effect due to destruction in the Environment.</p> <p>g) Bio-geochemical processes and its foot prints including environmental stress.</p> <p>h) Sediment geochemistry in the surface streams.</p>	Noted.
Agriculture & Agro Biodiversity		
13	Impact on surrounding agricultural fields around the proposed mining Area	Here will be no impact on the nearby agricultural land since the TAMIN Mining Operations are being done with dust extractor the remaining will also be

		suppressed with water sprinkler provision.
14	Impact on soil flora & vegetation around the project site	Impact and mitigation measures of soil given in Section 4.1,4.1.1&4.1.2 Impact and mitigation measures of flora&fauna given in Section 4.6.3
15	Details of type of vegetations including no. of trees & shrubs within the proposed mining area and If so, transplantation of such vegetations all along the boundary of the proposed mining area shall committed mentioned in EMP	Noted
16	The Environmental Impact Assessment should study the biodiversity, the natural ecosystem the so midre flora axan and suggest measures to maintain the natural ecosystem.	The details of Flora and fauna are discussed in Chapter 3, Section 3.10
17	Action should specifically suggest for sustainable management of the area and restoration of ecosystem for flow of goods and services.	A detailed action plan on sustainable management of the area and restoration of ecosystem for flow of goods and services are discussed in Chapter 4.
18	The project proponent shall study and furnish the impact of project on plantations in adjoining patta lands, Horticulture, Agriculture and livestock.	The impact of project on plantations in adjoining patta lands, Horticulture, Agriculture and livestock are discussed in Chapter 4.
Forests		

19	The project proponent shall detailed study on impact of mining on Reserve forests free ranging wildlife.	<p>Reserve Forest</p> <table border="1"> <thead> <tr> <th>S.No</th> <th>Places</th> <th>D stance (≈km)</th> <th>Direction</th> </tr> </thead> <tbody> <tr><td>1</td><td>Magimandalam RF</td><td>1.12</td><td>S</td></tr> <tr><td>2</td><td>Basavapalle RF</td><td>3.29</td><td>WSW</td></tr> <tr><td>3</td><td>Chilapalle RF</td><td>4.31</td><td>NW</td></tr> <tr><td>4</td><td>Basavapalle RF</td><td>4.56</td><td>WNW</td></tr> <tr><td>5</td><td>Bommasamudra Ext RF</td><td>6.44</td><td>SW</td></tr> <tr><td>6</td><td>Chittapara RF</td><td>6.94</td><td>W</td></tr> <tr><td>7</td><td>Bommasamudram RF</td><td>6.99</td><td>W W</td></tr> <tr><td>8</td><td>anjanur RF</td><td>7.7</td><td>SW</td></tr> <tr><td>9</td><td>Amudala RF</td><td>7.85</td><td>N</td></tr> <tr><td>10</td><td>Pana andangi RF</td><td>8.57</td><td>SW</td></tr> <tr><td>11</td><td>Chittapara RF</td><td>9.27</td><td>W</td></tr> <tr><td>12</td><td>Ammur RF</td><td>10.68</td><td>ESE</td></tr> <tr><td>13</td><td>Chaseskonda RF</td><td>12.03</td><td>NNW</td></tr> <tr><td>14</td><td>Reddigunta RF</td><td>12.61</td><td>NW</td></tr> <tr><td>15</td><td>Tiruvalam RF</td><td>13.09</td><td>SSE</td></tr> <tr><td>16</td><td>RF near Ammundi</td><td>13.48</td><td>S</td></tr> <tr><td>17</td><td>Pachigunta RF</td><td>13.91</td><td>NNE</td></tr> <tr><td>18</td><td>Kil Minnal RF</td><td>13.93</td><td>S</td></tr> <tr><td>19</td><td>Kinatampalle RF</td><td>14.52</td><td>WNW</td></tr> </tbody> </table>	S.No	Places	D stance (≈km)	Direction	1	Magimandalam RF	1.12	S	2	Basavapalle RF	3.29	WSW	3	Chilapalle RF	4.31	NW	4	Basavapalle RF	4.56	WNW	5	Bommasamudra Ext RF	6.44	SW	6	Chittapara RF	6.94	W	7	Bommasamudram RF	6.99	W W	8	anjanur RF	7.7	SW	9	Amudala RF	7.85	N	10	Pana andangi RF	8.57	SW	11	Chittapara RF	9.27	W	12	Ammur RF	10.68	ESE	13	Chaseskonda RF	12.03	NNW	14	Reddigunta RF	12.61	NW	15	Tiruvalam RF	13.09	SSE	16	RF near Ammundi	13.48	S	17	Pachigunta RF	13.91	NNE	18	Kil Minnal RF	13.93	S	19	Kinatampalle RF	14.52	WNW
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20	The Environmental Impact Assessment should study impact on forest, vegetation, endemic.vulnerable and endangered indigenous flora and fauna.	Detailed biodiversity study is discussed in Chapter 3, Section 3.10																																																																																
21	The Environmental Impact Assessment should study impact on standing trees and the existing trees should be numbered and action suggested for protection.	<p>The impacts and mitigation measures of Biological environment is discussed in Chapter 4, Section 4.6</p> <p>Action suggested for protection: An area of 0.10.0 Ha land was allotted for greenbelt development during 5 years of mining plan, TAMIN Siruvalai Black Granite quarry proposed to plant 20 No's of trees per year and Rs.30,000/- will spend for proposed greenbelt</p>																																																																																

		development and maintenance. Plants are chosen to provide aesthetic, ecological and economical value. Trees will help to arrest propagation of noise and help to lessen dust pollution due to dust arresting action. The plantation will be developed around 7.5m safety zone of the quarry.
22	The Environment Impact Assessment study impact on protected areas. Reserve Forests, National Parks. Corridors and life pathways, near project site.	There are no National parks, Biosphere Reserves, Wildlife Corridors; Tiger/ Elephant Reserves is located within 10km of the mine lease area.
Water Environment		
23	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, tank 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 this regard may be provided, covering the entire mine lease period.	Noted will be followed
24	Erosion Control measures.	Green belt development is one the important control measure of erosion which is discussed in Chapter 4 in Section 4.7.
25	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 area.	Noted. The environmental sensitive areas covering an aerial distance of 15 km from the project boundary is given in Chapter 3, Section 3-3, Table 3-1
26	The project proponent shall study impact on fish habitats and the food WEB food chain in the water body and Reservoir	A detailed study on impacts and its mitigation measures of biological environment is discussed in Chapter 4, Section 4.6
27	The project proponent shall study and furnish the details on potential fragmentation impact of natural environment, by the activities.	The potential fragmentation impact of natural environment, by the activities is discussed in Chapter 4.
28	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	The detailed impact on on aquatic plants and animals in water bodies and possible scars on the landscape, damages to nearby caves, heritage site, and archaeological sites are discussed in Chapter 4.

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

	archaeological sites possible land form changes visual and aesthetic impacts	
29	The Terms of Reference should specifically study impact on soil health, soil erosion, the soil physical, chemical components and microbial components.	Soil quality monitoring locations & results are discussed in Chapter 3, Section 3.9.
30	The Environmental Impact Assessment should study on wetlands, water bodies, rivers streams, lakes and farmer sites.	Noted.
Energy		
31	The measures taken to control Noise. Air. Water, Dust Control and steps adopted so efficiently utilise the Energy shall be furnished.	Noted. Environmental Impacts and Mitigation Measures are provided in Chapter 4.
Climate Change		
32	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 or other emission and climate mitigation activities	The mitigation measures of Air Environment is discussed in Chapter 4, Section 4.2
33	The Environmental Impact Assessment should study impact on climate change, temperature rise, pollution and above soil & below soil carbon stock.	Noted
Mine Closure Plan		
34	Detailed Mine Closure Plan covering the entire mine lease period as per precise area communication order issued.	Mine Closure Plan is provided in Chapter 7, Section 7.2.4
EMP		
35	Detailed Environment Management Plan along with adaptation, mitigation & remedial strategies covering the entire issued e period as per precise area communication order issued.	Environment Management Plan is provided in Chapter 10
36	The Environmental Impact Assesment should hold detailed study on EMP with budget for Green belt development and mine closure plan including disaster management plan.	Noted

Risk Assessment		
37	To furnish risk assessment and management plan including anticipated vulnerabilities during operational and post operational phases of Mining	Risk Identification & Management are provided in Chapter 7, Section 7.3
Disaster Management Plan		
38	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 ares due to the proposed method of mining activity & its related activities covering the entire mine lease period as per precise area communication order issued.	Disaster Management Plan is provided in Chapter 7, Section 7.2.3
Others		
39	The project proponent shall furnish VAO certificate with reference to 300m radius regard to approved habitations, schools. Archaeological sites. Structures, railway lines, roads, water bodies such as streams, oda, vaari, canal, channel, river, lake pond, tank etc.	Environmental Sensitive Areas within 15km from Project Boundary is given in Chapter 3, Section 3.3 and Table 3-1.
40	As per the MoEF& CC office memorandum F.No.22-65/2017-IA III dated: 30.09.2020 and 20.10.2020 the proponent shall address the concerns raised during the public consultation and all the activities proposed shall be part of the Environment Management Plan	Noted and will be followed
41	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	No plastics are involved in the proposed project

1.11.5.1 Standard Terms of Reference

S. No	Terms of Reference	Compliance
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.	This Granite (Minor Mineral) Mining Projects. EC is applicable as per from 14.09.2006 vide notification S.O.1533(E) dated 14.09.2006. Year-wise production details since 1994 is given in Annexure –9 The mine was operated with prior EC and came under violation category. Accordingly, TAMIN applied for EC under violation category and obtained EC from MoEF&CC vide F.No 23-203/2018-1A, III(V), Dated : 09.04.2021
2	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	TAMIN is rightful lessee in accordance with the above Government of Tamil Nadu has granted precise area communication letter from IIPC (MME.1) Department vide letter No.3865290/MME.1/2023-1, dated: 13.03.2023is enclosed as Annexure–2.
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.	Yes. All documents including approved mine plan, EIA and Public Hearing is compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and it is in the name of TAMIN (lessee).
4	All corner co-ordinates of the mine lease area, superimposed in a High Resolution Imagery/ topo sheet, topographic sheet, geomorphology and geology of the area should be provided. Such a Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	<ol style="list-style-type: none"> 1. All corner co-ordinates of ML area given in Chapter 1.7.3. Table 1.4. 2. All corner co-ordinates of the mine lease area, superimposed in a High Resolution Imagery/ topo sheet, topographic sheet, geomorphology and geology of the area has been provided in Chapter 3. 3. Such a Imagery of the proposed area and land use and other ecological features of the study area (core and buffer zone) has been clearly shown in Chapter 3.
5	Information should be provided in Survey of India Topo sheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.	Information has been provided in Survey of India Topo sheet 1:50,000 scale indicating geological map of the area vide Figure 2-9. Geomorphology of land forms of the area is given in Figure 3-13 Existing Minerals and Mining History of the area:- Vellore District in Tamil Nadu accounts for 79% of country's resources of vermiculite (source: IBM - Indian Minerals year book 2016) with a single operating mine producing 989 tonnes in

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

		<p>2015-16 valued for 2218 million rupees. In addition to Granites (Dimension stones) and River Sand with minor occurrence of other minerals such as Fireclay, Graphite, Limestone, Quartz/Silica sand, Apatite, Barytes, Molybdenum, etc., excluding Atomic and Rare Earth Minerals.</p> <p>[Source: Vellore District Survey Report As per MoEf &CC notification No.S.O. 141 (E) dt.15.01.2016].</p> <p>Important water bodies, streams and rivers and soil characteristics. Important water bodies, streams and rivers and soil characteristics have been explained in Chapter 3. Drainage map is shown in Chapter 3, Section 3.5.7, and Figure 3-15.</p>
6	<p>Details about the land proposed for mining activities should be given with information as to whether mining confirms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.</p>	<p>The proposed quarry cite is Govt. Poramboke land and GoTN has already given lease to TAMIN up to 22.11.2022. As of now again the GoTN has proposed to grant lease to TAMIN for 20 years vide GoTN, IIPC (MME.1) Department, Lr. No.3865290/MME.1/2023-1,dated: 13.03.2023 i.e., Precise area communication letter is enclosed as Annexure-2.</p>
7	<p>It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? I 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/vibration of the environmental or forest norms/conditions? The hierarchical systems or administrative order of the Company to deal with the environmental issues and for ensuring compliances 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 stakeholders at large, may also be detailed in the EIA Report.</p>	<p>TAMIN has a well laid down Environment Policy approved by its Board of Directors. Environmental Policy of TAMIN is given in Chapter 10 Section 10.15.</p> <p>The hierarchical systems or administrative order of the Company to deal with the environmental issues and for ensuring compliances with the EC conditions has been given in Chapter 10, Figure 10-1. The system of reporting of non-compliances /violations of environmental norms to the Board of Directors of the Company and /or stakeholders at large, has been be detailed in the EIA Report vide Chapter 10.</p>
8	<p>Issues relating to Mine safety, including subsidence study in case of underground mining and slope study in case of open</p>	<p>It is open cast semi mechanized mining and no underground mining will be done. So no</p>

	cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should be provided.	subsidence study is required. A detail regarding Slope of the pit, drilling and blasting is mentioned in Chapter 2 and Section 2.9 and Section 2.10. Safeguard measures are provided in Chapter-7, Section 7.2.2.8.																														
9	The study area will comprise of 10km 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.	The study area of 10km zone around the mines lease from lease periphery and furnished in Chapter 3. The production capacity, mineable capacity, waste generation and other such details have been calculated for the lease period of five years as per the approved mining plan and also discussed in EIA in the Chapter 2 in Table 2-7																														
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 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 are given below. Land use pattern of the Study Area: Land use/land cover of Study Area is given in Chapter 3 and Section 3.5.4.1, Table 3-3, Figure 3-7 & Figure 3-8. Land use details of the quarry area: <table border="1"> <thead> <tr> <th>S. No</th> <th>Land Use</th> <th>Present Area (in Ha)</th> <th>Area to be required during the mining plan (Ha)</th> <th>Area at the end of the quarrying period (Ha)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Mining</td> <td>9.58.5</td> <td>2.35.5</td> <td>26.64.0</td> </tr> <tr> <td>2</td> <td>Waste Dump</td> <td>6.46.0</td> <td>1.75.0</td> <td>75.38.0</td> </tr> <tr> <td>3</td> <td>Infrastructure</td> <td>0.05.0</td> <td>-</td> <td>0.05.0</td> </tr> <tr> <td>4</td> <td>Mine Approach Road</td> <td>3.40.0</td> <td>-</td> <td>1.26.5</td> </tr> <tr> <td>5</td> <td>Village Road</td> <td>0.01.0</td> <td>-</td> <td>0.01.0</td> </tr> </tbody> </table>	S. No	Land Use	Present Area (in Ha)	Area to be required during the mining plan (Ha)	Area at the end of the quarrying period (Ha)	1	Mining	9.58.5	2.35.5	26.64.0	2	Waste Dump	6.46.0	1.75.0	75.38.0	3	Infrastructure	0.05.0	-	0.05.0	4	Mine Approach Road	3.40.0	-	1.26.5	5	Village Road	0.01.0	-	0.01.0
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		6	Afforestation	2.15.0	0.10.0	4.37.0
		7	Un utilized Area	145.26.0	141.05.5	59.20.0
		Total		166.92.0	145.26.0	166.92.0
		A Land use detail of the quarry areas provided in Chapter 2, Section 2.6, Table 2.6.				
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.	There is no external dump for over burden, side burdens. Over burden, Side burden and granite rejects will be dump within the lease area/boundary only.				
12	A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.	<p>The lease area is Government poramboke land and the same has been mentioned in Precise area communication letter issued by GoTN vide Lr.No.3865290/MME.1/2023-1, dated: 13.03.2023, is enclosed as Annexure-2.</p> <p>Hence, the question of certificate from the Competent Authority in the State Forest Department does not arise.</p>				
13	State of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	As the lease area is Government poramboke land and there is no forest land involved in the lease applied area the question of net present value (NPV) and compensatory afforestation (CA) and copy of the forestry clearance does not arise.				
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.	The area is not covered under Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006. Hence, it is not applicable.				
15	The vegetation in the RF/ PF areas in the study area, with necessary details, should be given.	The details of vegetation in the RF/ PF areas in the study area, are given in Chapter 3, Section 3.4, Table 3-1 and Figure 3-3(a) & Figure 3-4(b).				

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.	There are no protected wildlife areas within the 15km radius of the project. Impact study was carried out as per ToR and detailed mitigation measures are furnished in Chapter 4 Section 4.6.3.
17	Locations of National parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/(existing as well proposed), if any, within 10km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.	There are no National Park, Sanctuaries, Biosphere Reserve, Wild life Corridors, Tiger/Elephant reserves (existing as well as proposed) present in the Study area .This site or study area is not even coming under any ESZ also. The details of environmental sensitive areas covering within 15km from project boundary are given in Chapter 3 and section 3.4, Table 3-1 &Figure 3-3(a) &Figure 3-4(b).
18	A detailed biological study of the study area [core zone and buffer zone (10km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary filed survey, clearly indicating the schedule of the fauna present. In case of any Schedule-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds implementing the same should be made as part of the project cost.	Detailed of flora & fauna Ecology and Biodiversity along with methodology, of the Study area has been carried out and details are added in Chapter 3, Section 3.11. No Schedule 1 Species has been found in the study area; hence species specific conservation plan is not required.
19	Proximity to Areas declared as “Critically Polluted” or the Project areas likely to come under the ‘Aravali Range’,	The project site is not falling near to any sensitive area or Critically polluted area.

	(attracting court restriction for mining operations), should also be indicated and whereso 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.	
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.
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 access their requirements and action programmes prepared 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.	The lease area is classified as Government Poramboke land. There is no Project Affected People (PAP) by the proposed mining activities. Hence, there is no need of R&R Plan. There is no human settlement in allotted mine lease area. Socio economic study has been done and incorporated in chapter 3.
22	One season (non-monsoon) [i.e March–May (Summer Season); October-December (Post Monsoon Season); December-February (Winter Seasons)] primary baseline data	The primary baseline data monitored covered three (3) months i.e., from March 2023 – May 2023 , and secondary data was collected from Government and Semi-Government organizations.

	<p>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 data-wise in the EIA and EMP report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500m of the mine lease in the pre-dominant downwind direction.</p> <p>The mineralogical composition of PM10, particularly for free silica, should be given.</p>	<p>The primary baseline data results and discussions are furnished in Chapter 3.</p> <p>Ambient Air Quality:</p> <p>The details of Ambient Air Quality Monitoring Locations, Results and Maps are provided in Chapter 3, Section 3.7, Table 3.7- Table 3.9, Figure 3.22 & Figure 3.23.</p> <p>Noise:</p> <p>The details of Noise Monitoring Locations, Results and Maps are provided in Chapter 3, Section 3.8, Table 3.10, Figure 3.24.</p> <p>Water:</p> <p>The details of Surface Water Monitoring Locations, Results and Maps are provided in Chapter 3, Section 3.9.1, Table 3.13 & Table 3.14, Figure 3.25.</p> <p>The details of Ground Water Monitoring Locations, Results and Maps are provided in Chapter 3, Section 3.9.3, Table 3.15 to Table 3.16, Figure 3.27.</p> <p>Soil:</p> <p>The details of soil Monitoring Locations, Results and Maps are provided in Chapter 3, Section 3.10, Table 3.17 & Table 3.18, Figure 3.28.</p>
23	<p>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.</p>	<p>Total maximum GLCs from emissions:</p> <p>The maximum ground level concentration observed due to mining activities and traffic movement through Air Modelling for TSPM, PM₁₀, PM_{2.5}, SO₂ and NO_x are 173µg/m³, 69µg/m³, 39µg/m³, 17µg/m³, and 35µg/m³ respectively.</p> <p>The details are provided in Chapter 4, Section 4.2.5, Table 4.15.</p> <p>Predominant wind direction South west.</p> <p>Map showing the Ambient Air Quality monitoring locations are given in Chapter 3, Section 3.7.1 Figure 3.22.</p>

		<p>Wind rose diagram considered for dispersion modeling is shown in Chapter 4, Section 4.2.3 Figure 4.1.</p> <p>Traffic Volume after Implementation of the Project: Due to propose project there will be slight increment in the vehicle movement but the level of service (LOS) anticipated will be Free Flow. The details are provided in Chapter 4, Section 4.2.5, Table 4.16 & Table 4.17.</p>
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.	<p>The water requirement for the project is addressed in Chapter 2 and Section 2.11.2. Table 2.12.</p> <p>The total water requirement is sourced from Private tank suppliers. The details are shown in Chapter 4, Section 4.3, Figure 4.49.</p>
25	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	No ground water withdrawal to meet the water requirement is proposed. The total water requirement will be sourced from Private tank suppliers.

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.	<p>Water conservation measures: Portable Tankers hired from nearby village are source for dust suppression and land reclamation and Drinking Purpose. Optimum utilization to avoid unnecessary wastage of water will be done like Atomized water sprinklers will be used to minimize the air borne dust emissions on haul roads.</p> <p>Rainwater harvesting: The rainwater will be diverted towards the middle of the mine to prevent water entering the mine working. The rainwater flows will also contain fines both from surface and waste dumps during seasonal flows. As such, it is proposed to have structures in such a way to act as settling pond and also for rainwater harvesting.</p> <ul style="list-style-type: none"> ➤ Construct barriers at suitable intervals along the path of the drains. ➤ Divert the water to de-silting cum rainwater harvesting pond in the mine area. <p>Provide necessary overflow arrangement to maintain the natural drainage system. Rainwater harvesting details are provided in Chapter 4 Section 4.3.4.2</p>
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.	<p>The Proposed depth the quarry is 30m from top of the hill and the ground water is in 38.6m BGL (As per Vellore District profile of TWAD board). So there will be no impact on the Ground water. There are no major surface water bodies in the surrounding the project area but the following measures will be taken to prevent the runoff water from polluting.</p> <p>Surface Water Pollution Control Measures:</p> <ul style="list-style-type: none"> ➤ Construction of garland drains of suitable size around mine area and dumps to prevent rain water descent into active mine areas. ➤ During monsoon season, the rain water will be collected by natural slope of area to water fed tank of the mine and it will be utilized for dust suppression and greenbelt development. ➤ The dump tops will be provided with inner slopes to control water flow to prevent erosion washouts. The dumps tops and slopes of in active areas will be covered with grasses, shrubs, mulching, etc, to prevent erosion, till final backfilling of dumps into mined out

		<p>areas.</p> <ul style="list-style-type: none"> ➤ Retaining walls of adequate dimensions will be provided at the top of dumps and the unstable OB benches within the mine to prevent wash off from dumps and sliding of material from benches. This will help in preventing silting of water drains/channels. ➤ The water channels/drains carrying the rain water from the mine will be provided with baffles and settling pits to arrest the suspended solids, if any, present in this water. ➤ The worked out slopes will be stabilized by planting appropriate shrub/grass species on the slopes. ➤ The mine water will be regularly tested for presence of any undesirable elements and appropriate measures will be taken in case any element is found exceeding the limits prescribed by CPCB. <p>Ground Water Pollution Control Measures</p> <ul style="list-style-type: none"> ➤ The proposed mining project will not generate any effluent. The domestic sewage from the toilets will be routed to septic tanks. ➤ Regular monitoring of water levels and quality in the existing open wells and bore well in the vicinity will be carried out. <p>The details are provided in Chapter 4, Section 4.3.4.2.</p>
28	<p>Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should be obtained and copy furnished.</p>	<p>The mining activity proposed in depth of 30m from the top of the hill. (ABL as per mining plan)</p> <p>Ground water table is available at 38.6m BGL as per Vellore District ground water Profile of TWAD board.</p> <p>Mining activities will not intersect with ground water table as the proposed depth of mining will be above ground level (from the top of the hill). Workable depth will be 30m from the top of the hill of height.</p>

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.	<ul style="list-style-type: none"> ➤ A safety distance of 7.5m shall be maintained for the Patta lands. ➤ A safety distance of 10m shall be maintained for the Govt Poromboke land S.F.No: 917(P) & 921(P) ➤ Details are provided in area precise communication letter is provided as Annexure-2.
30	Information on site elevation, working depth, groundwater table etc. Should be provided both in ASML and bgl. A schematic diagram may also be provided for the same.	<p>Site Elevation: 445m Groundwater level is 19m. (As per mining plan) Proposed Depth of Mining is 30m AGL given in the Mining Plan enclosed as Annexure-4.</p>
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 greenbelt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.	<p>About 0.10.0 Ha of area is proposed for Green Belt development. It is proposed to plant 20 No's of trees per year. Detailed Green Belt Development plan is given in Chapter 2 section 2.16.8. Table 2.18.</p> <p>Species of ecological value and good utility value to the local population with emphasis on local and native species are proposed as part of the afforestation.</p>
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	<p>The transportation of Mineral will be done by vehicles through existing roads and high ways. Traffic volume after implementation of the project he transportation of Mineral will be done by vehicles through existing roads and high ways. Traffic volume after implementation of the project.</p> <p>Due to propose project there will be slight increment in the vehicle movement but the level of service (LOS) anticipated will be Free Flow.</p> <p>Impact and Mitigation on local transport:</p>

	Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.	<p>The increment in the dust emissions will be mainly due to transportation activity. Therefore, emissions due to mineral handling during mining operation are not much and restricted to the lease area only. Proper mitigation measures are practiced during mining activities to control air pollution load below the prescribed limits are as follows:</p> <ul style="list-style-type: none"> ➤ Regular water sprinkling on haul and access roads. ➤ Watering of haul roads and other roads at regular intervals ➤ Provision of green belt by vegetation for trapping dust. ➤ Greenbelt development along the haul roads, dumps and along the boundaries of the lease area. ➤ Utmost care will be taken to prevent spillage of sand and stone from the trucks. <p>Impacts and mitigation measures on transportation is given in Chapter 4. Section 4.2.5.1.</p>
33	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	<p>Sanitation facilities are provided to mines workers. The details are provided in Mining plan and the same is enclosed as Annexure-4 (Table 2.5).</p> <p>Land use details of the quarry area are given in Chapter-2, Section 2.6.</p>
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.	<p>There will be no reclamation and restoration.</p> <p>It is proposed not to fill back the ultimate pit, in as much as good quantity of reserve is available below the workable depth.</p>
35	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	<p>Impacts on Occupational Health due to project operations:</p> <p>Anticipated occupational illness sequel to mining activities involved in the project. Occupational health problems due to dust & noise and Occupational illness by quarry activities as follows;</p> <ul style="list-style-type: none"> ➤ Dust related pneumonia ➤ Tuberculosis ➤ Rheumatic arthritis ➤ Segmental vibration <p>Mitigate Measures for Occupational Health</p>

- Adoption of dust suppression measures like spraying water, use of drill with dust collection system or wet drills etc.
- Plantation
- Avoid blasting during unfavorable wind & atmospheric conditions.
- Use of personal protective equipment. Compliance with DGMS circulars.
- Emergency response plan that includes installation of emergency response equipment to combat events such as fire.
- All personnel required to handle hazardous materials will be provided with personal protective equipment suitable for the hazardous material being handled.
- On-site first aid facilities will be provided and employees will be extended to the local community in emergencies.

Mine Safety and Mitigation Measures:

S. No	Activity	Mitigation measures
1	Excavation	➤ Planned excavation, avoid haphazard mining.
2	Drilling and blasting	➤ In addition, the operators and other workers should be provided with masks, helmets, gloves and earplugs.
3	Safety zone	<ul style="list-style-type: none"> ➤ Provisions for a buffer zone between the local habitation and the mine lease in the form of a green belt of suitable width. ➤ Restricted entry, use of sirens and cordoning of the blasting area are some of the good practices to avoid accidents.
4	Overburden stabilization	<ul style="list-style-type: none"> ➤ Accidents are known to happen due to overburden collapse. ➤ Therefore, slope stabilization and dump stability are critical issues for safety and environment. All measures will be taken

			care for stabilization of Overburden.	
		5	Worker's health surveillance	<ul style="list-style-type: none"> ➤ Health survey programmes for workers and local community. ➤ Regular training and awareness of employees to be conducted to meet health and safety objectives.
		Occupational Health impacts & preventive measures detail given in Chapter 4Section 4.7.3 The EMP details are given separately as Chapter 10 along with EMP Cost details are provide in Section 10.14.		
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.	Due to implementation of proposed environmental Management plan mentioned in this report no significant public health implications are anticipated. budgetary allocations on remedial measures have been included in EMP Budget in Chapter 10 "Environmental Management Plan".		
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.	Corporate Environment Responsibility Programmes such as providing Solar lights, Computers to the Govt School, Mahimandalam. In accordance with MoEF&CC Om date 20.10.2020. Quantitative dimension along with budgetary allocations and time line have been mention in Chapter 8 "Project Benefits".		
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.	<p>Current land use pattern is Government proarmaoke land. As apetrgetic character, the depth persistence of the Black Granite body in the mine area is beyond the workable limits. However, it is very difficult to operate granite dimensional stone mine economically below an average depth of 30m by observing statutory provisions.</p> <p>Hence, it not to back fill the ultimate pit, in as much as good quantity of reserves is available below the work depth and there is a possibility of technology of up gradation in Granite mining for greater depth.</p> <p>Hence, the Pit boundaries will be fenced and used for agricultural purpose when the pit is</p>		

		filled with underground seepage or rain water. The EMP details are given as a separately as Chapter 10 along with EMP Cost details are provided in Section 10.14.
39	Public Hearing points raised and commitment of the Project Proponent on the same along with time bound action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.	Public Hearing points and commitment of the project applicant were provided and also incorporated in Chapter- 7 “Additional Studies” in Final EIA/EMP Report after PH.
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.	There is no litigation against the project. [As the Mine was operated without prior EC, credible action was initiated under E(P) Act, 1986 and Judgment pronounced. As of now no litigation]
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.	The project Cost is 99,97,000/- as addressed in Chapter 2 and Section 2.8
42	A Disaster Management Plan shall be prepared and include in the EIA/EMP Report.	Detailed Disaster management plan are provided in Chapter 7 and Section 7.2.3.
43	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the project shall clearly indicate environmental, social, economic, employment potential, etc.	All the details of project benefits of project is added in, Chapter- 8 “Project benefits” & Chapter-10 “Environmental Management Plan”
44	Besides the above, the below mentioned general points are also to be followed:	
a)	Executive Summary of the EIA/EMP report.	Executive Summary of EIA Report enclosed separately
b)	All documents to be properly referenced with index and continuous page numbering.	Noted and all documents addressed with properly referenced with index and continuous page numbers.
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.	Noted and sources for all tables are addressed.
d)	Project Proponent shall enclose all the analysis/testing reports of Water, Soil, Air, Noise etc. using the MoEF&CC/NABL	All the analysis/testing reports of Water, Soil, Air, Noise etc. are conducted by MoEF&CC& NABL accredited laboratories.

	accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.	The disclosure of Consultant is given in Chapter 12 .
e)	Where the documents provided are in a language other than English, an English translation should be provided.	The entire document is prepared in English.
f)	The Questionnaire for environmental appraisal of mining projects as devised earlier by the ministry shall also be filled and submitted.	Questionnaire for environmental appraisal of mining projects is prepared as per prescribed format.
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.	EIA is Prepared as per O.M No. J-11013/41/2006-IA. II (I) dated 4th August, 2009 given by MoEF&CC and the generic structure prescribed in Appendix-III of EIA Notification 2006 and covered all ToR Compliances.
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
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 condition 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.	Enclosed.
j)	The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and	All the Sectional Plates are enclosed as Annexure-5

	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 adjoin area.	
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1.11.5.2 In addition to the above the following shall be furnished:

The executive summary of the EIA/EMP report in about 8-10 pages should be prepared incorporating the information on following point:

S. No	ToR Point	Compliance
1	Project name and location (village, District, State, Industrial Estate (if applicable))	Noted and is followed
2	Process description in brief, specifically indicating the gaseous emission, liquid effluent and solid and hazardous waste.	Noted and is followed
3	Measures for mitigation the impacts on the environment and mode of discharge or disposal	Noted and is followed
4	Capital cost of the project, estimated time of completion.	Noted and is followed
5	The proponent shall furnish the contour map of the water table detailing the number of wells located around the site and impacts on the wells due to mining activity	Noted and is followed
6	A detailed study of the lithology of the mining lease area shall be furnished	Noted and is followed
7	Detailed of village map” A” register and FMB sketch shall be furnished	Noted and is followed
8	Detailed mining closure plan for the proposed projects approved by the Geology of Mining department shall be shall be submitted along with EIA report	Noted and is followed
9	Obtain a letter/certificate from the Assisstant Director of Geology and Mining standing that there is no other Minerals/resources like sand in the quarrying area within the approved depth of mining and below depth of mining and the same shall be furnished in the EIA report	Noted and is followed
10	EIA report should strictly follow the Environmental Impact Assessment Guidance Manual for Mining of Minerals published February 2010	Noted and is followed
11	Details plan on rehabilitation and reclamation carried out for the stabilization and restoration of the mined areas.	Noted and is followed
12	The EIA study report shall include the surrounding mining activity, if any.	Noted and is followed
13	Modelling study for Air, Water and Noise shal be carried out in this field and incremental increase	Noted and is followed

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

	in the above study shall be substantiated with mitigation measures	
14	A study on the geological resources available shall be carried out and reported	Noted and is followed
15	A specific study on agriculture and livelihood shall be carried out and reported	Noted and is followed
16	Impact of soil erosion, soil physical chemical and biological property changes may be assumed	Noted and is followed
17	Site selected for the project-Nature of land Agricultural (single/double crop), barren, Govt./private land, status of is acquisition, nearby (in 2-3km) water body, population, with in 10km other industries, forest, eco-sensitive zones, accessibility, (note-incase if industrial estate this information may not be necessary)	Noted and is followed
18	Baseline environmental data-air quality, surface and ground water quality and soil characteristic, flora and fauna, socio economic conditions of the nearby population.	Noted and is followed
19	Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.	Noted and is followed
20	Likely impact of the project on Air, Water, Land, flora and fauna and nearby population.	Noted and is followed
21	Emergency preparedness plan in case of natural or in case of plant emergencies.	Noted and is followed
22	Issues raised during public hearing (if applicable) and response giving.	Noted and is followed
23	CER plan with proposed expenditure.	Noted and is followed
24	Occupational Health Measures.	Noted and is followed
25	Post project monitoring plan.	Noted and is followed
26	The project proponent shall carry out detailed hydro geological study through institutions/NABET Accredited agencies.	Noted and is followed
27	A detailed report on the greenbelt development already undertaken is to be furnished and also submit the proposal for greenbelt activities	Noted and is followed
28	The proponent shall propose the suitable control measure to control the fugitive emissions during the operations of the mines	Noted and is followed
29	A specific study should include impact on flora and fauna, disturbance to migratory pattern of animals	Noted and is followed
30	Reserve funds should be earmarked for proper closure plan	Noted and is followed
31	A detailed plan on plastic waste management shall	Noted and is followed

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

	be furnished. Further, the proponent should strictly comply with, Tamil Nadu Government Order (Ms) No.84 Environment and Forests (EC.2) Department dated 25.06.2018 regarding ban on time use and throw away plastics irrespective of thickness with effect from 01.01.2019 under Environment (Protection) Act, 1986. In this connection, the project proponent has to furnish the action plan.	
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1.11.5.3 Besides the above the below mentioned general points should also be followed:

S. No	ToR Point	Compliance
a.	A note containing compliance of the ToR with cross referencing of the relevant sections/pages of the EIA report should be provided.	Noted and is followed
b.	All documents may be properly referenced with index, page number and continuous page numbering.	Noted and is followed
c.	Where data are present in the report especially in table, the period in which the data were collected and the sources should be indicated.	Noted and is followed
d.	While preparing the EIA report, the instructions for the proponents and instruction for the consultant issued by the MoEF vide OM no. J-11013/41/2006-IA.II (I) dated 4 th August 2009 which are available on the website of the ministry should also be followed.	Noted and is followed
e.	The consultants involved in the preparation of EIA/EMP report after accreditation with quality council of India (QCI)/National Accreditation board of Education and Training (NABET) would need to include a certificate in this regard in the EIA/EMP reports prepared by them and data provided by other organizations/laboratories including the status of the approvals etc. in this regards circular no. F.No.J-11013/77/2004-IA-II(I) dated 2 nd December, 2009, 18 th March 2010, 28 th May 2010, 28 th June 2010, 31 st December 2010 and 30 th September 2011 posted on the Ministry's website http://www/moef.nic.in/ may be referred.	EIA Report is prepared by NABET accredited Consultant, The Consultancy Laboratory is certified by MoEF&CC and NABL accredited. The disclosure of Consultant is given in Chapter 12 .

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

2 PROJECT DESCRIPTION

2.1 Type of Project including interlinked and interdependent projects

The black granite quarrying operation is proposed to carry out by opencast semi mechanized method by formation of benches. Benches are proposed with a height of 6m & 6 m width with vertical slopes. The area applied for quarry lease exhibits hilly terrain; the altitude of the area is above (-445) AMSL. Total estimated Geological reserves are 46,85,817 m³. Total Mineable Reserves is estimated as 42,21,763 m³. Maximum production will be 15,000 m³ of ROM of Black Granite. Summary of quarry reserves are given in **Table 2-1**.

The extent of the Quarry lease area is 166.92.0 Ha. The Quarry is located at Mahimandalam Village, Katpadi Taluk, Vellore District, Tamil Nadu State. Quarry lease area falls in the survey of India Topo sheet D 44N4 & 8, D44T 1&5 and the area lies in the Eastern Longitude from 79°12'00.57"E to 79°13'57.48"E and Northern latitude from 13°04'57.45"N to 13°05'34.90"N.

Table 2-1 Summary of Project Reserves

S. No	Description	Quantity (m ³)
Geological Reserves:		
1	Geological Reserves (ROM)	46,85,817
Mineable Reserves:		
1	Mineable Reserves (ROM)	42,21,763
2	Mineable Reserves (at 10 % Recovery)	4,22,176
3	The peak/maximum annual production per year would be	15,000

2.2 Need of the Project

The granite dimensional stone material by virtue of its pleasing color and texture and its best ability to take polishing and appealing look in polished product has attracted the consumers in the building construction and interior decoration industries. The domestic market capabilities have also been explored in recent periods. Bulk quantity of the blocks is produced and exported as raw blocks and some quantity is being processed at TAMIN's granite processing units and exported as value added finished products.

The earning source in the targeted area is limited, most of the people in and around the area depend upon the seasonal agriculture and much of the people migrate to nearby towns where good industries and factories are growing up.

This project will provide direct employment for about 30 persons. This material is well known in the international supermarket of Granite which will fetch a good foreign exchange to the nation.

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

2.3 Location of the project

The quarry is located at SF.No.917 (P) & 921(P), Mahimandalam Village, Katpadi Taluk, Vellore District, Tamil Nadu State. Quarry lease area falls in the survey of India Topo sheet D 44N4 & 8, D44T 1&5 and the area lies in the eastern Longitude from 79°12'00.57"E to 79°13'57.48"E and Northern latitude from 13°04'57.45"N to 13°05'34.90"N. The topography of the area is hilly. The elevation of the lease area is \approx 445m AMSL. The boundary coordinates of the site are shown in the **Table 2.2.**

Table 2-2 The Boundary Coordinates of the Site

S. No	Bourndary mark point	Latitude (N)	Longitude(E)
1	TM1	13° 5' 13.69"	79° 12' 0.57"
2	TM2	13° 5' 20.74"	79° 12' 3.44"
3	TM3	13° 5' 26.55"	79° 12' 38.95"
4	TM4	13° 5' 32.59"	79° 12' 37.84"
5	TM5	13° 5' 31.34"	79° 12' 53.42"
6	TM6	13° 5' 33.3"	79° 13' 9.31"
7	TM7	13° 5' 34.9"	79° 13' 28.75"
8	TM8	13° 5' 24.65"	79° 13' 29.58"
9	TM9	13° 5' 19.35"	79° 13' 29.12"
10	TM10	13° 5' 13.65"	79° 13' 56.52"
11	TM11	13° 5' 9.13"	79° 13' 57.48"
12	TM12	13° 5' 8.11"	79° 13' 56.43"
13	TM13	13° 5' 7.88"	79° 13' 55.86"
14	TM14	13° 5' 7.55"	79° 13' 54.4"
15	TM15	13° 5' 6.71"	79° 13' 50.53"
16	TM16	13° 5' 6.51"	79° 13' 50.06"
17	TM17	13° 5' 6.36"	79° 13' 47.11"
18	TM18	13° 5' 6.72"	79° 13' 47.04"
19	TM19	13° 5' 6.18"	79° 13' 44.69"
20	TM20	13° 5' 5.35"	79° 13' 42.01"
21	TM21	13° 5' 5.15"	79° 13' 41.41"
22	TM22	13° 5' 3.65"	79° 13' 41.02"
23	TM23	13° 5' 2.77"	79° 13' 41.09"
24	TM24	13° 5' 1.18"	79° 13' 36.76"
25	TM25	13° 5' 0.98"	79° 13' 36.19"
26	TM26	13° 4' 59.94"	79° 13' 36.33"
27	TM27	13° 4' 59.18"	79° 13' 34.65"
28	TM28	13° 4' 59.36"	79° 13' 32.59"
29	TM29	13° 4' 59.0"	79° 13' 31.73"
30	TM30	13° 4' 57.5"	79° 13' 31.54"
31	TM31	13° 4' 57.45"	79° 13' 29.71"
32	TM32	13° 4' 58.38"	79° 13' 27.35"
33	TM33	13° 4' 59.15"	79° 13' 26.18"
34	TM34	13° 4' 59.69"	79° 13' 24.45"
35	TM35	13° 5' 0.21"	79° 13' 24.35"
36	TM36	13° 5' 2.02"	79° 13' 21.78"

37	TM37	13° 5' 2.92"	79° 13' 20.98"
38	TM38	13° 5' 3.44"	79° 13' 19.91"
39	TM39	13° 5' 5.36"	79° 13' 19.83"
40	TM40	13° 5' 5.71"	79° 13' 19.2"
41	TM41	13° 5' 5.5"	79° 13' 16.34"
42	TM42	13° 5' 9.97"	79° 13' 14.12"
43	TM43	13° 5' 10.81"	79° 13' 13.68"
44	TM44	13° 5' 16.77"	79° 13' 9.59"
45	TM45	13° 5' 16.22"	79° 13' 9.6"
46	TM46	13° 5' 15.62"	79° 13' 8.27"
47	TM47	13° 5' 16.1"	79° 13' 6.31"
48	TM48	13° 5' 15.3"	79° 13' 3.36"
49	TM49	13° 5' 15.57"	79° 13' 0.87"
50	TM50	13° 5' 16.03"	79° 12' 55.79"
51	TM51	13° 5' 15.6"	79° 12' 50.65"
52	TM52	13° 5' 12.23"	79° 12' 52.06"
53	TM53	13° 5' 11.54"	79° 12' 51.9"
54	TM54	13° 5' 10.21"	79° 12' 52.01"
55	TM55	13° 5' 9.82"	79° 12' 52.15"
56	TM56	13° 5' 9.3"	79° 12' 53.11"
57	TM57	13° 5' 8.53"	79° 12' 53.32"
58	TM58	13° 5' 4.77"	79° 12' 47.34"
59	TM59	13° 5' 17.4"	79° 12' 47.91"
60	TM60	13° 5' 16.68"	79° 12' 28.33"
61	TM61	13° 5' 12.49"	79° 12' 24.08"
62	TM62	13° 5' 12.12"	79° 12' 17.54"
63	TM63	13° 5' 12.29"	79° 12' 10.3"

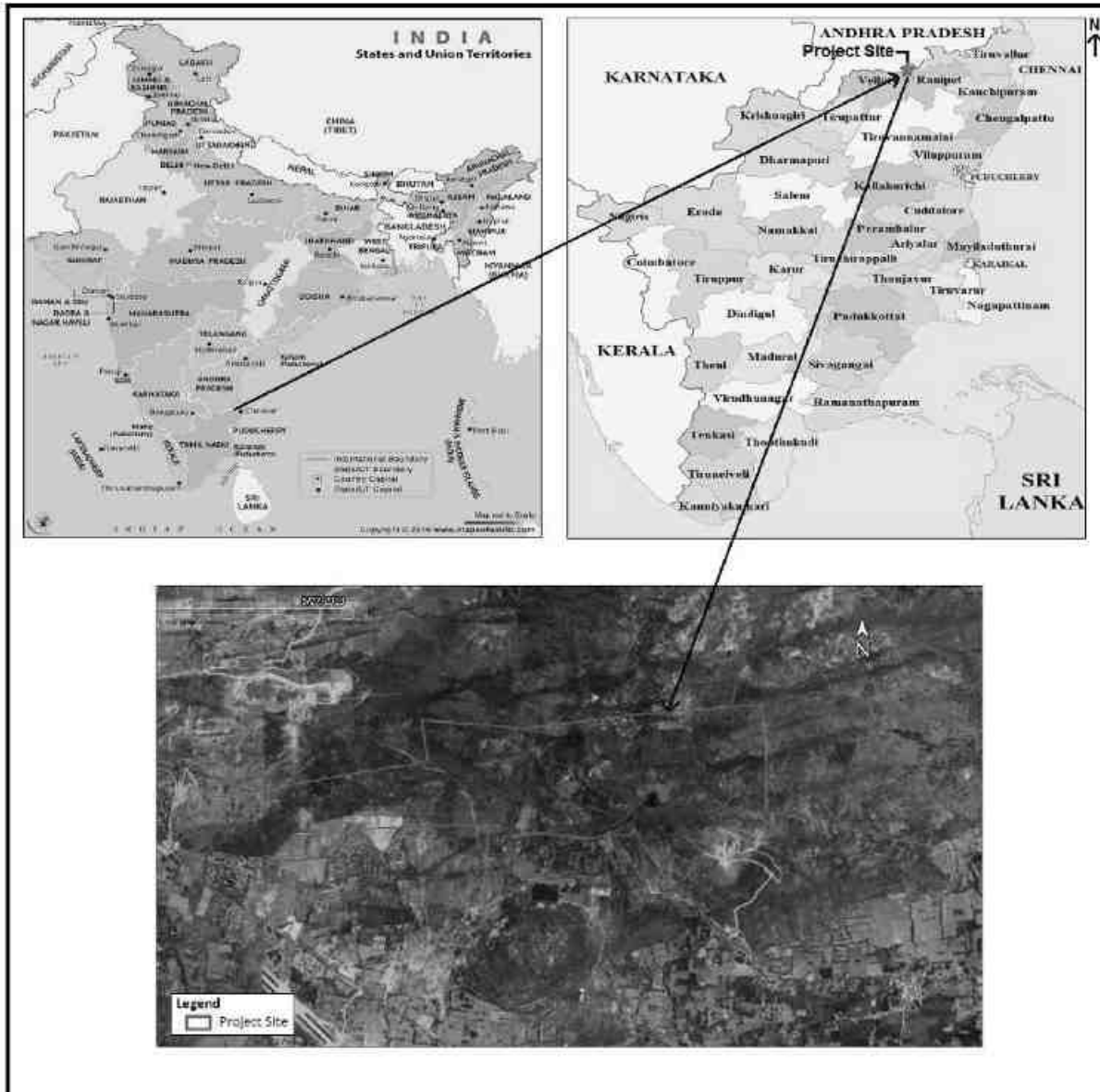


Figure 2-1 Project Location map



Figure 2-2 300m Google image of the lease area

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Figure 2-3 500m radius Google imagery of the lease area

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Figure 2-4 Google Imagery of 1 km radius of the lease area

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081



Figure 2-5 5km Google Imagery of the project site

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

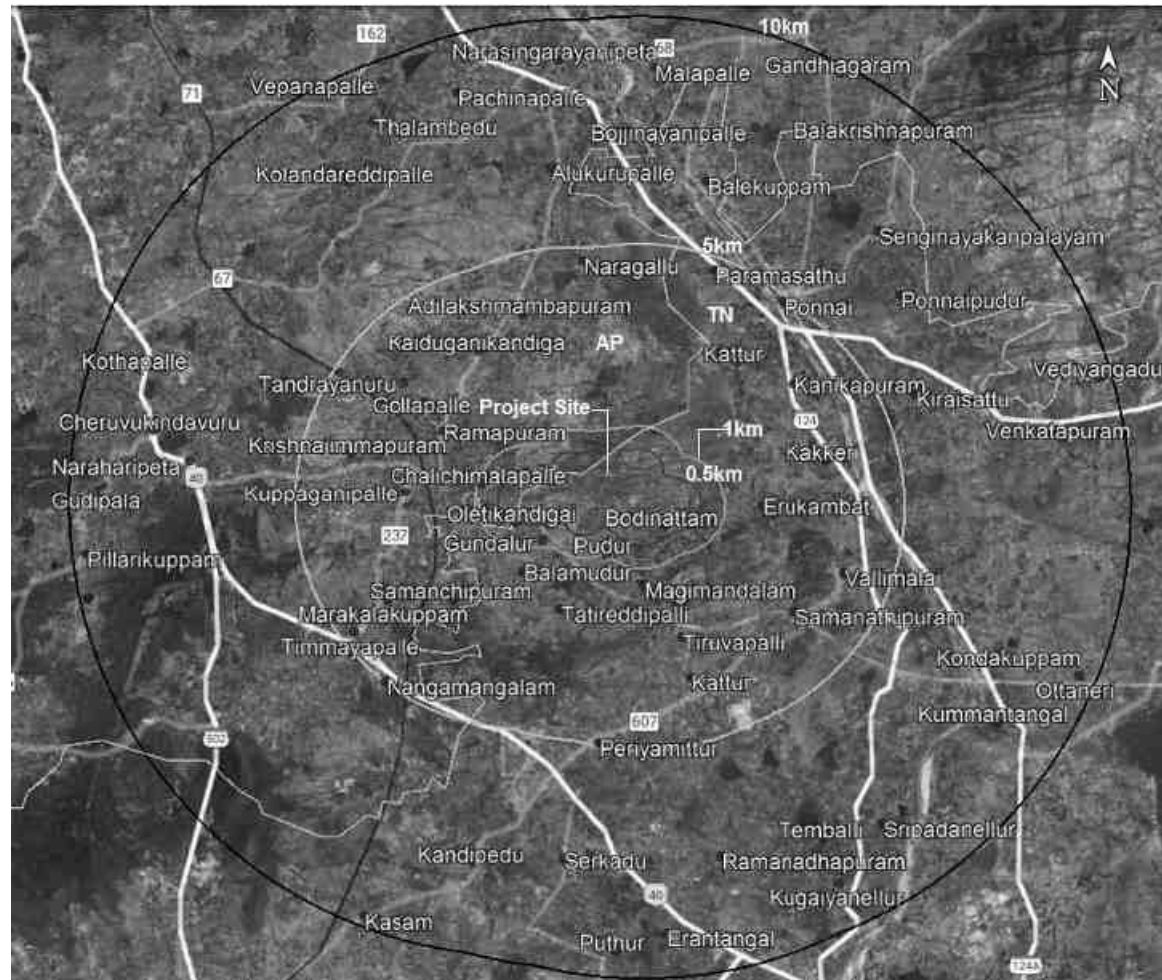


Figure 2-6 10km Google Imagery of the project site

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

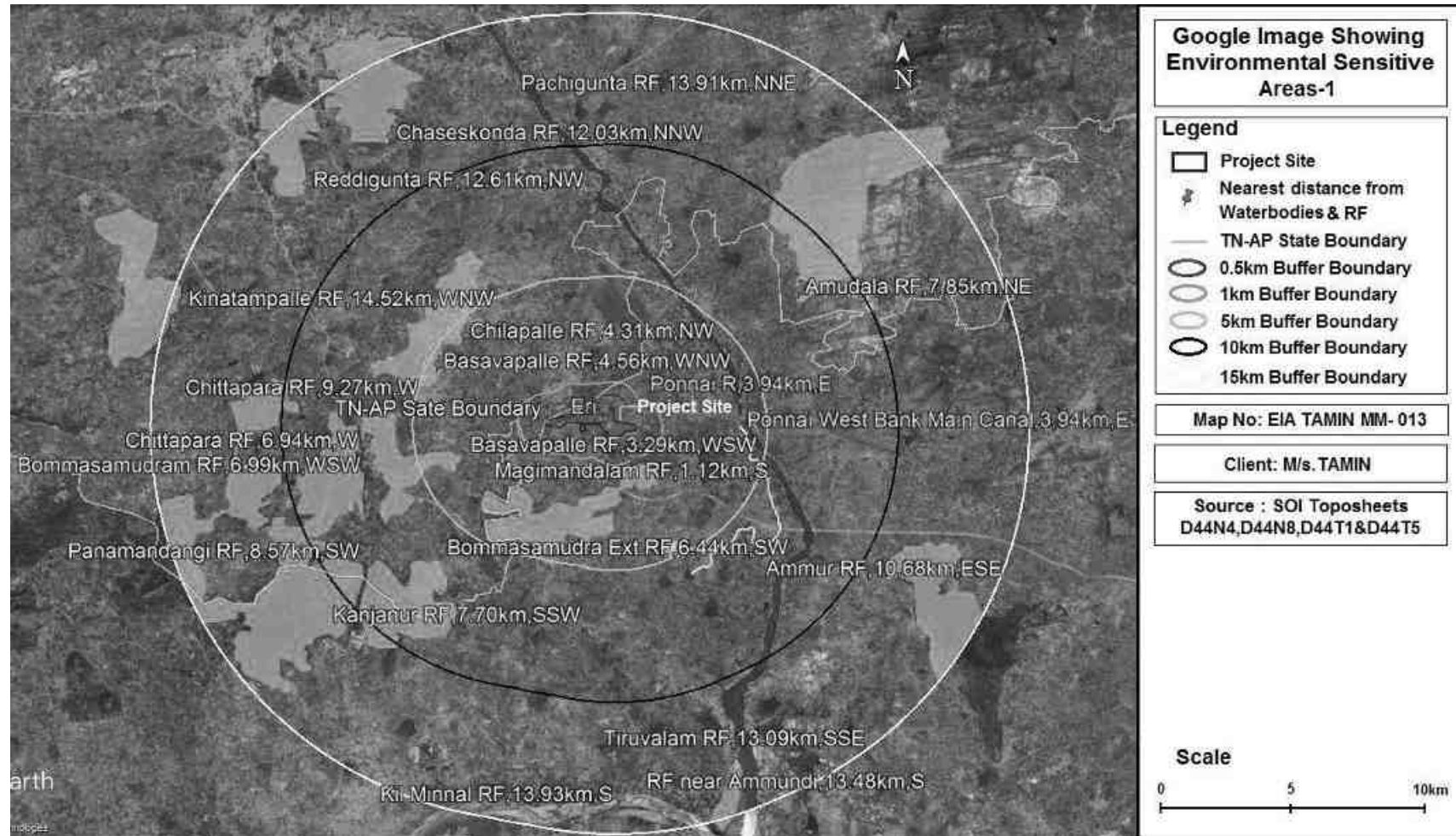


Figure 2-7 Environmental Sensitive areas within 15km radius of the lease area demarcated on Google image

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

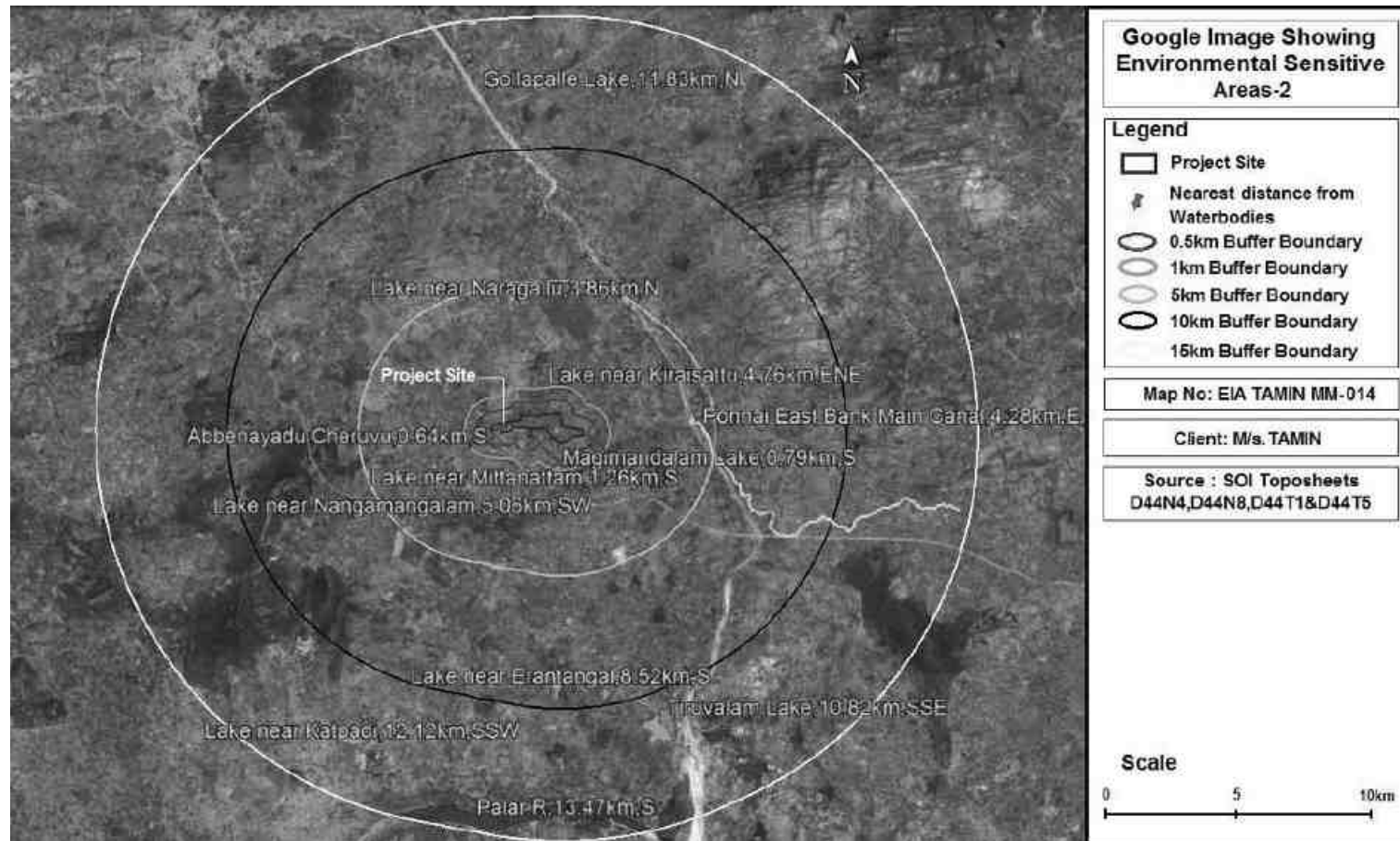


Figure 2-8 Environmental Sensitive areas within 15km radius of the lease area demarcated on Google image

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

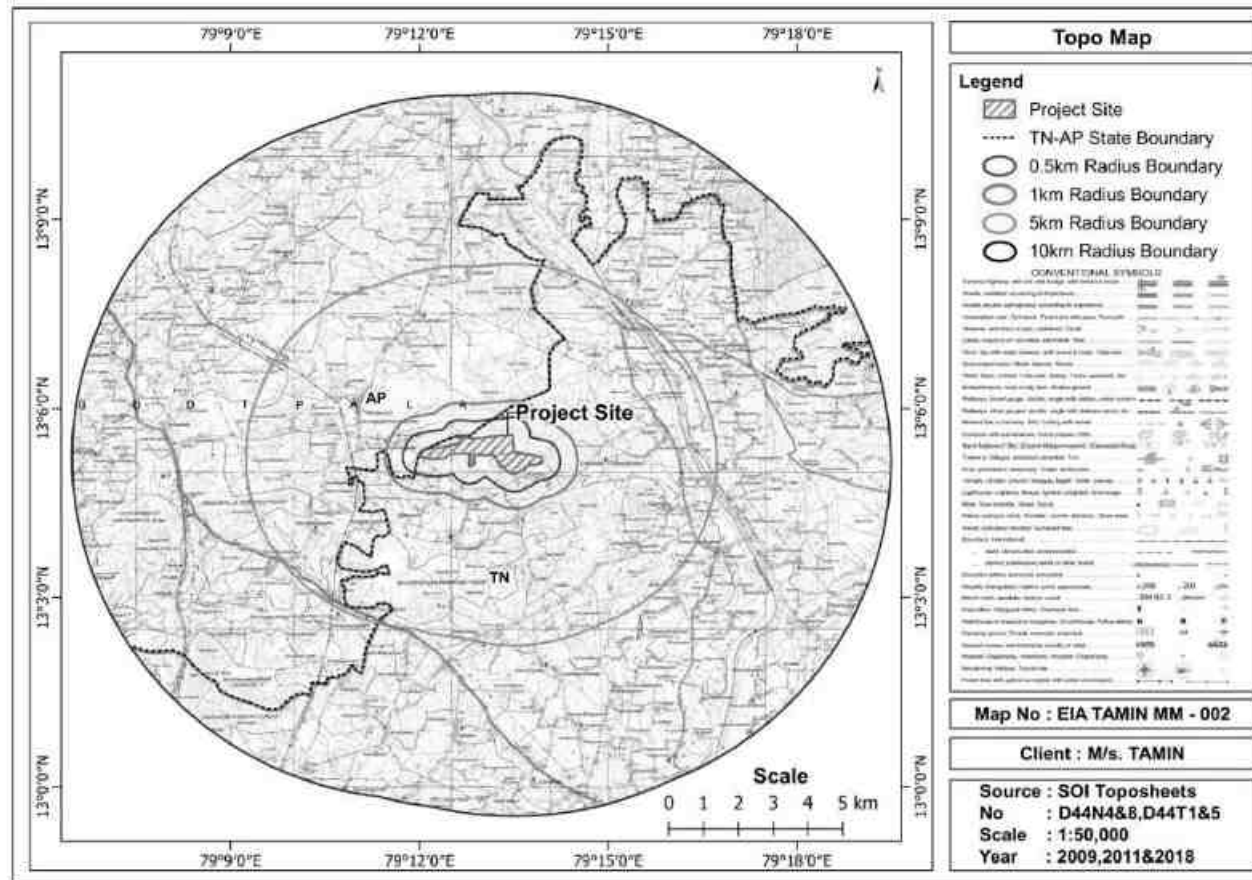


Figure 2-9 Topo map of the study area

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

Table 2-3 Salient Features and Environmental sensitivity details within 15km radius of the project side

S. No	Particulars	Details																																							
1	Latitude	79°12'00.57"E to 79°13'57.48"E																																							
2	Longitude	13°04'57.45"N to 13° 05'34.90"N																																							
3	The lease area height	445m																																							
4	Topo sheet no.	D 44N4 & 8, D44T 1&5																																							
5	Topography	Hilly terrain																																							
6	Land Type	Government Poramboke land																																							
7	Extent of lease area(hectares)	166.92.0																																							
8	Nearest National highway	NH 40-(Ranipettai-Kurnool) ≈ 4.75km- SW																																							
9	Nearest State highway	SH 124(Ponnai-Thiruvalam) ≈3.36km-NE																																							
10	Nearest railway station	Ramapuram Railway station ≈ 2.46km-WNW																																							
11	Nearest airport	Vellore Airport≈ 24.02km- SW Tirupathi International Airport≈ 67.10km- NNE																																							
12	Nearest town / city	Katpadi≈13km-SSW																																							
13	Hills / valleys	Nil in 15 km radius																																							
14	Archaeologically important Places	<table border="1"> <thead> <tr> <th>S.No</th> <th>Name</th> <th>Distance</th> <th>Direction</th> </tr> </thead> <tbody> <tr> <td colspan="4" style="text-align: center;">Monuments</td> </tr> <tr> <td>1.</td> <td>Subramania Temple</td> <td>3.20km</td> <td>ESE</td> </tr> <tr> <td>2.</td> <td>Ranganatha Temple</td> <td>3.27km</td> <td>E</td> </tr> <tr> <td>3.</td> <td>Jain sculptures and inscriptions on the hill</td> <td>3.47km</td> <td>ESE</td> </tr> <tr> <td>4.</td> <td>Somanatha Temple</td> <td>5.99km</td> <td>ESE</td> </tr> <tr> <td>5.</td> <td>Choleswara Temple</td> <td>6.11km</td> <td>ESE</td> </tr> <tr> <td colspan="4" style="text-align: center;">Heritage Sites</td> </tr> <tr> <td>1.</td> <td>Mahimandalam Fort(Ruined)</td> <td>1.32km</td> <td>S</td> </tr> </tbody> </table>				S.No	Name	Distance	Direction	Monuments				1.	Subramania Temple	3.20km	ESE	2.	Ranganatha Temple	3.27km	E	3.	Jain sculptures and inscriptions on the hill	3.47km	ESE	4.	Somanatha Temple	5.99km	ESE	5.	Choleswara Temple	6.11km	ESE	Heritage Sites				1.	Mahimandalam Fort(Ruined)	1.32km	S
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Heritage Sites																																									
1.	Mahimandalam Fort(Ruined)	1.32km	S																																						
15	National parks / Wildlife Sanctuaries	Nil in 15 km radius																																							
16	Seismicity	Seismic zone-III (moderate risk)																																							
17	Defense Installations	Nil in 15 km radius																																							
18	State Boundary	<ul style="list-style-type: none"> TN –AP State Boundary ≈ Adjacent to site – W 																																							

S. No	Particulars	Details			
		S.No	Name	Distance (≈km)	Direction
19	Water Bodies	1	Eri	Within the Site	
		2	Abbenayadu Cheruvu	0.64	S
		3	Magimandalam Lake	0.79	S
		4	Lake near Mittanattam	1.26	S
		5	Lake near Naragallu	3.86	N
		6	Ponnai R	3.94	E
		7	Ponnai West Bank Main Canal	3.94	E
		8	Ponnai East Bank Main Canal	4.28	E
		9	Lake near Kiraisattu	4.76	ENE
		10	Lake near Nangamangalam	5.06	SW
		11	Lake near Erantangal	8.52	S
		12	Tiruvalam Lake	10.82	SSE
		13	Gollapalle Lake	11.83	N
		14	Lake near Katpadi	12.12	SSW
		15	Palar R	13.47	S
20	Reserve Forest	S.No	Name	Distance (≈km)	Direction
		1	Magimandalam RF	1.12	S
		2	Basavapalle RF	3.29	WSW
		3	Chilapalle RF	4.31	NW
		4	Basavapalle RF	4.56	WNW
		5	Bommasamudra Ext RF	6.44	SW
		6	Chittapara RF	6.94	W
		7	Bommasamudram RF	6.99	WSW
		8	Kanjanur RF	7.7	SSW
		9	Amudala RF	7.5	NE
		10	Panamandangi RF	8.57	SW
		11	Chittapara RF	9.27	W
		12	Ammur RF	10.68	ESE
		13	Chaseskonda RF	12.03	NNW
		14	Reddigunta RF	12.61	NW
		15	Tiruvalam RF	13.09	SSE
		16	RF near Ammundi	13.48	S
		17	Pachigunta RF	13.91	NNE
		18	Kil Minnal RF	13.93	S
19	Kinatampalle RF	14.52	WNW		

S. No	Particulars	Details				
		S.No	Name	Distance (≈km)	Direction	Population
21	Nearest villages	1	Bodinattam	0.06	S	1,000
		2	Oletikandigai	0.37	SSW	80
		3	Gundalur	0.69	S	250
		4	Chalichimalapalle	0.83	WNW	200
		5	Pudur	0.86	S	200
21	Monuments	S.No	Name	Distance (≈km)	Direction	
		1	Subramania Temple	3.20	ESE	
		2	Ranganatha Temple	3.27	E	
		3	Jain sculptures and inscriptions on the hill	3.47	ESE	
		4	Somanatha Temple	5.99	ESE	
		5	Choleswara Temple	6.11	ESE	

Table 2-4 Project summary

S. No	Particulars	Details
1.	Project Location	S.F.No.917 (P) & 921(P), Mahimandalam Village, Katpadi Taluk, Vellore District, TamilNadu State.
2.	Land classification	Government Land
3.	Extent of lease area (Ha.)	166.92.0
4.	Precise area communication	Precise area communication letter was granted vide Industries (MME.1) Department, Lr. No. 3865290/MME.1/2023-1, dated: 13.03.2023.
5.	Lease Period	20 years
6.	Estimated Geological Reserves (ROM) m ³	46,85,817
7.	Estimated Mineable Reserves (ROM) m ³	42,21,763
8.	Black Granite production per annum m ³	15,000
9.	Depth of Mining	30m from the surface level and the top surface of the granite body
10.	Method of Mining	Open cast semi mechanized method
11.	Water Requirement (KLD)	1.5
12.	Source of Water	Road tankers
13.	Power requirement (kVA)	60
14.	Power Backup (DG set)Kva	1* 125
15.	Fuel requirements (Lts/Day)	200
16.	Direct Manpower (Nos)	30
17.	Municipal Solid Waste Generation (kg/day)	13.5
18.	Waste Oil generation (Lts/Year)	3.0
19.	Project Cost in Lakhs	99.97
20.	EMP Cost in Lakhs	2.05

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2.4 Nearest Human Settlement

The detail of nearest human settlement from the project site is provided below in **Table 2.5**.

