DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

For

SIVANMAMALAI MULTI COLOUR GRANITE QUARRY

OVER AN EXTENT OF 17.09.0 Ha

At

Survey No: 1456 & 1458
Village: Sivanmalai
Taluk: Kangeyam
District: Tiruppur
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)

EIA Consultant

HUBERT ENVIRO CARE SYSTEMS (P) LTD, CHENNAI

JUNE 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 report on Environmental Impact Assessment (EIA) report of Sivanmalai Multi Colour Granite Quarry, over an extent of 17.09.0 Ha at S.F. 1456 & 1458 at Sivanmalai Village, Kangeyam Taluk, Tiruppur District,Tamilnadu 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, Dr. 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 **"Sivanmalai Multi Colour Granite Quarry, over an extent of 17.09.0 Ha at S.F. 1456 & 1458 at Sivanmalai Village, Kangeyam Taluk, Tiruppur District, Tamilnadu 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 **"Sivanmalai Multi Colour Granite Quarry, over an extent of 17.09.0 Ha at S.F. 1456 & 1458 at Sivanmalai Village, Kangeyam Taluk, Tiruppur District, Tamilnadu State"**. I also confirm that I shall be fully accountable for any misleading information mentioned in this statement.

Signature:

Date: 09.06.2023

Name: Dr. J. R. Moses

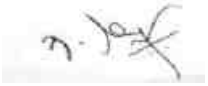
Designation: Chief Executive Officer

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

NABET Certificate No & Validity: NABET/EIA/2224/SA 0190 & valid upto 27.07.2024

Declaration of Experts contributing to the EIA

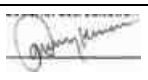
I, hereby, certify that I was involved in the EIA report for the project titled **"Sivanmalai Multi Colour Granite Quarry, over an extent of 17.09.0 Ha at S.F. 1456 & 1458 at Sivanmalai Village, Kangeyam Taluk, Tiruppur District, Tamilnadu State"**. I was a part of the EIA team in the following capacity that developed the above EIA with the support of the following functional area experts.

EIA Coordinator
Name: Mr. Vamsee Krishna Navooru
Signature: 
Date: 09.06.2023

Contact Information: M/s. Hubert Enviro Care Systems (P) Ltd

A-21, III Phase, Behind Lions Club School
Thiru Vi Ka Industrial Estate
Guindy, Chennai - 600 032,
Tamilnadu, India.
Email: consultancyhead@hecs.in
Website: www.hecs.in

Functional Area Experts (FAEs):

S. No.	Functional Areas		Name of the Expert	Signature	Duration of Involvement
1.	AP	FAE	Mr. Vamsee Krishna Navooru		Jan 2023 to Till Date
2.	WP	FAE	Mr. Vamsee Krishna Navooru		Jan 2023 to Till Date
3.	SHW	FAE	Mr. Vamsee Krishna Navooru		Jan 2023 to Till Date
4.	SE	FAE	Mr. V. Dhivakar		Jan 2023 to Till Date
5.	EB	FAE	Dr. Rajkumar Samuel		Jan 2023 to Till Date
6.	HG	FAE	Mr. Mallikarjuna Rao		Jan 2023 to Till Date
7.	GEO	FAE	B. Mallikarjuna Rao		Jan 2023 to Till Date

S. No.	Functional Areas		Name of the Expert	Signature	Duration of Involvement
8.	NV	FAE	Mr. VivekNavare		Jan 2023 to Till Date
9.	LU	FAE	Mr. Venkateswarlu		Jan 2023 to Till Date
10.	RH	FAE	Dr. J R Moses		Jan 2023 to Till Date
11.	SC	FAE	Dr. B.C. Nagaraja		Jan 2023 to Till Date

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

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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
MSDS	Material Safety Data Sheet
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
STP	Sewage Treatment Plant
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 Appsaisal Committee
TOR	Terms of Reference
TANGEDCO	Tamil Nadu Generation and Distribution Corporation
kVA	kilovolt-ampere

1. INTRODUCTION

1.1 Purpose of the report

The multi colour 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 varities 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,.