Table 2-5 Nearest Human Settlement

S. No	Places	Distance (≈km)	Direction	Population
1.	Bodinattam	0.06	S	1,000
2.	Oletikandigai	0.37	SSW	80
3.	Gundalur	0.69	S	250
4.	Chalichimalapalle	0.83	WNW	200
5.	Pudur	0.86	S	200

2.5 Details of alternate sites considered

The mineral deposits are site specific in nature; hence question of seeking alternate site does not arise. No R&R, no Sensitive area etc., making the site suitable for the mining of Black Granite. The site meets the requirement of all critical factors that are important for success of mining in the state and could be a pre-eminent location. Thus, there are no alternative sites examined.

2.6 Size or Magnitude of operation

The black granite quarrying operations is carryout by opencast semi mechanized method by formation of benches. Benches are proposed with a height of 6m & 6m.

The Geological reserves of Black granite have been computed based on the Geological Plan & Sections up to the economically workable average depth of 30m from the surface level and the top surface of the granite body works out to 46,85,817 m³.

Mineable Reserves have been computed as 42,21,763 m³ after deleting the reserves locked up in safety barrier and benches based on the Conceptual Plan and sections, the effective (Saleable) Mineable Reserves have been worked out as 4,22,176 m³ by applying the recovery factor 10%. The annual peak production per year would be 15,000m³.

Total waste to be generated during the five years of Mining Plan period will be around 2,61,000m³. These wastes are proposed to be dumped on the South side of lease area. The Land Use break up summarized as **Table 2.6**.

Table 2-6 Land use details of the quarry area

S. No	Description	Present Area (in Ha)	Area to be required during the mining plan(Ha)	Area at the end of the quarrying period (Ha)
1	Mining	9.58.5	2.35.5	26.64.0
2	Waste Dump	6.46.0	1.75.0	75.38.0
3	Office Infrastructure	0.05.0	-	0.05.0
4	Mine Approach Road	3.40.0	-	1.26.5

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5	Village Road	0.01.0	-	0.01.0
6	Afforestation	2.15.0	0.10.0	4.37.0
7	Unutilized area	145.26.0	141.05.5	59.20.0
Total		166.92.0	145.26.0	166.92.0

2.7 Granite Reserves

The Geological reserves of Black granite have been computed based on the Geological Plan & Sections up to the economically workable average depth of 30m from the surface level and the top surface of the granite body works out to 46,85,817 m³.

Mineable Reserves have been computed as 42,21,763 m³ after deleting the reserves locked up in safety barrier and benches based on the Conceptual Plan and sections, the effective (Saleable) Mineable Reserves have been worked out as 4,22,176 m³ by applying the recovery factor 10%. The annual peak production per year would be 15,000m³. Sectional plates are enclosed as **Annexure-IV**.

The generation of total waste estimated about 2, 61, 000m³ and the dumps will be maintained not exceeding 5m height and the angle of slope of dumps will be at 45° from horizontal. The area for disposal of waste rock has been identified by extending the existing waste dump on south eastern side of the lease area. The unsold blocks are kept within the boundary on the country rock area.

The total waste to be generated during the 5 years of Mining plan period will be around 2,61,000 m³. These wastes are proposed to be dumped on the South side of lease area. Granite Quarry Reserves is given in **Table 2-7**. The yearwise production details are given in the **Table 2.8**. Surface Plan of the Quarry is given in **Figure 2.8** Geological plan and cross section of the quarry is shown in **Figure 2.9**. Conceptual Plan of the quarry area is shown as **Figure 2.14**. Land use and afforestation of the quarry is shown as **Figure 2.11**. Year wise production plan is shown as **Figure 2.12**.

Table 2-7 Granite Quarry Reserves

S. No	Geological Resource	Mineable Reserves (m ³)	Recovery 10% (m ³)	Granite waste 90% (m ³)
1	46,85,817	42,21,763	4,22,176	2,61,000

Table 2-8 Yearwise Production details

S. No	Year	ROM (m ³)	Recovery @ 10% (m ³)	Granite Waste @ 90% (m ³)
1	1 st Year	50000	5000	45000
2	2 nd Year	150000	15000	135000
3	3 rd Year	30000	3000	27000

4	4 th Year	30000	3000	27000
5	5 th Year	30000	3000	27000
Total		2,90,000	29,000	2,61,000

Estimated Life of the Quarry:

- Proposed ROM: 2,90,000 m³
- Recoverable Reserved @10%: 29,000 m³
- Average Production per Year@10%: 4,22,176/29 Years= 15,000 m³
- Estimated Life of the Quarry: 4,22,176/15,000 m³=29 years

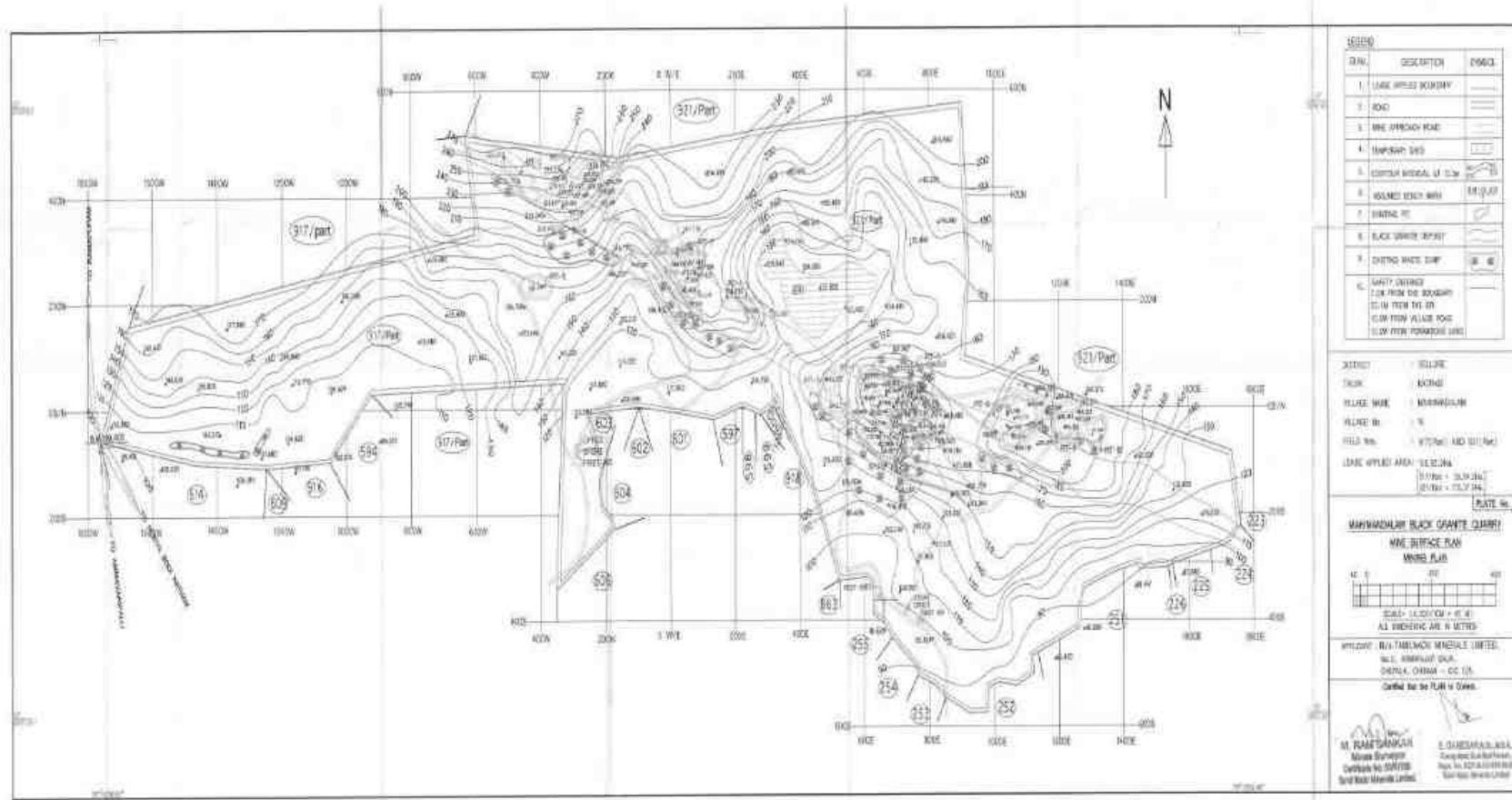


Figure 2-8 Surface Plan of the Quarry

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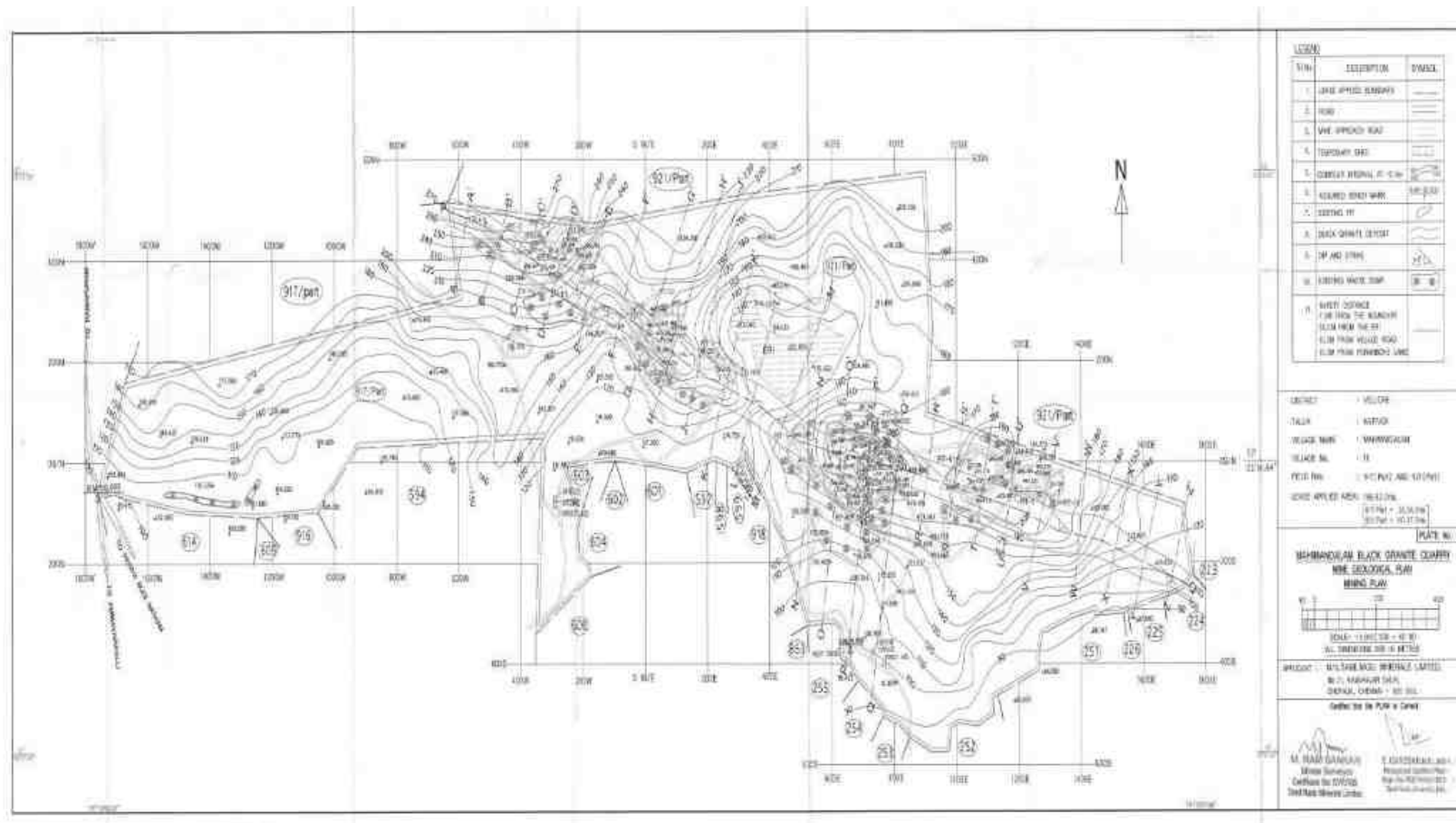


Figure 2-9 Geological plan of the quarry

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

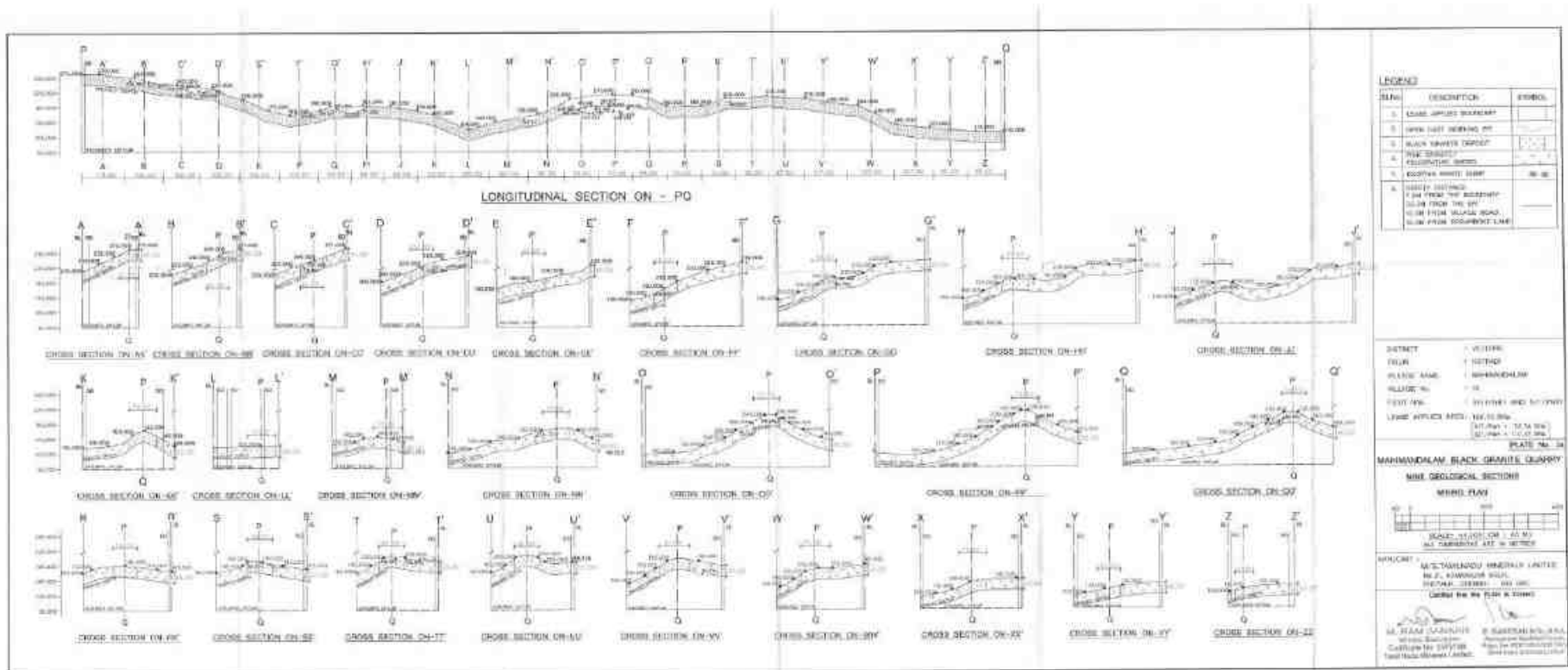


Figure 2-10 Geological Section of the quarry

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

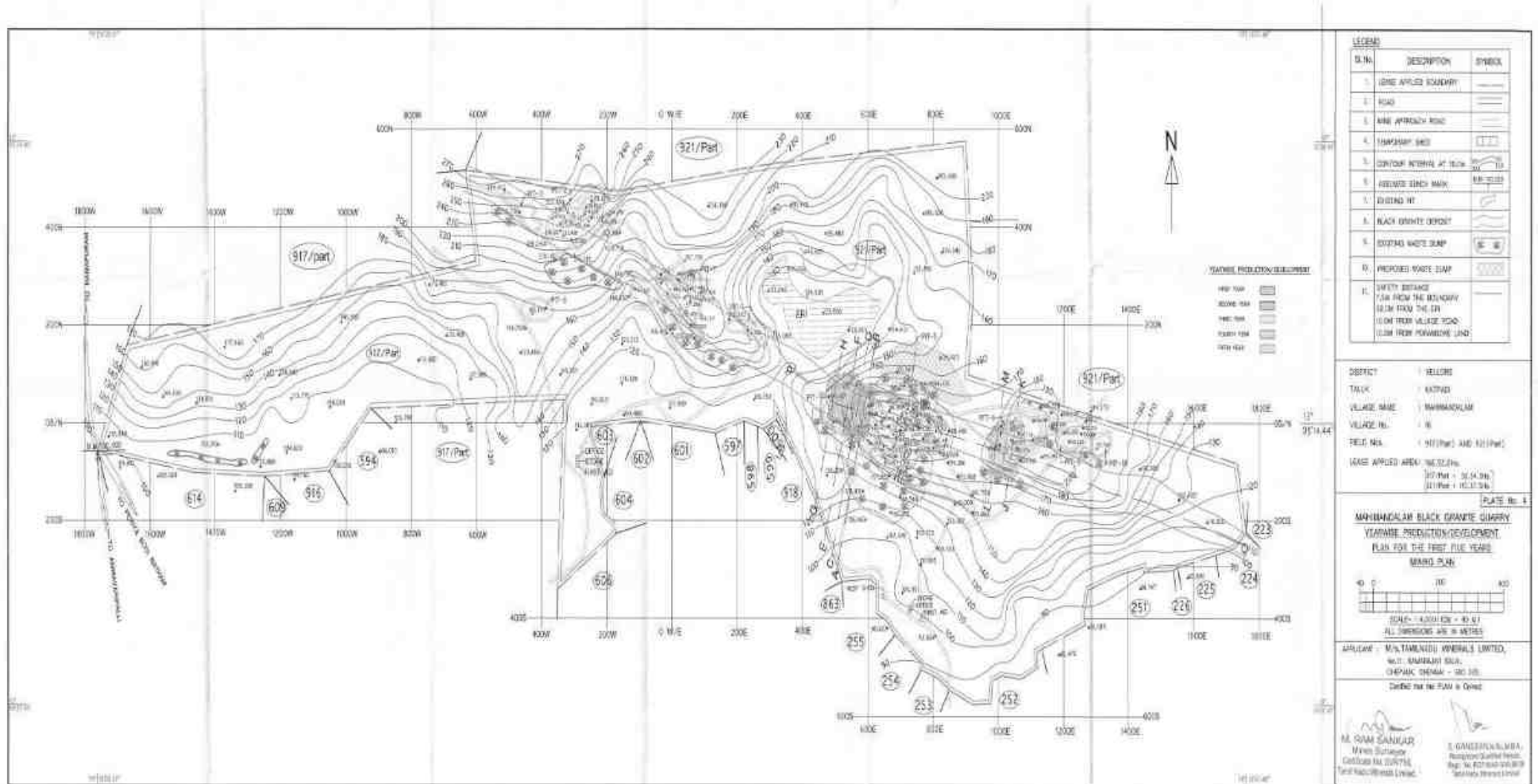


Figure 2-11 Yearwise Production/Development Plan for 5 years

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

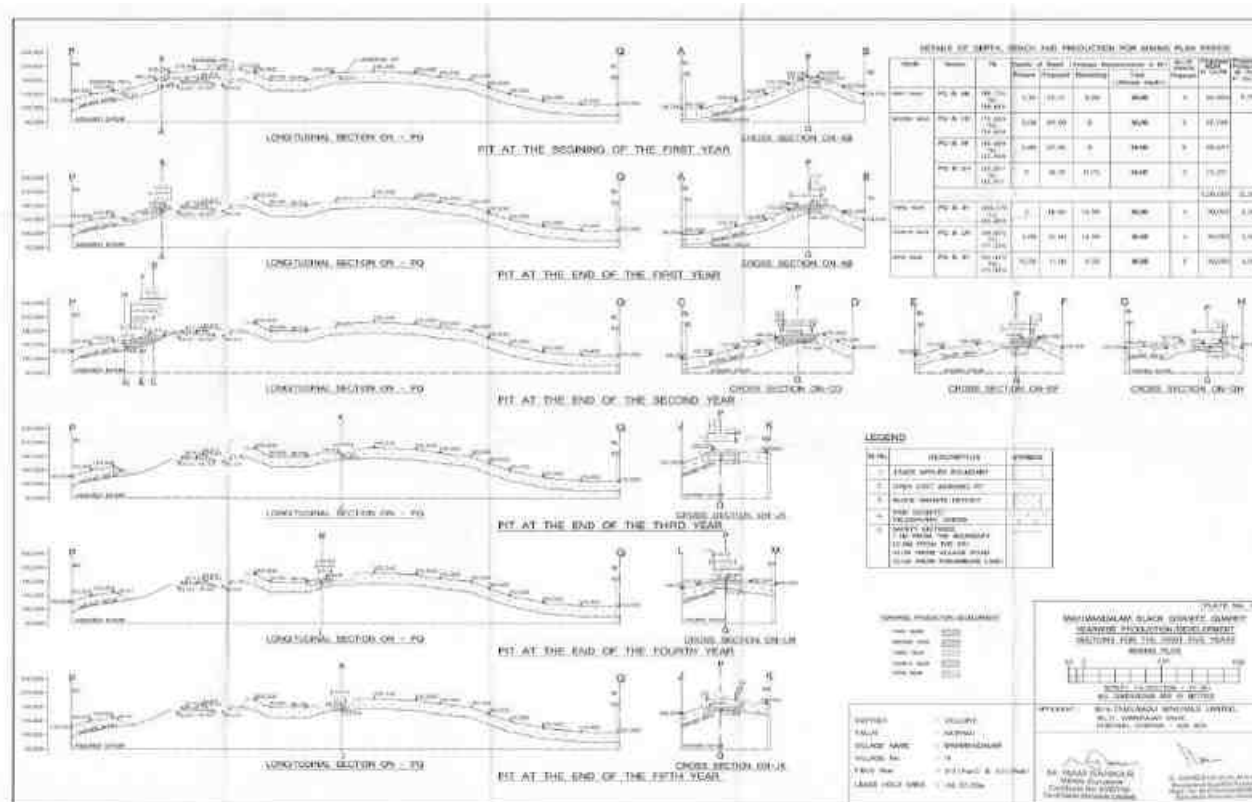


Figure 2-12 Yearwise Production/Development Section for 5 year

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

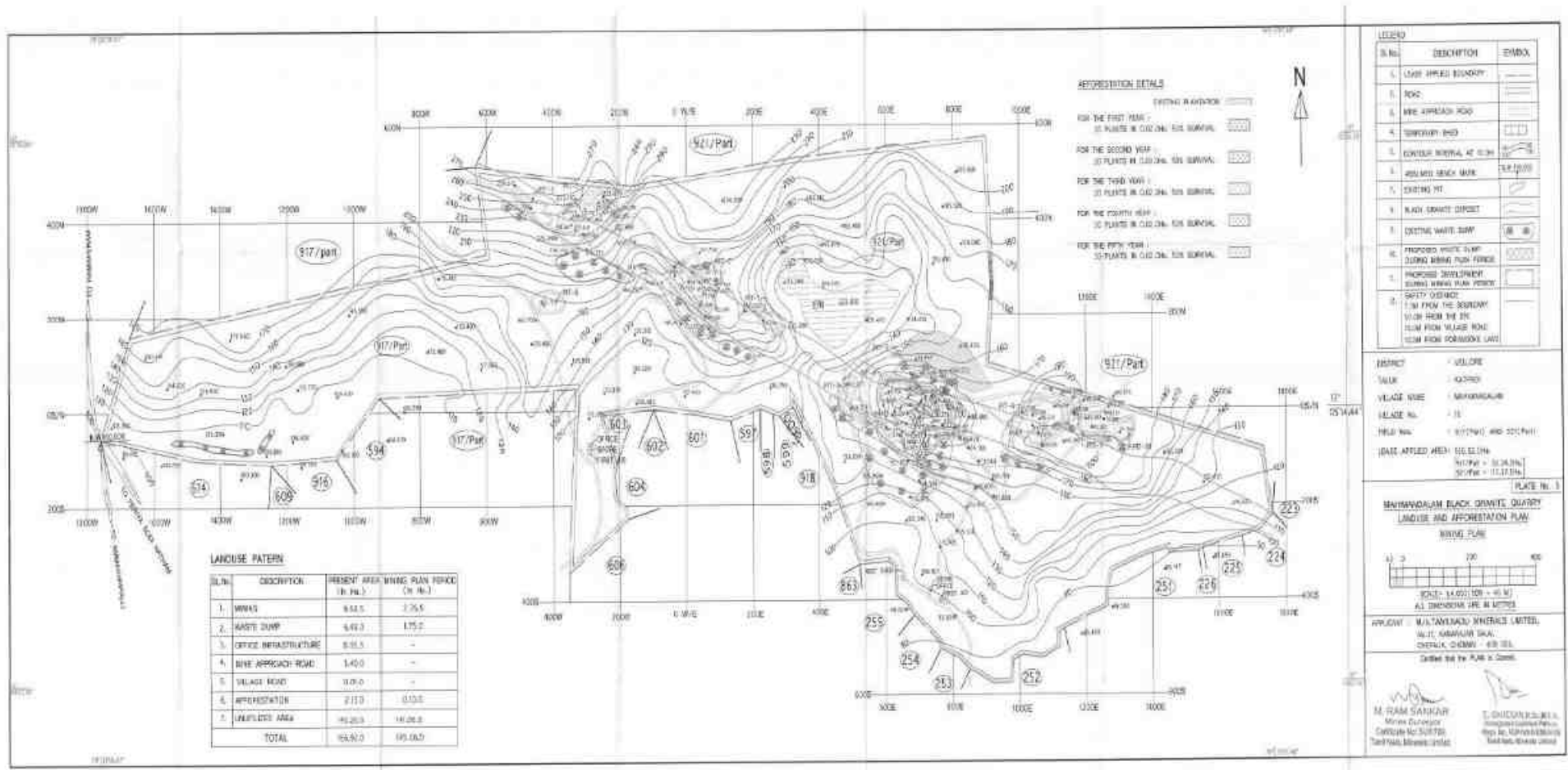


Figure 2-13 Land Use and Afforestation Plan

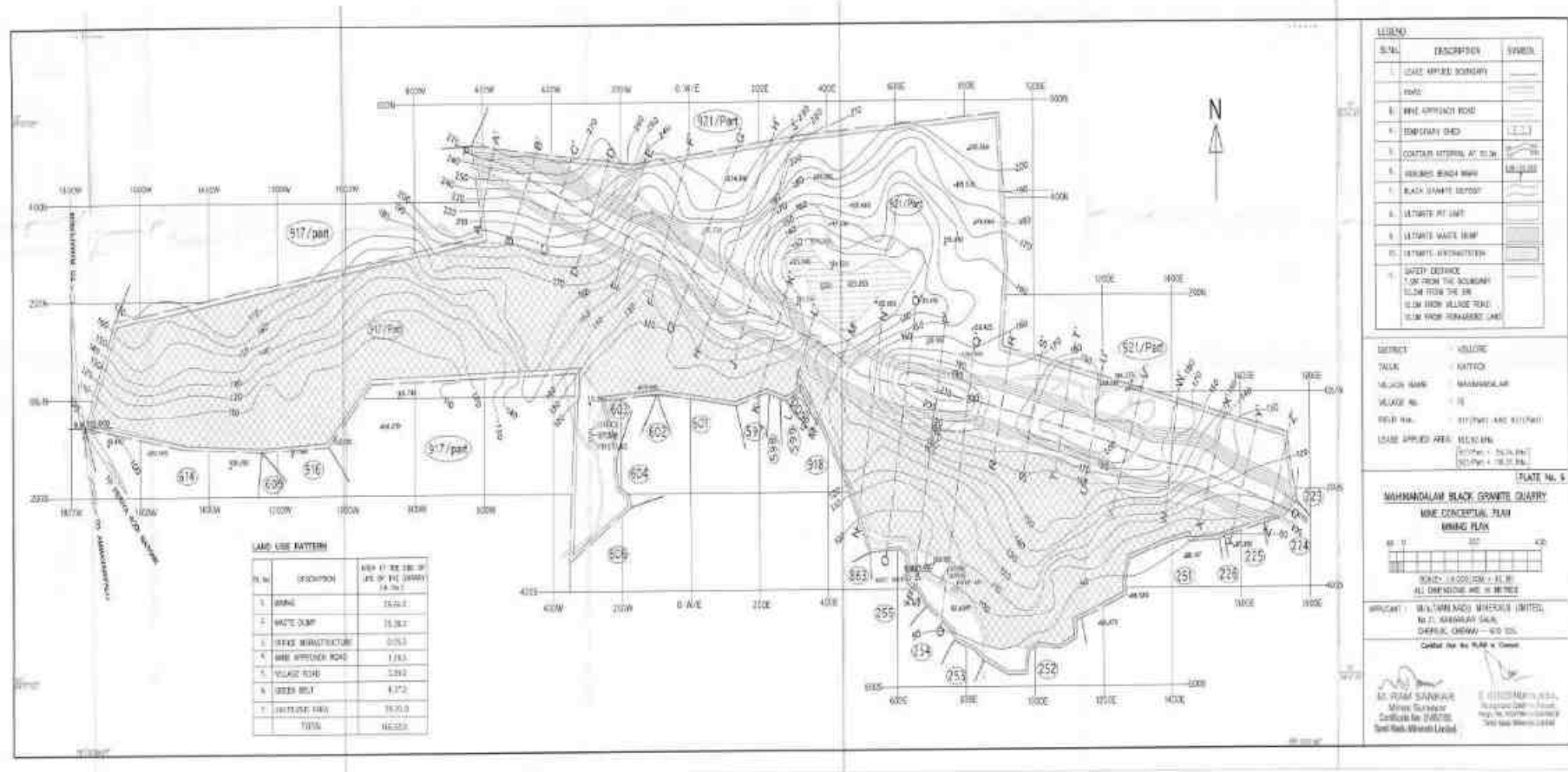


Figure 2-14 Conceptual Plan

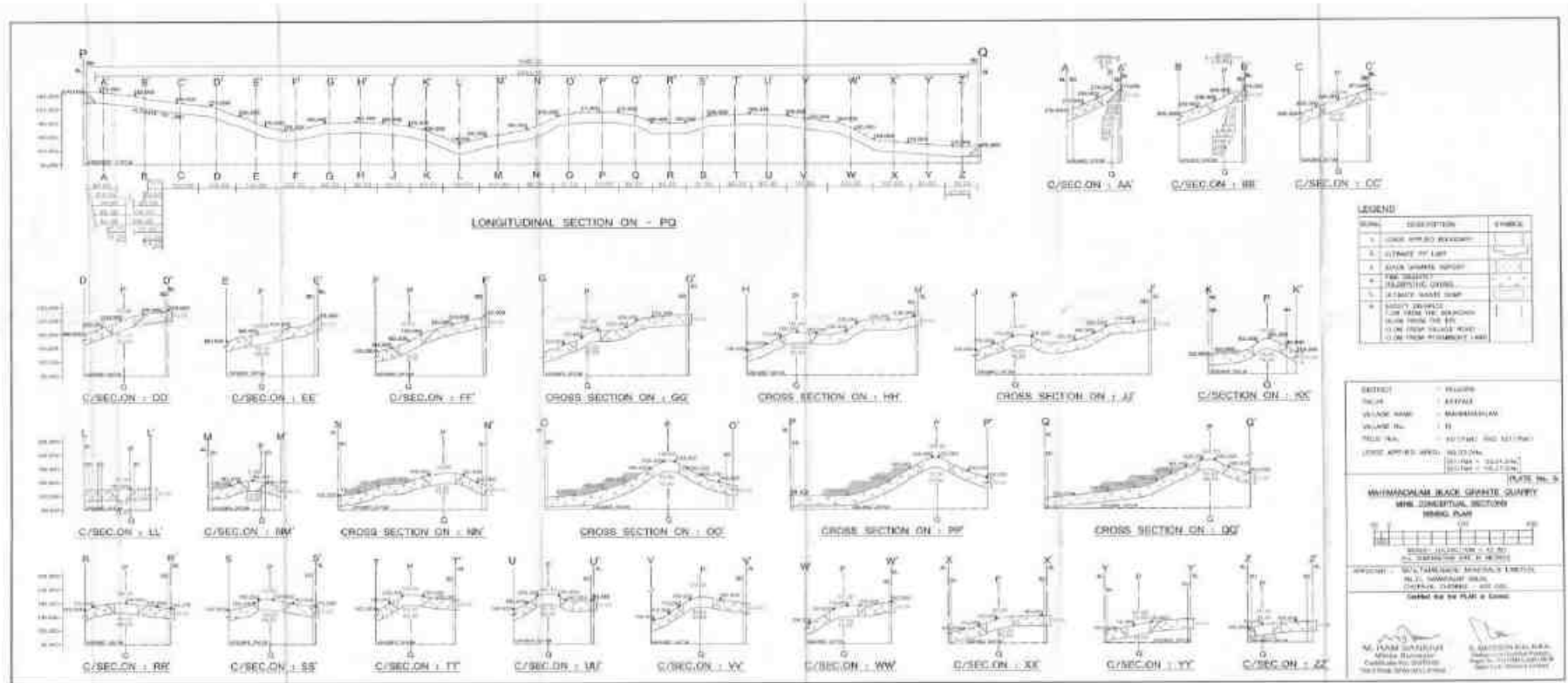


Figure 2-15 Conceptual Section

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

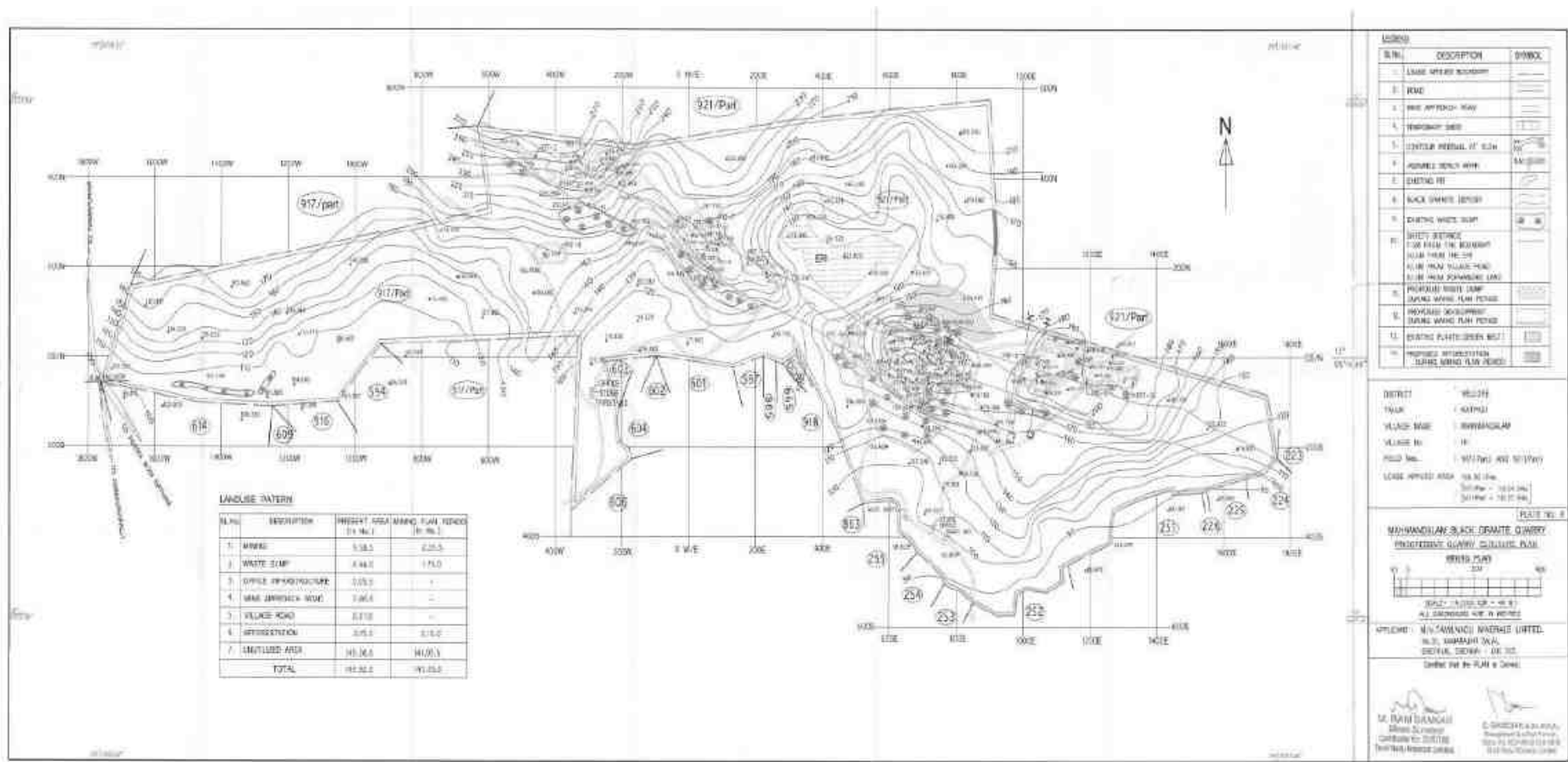


Figure 2-16 Progressive Quarry Closure Plan

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2.7.1 Proposed schedule for approval and implementation

The time schedule for the completion of the proposed mining project is given in the below as,

Particulars	Time Schedule
Preparation of PFR, FORM – I and obtaining ToR	October 2023
Submission of DRAFT EIA/EMP	November 2023
Conducting Public Hearing and submitting final EIA/EMP and PoD	December 2023
Presentation before SEAC and Obtaining EC	January 2024

The project will be implemented after Obtaining EC from SEIAA and CTO from PCB.

2.8 Project Cost

The project cost is summarized in Table 2.9.

Table 2-9 Project cost

S. No	Description of the Cost	Amount in Rs.
A. Fixed Cost		
1	Land Cost	Nil. Because Govt. land
2	Labour shed	50,000/-
3	Sanitary facilities	50,000/-
4	Fencing Cost	1,25,000/-
Total		2,25,000/-
B. Operational Cost		
1	Jack Hammers	1,98,000/-
2	Compressor	19,82,000/-
3	Diamond wire saw	4,87,000/-
4	Diesel General	4,00,000/-
5	Excavators	6,00,000/-
6	Tippers	58,00,000/-
7	Drinking water facilities for the labours	50,000/-
8	Safety kits	50,000/-
Total Operational Cost		95,67,000/-
C. EMP Cost		
1	Afforestation	30,000/-
2	Water Sprinkling	50,000/-
3	Water Quality test	25,000/-
4	Air Quality test	25,000/-
5	Noise/Vibration test	25,000/-
6	CSR activities	50,000/-
Total EMP Cost		2,05,000/-
Total Cost of the Project (A+B+C)		99,97,000/- (Say 1 Crore)

2.9 Technology & Process Description

2.9.1 Technology

Primary step of mining of minerals is the removal of the deposits from the ground. Once the minerals / ore are removed, additional preparation process is required to isolate the valuable minerals from their waste gangue minerals. There are two basic method of mining of minerals opencast and underground mining. The choice of method depends on the geologic, hydrological, geo-technical, geographic, economic, technological, environmental, safety, Socio - political and financial considerations. Schematic Diagram of Mining Process is given in **Figure 2.13**.



Figure 2-17 Schematic Diagram of Mining Process

2.9.2 Method of mining-Open Cast Working

In accordance with the Regulation 106 (2)(a) of the Metalliferous Mines Regulations 1961, in all open cast workings where the ore body forms hard rock, the working faces and sides should be adequately benched and sloped. A bench height not exceeding 6m and a bench width not less than the height has to be maintained. The slope angle of such benches and sides should not exceed 60° from the horizontal. However, observance of these statutory provisions into in granite dimensional stone mining is seldom possible due to the field difficulties and technical reasons as below:

- Recovery of the granite mineral is to be as undamaged rectangular dimensional blocks. In the attempt to the benches and sides with the above statutory parameters haphazard blasting may be involved.
- In which case the commercial granite body may get spoiled due to generation of blasting cracks. In the exercise of forming the benches with 60° slope within the granite deposit, the portion confined within the 60° as well as its complimentary part in the extricated block will become as mineral waste while shaping into rectangular blocks.
- The granite industry needs blocks as huge as few cubic meters volume with measurements up to 3m x 2m x 2m. Production of such huge blocks with a moving bench of 6m height is not possible. Production of such

huge blocks in turn increases the recovery and reduces the mineral waste during dressing. Blocks of smaller size of certain varieties of granite are not marketable now-a-days.

- Formation of too many benches with more height and the width equal to the height may lead to mineral lock up. Hence, in order to avoid granite waste and to facilitate economical and convenient mining operations, it is proposed to obtain relaxation to the provisions of Regulation 106 (2) (a) up to a bench parameter of 6m height and 3m width with vertical faces. Such a provision for relaxation of the Regulation has been provided within the regulation 106 (2) (a). Further, it is to be noteworthy that opencast granite mining operations with the above proposed bench parameters may not be detrimental to Mines Safety, since the entire terrain is made up of hard rock, compact sheet and possess high stability on slope even at higher vertical angles.

It is proposed not to backfill the pit in as much as good quantities of reserves are underlying the pits. The stock yard for the granite blocks produced and the dressing yard where the manual dressing and shaping of the blocks are carried out are located near the working pit in order to minimize the lead from the pit to the dressing yard and stock yard. A mine office, store room, first-aid room and workers rest shelter are provided within the lease hold area.

2.10 Process Description

2.10.1 Mining

The production of Black Granite dimensional stone in this mine involves the following methods typical for granite mining in contrast to any other major mineral mining. Splitting of rock mass of considerable volume from the parent sheet rock carefully avoiding any kind of damage in the form of cracks in the deposit by adopting the following methods.

- a. Separation of two vertical ends along the width side by diamond wire cutting.
- b. Separation of the horizontal(bottom) and the vertical(lengthside) planes by serial blasting simultaneously along the above two plans by using 32mm dia blast holes charged with mild explosives like gunpowder or detonating cord.
- c. Diamond wire cutting along the horizontal as well as two sides parallel to strike and dip direction and the vertical face will be a free face is liberated by conventional serial blasting.

All the above process continued together aiming at the liberation of huge volume of the granite body from the parent sheet rock is called 'primary cutting'.

The secondary splitting in to required size involves long hole drilling up to the bottom of the separated block and mild blasting along the required plans. The blocks split as above are separated and removed from the pit to the dressing yard by using hydraulic excavators.

Now-a-days the secondary splitting is carried out by way of splitting and overturning cushion operational procedure. The procedure is by utilizing the compressed air available at the quarry at 7 to 8 bar pressure, initially (widening) splitting up to 15 to 18cms. Next by using super imposed cushion widening up to 80cms and overturning of the blocks.

Removing the defective portions and dressing into the dimensional blocks are done manually using feather and wedges and chiseling respectively by the laborers who are skilled in this work.

The defect free rectangular shaped dimensional stones as acceptable to consumers are produced by the method described as above which is constantly supervised by experienced mining geologist.

The waste material generated during mining activity include the rock fragments of different angularity formed during the works, during the removal of naturally defective and uneconomical portions of the deposits and the working waste formed during dressing of the extricated blocks. Such waste materials are proposed to be dumped along the northern side of the lease boundary / barren area where the commercial granite occurrences are not seen / the area covered with poor quality granite deposit identified to be uneconomical due to sheared and contacted nature or the presence of closely space natural joints, etc.

2.10.2 Blasting

The blasting parameters in the mining of granite dimensional stones are entirely different from that of industrial minerals, since the basic purpose for the use of explosives in both the cases are entirely different. In the industrial minerals, maximum fragmentation and crushing of the ore is essential, whereas in the granite mining, the granite stones are to be extricated intact, without any damage on both the extricated part and the parent rock body.

The portion to be extricated from the parent rock body is free in all planes by adopting different methods. Only mild explosives such as detonating cord, ordinary detonators etc will be used for the production of granite blocks. The blast holes of 32mm diameter are drilled up to the bottom of the horizontal plane all along the required planes without deviations.

Conventional 32 mm dia blast holes are drilled perfectly parallel to each other at 20 to 25cm intervals without any hole deviations, all along the required plane of splitting. The holes are drilled up to a depth of few cms above the required horizontal plane. Sub grade drilling is not necessary, since the splitting will be affected up to a further distance of few cms from the drill hole on blasting. Sub grade drilling may affect the underlying granite deposit.

Explosives such as gelatin, delay detonators etc. may also be used occasionally at places further away from the granite deposit for certain development works such as forming approach roads to the working faces below ground level for forming flat surfaces to be used as dumping yard etc. The explosives required for this mine is obtained from the authorized, licensed dealer for which necessary permission will be obtained from the authority concerned. The blasting will be under the direct supervision of the statutory persons of TAMIN.

Blasting is carried out at appointed hours only with prior precaution to the local public. Now-a-days the splitting within the sheet rock is affected by diamond wire sawing, which largely reduces the use of explosives in granite mining. Many adverse effects of blasting are avoided and hence the recovery will be substantially increased by diamond wire cutting. Hence it is proposed to deploy one wire saw machine in this mine.

Now-a-days expansion mortar [$\text{Ca}(\text{OH})_2$] is used for splitting granite blocks from parent rocks and wire saw cutting is also used for that. Thus, kind of technique will minimize the blasting activities in granite mining.

2.10.3 Loading & Transportation

The mode of transport of the granite blocks produced and marketed is by road of various consumer destinations and granite processing units located at different parts of the country. The blocks approved for export market are shipped through Chennai / Tuticorin Harbours to various countries.

2.10.4 Exploration

A number of valuable data for economical mining of the granite stone in this area have been known.

1. Occurrence of the Black granite stone is economically viable quality and quantity has been established by geological mapping and visual examination by mining geologist experiences in granite mining which have been proved by actual mining practice.
2. The depth persistence of the granite stone is proved beyond the workable limits of depth of 30m from the surface level and the top surface of the granite body works.
3. The recovery of the saleable granite stones has been established as 5% from the visual exploration and from the data available by actual mining practices during the past mining in this area. As the sale of granite dimensional stone is in terms of volumes (cubic meter) only and not in terms of tonnage as in the case of the mining of Industrial minerals, the geological reserves, mineable reserves and quantum of waste generation etc., are given in terms of cubic meter (volume) only.

2.10.5 Storage of Explosives

The applicant will engage an authorized explosive agency to carry out the small amount of blasting as such no storage of explosives is envisaged for this proposal. The blasting will be supervised by DGMS authorized. Mines Foreman /Mines Manager certificate of competency.

2.10.6 Mine Drainage

The lease applied area is hillock 180m height with slope towards northern and southern sides. Through the area receives scanty rainfall, the ground water level is at 38.6m BGL as per Vellore District ground water profile of TWAD Board.. The Production faces are operated at shallow depths. During the rainy seasons the surface run of water and the ground water are collected at one point called as sump and dewatered nearby agricultural field with the help of 10HP oil engines.

2.10.7 Disposal of Waste

The Mine waste in the mine includes the over burden, side burden, rock fragments and rubbles generated as mineral rejects during production works and the country rock fragments generated during development works as approach road formation, formation of dumping yard sites etc., During the first five years of Mining Plan period, such waste material are proposed to be dumped along the Southern part of the lease area where it comprises of country rock terrain.

2.10.8 Top Soil Management

Topsoil will be properly stacked at earmarked dump site with adequate measures. It will be used for growing plants along the fringes of the site roads and reclamation of external dump and backfilled area. The topsoil stockpiles will be low height and will be grassed to retain fertility. Besides these topsoil stacks there will be temporary stacks near the excavation area and area to be reclaimed which will be made use of concurrent lying without bringing the topsoil to the soil stack near the OB dump.

2.10.9 Stabilization of Dump

As the waste generation in the mine includes hard rock fragments of considerable size and irregular shape with varying angularity, the waste dump will be stable on its own even at higher slopes of the sides. However, suitable variety of soil will be identified and brought from outside and used for increasing the stability of the sides of the waste dumps and also for planting trees over the dumps in a phased manner.

2.11 Requirements

2.11.1 Land Requirement and Land Use Planning

Quarry Land details are shown in **Table 2-10** and Land use pattern is provided in **Table 2-11**.

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Table 2-10 Quarry Land details

District and State	Taluk	Village	S.F. No	Area (Ha)	Land Classification
Vellore, Tamil Nadu	Katpadi	Mahimandalam	917(P)&921(P)	166.92.0	Government land

Table 2-11 Land Use Pattern of the lease area

S.No	Description	Present Area (in Ha)	Area to be required during the mining plan(Ha)	Area at the end of the quarrying period (Ha)
1	Area under Quarry	9.58.5	2.35.5	26.64.0
2	Waste Dump	6.46.0	1.75.0	75.38.0
3	Infrastructure	0.05.0	-	0.05.0
4	Village Road	3.40.0	-	1.26.5
5	Mine Roads	0.01.0	-	0.01.0
5	Green Belt	2.15.0	0.10.0	4.37.0
6	Un utilized Area	145.26.0	141.05.5	59.20.0
Total		166.92.0	145.26.0	166.92.0

2.11.2 Water Requirement

The total water requirement is 1.5 KLD. The total water requirement will be met through private tankers. The granite quarry will not produce toxic effluent in the form of solid, liquid or gas. No wastewater will be generated by quarry operation except domestic sewage. Domestic sewage will be disposed to septic tank followed by soak pit. Septic tank will be cleaned periodically.

Table 2-12 Water requirement breakup

S. No	Description	Water Requirement(KLD)
1	Drinking & Domestic purpose	0.5
2	Wire Saw Cutting	0.3
3	Dust suppression	0.3
4	Green Belt	0.4
Total		1.5

2.11.3 Power & Fuel Requirement

The Power and Fuel requirement details are given in **Table 2-13**.

Table 2-13 Power Requirements

S. No	Description	Power Required
1	Power requirement (kVA)	60

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2	Power Backup (DG set)	1*125kVA
3	Fuel requirements (Lts/Day)	200

2.11.4 List of Equipments

1 No. of Excavator having 600LC capacity Tata Hitachi will be used for excavation and 2 nos of 25 tones capacity Ashok Leyland Dumpers will be used during loading. The list of Equipments is given in **Table 2-14**.

Table 2-14 Lists of Machineries

S. No	Machinery type	Numbers	Capacity	Motive power
1	Jack Hammar (32mm dia.)	6	1.2 to 6m	Compressed air
2	Compressor	2	400 psi	Diesel Drive
3	Tractor Mounted air Compressor	1	-	Diesel Drive
4	Diamond wire saw	1	30m ³ /day	Diesel Generator
5	Diesel Generator	1	125 kVA	Diesel
6	Excavator	1	300Lc	Diesel
7	Dumper	2	25Tonnes	Diesel

2.11.5 Man power Requirement

Manpower details are given in **Table 2-15**.

Table 2-15 Manpower Details

S.No	Details	Numbers
A	Technical/Mining Personnel	
1	Geologist/Agent (M.sc Qualified)	1
2	Mine Manager (Holder of Manager Certificate of Competency under MMR, 1961)	1
3	Mining Mate cum Blaster	1
4	Machinery operator	6
5	Diesel Mechanic	1
B	Workers	
1	Skilled	1
2	Semi- Skilled	9
3	Un-skilled	10
Total		30
Indirect Manpower		20

2.11.6 Solid Waste Management

The municipal solid waste generation and management details are given in **Table 2-16**.

Table 2-16 Municipal Solid Waste generation & Management

S. No	Type	Quantity Kg/day	Disposal method
1	Organic	8.1	Municipal bin including food waste
2	Inorganic	5.4	TNPCB authorized recyclers

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Total	13.5	
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As per CPHEEO guidelines: MSW per capita/day =0.45

2.11.7 Hazardous waste Management

The type of hazardous waste and the quantity generated are detailed in **Table 2-17**.

Table 2-17 Hazardous Waste Management

Waste Category No	Description	Quantity (L/Year)	Mode of Disposal
5.1	Waste Oil	3.0	Will be Collected in leak proof containers and disposed to TNPCB Authorized Agencies for Reprocessing/Recycling

2.12 Infrastructure facilities

Sanitation facility, office room and rest room facilities will be provided.

2.13 Resource optimization/recycling and reuse envisaged in the project

No optimization/recycling and reuse envisaged in the black granite quarry.

2.14 Availability of water its source, Energy/power requirement and source

This quarry project does not require huge water and No electricity requirement is proposed for the project. The operations will be carried out in day time only.

2.15 Schematic Representations of the Feasibility Drawing which Give Information Important for EIA Purpose

A schematic representation of the overall feasibility and environmental assessment process is shown in **Figure 2-14**. The EIA process is composed of the following stages:

- Study of project information
- Screening & Scoping
- Environmental Pre-Feasibility study & application for approval of TOR
- Collection of detailed project management plan/report
- Baseline data collection
- Impact identification, Prediction & Evaluation
- Mitigation measures & delineation of EMP
- Risk Assessment and Safety & Disaster Management plan

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- Review & finalization of EIA report based on the TOR requirements.
- Submission of EIA report for implementation of mitigation measures & EMP as well as necessary clearances from relevant Authority.

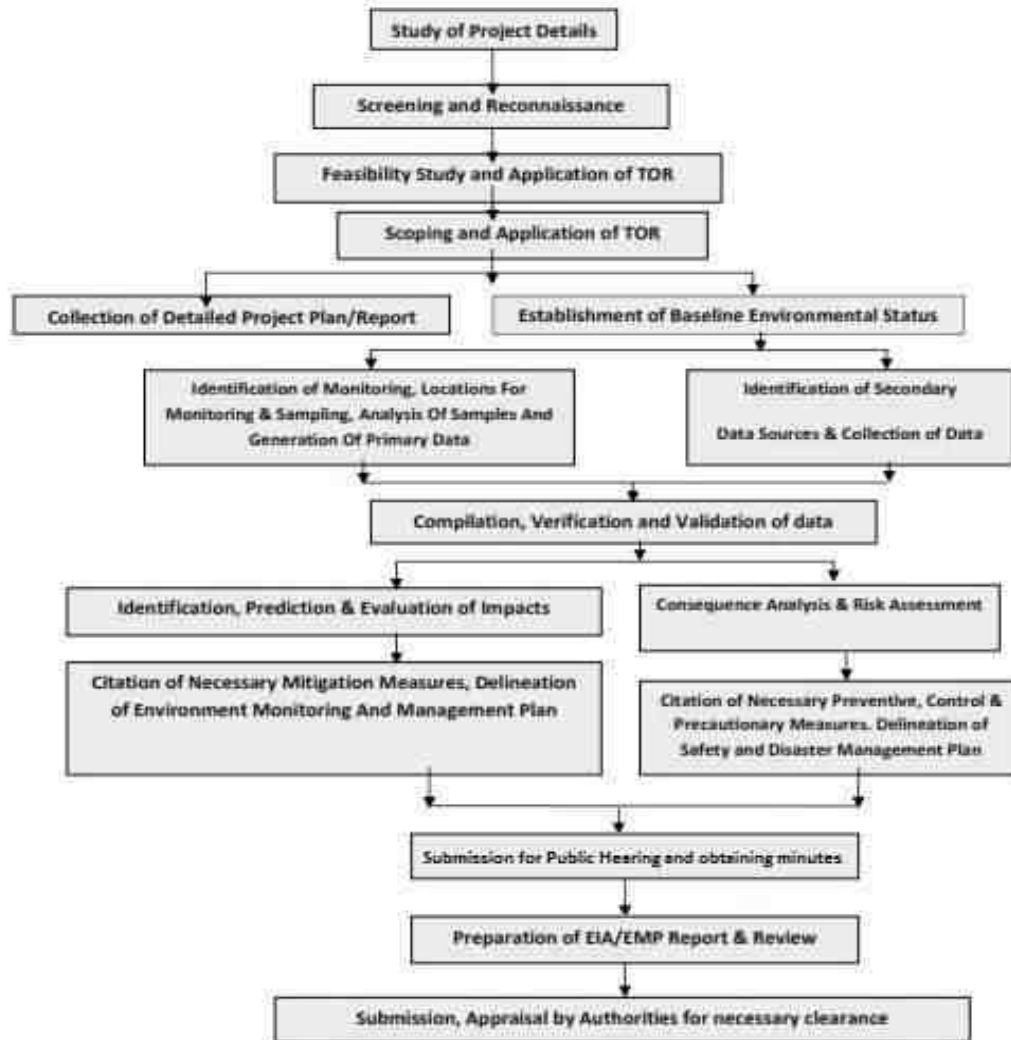


Figure 2-18 Feasibility & Environmental Assessment Process

2.16 Description of mitigation measures incorporated into the project to meet the environmental standards

From an environmental perspective, this phase is of paramount significance due to its potential to invoke long-term impacts. The adverse effects that are likely to occur during operational phase of the project are: Air Pollution (gaseous emissions), Effluent/Sewage generation, Noise generation, Solid waste generation etc.

2.16.1 Land Environment

The land use of the existing area is already for mining purpose. Hence there will be no change in land use pattern.

i. Discharges on Land-Impact

Domestic:

Domestic sewage will be disposed in to septic tank followed by soak pit.

Mitigation Measures

- The mine waste in the mine includes the topsoil/rock fragments and rubbles generated as mineral rejects during production works and the country rock fragments generated during development works as approach road formation or dumping yard/sites etc.
- The dumps may also be source of airpollution due to wind erosion incase they are not properly rehabilitated. Topsoil and overburden will be generated from the mining project which will be stacked separately at the designated areas.

ii. Impacts- Soil Contamination

Potential impacts on land environment are envisaged due to hazardous and non-hazardous wastes generated due to various operations in the project site like municipal waste from domestic use and waste diesel oil from quarry machineries. Poor management of such materials/wastes from the operations is a potential risk of soil contamination.

Soil – Mitigation Measures

Good housekeeping and best practices of waste handling shall be adopted to eliminate/minimize the risks of soil contamination. The wastes generated will be stored in temporary storage facility and transferred to nearby municipal disposal bins. Waste oil generated from quarry machineries and the same is disposed through TNPCB Authorized dealers.

2.16.2 Air Environment

Mining operations contribute towards air pollution in two ways: addition of gaseous pollutants to the atmosphere and the dust particles. The gaseous pollutants include NO_x, SO₂ and Hydrocarbons. The sources of pollutants from the mining activity include:

- Operation of Heavy Earth Moving Machinery (HEMM) which mostly run on diesel
- Loading /unloading operations
- Transportation of mineral/overburden in dumpers
- Drilling and Blasting operations.

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2.16.3 Sources of Air Pollution

2.16.3.1 Point Source/Single Source

These are stationary sources, which emit air pollutants into the atmosphere from a certain fixed point. In the proposed quarry, the following sources or activities from the point sources, which emit Suspended Particulate Matter (SPM), SO₂& NO_x.

2.16.3.2 Drilling

Drilling is an important activity of mining process. The secondary splitting in to required size involves drilling up to the bottom of the separated block. Air pollution in the form of SPM is envisaged from this activity.

2.16.3.3 Loading

In the proposed project, the loading of side burden and granite rejects is proposed by Hydraulic excavators. This activity is likely to contribute air pollution in the form of SPM (dust) during discharge of material from bucket and gaseous pollutants like SO₂, NO_x and Hydrocarbons due to combustion of fuel (diesel) in the loading machinery.

2.16.3.4 Unloading

The generated rejects and granite at mine face will be transported by dumpers and unloaded at the designated locations. During unloading operation of both the material, air pollution in the form of SPM (dust) is envisaged due to discharge of material from the dumper and gaseous pollutants like SO₂, NO_x and Hydrocarbons due to consumption of fuel (diesel) by dumper while unloading the material.

2.16.3.5 Linesources

These are normally mobile sources, which emit atmospheric pollutants in the area through which they pass.

2.16.3.6 Transportation

The generated rejects and granite from site will be transported by haul road. Transportation also includes movement of service vehicles also in the mine lease area. The traffic on the haul roads is likely to contribute towards increase in dust and gaseous pollutants concentration in the area. However, this is more of a localized phenomenon within the mining areas that have limited human exposure.

2.16.3.7 Area sources/multiple sources

These constitute pollution from various sources and activities situated in the mine lease area. The total mine area with all its mining activities constitutes the area source. These include all the mining activities, operations of equipment/machinery (HEMM), wind erosion from active mine pit, and waste dump locations and haul road which contribute to the atmospheric pollution from the various units/activities.

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2.16.3.8 Instantaneous Sources

The instantaneous sources consist of air pollution due to sudden/instantaneous activities like blasting in the mine area. Blasting process involves dislodgement of big blocks of hard strata/mineral from the mines. This operation generates maximum dust, which results in the increase of SPM concentration. It also contributes to emissions of certain gases (Oxides of Nitrogen and Ammonia) due to the use of explosives.

The size of the dust particles emitted into the atmosphere plays a major role in deciding the distance to which they may be transported. Particles of larger size fall fairly rapidly and closer to their source, because of gravitational settling. However, the aerosols because of their small size may be held in suspension for years in the atmosphere and may be transported on a global scale. Eventually, these smaller particles are collected in raindrops and fall on earth. The composition of these particles largely depends on the composition of the mineral being processed.

Mitigation Measures

- The increment in the fugitive emissions will be mainly due to transportation activity. Therefore emissions due to mineral handling during mining operation are not much and restricted to the lease area only.
- Proper mitigation measures are practiced during mining activities to control air pollution load below the prescribed limits are as follows:
 - Watering of haul roads and other roads at regular intervals
 - Spraying of water on permanent transport roads at required frequencies.
 - Provision of dust filter / mask to workers working at highly dust prone and affected areas.
 - Provision of green belt by vegetation for trapping dust.
 - Greenbelt development along the haul roads, dumps and along the boundaries of the lease area.
 - Utmost care will be taken to prevent spillage of sand and stone from the trucks.
 - Covered tarpaulin for transport of materials.

2.16.4 Noise & Vibration environment

The sound pressure level generated by noise sources decrease with increase in distance from the source due to wave divergence. The main sources of noise in the mine are as follows:

- Transportation vehicles
- Loading & unloading of minerals.
- Drilling and Blasting

2.16.4.1 Noise Levels

Heavy Earth Moving Machineries (HEMM) is deployed in mining operations. The noise levels of the major equipment are in the range of 88 to 90 dB (A). The noise levels are localized within the mining areas and have HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

human exposure. Occupational hazard is envisaged if proper personal protective equipment is not provided to operator.

2.16.4.2 Vibration

The vibration due to blasting can cause damage to the nearby structures if appropriate technology and control measures are not adopted in the blasting operation. Fly rock is another possible damage causing outcome of blasting. There are many factors which influence fly rock during blasting. Most important of these factors are long explosive column with little stemming column, improper burden, loose material or pebbles near the holes and long water column in the hole.

By adopting controlled blasting, the problems will be greatly minimized and the impacts will also be minimized by choosing proper detonating system, optimizing total charge and charge/delay.

Ground vibration, fly rock, air blast, noise, dust and fumes are the deleterious effects of blasting on environment. The explosive energy sets up a seismic wave in the ground, which can cause significant damage to structures and disturbance to human occupants. The impact will be minimized by choosing proper detonating system and optimizing total charge and charge/delay and by regular monitoring of magnitude of ground vibrations and air blast.

Impact

A noise generation source during operation phase is classified into two categories:

- Stationary sources due to operation of heavy duty machineries at the project site like Compressors, DG sets, Quarry vehicles and drilling machineries etc.

Mitigation Measures

- The major noise generating equipments like Compressors, DG sets, Excavator, &Tippers etc, will be enclosed in an acoustic enclosure designed for an insertion loss of 25 dB (A) and silencers to other equipment etc.
- Drilling will be carried out with the help of sharp drill bits which will help in reducing noise.
- Secondary blasting will be totally avoided.
- Controlled blasting with proper spacing, burden, stemming and optimum charge/delay will be maintained.
- The blasting will be carried out during favorable atmospheric condition and less human activity timings i.e. during lunch interval.

- Proper maintenance, oiling and greasing of machines at regular intervals will be done to reduce generation of noise.
- Greenbelt and plantation will be developed around the mining activity area and long haul roads. The plantation minimizes propagation of noise.
- Periodical monitoring of noise will be done.
- The occupational noise exposure to the workers in the form of eight hourly times weighted average will be maintained well within the prescribed Occupational Safety and Health Administration (OSHA) standard limits.
- Adequate PPE will be provided to the staff exposing to noise risks.
- Acoustic silencers will be provided in equipment wherever necessary.
- Use of personal protective equipments/devices such as ear-muffs, ear plugs etc. will be strictly enforced for the workers engaged in high noise areas.
- Periodic maintenance of the equipment to be used in the developmental works will be carried out. Worn out parts will be replaced and rotating parts will be lubricated to minimize noise emissions.
- Implementation of greenbelt for noise attenuation will be undertaken.
- Ambient noise levels will be monitored at regular intervals during operational phase of the project.
- Low vibration generating machines/equipment will be selected to meet international standards and foundations will be so designed to minimize vibrations and secured properly.
- Vibration generating sources and their platforms should be maintained properly to minimize vibrations and related impacts.
- Vibration dampers will be provided around the source of generation.
- Transportation Management Plan will be prepared and the transportation of materials will be planned in line with the same.

2.16.5 Water Environment

2.16.5.1 Impact on Existing Water Resources

The total water requirement for quarry is 1.5 KLD. The total water requirement is met from private tankers; Domestic sewage will be disposed into Septic tank & no toxic/other effluent generation. Hence the impact due to the project is very minimal.

2.16.5.2 Impacts on Surface Water Bodies

The surface water and groundwater are the life line of the villages. All the ponds in the area are working as recharge sites for the under lying groundwater and hence the surface water and ground water systems are acting like a single unit and therefore cannot be seen in Isolation.

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Any contamination in surface drainage due to operation of project could collapse the system and will have serious impacts to the water resources especially the availability of potable water in the PIA area. The impacts will be high in the core area especially the 10 km radius area. Therefore, apparent to that there will be negligible impact of mining on the surface water regime.

2.16.5.3 Impact on Ground Water

There will not be any ground water withdrawal, as the total water requirement will be met by private water tankers. As, the mine lease area is a Hilly area, elevated at 445m AMSL height from the ground level. Hence, there will not be any groundwater level intersect as the planned depth of mining is 30m.

Mitigation Measures

The following measures are proposed as a part of development to improve the ground water scenario and also to ensure that ground water is not contaminated. Strategic plans such as implementing the following structures for rainwater harvesting and groundwater recharging purposes in project site will be adhered.

- Rainwater storage ponds/tanks
- Storage cum recharge ponds
- Monitoring of water quality and groundwater level variations in the project site.

2.16.6 Biological Environment

2.16.7 Impact on migratory paths for wildlife and forest blocks

There are no identified migratory paths for major and minor wildlife in the project site and the study area. The identified fauna which are observed at the project site and in the study, area are local migrants only. Therefore, the proposed project operations are not likely to have any adverse impact on the paths for avid-fauna.

Mitigation Measures

- Discharge of wastes into the water bodies during the quarry operation phase would not be allowed.
- Awareness will be given to workers about the importance and conservation of terrestrial ecology and biodiversity.

2.16.8 Solid Waste Management

2.16.8.1 Impact due to Solid Waste Generation

During quarry operations, Municipal solid waste and waste oil are likely to be generated which can be broadly categorized as Hazardous Waste and Non-hazardous Waste. Further, the generated solid waste generation may include Biodegradable, Recyclable and Inert compounds. The details of solid waste generation and its management HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

proposed are discussed in **Chapter 2, Section 2.11.6 & 2.11.7**. If the solid waste generated is not properly managed and disposed in unauthorized manner, it will impact on soil quality, groundwater and air quality.

2.16.8.2 Solid Waste Management

Strict guidelines will be put in place in order to manage the solid waste generation during the operational phase of the development. The main goals of the guidelines will be to ensure adopting recycling techniques and encouraging sorting of solid waste at source into organic and inorganic wastes. Waste management is given in **Figure 2-15**.

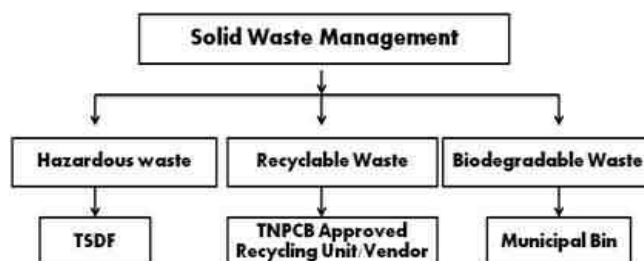


Figure 2-19 Waste Management Concepts

2.16.9 Afforestation

The main aim of the plantation of the mined out areas is to stabilize the area to protect it from rain, wind erosion, improve the aesthetics and support the re-creation of bio-diversity as well as to prevent air pollution & noise pollution. Afforestation will be taken up along the lease area.

During Mining plan period 20 plants per year is proposed to be planted for complying Afforestation program with the arrived survival rate of 50% within the safety distance along the 650m² portion of the lease area in a phase manner. Native species will be planted in phased manner as given in table below **Table 2-18**.

Table 2-18 Afforestation Plan details

Year	No. of trees proposed to be planted	Name of the species	Area(Ha)	Survival rate expected	No. of trees expected to be grown
1 st Year	500	Neem/Pungam	4.37.0	80%	400

2.16.10 Assessment of New and untested technology for the risk of technological failure

The project is a expansion granite quarry. The technology used for mining is made by TAMIN in house there would not be any changes in the Mining. The mining technology is tried & tested method, and therefore there is no risk of technological failure. In addition to this the TAMIN is being processed to take care of any technological failures.

3 DESCRIPTION OF ENVIRONMENT

This chapter depicts the establishment of baseline for valued environmental components, as identified in and around the proposed project of **Black granite quarry** over an extent of 166.92.0 Ha in S.F. No. 917/Part and 921, Mahimandalam Village, Katpadi Taluk, Vellore District & Tamilnadu State by M/s. Tamil Nadu Minerals Limited. The primary baseline data monitored covered three (3) months i.e., from **March 2023 to May 2023** and secondary data was collected from government and semi-government organizations published data. The primary baseline data has been generated by M/s. Hubert Enviro Care Systems (P) Ltd, Chennai, NABL accredited MoEF&CC approved environmental testing laboratory for the following terrestrial environmental components.

3.1 Study area and Period

A 10 Km radial distance with the proposed project site as the epicentre has been identified as the General study area for assessing the baseline environmental status. The core study area is the project area and its immediate surroundings to the tune of 1.0 Km radius from the boundary. Further the Project Impact/Influence Area (PIA) is 10Km from the boundary of the project site which covers parts of Katpadi Taluk, Vellore district of Tamil Nadu State. The primary baseline data monitored covered three (3) months i.e., from **March 2023 to May 2023**.

3.2 Description of the Study Area, components & Methodologies

As described in Chapter 1, the proposed project is M/s. Tamil Nadu Minerals Limited, **Black granite quarry** over an extent of 166.92.0 Ha in S.F. No. 917/Part and 921, Mahimandalam Village, Katpadi Taluk, Vellore District & Tamil Nadu State. State Highway SH-124 Ponnai – Thiruvalem is located at a distance of 3.36 km towards North East. Ramapuram Railway station is located at a distance of 2.46 km in WNW direction from the project site. An overall idea of the study area with reference to the physical conditions are presented for better understanding in the following sections before proceeding into the section on the prevailing environmental conditions of the study area. The map showing the satellite image of the study area is given in Figure 3-1 and Topo Map of the study area is given in Figure 3-2.

- **Meteorology**
- **Ambient Air Quality**
- **Ambient Noise Levels**
- **Water Quality**
- **Soil Quality**
- **Biological Environment**
- **Socio Economic Status**

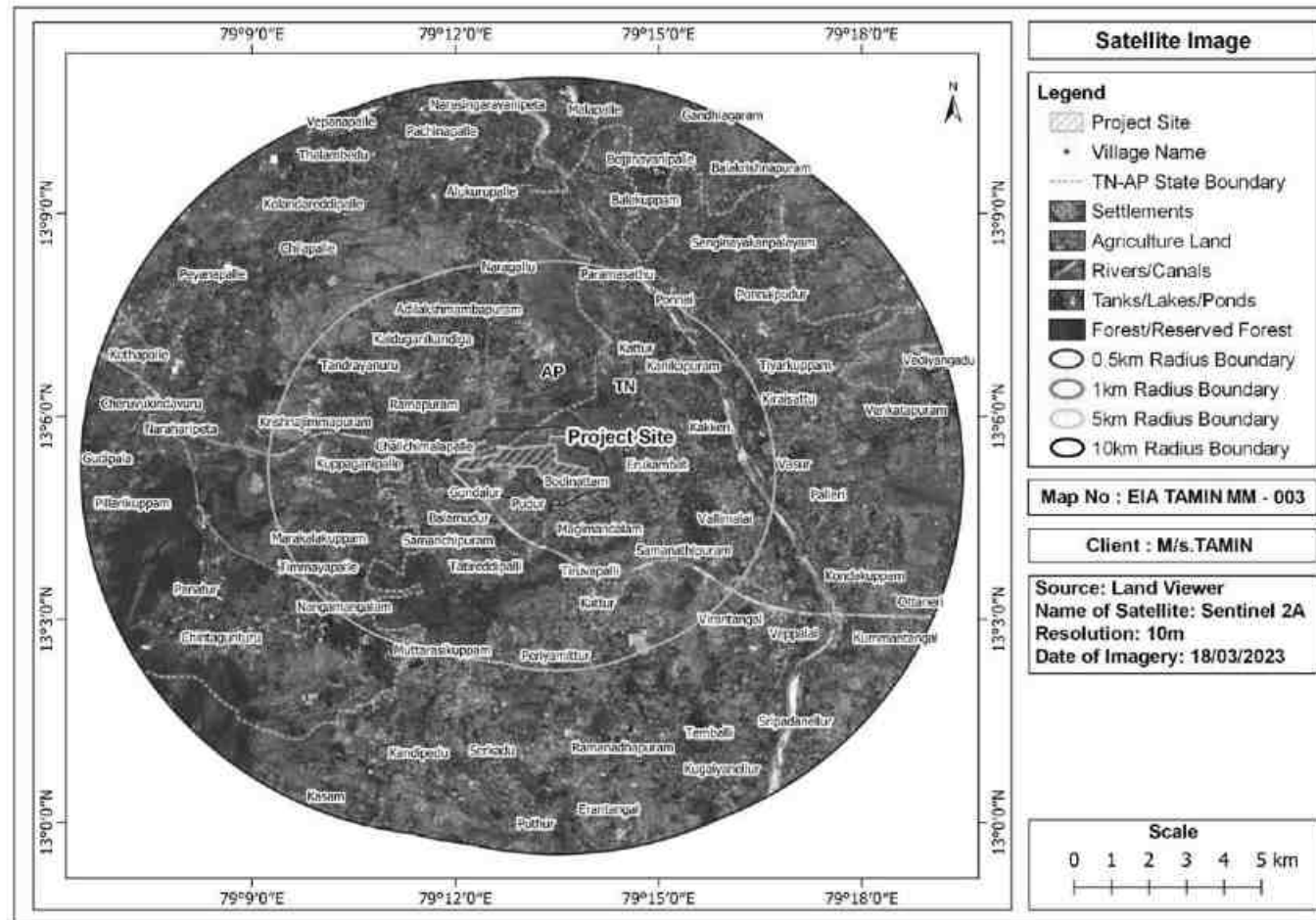


Figure 3-1 Mapshowing the Satellite Image of the study area of Project

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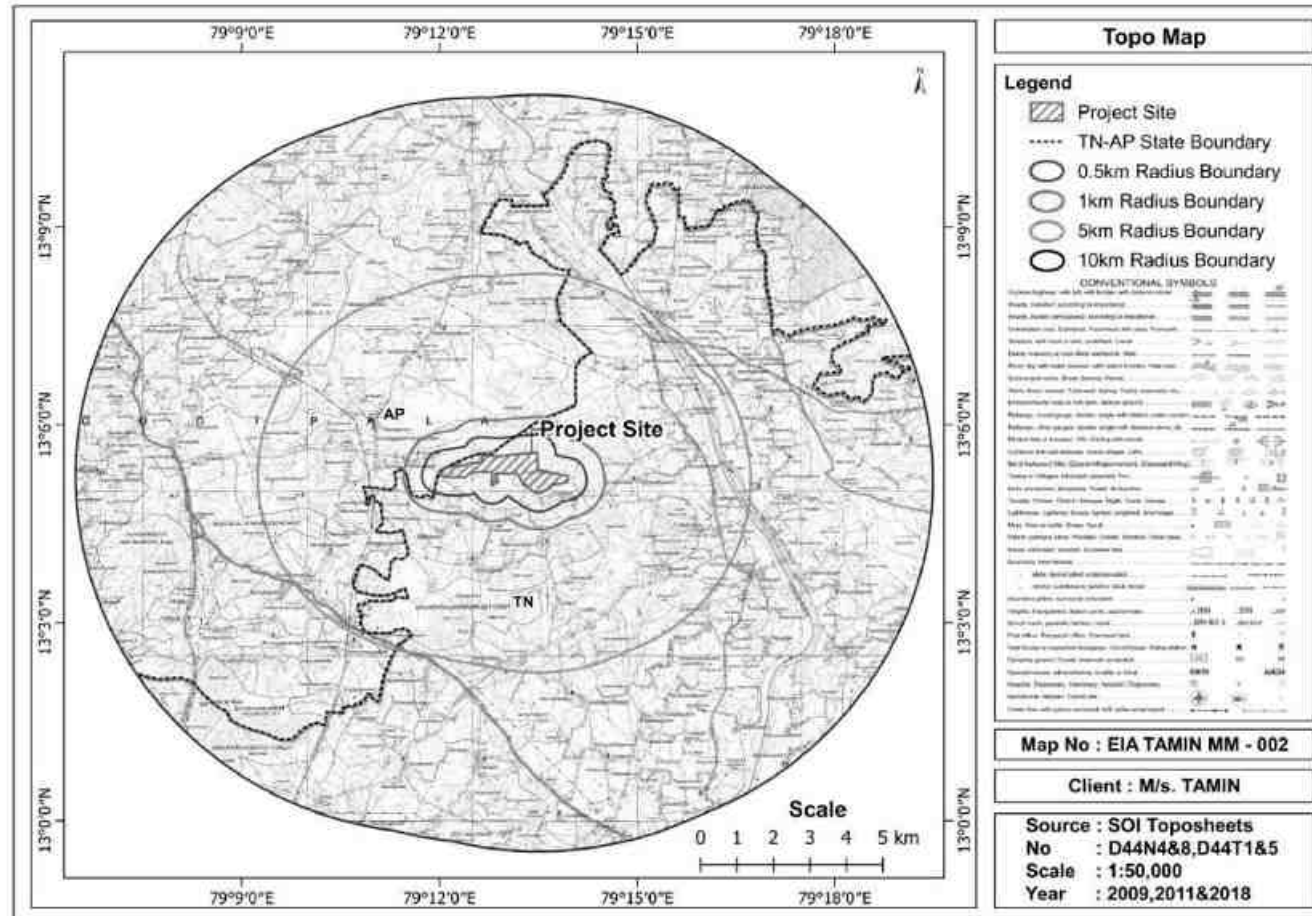


Figure 3-2 Topo Map of Study area

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3.3 Environmentally/Ecologically Sensitive areas

This section details with the environmentally sensitive areas present within the project site and surrounding environs. It included national parks, state forest, essential habitats etc. The environmental sensitive areas covering an aerial distance of 15 km from the project boundary is given in Table 3-1 and Figure 3-3 and Figure 3-4.

Table 3-1 Environmentally Sensitive Areas within 15km from Project Boundary

S.No	Areas	Distance & Direction from project boundary					
		S.No	Monuments	Distance (~km)	Direction		
1	Monuments	1.	Subramania Temple	3.20	ESE		
		2.	Ranganatha Temple	3.27	E		
		3.	Jain sculptures and inscriptions on the hill	3.47	ESE		
		4.	Somanatha Temple	5.99	ESE		
		5.	Choleswara Temple	6.11	ESE		
2	Heritage	S.No	Heritage	Distance (~km)	Direction		
		6.	Mahimandalam Fort (Ruined)	1.32	S		
3	Waterbodies & Reserve Forest	S.No	Water bodies	Distance (~km)	Direction		
		7.	Eri	Within the Site			
		8.	Abbenayadu Cheruvu	0.64	S		
		9.	Magimandalam Lake	0.79	S		
		10.	Lake near Mittanattam	1.26	S		
		11.	Lake near Naragallu	3.86	N		
		12.	Ponnai R	3.94	E		
		13.	Ponnai West Bank Main Canal	3.94	E		
		14.	Ponnai East Bank Main Canal	4.28	E		
		15.	Lake near Kiraisattu	4.76	ENE		
		16.	Lake near Nangamangalam	5.06	SW		
		17.	Lake near Erantangal	8.52	S		
		18.	Tiruvalam Lake	10.82	SSE		
		19.	Gollapalle Lake	11.83	N		
		20.	Lake near Katpadi	12.12	SSW		
		21.	Palar R	13.47	S		
		Reserved Forest					
		22.	Magimandalam RF	1.12	S		
		23.	Basavapalle RF	3.29	WSW		
		24.	Chilapalle RF	4.31	NW		
		25.	Basavapalle RF	4.56	WNW		
		26.	Bommasamudra Ext RF	6.44	SW		
		27.	Chittapara RF	6.94	W		
		28.	Bommasamudram RF	6.99	WSW		
		29.	Kanjanur RF	7.7	SSW		
		30.	Amudala RF	7.85	NE		
		31.	Panamandangi RF	8.57	SW		
		32.	Chittapara RF	9.27	W		

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		33.	Ammur RF	10.68	ESE																																																																																																																																																
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		3	Katpadi Mandal Revenue Office	14.39	SSW
		4	Katpadi Combined Court	14.42	SSW
		Religious Places			
		S.No	Places	Distance	Direction
		1	Sri Muneeswaran Temple	0.42	S
		2	Kolgatta Chapel	0.52	S
		3	Masjid E Arfa	1.23	S
		4	Vallimalai Murugan Hill Temple	3.20	ESE
		5	Shree Subramanya Swamy Temple	4.26	N
		6	CSI Ponnai Anaicut Church	4.39	E
		7	Angalaparameshwari Temple	5.09	NE
		8	Jamiea Mosque	5.31	NE
		9	Sorna Vinayagar Navagraha Kottai	6.44	NNE
		10	Thiruvalem Shiva Temple	11.67	SSE
		11	Adavichenu Murugan Temple	11.79	W
		Industries			
		S.No	Places	Distance	Direction
		1	CPF India Pvt	5.39	WSW
		2	Ranga Fruit Products	6.67	W
		3	Tropic Fruit Products	6.85	W
		4	Foods & Inns Kanakaneri	7.13	SSW
		5	Alaa foods	7.76	SW
		6	Foods and Inns Ltd	8.09	SW
		7	Steel India Pvt limited	10.69	SE
		8	Chamundi Die Cast Pvt Ltd Unit II	10.74	SE
		9	Alok Masterbatches Pvt Ltd	10.83	SE
		10	Nezone Tubes Limited	10.90	SE
		11	Powergear Limited	10.97	SE
		12	MKK Metal Sections Pvt Ltd	11.06	SE
		13	Plastic Omnium Auto Inergy India Pvt Ltd	11.09	SE
		14	Indocool Composite Private Limited	11.25	SSE
		15	Vel Castings Pvt Ltd	11.32	SSE
		16	Indocool Composites Pvt Ltd Unit ii	11.38	SE
		17	Sellowrap Industries Pvt Ltd	11.42	SSE
		18	Vellore Cooperative Sugar Mill	11.49	S
		19	Bharat Heavy Electricals Ltd	12.11	SSE
		20	Rajyog Granite Import and Export Pvt Ltd	12.21	NW
		21	CPF india Pvt Ltd	12.22	NNW
		22	M+L Shoe and Accessories Pvt Ltd	12.76	S
		23	FCI Godown	12.77	S
		24	Funskool (India) Limited	13.87	SSE
		25	Ampere Vehicles Private Limited	14.40	SSE
		26	P A Footwear Pvt Ltd	14.80	SSE
5	State, National boundaries	TN-AP state boundary~Adjacent to site,W			

6	Nearest Highway/Railway/Town and city	S. No	Description	Distance (~Km)	Direction	
		1	SH-124(Ponnai - Thiruvalam)	3.36	NE	
		2	NH-40(Ranipettai-Kurnool)	4.75	SW	
		3	Nearest Railway st- Ramapuram	2.46	WNW	
		4	Nearest Railway line(Bomma Samudram RS- Ramapuram RS)	1.92	WSW	
		5	Nearest Town - Katpadi (Pop~28,797)	13	SSW	
		6	Nearest City - Vellore (Pop~1,85,803)	16	SSW	
7	Nearest port/ Airport	<ul style="list-style-type: none"> ➤ Tirupathi International airport at a distance of ~ 67.10km towards NNE ➤ Vellore Airport (Domestic) at a distance of ~ 24.02km towards SW ➤ Chennai Port at a distance of ~ 114.26km towards E 				
8	Near by villages and Population	S. No	Villages	Distance (~Km)	Direction	Population
		1	Bodinattam	0.06	S	1,000
		2	Oletikandigai	0.37	SSW	80
		3	Gundalur	0.69	S	250
		4	Chalichimalapalle	0.83	WNW	200
		5	Pudur	0.86	S	200
9	Defence installations	Nil				



Figure 3-3 Environmental sensitive areas covering within 15 km from project boundary

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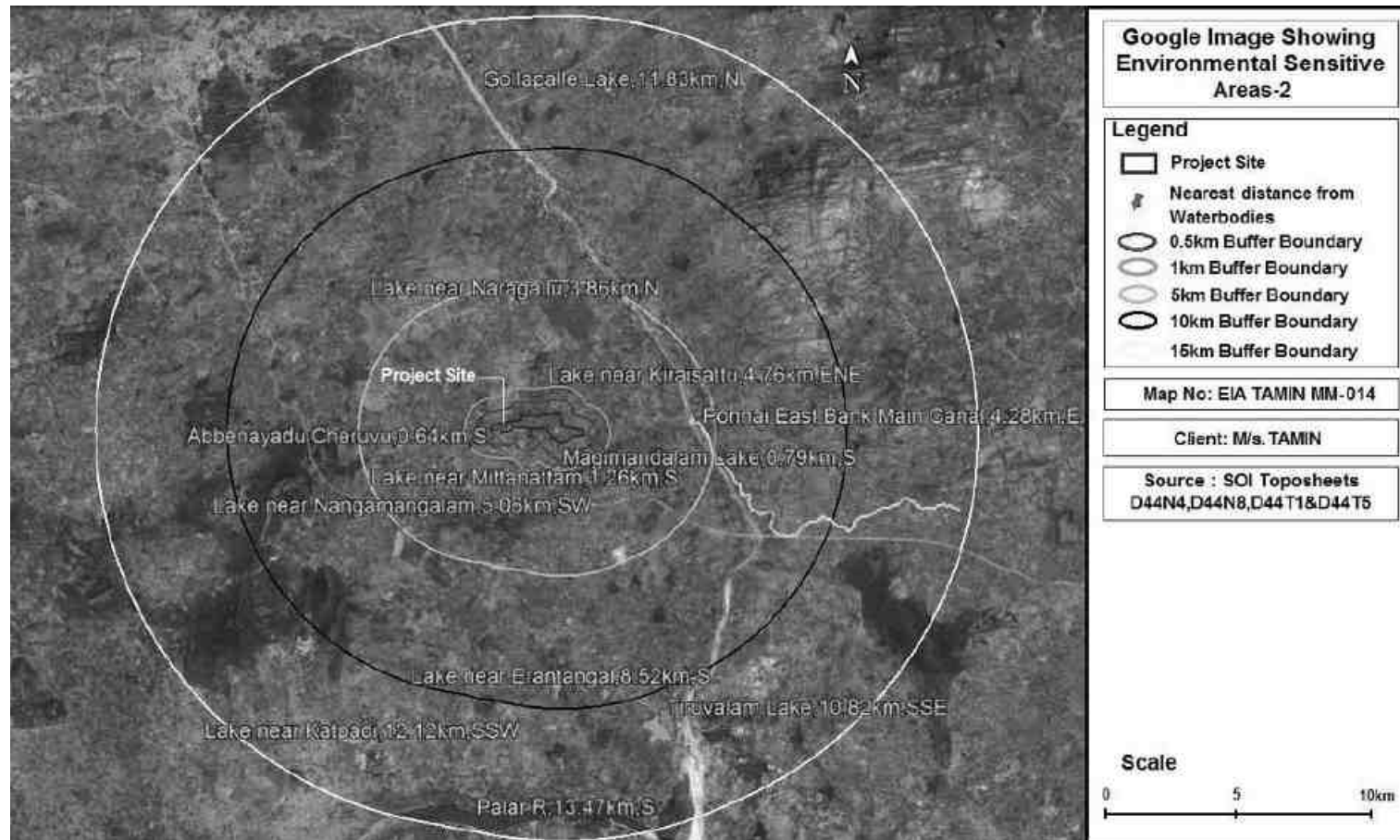


Figure 3-4 Environmental sensitive areas covering within 15 km from project boundary

3.4 Physical Conditions of PIA district

In this section, the physical conditions of PIA district are discussed in general and wherever possible references to the conditions prevailing in the study area in particular are also provided. The physical conditions are discussed as under:

- District profile
- Drainage, land use, geology, Physiographic
- Natural resources
- Climatic conditions, seismic zone characteristics and natural hazard

PIA District Profile

Vellore District lies between 12° 15' to 13° 15' North latitudes and 78° 20' to 9° 50' East longitudes in Tamilnadu State. District geographical area is 5920.18 sq. Km. The total population is 39, 36,331 as per 2011 Census. Vellore is the headquarters of Vellore District and well connected by Rail and bus routes to major towns of the neighbouring states like Andhra Pradesh, Karnataka and Kerala. District bounces a vivid picture of Monuments of the town through the ages. In the 18th Century Vellore District was the scene of some of the decisive battles fought in Ambur 1749 A.D., Arcot 1751 A.D. and Vandavasi 1768 A.D. as a result of the long – drawn struggle between the English and the French for Supremacy.

Source:

https://censusindia.gov.in/nada/index.php/catalog/1106/download/3438/DH_2011_3304_PART_A_DCHB_VELLORE.pdf

(Ref: Directorate of Census Operations-Tamil Nadu, “District Census Handbook-2011, Vellore District”, Series-34 Part XII-A)

Chittoor District is a part of the Rayalaseema Region and is located at the extreme South of the Andhra Pradesh State and lies approximately between 12° 37' to 14° 08' North latitudes and 78° 03' to 79° 55' East longitudes. YSR in the North, North-east by Nellore, North-west by Anantapur are bounded by the Andhra Pradesh state districts, as well as Karnataka at South-west and Tamilnadu State at South direction. District total area is 15,151 Sq. Km and ranks 8th position contributing 5.51 % area in the state of Andhra Pradesh.

Source: http://censusindia.gov.in/2011census/dchb/2823_PART_A_DCHB_CHITTOOR.pdf

3.4.1 Climatic Conditions

Moderate climate is recorded in the district. Better climate has been recorded in the areas where more forest cover and hilly region. The maximum temperature of Vellore in 2009- 10 was 40.4°C in April and minimum temperature was 18.5°C in January. In 2009-10, Vellore district received 814.8mm of rainfall as compared to a normal of 917mm. This district gets maximum rainfall (251.7mm) in September (South West Monsoon) and minimum rainfall (0.0mm) in February and March (winter and Hot Weather).

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Source: https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf
(**Ref:** Directorate of Census Operations Tamil Nadu, "District Census Handbook 2011, Vellore District", Series-34, Part XII-A)

3.4.2 Natural Resources of PIA District

3.4.2.1 Flora & Fauna

Ordinary plants such as tamarind, teakwood, sandal wood, ven-teak, casuarina, bamboo etc are common in the forests. Bison, tiger, Black bears, hyenas, sambar, spotted deer, jungle sheep, barking deer, antelope, king cobras, Monkeys exist in several places in the district. The most common birds of South Indian species are seen in the district.

Source: https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf
(**Ref:** Directorate of Census Operations Tamil Nadu, "District Census Handbook 2011, Vellore District", Series-34, Part XII-A)

3.4.2.2 Forest Resources

The geographical area of the Vellore District is about 6077sq. Km in which Vellore Forest Division covers is about 1002.722 Sq.Km (100272.22 Ha.) and this division comprises 7 territorial ranges namely Vellore, Arcot, Gudiyatham, Odugathur, Amirdhi, Pernampet and Rowing Check Post Range. This division comprises 60 Reserved Forests ranging from Scrub Thorny Forests to Semi Ever Green Forest.

Source: <https://www.forests.tn.gov.in/img/document/CIRCLES/VELLORE.pdf>

The total forest area of Chittoor district is 4,514 Sq. Km which is about 30% of the total area of the district. The forests of Bhakarapet and Tirupathi ranges mainly confined to the imposing Sheshachalam hills which are alleged to be portion of the ancient Dandakaranya as expounded in the famous epic of Ramayana. Among the forest products, red sandal is the richest and valuable forest product and its revenue per Sq. Km. is about Rs. 18,550.

Source: http://censusindia.gov.in/2011census/dchb/2823_PART_A_DCHB_CHITTOOR.pdf

3.4.2.3 Irrigation

Irrigation sources in the district are poor and the agriculture depends on seasonal rainfall. Tube wells and dug wells are chief sources of irrigation. The rivers Palar, Ponnai and the Pennai River meet a good part of the irrigational needs and "anaicuts" have been constructed across them. The three important anaicuts are built across Palar, Ponnai and Pennaiyar. The Palar anaicut irrigates land in Wallajah and Arakonam taluks. The anaicut across Ponnai River also irrigates smaller area in these taluks. For irrigation of agricultural lands, there were 604 canals and 110,220 wells (for irrigation only) besides 57,055 wells used for domestic purposes in 2009-10. There were 1355 tanks in the district; out of this 420 have ayacuts of 40 hectares or more while remaining tanks have ayacuts of less than 40 hectares. Kaveripakkam Lake, covering an area of 6 sq. kms, is a

major tank in the district which irrigates large area of land. The water from the lake, when ever it is filled, irrigates land in 33 villages. Depending on water availability, the cultivation is done in 2-3 times a year.

Source: https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf
(**Ref:** Directorate of Census Operations Tamil Nadu, "District Census Handbook 2011, Vellore District", Series-34, Part XII-A)

3.4.2.4 Agricultural Resources

Paddy, Sorghum, Red gram, Horse gram, Ground nut, Gingelly, Sugarcane, Cotton and Brinjal are the major crops grown in Vellore district. The cropping arrangement of the Vellore district indicated that ground nut was the predominant crop with 28.4 per cent of the total cropped area and it was followed by Paddy (22.8%), Red gram (7.2 %), Sugar cane (5.9 %), Ragi (5.8 %) in that order during 2006-07. 64 % of Food grains like cereals and pulses together accounted in total cropped area.

Source: http://agritech.tnau.ac.in/govt_schemes_services/pdf/govt_schemes_nadp_dap_Vellore.pdf

3.4.2.5 Mineral Resources

Vellore District in Tamil Nadu accounts for 79% of country's resources of vermiculite (source: IBM - Indian Minerals year book 2016) with a single operating mine producing 989 tonnes in 2015-16 valued for 2218 million rupees. In addition to Granites (Dimension stones) and River Sand with minor occurrence of other minerals such as Fireclay, Graphite, Limestone, Quartz/Silica sand, Apatite, Barytes, Molybdenum, etc., excluding Atomic and Rare Earth Minerals. The details of the production of minerals are given in **Table 3.2**. Geology and Minerals Maps of Tamilnadu and Pondicherry is shown in **Figure 3.4**.

Source: <https://cdn.s3waas.gov.in/s31651cf0d2f737d7adeab84d339dbabd3/uploads/2019/04/2019040961.pdf>
(**Ref:** District Survey Report-Vellore District-Department of Geology and Mining-Government of Tamil Nadu)

The mineral map of Tamilnadu is shown in the **Figure 3-5**



Source: Maps of India

Figure 3-5 Mineral Map of Tamil Nadu

3.4.3 Land Use & Land Cover

Total geographical area of Vellore District and Chittoor districts are 6077 Sq.Km and 15152 sq. Km, respectively. Details of Land use/ Land cover statistics given in **Table 3-4** and in **Figure 3-6**. Land Use pattern and Land use /Land Cover Map of Vellore District is given in **Figure 3-7**.

Table 3-2 Land use/land cover statistics for Vellore District

S.No	Particulars	Area (Sq. Km)	Area (Acres)	Area (Hectares)	Area (%)
1	Built up, Urban	110.98	27423.7	11098	1.83
2	Built up Mining	13.03	3219.8	1303	0.21
3	Agriculture, Plantation	416.87	103010.7	41687	6.86
4	Forest Evergreen/ semi evergreen	237.63	58719.6	23763	3.91
5	Forest, forest Plantation	15.31	3783.2	1531	0.25
6	Barren/unculturable/wasteland, salt affected land	9.38	2317.8	938	0.15
7	Barren/unculturable/wasteland, Sandy area	0.81	200.2	81	0.01
8	Wetlands/water bodies,River/stream/canal	111.16	27468.2	11116	1.83
9	Builtup, Rural	97.81	24169.3	9781	1.61
10	Agriculture, crop land	2593.47	640859.4	259347	42.68
11	Agriculture, Fallow	486.59	120238.8	48659	8.01
12	Forest, Deciduous	1111.98	274775.8	111198	18.30
13	Forest, Scrub forest	309	76355.4	30900	5.08
14	Barren/unculturable/wasteland, scrub land	271.01	66967.9	27101	4.46
15	Barren/unculturable/wasteland, barren rocky	10.77	2661.3	1077	0.18
16	Wetlands / water bodies, Reservoir / lakes / ponds	281.2	69485.9	28120	4.63
	Total	6077.0	1501657.1	607700.0	100.0

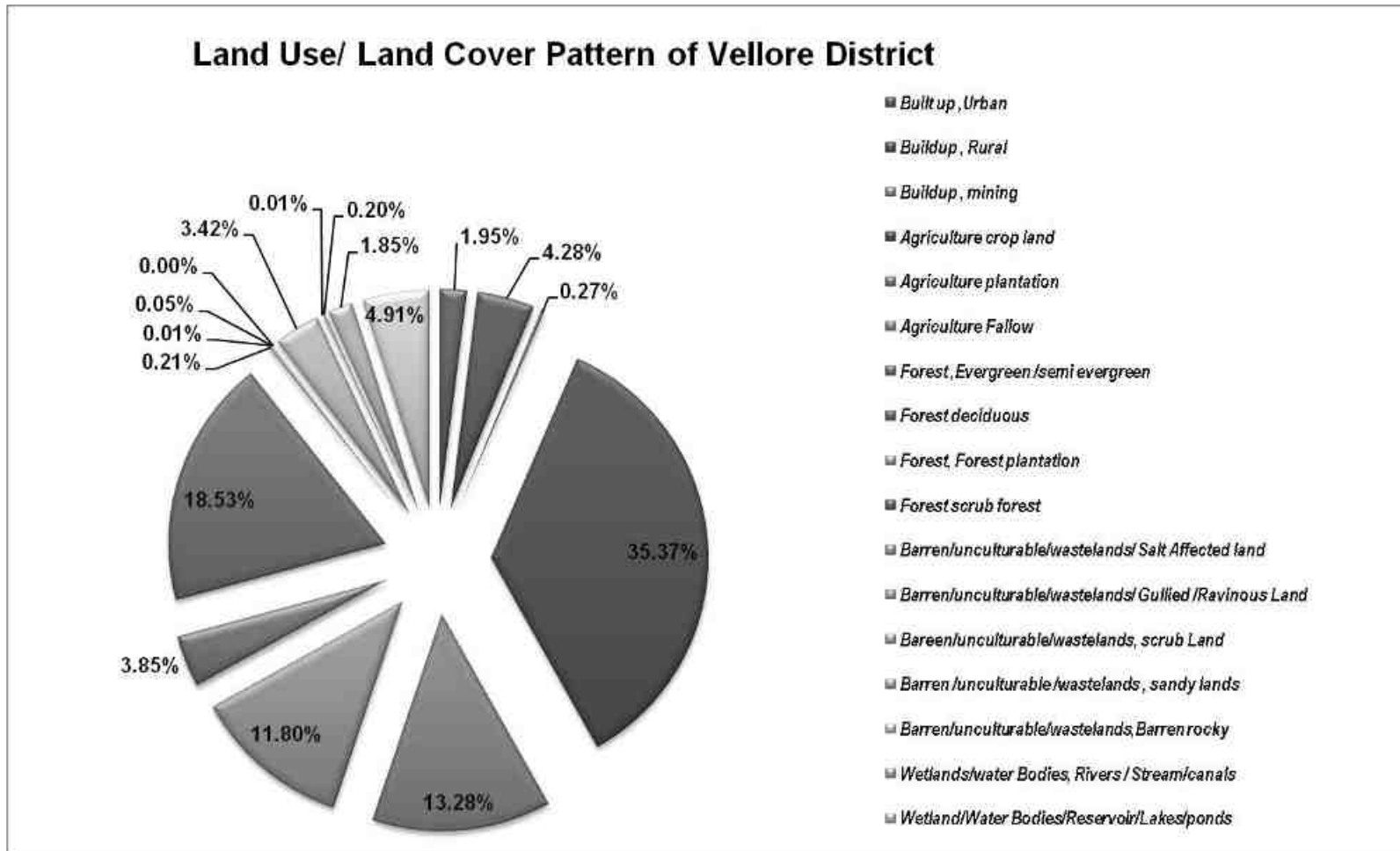


Figure 3-6 Land use/Land cover pattern for Vellore district

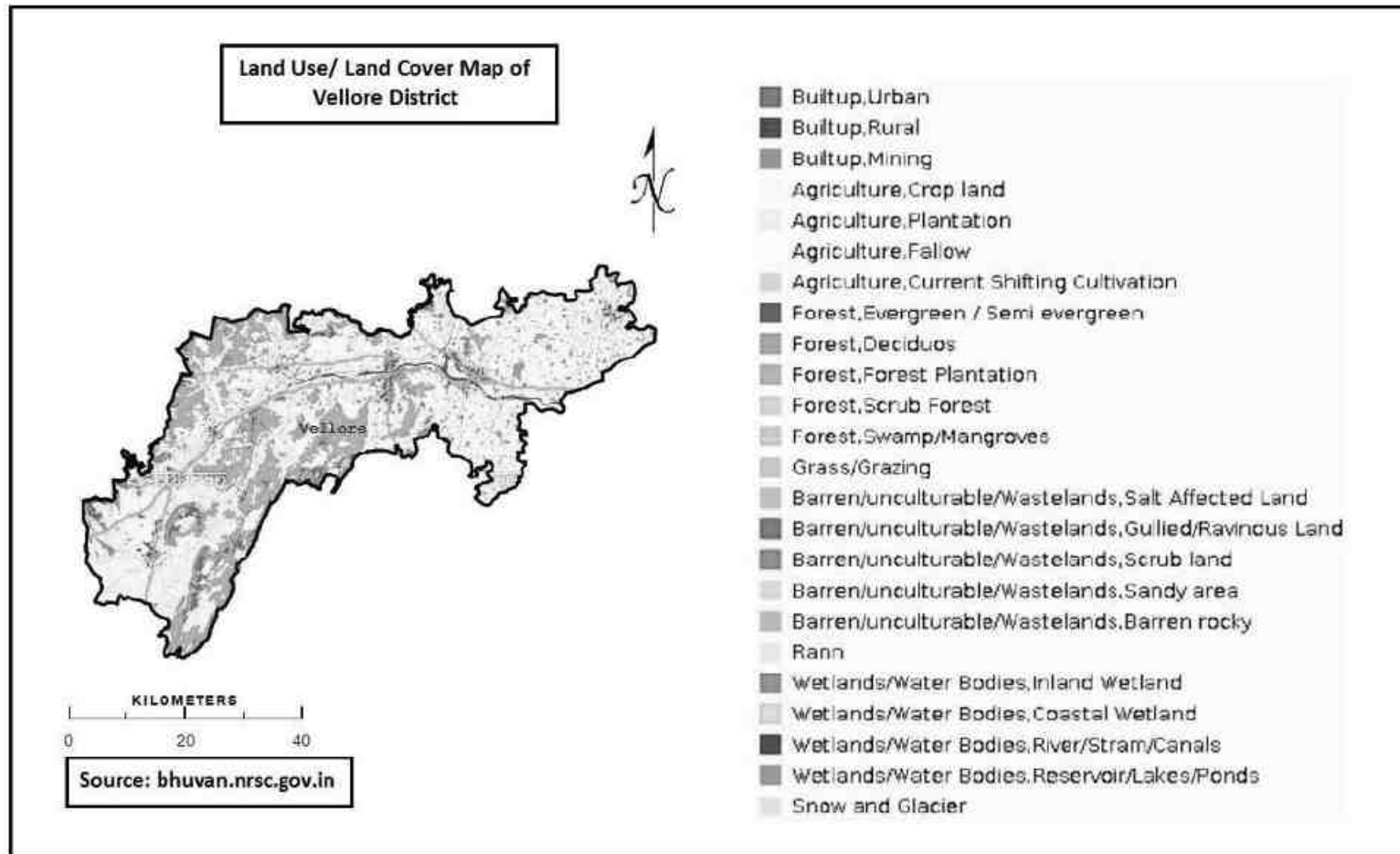


Figure 3-7 Land use/Land cover Map of Vellore district

3.4.3.1 Land use land cover for the study area

The land use pattern of the study area is 395.37 Sq.Km given in **Table 3-3** Land use pattern and land use map of the study area is given in **Figure 3-8** and **Figure 3-9** respectively.

Table 3-2 Land use pattern of the Study Area

S.No.	Description	Area (Sq.Km)	Area (Acres)	Area (Hectares)	Percentage (%)
1	Crop land	232.74	57511.218	23274	58.87
2	Scrub land	60.8	15023.984	6080	15.38
3	Fallow	21.81	5389.3601	2181	5.52
4	Deciduous	21.41	5290.5181	2141	5.42
5	Waterbodies	17.31	4277.3876	1731	4.38
6	Scrub Forest	14.94	3691.7487	1494	3.78
7	Rural	13.15	3249.4308	1315	3.33
8	River / Stream / Canals	6.02	1487.5721	602	1.52
9	Urban	2.42	597.9941	242	0.61
10	Barren rocky	2.36	583.1678	236	0.60
11	Plantation	1.64	405.2522	164	0.41
12	Mining	0.67	165.56035	67	0.17
13	Salt affected land	0.1	24.7105	10	0.03
	Total	395.37	97697.904	39537	100

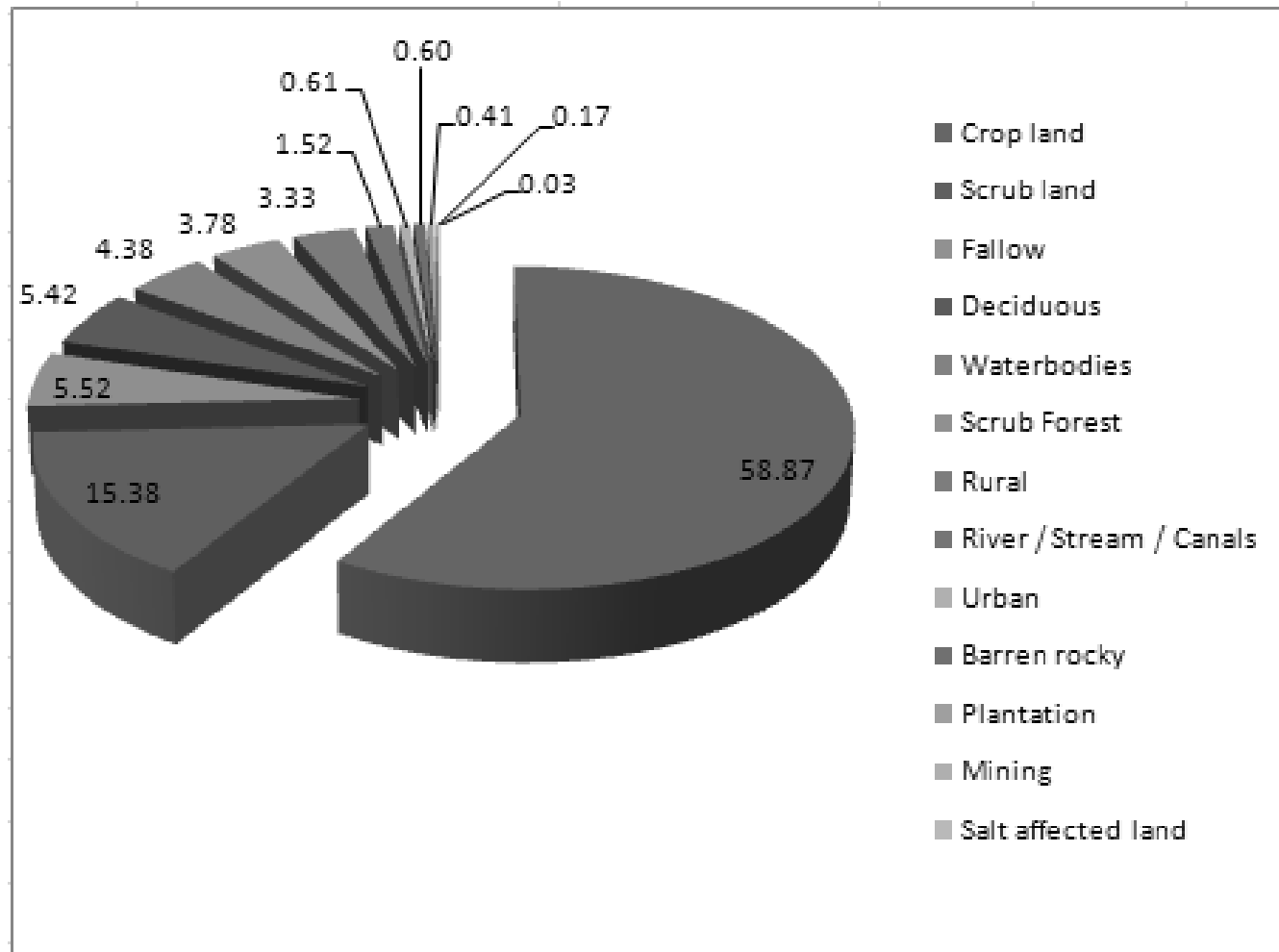


Figure 3-8 Land use pattern of the Study Area

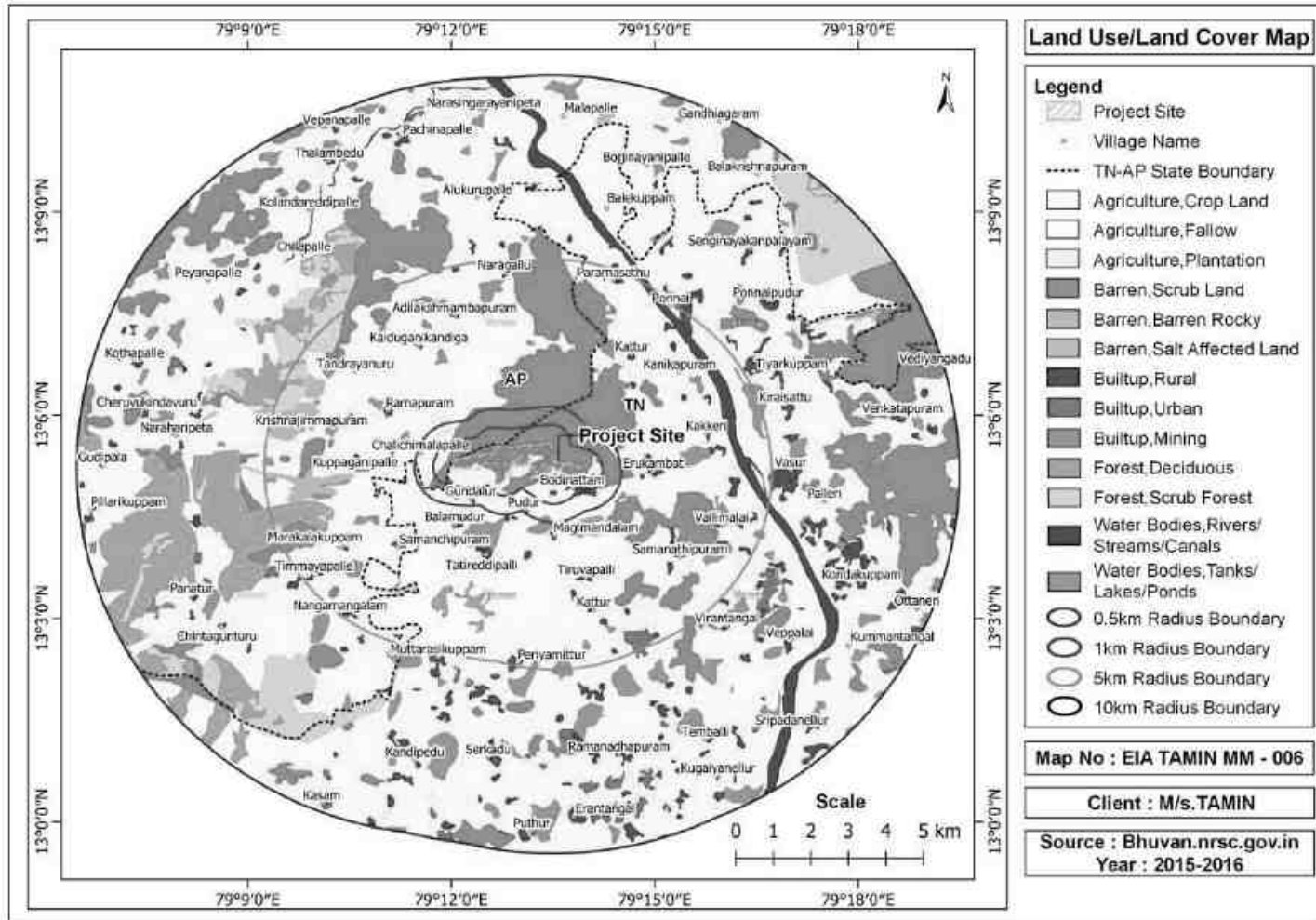


Figure 3-9 Land use/Land cover map of the Study Area

3.4.4 Topography

Vellore district can be classified into two major physiographic divisions i) Hilly terrain in the eastern and southwestern parts ii) Plain regions in the eastern part. The western part of the district is occupied by the Javadi and Elagiri hills. In the Elagiri hills, a few peaks 1121m, 942m, 841m raise above, are prominent. In Javadi hills, the peaks 1076m, 975m and 99m are prominent. The eastern areas of Vellore are undulating rugged plains with isolated hillocks of 120m and 140m above msl. The area is drained by Palar, Cheyyar and smaller distributary streams. The drainage is subdendritic and most of the streams are ephemeral. The Palar Flood Plain becomes broader on entering into the Kancheepuram district whereas in the west, it is restricted to the river bed only. The south western part of the district viz., Elagiri hills ranging upto 1330 m above mean sea level. The lowest of 21m at the eastern margin of the district in the alluvial plains of Palar River.

Source: <https://cdn.s3waas.gov.in/s31651cf0d2f737d7adeab84d339dbabd3/uploads/2019/04/2019040961.pdf>
(**Ref:** District Survey Report-Vellore District-Department of Geology and Mining-Government of Tamil Nadu)

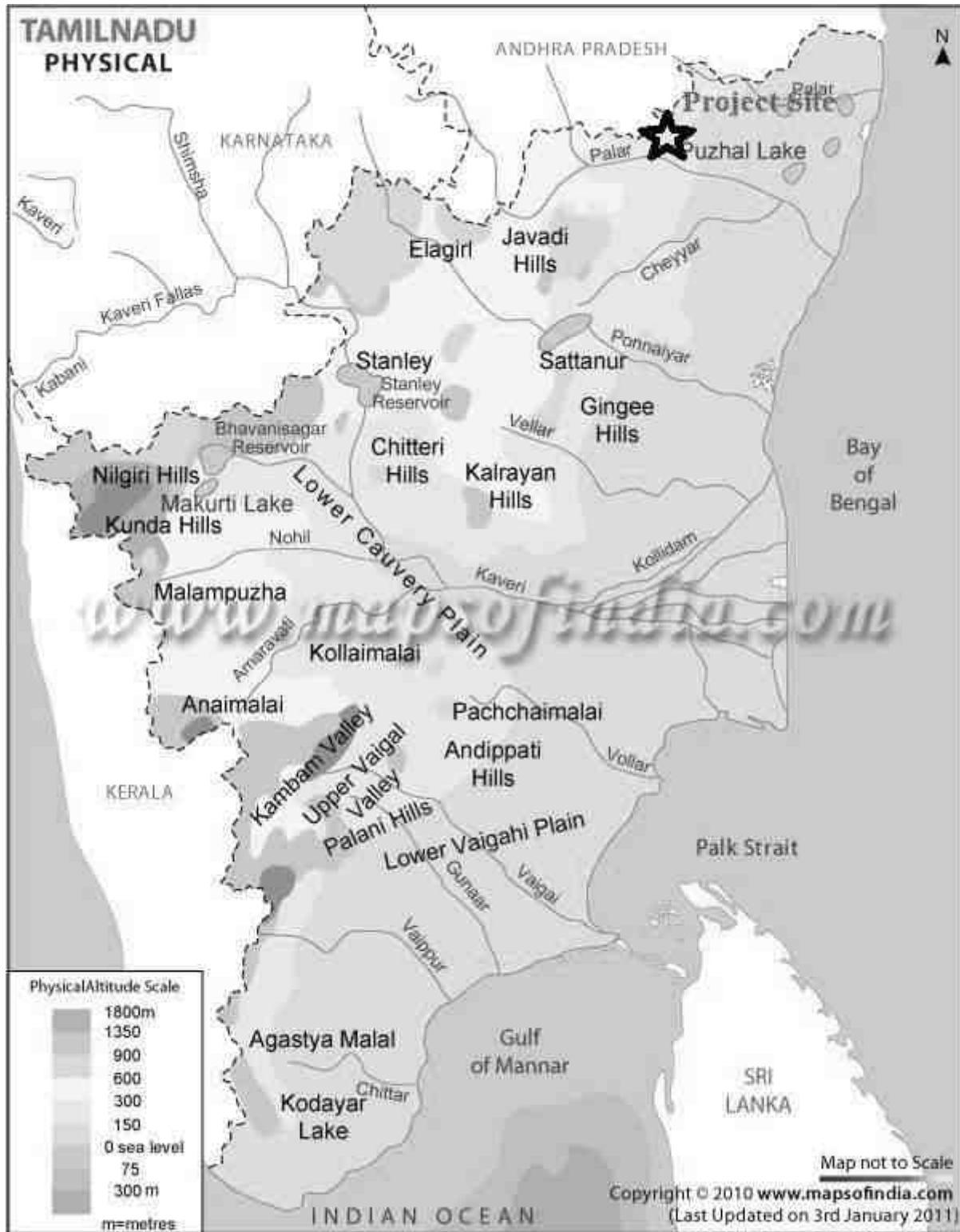


Figure 3-10 Physical Map of Tamilnadu

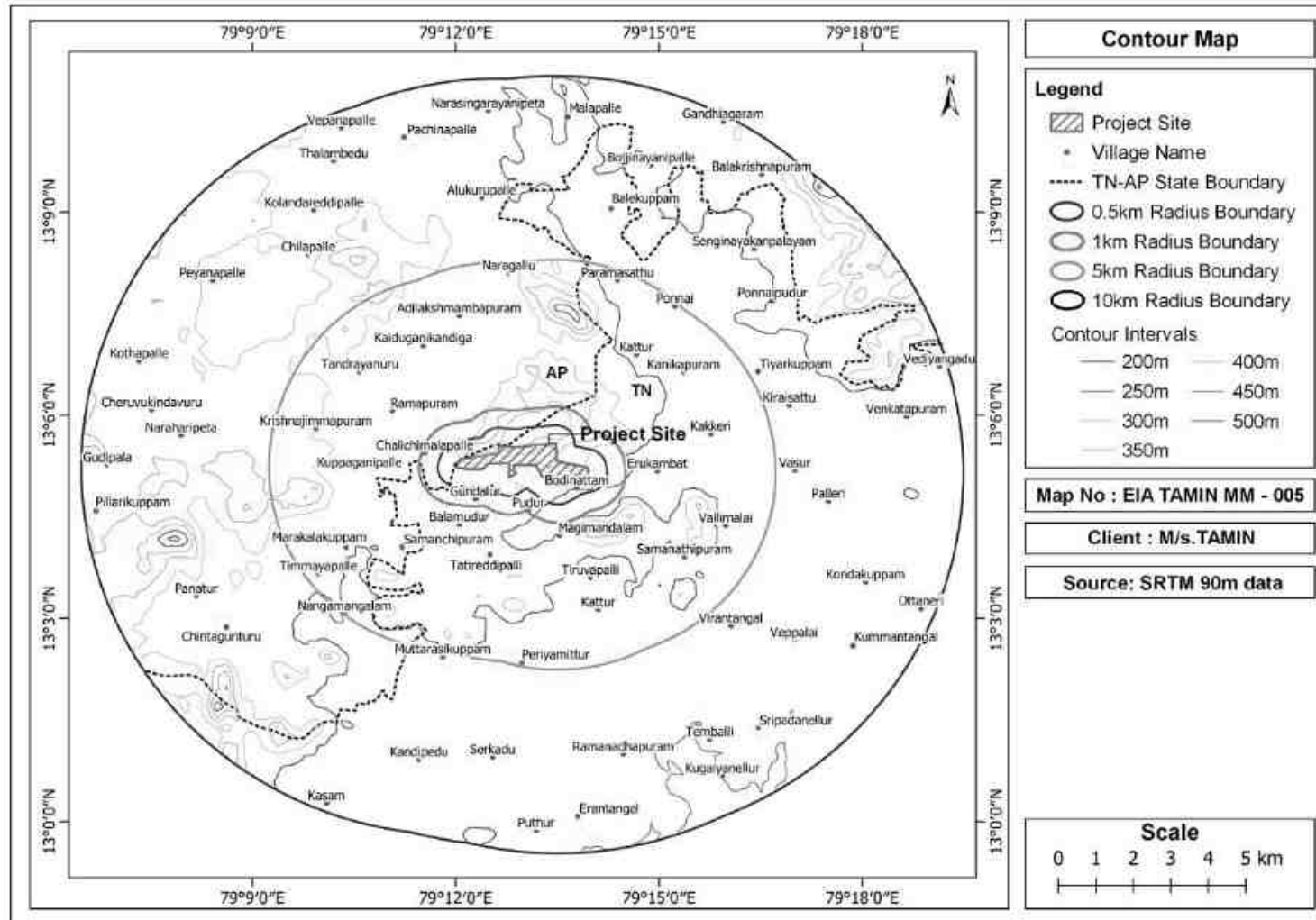


Figure 3-11 Contour map of the Study Area

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3.4.5 Geomorphology of PIA District

, Vellore district can be classified into two major physiographic divisions viz., i) Hilly terrain in the eastern and southwestern parts and ii) Plain regions in the eastern part. The landscape in the hilly terrain is undulating to rugged, flanked by hill ranges belonging to Eastern Ghats. The major hill ranges in the district are those belonging to Jawadu, Elagiri and Kalrayan hills. The eastern part of the district is a gently undulating plain dotted with isolated hillocks with sharply rising peaks, sloping towards east.

Source: http://cgwb.gov.in/District_Profile/TamilNadu/Vellore.pdf

(Ref: District Groundwater Brochure-Vellore District-Central Ground Water Board-January 2009)

3.4.5.1 Geomorphology of the study area

Total geographical area of the study area is 395.37 Sq.Km. The Geomorphology pattern of the study area is given in below Table 3-3, Geomorphology pattern of the study area is given in **Figure 3-12**. Geomorphology map of the study area is given in **Figure 3-13**.

Table 3-3 Geomorphology pattern of the study area

S.No.	Description	Area (Sq.Km)	Area (Acres)	Area (Hectares)	Percentage (%)
1	Denudational Origin-Pediment-PediPlain Complex	291.93	72137.363	29193	73.84
2	Denudational Origin-Moderately Dissected Hills and Valleys	36.33	8977.3247	3633	9.19
3	Denudational Origin-Low Dissected Hills and Valleys	24.09	5952.7595	2409	6.09
4	Waterbodies	23.33	5764.9597	2333	5.90
5	Fluvial Origin-Active Flood Plain	11.09	2740.3945	1109	2.80
6	Structural Origin-Moderately Dissected Hills and Valleys	5.5	1359.0775	550	1.39
7	Structural Origin-Low Dissected Hills and Valleys	2.02	499.1521	202	0.51
8	Anthropogenic Origin-Anthropogenic Terrain	1.08	266.8734	108	0.27
Total		332.14	97697.904	39537	100.00

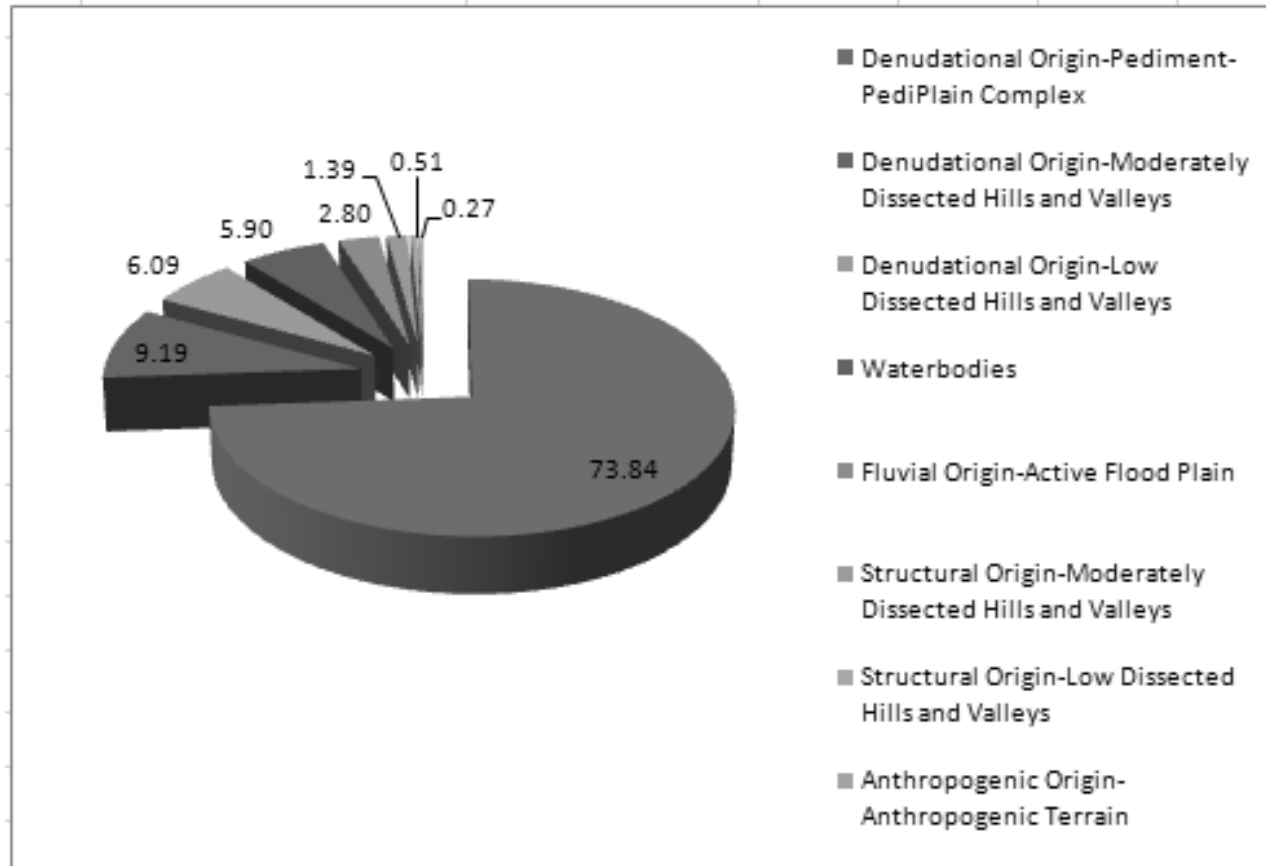


Figure 3-12 Geomorphology pattern of the study area

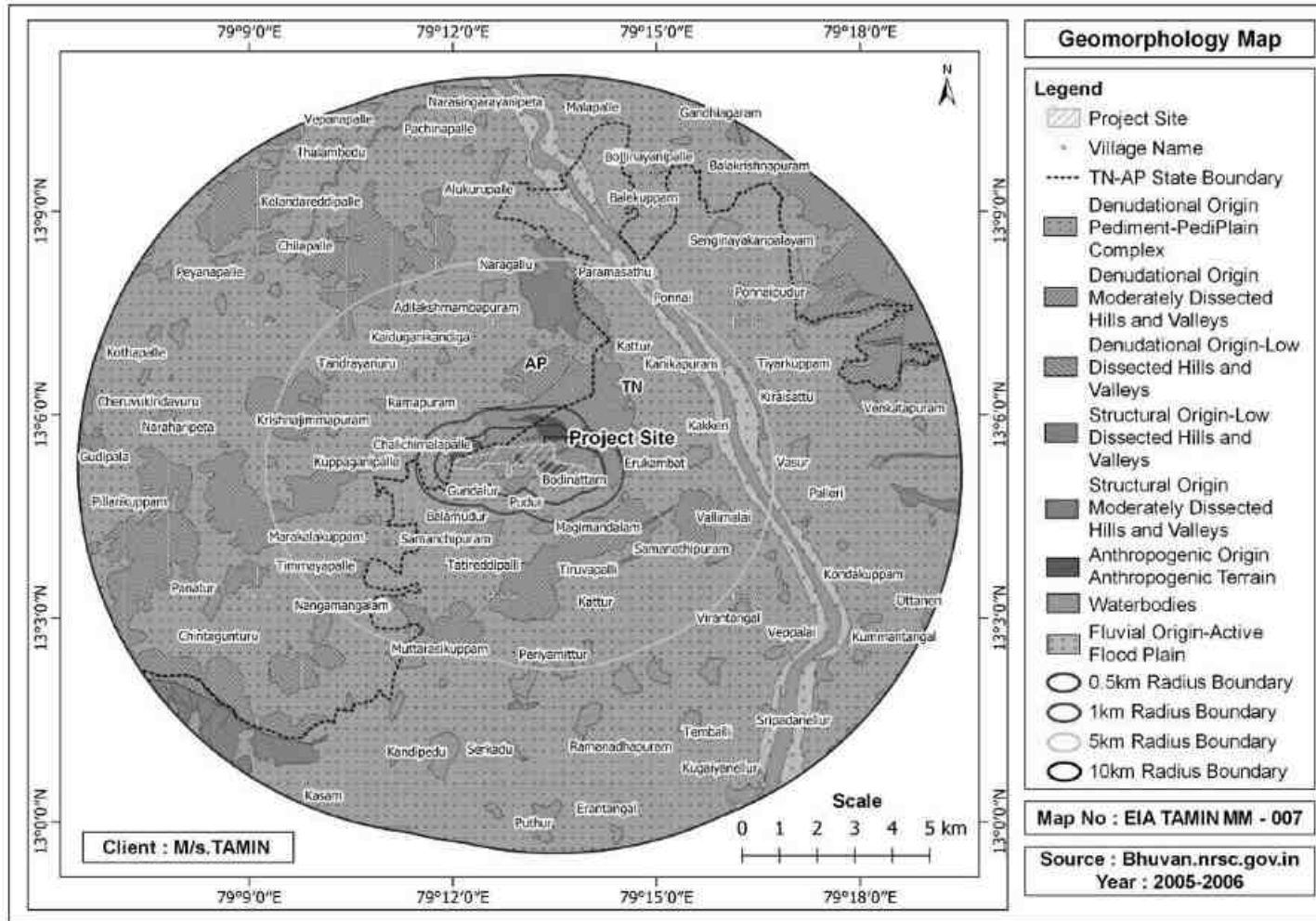


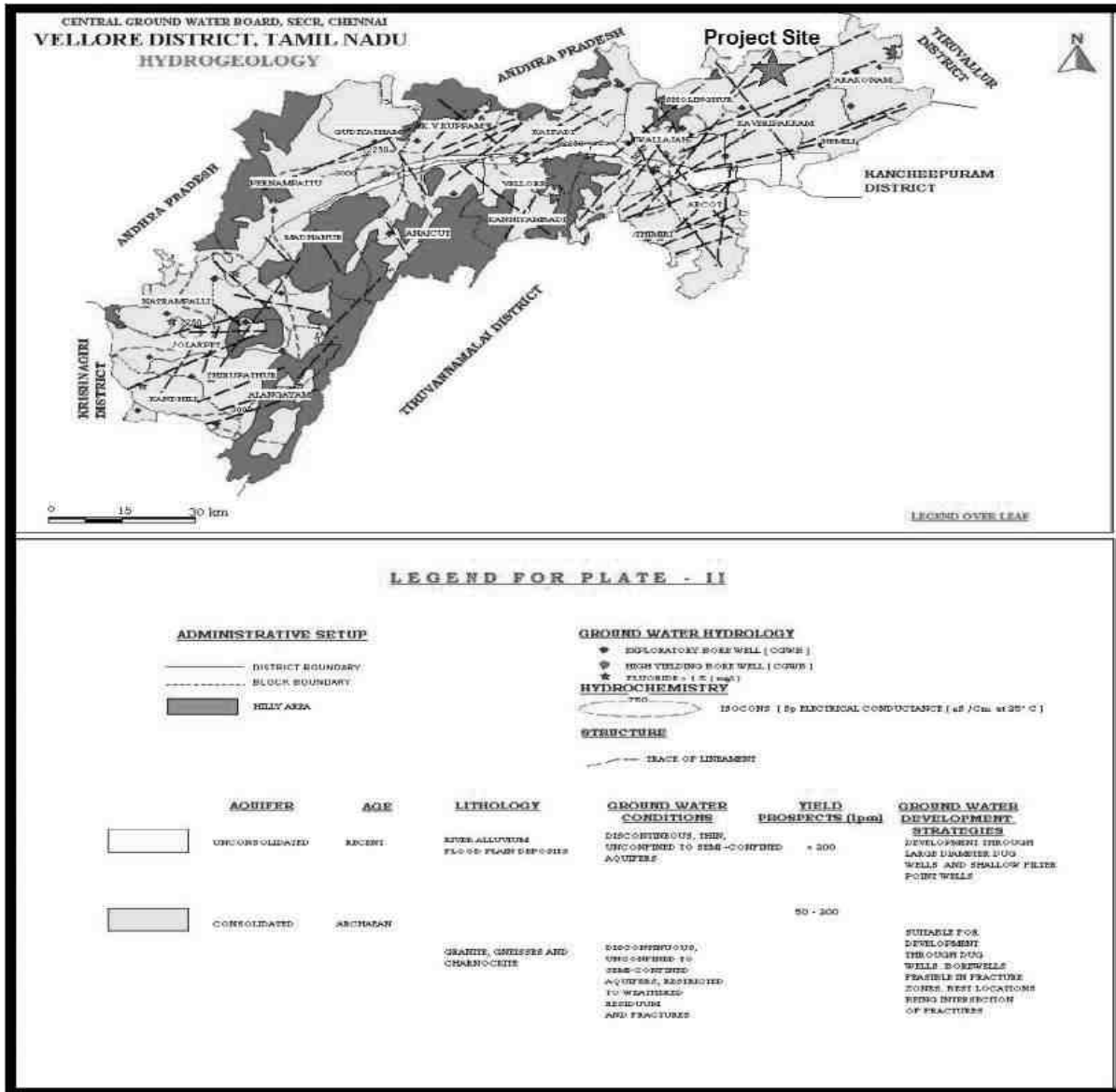
Figure 3-13 Geomorphology Map of Study Area

3.4.6 Hydrogeology of PIA District Profile

Vellore district is underlain by geological formations ranging in age from Archaean to Recent. In the crystalline formations comprising charnockites, gneisses and granites. The yield of dug wells is less than <1 lps in massive crystalline rocks whereas it is up to 2.3 lps in highly weathered gneisses. The specific capacity of wells tested in the district ranged from 18.82 to 80.58 lpm/m/dd. The yield of exploratory wells drilled in crystalline rock areas of the district ranged from 0.27 to 10.55 lps. The specific capacity of bore wells ranged from 0.738 to 23.41 lps/m/dd. While the exploratory wells in alluvium have yields in the range of 3 – 7 lps. During May 2006, the depth to water levels in observation wells tapping shallow aquifer ranged from 1.15 – 18.60 m bgl. Shallow ground water levels i.e. less than 5 m bgl were prominently observed in observation wells at Arcot, Girisamudram, Rangavaram, Ranipet and Vishram, and comparatively deeper ground water levels (10 – 20 m bgl) at Asanampatti, Kandhili, K.V.Kuppam, Madhanur, Paradarami, Thirupathur and Thimiri. Depth to ground water levels during January 2007 ranged from 1 to 18.45 m bgl. Water levels were within 2 m bgl in isolated pockets in Echipudur and Ranipet and resulted in localised seasonal water logging conditions. Deeper ground water levels (10 – 20 m bgl) still persisted in the pockets of Asanampattu, Kandhili, K.V.Kuppam, Madhanur, Paradarami-I, Pernampattu, Thirupathur and Thimiri. The depth to piezometric surface of the deeper fractured aquifers ranged from 3.78 – 21.70 m bgl during pre monsoon and 2.08 to 8.02 m bgl during post monsoon period. Hydrogeology map of the PIA district is given in **Figure 3.13**.

Source: http://cgwb.gov.in/District_Profile/TamilNadu/Vellore.pdf

(Ref: *District Groundwater Brochure-Vellore District-Central Ground Water Board-January 2009*)



Source: https://cgwb.gov.in/District_Profile/TamilNadu/Krishnagiri.pdf

Figure 3-14 Hydrogeology Map of Krishnagiri District

3.4.7 Drainage Pattern in PIA District

Rivers such as Palar, Ponnai, Pamban, Malattar, Kavundinyanadi, Agaram Aru, Kallar, Naganadi and Goddar are important but not useful for irrigation as they mostly dry and waste water except during heavy rain seasons. Originating near Nandidurg in Karnataka, Palar river enters the district in the western part through Vaniyambadi taluk. It is an important river in the district. Running towards east crossing Gudiyatham taluk, the river forms the boundary between Vaniyambadi, Gudiyatham and Vellore taluks. Making boundary between Wallajah and Arcot taluks, and separating Arcot and Ranipet towns Palar River enters into Cheyyar taluk in Tiruvannamalai district on the east. Ponnai River rising in Chittoor district of Andhra Pradesh flows on the western part of Walajapet taluk and joins Palar near Ranipet. Other rivers such as Goddar and Kavundinyanadi originating from north to south in Gudiyatham flow into Palar river. Drainage map of the study area is given in **Figure 3.14**.

Source: https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

(**Ref:** Directorate of Census Operations Tamil Nadu, "District Census Handbook 2011, Vellore District", Series-34, Part XII-A)

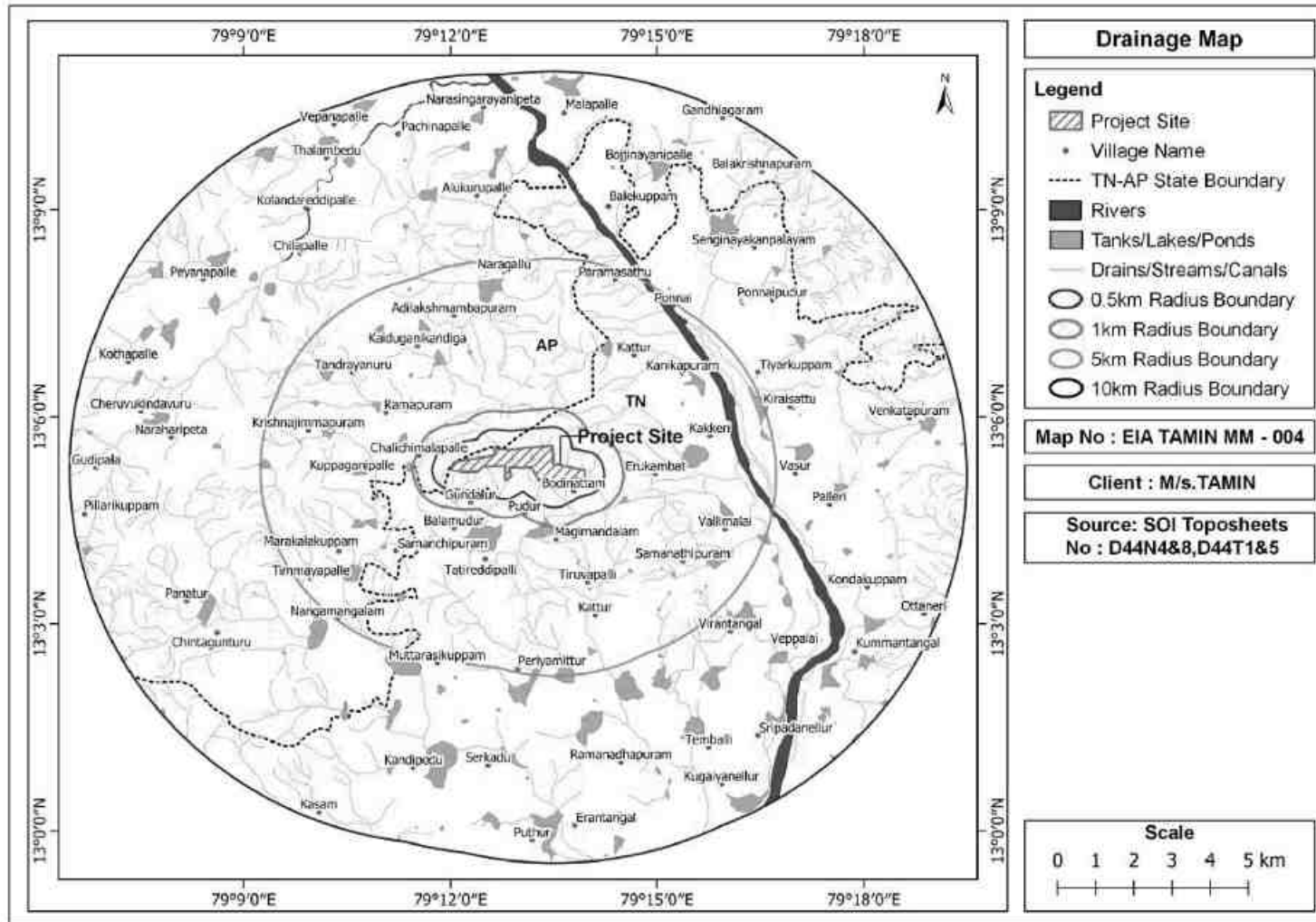


Figure 3-15 Drainage map of the study area

3.4.8 Geology

Vellore district is popularly known for its forest, hills and Rocky Mountains with height ranging from 2500 ft to 4500 ft. Jawadhu Hills is an important mountain range inhabited by Malyali tribes. It is surrounded by Tirupathur and Vaniyambadi taluks on the west, by Chengam taluk on the north-east, Polur taluk of Tiruvannamalai district on the east and north by Vellore taluk. The Elagiri Hills is an important hill known for summer tourism where people from neighbouring areas enjoy the cool weather during summer season. It lies on the north-eastern part of Tirupathur taluk. Besides these, there are many rocky hills of lower elevation scattered in Vellore, Vaniyambadi, Gudiyatham, Ranipet, Arakonam, Arcot and Walajapet taluks. Thiruvallur district can be geologically classified into hard rock and sedimentary (alluvial) formation. This district is principally made up of Archaean, upper Gondwana and the tertiary formations. These are overlaid by laterites and alluvium. The oldest of the crystalline rocks of Archaean age are of Biotite and Hornblende Gneiss, Charnockite and granite. These are intruded by Amphibole dykes, and occasionally with veins of quartz and pegmatites. Granites and gneisses of Archaean age are mainly seen in Tiruthani taluk. Geological map of Tamilnadu is given as **Figure 3-16**.

Source: https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

(Ref: Directorate of Census Operations Tamil Nadu, "District Census Handbook 2011, Vellore District", Series-34, Part XII-A)



Figure 3-16 Geology Map of Tamilnadu

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3.4.9 Seismicity

As per Earthquake hazard map of India, The project location/study area falls in Zone III, which is categorized as a Moderate Damage Risk Zone. The Earthquake hazard map of India is shown in **Figure 3-17**

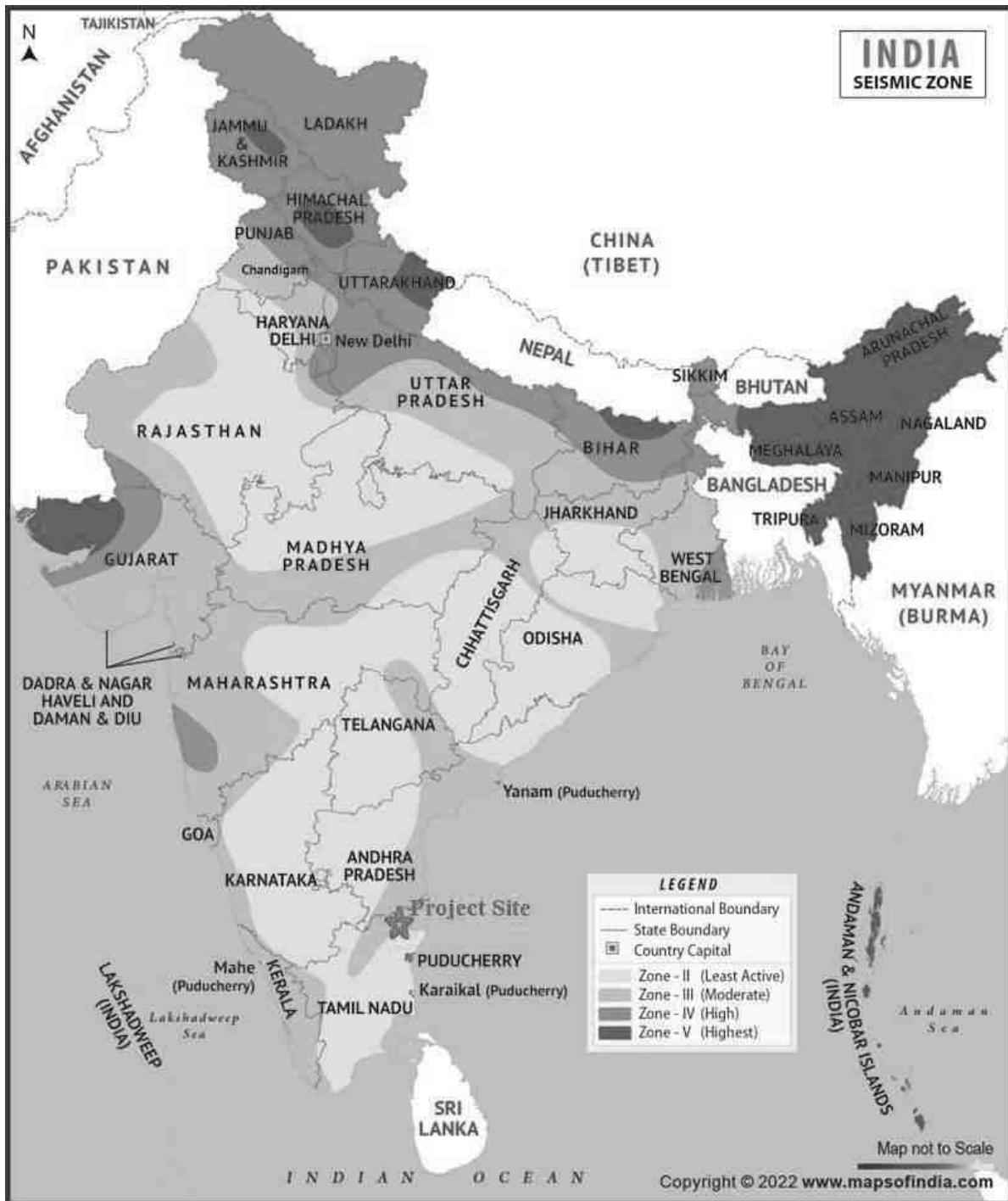


Figure 3-17 Seismicity Map of Tamil Nadu

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

3.4.10 Soils in PIA District

Containing complex mineral compounds, the soil is thin layer of earth's crust made up of disintegrated and decomposed rocks. It constituted with the natural resources which supports to the growth of plants on earth. The central and southern parts of the district are mostly hilly and the eastern portion is almost a stretch of unbroken plain. In the western part, the land rises gradually towards the Mysore plateau along the Chittoor district. The soil is mostly of the red ferruginous variety both sandy and loamy, with black area accounting for about 16%. The black soil is found mostly in the neighbourhood of the rivers of Palar, Ponnai and in the ayacuts of a few big tanks. The black soil occurs in Arakonam, Wallajah, Arcot and Tirupathur Taluks. The black type loam soil is found mostly in Arakonam and Gudiyatham taluks in larger areas than in other taluks while red loam soil is found in all the taluks.

Source: https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

(Ref: Directorate of Census Operations Tamil Nadu, "District Census Handbook 2011, Vellore District", Series-34, Part XII-A)

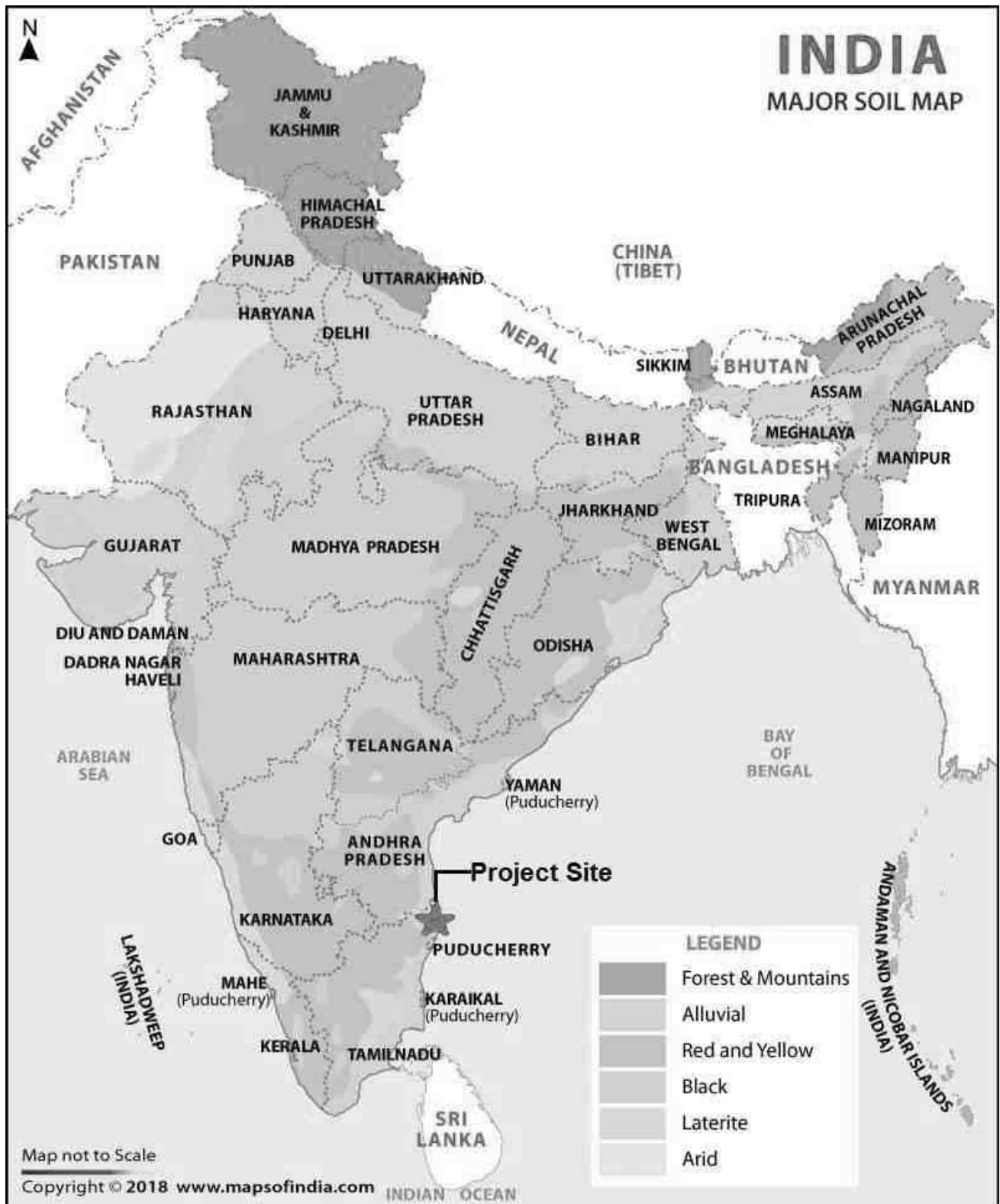


Figure 3-18 Soil map of India

3.4.11 Natural Hazards in PIA District

Tamil Nadu is multi hazard prone and faces the brunt of the Cyclonic storms during the Northeast Monsoon periods. In addition, Tamil Nadu also faces spells of heavy downpours and cloud bursts resulting in damages due to floods. Natural Hazard map of India is given in **Figure 3-19**.

Source: <https://ndma.gov.in/sites/default/files/PDF/Reports/Study-Report-Gaja-Cyclone-2018.pdf>

(Ref: Government of India, ministry of home affairs, National Disaster Management Authority)

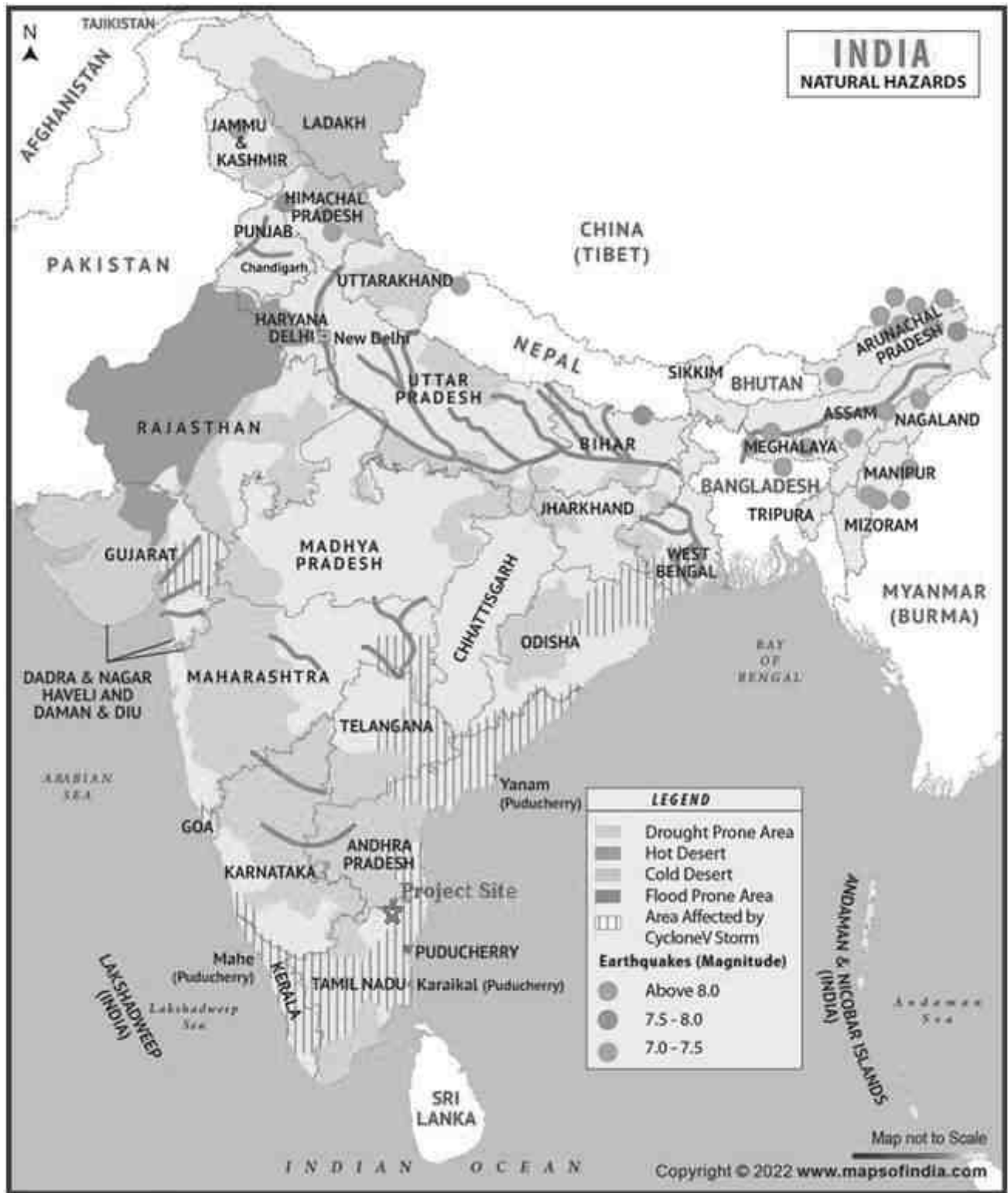


Figure 3-19 Natural Hazards Map of India

3.5 Establishment of Baseline for valued environmental components

3.5.1 Air Environment

Baseline ambient air quality assessment gives the status in the vicinity of site and is an indispensable part of environmental impact assessment studies. Significant changes, in predominant winds and weather conditions are observed in winter, summer and post-monsoon seasons apart from the local topographic influences. The baseline status of air environment in the study area is assessed through a systematic air quality surveillance programme

3.5.2 Meteorological Conditions

The regional air quality is influenced by the meteorology of that region. The principal weather parameters that influence the concentration of the air pollutants in the surroundings are wind speed, wind direction and temperature. The meteorological data is useful for proper interpretation of the baseline data.

3.5.3 Meteorological Data Collection

Available secondary data pertaining to the meteorological parameters was obtained from the IMD Climatological tables. In addition, baseline meteorological data was generated during the study period (**March 2023 to May 2023**). The methodology adopted for monitoring surface observations is as per the standard norms laid down by Bureau of Indian Standards (BIS) i.e. IS:8829 and Indian Meteorological Department (IMD).

3.5.4 General Meteorological Scenario based on IMD Data

The nearest Indian Meteorological Department (IMD) station located to project site is Vellore. The Climatological data for Vellore (12°55' N and 79° 09' E), published by the IMD, based on daily observations at 08:30 and 17:30 hour IST for a 30-year period, is presented in the following sections on the meteorological conditions of the region. The monthly variations of the relevant meteorological parameters are reproduced in Table 3-5

Table 3-4 Climatological Summary– Velloer (1991-2020)

Month	Temp (°C)		Rainfall		Relative Humidity (%)		Vapour Pressure hPa		Mean Wind Speed (Kmph)	Predominant Wind Directions (From)*	
	Daily Max.	Daily Min.	Total (mm)	No. of days	08:30	17:30	08:30	17:30		08:30	17:30
Jan	29.9	18	6.8	0.6	88	56	22.1	21.4	3.1	NE	NE
Feb	32.8	19.1	5.5	0.4	84	49	23	21.9	3.6	NE	NE
Mar	36.2	21.8	11.4	0.6	80	43	25.8	22.7	3.3	SW,W	E
Apr	38.3	24.8	30.5	1.7	74	43	29.3	24.8	4	SW	SE
May	39.2	26	63.8	4.4	67	48	28.7	26.6	3.9	SW	SW
Jun	36.7	25.5	89.9	5	67	51	27.2	26.7	4.9	SW	SW
Jul	35.2	24.9	104.9	5.9	70	55	26.8	27.1	4.8	SW	SW
Aug	34.4	24.3	144.9	8	75	60	27.4	28.3	4.1	W	SW
Sep	33.9	23.8	183.8	8.7	78	65	28	28.9	3.2	SW	SW
Oct	32.3	22.8	167.4	9.2	83	71	28.1	28.3	2.2	SW	NE
Nov	29.9	20.9	165.4	7.9	87	73	26.1	26.3	2.2	NE	NE
Dec	28.8	18.6	75.8	3.6	88	67	23.2	23.3	2.6	NE	NE
Max.	39.2	26	183.8	9.2	88	73	28.7	28.9	4.9	Annual Wind Predominant direction is & NORTH EAST	
Min.	28.8	18	5.5	0.4	67	43	22.1	21.4	2.2		
Annual Avg/Total.	33.9	22.5	1050.1	56.0	79	57	26.3	25.5	3.5		

As per the above IMD climatological Data given in **Table 3-5**, the observations drawn are as follows

- Daily maximum temperature is **39.2°C** and the daily minimum temperature is **18°C** were recorded in the months of **May** and **January** respectively.
- Maximum and minimum relative humidity of **88%** and **43%** were recorded in the months of **January, December** and **March, April** respectively.
- Maximum and minimum rainfall of **183.8 mm** and **5.5 mm** was recorded in the months of **September** and **February** respectively. Annual total rainfall recorded in the region was **1050.1 mm**.

- Maximum and minimum mean wind is **4.9 kmph** and **2.2 kmph** was recorded in the months of **June** and **October,November** respectively. Annual Wind predominant pattern is from **North East**.

3.5.5 Meteorological data during Study Period

The meteorological scenario in and around the project site is an essential requirement during study period for proper interpretation of baseline air quality status. Meteorological data was collected during the study period **March 2023 to May 2023** and is presented in **Table 3-5**. The wind rose for the study period is given as **Figure 3-20**.

Table 3-5 Meteorology Data for the Study Period (March 2023 to May 2023)

S. No	Parameter	Observation
1	Temperature	Max. Temperature: 41°C Min. Temperature: 23°C Avg. Temperature: 30.63°C
2	Average Relative Humidity	74.71%
3	Average Wind Speed	3.43m/s
4	Predominant Wind Direction	S

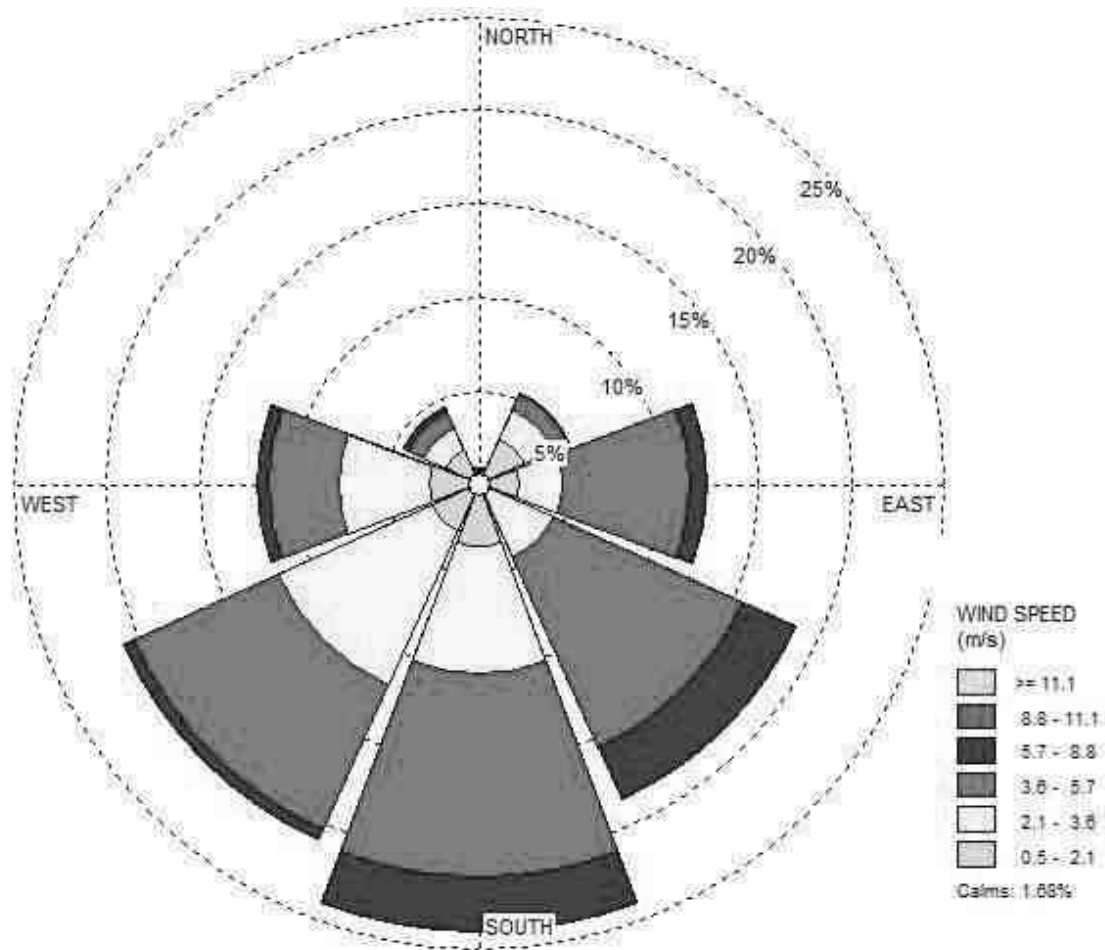


Figure 3-20 Wind Rose during March 2023 to May 2023

3.5.6 Atmospheric Inversion

Atmospheric inversion level at the project site was monitored; the results observed at the site during the study period are as follows

- Average atmospheric temperature: 30.63°C
- Average Relative humidity: 74.71%
- Average Wind speed: 3.43m/s

The daily inversion level calculated based on the average temperature and average wind speed at the project site and the maximum inversion height is derived by the graph plotted based on the average temperature and average wind speed. The daily inversion level at the project site varies from 50 to 4000 m during 6 AM to 5 PM, the maximum recorded at 4000 m during May 2023. This is shown in the following **Figure 3-21**.

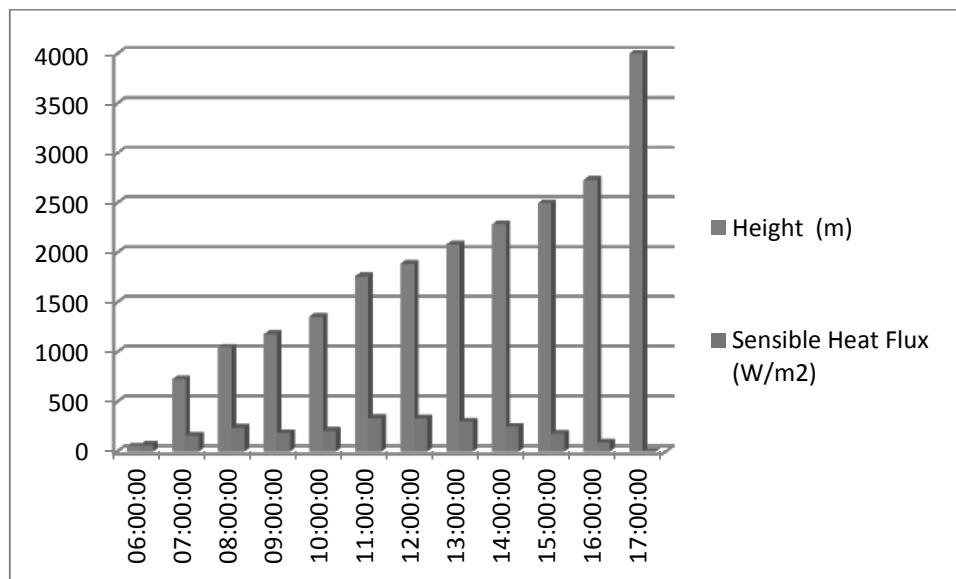


Figure 3-21 Atmospheric inversion level at the project site

3.6 Ambient Air Quality

The selection criteria for monitoring locations are based on the following:

- Topography/Terrain
- Meteorological conditions
- Residential and sensitive areas within the study area
- Representatives of regional background air quality/pollution levels and
- Representation of likely impacted areas

3.6.1 Ambient Air Quality Monitoring Stations

To evaluate the baseline air quality of the study area, Eight (08) monitoring locations have been identified as per annual wind predominance of Vellorei from IMD data (1991-2020). The wind predominance during study period (March 2023 to May 2023 is from North East). AAQ monitoring locations are selected based on Annual wind predominance, map showing the AAQ monitoring locations is given in **Figure 3-22** and the details of the locations are given in **Table 3-7**.

Table 3-6 Details of Ambient Air Quality Monitoring Locations

Station Code	Location	Type of Wind	Distance (~km)	Azimuth Directions
AAQ1	Near Project Site	-	0.07	S
AAQ2	Madandakuppam	u/w	4.06	NE
AAQ3	Vallimalai	c/w	3.92	E
AAQ4	Veppalai	c/w	7.16	SE
AAQ5	Magimandalam	c/w	1.29	S

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Station Code	Location	Type of Wind	Distance (~km)	Azimuth Directions
AAQ6	Marakalakuppam	d/w	3.55	SW
AAQ7	Chintagunturu	d/w	7.45	SW
AAQ8	Ramapuram	c/w	2.20	NW

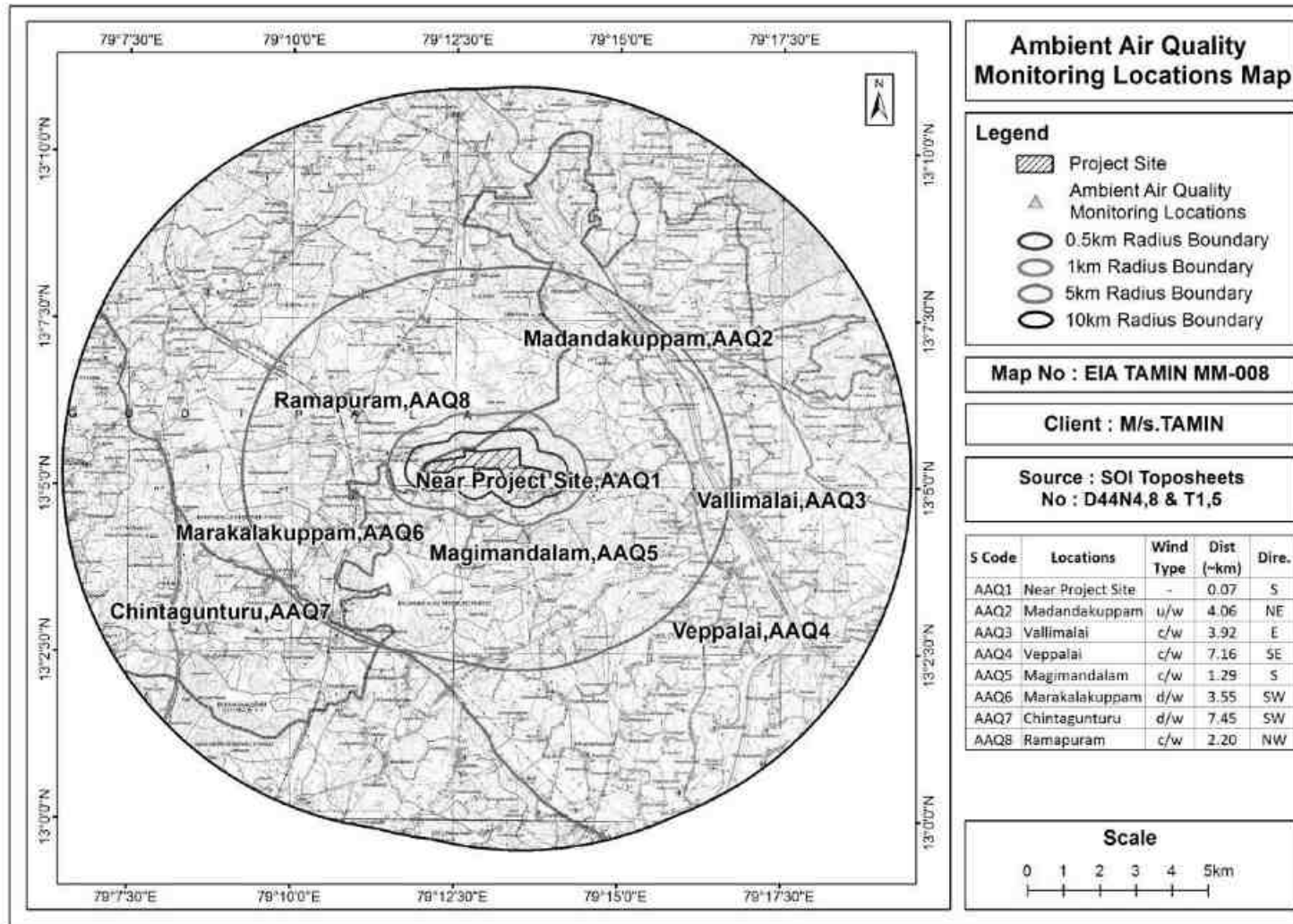


Figure 3-22 Map showing the Ambient Air Quality monitoring locations

3.6.2 Ambient Air Quality Monitoring Techniques and Frequency

Ambient air quality was monitored twice in a week for One (01) season (shall cover 12 weeks), i.e. during (March 2023 to May 2023). PM₁₀, PM_{2.5}, SO₂, NO_x, CO, Pb, O₃, NH₃, C₆H₆, C₂₀H₁₂, As, Ni, TVOC, and Methane Hydrocarbon and Non-Methane Hydrocarbon was monitored. Sampling was carried out as per Central Pollution Control Board (CPCB) monitoring guidelines at each location. Analytical methods used for analysis of parameters are given in Table 3-8.

Table 3-7 Analytical Methods for Analysis of Ambient Air Quality Parameters (NAAQ)

S. No	Parameters	Analytical method	NAAQ standards: 2009		Sampling Time
1	Sulphur Dioxide (SO ₂), µg/m ³	IS 11255: (Part 2) / USEPA Method 6	50 (Annual)	80(24 Hours)	24 Hours
2	Nitrogen Dioxide (NO ₂), µg/m ³	IS: 5182 (Part - 6): 2006 / CPCB guidelines Volume1	40 (Annual)	80 (24 Hours)	24 Hours
3	Particulate Matter (PM _{2.5}), µg/m ³	In house method (Gravimetric method) based on CPCB guidelines Volume1	40 (Annual)	60 (24 hours)	24 Hours
4	Particulate Matter (PM ₁₀), µg/m ³	IS:5182 (Part- 23): 2006 CPCB guidelines Volume1	60 (Annual)	100 (24 hours)	24 Hours
5	CO, mg/m ³	IS:5182(Part-10):1999 (Reaff:2006) CPCB guidelines Volume1	2 (8 hours)	4 (1hour)	8 Hours
6	Pb, µg/m ³	IS:5182(Part-22):2004 (Reaff:2006) CPCB guidelines Volume1	0.5(Annual)	1(24 hours)	24 Hours
7	O ₃ , µg/m ³	In house method (Spectrophotometric method) based on CPCB guidelines Volume1	100(8hours)	180 (1hour)	8 Hours
8	NH ₃ , µg/m ³	In house method (Spectrophotometric method) based on CPCB guidelines Volume1	100(Annual)	400(24 hours)	8 Hours
9	Benzene, µg/m ³	GC FID/ GC MS based on IS 5182 (Part:12)/ CPCB guidelines Volume1	5 (Annual)	5 (Annual)	24 Hours
10	Benzo (a) pyrene, ng/m ³	In House Validated method By HPCL , UV & GC MS Based on IS:5182(Part-12) CPCB guidelines Volume1	1 (Annual)	1 (Annual)	24 Hours
11	Arsenic, ng/m ³	In house method (AAS method) Based on CPCB guidelines Volume 1	6 (Annual)	6 (Annual)	24 Hours
12	Nickel, ng/ m ³	In house method (AAS method) Based on CPCB guidelines Volume 1	20(Annual)	20 (Annual)	24 Hours

3.6.2.1 Results and Discussions

The variations of the pollutants Particulate matter <10 micron size (PM₁₀), Particulate matter <2.5 micron size (PM_{2.5}), Sulphur Dioxide (SO₂), Nitrogen Dioxide (NO₂), Carbon Monoxide (CO), Lead (Pb), Ozone HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

(O₃), Benzene (C₆H₆), Benzo (a) pyrene (C₂₀H₁₂), Arsenic (As), Nickel (Ni), Ammonia (NH₃) are compared with National Ambient Air Quality Standards (NAAQS), MoEF&CC Notification, November 2009. Ambient Air Quality Monitoring Data (**March 2023 to May 2023**) for the study area is given in **Table 3-9** and trends of measured ambient concentration in the study area were graphically represented in **Figure 3-23**.

Table 3-8 Summary of the average baseline concentrations of pollutants

Parameters	Conc.	NAAQ Standards	Locations							
			Near Project Site	Madandakuppam	Vallimalai	Veppalai	Magimandalam	Marakalakkuppam	Chintagunturu	Ramapuram
			AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
PM ₁₀ Conc. (µg/m ³)	Min.	100 (24 Hours)	43.09	48.76	51.77	49.93	53.27	47.34	50.94	46.18
	Max.		61.40	69.50	73.78	71.16	75.92	67.47	72.59	65.81
	Avg.		51.67	58.48	62.08	59.88	63.88	56.78	61.08	55.37
	98th 'tile		61.05	69.09	73.35	70.75	75.48	67.08	72.17	65.43
PM _{2.5} Conc. (µg/m ³)	Min.	60 (24 Hours)	25.85	27.31	30.39	29.96	31.75	28.41	29.47	27.65
	Max.		36.84	38.92	43.31	42.70	45.25	40.48	42.00	39.41
	Avg.		31.00	32.75	36.44	35.93	38.08	34.07	35.34	33.16
	98th 'tile		36.63	38.69	43.06	42.45	44.99	40.25	41.76	39.18
SO ₂ Conc. (µg/m ³)	Min.	80 (24 Hours)	6.69	7.11	7.64	9.42	7.34	7.22	7.33	10.75
	Max.		9.53	10.14	10.89	13.42	10.46	10.29	10.45	15.32
	Avg.		8.03	8.54	9.17	11.30	8.81	8.67	8.80	12.89
	98th 'tile		9.48	10.08	10.83	13.35	10.40	10.23	10.39	15.23
NO ₂ Conc. (µg/m ³)	Min.	80 (24 Hours)	13.12	14.23	15.28	18.84	14.68	14.45	14.66	21.49
	Max.		18.70	20.28	21.78	26.85	20.92	20.59	20.90	30.63
	Avg.,		15.74	17.07	18.33	22.59	17.61	17.33	17.59	25.78
	98th 'tile		18.59	20.16	21.65	26.69	20.80	20.47	20.78	30.45
Lead (Pb) (µg/m ³)	Avg.	1 (24 hour)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)
Carbon monoxide (CO) (mg/m ³)	Avg.	4 (1hour)	0.32	0.24	0.26	0.23	0.24	0.28	0.22	0.3
Ozone O ₃ (µg/m ³)	Avg.	180 (1hour)	BLQ(LO Q10)	BLQ(LO Q10)	BLQ(LOQ 10)	BLQ(LOQ10)	BLQ(LOQ10)	BLQ(LOQ10)	BLQ(LOQ10)	BLQ(LOQ 10)

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Parameters	Conc.	NAAQ Standards	Locations							
			Near Project Site	Madandakuppam	Vallimalai	Veppalai	Magimandalam	Marakalakkuppam	Chintagunturu	Ramapuram
			AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Benzene (C₆H₆) (µg/m³)AQ	Avg.	5(Annual)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)
Benzo (a) Pyrene (C₂₀H₁₂ (a))	Avg.	1(Annual)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)
Arsenic (As) ng/m³	Avg.	6 (Annual)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)
Nickel as Ni (ng/m³)	Avg.	20 (Annual)	BLQ(LOQ 10)	BLQ(LOQ 10)	BLQ(LOQ 10)	BLQ(LOQ 10)	BLQ(LOQ 10)	BLQ(LOQ 10)	BLQ(LOQ 10)	BLQ(LOQ 10)
Ammonia (NH₃) (µg/m³)	Avg.	400 (24 hour)	BLQ(LOQ 5)	BLQ(LOQ 5)	BLQ(LOQ 5)	BLQ(LOQ 5)	BLQ(LOQ 5)	BLQ(LOQ 5)	BLQ(LOQ 5)	BLQ(LOQ 5)
Free Silica(µg/m³)	Avg.	-	0.57	BDL (LOQ 0.4)	BDL (LOQ 0.4)	BDL (LOQ 0.4)	BDL (LOQ 0.4)	BDL (LOQ 0.4)	BDL (LOQ 0.4)	BDL (LOQ 0.4)

Note: BDL (Below detection limit), DL (Detection limit), BLQ (Below Limit Of Quantification), LOQ (Limit of Quantification)

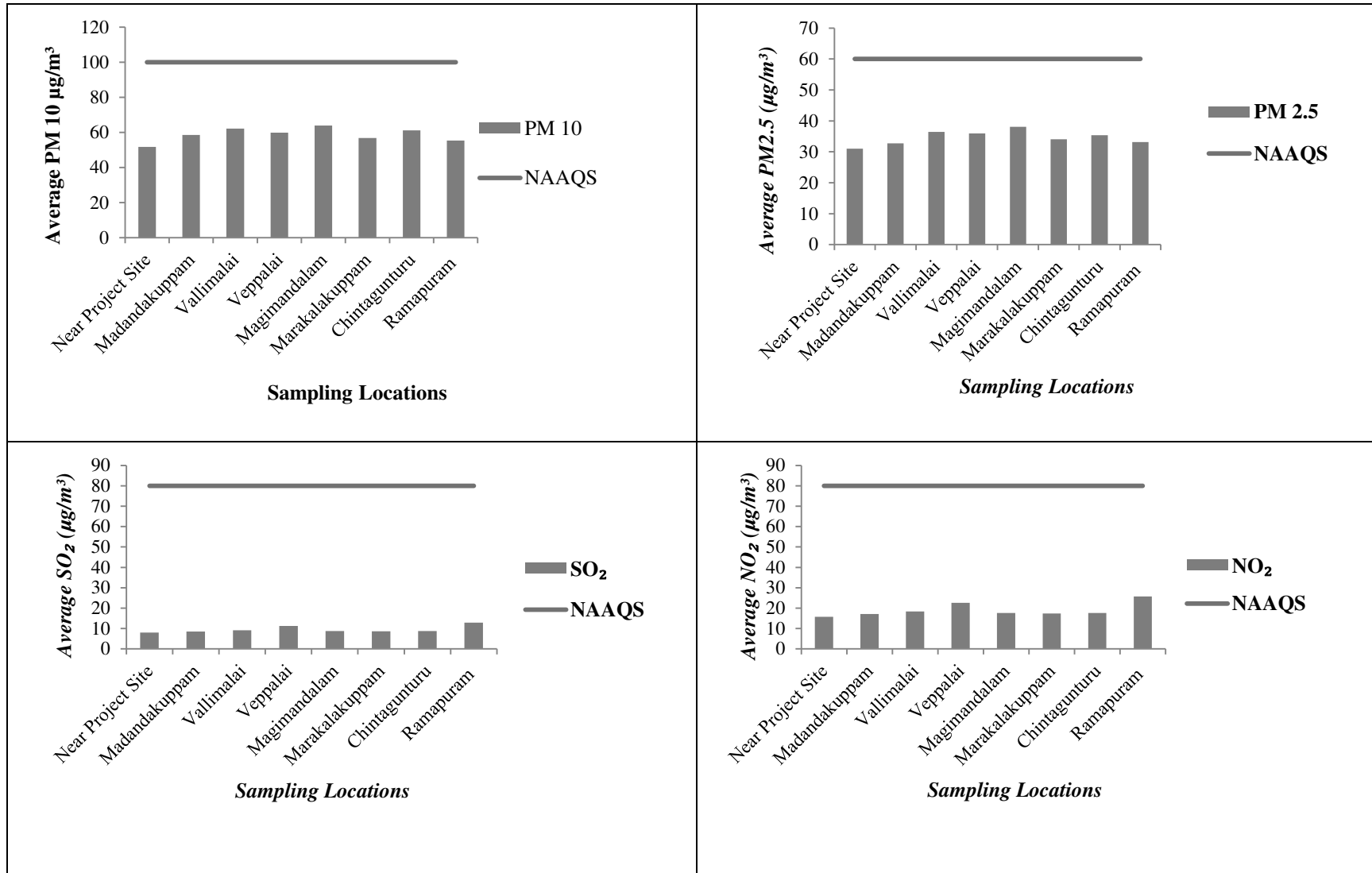


Figure 3-23 Trends of Measured Ambient Concentrations in the Study Area

3.6.2.2 Observations

The ambient air quality has been monitored at 8 locations as per NAAQS, 2009 within the study area. The results obtained are summarised as below:

- The average baseline levels of PM₁₀ vary from **51.67 µg/m³ to 63.88µg/m³**.
- The average baseline levels of PM_{2.5} vary from **31µg/m³ to 38.08µg/m³**.
- The average baseline levels of SO₂ vary from **8.03µg/m³ to 12.89µg/m³**.
- The average baseline levels of NO₂ vary from **15.74µg/m³ to 25.78 µg/m³**.

3.7 Noise Environment

The prevailing ambient noise level at a particular location is nothing but the resultant (total) of all kinds of noise sources existing at various distances around that location. The ambient noise level at a location varies continuously depending on the type of surrounding activities.

Ambient noise levels have been established by monitoring noise levels at Eight (08) locations in and around 10Km distance from project area during the study period using precision noise level meter. The noise monitoring locations in the study area were selected after giving due consideration to the various land use categories. The land use categories include commercial, residential, rural and sensitive areas. Noise levels were recorded on an hourly basis for one complete day at each location using pre- calibrated noise levels. Map showing noise monitoring locations is **Figure 3-24**.

3.7.1 Results and Discussions

Based on the recorded hourly noise levels at each monitoring location, the day equivalent (Ld) and night equivalent (Ln) were calculated;

- Ld: Average noise levels between 6:00 hours to 22.00 hours
- Ln: Average noise levels between 22:00 hours to 6.00 hours.

The day and night equivalent noise levels given in **Table 3-10**.

Table 3-9 Day and Night Equivalent Noise Levels

S. No	Location	Location Code	Distance (~km) from Project boundary	Azimuth Direction	Noise level in dB(A) Leq		CPCB Standard		Environmental Setting
					Day	Night	Lday (Ld)	LNight (Ln)	
1	Project Site	N1	Within Site		68.5	53.5	75	70	Industrial
2	Madanakuppam	N2	4.06	NE	46.3	40.6	55	45	Residential
3	Vallimalai	N4	3.92	E	52.4	42.8	55	45	Residential
4	Veppalai	N7	7.16	SE	51.6	41.1	55	45	Residential
5	Magimandalam	N6	1.29	S	48.3	39.9	55	45	Residential
6	Marakalakuppam	N3	3.55	SW	56.5	43.4	55	45	Residential
7	Chintagunturu	N5	7.45	SW	46.1	40.2	55	45	Residential
8	Ramapuram	N8	2.20	NW	49.7	43.2	55	45	Residential

3.7.1.1 Observations

It is observed that the day equivalent and night equivalent noise levels at all locations are within prescribed CPCB standards

- In Industrial area day time noise levels varied from **68.5 dB (A) to 53.5 dB (A)** and night time which is within prescribed limit by CPCB (75 dB(A) Day time & 70 dB(A) Night time).
- In Residential area day time noise levels varied from **46.1dB (A) to 56.5 dB (A)** and night time noise levels varied from 39.9 dB(A) to 43.5 across the sampling stations. The field observations during the study period indicate that the ambient noise levels in some residential area is within the prescribed limit by CPCB (55 dB(A) Day time & 45 dB(A) Night time).

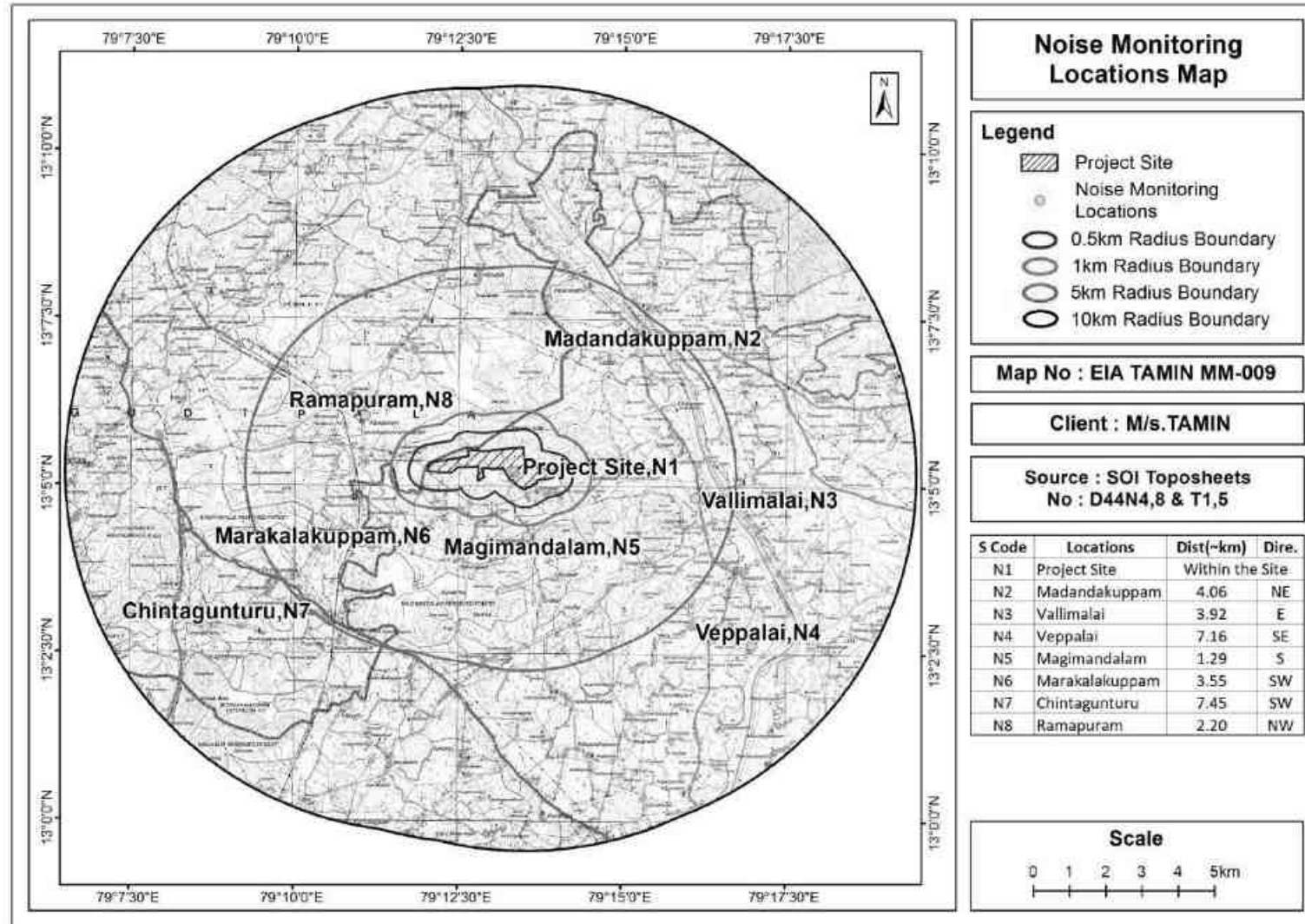


Figure 3-24 Map showing the noise monitoring locations

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3.8 Water Environment

3.8.1 Surface Water Resources

Palar River is the major river draining the District, flowing towards east for a distance of about 295 km. It runs parallel to the hill ranges of the Eastern Ghats for a major part of its course. It has a vast flood plain in the lower reaches, but is dry for major part of the year. Ponnaiyar, Cheyyar, Pambar and Malattar are some of the major tributaries of Palar draining the District. Almost all the streams are ephemeral in nature and are mostly structurally controlled.

3.8.2 Surface Water Quality Assessment

Water quality monitoring and assessment can be used to determine ambient water quality, the extent and causes of a water quality problem, or to measure the effectiveness of best management practices being implemented in water system. Monitoring helps to determine the trends in the quality of the aquatic environment and the impact due to the release of contaminants, other anthropogenic activities, and/or by waste treatment operations (impact monitoring). To establish the baseline status of water environment, the representative sampling locations for surface water within a radial distance of 10Km from project site have been selected as per CPCB guidelines of Water Quality Monitoring through an adequate survey of the project area. Test methods used for the analysis of water quality parameters is given in **Table 3-10**. Water sampling and map of sampling location are given in **Table 3-11**. And **Figure 3-25**. Physicochemical Parameters of Surface water samples from the study area given in **Table 3-12**.

Table 3-10 Test methods used for the analysis of water quality parameters

S. No	Parameter Measured	Test Method
1.	Colour	IS:3025 (Part- 4) 1983
2.	Turbidity	IS 3025(Part - 10):1984
3.	pH	IS:3025 (Part - 11): 1983
4.	Conductivity	IS:3025 (Part - 14): 1983
5.	Total Dissolved Solids	IS:3025:1(Part - 16) 1984
6.	Total Suspended Solids	IS 3025 (Part - 17) 1984
7.	Alkalinity as CaCO ₃	IS:3025,1 (Part - 23) 1986
8.	Total Hardness as CaCo ₃	IS:3025 (Part - 21) 1983
9.	Sodium	IS:3025,5(Part - 45) 1993
10.	Potassium	IS:3025,5(Part - 45) 1993
11.	Calcium as Ca	IS 3025 (Part - 40):1991
12.	Magnesium as Mg	IS 3025 (Part - 46) 1994
13.	Chloride	IS 3025 (Part - 32):1988
14.	Sulphate SO ₄	IS 3025(Part - 24):1986
15.	Nitrate as NO ₃	ASTM(Part - 31)1978
16.	Phosphate	IS 3025 (Pt 45) 1993

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

S. No	Parameter Measured	Test Method
17.	Fluorides as F	IS 3025 (Part - 60):2008
18.	Cyanide	IS 3025 (Part-27):1986
19.	Arsenic	IS 3025:(Part-37):1988
20.	Boron	IS:3025 (Part - 57):2003
21.	Cadmium	IS 3025 (Part - 41)1991
22.	Chromium, Total	IS:3025 (Part - 52) 2003
23.	Copper	IS:3025 (Part - 42)1992
24.	Iron	IS 3025 (Part - 53):2003
25.	Lead	IS:3025 (Part - 47) 1994
26.	Manganese	IS 3025:(Part - 59):2006
27.	Mercury	IS 3025 (Part48):1994 RA 1999
28.	Nickel	IS 3025:(Part-54):2003
29.	Selenium	IS 3025 Part (56)2003
30.	Zinc	IS:3025 (Part - 49) 1994
31.	Dissolved Oxygen	IS:3025 (Part - 38)1989
32.	BOD	5210B APHA22nd Edn 2012
33.	COD	IS:3025 (Part-58)-2006
34.	Total Coliform	IS 1622: 1981

Table 3-11 Details of Surface water sampling locations

S.No	Location	Location Code	Distance in Km	Direction
1	Eri	SW1	Within the site	
2.	Lake near Naragallu	SW2	4.47	N
3	Ponnai R u/s	SW3	8.21	N
4	Ponnai East Bank Main Canal	SW4	4.77	E
5	Ponnai R d/s	SW5	7.66	SE
6	Magimandalam Lake	SW6	0.92	S
7	Kandipedu Lake	SW7	7.73	S
8	Gudipala Lake	SW8	9.10	W

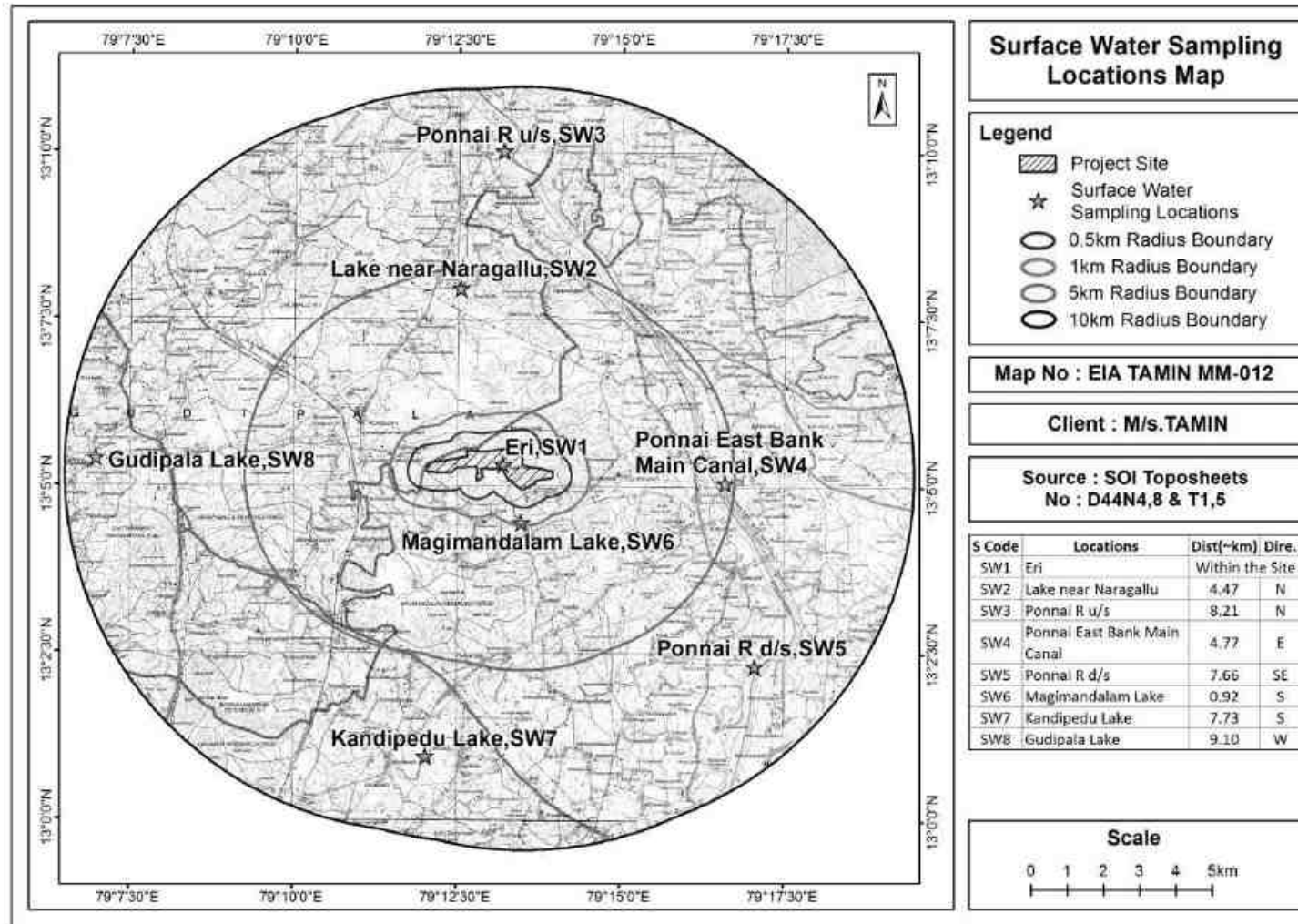


Figure 3-25 Map showing the surface water monitoring locations

Table 3-12 Physicochemical Parameters of Surface water samples from the study area

SL NO	Parameter	Unit	Surface water standards (IS 2296 Class-A)	Eri	Lake near Naragallu	Ponnai R u/s	Ponnai East Bank Main Canal	Ponnai R d/s	Magiman dalam Lake	Kandiped u Lake	Gudipala Lake
				SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
1.	Turbidity	NTU	1	7.0	10.0	7.0	14.3	20.9	10.9	5.7	7.4
2.	pH (at 25°C)	--	6.5-8.5	7.31	6.74	7.25	7.41	6.98	7.52	7.71	7.03
3.	Electrical Conductivity	µS/cm	-	416	526	323	338	331	409	569	341
4.	Total Dissolved Solids	mg/l	500	219	277	170	178	174	215	300	180
5.	Total Suspended Solids	mg/l	-	16	23	16	33	48	25	13	17
6.	Total Alkalinity as CaCO ₃	mg/l	-	124	113	97	98	123	98	142	131
7.	Total Hardness as CaCO ₃	mg/l	300	152	162	112	118	157	129	172	147
8.	Sodium as Na	mg/l	-	21	39	16	17	46	27	40	9
9.	Potassium as K	mg/l	-	2	5	2	2	5	3	5	1
10.	Calcium as Ca	mg/l	-	35.33	37.66	26.04	27.43	36.50	29.99	39.98	34.17
11.	Magnesium as Mg	mg/l	-	15.5	16.5	11.4	12.0	16.0	13.2	17.6	15.0
12.	Chloride as Cl	mg/l	250	35.21	64.91	26.13	28.45	77.42	44.53	65.87	14.85
13.	Sulphate as SO ₄	mg/l	400	13.89	25.61	10.31	11.23	30.55	17.57	25.99	5.86
14.	Nitrate as NO ₃	mg/l	20	1.75	1.98	1.24	1.85	2.31	2.14	1.84	2.28
15.	Phosphate as PO ₄	mg/l	-	0.48	0.27	0.32	0.26	0.38	0.46	0.32	0.41
16.	Fluorides as F	mg/l	1.5	0.32	0.42	0.57	0.47	0.34	0.24	0.36	0.21
17.	Cyanide	mg/l	0.05	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
18.	Arsenic	mg/l	0.05	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)
19.	Boron as B	mg/l	-	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
20.	Cadmium as Cd	mg/l	0.01	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)

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SL NO	Parameter	Unit	Surface water standards (IS 2296 Class-A)	Eri	Lake near Naragallu	Ponnai R u/s	Ponnai East Bank Main Canal	Ponnai R d/s	Magiman dalam Lake	Kandipedu Lake	Gudipala Lake
				SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
21.	Chromium, Total	mg/l	0.05	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
22.	Copper as Cu	mg/l	1.5	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
23.	Total Iron	mg/l	0.3	0.25	3.1	1.61	2.61	9.57	10.57	11.57	4.26
24.	Lead as Pb	mg/l	0.1	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
25.	Manganese as Mn	mg/l	0.5	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)
26.	Mercury	mg/l	0.001	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)
27.	Nickel as Ni	mg/l	-	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
28.	Selenium as Se	mg/l	0.01	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
29.	Zinc	mg/l	15	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
30.	Dissolved Oxygen	mg/l	6	6.2	6.1	6.1	5.9	5.6	6.1	6.2	6.3
31.	Chemical Oxygen Demand as O ₂	mg/l	-	16	16	16	24	30	20	16	16
32.	BOD, 3 days @ 27°C as O ₂	mg/l	2	2	2	2	3	4	3	2	2

Note: BLQ – Below Limit of Quantification; LOQ – Limit Of Quantification

3.8.2.1 Results and Discussions

Surface water sample results are discussed below:

- Water sampling results are compared with Surface water standards IS 2296:1992.
- pH in the collected surface water samples varies between **6.74 to 7.71** which is within the limit of IS 2296:1992.
- The Electrical Conductivity (EC) of the collected surface water ranges from 323 $\mu\text{S}/\text{cm}$ to 569 $\mu\text{S}/\text{cm}$.
- The chloride content in the collected surface water ranges from 14.85 mg/l to 77.42 mg/l.
- The Sulphate content in the collected surface water sample ranges from 5.86 mg/l to 30.55 mg/l.
- The Total hardness of the collected surface water sample ranges from 112 mg/l to 172 mg/l.
- The COD ranges of the surface water sample ranges from 16 mg/l to 60 mg/l. is observed that some of the samples are exceeding the limit.
- The BOD ranges of the surface water sample ranges from 2 mg/l to 4 mg/l. It is observed that some of the samples are slightly exceeding the limit.

Surface water standards (IS 2296:1992) given in **Table 3-13**.

Table 3-13 Surface water Standards (IS 2296:1992)

S.No	Parameters	Unit	A	B	C	D	E
1	Turbidity	NTU	---	---	---	---	---
2	pH	--	8.5	8.5	8.5	8.5	8.5
3	Conductivity	$\mu\text{S}/\text{cm}$	---	---	---	1000	2250
4	Total Dissolved Solids	mg/l	500	---	1500	---	2100
5	Alkalinity as CaCO_3	mg/l	---	---	---	---	---
6	Total Hardness as CaCO_3	mg/l	300	---	---	---	---
7	Calcium as Ca	mg/l	80.10	---	---	---	---
8	Magnesium as Mg.	mg/l	24.28	---	---	---	---
9	Sodium Na	mg/l	---	---	---	---	---
10	Potassium	mg/l	---	---	---	---	---
11	Chloride as Cl	mg/l	250	---	600	---	600
12	Sulphate as SO_4	mg/l	400	---	400	---	1000
13	Phosphate	mg/l	---	---	---	---	---
14	Nitrate as NO_3	mg/l	20	---	50	---	---
15	Fluorides as F	mg/l	1.5	1.5	1.5	---	---
16	Cyanide	mg/l	0.05	0.05	0.05	---	---
17	Arsenic	mg/l	0.05	0.2	0.2	---	---
18	Cadmium	mg/l	0.01	---	0.01	---	---
19	Chromium, Total	mg/l	0.05	0.05	0.05	---	---

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S.No	Parameters	Unit	A	B	C	D	E
20	Copper	mg/l	1.5	---	1.5	---	---
21	Iron	mg/l	0.3	---	50	---	---
22	Lead	mg/l	0.1	---	0.1	---	---
23	Zinc	mg/l	15	---	15	---	---
24	Manganese	mg/l	0.5	---	---	---	---
25	Selenium	mg/l	0.01	---	0.05	---	---
26	Mercury	mg/l	0.001	---	---	---	---
27	Dissolved Oxygen	mg/l	6	5	4	4	---
28	COD	mg/l	---	---	---	---	---
29	BOD	mg/l	2	3	3	---	---

Class A – Drinking water without conventional treatment but after disinfection.

Class B –Water for outdoor bathing.

Class C – Drinking water with conventional treatment followed by disinfection.

Class D – Water for fish culture and wild life propagation.

Class E – Water for irrigation, industrial cooling and controlled waste disposal

3.8.3 Groundwater resources

Ground water occurs under phreatic conditions in the weathered zone and under semiconfined conditions in the fractures. The thickness of weathered zone varies from less than a metre to about 15 m in the area depending on the topography. Potential aquifer zones are also developed in these rocks by fractures persisting to depths, particularly along lineaments and their inter sections. The depth of dug wells in crystalline formations varies from 8 – 19.5 m bgl. Fracture zones have been encountered in the well down to a depth of 116 m bgl in the borehole drilled by CGWB. The thickness of alluvium along the course of Palar River ranges from 8 – 12 m.

Source: http://cgwb.gov.in/District_Profile/TamilNadu/Vellore.pdf

(Ref: District Groundwater Brochure-Vellore District-Central Ground Water Board-January 2009)

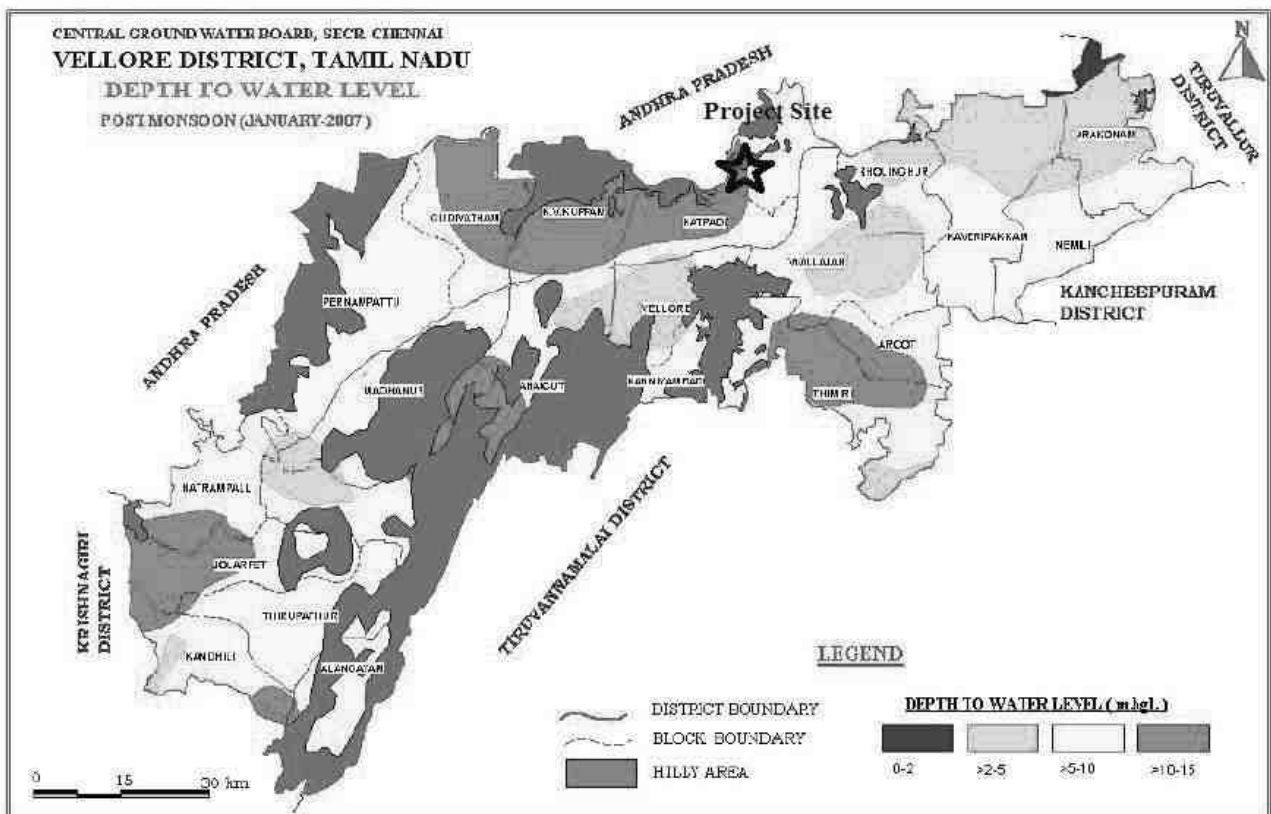
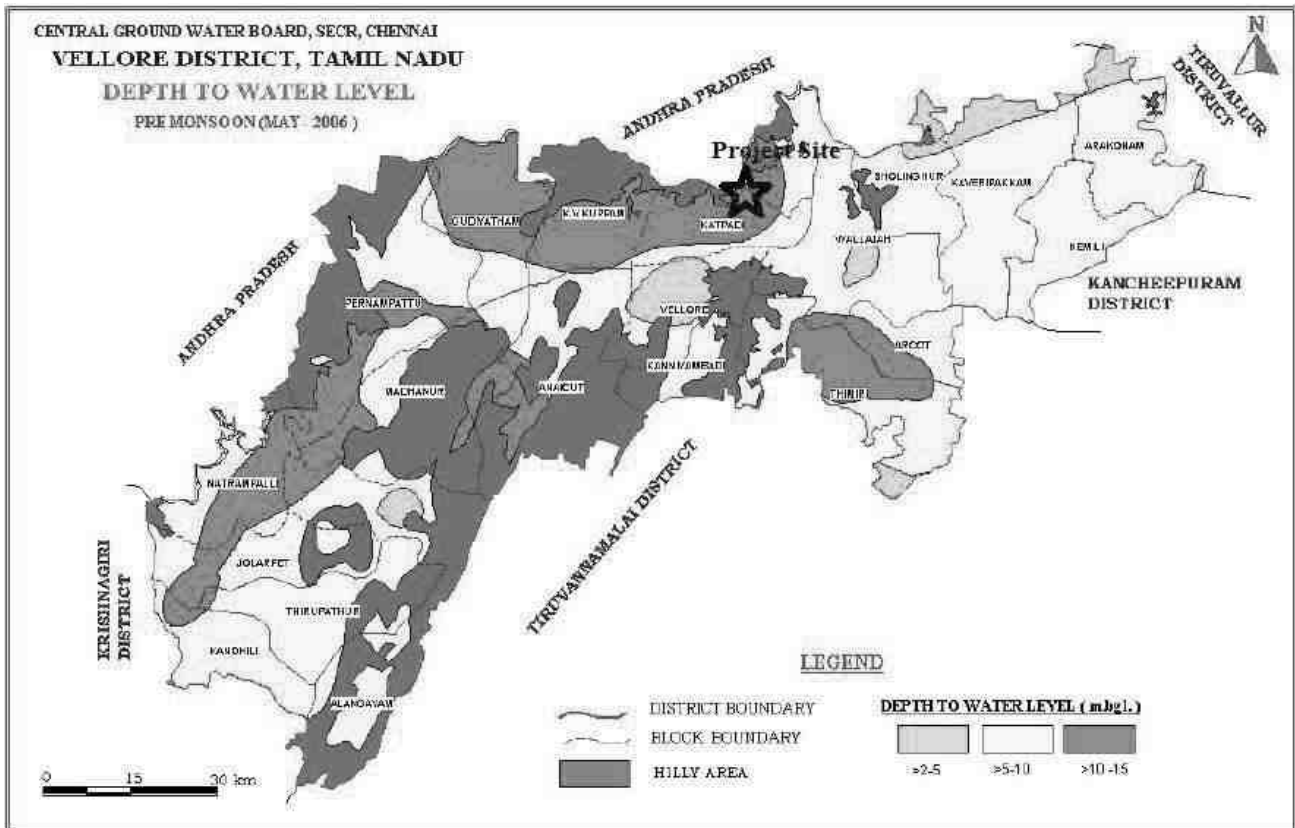


Figure 3-16 Depth to water level during Pre-Monsoon & Post Monsoon in Vellore District

3.8.3.1 Groundwater Quality

Groundwater is the principal source for domestic and drinking purposes in almost all villages near the study area. The quality of the groundwater received is influenced by pollution of soil and air, industrial and domestic waste disposal, organic components, pathogenic microorganisms, application of fertilizers and pesticides in agriculture, etc. Total Eight (08) ground water monitoring locations were identified for assessment in different villages around the project site based on the usage of sub surface water by the settlements/ villages in the study area. The groundwater results are compared with the desirable and permissible water quality standards as per IS 10500 (2012) for drinking water. Groundwater quality monitoring locations and results are given in **Table 3-15**.and **Table 3-16**. Map showing the groundwater monitoring locations are given in **Figure 3-27**.

Table 3-14 Details of Groundwater Quality Monitoring Locations

S.No	Location	Location Code	Distance in Km	Direction
1	Near Project Site	GW1	0.07	S
2	Madanakuppam	GW2	4.06	NE
3	Vallimalai	GW3	3.92	E
4	Veppalai	GW4	7.16	SE
5	Magimandalam	GW5	1.29	S
6	Marakalakuppam	GW6	3.55	SW
7	Chintagunturu	GW7	7.45	SW
8	Ramapuram	GW8	2.20	NW

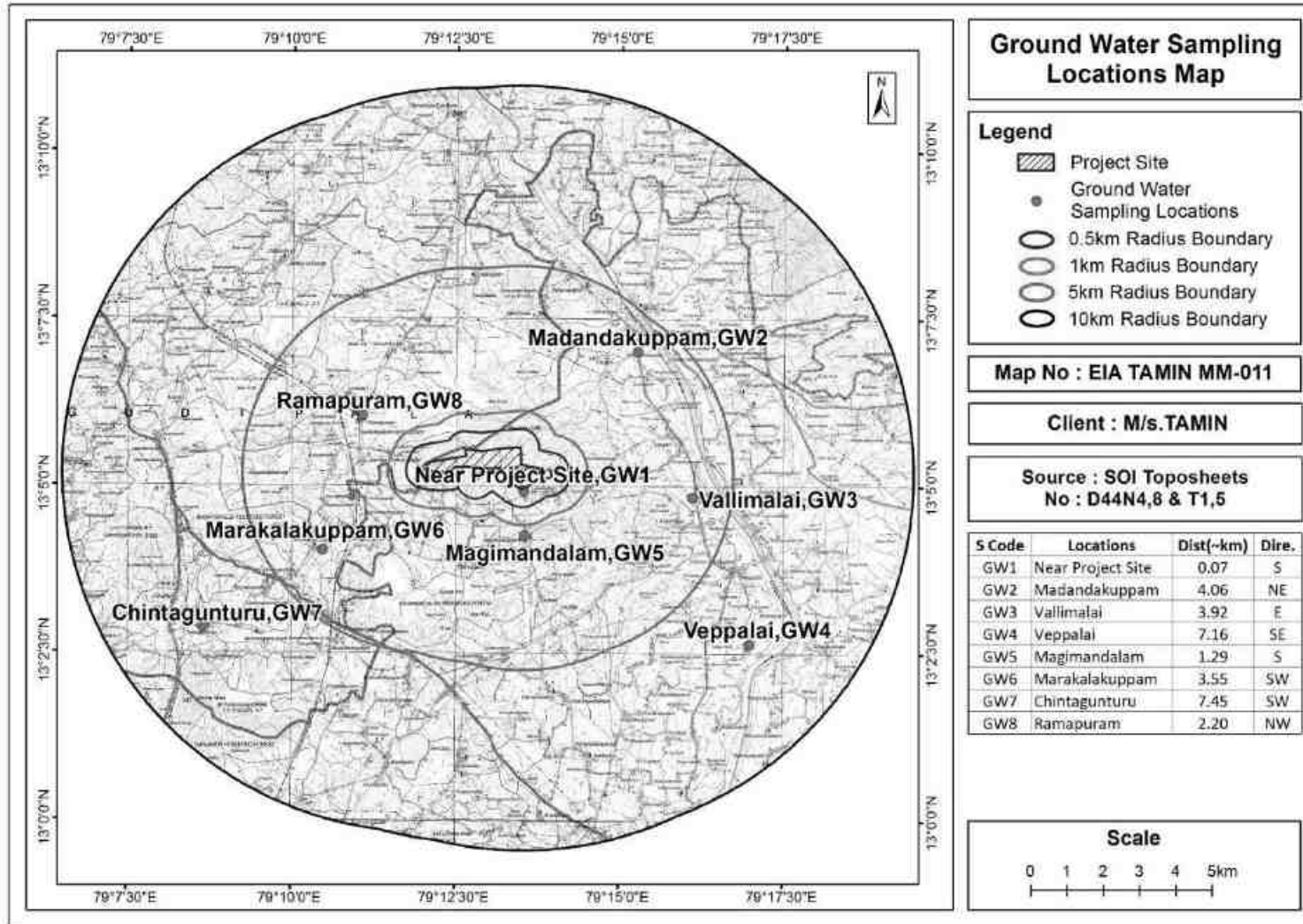


Figure 3-27 Map showing the groundwater monitoring locations

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Table 3-11 Physico chemical analysis of Ground water samples from study area

SL NO	Parameters	Unit	Drinking water Standard (IS 10500: 2012)		Near Project Site	Madanda kuppam	Vallimalai	Veppalai	Magiman dalam	Marakala kuppam	Chintagunturu	Ramapuram
			Permissible Limit	Acceptable Limit	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
1	Colour	Hazen	15	5	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)
2	Turbidity	NTU	5	1	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
3	pH	-	NR	6.5-8.5	8.02	7.93	8.24	8.14	7.54	7.83	7.53	8.12
4	Electrical Conductivity	µS/cm	-	-	1477	1574	1060	1457	1524	1236	1156	1448
5	Total Dissolve Solids	mg/l	2000	500	778	828	558	767	802	651	608	762
6	Total Suspended Solids		-	-	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)
7	Total Alkalinity as CaCO ₃	mg/l	600	200	178	187	172	214	230	254	336	180
8	Total Hardness as CaCO ₃	mg/l	600	200	342	361	258	378	387	345	398	307
9	Sodium as Na	mg/l	-	-	155	167	101	143	149	119	83	154
10	Potassium as K	mg/l	-	-	18	19	12	17	17	14	10	18
11	Calcium as Ca	mg/l	200	75	79.50	128.26	64.13	60.12	58.16	48.1	92.18	38.06
12	Magnesium as Mg	mg/l	100	30	34.9	43.74	31.59	60.75	26.73	43.74	41.31	27.9
13	Chloride	mg/l	1000	250	258.91	278.54	168.27	237.85	248.63	198.87	138.75	256.79
14	Sulphate SO ₄	mg/l	400	200	102.15	109.90	66.39	93.84	98.10	29.83	20.81	101.32
15	Nitrate as NO ₃	mg/l	NR	45	2.8	1.2	2.1	1.7	2.3	1.8	2.1	2.3
16	Phosphate as PO ₄	mg/l	-	-	BLQ(LOQ 0.02)	0.14	0.13	0.19	BLQ(LOQ 0.02)	BLQ(LOQ 0.02)	BLQ(LOQ 0.02)	BLQ(LOQ 0.02)
17	Fluorides as F	mg/l	1.5	1	0.31	0.58	0.39	0.38	0.49	0.47	0.42	0.45
18	Cyanide	mg/l	NR	0.05	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)

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SL NO	Parameters	Unit	Drinking water Standard (IS 10500: 2012)		Near Project Site	Madanda kuppam	Vallimalai	Veppalai	Magiman dalam	Marakala kuppam	Chintagunturu	Ramapuram
			Permissible Limit	Acceptable Limit	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
19	Arsenic as As	mg/l	0.05	0.01	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
20	Boron as B	mg/l	1.0	0.5	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)
21	Cadmium as Cd	mg/l	NR	0.003	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)
22	Chromium as Cr	mg/l	NR	0.05	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)
23	Copper as Cu	mg/l	1.5	0.05	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
24	Total Iron	mg/l	NR	0.3	BLQ(LOQ 0.02)	BLQ(LOQ 0.02)	BLQ(LOQ 0.02)	BLQ(LOQ 0.02)	BLQ(LOQ 0.02)	BLQ(LOQ 0.02)	BLQ(LOQ 0.02)	BLQ(LOQ 0.02)
25	Lead as Pb	mg/l	NR	0.01	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
26	Manganese as Mn	mg/l	0.3	0.1	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)
27	Mercury	mg/l	NR	0.001	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)
28	Nickel as Ni	mg/l	NR	0.02	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
29	Selenium as Se	mg/l	NR	0.01	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
30	Zinc as Zn	mg/l	15	5	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)

Note: BLQ – Below Limit of Quantification; LOQ – Limit Of Quantification; NR – No Relaxation

HECS/EIA/1(a)/TAMIN/Mahimandalam/18.01.2023/081

3.8.3.2 Results and Discussions

A summary of analytical results are presented below:

- The ground water results of the study area indicate that the pH range varies between 7.53 to 8.24. It is observed that the pH range is within the limit of IS 10500:2012.
- The Total Dissolved Solids range is varied between 558 mg/l – 828 mg/l for the ground water. It is observed that some of the samples exceed the acceptable limits, but all are well within the permissible limit of IS 10500: 2012.
- The acceptable limit of the chloride content is 250 mg/l and permissible limit is 1000 mg/l. The chloride content in the ground water for study area ranges between 139 mg/l – 279 mg/l. It is observed that Chloride content in all collected water samples are well within the permissible limit of IS 10500:2012.
- The desirable limit of the sulphate content is 200mg/l and permissible limit is 400mg/l. the sulphate content of the ground water of the study area is varied between 21 mg/l – 110 mg/l. It is observed that all the samples are meeting the acceptable limit of the IS 10500: 2012.
- The Total hardness ranges is between 258 mg/l – 398 mg/l for ground water samples. It is observed that some of the samples are exceeding the acceptable limit but all are within the permissible limit of the IS 10500: 2012.

3.9 Soil Quality

Soil quality monitoring locations & results are given in **Table 3-17** & **Table 3-18**. Map showing the soil monitoring locations are given in **Figure 3-28**.

Table 3-12 Soil & Sediment Quality Monitoring Locations

S.No	Location	Location Code	Distance in Km	Direction
1	Project Site	S1	Within the Site	
2	Madandakuppam	S2	4.06	NE
3	Vallimalai	S3	3.92	E
4	Veppalai	S4	7.16	SE
5	Magimandalam	S5	1.29	S
6	Marakalakuppam	S6	3.55	SW
7	Chintagunturu	S7	7.45	SW
8	Ramapuram	S8	2.20	NW

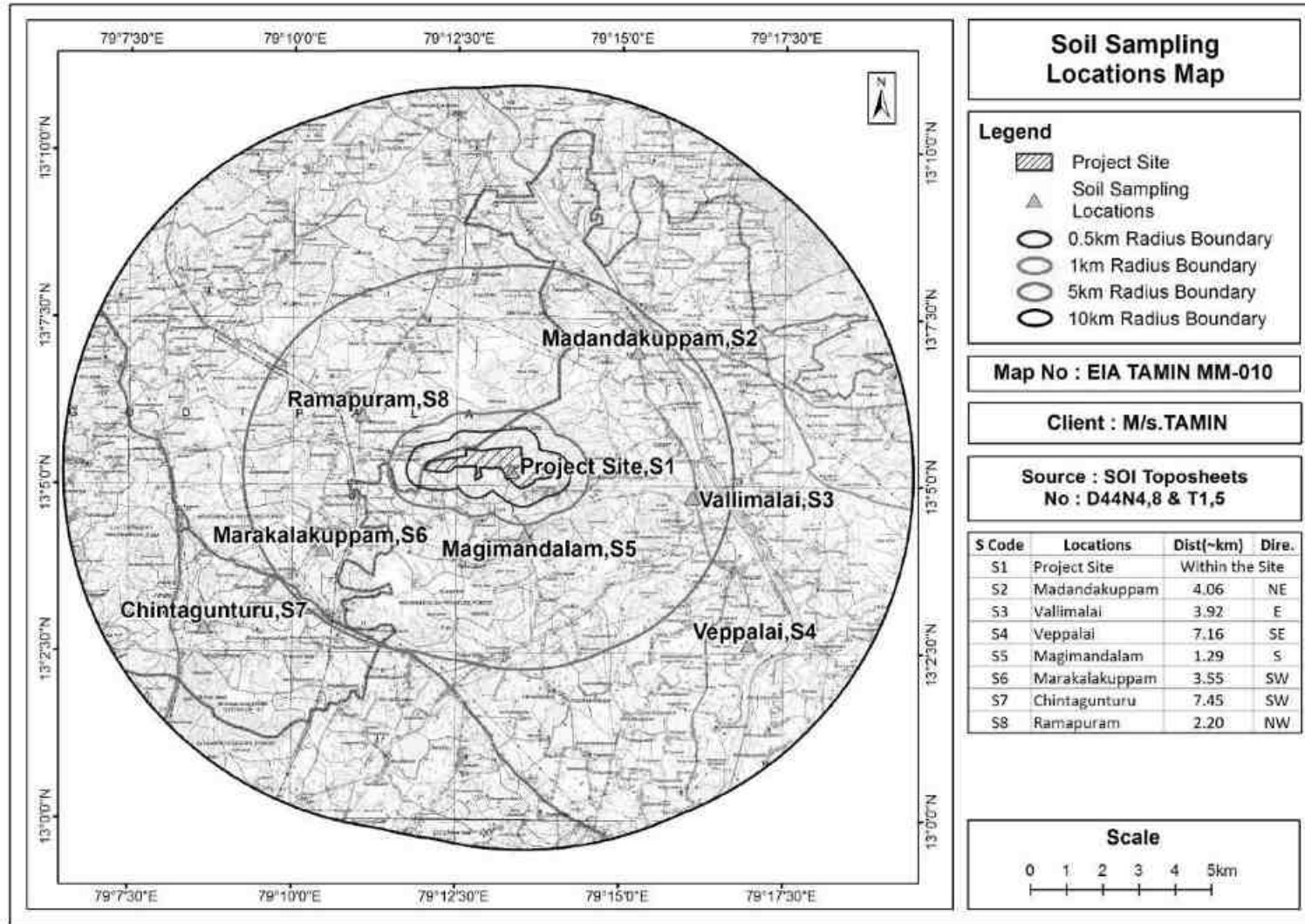


Figure 3-28 Map showing the soil monitoring location

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Table 3-13 Physico Chemical parameters of soil samples from the study area

Sl. No	Parameters	Units	Project Site	Madanda kuppam	Vallimalai	Veppalai	Magimanda lam	Marakalaku ppam	Chintagun turu	Ramapura m
			S1	S2	S3	S4	S5	S6	S7	S8
1	Soil Texture	-	Clay Loam	Sandy Clay Loam	Sandy Loam	Sandy Loam	Sandy Loam	Clay Loam	Sandy Loam	Sandy Loam
2	Sand	%	40.0	36.0	36.0	39.0	50.0	60.0	22.0	49.0
3	Silt	%	6.0	7.0	12.0	10.0	9.0	9.0	8.0	6.0
4	Clay	%	54.0	57.0	52.0	51.0	41.0	31.0	70.0	45.0
5	pH		6.88	7.03	8.46	7.03	8.40	7.56	7.63	8.35
6	Electrical conductivity	μS/cm	97.0	115.0	127.0	164.0	195.0	324.0	62.0	115.0
7	Infiltration Rate	cm/hr	0.50	0.40	0.70	0.50	2.00	2.10	0.30	1.80
8	Bulk Density	gm/cc	1.44	1.43	1.44	1.47	1.43	1.38	1.42	1.36
9	Cation Exchange Capacity	meq/100 gm	27.62	30.68	27.22	27.56	25.45	31.08	35.54	25.86
10	Moisture content	%	2.51	2.35	2.58	2.27	2.52	1.45	3.21	1.63
11	Water Holding Capacity	%	19.8	19.2	19.1	18.0	15.8	15.2	19.8	15.2
12	Porosity	-	0.48	0.47	0.48	0.46	0.42	0.41	0.48	0.42
13	Organic Carbon	%	0.28	0.83	0.57	0.89	0.24	0.34	0.65	0.89
14	Organic matter	%	0.48	1.43	0.98	1.54	0.42	0.58	1.12	1.54

Sl. No	Parameters	Units	Project Site	Madanda kuppam	Vallimalai	Veppalai	Magimandalam	Marakalappam	Chintagunturu	Ramapuram
			S1	S2	S3	S4	S5	S6	S7	S8
15	Nitrogen as N	mg/kg	110.24	115.75	112.68	120.74	103.82	117.35	114.93	110.24
16	Phosphorus	mg/kg	12.85	11.57	12.52	13.56	13.84	13.04	12.77	12.85
17	Potassium	mg/kg	64.25	57.87	62.60	67.80	69.21	65.20	63.85	64.25
18	Calcium	mg/kg	75.11	205.77	173.98	154.52	162.87	385.84	175.88	180.16
19	Magnesium	mg/kg	3.96	3.55	3.85	4.18	4.27	4.02	3.93	2.78
20	Boron	mg/kg	0.61	0.58	0.63	0.59	0.64	0.68	0.65	0.73
21	Cadmium	mg/kg	BLQ (LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
22	Chromium	mg/kg	95.03	57.08	36.52	27.33	12.09	47.59	50.60	58.38
23	Copper	mg/kg	2.64	2.37	2.57	2.79	2.85	2.68	2.62	1.86
24	Iron	mg/kg	3.76	2.58	2.31	1.93	1.62	1.81	3.36	2.84
25	Manganese	mg/kg	2.72	2.45	2.65	2.87	2.93	2.76	2.70	1.94
25	Zinc	mg/kg	0.66	0.59	0.64	0.70	0.71	0.67	0.65	0.46

Note: BLQ – Below Limit of Quantification; LOQ – Limit Of Quantification

3.9.1 Results and Discussions

Summary of analytical results

- The pH of the soil samples ranged from 6.88 to 8.46.
- Conductivity of the soil samples ranged from 315 to 474 μ mho/cm.
- Nitrogen content ranged from 103.82 mg/kg to 120.74 mg/kg.
- Phosphorous ranged from 11.57 mg/kg to 13.84 mg/kg.
- Potassium content ranges from 57.87 mg/kg to 69.21 mg/kg.

3.10 Biological Environment

An ecological study of the ecosystem is essential to understand the impact of industrialization and urbanization on existing flora and fauna of the study area. Studies on various aspects of ecosystem play an important role in identifying sensitive issues for under taking appropriate action to mitigate the impact, if any. The biological study was under taken as a part of the EIA study report to understand the present status of ecosystem prevailing in the study area, to compare it with past condition with the help of available data, to predict changes in the biological environment as a result of present activities and to suggest measures for maintaining its health. Secondary information was collected to study the flora & fauna in 10 km radius. Some of the information was gathered from the local habitants. All the collected data were classified to interpret the impact of pollution on the flora and fauna of that region. All the available information was recorded about the wild plants and cultivated crop plants.

During secondary information, following aspects were considered for ecological studies:

- ❖ Assessment of present status of flora and fauna;
- ❖ Identification of rare and endangered species of plants and animals (if any);
- ❖ Identification of ecologically sensitive areas within the study area;
- ❖ Assessment of migratory route of wildlife (if any); and
- ❖ Assessment of Aquatic Ecology with specific reference to aquatic birds and plankton resources.

3.10.1.1 Methodology

Terrestrial investigations for flora and fauna records were collected by secondary information like research article, periodicals, floras and forest checklist.

3.10.1.2 Floral Study

- ❖ Plants species were identified based on their specific diagnostics characters of family, genus and species using available floral, other related literature.

- ❖ Besides the identification of plant species, information was collected on the vernacular names and uses of plants made by local inhabitants.

3.10.1.3 Faunal Study

- ❖ Secondary information collected from published government data etc.
- ❖ List of the endangered and endemic species as per the schedule of The Wildlife Protection Act, 1972.
- ❖ Emphasis is given to identify avifauna and mammals to determine the presence and absence of Schedule-1 species, listed in The Wildlife Protection Act 1972, as well as in Red List of IUCN.

3.10.1.4 Floristic composition within the study area

- ❖ As per the secondary information, a total 182 species under 65 family found in the study area. The detailed list of plant species found in each quadrat provided in given in Table 3-21.

Table 3-14 Flora/Vegetation in the Study Area

S.No.	Botanical name	Family	Local name	IUCN
Trees				
1	<i>Acacia catechu</i>	Mimosaceae	Kaachu	NA
2	<i>Azadirachta indica</i>	Meliaceae	Turakabevu	NA
3	<i>Bauhunia purpurea</i>	Caesalpiniaceae	Devakanchan	NA
4	<i>Bombax ceiba</i>	Bombacaceae	Silk Cotton Tree	NA
5	<i>Buchanania lanzan</i>	Anacardiaceae	Charoli	NA
6	<i>Careya arborea</i>	Lecythidaceae	alagavvele	NA
7	<i>Cassia fistula</i>	Caesalpiniaceae	Amalataash	NA
8	<i>Erythrina stricta</i>	Fabaceae	Halivana	NA
9	<i>Gmelina arborea</i>	Verbenaceae	Shivani	NA
10	<i>Mammea longifolia</i>	Guttiferae	Surangi	NA
11	<i>Mimusops elengi</i>	Sapotaceae	Ranjal	LC
12	<i>Morinda citrifolia</i>	Rubiaceae	Tagase maddi	NA
13	<i>Moringa oleifera</i>	Moringaceae	Drumstick tree	NA
14	<i>Pithecolobium dulce</i>	Mimosaceae	Seeme hunase	NA
15	<i>Pongamia pinnata</i>	Fabaceae	Honge	LC
16	<i>Pterocarpus marsupium</i>	Fabaceae	Honne	NT
17	<i>Semecarpus anacardium</i>	Anacardiaceae	Geru	NA
18	<i>Syzigium cuminii</i>	Myrtaceae	Nerale Hannu	NA
19	<i>Tamarindus indica</i>	Caesalpiniaceae	Tamarind/ Hunase	NA
20	<i>Terminalia bellerica</i>	Combretaceae	Taarekaayi	NA
21	<i>Terminalia paniculata</i>	Combretaceae	Ulabe	NA
Shrubs				
22	<i>Calotropis procera</i>	Asclepiadaceae	bili aekka	NA
23	<i>Carissa congesta</i>	Apocynaceae	Karanda	NA
24	<i>Euphorbia ligularia</i>	Euphorbiaceae	Hedge Euphorbia	NA
25	<i>Helicterus isora</i>	Sterculiaceae	Yedmuri	NA
26	<i>Holarrhena antidysenterica</i>	Apocynaceae	Safed kuda	NA
27	<i>Ixora coccinea</i>	Rubiaceae	Devari	NA

28	<i>Jatropha curcas</i>	Euphorbiaceae	Kananeranda	NA
29	<i>Lantana camera</i>	Verbenaceae	Kakke	NA
30	<i>Thespesia lampas</i>	Malvaceae	Kilankoi	NA
31	<i>Wrightia tintoria</i>	Apocynaceae	Sweet Indrajao	NA
32	<i>Zizyphus rugosa</i>	Rhamnaceae	Belahadu	NA
Herbs				
33	<i>Cassia tora</i>	Caesalpinaceae	Sogata	NA
34	<i>Eranthemum roseum</i>	Acanthaceae	Rosy Eranthemum	NA
35	<i>Hemidesmus indicus</i>	Asclepiadaceae	Indian Sarsaparilla	NA
Climbers				
36	<i>Abrus precatorius</i>	Fabaceae	Gulugunji	NA
37	<i>Asparagus racemosus</i>	Liliaceae	Aheruballi	NA
38	<i>Cocculus hirsutus</i>	Menispermaceae	Daagadi balli	NA
39	<i>Gymnema sylvestre</i>	Asclepiadaceae	Kadhasige	NA
40	<i>Jasminum malabaricum</i>	Oleaceae	Kadu mallige	NA
41	<i>Mucuna prurita</i>	Fabaceae	Nayisonanguballi	NA
42	<i>Phanera vahlii</i>	Caesalpinaceae	Chambolli	NA
43	<i>Smilax ovatifolia</i>	Smilacaceae	Kaadu hambu	NA
44	<i>Tinospora cordifolia</i>	Menispermaceae	Madhuparni	NA
45	<i>Tylophora dalzellii</i>	Asclepiadaceae	Antamula	NA

Source:

1. List of Plants : TN Plants of Tamil Nadu:
http://tnenvis.nic.in/tnenvis_old/database_bio_flo.htm
2. Flora of Tamil Nadu. Botanical survey of India.1983.
3. IUCN Status : <https://www.iucnredlist.org/>

3.10.2 Fauna

Secondary information for Fauna diversity were collected to cross check with relevant literatures (Smith 1933-43, Ali and Ripley 1983, Daniel 1983, Prater 1993, Murthy and Chandrasekhar 1988).

3.10.2.1 Birds species

A total of 50 species belonging to 32 families have been recorded.

IUCN threatened species not observed. Bird recorded from the Study area and Conservation Status is given in below table

Table 3-20 List of Birds

S.	Common Name	Scientific Name	IUCN status
Phasianidae			
1	Indian peafowl	<i>Pavo cristatus</i>	LC
2	Grey francolin	<i>Francolinus pondicerianus</i>	LC
Anatidae			
3	Indian spot billed duck	<i>Anas poecilorhyncha</i>	LC
Threskiornithidae			
4	Black headed Ibis	<i>Threskiornis melanocephalus</i>	NT
Ardeidae			

5	Indian pond heron	<i>Ardeola grayii</i>	LC
6	Purple heron	<i>Ardea purpurea</i>	LC
7	Grey heron	<i>Ardea cinerea</i>	LC
8	Cattle egret	<i>Bubulcus ibis</i>	LC
	Phalacrocoracidae		
9	Little cormorant	<i>Phalacrocorax niger</i>	LC
	Accipitridae		
10	Brahminy kite	<i>Haliastur indus</i>	LC
11	Shikra	<i>Accipter badius</i>	LC
12	Black kite	<i>Milvus migrans</i>	LC
	Rallidae		
13	White breasted waterhen	<i>Amaurornis phoenicurus</i>	LC
14	Purple swamphen	<i>Porphyrio porphyrio</i>	LC
	Charadriidae		
15	Red wattled lapwing	<i>Vanellus indicus</i>	LC
16	Common ringed plover	<i>Charadrius hiaticula</i>	LC
	Columbidae		
17	Common pigeon	<i>Columba livia</i>	NT
	Psittaculidae		
18	Rose ringed parakeet	<i>Psittacula krameri</i>	LC
	Cuculidae		
19	Common hawk cuckoo	<i>Hierococcyx varius</i>	LC
20	Asian koel	<i>Eudynamys scolopaceus</i>	LC
21	Southern coucal	<i>Centropus parroti</i>	LC
	Strigidae		
22	Spotted owlet	<i>Athene brama</i>	LC
	Upupidae		
23	Common hoopoe	<i>Upupa epops</i>	LC
	Coraciidae		
24	Indian roller	<i>Coracias benghalensis</i>	LC
	Alcedinidae		
25	White throated king fisher	<i>Halcyon smyrnensis</i>	LC
26	Pied kingfisher	<i>Ceryle rudis</i>	LC
	Meropidae		
27	Green bee eater	<i>Merops orientalis</i>	LC
	Ramphastidae		
28	Brown headed barbet	<i>Megalaima zeylanica</i>	LC
29	Copper smith barbet	<i>Megalaima haemacephala</i>	LC
	Picidae		
30	Flame back	<i>Dinopium benghalense</i>	LC
	Dicruridae		
31	Greater racket tailed drongo	<i>Dicrurus paradiseus</i>	LC
32	Black drongo	<i>Dicrurus macrocercus</i>	LC
	Monarchidae		

33	Indian paradise flycatcher	<i>Terpsiphone paradise</i>	LC
	Hirundinidae		
34	Barn swallow	<i>Hirundo rustica</i>	LC
	Corvidae		
35	House crow	<i>Corvus splendens</i>	LC
36	Rufous treepie	<i>Dendrocitta vagabunda</i>	LC
	Sturnidae		
37	Common myna	<i>Acridotheres tristis</i>	LC
38	Brahminy starling	<i>Sturnia pagodarum</i>	LC
	Estrildidae		
39	Scaly breasted munia	<i>Lonchura punctulata</i>	LC
40	White rumped munia	<i>Lonchura striata</i>	LC
41	Black headed munia	<i>Lonchura Malacca</i>	LC
	Motacillidae		
42	Grey wagtail	<i>Motacilla cinerea</i>	LC
43	White browed wagtail	<i>Motacilla maderaspatensis</i>	LC
	Ciconiidae		
44	Asian openbill	<i>Anastomus oscitans</i>	LC
	Podicipedidae		
45	Little Grebe	<i>Tachybaptus ruficollis</i>	LC
	Timallidae		
46	Yellow-billed babbler	<i>Turdoides affinis</i>	LC
	Ploceidae		
47	Baya weaver	<i>Ploceus philippinus</i>	LC
	Muscicapidae		
48	Pied Bushchat	<i>Saxicola caprata</i>	LC
	Nectariniidae		
49	Purple sunbird	<i>Cinnyris asiaticus</i>	LC
	Scolopacidae		
50	Wood sandpiper	<i>Tringa glareola</i>	LC

LC- Least Concern, NT- Near Threatened, EN- Endangered, NE-Not Evaluated, DD -Data Deficient, VU- Vulnerable, IUCN- International Union for Conservation of Nature.

3.10.2.2 Mammals:

Based on secondary information Mammals recorded in the study area is given in **Table 3-**

StatuLC- Least Concern, NT- Near Threatened, EN- Endangered, NE-Not Evaluated, DD -Data Deficient, VU-Vulnerable, IUCN- International Union for Conservation of Nature.

Table 3-21 Mammals recorded in the Study area and their Conservation

S.No	Species name	Common name	IUCN Conservation Status
1	Mus musculus	Common Mouse	Not assessed
2	Funambulus pennanti	Palm -Squirrel	Not assessed
3	Mus rattus	Indian rat	Not assessed

4	<i>Lepus nigricollis</i>	Indian Hare	Least Concern
5	<i>Rattus norvegicus</i>	Brown Rat	Least Concern
6	<i>Felis catus</i>	Cat	Not assessed

Reptiles

Table 3-22 Reptiles & Amphibians recorded in the Study area and their Conservation Status

S.No	Species name	Common name	IUCN Conservation Status
1	<i>Eutropismacularia</i>	Common skink	Not assessed
2	<i>Plyasmucosus</i>	Rat Snake	Not assessed
3	<i>Nerodiasipedon</i>	Fresh water snake	Not assessed
4	<i>Rana tigrina</i>	Common yellow frog	Least Concern
5	<i>Calotes versicolor</i>	Common Garden Lizard	Not assessed
6	<i>Hemidactylus sp.</i>	House lizard	Not assessed
7	<i>Ophisopsleschenaultiix</i>	Snake-eyed lizard	Not assessed
8	<i>Rana hexadactyla</i>	Frog	Least Concern

3.10.3 Butterfly

Butterfly can also serve as useful indicators of habitat biodiversity. They are responsible for a large part of the complex interconnections that characterize natural ecosystems. The butterfly communities that are present in forests help to maintain crucial ecological processes and preserve biodiversity as a whole. They participate in most of the ecological processes that sustain ecosystems. A totally 21 species belonging to five families of butterflies recorded. The Nymphalidae were more dominant family followed by Lycaenidae, Pieridae, Papilionidae and Hesperidae. Butterfly recorded from the Study area is given in Table 3-23

Table 3-23 Occurrence of butterfly species in buffer zone

S.No	Family	Species name	Common name	Status	WPA 72 Schedule
1.	Nymphalidae	<i>Danaus chrysippus</i>	Plain Tiger	LC	Sch-IV
2.	Nymphalidae	<i>Danaus genutia</i>	Striped Tiger	LC	Sch-IV
3.	Nymphalidae	<i>Ariadne merione</i>	Common Caster	LC	Sch-IV
4.	Nymphalidae	<i>Melanitisleda</i>	Common Evening Brown	LC	Sch-IV
5.	Nymphalidae	<i>Mycalesisperseus</i>	Common Bush Brown	LC	Sch-IV
6.	Nymphalidae	<i>Ypthimaasterope</i>	Common Three Ring	LC	Sch-IV
7.	Nymphalidae	<i>Euthalanais</i>	Baronet	LC	Sch-IV
8.	Nymphalidae	<i>Argynnis hyperbius</i>	Indian Fritillary	LC	Sch-IV
9.	Nymphalidae	<i>Bybliaailithya</i>	Joker	LC	Sch-IV
10.	Pieridae	<i>Colotisdanae</i>	Crimson Tip	LC	Sch-IV
11.	Pieridae	<i>Colotisetrida</i>	Small Orange Tip	LC	Sch-IV
12.	Pieridae	<i>Euremahecabae</i>	Common Grass Yellow	LC	Sch-IV

13.	Pieridae	Catopsilliapomona	Common Emigrant	LC	Sch-IV
14.	Pieridae	Ceporanerissa	Common Gull	LC	Sch-IV
15.	Lycaenidae	Euchrysopscejus	Gram Blue	LC	Sch-IV
16.	Lycaenidae	Jamides celeno	Common Cerulin	LC	Sch-IV
17.	Lycaenidae	Freyeriatrochylus	Grass Jewel	LC	Sch-IV
18.	Papilionidae	Papilio polytes	Common Mormon	LC	Sch-IV
19.	Papilionidae	Papilio demoleus	Lime Butterflies	LC	Sch-IV
20.	Papilionidae	Atrophaneuraaristolochiae	Common Rose	LC	Sch-IV
21.	Hesperiidae	Borbocinnara	Rice Swift	LC	Sch-IV

LC- Least Concern, NT- Near Threatened, EN- Endangered, NE-Not Evaluated, DD -Data Deficient, VU- Vulnerable, IUCN- International Union for Conservation of Nature.

Source:

1. List of Birds: Ali, S. (2002). The Book of Indian Birds (13th Revised Edition). Oxford University Press, New Delhi, 326pp.
2. List of Butterflies: Kehimkar I. The Book of Indian Butterflies. Bombay Natural History Society, 2008, 497.
3. List of Mammals: Kamalakannan, M.&P.O.Nameer (2019). A checklist of mammals of Tamil Nadu, India. Journal of Threatened Taxa 11(8): 13992–14009; <https://doi.org/10.11609/jott.4705.11.8.13992–14009>.
4. List of Reptiles: Aengals, R., Sathish Kumar, V.M., Palot, M.J. & Ganesh, S.R. (2018). A Checklist of Reptiles of India. 35 pp. Version 3.0. Online publication is available at www.zsi.gov.in (Last update: May 2018)
5. List of schedule species : [http://wiienviis.nic.in/Database/ Schedule species database](http://wiienviis.nic.in/Database/Schedule%20species%20database).

3.10.3.1 Impact on Biological Environment

The project site is not found in forest area. The proposed project will not have any impact of terrestrial ecology of the area. Project area can be developed with greenbelt by planting native species to maintain the good environment.

3.10.3.2 Impact on Wildlife

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

3.10.3.3 Impact on Flora

Plantation will be developed in the undeveloped area as per plantation programme. These activities will help to improve the floral cover of the area. The greenery and plantation development will eventually attract micro fauna, birds etc in the area. Assistance will be taken from local forest department in selection of species of plants so that green coverage may improve fast. The varieties would include those plants, which are suitable to the area. The following plant species will be planted according to CPCB guidelines: *Acacia*

nilotica, Azadirachta indica, Albizza lebbek, Butea monosperma, Cassia fistula, Delbergiasisso, Delonix regia, Ficus benghalensis, Prosopis cineraria, Tectona grandis, Wrightia tinctoria etc.

3.10.3.4 Impact on Fauna

The quarry area core zone found forest land. As such, there will be little adverse impact of the plant unit activity on fauna around the plant unit area. A comprehensive Central Legislation Namely Wild Life (Protection) Act was enforced in 1972 to provide protection to wild animals. Schedule-I of this act contains the list of rare and endangered species, which are completely protected throughout the country. The list of wild animals and their conservation status as per Wild Life Act (1972) are presented in for the study area.

3.10.3.5 Conservation Plan

The Conservation Plan would focus on conservation of habitats of Schedule-I species identified during the study. We identified 2 IUCN red list species viz.. two faunal species in the study area i.e. 10 km buffer area. of the shikra. The shikra is very similar in appearance to other sparrow hawk

S.No	Common Name	Species Name	IUCN	WPA 1972
Birds				
1	Shikra	<i>Accipiter badius</i>	LC	Schedule I
2	Peafowl	<i>Pavo Cristatus</i>	LC	Schedule I

3.10.3.6 Management Plan

Capacity Building: Capacity building program on protection would be of high significance. Creation of awareness among local people as well as employees about the importance of protecting the habitat and foraging grounds.

- **Anti-Poaching Plan:** Poaching being one of the causes for depletion of wildlife in general and it being one of the main reasons for the poor faunal assemblage, it is necessary to increase protection for the RET species. The people living in the surrounding area should be rewarded for timely information about disturbing and/or poaching of the bird more specifically the threatened species.
- **Habitat Improvement:** Sufficient food, water resources, vegetation cover, and breeding sites must be available at the release location.

Further suggestion/ recommendation

- Restricted uses of pollutants in their habitat.
- Stopping the increased vehicle pollution, wildlife road fatalities and damaged to precious habitat by people to start movement towards these areas.
- To carry annual census research project to ecology and habitat use by peacock.
- By making provision of veterinary care and cages for injurious or sick deformed birds.

Table 3-24. Conservation plan for Peacock for five years

S. No	Work or Activity	1 to 5 years	Location
1	Plantation	350 trees per year plant of local plant species for five years in villages.	Boundary
2	Water filling	5 number in water hole filing during summer.	Ponds covered in 10 km study area
3	Awareness	In school of nearby villages for peacock conservation as Drawing Competition. (Peacock Picture) & Essay Writing on Peacock.	Villages covered in 5 km study area

**All above activity will be carried out with the consultation of Ecologist

Plant Species will be suggested by the Ecologist and plant saplings will be distributed in project villages as per the above mentioned schedule (year wise).

The proponent has proposed a sum of Rs. 5,35,000/-for the “Schedule – I species” conservation plan under the following heads:

S.No	Work or Activity	Approximate Cost. Rs.				
		Year 1	Year 2	Year 3	Year 4	Year 5
1	Plantation-350 tree plants (@ 150/-per plant)	52,500/-	52,500/-	52,500/-	52,500/-	52,500/-
2	Small water tank –20 in number @ 5000/-per tank	1,00,000/-	--	--	--	--
3	One awareness programme	20,000/-	20,000/-	20,000/-	20,000/-	20,000/-
Total		202500/-	72,500/-	72,500/-	72,500/-	72,500/-

(Not including water supply, grass seed collection and plantation)

Following Plants will be planted on the periphery of Project are a& along the Approachable Road

S.No	Botanical name	Common Name	Key future of Tree
1	Albizia lebeck	Vagai	A middle-sized deciduous tree with a spreading crown.
2	Azadicrta Indica	Vembu	It is adapted to various climate zones.
3	Dalbergia latifolia	Eeitti	It is common on deep loams or clays containing lime.
4	Ficus benghalensis	Allamaram	Nesting and food purpose for wildlife
5	Ficus relegiosa	Arasamaram	It is tolerant to various climate zones.
6	Madhuca longifolia	Illupai	A large deciduous shapely, long lived tree
7	Pongamia pinnata	Pungaimaram	Dust reduce
8	Pterocarpus marsupium	Vengai	--
9	Syzygiumcumini	Naval	It is tolerant to temprature resistant.
10	Termanilia arjuna	Maruthu	It is reducing soil erosion

(Source: National Health Mission, as on May 31, 2019)

(Source: Census 2011)

3.11 Socio Economic profile

As per the 2011 Census, Vellore district consists of 3 Revenue Divisions viz., Vellore (Taluks include Vellore, Katpadi, Gudiyatham), Ranipet (Taluks include Walajah, Arakonam, Arcot), and Tirupathur (Taluks include Thirupathur, Vaniyambadi, Ambur). This district has 9 Taluks, 20 Community Development Blocks, 52 Firkas, 1 Municipal Corporation, 13 Municipalities, 22 Town Panchayats and 36 Census Towns. Vellore district is situated in the northern part of Tamil Nadu bordering Andhra Pradesh. The district bounded by

Andra Pradesh on the north, Thiruvallur district on the northeast, Kancheepuram district on the east, Tiruvannamalai district on the south and Krishnagiri district on the West. The total geographical area of the district is 6075 sq. kms. In terms of size, Vellore district ranked 4th in comparison to other district in the State.

Vellore district ranked 3rd place in terms of the highest population in the State. The district has recorded population density of 648persons/sq.km. The urban population in the district was 43.2% to the total population. The decadal population growth of the district during 2001-2011 was 13.2%. The district sex ratio was 1007, higher than the State sex ratio of 996. The district has recorded the 3rd highest Scheduled Caste sex ratio of 1026 among the districts. The district has recorded the literacy of 79.2%.

Source:https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

(Ref: Directorate of Census Operations Tamil Nadu, “District Census Handbook 2011, Vellore District”, Series-34, Part XII-A)

3.11.1 Socio Economic Aspects

A socio-economic study was undertaken in assessing aspects which are dealing with social and cultural conditions, and economic status in the study area. The study provides information such as demographic structure, population dynamics, infrastructure resources, and the status of human health and economic attributes like employment, per-capita income, agriculture, trade, and industrial development in the study area. The study of these characteristic helps in identification, prediction and evaluation of impacts on socio-economic and parameters of human interest due to proposed project developments. The parameters are:

- Demographic structure
- Infrastructure Facility
- Economic Status
- Health status
- Cultural attributes
- Awareness and opinion of people about the project and Industries in the area.

The following **Table 3-25** provides the certain important social indicators of Vellore district in Tamil Nadu.

Table 3-25 Social Indicators of PIA district

S.No	Social Indicators	Vellore District
1.	Decadal variation %	13.2
2.	Urban population %	43.24
3.	Rural Population %	56.76
4.	Sex ratio	1007
5.	0-6 age Child sex ratio	944
6.	Population density (Persons per	648

	square Km)	
7.	Scheduled caste population %	21.85
8.	Scheduled tribe population %	1.85
9.	Literacy rate %	79.17
10.	Work Participation rate %	37.5
11.	Main Workers %	80.52
12.	Marginal Workers %	19.48
13.	Cultivators %	10.37
14.	Agricultural labourers %	23.2
15.	Workers in household industries %	8.08
16.	Other workers %	58.36

Source: https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

(Ref: Directorate of Census Operations Tamil Nadu, “District Census Handbook 2011, Vellore District”, Series-34, Part XII-A)

3.11.1.1 Population and Household Size

In 2011 census, the total population of Vellore district was 3936331. Of this, rural population was 2234344 and urban population was 1701987. In 2001, they were 3477317, 2169319 and 1307998 respectively. Arakonam taluk has the highest number of inhabited villages (133) while Vaniyambadi taluk has the lowest number (48) of such villages. Madapalli village in Tirupathur taluk had the highest population of 14,868 and Madakadappa R.F. village in Vaniyambadi taluk recorded the lowest population of 14 in the district. Ambur Reserve Forest Village in Ambur taluk is the largest village with an area of 10656.09 hectares and Ambur Plantation Reserve Forest in Ambur taluk is the smallest village with an area of 2.47 hectares. The district has recorded the 3rd highest percentage of household industry workers to total workers of 8.1% among the districts.

Source: https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

(Ref: Directorate of Census Operations Tamil Nadu, “District Census Handbook 2011, Vellore District”, Series-34, Part XII-A)

3.11.1.2 SexRatio

The sex ratio is defined as number of females to 1000males. The total sex ratio in the district as per 2011 census was 1007. This was recorded as 997 in 2001 census. The child sex ratio in the district during 2011 census was 944 and this was 943 in 2001 census.

Source: https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

(Ref: Directorate of Census Operations Tamil Nadu, “District Census Handbook 2011, Vellore District”, Series-34, Part XII-A)

3.11.1.3 Scheduled Caste (SC)

The Scheduled Castes (SCs) population in Vellore district was 20.5% in 2001 census which has increased to 21.9% in 2011 census. The rural-urban composition of SCs was 24.5% and 18.4% respectively in 2011 census. The Scheduled Tribes (STs) population in the district was 1.8% in 2001 census and returned with a marginal increase to 1.9% in 2011 census. The rural-urban composition of STs in 2011 census was 2.9% and 0.5% respectively.

Source: https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3304_PART_A_DCHB_VELLORE.pdf

(Ref: Directorate of Census Operations Tamil Nadu, “District Census Handbook 2011, Vellore District”, Series-34, Part XII-A)

3.11.1.4 Education & Literacy

In Census, a person aged 7 and above is considered literate, if he or she can read and write with understanding in any language. The literacy rate in the Vellore district has increased in 2011 census compared to 2001 census. The rural and urban literacy in the district has recorded significant disparity. The rural literacy was 67.4% in 2001 which has marginally increased to 7.3% in 2011 with 74.7% while the urban literacy in the district was 80.5% in 2001. The urban literacy in the district has seen significant increase in 2011 census compared to 2001 census. In 2011 census, Vellore district has returned 79.2% as literate population; males with 86.5% and females with 71.9%. The total literacy in 2001 was 72.4%; males with 82.4% and females at 62.8%. The accessibility of Primary and Upper Primary education has increased the literacy rate as well as reducing the dropout rate **Table 3-26** Show the details of education infrastructures in Vellore District.

Table 3-26 Education Infrastructures in Vellore district

Type of school	Total schools		Rural Schools	
	Government	Private	Government	Private
Primary	1439	660	1307	401
Primary + Upper Primary	460	84	410	44
P + UP+ Secondary + Higher Secondary	13	122	8	68
UP only	0	1	0	1
UP + Secondary + Higher Secondary	175	53	138	11
P + UP + Secondary	13	79	11	55
UP + Secondary	174	25	166	15

Source: http://udise.in/Downloads/Publications/Documents/District_Report_Cards-2016-17-Vol-II.pdf)

3.11.1.5 Health Facilities

Primary Health Centers (PHCs) and Sub-centers (SCs) are providing the preventive, curative and rehabilitative health care services to the rural people. The district has good number of public health systems

accessible and affordable apart from the private health facilities. The Health Facilities given in Vellore district is given in **Table 3-**.

Table 3-27 Socio Economic analysis: Health care

		Facilities As on November 19, 2020									
		Total Facility					Active Facilities				
Name of the District	Type of Facility	Total [(A+B) or (C+D)]	Public [A]	Private [B]	Urban [C]	Rural [D]	Total [(A+B) or (C+D)]	Public [A]	Private [B]	Urban [C]	Rural [D]
Vellore District	SC	455	455	0	0	455	454	454	0	0	454
	PHC	104	104	0	22	82	100	100	0	22	78
	CHC	21	20	1	1	20	21	20	1	1	20
	SDH	13	13	0	11	2	13	13	0	11	2
	DH	1	1	0	0	1	1	1	0	0	1
	Total		594	593	1	34	560	589	588	1	34

(Note: SC – Sub Center; PHC – Primary Health Center; CHC – Community Health Center; SDH – Sub District Hospital; DH – District Hospital)

(Source: National Health Mission)

3.11.2

3.11.3 Social Economic Profile of the study area

The villages and towns covering 10 km radius from the boundary of the project site is taken for the study. **Table 3-5** shows the list of locations which comes under the study area.

Table 3-5 Population profile within the study area

Sl. No	Name	Households	Total Population	Male	Female	Children below 6	Scheduled Caste	Scheduled Tribe
0-5 km								
Vellore District								
Katpadi Taluk								
1.	Thengal	378	1586	759	827	157	615	0
2.	Paramasathu	384	1584	781	803	139	348	7
3.	Madandakuppam	324	1360	682	678	134	193	0
4.	Gollapalli	378	1578	774	804	171	208	78
5.	Ammavaripalle	256	985	455	530	103	178	74
6.	Mahimandalam	1120	4570	2243	2327	492	483	74
7.	Perumalkuppam	239	905	450	455	84	0	0
8.	Erukkambattu	277	1136	543	593	132	447	0
Chittoor District								
Chittoor Mandal								
9.	Settiappam Thangal	63	215	100	115	14	0	0
10.	S.Venkatapuram	228	930	470	460	81	414	1
11.	Kurchivedu	89	373	187	186	27	169	0
12.	Alukurupalle	74	316	168	148	40	198	1
13.	Venkatapuram	28	126	64	62	12	0	0
Gudipala Mandal								
14.	Gollapalle	105	403	193	210	38	0	0
15.	Naragallu	428	1941	968	973	170	830	38
16.	Adilakshmamba Puram	151	592	302	290	59	27	20

Sl. No	Name	Households	Total Population	Male	Female	Children below 6	Scheduled Caste	Scheduled Tribe
17.	Cheruvu Mundara Khandriga	107	395	201	194	45	0	0
18.	Kaidugani Khandriga	235	1000	494	506	87	630	15
19.	Ramapuram	625	2481	1229	1252	278	987	0
20.	Krishna Jammapuram	47	168	88	80	6	6	16
21.	Pasumanda	139	565	285	280	47	314	58
22.	Thimmaiahpalle	213	834	407	427	54	92	3
23.	Ragimanupatteda	25	79	38	41	5	0	0
24.	Venkata Lakshmbamba Puram	31	118	54	64	8	0	0
25.	Bandarlapalle	25	101	47	54	16	0	16
26.	Kuppiganipalle	247	982	470	512	97	388	3
27.	Dakshina Brahmana Palle	344	1379	680	699	132	599	0
28.	Marakalakuppam	347	1370	684	686	124	738	74
29.	Bomma Samudram	1220	4559	2239	2320	386	1869	131
30.	Nangamangalam	691	2430	1188	1242	231	800	241
31.	Mandi Krishnapuram	470	1775	885	890	179	721	107
Gangadhara Nellore Mandal								
32.	Garigalapalle	90	382	185	197	35	24	98
5-10 km								
Vellore District								
Katpadi Taluk								
33.	Balekuppam	423	1978	995	983	172	750	22
34.	Kondareddipalli	38	161	79	82	7	0	0
35.	Ponnai	2318	10190	5104	5086	932	2888	47
36.	Keeraiathu	834	3362	1666	1696	312	840	185
37.	Vallimalai	296	1157	589	568	106	152	0
38.	Melpadi	1374	5767	2910	2857	579	626	21
39.	Mutharasikuppam	465	1809	868	941	153	68	20

Sl. No	Name	Households	Total Population	Male	Female	Children below 6	Scheduled Caste	Scheduled Tribe
40.	Vinnampalli	866	3492	1713	1779	359	220	69
41.	Kodukkanthangal	619	2566	1239	1327	308	10	0
42.	Elayanellore	687	2668	1306	1362	296	623	72
43.	Thenpalli	381	1548	761	787	152	609	0
44.	Veppalai	445	1826	910	916	191	70	35
45.	Sripadanallore	181	663	309	354	52	112	0
46.	Eranthangal	509	2137	1029	1108	251	530	0
47.	Oddanhangal	283	1199	579	620	125	103	44
48.	Vandaranthangal	1705	6946	3374	3572	700	820	121
49.	Karigiri	1221	5185	2532	2653	579	735	60
50.	Kandipedu	685	2794	1359	1435	239	370	6
51.	Dharapadavedu	795	3283	1550	1733	381	1103	62
Walajah Taluk								
52.	Vasur	446	1829	913	916	176	118	0
53.	Palleri	207	832	430	402	100	52	33
54.	Kondakuppam	687	2915	1452	1463	305	620	15
55.	Thagarakuppam	673	2810	1397	1413	348	125	19
Thiruvallur District								
Pallipattu Taluk								
56.	Paivalasa	542	2366	1217	1149	228	597	1
57.	Vediyangadu	1065	4668	2372	2296	475	1045	119
58.	Venugopalapuram	73	260	130	130	15	5	0
Chittoor District								
Chittoor Taluk								
59.	Diguvamasapalle	976	3855	1903	1952	362	1472	236
60.	Ayanavedu	55	210	119	91	23	163	0
61.	Muthukuru	385	1567	739	828	163	1239	1
62.	Anagallu	187	752	380	372	77	487	2
63.	Paluru	41	132	72	60	12	11	39

Sl. No	Name	Households	Total Population	Male	Female	Children below 6	Scheduled Caste	Scheduled Tribe
64.	Bakara Narasinga Rayani Peta	258	1147	533	614	118	73	2
65.	Arathala	202	827	421	406	88	19	0
66.	Bandapalle	168	653	342	311	58	4	5
67.	Krishnapuram	28	121	65	56	15	22	0
68.	Gollapalle	43	178	84	94	19	0	0
69.	Guvvakallu	199	666	331	335	64	556	1
70.	Mapakshi	80	325	161	164	36	14	22
71.	Siddampalle	195	784	428	356	66	0	0
72.	Narigapalle	302	1137	552	585	129	159	70
73.	Lakshmambapuram	326	1303	658	645	106	527	37
74.	Varadarajulapalle	33	130	61	69	9	0	0
75.	Thalambedu	713	2772	1390	1382	298	921	103
76.	Ananthapuram	309	1205	640	565	136	812	1
77.	Pachanapalle	266	1241	637	604	161	1051	1
Gudipala Mandal								
78.	Ramapuram	683	2761	1401	1360	257	1077	42
79.	Mogralapalle	593	2466	1264	1202	249	1054	89
80.	Cheelapalle	495	2118	1080	1038	212	1013	0
81.	Srirangampalle	228	968	519	449	82	669	0
82.	Muthukurpalle	51	210	106	104	26	0	0
83.	Kothapalle	711	2722	1345	1377	269	1778	14
84.	Papasamudram	422	1618	784	834	146	300	1
85.	Chittapara	601	2314	1153	1161	227	717	8
86.	Gudipala	731	2790	1416	1374	259	612	110
87.	Vasanthapuram	312	1246	607	639	121	335	0
88.	Basavapalle	469	1928	921	1007	175	1098	10
Gangadhara Nellore Mandal								
89.	Chinnavepanjeri	422	1597	824	773	146	374	8

Sl. No	Name	Households	Total Population	Male	Female	Children below 6	Scheduled Caste	Scheduled Tribe
90.	Mukkelathuru	607	2352	1183	1169	204	1310	0
91.	Mahadevamangalam	408	1816	930	886	149	460	33
92.	Tungundram	1160	5155	2636	2519	579	1500	94
93.	Kadapagunta	312	1287	641	646	152	979	0
94.	Atmakur	137	567	266	301	49	353	0
95.	Errabodireddipalle	56	284	157	127	26	22	4
96.	Murthinayanipalle	295	1215	628	587	151	1015	0
97.	Ambodharapalle	329	1310	666	644	123	683	9
98.	Pathapalem	275	1203	629	574	133	428	65
99.	Pathavenkatapuram	165	761	391	370	100	427	0
100.	Ellapalle	151	706	349	357	84	0	0
101.	Bojjinayanipalle	128	595	298	297	69	321	0
102.	Kothavenkatapuram	296	1446	755	691	155	573	0
Palasamudram Mandal								
103.	Amudala	466	1994	1005	989	203	986	11
104.	Kaverirajupuram	67	290	146	144	18	125	0
105.	Amudalaputhur	95	422	209	213	36	0	11
106.	Ramakrishnapuram	232	1066	530	536	96	304	0
	Total	42859	175841	87451	88390	17560	50512	3035

3.11.4 Employment and Livelihood within study area

Majority of population in the study area comes under other working categories. As agriculture cannot be a main sustenance for most of farmers, they have dual professions. Farming is mostly seasonal, they involve in other livelihood activities like business, non-agriculture labour, agriculture labour and other service sectors. Fragmentation of landholding leads to adopt to have additional occupation. Summaries of employment and livelihood within the study are given in Table 3-29.

Table 3-29 Summaries of Employment and Livelihood within the study area

Sl. No	Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers		Main	Marginal	Main	Marginal
					Main	Marginal	Main	Marginal				
0-5 km												
Vellore District												
Katpadi Taluk												
1.	Thengal	908	814	94	47	0	735	88	1	5	31	1
2.	Paramasathu	692	408	284	70	3	108	226	13	14	217	41
3.	Madandakuppam	682	681	1	166	0	306	1	14	0	195	0
4.	Gollapalli	708	249	459	74	36	6	149	9	24	160	250
5.	Ammavaripalle	422	419	3	110	1	225	1	0	0	84	1
6.	Mahimandalam	2114	1918	196	650	6	556	111	76	27	636	52
7.	Perumalkuppam	532	106	426	8	287	0	130	3	4	95	5
8.	Erukkambattu	590	355	235	32	3	9	154	8	50	306	28
Chittoor District												
Chittoor Mandal												
9.	Settiappam Thangal	72	72	0	53	0	10	0	0	0	9	0
10.	S.Venkatapuram	477	348	129	134	53	141	65	2	0	71	11
11.	Kurchivedu	183	149	34	52	1	81	0	1	0	15	33
12.	Alukurupalle	151	134	17	32	1	85	1	0	0	17	15
13.	Venkatapuram	58	50	8	32	0	11	6	0	0	7	2
Gudipala Mandal												
14.	Gollapalle	205	133	72	48	28	15	38	6	1	64	5
15.	Naragallu	1019	809	210	366	124	376	66	1	2	66	18
16.	Adilakshamba Puram	236	235	1	104	1	68	0	1	0	62	0
17.	Cheruvu Mundara Khandriga	211	134	77	102	16	21	20	1	6	10	35

Sl. No	Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers		Main	Marginal	Main	Marginal
					Main	Marginal	Main	Marginal				
18.	Kaidugani Khandriga	507	453	54	117	1	313	48	8	1	15	4
19.	Ramapuram	1060	971	89	223	6	484	33	17	2	247	48
20.	Krishna Jammapuram	58	57	1	39	0	7	0	0	0	11	1
21.	Pasumanda	202	11	191	1	15	2	30	0	6	8	140
22.	Thimmaiahpalle	324	315	9	86	3	108	2	6	0	115	4
23.	Ragimanupatteda	35	33	2	14	1	13	0	0	1	6	0
24.	Venkata Lakshmamba Puram	42	38	4	10	2	17	2	1	0	10	0
25.	Bandarlapalle	33	33	0	22	0	9	0	0	0	2	0
26.	Kuppiganipalle	314	307	7	106	1	137	4	1	0	63	2
27.	Dakshina Brahmana Palle	606	529	77	128	4	172	36	31	1	198	36
28.	Marakalakuppam	704	692	12	114	3	451	6	2	0	125	3
29.	Bomma Samudram	2129	1924	205	390	20	1044	101	30	0	460	84
30.	Nangamangalam	1102	965	137	114	12	528	61	38	2	285	62
31.	Mandi Krishnapuram	712	648	64	87	9	409	41	11	2	141	12
Gangadhara Nellore Mandal												
32.	Garigalapalle	200	174	26	80	1	34	14	1	0	59	11
5-10 km												
Vellore District												
Katpadi Taluk												
33.	Balekuppam	922	731	191	198	1	315	183	37	2	181	5
34.	Kondareddipalli	51	38	13	29	0	1	13	1	0	7	0
35.	Ponnai	4103	3415	688	957	27	695	476	360	45	1403	140
36.	Keerai sathu	1809	559	1250	332	6	56	826	8	69	163	349
37.	Vallimalai	426	423	3	36	1	90	0	23	0	274	2
38.	Melpadi	2666	2267	399	488	57	566	115	219	45	994	182

Sl. No	Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers		Main	Marginal	Main	Marginal
					Main	Marginal	Main	Marginal				
39.	Mutharasikuppam	697	400	297	70	5	88	111	1	8	241	173
40.	Vinnampalli	1605	1239	366	219	76	520	201	20	19	480	70
41.	Kodukkanthangal	1375	1332	43	413	3	617	17	19	0	283	23
42.	Elayanellore	1089	762	327	154	6	314	196	7	7	287	118
43.	Thenpalli	740	464	276	89	1	163	81	12	4	200	190
44.	Veppalai	948	849	99	285	2	229	54	11	8	324	35
45.	Sripadanallore	370	355	15	254	8	69	4	0	0	32	3
46.	Eranthangal	904	483	421	63	8	94	227	22	41	304	145
47.	Oddanhangal	447	427	20	41	5	142	3	2	0	242	12
48.	Vandaranthangal	2485	2301	184	148	33	649	43	28	6	1476	102
49.	Karigiri	2291	1448	843	232	48	145	355	18	45	1053	395
50.	Kandipedu	1202	1084	118	146	2	202	15	5	32	731	69
51.	Dharapadavedu	1246	910	336	57	11	35	32	23	5	795	288
Walajah Taluk												
52.	Vasur	1061	640	421	156	56	89	129	41	126	354	110
53.	Palleri	504	500	4	427	1	0	0	3	0	70	3
54.	Kondakuppam	1698	1362	336	143	9	363	189	199	58	657	80
55.	Thagarakuppam	1717	834	883	208	31	151	407	42	289	433	156
Thiruvallur District												
Pallipattu Taluk												
56.	Paivalasa	1352	979	373	122	1	694	313	10	0	153	58
57.	Vediyangadu	1966	852	1114	190	14	103	798	193	33	366	269
58.	Venugopalapuram	146	103	43	62	14	9	12	8	6	24	11
Chittoor District												
Chittoor Taluk												

Sl. No	Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers		Main	Marginal	Main	Marginal
					Main	Marginal	Main	Marginal				
59.	Diguvamasapalle	1909	1650	259	376	104	703	83	14	8	557	64
60.	Ayanavedu	76	70	6	62	3	8	3	0	0	0	0
61.	Muthukuru	677	671	6	98	0	533	1	0	0	40	5
62.	Anagallu	321	280	41	94	5	126	15	0	1	60	20
63.	Paluru	51	34	17	4	1	16	13	1	0	13	3
64.	Bakara Narasinga Rayani Peta	392	367	25	43	6	102	10	0	2	222	7
65.	Arathala	388	358	30	149	14	133	6	1	0	75	10
66.	Bandapalle	248	239	9	77	3	70	6	2	0	90	0
67.	Krishnapuram	48	48	0	27	0	14	0	0	0	7	0
68.	Gollapalle	82	82	0	22	0	53	0	0	0	7	0
69.	Guvvakallu	242	218	24	34	2	80	7	1	1	103	14
70.	Mapakshi	141	137	4	42	0	28	0	1	0	66	4
71.	Siddampalle	361	284	77	112	22	30	8	9	1	133	46
72.	Narigapalle	440	383	57	51	0	182	55	8	0	142	2
73.	Lakshmambapuram	551	464	87	111	3	223	75	12	2	118	7
74.	Varadarajulapalle	46	46	0	34	0	8	0	0	0	4	0
75.	Thalambedu	1378	1218	160	371	18	537	125	6	2	304	15
76.	Ananthapuram	629	594	35	212	24	360	6	0	1	22	4
77.	Pachanapalle	488	135	353	35	10	20	306	0	1	80	36
Gudipala Mandal												
78.	Ramapuram	1315	1066	249	272	9	521	132	23	5	250	103
79.	Mogalarapalle	1055	1018	37	254	10	477	19	8	0	279	8
80.	Cheelapalle	772	759	13	191	4	440	5	5	0	123	4
81.	Srirangampalle	494	462	32	127	6	187	3	10	1	138	22

Sl. No	Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers		Main	Marginal	Main	Marginal
					Main	Marginal	Main	Marginal				
82.	Muthukurpalle	106	84	22	50	13	17	8	6	0	11	1
83.	Kothapalle	1291	1202	89	192	0	641	61	30	0	339	28
84.	Papasamudram	715	458	257	186	64	154	180	7	2	111	11
85.	Chittapara	1103	1013	90	373	10	538	75	8	0	94	5
86.	Gudipala	1419	1249	170	360	17	699	107	3	4	187	42
87.	Vasanthapuram	385	355	30	104	6	103	16	11	4	137	4
88.	Basavapalle	778	624	154	111	10	310	113	32	1	171	30
Gangadhara Nellore Mandal												
89.	Chinnavepanjeri	831	779	52	325	16	243	15	16	0	195	21
90.	Mukkelathuru	1162	1013	149	243	78	342	22	11	3	417	46
91.	Mahadevamangalam	898	766	132	240	53	171	28	53	10	302	41
92.	Tungundram	2381	2247	134	392	23	699	32	399	33	757	46
93.	Kadapagunta	450	423	27	44	0	245	25	4	0	130	2
94.	Atmakur	252	231	21	40	20	93	0	5	1	93	0
95.	Errabodireddipalle	99	96	3	11	1	23	0	1	0	61	2
96.	Murthinayanipalle	618	563	55	66	7	232	24	4	4	261	20
97.	Ambodharapalle	755	497	258	147	15	316	224	5	9	29	10
98.	Pathapalem	452	373	79	86	6	91	52	9	0	187	21
99.	Pathavenkatapuram	391	254	137	45	0	63	95	2	0	144	42
100.	Ellapalle	119	89	30	72	1	7	13	2	2	8	14
101.	Bojjinayanipalle	214	206	8	45	0	95	0	0	0	66	8
102.	Kothavenkatapuram	683	285	398	147	85	35	118	0	2	103	193
Palasamudram Mandal												
103.	Amudala	1081	1050	31	370	0	505	26	2	1	173	4
104.	Kaverirajupuram	142	132	10	50	0	44	10	2	0	36	0

Sl. No	Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers		Main	Marginal	Main	Marginal
					Main	Marginal	Main	Marginal				
105.	Amudalaputhur	123	121	2	61	1	23	0	0	0	37	1
106.	Ramakrishnapuram	547	399	148	277	8	64	133	6	3	52	4
	Total	62919	49849	13070	12354	1104	17003	7055	2031	952	18461	3958

(Source: Census 2011)

3.11.5 Educational Infrastructure within study area

The district has good primary and secondary education infrastructure in urban and rural areas. The people around the study area have well connected to educational infrastructures. The educational facilities in the study area are summarized in **Table 3-30**.

Table 3-30 Details of Education facilities within study area

S. No	Type of School	Numbers	
		0-5 km	5-10 km
1	Government Pre-Primary school	25	186
2	Private Pre-Primary school	29	200
3	Government Primary school	15	118
4	Private Primary school	29	195
5	Government Middle school	22	161
6	Private Middle school	29	199
7	Government Secondary school	27	190
8	Private Secondary school	29	205
9	Government Senior Secondary school	29	208
10	Private Senior Secondary school	30	213

(Source: Census 2011)

The following **Table 3-31** shows the literates population and the percentage within the study area

Table 3-31 Literates population and the percentage within the study area

Sl. No	Name	Total Literates	Literates Male	Literates Female	Illiterates Population	Illiterates Male	Illiterates Female
0-5 km							
Vellore District							
Katpadi Taluk							
1.	Thengal	1143	582	561	443	177	266
2.	Paramasathu	1040	578	462	544	203	341
3.	Madandakuppam	850	492	358	510	190	320
4.	Gollapalli	1104	605	499	474	169	305
5.	Ammavaripalle	776	386	390	209	69	140
6.	Mahimandalam	3170	1749	1421	1400	494	906
7.	Perumalkuppam	540	307	233	365	143	222
8.	Erukkambattu	761	405	356	375	138	237
Chittoor District							
Chittoor Mandal							
9.	Settiappam Thangal	155	79	76	60	21	39
10.	S.Venkatapuram	676	374	302	254	96	158
11.	Kurchivedu	278	150	128	95	37	58
12.	Alukurupalle	209	119	90	107	49	58
13.	Venkatapuram	79	45	34	47	19	28
Gudipala Mandal							
14.	Gollapalle	246	150	96	157	43	114
15.	Naragallu	1341	728	613	600	240	360
16.	Adilakshmbamba Puram	444	238	206	148	64	84
17.	Cheruvu Mundara Khandriga	254	136	118	141	65	76
18.	Kaidugani Khandriga	650	350	300	350	144	206

Sl. No	Name	Total Literates	Literates Male	Literates Female	Illiterates Population	Illiterates Male	Illiterates Female
19.	Ramapuram	1576	892	684	905	337	568
20.	Krishna Jammapuram	133	73	60	35	15	20
21.	Pasumanda	426	238	188	139	47	92
22.	Thimmaiahpalle	666	357	309	168	50	118
23.	Ragimanupatteda	59	31	28	20	7	13
24.	Venkata Lakshmamba Puram	93	51	42	25	3	22
25.	Bandarlapalle	61	31	30	40	16	24
26.	Kuppiganipalle	725	377	348	257	93	164
27.	Dakshina Brahmana Palle	1070	570	500	309	110	199
28.	Marakalakuppam	957	524	433	413	160	253
29.	Bomma Samudram	3159	1697	1462	1400	542	858
30.	Nangamangalam	1842	938	904	588	250	338
31.	Mandi Krishnapuram	1323	680	643	452	205	247
Gangadhara Nellore Mandal							
32.	Garigalapalle	282	147	135	100	38	62
5-10 km							
Vellore District							
Katpadi Taluk							
33.	Balekuppam	1385	770	615	593	225	368
34.	Kondareddipalli	125	67	58	36	12	24
35.	Ponnai	7357	4034	3323	2833	1070	1763
36.	Keeraiathu	2092	1165	927	1270	501	769
37.	Vallimalai	792	457	335	365	132	233
38.	Melpadi	4006	2269	1737	1761	641	1120
39.	Mutharasikuppam	1354	705	649	455	163	292
40.	Vinnampalli	2461	1320	1141	1031	393	638
41.	Kodukkanthangal	1676	934	742	890	305	585
42.	Elayanellore	1811	990	821	857	316	541

Sl. No	Name	Total Literates	Literates Male	Literates Female	Illiterates Population	Illiterates Male	Illiterates Female
43.	Thenpalli	1212	645	567	336	116	220
44.	Veppalai	1210	687	523	616	223	393
45.	Sripadanallore	514	253	261	149	56	93
46.	Eranthangal	1489	795	694	648	234	414
47.	Oddanthangal	899	470	429	300	109	191
48.	Vandaranthangal	5196	2707	2489	1750	667	1083
49.	Karigiri	3675	1962	1713	1510	570	940
50.	Kandipedu	2178	1127	1051	616	232	384
51.	Dharapadavedu	2543	1280	1263	740	270	470
Walajah Taluk							
52.	Vasur	1320	768	552	509	145	364
53.	Palleri	507	299	208	325	131	194
54.	Kondakuppam	2006	1135	871	909	317	592
55.	Thagarakuppam	1589	905	684	1221	492	729
Thiruvallur District							
Pallipattu Taluk							
56.	Paivalasa	1444	834	610	922	383	539
57.	Vediyangadu	3090	1762	1328	1578	610	968
58.	Venugopalapuram	166	103	63	94	27	67
Chittoor District							
Chittoor Taluk							
59.	Diguvamasapalle	2593	1417	1176	1262	486	776
60.	Ayanavedu	156	87	69	54	32	22
61.	Muthukuru	1015	525	490	552	214	338
62.	Anagallu	461	253	208	291	127	164
63.	Paluru	85	50	35	47	22	25
64.	Bakara Narasinga Rayani Peta	870	422	448	277	111	166
65.	Arathala	571	312	259	256	109	147

Sl. No	Name	Total Literates	Literates Male	Literates Female	Illiterates Population	Illiterates Male	Illiterates Female
66.	Bandapalle	459	268	191	194	74	120
67.	Krishnapuram	96	53	43	25	12	13
68.	Gollapalle	109	62	47	69	22	47
69.	Guvvakallu	468	250	218	198	81	117
70.	Mapakshi	237	129	108	88	32	56
71.	Siddampalle	588	348	240	196	80	116
72.	Narigapalle	721	387	334	416	165	251
73.	Lakshmambapuram	836	472	364	467	186	281
74.	Varadarajulapalle	98	55	43	32	6	26
75.	Thalambedu	1768	994	774	1004	396	608
76.	Ananthapuram	881	492	389	324	148	176
77.	Pachanapalle	855	476	379	386	161	225
Gudipala Mandal							
78.	Ramapuram	1843	1052	791	918	349	569
79.	Mogaralapalle	1793	1014	779	673	250	423
80.	Cheelapalle	1580	867	713	538	213	325
81.	Srirangampalle	701	413	288	267	106	161
82.	Muthukurpalle	153	84	69	57	22	35
83.	Kothapalle	1957	1044	913	765	301	464
84.	Papasamudram	1080	586	494	538	198	340
85.	Chittapara	1459	816	643	855	337	518
86.	Gudipala	1893	1085	808	897	331	566
87.	Vasanthapuram	985	514	471	261	93	168
88.	Basavapalle	1479	768	711	449	153	296
Gangadhara Nellore Mandal							
89.	Chinnavepanjeri	1126	625	501	471	199	272
90.	Mukkelathuru	1633	900	733	719	283	436
91.	Mahadevamangalam	1192	684	508	624	246	378
92.	Tungundram	3326	1873	1453	1829	763	1066

Sl. No	Name	Total Literates	Literates Male	Literates Female	Illiterates Population	Illiterates Male	Illiterates Female
93.	Kadapagunta	809	447	362	478	194	284
94.	Atmakur	444	221	223	123	45	78
95.	Errabodireddipalle	201	123	78	83	34	49
96.	Murthinayanipalle	827	445	382	388	183	205
97.	Ambodharapalle	921	519	402	389	147	242
98.	Pathapalem	832	484	348	371	145	226
99.	Pathavenkatapuram	560	318	242	201	73	128
100.	Ellapalle	383	210	173	323	139	184
101.	Bojginayanipalle	407	227	180	188	71	117
102.	Kothavenkatapuram	965	547	418	481	208	273
Palasamudram Mandal							
103.	Amudala	1200	687	513	794	318	476
104.	Kaverirajapuram	210	112	98	80	34	46
105.	Amudalaputhur	272	145	127	150	64	86
106.	Ramakrishnapuram	717	397	320	349	133	216
	Total	122000	66781	55219	53841	20670	33171

(Source: Census 2011)

3.11.6 Health facility within the study area

The majority of people visit nearby Hospitals/health services provided by the Government. The area has got good public health facilities at easily reachable distances. There was no major health issues reported in our survey. Even for any minor ailments they contact medical facilities immediately as it is very accessible to them. The local transport facilities and the communication facilities are the main reasons to get immediate medical attention. The incidents of institutional delivery are high due to awareness, education, economic development, proximity to health delivery system. The Infant mortality rate and the maternal mortality rate have significantly reduced. The health facilities within the study area are given in **Table 3-32**.

Table 3-32 Health facility within the study area

Sl.No	Type	Numbers	
		0-5 km	5-10 km
1	Community health centre	0	2
2	Primary health centre	1	10
3	Primary health sub-centre	4	41
4	Maternity and Child Welfare Centre	0	3
5	TB hospital/Clinic	10	3
6	Hospital Allopathic	0	0
7	Hospital Alternative Medicine	0	0
8	Dispensary Health Centre	0	4
9	Veterinary hospital	0	8
10	Mobile health clinic	0	50
11	Family Welfare Centre	0	3

(Source: Census 2011)

3.11.7 Summary

The Socioeconomic profile of the study area shows that the majority of people in the study area work in non-agricultural sector, however in rural area majority of the people in the rural area depends on agricultural sector. They have good educational infrastructures and the people in the study area are well connected to the educational infrastructures. The average literacy rate of the study area is 69.38%. The people in the study area are well connected to Government primary health centres and Primary health sub-centres shows the socio-economic indicators within the study area given in **Table 3-33**.

Table 3-33 Summaries of Socio-economic indicators within the study area

S.No	Particulars	Study area	Unit
1.	Number of villages in the Study Area	106	Nos.
2.	Total Households	42859	Nos.
3.	Total Population	175841	Nos.
4.	Children Population (<6 Years Old)	17560	Nos.

5.	SC Population	50512	Nos.
6.	ST Population	3035	Nos.
7.	Total Working Population	80207	Nos.
8.	Main Workers	64013	Nos.
9.	Marginal Workers	16194	Nos.
10.	Cultivators	17710	Nos.
11.	Agricultural labours	31973	Nos.
12.	Household Industries	3413	Nos.
13.	Other Workers	27113	Nos.
14.	Literates	122000	Nos.

4 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The impacts due to mining operation and its mitigation measures adopted are detailed in this chapter. In general, the opencast mining operations cause environmental problems such as degradation of land, deteriorating air, water and soil quality, affecting the biological and socio-economic environment of the area, if adequate control measures are not taken to prevent/mitigate the adverse environmental impacts, these operations may cause irreversible damage to the eco-system.

The opencast mining operations involve development of benches, approach roads, haul roads, blasting, excavation and handling & transportation of materials. If adequate control measures are not taken to prevent/mitigate the adverse environmental impacts, these operations may cause environmental degradation and lead to irreversible damage to the ecosystem. Various environmental impacts, which have been identified due to the mining operations proposed project, are discussed in the following sections. The environmental parameters most commonly affected by mining activities are:

- Air quality including Climate
- Noise levels and ground vibrations
- Water resources and quality
- Land use Pattern
- Soil quality
- Flora and Fauna
- Socio-Economic conditions
- Occupational Health.

4.1 Land Environment

The total extent of lease area is 166.92.0 Ha. The Land is classified as a Government land. The lease area exhibits hilly terrain ($\approx 445\text{mAMSL}$) topography covered by massive granite formation. Quarry lease was granted over an extent of 166.92.0Ha. In S.F.No.917(P)&921(P), Mahimandalam Village, Katpadi Taluk, Vellore District, Tamil Nadu state. Precise area communication letter was granted vide Lr.No.3865290/MME.1/2023-1, dated: 13.03.2023 for 20 years of mining. Precise area communication letter is enclosed as **Annexure-1**. The land use pattern is given in **Table 4-1**.

4.1.2 Land Degradation

The impact on land pattern in the area has been and will be due to the following:

- Land degradation due to disposal of large volume of waste materials.

- Creation of infrastructural facilities like office, rest shelter, first-aid centre and other service facilities.
- Exposure of topsoil to wind and water erosion.

Table 4-1 Land Use Pattern of the lease area

S. No	Description	Present Area (Ha)	Area to be required during the mining plan (Ha)	Area at the end of the quarrying period (Ha)
1	Mining	9.58.5	2.35.5	26.64.0
2	Waste Dump	6.46.0	1.75.0	75.38.0
3	Office Infrastructure	0.05.0	-	0.05.0
4	Mine Approach Road	3.40.0	-	1.26.5
5	Village Road	0.01.0	-	0.01.0
6	Afforestation	2.15.0	0.10.0	4.37.0
7	Unutilized area	145.26.0	141.05.5	59.20.0
Total		166.92.0	145.26.0	166.92.0

4.1.3 Mitigation Measures

- Dust suppression on exposed areas using water tankers.
- Contour overburden dump to minimize erosion
- Plantation around service building, along road, in and around safety zone using native plant sapling.
- Compliance with mine decommissioning plan.
- The following precautions will be taken to reduce the risk of dump failure:
 - OB benches will be made of <10m height in each tier. Angle of repose of OB dump to be around 26°. Construction of toe wall around the OB dump.
 - Drainage control structures like garland drain to be made around OB dump area to avoid water flow during monsoon below the OB dump.
 - Leveling, grading and drainage arrangement for OB dumps.
 - The deeper working pits, after completion of mining /quarrying left as it is which would serve as water ponds/water reservoirs.
 - The quarried pits after the end of the life of lease will be fenced to prevent inherent entry of public and cattle.
 - Management plan for topsoil utilization and conservation.
 - Progressive year-wise green belt development inside.

4.2 Air Environment

The main source of air pollution is from open cast mining activities is dust generation from excavation of granite, movement of vehicles for transportation of product to consumers, drilling, loading and unloading operation and wind erosion of dumps and also gaseous emission due to

operation of diesel driven mining equipment. The sources of air emission are detailed below in **Table 4-2**.

Table 4-2 Sources of air pollution at quarry

S. No	Source of emission	Pollutant
1.	Excavation of Granite	PM
2.	Operation of diesel driven equipment	Gaseous emission
3.	Transportation of product	PM

The major air pollution sources from the mining operations are DG sets, mining activities like drilling, and transportation. The DG sets are provided with stacks of adequate height to disperse the emanating flue gases containing suspended particulate matter, oxides of Sulphur and nitrogen without affecting the ground level concentrations. The emissions mainly generated from the mining activities are Blasting, Drilling, Excavation, Loading, Unloading, and transportation etc. Machinery like compressors and jack hammers are used for Drilling.

4.2.1 Mitigation measures

- Use of dust aprons on drilling equipment and adopting wet drilling methods.
- Delay blasting under unfavorable wind and atmospheric conditions
- The production of blast fumes containing noxious gases will be reduced by the following methods:
 - Use of adequate booster/primer.
 - Proper stemming of the blast hole.
 - Development of greenbelt.

Table 4-3 Fugitive dust control in mine

S. No	Activities	Best practices
1	Drilling	➤ Drills should be provided with dust extractors (dry or wet system)
2	Blasting	<ul style="list-style-type: none"> ➤ Water spray before blasting ➤ Water spray on blasted material prior to transportation ➤ Use of control blasting technique
3	Transportation of mined material	<ul style="list-style-type: none"> ➤ Covering of the trucks/dumpers to avoid spillage ➤ Compacted haul road ➤ Speed control on vehicles ➤ Development of a green belt of suitable width on both sides of road, which acts as wind break and traps fugitive dust

Table 4-4 Dust control measures in quarry

S. No	Operation or source	Control options
1	Drilling	<ul style="list-style-type: none"> ➤ Liquid injection (water or water plus a wetting agent) ➤ Capturing and venting emissions to a control device.
2	Blasting	➤ Water spray before blasting

		<ul style="list-style-type: none"> ➤ Water spray on blasted material prior to transportation ➤ Use of control blasting technique
3	Loading	<ul style="list-style-type: none"> ➤ Water spray
4	Hauling (emissions from roads)	<ul style="list-style-type: none"> ➤ Water spray, treatment with surface agents, soil stabilization, paving, traffic control.

4.2.2 Meteorological Data

The meteorological data for three months, i.e. from **March 2023 to May 2023** was considered for the study. Data included for AERMET were daily wind speed, wind direction, temperature, relative humidity, air pressure, precipitation, and solar radiation recorded during the period. AERMET reformats meteorological data so that it can be used as input for AERMOD model. Meteorology considered for modeling is shown below.

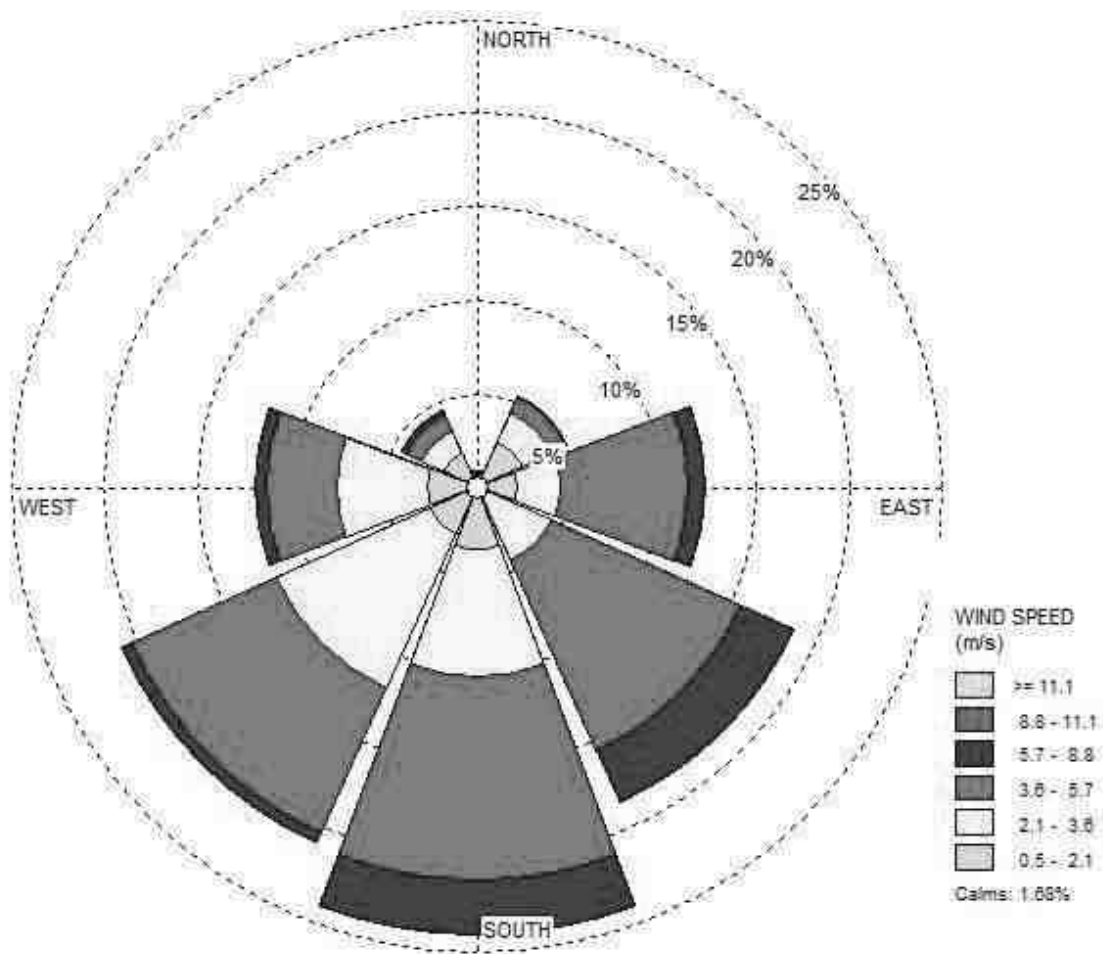


Figure 4-1 Wind rose diagram considered for dispersion modeling

4.2.3 AERMET Process

For the 3 phase AERMET processing of the meteorological data, specifications of the land use in the area are required to determine the terrain roughness for modeling. The land use was characterized for in and around the site. The surface characteristics for the site and surroundings were selected and used to calculate the Albedo, Bowen ratio and surface roughness parameter.

The meteorological data were processed in the AERMET software to generate wind flow pattern & to generate surface meteorological data and profile meteorological data in a prescribed format that can be fed to AERMOD for modeling.

4.2.4 AERMOD Process

AERMOD Software Version 8.0.5 was used for air dispersion modeling and is applicable to a wide range of buoyant or neutrally buoyant emissions up to a range of 50 km. In addition to more straight forward cases, AERMOD is also suitable for complex terrain and urban dispersion scenarios.

AERMOD is a steady-state plume model. In the Stable Boundary Layer (SBL), it assumes the concentration distribution to be Gaussian in both the vertical and horizontal. In the Convective Boundary Layer (CBL), the horizontal distribution is also assumed to be Gaussian, but the vertical distribution is described with a bi-Gaussian probability density function (pdf). This behavior of the concentration distributions in the CBL was demonstrated by Willis and Deardorff (1981) and Briggs (1993). Additionally, in the CBL, AERMOD treats “plume lofting,” whereby a portion of plume mass, released from a buoyant source, rises to and remains near the top of the boundary layer before becoming mixed into the CBL. AERMOD also tracks any plume mass that penetrates into the elevated stable layer, and then allows it to re-enter the boundary layer when and if appropriate. For sources in both the CBL and the SBL, AERMOD treats the enhancement of lateral dispersion resulting from plume meander. The emissions mainly generated from the mining activities are Blasting, Drilling, Scrapping, Excavation, Loading, Unloading, and transportation etc. Machinery like compressors and jack hammers are used for Drilling are estimated and used as inputs for the air dispersion modeling as shown in **Table 4.5 to Table 4.7**.

Maximum incremental value for SO₂, NO_x and PM are shown in **Figure 4.2 to Figure 4.6** and Top 10 highest Ground Level Concentration (GLC) obtained from modeling are given in **Table 4.10 to Table 4.14** respectively.

4.2.5 Emission Calculations

Each mining activity is a source of emission and the estimation of emissions depends on parameters such as meteorological, topographic conditions and material characteristics. It is necessary to calculate the qty of emissions for work or a source on site to the atmosphere. The following emission formulas are used to calculate the emission rate for the different emission source.

Table 4-5 Overview of the Source Parameters

S. NO	Description	Symbol	Quantity
1	Moisture Content (%)	m	1.64
2	Silt Content (%)	s	6
3	Production / Day (Tonn/Day)		53.16

4	Waste Dumping Area (Sq.Km)	a	0.0175
5	Open Pit Area (Sq.Km)	Aa	0.0235

Source:

Emission Estimation Technique Manual for Mining and Processing of Non-Metallic Minerals by NPI, Nov 1999

Determination of the emission rate from various opencast mining operations, S. K. CHAULYA*, M. K. CHAKRABORTY, et. Al. *Water, Air, and Soil Pollution 140: 21–55, 2002.*

Chaulya, S., 2006. Emission rate formulae for surface iron mining activities. *Environmental Modeling Assessment*, Issue 11, pp. 361-370.

EPA. August, 2004. Section 11.19.2, Crushed Stone Processing and Pulverized Mineral Processing. In: Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Fifth Edition, AP-42. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, North Carolina.

4.2.5.1 Emission dispersion models

Each mining activity is a source of emission and the estimation of emissions depends on parameters such as meteorological, topographic conditions and material characteristics. The emission factors for PM_{2.5}, which is particulate matter of 2.5µm or less in diameter, were not available in literature. Thus, PM_{2.5} emissions have been calculated considering an assumption that 60% of for PM₁₀ emissions contribute to PM_{2.5}.

Table 4-6 Emission from Mining Equipment's

Source	Fuel used	Stack Details					Emissions (g/s)		
		No of Stack	Height (m) AGL	Dia (m)	Temp (°C)	Exit Velocity (m/s)	PM ₁₀	SO ₂	NO _x
125 KVA DG	Diesel	1	3	0.3	180	10	5.81E-03	5.38E-03	8.16E-02

Table 4-7 Vehicular Source Emission details

Source	Emission (g/s)		
	PM ₁₀	PM _{2.5}	NO _x
4 Wheeler (1no.)	6.94E-05	4.17E-05	6.94E-04
Heavy Duty Vehicles (2 no.)	1.11E-04	6.67E-05	1.94E-02
Total	1.81E-04	1.08E-04	2.01E-02

Table 4-8 Emissions considered for mining

Activities	PM ₁₀ Emission rate	PM _{2.5} Emission rate
------------	--------------------------------	---------------------------------

Wet Drilling (g/s)	1.12E-06	6.70E-07
Haulage (g/s)	5.91E-05	3.54E-05
Waste Dumping (g/s)	2.48E-06	1.49E-06
Open Pit (g/s.m ²)	6.38E-07	3.83E-07

Table 4-9 Emission input for modelling

Activities	PM ₁₀	PM _{2.5}	SO ₂	NO _x
Line Source (Haul Road) (g/s)	5.91E-05	3.54E-05	-	-
Area Source (Open Pit) (g/s.m ²)	6.38E-07	3.83E-07	-	-
Area Source (Waste Dumping) (g/s)	2.48E-06	1.49E-06	-	-
Point Source (DG) (g/s)	5.81E-03	3.48E-03	5.38E-03	8.16E-02
Point Source (Drilling) (g/s)	1.12E-06	6.70E-07	-	-
Point Source (Vehicle)(g/s)	1.81E-04	1.08E-04	-	2.01E-02

Note:

a. Since emission factors are available for PM₁₀ the following assumptions are made for PM₁₀ and PM_{2.5} estimation

1. TSPM is considered as 5 times of PM₁₀
2. 60% of PM₁₀ is considered as PM_{2.5}

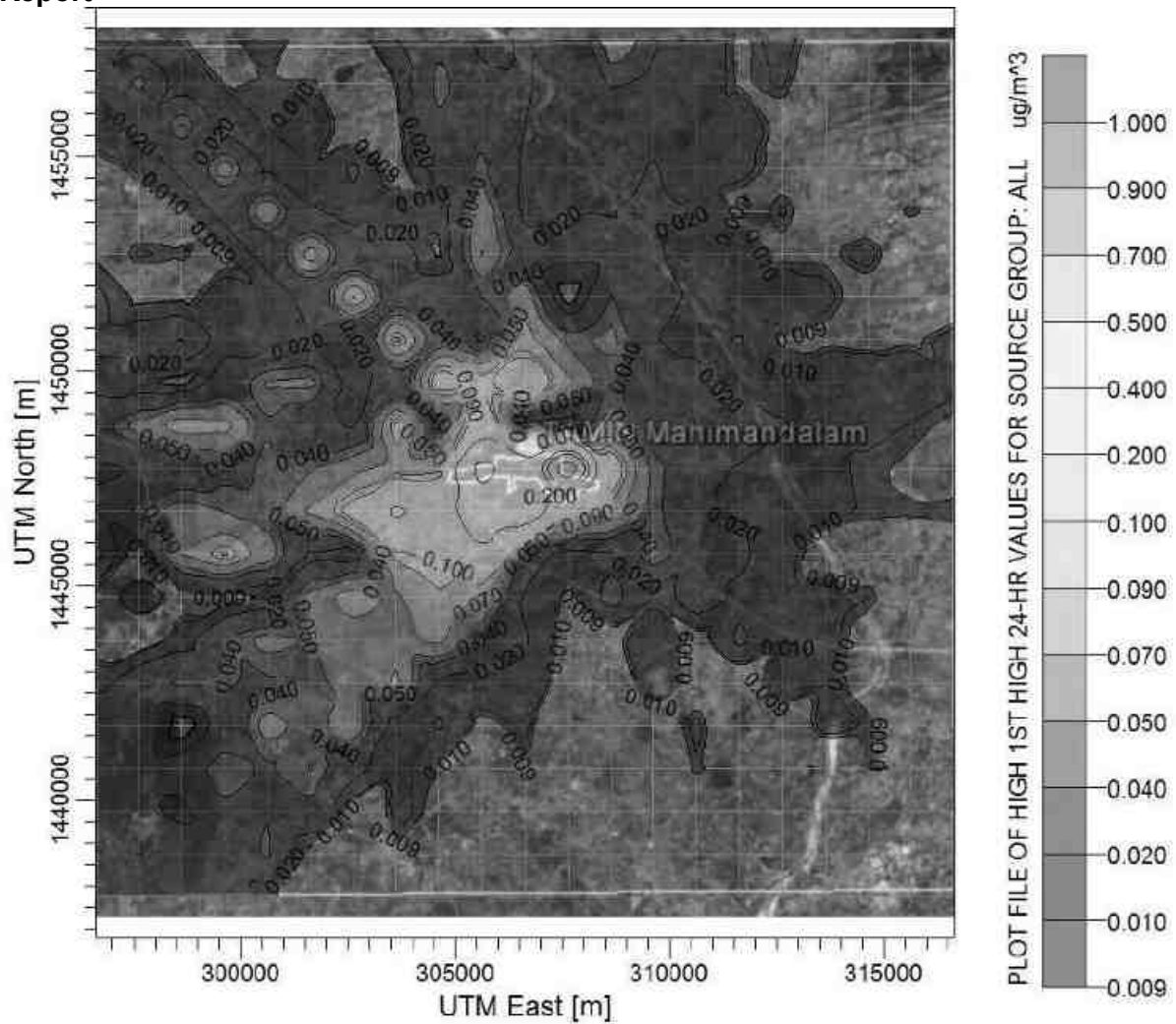


Figure 4-2 Predicted 24 Hrs GLC's of PM₁₀ within 10km radius of the study area

Table 4-10 Predicted Top 10 Highest Concentrations Particulate Matter PM₁₀

S.No	UTM coordinates (m)		Conc. (µg/m ³)	Distance from Centre of the project (km)	Direction from project Centre
	E	N			
1.	307627	1447737	3.61179	1.00	E
2.	305627	1447737	1.87516	1.00	W
3.	305627	1446737	1.21193	1.41	SW
4.	306627	1446737	1.11261	1.00	S
5.	306627	1447737	1.03707	Project Site	Project Site
6.	303627	1446737	0.84859	3.16	WSW
7.	305627	1445737	0.72677	2.23	SSW
8.	306627	1449737	0.6771	2.00	N
9.	304627	1446737	0.54436	2.23	WSW
10.	305627	1448737	0.49366	1.41	NW

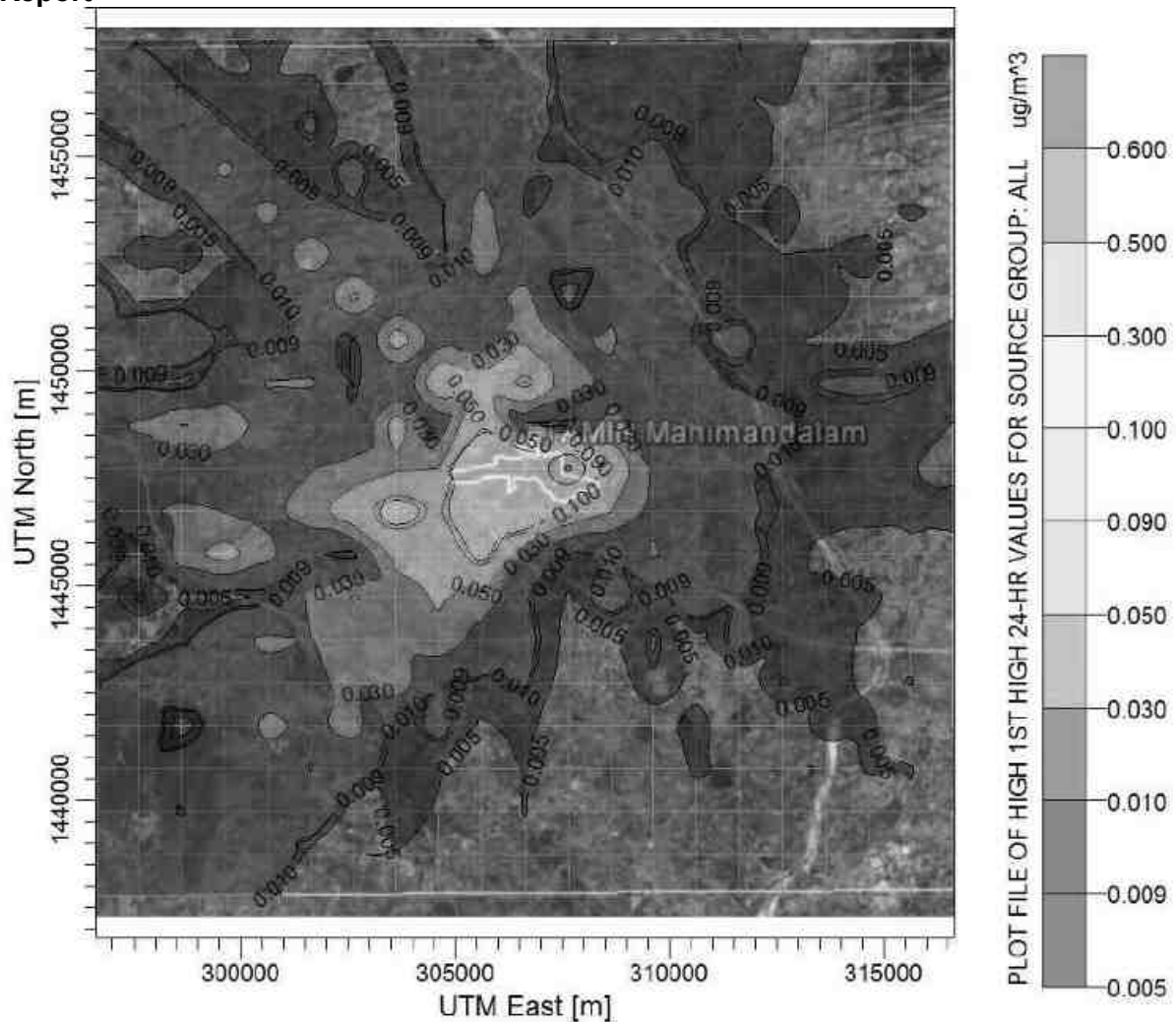


Figure 4-3 Predicted 24-Hrs GLC of Particulate matter $PM_{2.5}$ within 10 km radius of the study area

Table 4-11 Predicted Top 10 Highest Concentrations Particulate Matter $PM_{2.5}$

S.No	UTM coordinates (m)		Conc. ($\mu\text{g}/\text{m}^3$)	Distance from Centre of the project (km)	Direction from project Centre
	E	N			
1.	307627	1447737	2.16143	1.00	E
2.	305627	1447737	1.12217	1.00	W
3.	305627	1446737	0.72527	1.41	SW
4.	306627	1446737	0.66584	1.00	S
5.	306627	1447737	0.62063	Project Site	Project Site
6.	303627	1446737	0.50784	3.16	WSW
7.	305627	1445737	0.43493	2.23	SSW
8.	306627	1449737	0.4052	2.00	N
9.	304627	1446737	0.32577	2.23	WSW
10.	305627	1448737	0.29543	1.41	NW

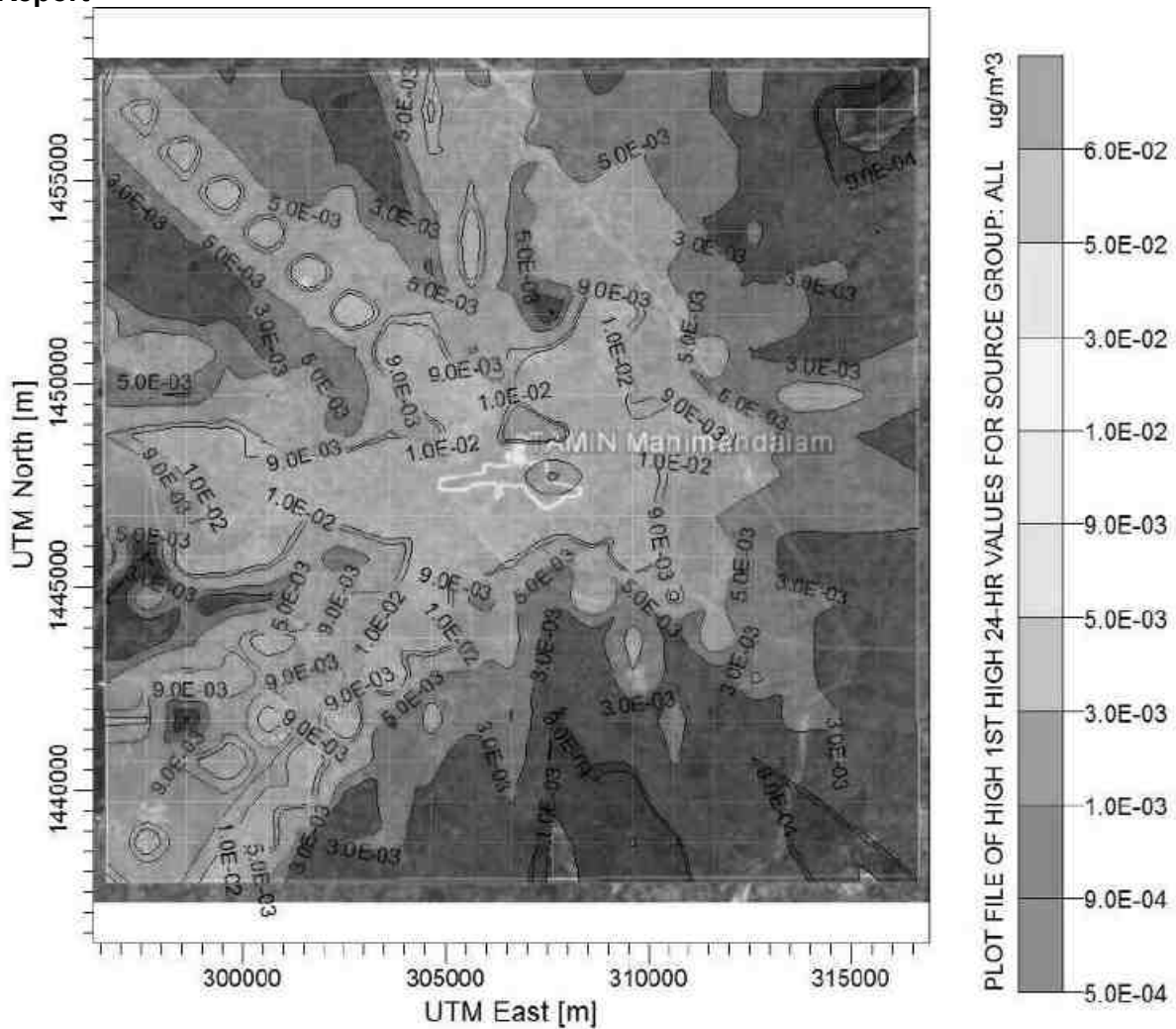


Figure 4-4 Predicted 24-Hrs' GLC's of SO₂ within 10 km Radius of the Study Area

Table 4-12 Predicted Top 10 Highest Concentrations of Sulphur Dioxide

S.NO	UTM coordinates (m)		Conc. (µg/m ³)	Distance from Centre of the project (km)	Direction from project Centre
	E	N			
1.	307627	1447737	0.05635	1.00	E
2.	308627	1447737	0.02911	2.00	E
3.	300627	1446737	0.02771	6.08	WSW
4.	304627	1447737	0.02698	2.00	W
5.	306627	1447737	0.02667	Project Site	Project Site
6.	306627	1446737	0.02417	1.00	S
7.	303627	1447737	0.02331	3.00	W
8.	308627	1446737	0.02265	2.23	ESE
9.	307627	1449737	0.02155	2.23	NNE
10.	305627	1445737	0.02112	2.23	SSW

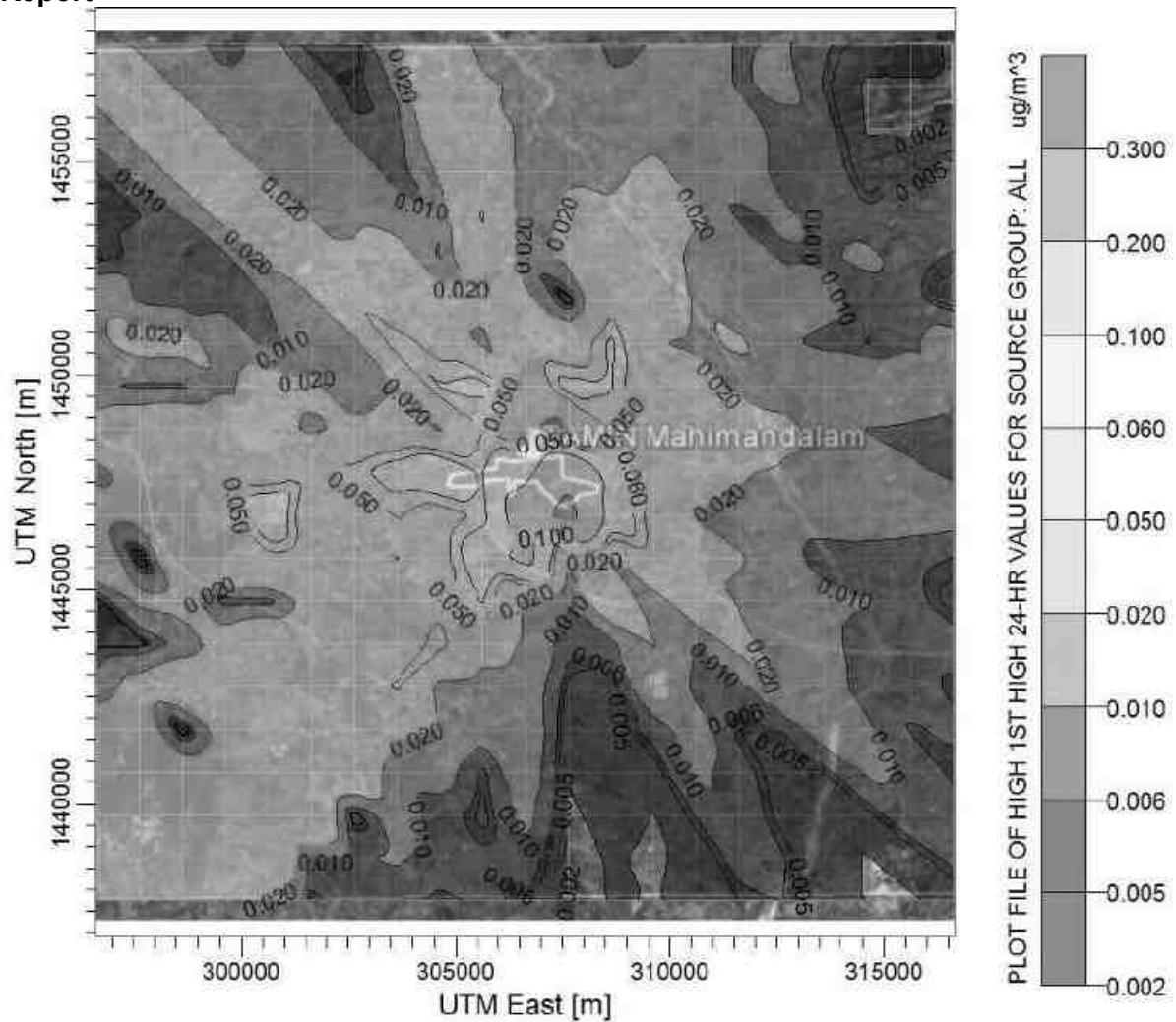


Figure 4-5 Predicted 24-Hrs' GLC's of NO_x within 10 km Radius of the Study Area

Table 4-13 Predicted Top 10 Highest Concentrations Nitrogen Oxide

S.NO	UTM coordinates (m)		Conc. (µg/m ³)	Distance from Centre of the project (km)	Direction from project Centre
	E	N			
1.	307627	1446737	0.23771	1.41	SE
2.	307627	1447737	0.17134	1.00	E
3.	306627	1446737	0.13793	1.00	S
4.	306627	1445737	0.11646	2.00	S
5.	308627	1447737	0.08821	2.00	E
6.	300627	1446737	0.08398	6.08	WSW
7.	304627	1447737	0.08397	2.00	W
8.	306627	1447737	0.08236	Project Site	Project Site
9.	308627	1446737	0.08176	2.23	ESE
10.	305627	1445737	0.07744	2.23	SSW

4.2.6 Conclusion

The total increase in concentrations above baseline status to estimate the percentage increase is summarized in the below **Table 4.14**.

Table 4-14 Total maximum GLCs from emissions

Pollutant	Max. Base Line Conc. ($\mu\text{g}/\text{m}^3$)	Estimated Incremental Conc. ($\mu\text{g}/\text{m}^3$)	Total Conc. ($\mu\text{g}/\text{m}^3$)	NAAQ standard
PM ₁₀	75.92	0.90	76.82	100
PM _{2.5}	45.25	0.53	45.78	60
SO ₂	15.32	0.05	15.37	80
NO _x	30.63	0.23	30.86	80

4.2.7 Impacts due to Transportation

The Granite is transported to consumer directly as per buyer's requirement. The granite will be transported through existing road by tippers and approx. no. of trips required is 2 times per week. This minimum trip does not create impact on existing transportation. The vehicular movement for the proposed project is given in Table 4.15.

Table 4-15 Existing & proposed vehicular movement per Hour (Peak Hour) SH-61

S. No	Type of Vehicle	Existing vehicles	Existing PCU	Proposed vehicles	Proposed PCU	Total vehicles after project implementation	PCU Factors IRC (SP 41)	Total PCU after project implementation
1	2 wheeler	97	72.75	7	5.25	104	0.75	78
2	3 wheelers	22	26.4	0	0	22	1.2	26.4
3	4 wheelers/ cars	59	59	2	2	61	1	61
4	truck/Lorry	43	159.1	11	40.7	54	3.7	199.8
5	agricultural tractor	27	135	0	0	27	5	135
6	light emission vehicle	4	5.6	0	0	4	1.4	5.6
	Total	252	457.85 0	20	47.95	272		505.8

Table 4-16 Traffic Volume after Implementation of the Project

For the Road	Volume of Traffic	Volume (V)	Road Capacity (C)	V/C Ratio	LOS Category*	Traffic Classification
Existing	252	457.85	1500	0.31	"A"	Free Flow Traffic
After implementation	272	505.8	1500	0.34	"A"	Free Flow Traffic

*LOS (Level of Service) categories are A-Free Flow, B- Reasonably Free Flow, C-Stable Flow, D- Approaching unstable flow, E- Unstable flow, F- Forced or breakdown flow

Due to propose project there will be slight increment in the vehicle movement but the level of service (LOS) anticipated will be Free Flow.

4.2.7.1 Mitigation Measures

The increment in the dust emissions will be mainly due to transportation activity. Therefore, emissions due to mineral handling during mining operation are not much and restricted to the lease area only. Proper mitigation measures are practiced during mining activities to control air pollution load below the prescribed limits are as follows:

- Regular water sprinkling on haul and access roads.
- Watering of haul roads and other roads at regular intervals
- Provision of green belt by vegetation for trapping dust.
- Greenbelt development along the haul roads, dumps and along the boundaries of the lease area.
- Utmost care will be taken to prevent spillage of sand and stone from the trucks.

4.3 Water Environment

The existing water environment quality has been studied and the study results are discussed in **Section 3.9 of Chapter-III**, which show that generally the water quality in the area is well within statutory standards.

The major sources of water pollution due to this quarry operation will be as below:

- Domestic sewage from the mine.
- Deterioration in surface / ground water quality of receiving body.
- Changes to hydraulic regime.

4.3.3 Wastewater Generation

There is no process effluent generation. The domestic sewage of 0.3 KLD will be disposed through septic tank followed by soakpit.

4.3.4 Mitigation Measures

4.3.4.1 Surface Water Pollution Control Measures

- A safety distance of 50m has been provided in the Southern side of the applied area and running through Patta lands of the Mahimandalam village.
- Construction of garland drains of suitable size around mine area and dumps to prevent rain water descent into active mine areas.

- During monsoon season, the rain water will be collected by natural slope of area to water fed tank of the mine and it will be utilized for dust suppression and greenbelt development.
- The dump tops will be provided with inner slopes to control water flow to prevent erosion washouts. The dumps tops and slopes of in active areas will be covered with grasses, shrubs, mulching, etc, to prevent erosion, till final backfilling of dumps into mined out areas.
- Retaining walls of adequate dimensions will be provided at the top of dumps and the unstable OB benches within the mine to prevent wash off from dumps and sliding of material from benches. This will help in preventing silting of water drains/channels
- The water channels/drains carrying the rain water from the mine will be provided with baffles and settling pits to arrest the suspended solids, if any, present in this water
- The worked out slopes will be stabilized by planting appropriate shrub/grass species on the slopes.
- The mine water will be regularly tested for presence of any undesirable elements and appropriate measures will be taken in case any element is found exceeding the limits prescribed by CPCB.

4.3.4.2 Ground Water Pollution Control Measures

- The domestic sewage from the toilets will be routed to septic tanks.
- Regular monitoring of water levels and quality in the existing open wells and bore well in the vicinity will be carried out.

4.3.4.3 Rain Water Harvesting

- The rainwater will be diverted towards the middle of the mine to prevent water entering the mine working. The rainwater flows will also contain fines both from surface and waste dumps during seasonal flows. As such, it is proposed to have structures in such a way to act as settling pond and also for rainwater harvesting.
- Construct barriers at suitable intervals along the path of the drains.
- Divert the water to de-silting cum rainwater harvesting pond in the mine area.
- Provide necessary overflow arrangement to maintain the natural drainage system.

4.3.4.4 Drainage pattern and Hydrogeology

- Catchment area inside the mine will be affected.

4.3.4.5 Mitigation measures

- The study has recommended new alignment in line with upstream drainage slope of the area to facilitate smooth entry of water into the diversion channel and ultimate discharge of water into the original stream. No reduction in surface run-off is envisaged.

4.4 Impact of Noise / Vibrations & Mitigation Measures

4.4.3 Impact of Noise on Working Environment

The main sources of noise in the mine are as follows:

- Transportation vehicles
- Loading & unloading of minerals.
- Drilling

4.4.4 Noise due to Drilling, Excavation and Transportation

The noise levels in the working environment will be maintained within the standards prescribed by Occupational Safety and Health Administration (OSHA). These standards were established with the emphasis on reducing the hearing loss. The permissible limits, as laid down by OSHA, are presented in **Table 4.17**.

Table 4-17 Permissible Exposure in Cases of Continuous Noise (OSHA, Govt. of India)

S. No	Sound Level (dB A)	Continuous Duration (Hours)
1	85	8
2	88	4
3	91	2
4	94	1
5	97	0.5
6	100	0.25

4.4.5 Noise Due to Blasting

Blasting activities are involved in this Quarry as green belt will be developed around the mine which restricts the propagation of noise. The main source of noise in quarrying is due to usage of machinery like excavators, mining tippers and compressors and diesel generators.

Following mitigation measures should be taken to control noise pollution:

- Wherever the noise levels exceed 85 dB (A), workers should be provided with earmuffs, ear plugs etc.
- All vehicles and machinery will be properly lubricated and maintained regularly.
- Speed of the Vehicles entering and leaving the quarrying lease will be limited to 25 kmph.
- Unnecessary use of horns by the drivers of the vehicles shall be avoided.

Summary:

The Noise level ranges within the limit for the proposed mining activity. The noise range for various mining activities within the site, at the site boundary and within 1km radius is given in the **Table 4.22**.

4.4.5.1 Mitigate Measures

- Controlled blasting with proper spacing, burden and stemming will be maintained
- No secondary blasting.
- Minimum quantity of detonating fuse will be consumed by using alternatively Excel non-electrical initiation system.
- The blasting will be carried out during favourable atmospheric condition and less human activity timings.
- The prime movers/diesel engines will be properly maintained.
- Provision of sound insulated chambers for the workers deployed on machines.
- Proper designing of plant & machinery by providing inbuilt mechanism like silencers, mufflers and enclosures for noise generating parts and shock absorbing pads at the foundation of vibrating equipment.
- Greenbelts around infrastructure site, service building area and township.
- Trees will be planted on both sides of haul roads.
- Personal Protective Equipment (PPE) like ear muffs/ear plugs will be provided to the operators.

4.4.6 Impact of Vibration

Blasting activities are involved in Granite Quarry operations. The vibration during the moment of machinery will be minimal for a short span that will be well within the prescribed limits. Proposed Peripheral green belt will be developed in 7.5m safety zone around the quarry. This will mitigate the Vibration.

4.4.6.1 Mitigation Measures

- Proper quantity of explosive, suitable stemming materials and appropriate delay system are to be adopted for safe blasting.
- Safe blasting zones are kept around the periphery of the quarry.
- Overcharging will be avoided. The charge per delay will be minimized and preferably more number of delays will be used per blasts.

4.5 Impact on Human Settlement

There are no monuments or places of worships in mine area. Ground vibration and noise pollution is maintained minimal and confined to the mine area. The quality of water both surface and ground water is good and all parameters of drinking water are as per IS standards. Water quality analysis will be carried out at periodical intervals during post project monitoring.

The PM, NO_x and SO₂ have been observed to be below the prescribed limit. Noise levels have also been found to be below the permissible limits at all the locations. Further, the noise generated in the lease area will get attenuated due to plantation and green belt all around the lease area. As preventive

measures, greenbelt development around the mine lease area will be further strengthening for control of air emission to environment.

- All the employees when inducted will be medically examined. Further, they will also be medically examined at periodical interval.

4.6 Biological Environment

4.6.3 Mining activities and their impact on biodiversity

Table 4-18 Impacts on Biodiversity

S. No	Activity	Examples of aspects	Examples of biodiversity impact
1	Extraction	Land clearing	Loss of habitat, introduction of plant diseases, Siltation of water courses
2	Blasting, Digging and hauling	Dust, noise ,vibration, water pollution	Disruption of water courses ,impacts on aquatic ecosystems due to changes in hydrology and water quality
3	Waste dumping	Clearing, water and soil pollution	Loss of habitat, soil and water contamination, sedimentation.
4	Air emissions	Air pollution	Loss of habitat or species
5	Waste disposal	Oil and water pollution	Encouragement of pests, disease transfer, contamination of groundwater and soil
6	Building power lines	Land clearing	Loss or fragmentation of habitat
7	Provision of accommodation	Land clearing, soil and water pollution, waste generation	Loss of habitat, sewage disposal and disease impacts
8	Access roads	Land clearing	Habitat loss or fragmentation, water logging upslope and drainage shadows down slope
9	Population growth	Land clearing or increased hunting	Loss of habitat or species, stress on local and regional resources, pest introduction, clearing
10	Water supply (potable or industrial)	Water abstraction or mine dewatering	Loss or changes in habitat or species composition

4.6.4 Existing Biological Scenario

- There will not be any adverse impact due to mining operations in this lease since only small production is involved from this lease and there will not be any major polluting source from the mining operations. Besides, all necessary mitigation measures will be implemented.
- There is no perennial water body near the site and there will be no discharge of effluent from the mine.
- In the Quarry area or its proximate areas there is no wetland and the natural flow of water not

available.

- There is no rare or endangered species.
- There are no wild animals in the area. In the post mining stage, proper fencing will be carried in the mined out area to prevent fall of animals in the mine pits.
- There are no any wetlands, fish breeding grounds, marine ecology nearby the quarry area, which will be affected due to this project.
- No such significantly important medicinal value species within both the ML areas and its nearby region.
- There are no any wetlands, fish breeding grounds, marine ecology nearby the quarry area, which will be affected due to this project.

4.6.4.1 Mitigate Measures

To reduce the adverse effects on flora/fauna status that are found in project area due to deposition of dust generating from mining operations, water sprinkling and water spraying systems will be ensured in all dust prone areas to arrest dust generation.

4.6.5 Flora and Fauna

Flora/Vegetation in the Study Area

Sl.No.	Species	Family	Common Name	Habit	IUCN
1	<i>Abrus precatorius</i>	Fabaceae	Kundumani	Shrub	NA
2	<i>Abutilon indicum</i>	Malvaceae	Perun thuthi	Shrub	NA
3	<i>Acacia nilotica</i>	Mimosaceae	Karuvelam	Tree	LC
4	<i>Acacia planifrons</i>	Mimosaceae	Kodai velam	Tree	NA
5	<i>Acalypha indica</i>	Euphorbiaceae	Kuppaimeni	Herb	NA
6	<i>Acanthospermum hispidum</i>	Compositae	--	Herb	NA
7	<i>Achyranthes aspera</i>	Amaranthaceae	Nayurivi	Herb	NA
8	<i>Aegle marmelos</i>	Rutaceae	Vilvam	Tree	NA
9	<i>Aerva lanata</i>	Amaranthaceae	Sirupeelai	Shrub	NA
10	<i>Aerva persica</i>	Amaranthaceae	Perumpeelai	Shrub	NA
11	<i>Aeschynomene americana</i>	Fabaceae	--	Herb	NA
12	<i>Aeschynomene aspera</i>	Fabaceae	Thakkai	Shrub	NA
13	<i>Ageratum conyzoides</i>	Compositae	Poom pillu	Herb	NA
14	<i>Alloteropsiscimicina</i>	Poaceae	--	Grass	NA
15	<i>Alternanthera sessilis</i>	Amaranthaceae	Ponnanganni	Herb	NA
16	<i>Anisomeles indica</i>	Labiatae	--	Herb	NA
17	<i>Annona squamosa</i>	Annonaceae	Seetha	Tree	NA
18	<i>Arachis hypogaea</i>	Fabaceae	Verkadalai	Herb	NA
19	<i>Argemone mexicana</i>	Papaveraceae	Braman Thandu	Herb	NA
20	<i>Aristida adscensionis</i>	Poaceae	--	Grass	NA
21	<i>Aristida hystrix</i>	Poaceae	--	Grass	NA
22	<i>Aristolochiabracteolata</i>	Aristolochiaceae	Aduthinnappalai	Herb	NA

23	<i>Barleria acuminata</i>	Acanthaceae	Vellai kurinji	Shrub	NA
24	<i>Barlerialongiflora</i>	Acanthaceae	--	Shrub	NA
25	<i>Barlerianoctiflora</i>	Acanthaceae	Barleria	Shrub	NA
26	<i>Boerhaviadiffusa</i>	Nyctaginaceae	Mookarattai	Herb	NA
27	<i>Boerhaviaerecta</i>	Nyctaginaceae	Seemaimookarattai	Herb	NA
28	<i>Carica papaya</i>	Caricaceae	Pappali	Tree	NA
29	<i>Carissa carandas</i>	Apocynaceae	Kalaa, Perun kala	Shrub	NA
30	<i>Cassia fistula</i>	Caesalpiniaceae	Kondrai	Tree	NA
31	<i>Celosia argentea</i>	Amaranthaceae	Pannaikerai	Herb	NA
32	<i>Cissus quadrangularis</i>	Vitaceae	Pirandai	Shrub	NA
33	<i>Citrullus colocynthis</i>	Cucurbitaceae	Peikkumatti	Herb	NA
34	<i>Citrus aurantifolia</i>	Rutaceae	Elumichai	Tree	NA
35	<i>Cleome viscosa</i>	Capparidaceae	Nai kadugu	Herb	NA
36	<i>Coccinia grandis</i>	Cucurbitaceae	Kovai	Climber	NA
37	<i>Croton bonplandianum</i>	Euphorbiaceae	Rail poondu	Herb	NA
38	<i>Cucumis sativus</i>	Cucurbitaceae	Vellarikkaai	Climber	NA
39	<i>Cyperus bulbosus</i>	Cyperaceae	—	Sedge	NA
40	<i>Ecliptaprostrata</i>	Compositae	Karisaalai	Herb	NA
41	<i>Eleocharis acutangula</i>	Cyperaceae		Sedge	NA
42	<i>Eragrostistenella</i>	Poaceae		Grass	NA
43	<i>Euphorbia antiquorum</i>	Euphorbiaceae	Sadura-kalli	Tree	NA
44	<i>Euphorbia hirta</i>	Euphorbiaceae	Ammanpacharisi	Herb	NA
45	<i>Euphorbia indica</i>	Euphorbiaceae	Ammanpacharisi	Herb	NA
46	<i>Evolvulusalsinoides</i>	Convolvulaceae	Vishnukarandi	Herb	NA
47	<i>Ficus benghalensis</i>	Moraceae	Aala maram	Tree	NA
48	<i>Ficus religiosa</i>	Moraceae	Arasu	Tree	NA
49	<i>Fimbristylis ovata</i>	Cyperaceae		Sedge	NA
50	<i>Glinuslotoides</i>	Molluginaceae	Siruserupadai	Herb	NA
51	<i>Gynandropsisgynandra</i>	Capparidaceae	Nal vaelai, Vaelai	Herb	NA
52	<i>Hedyotis aspera</i>	Rubiaceae		Herb	NA
53	<i>Heliotropium indicum</i>	Boraginaceae	Thaelkodukku	Herb	NA
54	<i>Hibiscus surattensis</i>	Malvaceae		Undershrub	NA
55	<i>Hybanthusenneaspermus</i>	Violaceae	Orilaithamarai	Herb	NA
56	<i>Hygrophilaschulli</i>	Acanthaceae	Neermulli	Herb	NA
57	<i>Hyptissuaveolens</i>	Labiatae		Shrub	NA
58	<i>Indigofera aspalathoides</i>	Fabaceae	Sivanaarvaambu	Herb	NA
59	<i>Indigofera linnaei</i>	Fabaceae		Herb	NA
60	<i>Indigofera tinctoria</i>	Fabaceae	Avuri, Neeli	Herb	NA
61	<i>Ipomoea pes-caprae</i>	Convolvulaceae	Kudhirai Kulambu	Creeper	NA
62	<i>Jasminum sambac</i>	Oleaceae	Peru malli	Climbing Shrub	NA
63	<i>Jatropha curcas</i>	Euphorbiaceae	Kaatu-amanakku	Shrub	NA
64	<i>Jatropha gossypifolia</i>	Euphorbiaceae	Kaatu-amanakku	Shrub	NA
65	<i>Justicia adhatoda</i>	Acanthaceae	Adathodai	Shrub	NA
66	<i>Justicia simplex</i>	Acanthaceae		Herb	NA

67	<i>Kylinga bulbosa</i>	Cyperaceae		Sedge	NA
68	<i>Lagenaria siceraria</i>	Cucurbitaceae	Surakkaai	Climber	NA
69	<i>Lantana camara</i>	Verbenaceae	Unnichedi	Shrub	NA
70	<i>Leucaena leucocephala</i>	Mimosaceae	Soundil	Tree	NA
71	<i>Leucas aspera</i>	Labiatae	Thumbai	Herb	NA
72	<i>Ludwigia perennis</i>	Onagraceae		Herb	NA
73	<i>Martynia annua</i>	Martyniaceae	ThaelKodukku	Herb	NA
74	<i>Melia azedarach</i>	Meliaceae	Malai vaambu	Tree	NA
75	<i>Merremia hederacea</i>	Convolvulaceae		Herb	NA
76	<i>Nyctanthes arbor-tristis</i>	Nyctanthaceae	Parijaatham	Tree	NA
77	<i>Ocimumamericanum</i>	Labiatae	Ganjaankorai	Herb	NA
78	<i>Pavonia odorata</i>	Malvaceae	Peramutti	Herb	NA
79	<i>Pedaliium murex</i>	Pedaliaceae	Perunerunji	Herb	NA
80	<i>Phyllanthus acidus</i>	Euphorbiaceae	Aranelli	Tree	NA
81	<i>Phyllanthus amarus</i>	Euphorbiaceae	Kizha-nelli	Herb	NA
82	<i>Phyllanthus emblica</i>	Euphorbiaceae	Muzhunelli	Tree	NA
83	<i>Phyllanthus reticulatus</i>	Euphorbiaceae	Inkipazham	Shrub	NA
84	<i>Pithecellobium dulce</i>	Mimosaceae	Kodukkaaipuli	Tree	NA
85	<i>Plumbago zeylanica</i>	Plumbaginaceae	Chitthiragam	Herb	NA
86	<i>Polygala javana</i>	Polygalaceae		Shrub	NA
87	<i>Pongamia pinnata</i>	Fabaceae	Punga maram	Tree	NA
88	<i>Portulaca oleracea</i>	Portulacaceae	Kari keerai	Herb	NA
89	<i>Prosopis juliflora</i>	Mimosaceae	Velikkaathan	Tree	NA
90	<i>Psidium guajava</i>	Myrtaceae	Koyya	Tree	NA
91	<i>Punica granatum</i>	Punicaceae	Madhulai	Shrub	NA
92	<i>Rhynchosia viscosa</i>	Fabaceae		Climber	NA
93	<i>Ricinus communis</i>	Euphorbiaceae	Amanakku	Shrub	NA
94	<i>Riveahypocrateriformis</i>	Convolvulaceae	Boodhikeerai	Climber	NA
95	<i>Ruellia tuberosa</i>	Acanthaceae		Herb	NA
96	<i>Sansevieria roxburghiana</i>	Dracaenaceae	Mottamamji	Herb	NA
97	<i>Senna auriculata</i>	Caesalpinaceae	Avaram	Shrub	NA
98	<i>Senna occidentalis</i>	Caesalpinaceae	Peiyavarai	Tree	NA
99	<i>Sesamum indicum</i>	Pedaliaceae	Ellu	Herb	NA
100	<i>Sida acuta</i>	Malvaceae	Malai thangi	Herb	NA
101	<i>Sida cordata</i>	Malvaceae	Pazhampaasi	Herb	NA
102	<i>Sida cordifolia</i>	Malvaceae	Nilatutthi	Herb	NA
103	<i>Solanum americanum</i>	Solanaceae	Manatakkali	Herb	NA
104	<i>Solanum melongena</i>	Solanaceae	Kathiri	Herb	NA
105	<i>Solanum torvum</i>	Solanaceae	Chundai	Shrub	NA
106	<i>Solanum trilobatum</i>	Solanaceae	Thoodhuvalai	Climber	NA
107	<i>Solanum virginianum</i>	Solanaceae	Kandankathiri	Herb	NA
108	<i>Spermacocehispidia</i>	Rubiaceae	Nathaichoori	Herb	NA
109	<i>Spermacoceocymoides</i>	Rubiaceae	Button Weed	Herb	NA
110	<i>Tamarindus indica</i>	Caesalpinaceae	Puliyamaram	Tree	NA
111	<i>Tectona grandis</i>	Verbenaceae	Thekku	Tree	NA

112	<i>Tephrosia purpurea</i>	Fabaceae	Kozhinji	Undershrub	NA
113	<i>Terminalia catappa</i>	Combretaceae	Badam	Tree	NA
114	<i>Thespesia populnea</i>	Malvaceae	Poovarasu	Tree	NA
115	<i>Thevetia peruviana</i>	Apocynaceae	Thangaarali	Shrub	NA
116	<i>Tinospora cordifolia</i>	Menispermaceae	Seenthilkodi	Climber	NA
117	<i>Toddalia asiatica</i>	Rutaceae	Mizhakaranai	Shrub	NA
118	<i>Trachys muricata</i>	Poaceae	Vennaithirattipul	Grass	NA
119	<i>Tridax procumbens</i>	Asteraceae	Vettukayapoonduthalai	Herb	NA
120	<i>Tribulus lanuginosis</i>	Zygophyllaceae	Nerungi	Herb	NA
121	<i>Tylophora indica</i>	Asclepiadaceae	Naippalai	Climber	NA
122	<i>Vernonia cinerea</i>	Asteraceae	Mookuthipoodu	Herb	NA
123	<i>Vitex negundo</i>	Verbenaceae	Nochi	Tree	NA
124	<i>Waltheria indica</i>	Sterculiaceae	Chempoodu	Herb	NA
125	<i>Wrightia tinctoria</i>	Apocynaceae	Vetpaalai	Tree	NA
126	<i>Ziziphus mauritiana</i>	Rhamnaceae	Illandhai	Tree	NA

Table 4-19 List of Birds Species in the Study Area

S.	Common Name	Scientific Name	IUCN
	Phasianidae		
1	Indian peafowl	<i>Pavo cristatus</i>	LC
2	Grey francolin	<i>Francolinus pondicerianus</i>	LC
	Anatidae		
3	Indian spot billed duck	<i>Anas poecilorhyncha</i>	LC
	Threskiornithidae		
4	Black headed Ibis	<i>Threskiornismelanocephalusmelanocephalus</i>	NT
	Ardeidae		
5	Indian pond heron	<i>Ardeolagravi</i>	LC
6	Purple heron	<i>Ardea purpurea</i>	LC
7	Grey heron	<i>Ardea cinerea</i>	LC
8	Cattle egret	<i>Bubulcus ibis</i>	LC
	Phalacrocoracidae		
9	Little cormorant	<i>Phalacrocorax niger ?</i>	LC
	Accipitridae		
10	Brahminy kite	<i>Haliasturindus</i>	LC
11	Shikra	<i>Accipter badius</i>	LC
12	Black kite	<i>Milvus migrans</i>	LC
	Rallidae		
13	White breasted waterhen	<i>Amaurornisphoenicurus</i>	LC
14	Purple swamphen	<i>Porphyrioporphyrio</i>	LC
	Charadriidae		
15	Red wattled lapwing	<i>Vanellus indicus</i>	LC
16	Common ringed plover	<i>Charadrius hiaticula</i>	LC
	Columbidae		
17	Common pigeon	<i>Columba livia</i>	LC

	Psittaculidae		
18	Rose ringed parakeet	<i>Psittaculakrameri</i>	LC
	Cuculidae		
19	Common hawk cuckoo	<i>Hierococcyxvarius</i>	LC
20	Asian koel	<i>Eudynamysscolopaceus</i>	LC
21	Southern coucal	<i>Centropusparroti?</i>	LC
	Strigidae		
22	Spotted owl	<i>Athene brama</i>	LC
	Upupidae		
23	Common hoopoe	<i>Upupa epops</i>	LC
	Coraciidae		
24	Indian roller	<i>Coracias benghalensis</i>	LC
	Alcedinidae		
25	White throated king fisher	<i>Halcyon smyrnensis</i>	LC
26	Pied kingfisher	<i>Cerylerudis</i>	LC
	Meropidae		
27	Green bee eater	<i>Meropsorientalis</i>	LC
	Ramphastidae		
28	Brown headed barbet	<i>Megalaimazeylanica</i>	LC
29	Copper smith barbet	<i>Megalaimahaemacephala</i>	LC
	Picidae		
30	Flame back	<i>Dinopiumbenghalense?</i>	LC
	Dicruridae		
31	Greater racket tailed drongo	<i>Dicrurusparadiseus</i>	LC
32	Black drongo	<i>Dicrurusmacrocercus</i>	LC
	Monarchidae		
33	Indian paradise flycatcher	<i>Terpsiphone paradise</i>	LC
	Hirundinidae		
34	Barn swallow	<i>Hirundo rustica</i>	LC
	Corvidae		
35	House crow	<i>Corvus splendens</i>	LC
36	Rufous treepie	<i>Dendrocittavagabunda</i>	LC
	Sturnidae		
37	Common myna	<i>Acridotheres tristis</i>	LC
38	Brahminy starling	<i>Sturniapagodarum</i>	LC
	Estrildidae		
39	Scaly breasted munia	<i>Lonchurapunctulata</i>	LC
40	White rumped munia	<i>Lonchura striata</i>	LC
41	Black headed munia	<i>Lonchura Malacca</i>	LC
	Motacillidae		
42	Grey wagtail	<i>Motacilla cinerea</i>	LC
43	White browed wagtail	<i>Motacillamaderaspatensis</i>	LC
	Ciconiidae		
44	Asian openbill	<i>Anastomusoscitans</i>	LC
	Podicipedidae		
45	Little Grebe	<i>Tachybaptus ruficollis</i>	LC

	Timallidae		
46	Yellow-billed babbler	<i>Turdoidesaffinis</i>	LC
	Ploceidae		
47	Baya weaver	<i>Ploceusphilippinus</i>	LC
	Muscicapidae		
48	Pied Bushchat	<i>Saxicola caprata</i>	LC
	Nectariniidae		
49	Purple sunbird	<i>Cinnyris asiaticus</i>	LC
	Scolopacidae		
50	Wood sandpiper	<i>Tringaglareola</i>	LC

LC- Least Concern, NT- Near Threatened, EN- Endangered, NE-Not Evaluated, DD -Data Deficient, VU-Vulnerable, IUCN- International Union for Conservation of Nature.

Table 4-20 List of Mammals in the Study Area

Family	Common name	Scientific name	IWPA Status	IUCN Red List status
Felidae	Jungle cat	<i>Felis chaus</i>	II	
Viverridae	Asian palm civet	<i>Paradoxurus hermaphroditus</i>	II	
Viverridae	Brown palm civet	<i>Paradoxurus jerdoni</i>	II	VU
Herpestidae	Common mongoose	<i>Herpestes edwardsii</i>	IV	
Herpestidae	Ruddy mongoose	<i>Herpestes smithii</i>	IV	
Herpestidae	Stripe-necked mongoose	<i>Herpestes vitticollis</i>	IV	
Herpestidae	Brown mongoose	<i>Herpestes fuscus</i>	IV	DD
Mustelidae	Eurasian otter	<i>Lutra lutra</i>	II	
Mustelidae	Smooth-coated otter	<i>Lutrogale perspicillata</i>	II	
Mustelidae	Nilgiri marten	<i>Martes gwatkinsii</i>	II	VU

LC- Least Concern, NT- Near Threatened, EN- Endangered, NE-Not Evaluated, DD -Data Deficient, VU-Vulnerable, IUCN- International Union for Conservation of Nature.

Table 4-21 List of Reptiles and Amphibians in the Study Area

S.No	Species name	Common name	IUCN Conservation Status
1	<i>Mus musculus</i>	Common Mouse	Not assessed
2	<i>Funambulus pennanti</i>	Palm -Squirrel	Not assessed
3	<i>Mus rattus</i>	Indian rat	Not assessed
4	<i>Lepus nigricollis</i>	Indian Hare	Least Concern
5	<i>Rattus norvegicus</i>	Brown Rat	Least Concern
6	<i>Felis catus</i>	Cat	Not assessed

Table 4-22 List of Butterfly species in the Study Area

S.No	Family	Species name	Common name	Status	WPA	72
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					Shedule
1.	Nymphalidae	Danaus chrysippus	Plain Tiger	LC	Sch-IV
2.	Nymphalidae	Danaus genutia	Striped Tiger	LC	Sch-IV
3.	Nymphalidae	Ariadne merione	Common Caster	LC	Sch-IV
4.	Nymphalidae	Melanitisleda	Common Evening Brown	LC	Sch-IV
5.	Nymphalidae	Mycalesisperseus	Common Bush Brown	LC	Sch-IV
6.	Nymphalidae	Ypthimaasterope	Common Three Ring	LC	Sch-IV
7.	Nymphalidae	Euthalanais	Baronet	LC	Sch-IV
8.	Nymphalidae	Argynnis hyperbius	Indian Fritillary	LC	Sch-IV
9.	Nymphalidae	Bybliailithya	Joker	LC	Sch-IV
10.	Pieridae	Colotisdanae	Crimson Tip	LC	Sch-IV
11.	Pieridae	Colotisetrida	Small Orange Tip	LC	Sch-IV
12.	Pieridae	Euremahecabe	Common Grass Yellow	LC	Sch-IV
13.	Pieridae	Catopsilliapomona	Common Emigrant	LC	Sch-IV
14.	Pieridae	Ceporanerissa	Common Gull	LC	Sch-IV
15.	Lycaenidae	Euchrysops snejus	Gram Blue	LC	Sch-IV
16.	Lycaenidae	Jamides celeno	Common Cerulin	LC	Sch-IV
17.	Lycaenidae	Freyeriatrochylus	Grass Jewel	LC	Sch-IV
18.	Papilionidae	Papilio polytes	Common Mormon	LC	Sch-IV
19.	Papilionidae	Papilio demoleus	Lime Butterflies	LC	Sch-IV
20.	Papilionidae	Atrophaneura aristolochiae	Common Rose	LC	Sch-IV
21.	Hesperiidae	Borbocinnara	Rice Swift	LC	Sch-IV

LC- Least Concern, NT- Near Threatened, EN- Endangered, NE-Not Evaluated, DD -Data Deficient, VU-Vulnerable, IUCN- International Union for Conservation of Nature.

4.6.5.1 Impact

- Displacement of existing fauna.
- Loss of vegetation

4.6.5.2 Mitigation measures

- Education and training etc.
- Logistic support in the form of equipment, Vehicles etc as required by the implementing DFO will be extended.

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

- Noise abatement
- Reuse of wastewater to the extent possible
- Prevention of soil erosion
- Ecological restoration
- Aesthetic, biological and visual improvement of area due to improved vegetative and plantation covers.
- Green belt around mine, dumps, etc:

- Tall growing, closely spaced, evergreen trees native to the area
- Easy, quick early growth and establishment
- Uniform spreading of crown habit.
- Timber trees having long gestation period.
- Trees with high foliage density, leaves with larger leaf area
- Attractive appearance with both good flowering and fruit bearing.
- Bird and insect attracting species
- Suitable green cover with minimal maintenance
- Avenue Trees:
 - Trees with conical canopy and with attractive flowering
 - Trees with medium spreading branches to avoid obstruction to the traffic
 - Trees with branching at 10feet and above.

4.7 Green Belt Development

The green belt plantation programme will be continued till the end of the mining operation in the area. In framing out this programme on a sustainable and scientific base, due consultation and coordination with the forest department will be sought.

An area of 0.06.5-hectare land was earmarked for greenbelt development during first 5 years of mining plan, at the end of life of quarry; the green belt area will be 0.06.5 Ha, TAMIN proposed to plant 20 No's of trees per year and Rs. 30,000/- per year will spend for proposed greenbelt development and maintenance.

Plants are chosen to provide aesthetic, ecological and economical value. Trees will help to arrest propagation of noise and help to lessen dust pollution due to dust arresting action. The existing plantation will be developed around 7.5m safety zone of the quarry. The soil dumps, are planted to prevent erosion and for stabilization of the soil. Plants are chosen to provide aesthetic, ecological and economical value. Trees will help to arrest propagation of noise and help to lessen dust pollution due to dust arresting action.

4.7.3 Impacts on Occupational Health due to project operations

Anticipated occupational illness is equal to mining activities involved in the project. Occupational health problems due to dust & noise and Occupational illness by quarry activities are as follows;

- Dust related pneumonia
- Tuberculosis
- Rheumatic arthritis
- Segmental vibration

4.7.3.1 Mitigate Measures for Occupational Health

- Adoption of dust suppression measures like spraying water, use of drill with dust collection system or wet drills etc.
- Plantation
- Avoid blasting during unfavorable wind & atmospheric conditions.
- Use of personal protective equipment. Compliance with DGMS circulars.
- Emergency response plan that includes installation of emergency response equipment to combat events such as fire.
- All personnel required to handle hazardous materials will be provided with personal protective equipment suitable for the hazardous material being handled.
- On-site first aid facilities will be provided and employees will be extended to the local community in emergencies.

Table 4-23 Mitigation for occupational health and safety

S. No	Activity	Mitigation measures
1	Excavation	Planned excavation, avoid haphazard mining
2	Drilling and blasting	➤ In addition, the operators and other workers should be provided with masks, helmets, gloves and earplugs.
3	Safety zone	<ul style="list-style-type: none"> ➤ Provisions for a buffer zone between the local habitation and the mine lease in the form of a green belt of suitable width. ➤ Restricted entry, use of sirens and cordoning of the lasting area are some of the good practices to avoid accidents.
4	Overburden stabilization	<ul style="list-style-type: none"> ➤ Accidents are known to happen due to overburden collapse. ➤ Therefore, slope stabilization and dump stability are critical issues for safety and environment. Proper measures will be taken care.
5	Worker's health surveillance	<ul style="list-style-type: none"> ➤ Health survey programmes for workers and local community. ➤ Regular training and awareness of employees to be conducted to meet health and safety objectives.

4.7.3.2 Mitigate Measures for Safety Aspects

- To reduce pollution emanation from quarry operations, carry out splitting of sheet rock by diamond wire saw which largely reduces the dust and noise generation.
- Water sprinkling on haul roads and dumping yards, etc.
- Green belt creation wherever possible to arrest dust and reduce noise propagation.
- All staff and workers will be provided with PPE to guard against excess noise levels
- Provision of safety Helmets, goggles, safety boots, ear muffs, gas masks, etc.
- To provide appropriate instruction, training, retraining, vocational training, etc.
- Organization of safety contests and safety campaigns regularly to update knowledge of safe operational procedures, etc.

- Observation and compliance of all precautions, control measures and stipulations on above lines will ensure that in this project, health and safety problems will be minimal.

4.8 Impacts on Social Environment

Since the entire lease area of the project has no habitations or hutments in the core zone area, no rehabilitation or resettlement problems are involved. By adopting various mitigation measures as explained earlier, the environmental scenario in respect of ambient air quality, water quality, Noise levels, water aspects, biological aspects etc. during the operation of the project will be maintained within the statutorily prescribed levels. As such, impact due to the projects will be positive on socio-economic aspects. It will be ensured that the buffer zone of the quarry will be properly preserved environmentally in all respects within sustainable limits through necessary monitoring. The project will be operated with care for minimizing environmental impacts with proper EMP measures for pollution control.

Indirectly scores of people will be benefited by gainful indirect employment opportunities through various service related activities connected with the project operations as shown under.

4.8.3 Corporate Environmental Responsibility

TAMIN Mahimandalam site had no Relocation and Rehabilitation. Most villages have benefitted mutually at Mahimandalam where the mining industry has provided indirect jobs for labour and villages provide accommodation for the labour and staff. Supportive industries like food supply and essential shops are economic growth in the villages. The site has provided road access to a few nearby village sites. 2% from the Total Project cost will be used for CER activity given in **Table 4.24**.

Table 4-24 Corporate Environmental Responsibility Plan

S. No	CER Activity	Beneficiary	Amount allocated (INR)	Remarks
1	Providing Smart screen facilities for nearby Govt.School& Solar Pannel(CER activity will be implemented as per moEF&CC OM date 20.10.2020)	Mahimandalam Village	1,99,940	-

Other benefits to Community

- Project related logistical operations.
- Various trading services for consumer goods, spare parts, sundry items, etc.
- Contractual services connected with the project.
- Green belt works in the project.
- Casual labour needs for various activities.

The project will provide ample opportunity to the local people for direct and in-direct employment. The proposed project may create opportunities for indirect employment in the field of vehicle hiring, labours, trading of construction materials, carpenters etc. The major areas which required immediate attention relates to infrastructure support, health & sanitation, Anganwadi services, school education, youth development, income generation activities & veterinary services.

5 ANALYSIS OF ALTERNATIVES

5.1 Alternate Technology

The project is a fresh granite quarry. The technology used for mining is made by TAMIN in house there would not be any changes in the Mining. The mining technology is tried & tested method, and therefore there is no risk of technological failure. In addition to this the TAMIN is being processed to take care of any technological failures.

5.2 Method of mining

5.2.1 Opencast Method

Open cast, semi-mechanized mining with 6m vertical bench with a bench width is 6m with vertical slope. Under the regulation 106(2) (a) of the Metalliferous Mines Regulation 1961 in all open cast working in hard ore body, the benches and sides should be properly benched and sloped. The height of any bench shall not exceed 6m and the width thereof shall not be less than the height. The benches shall be sloped at an angle of more than 45° from the horizontal.

5.3 Alternate Site

The mineral deposits are site specific in nature; hence question of seeking alternate site does not arise. The project site is located at S.F.917 (P) &921(P), Mahimandalam Village, Katpadi Taluk, Vellore District, Tamil Nadu state. It is Government Poramboke land.

5.4 Connectivity

SH 124 (Ponnai- Thiruvarami) at \approx 3.36km towards NNE. The nearest railway station is Ramapuram Railway station located at \approx 2.46Km towards WNW direction. NH-40 (Ranipettai-Kurnool) situated at distance of \approx 4.75Km (SW).

6 ENVIRONMENTAL MONITORING PROGRAMME

6.1 General

The mitigation measures suggested in **Chapter 4** will be implemented so as to reduce the impact on the environment due to the operations of the project. The monitoring schedules are planned for systematic study of various pollution levels with respect to air and water qualities, noise levels, etc. to ensure that they conform to the standards laid down by Environmental Protection Act and various Central and State Pollution Control Board Limits. The various methodologies and frequency of studies of all environmental quality parameters also conform to norms laid down by MOEF& CC, CPCB and SPCB in this respect.

The Project proponent will be overseeing/reviewing following activities:

- To observe the implementation of environmental control measures.
- To ensure implementation of planned plantation programme with monitoring of survival rate, etc.
- To keep monitoring records properly for submission of periodical returns to statutory authorities and for checking by them.
- To evaluate periodically the performance of existing pollution control equipment and systems for taking prompt action in this respect to rectify the defects.
- Conducting safety audits and programmes to create safety awareness in workers/staff.
- Monitoring of dumps and benches for slope stability, monitoring of OB dumps, laying of check dams, garland drains around the dumps and excavated areas and their regular maintenance for de-silting.
- To study the effects of project activities on the environment.
- To interact and liaise with State and Central Government Departments.
- To take immediate preventive action in case of some unforeseen environmental pollution attributable to the project.
- Imparting training on safety and conduct safety drills to educate employees.
- To ensure that firefighting equipment, etc, are kept in ready-to-use condition.

For each of the environmental attributes, the monitoring plan specifies the parameters to be monitored, location of monitoring sites, frequency and duration of monitoring and it also denotes the applicable standards, implementation and supervising responsibilities.

6.2 Monitoring Schedules for Various Environmental Parameters

The proponent shall adopt the following monitoring schedule for environmental parameters. However, based on the need and priority it may be suitably modified / improved. However, since the

proponents are different, monitoring, fulfilling of all the statutory obligations and maintaining records are to be carried out separately by the proponents.

6.2.3 Ambient Air Quality

The following monitoring schedule is given for ambient air quality.

➤ **Parameters**

Sulphur dioxide (SO₂), Oxides of Nitrogen (NO_x), Suspended Particulate Matter (SPM), Respirable Particulate Matter (PM_{2.5/10}).

➤ **Frequency of Monitoring**

Once in a year in each location.

➤ **Location**

2 or 3 locations in buffer zone and 1 location in work zone. The environmental standards for Ambient air quality prescribed by CPCB/MOEF/SPCB.

6.2.4 Water Environment

Water quality monitoring at least before and after monsoon from ground water near the lease area and mine pit water sample shall be monitored. General, Physical and chemical parameters, COD, BOD, TSS etc shall be analyzed.

6.2.5 Noise Measurement

Work Zone noise and Ambient Noise level shall be monitored at least once in a year. Noise monitoring at ambient air monitoring locations will be carried out. Besides, vibration studies in the nearby villages shall be carried out, as per necessity and direction of DGMS, etc. The noise level standards as given by CPCB / MOEF given in **Table 6-1** will be enforced in the mine.

Table 6-1 Environment (Protection) Rules 1986

S. No	Area code	Category of area	Limits in dB(A) Leg	
			Day Time	Night Time
1	A	Industrial area	75	70
2	B	Commercial area	65	55
3	C	Residential area	55	45
4	D	Silence Zone	50	40

Note:

- Day time shall mean from 6 a.m. and 10.0 p.m.
- Night time shall mean from 10.0 p.m. and 6 a.m.
- Silence zone is an area comprising not less than 100 meters around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority.

- Mixed categories of areas may be average as one of the four above mentioned categories by the competent authority.

* dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

A “decibel” is a unit in which noise is measured.

“A”, in dB (A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

Leq: It is energy mean of the noise level over a specified period.

6.3 Post Project Environmental Monitoring

It is imperative that the Project Authorities set up regular monitoring stations to assess the quality of the neighboring environment of the project. An environmental monitoring programme is important as it provides useful information and helps to:

- Verify the predictions on environmental impacts presented in this study
- Assist in detecting the development of any unwanted environmental situation, and thus, provides opportunities for adopting appropriate control measures, and
- Identify the effectiveness of mitigate measures suggested in the EMP.

Table 6-2 Post Project Environmental Monitoring Program

S. No	Area of Monitoring	Number of Sampling Stations	Frequency of Sampling	Parameters to be Analyzed
1.	Meteorology	One	Hourly and Daily basis.	Wind speed and direction, Temperature, Relative Humidity, Atmospheric pressure, Rainfall.
2.	Ambient Air Quality	2 Stations (In downwind)	Twice a week:24 hourly period	PM ₁₀ , PM _{2.5} , SO ₂ , and NO ₂
3.	Noise	2 (two within core area and two in buffer area)	Once every season	Ambient Equivalent continuous Sound Pressure Levels (Leq) at day and Night time.
4	Exhaust from DG set	Stack of DG set	Quarterly	PM ₁₀ , PM _{2.5} , SO ₂ & CO
5	Vehicular Emissions	Parking area	Periodic monitoring of vehicles	Air emission and noise, PCU
6	Soil	Two Locations within the Project Site	Yearly Once	Physico chemical properties, Nutrients, Heavy metals
7	Terrestrial Ecology	Within 10km, around the project	Once in three years	Symptoms of injuries on plants

8	Surface/ Ground water quality	Two Locations Within Project Site	Yearly Once	As per ISO 10500:2012 & IS 2296:1992 Standard parameters
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6.3.3 Occupational Health and Safety

- Occupational health survey of staff and permanent workers will be undertaken at least once in 3 years to detect early incidence of diseases and for prompt remedial medical follow up in the matter. Audiometric test for the workers will be done at regular interval for workers of the noise prone area. Safety matters also will be reviewed periodically by safety in-charge.
- Occupational health and safety is 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 blasting operation and maintenance of mining equipment and handling of explosive materials is to be taken care of as per the Mine Regulations, 1961 and Circulars of DGMS. To avoid any adverse effects on the health of workers due to dust, heat, noise and vibration, sufficient measures have been proposed in the EMP. These include
 - Provision of wet drilling /or dust collectors
 - Provision of rest shelters for mine workers with amenities like drinking water, fans, toilets etc.
 - Provision of personnel protection devices for the workers
 - Rotation of workers exposed to high noise areas
 - First-aid facilities

Occupational Health Survey of the employees will be carried out at regular intervals.

6.4 Environmental Monitoring Programme

Table 6-3 Environmental Management Plan

S. No	Salient Items	Position at the end of five years of Mining period
1	Land Reclamation	The pit boundaries shall be safely fenced and used for agricultural purpose when the pit is filled with underground seepage or rain waters
2	Waste Management	The waste materials can be dumped along the north eastern part of the lease area. By adding suitable variety of soil brought from outside and planting trees over the waste dump
3	Afforestation program with precautions for survival and protection of plantation.	As proposed, 20 plants per year were planted during the mining Period along the eastern boundary of lease area and achieved survival rate of 50%.
4	Quality of mine water and any interference with surface waters pruces	Followed the Procedure as proposed in the Mining plan.

5	Measures for dust suppression	Water will be sprinkled for the suppression of air borne dust from mine approach roads, waste dumps on regular intervals using water tankers.
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7 ADDITIONAL STUDIES

7.1 Introduction

The additional studies involved in this project will consist of following aspects:

1. Public consultation
2. Risk assessment /Disaster Management Plan
3. Mine closure plan as per GCDR 1999
4. Occupational Health and safety studies have been conducted and a safety plan was prepared.

Public Consultation

The proposed project is categorized as 'B1' category Schedule 1(a) as per EIA Notification 2006 and its amendments thereafter. The total area of the quarry is 166.92.0 Ha.

However, the proposed project falls under 'B1' category, Schedule 1(a), Public Hearing is Mandatory. So, EIA report has been prepared as per the obtained ToR vide. TN/F.No.10383/SEAC/1(a)/ToR-1610/2023, dated: 06.11.2023. Draft EIA report will be submitted for Public Hearing (PH). After PH, the minutes obtained will be incorporated in the EIA report along with action plan by the proponent. Final EIA will be submitted to TNSEAC for further appraisal of the project and obtaining Environment Clearance.

7.2 Risk Identification & Management

7.2.1 Introduction

Mining and allied activities are associated with several potential hazards both to the employees and the public at large. A worker in a mine should be able to work under conditions that are adequately safe and healthy. At the same time the environmental conditions should be such as not to impair his working efficiency. The various safeguards to be taken to ensure the safety of the mine and that of employees are provided in the Mines Act, 1952. Risk involves the occurrence or potential occurrence of some accidents consisting of an event or sequence of events. The risk assessment study covers the following:

- Identification of potential hazard areas.
- Identification of representative failure cases.
- Visualization of the resulting scenarios in terms of fire (thermal radiation) and explosion.
- Assess the overall damage potential of the identified hazardous events and their impact zones from the accidental scenarios
- Assess the overall suitability of the site from hazard minimization and disaster mitigation point of view
- Furnish specific recommendations on the minimization of the worst accident possibilities.

- Preparation of broad DMP, On-site and Off-site Emergency Plan.
- Occupational Health and Safety Plan.

The complete mining will be carried out under the management control and direction of a qualified mine manager holding a first class manager's certificate of competency. Moreover, mining staff will be sent to refresher courses from time to time to keep them alert. However, following natural/industrial hazards may occur during normal operation:

- Accident due to explosives
- Accident due to heavy mining equipment; and
- In order to take care of above hazard/disasters, the following control measures will be adopted.
- All safety precautions and provisions of the Mine Act, 1952, the MMR 1961 and the Mines Rules, 1955 will be strictly followed during all mining operations
- Entry of unauthorized persons will be prohibited
- Firefighting and first-aid provisions in the mines 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
- Training and refresher courses for all the employees working in hazardous premises; Under mines rules all employees of mines will have to undergo the training at a regular interval
- Working of mine, as per approved plans and regularly updating the mine plans;
- Cleaning of mine faces will be regularly done
- Handling of explosives, charging and blasting will be carried out by competent persons only.
- Regular maintenance and testing of all mining equipment as per manufacturer's guidelines.
- Suppression of dust on the haulage roads
- Increasing the awareness of safety and disaster through competitions, posters and other similar drives.
- For any type of above disaster, a rescue team will be formed by training the mining staff with specialized training.

7.2.2 Identification of Hazards in Open Cast Mining

There are various factors, which can cause disaster in the mines. These hazards are as follows:

- Drilling
- Blasting
- Overburden handling
- Heavy Machinery

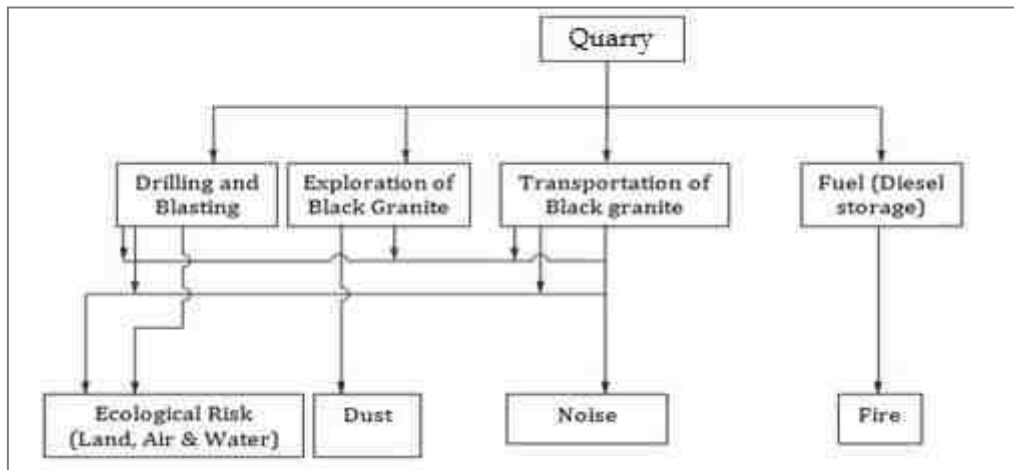


Figure 7-1 Identification of hazards in opencast mine

7.2.2.1 Drilling

Drilling is an important activity in mining. This activity releases particulate matter into the air and noise in the vicinity of the operation. The particulate matter/dust can be arrested by employing dust extractor, wet or dry type. The usage of standard drill bits also reduces the dust formation. The noise is also arrested by the usage of dust extractors. The compressors which feed the compressor air to the drilling jack hammers can be covered in acoustic enclosures which reduce the dust and noise. The hard strata will be excavated after drilling and blasting. Drilling will be done with jack hammers up to 1.2 to 1.5m depth having a diameter of 30-32 mm.

7.2.2.2 Blasting

Most of the accidents from blasting occur due to the projectiles, as they may sometimes go even beyond the danger zone, mainly due to overcharging of the shot-holes as a result of certain special features of the local ground. Flying rocks are encountered during initial and final blasting operations. Vibrations also lead to displacement of adjoining areas. Dust and noise are also problems commonly encountered during blasting operations.

- The damaging impacts on environment are evident noise, gas, and flyrock and ground vibration.
- The last factor is most important for safety of constructions, buildings and various natural objects in the vicinity of mining area.
- The ground vibration parameters, crucial for safety of endangered objects have a significant correlation with charge weight and distance of blasting.
- This study tried to associate the main vibration parameter, particle velocity with blasting parameters and properties of vibration medium.

7.2.2.3 Precautionary Measures to Avoid Accidents Due to Blasting

- The provisions laid down in the MMR 1961 related to Blasting shall strictly be followed. However, some of the main provisions are written here
- The Wire saw and crack powder will be utilized extensively to reduce the requirement for blasting.
- The blasting will be done under supervision of blaster/mine mate/mine foreman/mine manager
- Shots shall not be fired except during the hours of daylight.
- The holes charged on any particular day shall be fired on the same day.
- Adequate blasting shelters or other protection shall be provided at mines.
- The shot-firer shall give sufficient warning by effective signals over the entire area falling within a radius of danger zone.
- Multi-shot exploder shall be used. A shot-firer will fire maximum 120 Shots.
- During the approach and progress of electrical storm, adequate precautions shall be taken.

7.2.2.4 Overburden Handling

No overburden will be generated in the proposed project and side burden dump may cause landslides. High side burden dump created at the quarry edge may cause sliding of the side burden dump or may cause failure of the pit slope due to excessive loading, thereby causing loss of life and property.

7.2.2.5 Heavy Machinery

Most of the accidents during transport of dumpers, trucks, proclain, ripper dozers and other heavy vehicles are often attributable to mechanical failures and human errors.

7.2.2.6 Precautionary Measures to Prevent Accidents due to Trucks and Dumpers

- All transportation within the main working shall be carried out directly under the supervision and control of the management.
- The vehicles must be maintained in good conditions and checked thoroughly at least once a week by the competent person authorized for the purpose by the Management.
- Road signs shall be provided at each and every turning point especially for the guidance of the drivers.
- To avoid danger while reversing of vehicles especially at the embankment and tipping points, all areas for reversing of lorries should as far as possible be made man free. A statutory provision of the fences, constant education, training etc. will go a long way in reducing the incidents of such accidents.
- Generally, oversize rocks shall be dealt with in the pit by secondary blasting.
- A Load consisting of large rocks must not be over the edge. This is unsafe and may damage equipment.

- The movement of the dumpers will be governed under the Code of Traffic rule, this is already formulated & implemented.

7.2.2.7 Storage of Explosives

The explosive requirement of the quarry operation is minimal. The blasting requirement will be carried out using contractors approved by the Controller of Explosives. No Explosive storage is envisaged in this quarry.

7.2.2.8 Safety Measures at the quarry

- Adequate care has been taken in deciding the size of the bench for the working pit.
- The benches are properly sloped at an angle of 60 degree to avoid any spillage of benches.
- Adequate drainage system at the top of the pit and also on the benches shall be made to prevent erosion of the benches.
- The quarries will be protected by garland drains around the periphery for storm water drainage.

7.2.3 Disaster Management Plan

The disaster management plans aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities. For effective implementation of the disaster management plan, it should be widely circulated and personnel training through rehearsals/drills. The objectives of the disaster management plan is to make use of the combined resources of the mining operation 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
- Identify any dead
- Provide for the needs of relatives
- Provide authoritative information to the news media
- Secure the safe rehabilitation of affected area
- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the emergency
- In effect, it is to optimize operational efficiency to rescue rehabilitation and render medical help and to restore normalcy.

Emergency Organization (EO)

It is recommended to setup an emergency organization. A senior executive (Mine Manager) who has control over the affairs of the mine would be heading the emergency organization. He would be

designated as site controller. As per the general organization chart, in the mines, the Mines Foreman would be designated as the Incident Controller (IC). The incident controller would be reporting to the site controller. Emergency coordinators would be appointed who would undertake the responsibilities like firefighting, rescue, rehabilitation, transport and provide essential and support services.

Emergency Communication (EC)

Whoever notices an emergency situation such as fire, growth of fire etc. would inform the Mines Foreman. The Mines Foreman would appraise the site controller. Site Controller verifies the situation from the incident controller takes a decision about an impending on site emergency. Simultaneously, the emergency warning system would be activated on the instructions of the site controller.

In order to handle disaster/emergency situations, the following personnel shall deal with the disaster/Emergency

- Mines Manager-site controller
- Mines Forman-incident controller
- Mine mate –Fire controller
- Senior most Driver-Transport coordinator
- Senior most operator- Medical coordinator

7.2.3.1 Emergency Services

This includes the fire-fighting system, first aid center, etc. Alternate sources of power supply for operating fire pumps, communication with local bodies, fire brigade etc. will also be clearly identified. Adequate number of external and internal telephone connections shall be installed.

1. Fire Protection System
2. Off Site Emergency Plan

7.2.3.2 Fire Protection System

The fire protection system for the project maintained will consist of Portable hand appliances of suitable types/capacities for extinguishing small fires in selected mine areas, storages areas such as that of Diesel, Explosives, etc.

7.2.3.3 Off-Site Emergency Plan

The offsite emergency plan defining the various steps to tackle any offsite emergencies, which may affect surrounding areas of the project, has to be prepared after due finalizing discussion in this respect with local Panchayat official, Revenue officials and District Collector. As per this off site

plan, in case of any off site emergencies, actions have to be promptly initiated to deal with the situation in consultation with Collector and other revenue officials.

7.2.4 Mine Closure Plan

Land degradation is one of the major adverse impacts of opencast mining in the form of excavated voids and also in the form of waste dumps. As per the petro genetic character, the depth persistence of the black granite body in the area is beyond the workable limits. However, it is very difficult to operate granite dimensional stone mine economically below a depth of 30m by observing the statutory of mine safety rules and regulations. Hence in the proposed mining plan, only 30m depth has been envisaged as 'Workable depth' for safe and economic mining.

However, it is proposed not to back fill the ultimate pit, in as much as quantity of reserves is available below the workable depth of 30m and there is possibility of technology up-gradation in granite mining for greater depths. The site boundaries shall be safely fenced and used as a reservoir after mining activities are over.

There is no proposal for back filling, reclamation and rehabilitation. The quarried pits after the end of the life of lease will be fenced to prevent inherent entry of public and cattle. There is no proposal for back filling, reclamation and re habitation

7.2.4.1 Progressive Mine Closure Plan

The various schedules for mining activities regarding mining of granite block, waste disposal, proposed land use pattern, environmental preservation measures, disaster management plan, etc. have been fully covered in the earlier chapters in this EIA/EMP report.

Concurrent planning for various steps to be adopted for final mine closure, along with regular working schedules and systems of the mine, will facilitate to effect smooth switchover to final mine closure stages ultimately

7.2.4.2 Water Quality Management

The ground water quality in the region indicates neutral range with pH values. Most of the analytical results for ground and surface water showed parameter concentrations well within the permissible limits. Garland drains will be provided all along the periphery of the mining pit and along the toes of the side burden dumps. These drains will be aligned in such a way that all the surface drainage water will be carried away from the mining zone to settling tanks.

The mining pit's catchment water will be coursed to the main sump and used for dust suppression and green belt development & plantation activities.

7.2.4.3 Mines Seepage Water

The experience of mining during past three years suggests a very little, almost negligible seepage of water in the mining pit. It will be collected in a well guarded pond / sump for settling of solids. The treated water will be used for dust suppression on working faces, haul roads and dump surfaces.

7.2.4.4 Air Quality Management

Ambient air quality was monitored twice in a week for One (01) season (shall cover 12 weeks), iPM₁₀, PM_{2.5}, SO₂, NO_x, Pb, NH₃, C₆H₆, C₂₀H₁₂, As, Ni, were monitored. Sampling was carried out as per Central Pollution Control Board (CPCB) monitoring guidelines at each location.

The following precautions have been considered for abatement of air pollution in the black granite mine area:

- Water sprinkling shall be carried out at the active working faces, on all haul-roads and the dump surfaces.
- Regular cleaning and removal of spillage black granite from haul roads and weighbridge areas.
- Proper and regular maintenance of mining equipments.
- Development of comprehensive green belt around overburden dumps to reduce fugitive dust emissions in order to create clean and healthy environment.

7.2.4.5 Solid waste Management

As is stated earlier, mining will be carried out by opencast semi-mechanized method using conventional mining equipments i.e., hydraulic excavators / shovels and dumpers combination with ancillary mining equipment like compressor, wire cutting machine, generator etc.

The mine waste in the mine includes the over lain unrecoverable boulders / rock fragments and rubbles generated as granite rejects during the production works and the waste fragments generated during development works will be utilized for forming approach road and dumping yard purposes. Adequate space has been identified within the lease applied area for dumping such waste material on barren land covered with soil. The 7.5 m safety distance as well as the defective portion of the deposit may also be used for waste dumping purpose.

7.2.4.6 Stabilization of Dump

As the waste generation in the mine includes hard rock fragments of considerable size and irregular shape with varying angularity, the waste dump will be stable on its own even at higher slopes of the sides. However, suitable variety of soil will be identified and brought from outside and used for increasing the stability of the sides of the waste dumps and also for planting trees over the dumps in a phased manner.

7.2.4.7 Mine Drainage

The lease applied area is hillock 30m height with slope towards northern and southern sides. Through the area receives scanty rainfall, the ground water level is at 38.6m BGL as per Vellore District ground water profile of TWAD board.. The Production faces are operated at shallow depths. During the rainy seasons the surface run of water and the ground water are collected at one point called as sump and dewatered nearby agricultural field with the help of 10HP oil engines.

7.2.4.8 Disposal of Waste

The Mine waste in the mine includes the over burden, side burden, rock fragments and rubbles generated as mineral rejects during production works and the country rock fragments generated during development works as approach road formation, formation of dumping yard sites etc., During the first five years of Mining Plan period, such waste material are proposed to be dumped along the Southern part of the lease area where it comprises of country rock terrain.

7.2.4.9 Top Soil Management

Topsoil will be properly stacked at earmarked dump site with adequate measures. It will be used for growing plants along the fringes of the site roads and reclamation of external dump and backfilled area. The topsoil stockpiles will be low height and will be grassed to retain fertility. Besides these topsoil stacks there will be temporary stacks near the excavation area and area to be reclaimed which will be made use of for concurrent lying without bringing the topsoil to the soil stack near the OB dump.

7.2.4.10 Disposal of Mining Machinery

Mining operations are planned to be operated using Company owned machinery. The company has its own Excavators, Mining Tippers, compressors; wire saw machine, jack hammers, and other mining equipment. These machines are compliant to the RTO conditions and CPCB conditions. Further, the company also operates a central workshop at Salem, to cater to major repairs/Rectifications of company Equipment.

These machineries are written off and disposed on completion of their normal life as per the set guidelines of the Government and TAMIN Board. The surplus machinery in working order, will be transferred to Company's other projects.

7.2.4.11 Other Infrastructure

Mine office, store room, first-aid room etc, will be provided on semi-permanent structures within the lease applied area.

7.2.4.12 Safety & Security

The water ponds developed in the reclaimed areas shall be properly fenced for safety. The water from these ponds is likely to be potable and shall be used for human & cattle consumption and for agriculture purposes.

7.2.5 Social Impact Assessment R & R Action plan

There will be no Rehabilitation and Resettlement in this proposed project.

8 PROJECT BENEFITS

8.1 Improvements in the physical infrastructure

Providing Smart screen facilities for nearby Govt.School& Solar Pannel (2 No's) in Mahimandalam village.

8.2 Improvement in the Social infrastructure

- Improvement in Per Capita Income.
- The socio - Economic conditions of the village and distance will enhance due to the project, hence the project should be allowed after considering all the parameters.
- It can thus be concluded that the project is environmentally compatible, financially viable and would be in the interest of construction industry thereby indirectly benefiting the masses.

8.3 Employment potential –skilled; semi-skilled and unskilled

- The quarrying activities in this belt will benefit to the local people both directly 30 persons & indirect persons are 20 Nos.
- The direct beneficiaries will be those who get employed in the mines as skilled and unskilled workers.

8.4 other tangible benefits

Cultural & economic Development of the near by villages.

9 ENVIRONMENTAL COST & BENEFIT ANALYSIS

(Not recommended during scoping stage)

10 ENVIRONMENTAL MANAGEMENT PLAN

10.1 Environmental Management Plan

Environmental Management Plan covers the genesis of pollution, the principal sources of pollution, the nature of pollution, the proposed measures required for meeting the prevailing statutory requirements of air emissions, waste water discharge characteristics, noise levels, land use, socio economics etc for environmental management purpose in connection with the mining and quarrying related activities in the study area.

10.2 Emission Source Identification

The Emission sources are activities related to pits and quarries including, overburden operations, drilling, hauling, loading and unloading stockpiles. The emission sources may be subdivided into six broad categories:

- Emissions of PM and road dust due to HEMM & Mining Tippers.
- Emissions from generators.

10.3 Air Quality Management

Quarrying operations are semi mechanized, but there is involvement of labours too. Dust would be generated during the course of over burden removing, drilling, mining, hauling, handling and transportation of the material. Dust is likely to be generated from emissions of diesel vehicles such as SO₂, NO_x etc.

10.3.1 Measures for dust suppression

Water will be sprinkled for suppression of air borne dust on mine haulage roads and waste dumps on regular intervals by water tankers. Drilling of blast holes of 32 mm dia will be always under wet condition to prevent flying of dust. In the unloading point of Tippers, water will be sprinkled and further the drillers are provided with respirators in accordance with mines regulations.

10.3.2 Emissions from Material Handling

PM emissions occur during the handling and transfer operations of material from one process to another within the facility. Open storage piles of raw material and products are generated at various points throughout the operational area. The environmental control measures, which will be taken and proposed to control the fugitive dust released during the stone quarry production are given below:

- The working faces will be regularly wetted before carrying out the drilling and excavation.
- Dust masks will be provided to the workers especially for the drillers and for the workers working in the loading operations.
- Periodic health checkup for the workers shall be done
- Plantation along approach roads and surrounding the Quarry Lease area.

- Water tankers with spraying arrangement will be used for regular water sprinkling on the haul roads to ensure effective dust suppression.

Haulage

- Haul road will be maintained regularly.
- Speed limits will be prescribed for transport vehicles.
- Water will be sprayed daily on the roads by using water tankers.
- Periodic maintenance of the trucks used for transport shall be done to reduce smoke emissions.
- Over loading of trucks is avoided.

10.4 Noise Pollution Control

In an operational mine major noise sources are operation of mine machineries, equipment & plying vehicles. Noise generation may be for an instant, intermittent or continuous period, with low to high decibels. General noise levels generated at mines are documented as below:

Equipment	Noise Level (dB (A))
Rotary Drills	72-100
Compressor (85 M ³ /min)	50-55
Excavator	75-90
Diesel Tipper	74-109
Diesel Generator	80-94

The management plan for controlling noise pollution is as given below.

- Reducing the drilling operations as far as possible.
- Provision of earmuffs to workers working in high noise prone areas.
- Proper gradient of haul roads to reduce cumulative noise levels.
- Development of green belt all along the boundary of the mining lease area which will act as effective noise barrier.
- Use of Diamond Wire Saw machine and crack powder to reduce noise.
- Restriction of blast hole drilling to only day time hours and usage of sharp drilling bits and delivery of compressed air at optimal pressure during drilling.
- Noise emanating machine such as compressors, diesel generator is enclosed in acoustic enclosure so as to reduce the noise level.

10.5 Water Pollution Control Measures

10.5.1 Surface Water

There are no major streams and rivers, which can get effected by the mining. Hence there will be no major effect on the surface water environment. Surface water ditches or channels will be made to divert all surface drainage for agricultural purposes.

10.5.2 Mine Drainage Water

Mine water will be used in mechanized cutting of the blocks and for wetting purpose. The runoff from the dumps will be channelized and care will be taken.

- Mine water will be used in wet drilling process, dust suppression & green belt development
- The runoff from the dumps will be channelized and care will be taken.

10.6 Land Environment

Landscape will be slightly changed due to open cast quarry. There will be no land subsidence as area is made up of hard rock. Aesthetic environment will not be effected, as the quarry is located in hilly terrain. Soil cover and the weathered material accounts for the Over Burden. Agriculture is seen mainly in the plains far away from the lease area. A few bushes will be cleared to facilitate mining and other related activities and there are no big trees.

- Top soil shall be used in afforestation work, as early as possible.
- A retaining wall and garland drain will be constructed all around to prevent the wash off. Landscape will be changed due to open cast quarry. There will be no land subsidence as area is made up of hard rock. Aesthetic environment will be effected.
- Soil cover and the weathered material accounts for the Over Burden
- Top soil will be removed & stored on the inner boundary of the mining lease area. To improve its quality, soil stabilizers shall be mixed and leguminous plantation will be done over these stacks.

10.6.1 Top soil management

Top soil will be removed in advance and stacked separately. To improve its quality, soil stabilizers shall be mixed and leguminous plantation will be done over these stacks. Top soil shall be used in afforestation work, as early as possible. A retaining wall and garland drain will be constructed all around to prevent the wash off.

10.7 Solid Waste Management

The solid waste that is likely to be generated during the quarry activity will be stacked along the lease barrier according to their quality and size. The sub Grade material and waste generated will be stored within the lease boundary over areas where there are no granite deposits. All the care will be taken to minimize the waste generation at the source.

- Top Soil recovered will be used in the green belt areas on the Southern side of the lease area.

- Top soil Stored on the inner boundary of the mining lease area. To improve its quality, soil stabilizers shall be mixed and leguminous plantation will be done over these stacks.
- The solid waste that is likely to be generated during the quarry activity will be stacked along the lease barrier according to the mining plan.
- All the care will be taken to minimize the waste generation at the source.

10.8 Stabilization of Dumps

The dumps are mainly constituted of quarry waste. It will be afforested properly to stabilize the dumps and preserve soil character. Garland canal also will be dug around the dump.

As the waste generation in the mine includes hard rock fragments of considerable size and irregular shape with varying angularity, the waste dump will be stable on its own even at higher slopes of the sides. However suitable variety of soil will be identified and brought from outside and used for increasing the stability of the sides of the waste dumps and also for planting trees over the dumps in a phased manner.

10.9 Biological Environment

As in any typical Ligneous rocks deposit, there is no tree growth on the area, but grass shrub and bushes grow sparsely. No wildlife is found in quarry Lease area. In order to minimize the impacts and to improve up on the existing eco system afforestation plan will be envisaged.

- As in any typical intrusive igneous rocks deposit, there is no tree growth on the area, but grass shrub and bushes grow sparsely.
- In order to minimize the impacts and to improve up on the existing eco system afforestation plan will be envisaged.
- No wildlife is found in quarry Lease area.

10.10 Granite Conservation and Development

The mining plan proposed has fully covered the aspects of granite conservation with a future plan to extend the proposed working of the mine to the full depth of the deposit. Extreme care will be taken to ensure proper supervision of quality control of the granite dimensional stone aimed at the recovery of the maximum saleable quantity / quality of granite dimensional stones suitable for full utilization of the consumers

10.11 Afforestation Plan

The main aim of the plantation of the mined out areas is to stabilize the area to protect it from rain, wind erosion, improve the aesthetics and support the re-creation of bio-diversity.

- Afforestation will be taken up along the lease area.

- In the Scheme of Mining 20 plants per year is proposed to be planted for complying Afforestation program with the arrived survival rate of 50% in the North western portion of the lease area in the phased manner.
- Only Shrubs and bushes are seen in the quarry Lease area.

10.12 Occupational Health & Safety Measures

Granite stone does not contain any toxic elements. Further this being a semi-mechanized mine, production is by semi-mechanized means and waste material handling partly by mechanized way, there shall be marginal impact on air and noise qualities. Therefore, the possibilities of any health hazards are minimal.

- Awareness and planning are keys to prevention of occupational health hazards.
- Conducting air monitoring to measure worker exposures and to ensure that provided controls are adequate for protection of workers.
- Adequate respiratory protection will be provided to the workers.
- Periodic medical examinations for all workers.
- Provide workers with training that includes information about health effects, work practices, and use of protective equipments.

10.13 Socio-Economic Benefits

Granite Quarry project is not going to have any negative impact on the social or cultural life of the villagers in the near vicinity. The quarry activity will provide job opportunities, which will help them to develop economically.

Granite quarry will be done with the vision of leaving a positive impact on socio-economics of people living in the nearby villages. A first-aid centre to meet the basic medical needs of employees will be provided.

10.13.1 Employment potential

Around 30 people directly and 20 people indirectly employed including material suppliers, outside workshops, unit supported industries. Local villagers residing in the nearby villages shall be employed as semi-skilled workers.

10.13.2 Care and Maintenance during Temporary Discontinuance

All the provisions as per the Mines Act 1952 and Rule17 of GC & DR 1999 shall be strictly adhered during temporary discontinuation.

10.13.3 Safety and Security

At the end of quarry operations, the total area excavated will be fenced properly with single opening for workers engaged in closure plan work.

10.14 Budget for Environmental Protection

It is necessary to include the environmental cost as a part of the budgetary cost component. Total of Rs.2,05,000/- allocated for environmental protection activities. Environmental Management cost is given in **Table 10-1**.

Table 10-1 Environmental Management Plan Cost

S. No	Details	Amount (Rs.)
1	Afforestation	30,000/-
2	Water Sprinkling	50,000/-
3	Water Quality Test	25,000/-
4	Air Quality Test	25,000/-
5	Noise / Vibration Test	25,000/-
6	CSR Activities	50,000/-
Total		2,05,000

10.15 Environment Policy of TAMIN

M/s. Tamil Nadu Minerals Ltd believes that good safety, Health & Pollution control practices contribute to individual well-being and organization morale. Our commitment to Safety, Health and Environment stretch beyond statutory obligations and we are committed to manage and continually improve the overall safety, Health and Environmental performance.

We M/s Tamil Nadu Minerals Ltd are committed to ensure that:

- We develop safe working methods and practices, with as objective of no injuries and accidents at the work place and provide a safe work place for our employees, contractors and other who perform their duties. We shall provide adequate Health care to our employees, and create processes to reduce the adverse effect of the operations on the health of the employees.
- We provide safety appliances and continuous training in safety to our employees and contract workmen to ensure safe production and achieve the target of zero accidents. We are committed to supporting actions aimed at increase in employees' safety outside work hours.
- We protect the environment by control and prevention of pollution and promote green environment.
- We continuously evaluate and improve our conduct and carryout regular audit, analysis and studies to eliminate potential concerns and continuously improve upon our Safety, Health and Environmental standards.
- We communicate our Safety, Health and Environmental Policy to all our employees' contractors and to the public for better understanding and practice.

- Management has knowledge of relevant issues regarding Safety, Health and Environment and provides a foundation for setting objectives and targets. Management shall fulfill its responsibility to inform, educate and motivate employees and others to understand and comply with this policy and applicable laws.
- M/s. Tamil Nadu Minerals Ltd shall use its resources in order to live up to this policy and thereby promote our business.

Besides, the company has formulated well-planned and integrated Environmental policies as shown below: M/s Tamil Nadu Minerals Ltd is committed to welfare and development needs of the society around it.

- All rules and conditions prescribed in the Indian Mines Act, Metalliferous Mines Regulation etc., will be adopted to ensure risks-free and safe mining operations. All personal protective devices supplied to workers and staff should be used while they work in the mines and any violation in this respect will be dealt with inflict of warnings first, followed subsequently by punitive punishments including fines and ultimately dismissal, if repeated continuously.
- Any infringement / violation of any rule or unsafe mining operations should be reported to Mines Manager / Mine Foremen / Mine Mate/ Blaster who will take immediate corrective measures for avoiding major disasters. The report will ultimately reach the Board of Directors through upwardly hierarchical communicative channels from the lowest level to superior levels in quick time bound duration.
- The Agent and the Mines Manager should exercise overall control over entire mining and connected operations and all infringements / violations on any count pertaining to unsafe operations, environmental degradation, etc., should be brought to the notice of the Board of Directors. Remedial measures for such violations and deviations should be taken by the Mines Manager to avoid any hazards or disasters in the mine and nearby areas. The persons responsible for such violations will be punished through appropriate disciplinarily penal actions.
- The EC conditions and stipulations will be strictly followed by all supervisory staff of the mine, and will co-ordinate in various issues like prescribed environmental monitoring schedules, vibration monitoring studies during blasting, green belt development, management of dumps etc.
- Penal actions will be taken by the company in cases of continuous negligence resulting in violations deviations in this respect.
- A time schedule of once in 15 days for review of all operational factors as mentioned above is in force, for proper and quick corrective actions. Hierarchical System of the TAMIN is shown in **Figure 10-1**.

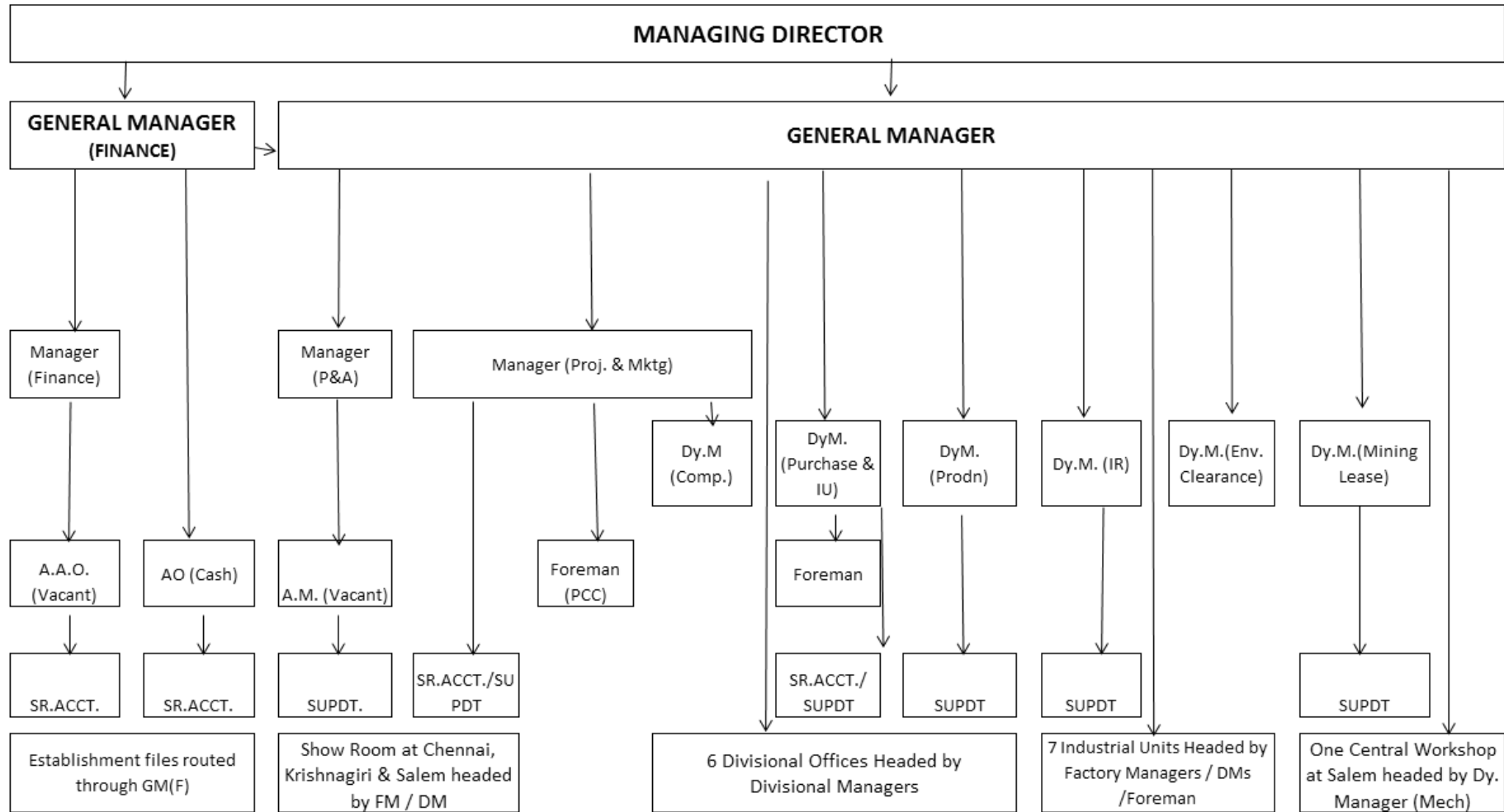


Figure 10-1 Hierarchical System of the TAMIN

11 SUMMARY & CONCLUSION

11.1 Background

The extent area of the quarry is 166.92.0 Ha at S.F. 917(P)&921(P) at Mahimandalam Village, Katpadi Taluk, Vellore District, Tamil Nadu. TAMIN has been proposed to get a fresh lease for Black Granite (Dolerite) quarry over an extent of 166.92.0 Ha for 20 years lease. Lease applied on 02.11.2021. Accordingly, the Government of Tamil Nadu issued the precise area communication letter under Rule, 8-C (3b) of Tamil Nadu Mineral Concession Rules, 1959.

The project falls under B1 Category, Schedule 1(a) Mining of Minerals as per EIA Notification dated 14th September 2006 and its subsequent amendments. The EC application was submitted under category B1, schedule 1(a) to TN SEIAA vide File No. 10383/2023.

The proposal was appraised during 416th SEAC meeting held on 13.10.2023 and 670th SEIAA meeting held on 06.11.2023 and ToR was issued vide Lr No. SEIAA-TN/F.No.10383/SEAC/ToR-1610/2023, dated: 06.11.2023 for the preparation of EIA/EMP report. The draft EIA/EMP report will be submitted for Public Hearing (PH). After completion of Public Hearing, the minutes issued will be incorporated in the EIA report along with action plan by the proponent. Final EIA will be submitted to TNSEAC for further appraisal of the project and obtaining Environment Clearance.

TAMIN as part of the compliance from MoEF&CC has appointed M/s Hubert Enviro Care systems (P) Ltd, Chennai as Environmental Consultants who are accredited by National Accreditation Board for Education and Training (NABET), Quality Council of India (QCI), New Delhi.

- The production capacity of the quarry during the mining plan period was 29,000 m³ Mine lease area falls in the survey of India Topo sheet D44N4&8, D44T1&5. lies between the GPS coordinates of Longitude: 79°12'00.57"E to 79°13'57.48"E Latitude: 13°04'57.45"N to 13°05'34.90"N.

11.2 Management Commitment

The company is assigning prime importance for environmental protection. The company will comply the environmental laws. TAMIN will maintain well developed Greenbelt. Also all the environmental statutory requirements will be implemented and maintained continually.

11.3 Environmental Sensitive Areas

There are no notified ecologically sensitive areas within 15km from project boundary. The Tamilnadu State / Andhra State boundary as per google runs in W direction at about \simeq Adjacent to the site from the project boundary. Project doesn't attract the special conditions and general conditions as per EIA

notifications. The detailed Environmental Sensitivity areas within the 15km radius of the project site are given in **Chapter 3, Section 3.4** and **Table 3-1**.

11.4 Black Granite Quarry Reserves

- The estimated Geological Reserves of Black Granite estimated based on the Geological cross sections was 46, 85,817 m³.
- The updated Mineable Reserves have been arrived as 42, 21,763m³ and by applying 10% recovery, the updated mineable reserves as 4, 22,176 m³.

11.5 Summary of the Magnitude of Operation

- The black granite quarrying operation is proposed to carry out by opencast semi mechanized method by formation of benches. Benches are proposed with a height of 6m & width bench not less than the height. Major machineries are Compressor, Jack hammer, Diamond wire saw machine and excavator and DG set is used in proposed quarry. Tippers and dumpers will be used for transportation.
- The Proposed production capacity is 2, 90, 000 m³ of Black Granite for five years.
- The mineable reserves have been computed as 42, 21, 763 m³ of Black Granite.
- The geological reserves have been worked out as 46, 85, 817 m³ of Black Granite.

11.6 Requirements

11.6.1 Land requirement:

- The Black granite mine is over an extent of 166.92.0 Ha. The entire area is under possession of TAMIN.
- Lease area located at S. F. No.917 (P) &921(P) Mahimandalam Village, Katpadi Taluk, Vellore District lies in the latitude of 13°04'57.45"N to 13°05'34.90"N and longitude of 79°12'00.57"E to 79°13'57.48"E.
- The lease area topography is hilly terrain; site elevation is 445m (max) AMSL. The area is marked in the survey of India Topo sheet No. D44N4&8,D44T1&5.
- Mining Lease obtained from Tamil Nadu Government for 20 years vide Government Industries, Investment Promotion & Commerce (MME.1) Department,Letter No.3865290/MME.1/2023-1, dated:13.03.2023.

11.6.2 Water Requirement

- The total water requirement is 1.5KLD Drinking & Domestic purpose-0.5 KLD, Wire Saw cutting -0.3 KLD, Dust suppression -0.3 KLD & for Greenbelt-0.4KLD. The total water requirement will be met from Road tankers.
- Hazardous waste like waste oil will be disposed through TNPCB Authorized dealers.
- Sewage will be disposed through septic tank followed by soak pit. Septic Tank will be cleaned periodically.

11.6.3 Power & Fuel Requirement

- Power requirement will be 60 kVA will me through 125 kVA DG Set. Diesel consumption will be 200 liters/day.
- Diesel will be brought from nearby diesel pumps. No electricity is required for the project.

11.6.4 Manpower

- Direct manpower will be 30 persons directly and indirectly 20 Nos.

11.6.5 Solid Waste Generation & Management

- Municipal solid waste (13.5 kg/day) will be segregated as Organic will dispse through local municipal bins and inorganic waste (5.4kg/day) will be disposed through TNPCB authorized recyclers.
- Waste diesel Oil will be collected in leak proof containers and disposed to TNPCB Authorized Agencies for Reprocessing/Recycling.

11.7 Project Cost

- The total capital investment on the project is Rs. 99, 97,000/- Lakhs including EMP cost is 2, 05,000/-.

11.7.1 Baseline Study

Project Influence Area (PIA)/Study Area: An area covering 10 km radius from Mahimandalam Black granite quarry boundary has been earmarked as study area for baseline studies.

Study Period:

The baseline environmental surveys were carried out during **(March 2023-May 2023)** within the study area.

Summary of Baseline Studies:

- Site has an undulating terrain with level 445m MSL.
- The project site falls under Zone- III (Low Risk Zone) as per IS 1893 (Part- I).
- The predominant wind direction is South during study period.
- Max Temperature: 41⁰C Min Temperature: 23⁰C & Avg Temperature: 30.63⁰C
- Average Relative Humidity: 74.741 %
- Average Wind Speed : 3.43 m/s

Ambient Air Quality

Maximum concentrations of PM₁₀, PM_{2.5}, SO₂, NO₂, CO, Pb, O₃, NH₃, C₆H₆, C₂₀ H₁₂, As & Ni, are well within the National Ambient Air Quality Standards for Industrial, Commercial and Residential

areas at all monitoring locations during the study period. The ambient air quality has been monitored at 8 locations for 12 parameters as per NAAQS, 2009 within the study area. The average baseline levels of PM₁₀ (51.67µg/m³-63.88µg/m³), PM_{2.5}(31µg/m³-38.08µg/m³), SO₂(8.03µg/m³-12.89µg/m³), NO₂(15.74µg/m³-25.78µg/m³), all the parameters are well within the National Ambient Air Quality Standards for Industrial, Commercial and Residential areas at all monitoring locations during the study period..

Noise Environment

Ambient noise levels were monitored using precision noise level meter in and around the project site at 10 km radius at 8 locations during study period.

- In Industrial area day time noise levels varied from **68.5 dB (A) to 53.5 dB (A)** and night time which is within prescribed limit by CPCB (75 dB(A) Day time & 70 dB(A) Night time).
- In Residential area day time noise levels varied from **46.1dB (A) to 56.5 dB (A)** and night time noise levels varied from 39.9 dB (A) to 43.5 across the sampling stations. The field observations during the study period indicate that the ambient noise levels in some residential area is within the prescribed limit by CPCB (55 dB (A) Day time & 45 dB (A) Night time).

Water Environment

The prevailing status of water quality at 08 locations for surface water and 8 locations for ground water have been assessed during the study period. The standard methods prescribed in IS were followed for sample collection, preservation and analysis in the laboratory for various physiochemical parameters.

Surface water quality

- pH ranges from 6.74 to 7.71.
- Electrical Conductivity range from 323 mg/l to 569 mg/l.
- Total hardness ranges between 112 mg/l – 172mg/l.
- The BOD value ranges from 2 mg/l to 4 mg/l
- COD value 16 mg/l to 60 mg/l.
- The concentration of heavy metals like As, Cd, Cr, Pb, Mn, Hg, Ni and Se at all locations are within the limits of IS 2296:1992(Class-C: Drinking water with conventional treatment followed by disinfection)
- Chloride content ranges from 14.85 mg/l to 77.42 mg/l.
- The Sulphate content ranges from 5.86 mg/l to 30.55 mg/l.

Ground Water Quality

- The average pH ranges from 7.53-8.24.
- The Total Dissolved Solids range is varied between 558 mg/l – 828 mg/l for the ground water.
- The Total hardness ranges is between 258 mg/l – 398 mg/l for ground water samples.
- The acceptable limit of the chloride content is 250 mg/l and permissible limit is 1000 mg/l. The chloride content in the ground water for study area ranges between 139 mg/l – 279 mg/l.
- The desirable limit of the sulphate content is 200mg/l and permissible limit is 400mg/l. the sulphate content of the ground water of the study area is varied between 21 mg/l – 110 mg/l.
- It is observed that all the collected ground water samples meets the drinking water standards (IS 10500:2012) and can be used for drinking.

Land Environment

Assessment of soil characteristics is of paramount importance since the vegetation growth, agricultural practices and production is directly related to the soil fertility and quality. Soil sampling was carried out at eight (08) locations in the study area. It is observed that,

- The pH of the soil samples ranged from 6.88 -8.46.
- Conductivity of the soil samples ranged from 39 – 420 umhos/cm
- Nitrogen content ranged from 109.69 mg/kg to 322.1 mg/kg
- Phosphorous ranged from 6.10 mg/kg – 39.83 mg/kg
- Potassium content ranges from 17.84 mg/kg – 84.60 mg/kg.

Biological Environment

An ecological study of the ecosystem is essential to understand the impact of industrialization and urbanization on existing flora and fauna of the study area. Studies on various aspects of ecosystem play an important role in identifying sensitive issues for under taking appropriate action to mitigate the impact, if any. The biological study was under taken as a part of the EIA study report to understand the present status of ecosystem prevailing in the study area, to compare it with past condition with the help of available data, to predict changes in the biological environment as a result of present activities and to suggest measures for maintaining its health. Secondary information was collected to study the flora & fauna in 10 km radius. Some of the information was gathered from the local habitants. All the collected data were classified to interpret the impact of pollution on the flora

and fauna of that region. All the available information was recorded about the wild plants and cultivated crop plants.

Flora

- ❖ Plants species were identified based on their specific diagnostics characters of family, genus and species using available floral, other related literature.
- ❖ Besides the identification of plant species, information was collected on the vernacular names and uses of plants made by local inhabitants.

The detailed List of flora in the study area is given in **Chapter 3, Section 3.10.1.4 &Table 3-19.**

Fauna

- ❖ Secondary information collected from published government data etc.
- ❖ List of the endangered and endemic species as per the schedule of The Wildlife Protection Act, 1972.
- ❖ Emphasis is given to identify avifauna and mammals to determine the presence and absence of Schedule-1 species, listed in The Wildlife Protection Act 1972, as well as in Red List of IUCN.

The detailed List of flora in the study area is given in **Chapter 3, Section 3.10.1.4 &Table 3-19.**

Socio Economic Environment

In 2011 census, the total population of Krishnagiri district was 1879809. Of this, rural population was 1451446 and urban population was 428363. In 2001, they were 1561118, 1299726 and 261392 respectively.

The literacy rate in the district has increased in 2011 census compared to 2001 census. In 2011 census, the Krishnagiri district returned 71.5 percent as literate population; males with 78.7 percent and females with 63.9 per cent. The total literacy of Krishnagiri district in 2001 was 62.3 percent; males at 72.3 per cent and females at 51.8 percent. The detailed information provided in **Chapter 3, Section 3.12.**

11.8 Anticipated Environmental Impacts

Air Environment

The emissions mainly generated from the mining activities are Blasting, Drilling, Scrapping, Excavation, Loading, Unloading, and transportation etc. Machinery like compressors and jack hammers are used for Drilling. Fugitive dust control in mine is shown in **Table 11-1.**

Table 11.8-1 Fugitive dust control in mine

S. No	Activities	Best practices
1	Drilling	➤ Drills should be provided with dust extractors (dry or wet system)
2	Blasting	➤ Water spray before blasting

		<ul style="list-style-type: none"> ➤ Water spray on blasted material prior to transportation ➤ Use of controlled blasting technique
3	Transportation of mined material	<ul style="list-style-type: none"> ➤ Covering of the trucks/dumpers to avoid spillage ➤ Compacted haul road ➤ Speed control on vehicles ➤ Development of a green belt of suitable width on both sides of road, which acts as wind break and traps fugitive dust

Noise Environment

- Baseline study showed that the noise levels in both Industrial area and in Residential area are slightly exceeded the limit prescribed by CPCB. The designed equipment with noise levels not exceeding beyond the requirements of Occupational Health and Safety Administration Standard will be employed.

Land Use

- The total quarry is over an extent of 166.92.0 Ha. at SF. No. located in 917(Part) and 921(Part) Mahimandalam Village, Katpadi Taluk, Vellore District, Tamil Nadu State.

Wastewater Management

- Sewage (0.3KLD) will be sent to septic tank followed by soak pit. There is no industrial effluent generation during quarry operation.

Biological Environment

- To reduce the adverse effects on flora/fauna status that are found in project area due to deposition of dust generating from mining operations, water sprinkling and water spraying systems will be ensured in all dust prone areas to arrest dust generation.

Solid/ Hazardous Waste Management

- Municipal Solid Wastes including food waste will be disposed to municipal bin.

Environmental Monitoring Program

- A monitoring schedule with respect to Ambient Air Quality, Water & Wastewater Quality, Noise Quality as per Tamil Nadu State Pollution Control Board (TNPCB), shall be maintained.

11.9 Greenbelt Development

- The green belt plantation programme will be continued till the end of the mining operation in the area. In framing out this programme on a sustainable and scientific base, due consultation and coordination with the forest department will be sought. The plantation will be developed inside the mining lease about 4.37.0Ha, out of 166.92.0Ha. Plants are chosen to provide aesthetic, ecological and economical value. Trees will help to arrest propagation of noise and

help to lessen dust pollution due to dust arresting action.

11.10 Disaster Management Plan

The salient features of Disaster Management Plan include

- Emergency shutdown procedure
- Fire protection system, Emergency safety equipment & Reporting and response to emergency. Emergency Help from nearby industries and tie up with nearby industries

11.11 Corporate Environmental Responsibility

- TAMIN Mahimandalam site had no Relocation and Rehabilitation.
- Most villages have benefitted mutually at Mahimandalam where the mining industry has provided indirect jobs for labor and villages provide accommodation for the labor and staff. Supportive industries like food supply and essential shops are economic growth in the villages.

11.12 Benefits of the Proposed Project

- The quarrying activities in this belt will benefit to the local people both directly 30 persons & indirect persons are 20 Nos
- Improvement in Per Capita Income.
- The socio - Economic conditions of the village and distance will enhance due to the project, hence the project should be allowed after considering all the parameters.
- It can thus be concluded that the project is environmentally compatible, financially viable and would be in the interest of construction industry thereby indirectly benefiting the masses.

12 DISCLOSURE OF CONSULTANTS

In order to assess the potential environmental impacts due to the proposed project at Survey No: 917(P) & 921(P) Mahimandalam Village, Katpadi Taluk, Vellore District, Tamil Nadu State to undertake EIA study. The nature of consultancy service rendered covers terrestrial environmental assessment.

12.1 Brief Profile of HubertEnviro Care Systems (P) Limited (HECS)

Hubert Enviro Care Systems (P) Limited is a leading Environmental Management Company and service provider serving as a catalyst for environmental protection in the industrial & service sectors.

Enviro care Systems was started in 1997 as a proprietor company. In the year 2004, Enviro Care Systems became a Private Limited Company and registered as Hubert Enviro Care Systems (P) Limited.

Across two decades of operation we have developed into a matured corporate house to meet client's requirements to provide products and services of Global standards at the most competitive price within committed schedule of time.

We have full-fledged office and laboratory at Chennai, Mangalore, Trivandrum & Hyderabad.

12.2 Strengths of HECS

Number of Employees as on till date

Total No of Employees	1170
Consultancy	42
Laboratory	100
Projects	29
Operation & Maintenance	999

Copy of QCI NABET Accreditation



**QUALITY COUNCIL
OF INDIA**
Creating an Ecosystem for Quality



**National Accreditation Board
for Education and Training**

Certificate of Accreditation



Hubert Enviro Care Systems Pvt. Ltd.,
A-21, (Behind Lions Club School) III Phase, Thiru Vi Ka Industrial Estate, Guindy, Chennai - 600 032.

The organization is accredited as **Category-A** under the QCI-NABET Scheme for Accreditation of EIA Consultant Organization, Version 3: for preparing EIA-EMP reports in the following Sectors –

S. No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals including open cast/ underground mining	1	1 (a) (i)	A
2	Offshore and onshore oil and gas exploration, development & production	2	1 (b)	A
3	River Valley projects	3	1 (c)	A
4	Thermal power plants	4	1 (d)	A
5	Mineral beneficiation	7	2 (b)	A
6	Metallurgical Industries (ferrous & nonferrous)- both primary & secondary	8	3 (a)	B
7	Cement plant	9	3 (b)	A
8	Petroleum refining industry	10	4 (a)	A
9	Pesticides industry and pesticide specific intermediates(excluding formulations)	17	5 (b)	A
10	Petro-chemical complexes (industries based on processing of petroleum fractions & natural gas and/or reforming to aromatics)	18	5 (c)	A
11	Petrochemical based processing (processes other than cracking & reformation and not covered under the complexes	20	5 (e)	A
12	Isolated storage & handling of hazardous chemicals (As per threshold planning quantity indicated in column 3 of Schedule 2 & 3 of MSIHC Rules 1989 amended 2000)	28	-	B
13	Synthetic organic chemicals industry	21	5 (f)	A
14	Industrial estates/ parks/ complexes/ Areas, export processing zones (EPZs), Special economic zones (SEZs), Biotech parks, Leather complexes	31	7 (c)	A
15	Ports, harbours, break waters and dredging	33	7 (e)	A
16	Highways	34	7 (f)	B
17	Common Effluent Treatment Plants (CETPs)	36	7 (h)	B
18	Common municipal solid waste management facility (CMSWMF)	37	7 (i)	B
19	Building and construction projects	38	8 (a)	B
20	Townships and Area development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in SAAC minutes dated Feb 3, 2023 posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no. QCI/NABET/ENV/23/2696 dated March 6, 2023. The accreditation needs to be renewed before the expiry date by Hubert Enviro Care Systems Pvt. Ltd, following due process of assessment


Sr. Director, NABET
Dated: March 6, 2023

Certificate No.
NABET/EIA/2224/SA 0190

Valid up to
July 27, 2024

For the updated List of Accredited EIA Consultant Organizations with approved Sectors please refer to QCI-NABET website.

Further details may be seen on the following URL: www.hecs.in.