The proposed project "**Sivanmalai Multi Colour Granite Quarry**" is a fresh quarry. The Precise area communication letter has been issued to grant lease for 20 years for extent of 17.09.0 Ha [13.52.0 Ha. at S.F. 1456 and 3.57.0Ha at S.F.No.1458 at Sivanmalai Village, Kangeyam Taluk, Tiruppur District, Tamil Nadu State vide Industries (MME.1) Department letter No. 3500834/MME.1/2022-1, dated: 13.01.23. Accordingly, mining plan has been submitted and approved by the Director of Geology and Mining, Chennai vide Rc.No.2445/MM4/2022, dated: 05.11.2022. Precise area communication letter is enclosed as **Annexure-I.** Mining plan is enclosed as **Annexure-II** and approval letter is enclosed as **Annexure-III.**

The area lies in the Eastern Longitude from 77°32'38.25701"E to 77°32'58.97292"E and Northern latitude from 11° 02'28.68702"N to 11° 02'27.73352"N. The Altitude of area is above 360m from

MSL. The sectional plates are enclosed as **Annexure-IV.** The area is a Government Poramboke land and also it does not falls under forest land of any category.

The Geological reserves of Colour granite have been computed based on the Geological Plan & Sections up to the economically workable average depth of 31m from the surface level and the top surface of the granite body works out to 51,28,140 m^3. By applying 25% recovery the effective Geological reserves 9,84,007 m^3.

Mineable Reserves have been computed as 39,36,028 m^3. 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 5,700 m^3 by applying the recovery factor 25%. The annual peak production per year would be 1800 m^3 during the first five year of Mining plan period at the rate of 25% recovery. Open cast Semi mechanized method will be followed for proposed mining as per Mining plan.

Total waste to be generated during the five years of Mining Plan period will be around 17,100m^3. These wastes are proposed to be dumped on the Southeren side of lease area with dimensions of 674.4m x 68.3 x 4.35m. The waste dump area has been identified as barren area. The waste dump has been maintained at 10m with slope will be maintained as per norms DGMS (Tech) (S & T) Circular No. 2 dated 06.07.2010. The waste dump at the end of the life of mine can be earmarked in the Mines Conceptual plan.

The total water requirement is 1.5KLD Water requirement for Drinking & Domestic purpose is 0.5 KLD and Wire Saw cutting is 0.3 KLD, Also water requirement for Dust suppression is 0.3 KLD & Greenbelt is 0.4KLD). The total water requirement will be met from private tankers and the existing borewell. The quarrying operation will be carried out during general shift only. The Power requirement is negligible due to limited scale of activities and the same is met from TNEB or from Solar light. Municipal Solid waste will be disposed into local municipal bins. 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

Project

The proposed Color Granite Mine is over an extent of 17.09.0 Ha located at S.F.No.1456, Part-5 & Part-1458, Sivanmalai village, Kangeyam taluk, Tiruppur District,Tamilnadu State. for 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.

3977(E) dated; 14th Aug 2018. The land use classification of the project site is government poramboke land. The area applied for quarry lease is exhibits hillock with height of about 360m above MSL. The area lies in the Eastern Longitude from 77°32'38.25701"E to 77°32'58.97292"E and Northern latitude from 11° 02'28.68702"N to 11° 02'27.73352"N. enclosed sectional plates as **Annexure-IV**. The area is marked in the survey of India Topo sheet No. 58E/12, 58F/9.

1.3.1 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 Government letter No. 3500834/MME.1/2022-1, dated: 13.01.2023 Precise area communication letter is enclosed as **Annexure-I.**

ii. The Mining Plan has been prepared for quarrying Colour Granite over an extent of 13.52.0 Ha. in S.F. 1456 & over an extent of 3.57.0 Ha in S.F.No.1458 and a total extent of 17.09.0 Ha of Sivanmalai Village, Kangeyam Taluk, Tiruppur District, Tamil Nadu State, for 20 years. Mining plan was approved by the Director of Geology& Mining, vide Rc.No.2445/MM4/2022, dated: 05.11.2022and letter is enclosed as **Annexure-II.**

1.5 Land Acquisition Status

The entire mine lease area of 17.09.0 Ha is Government land which is leased by TAMIN. TAMIN obtained precise area communication letter vide Government letter No. 3500834/MME.1/2022-1, dated: 13.01.2023. Precise area communication letter is enclosed as Annexure-I.

Table 3-1 Land Use Description

District and State	Taluk	Village	S.F. No	Area in (Ha)	Land Classification
TiruppurDistrict, Tamil Nadu	Kangeyam	Sivanmalai	S.F.No.1456 and 1458	17.09.0	Government Poramboke Land

1.6 Purpose and Status of the Report

The Sivanmalai Colour Granite Quarry is over extent of 17.09.0 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.4052/2015.The proposal was appraised during 339th SEAC meeting held on 22.12.2022 and 584th SEIAA meeting held on 12.01.2023. Draft EIA report will be submitted for Public Hearing (PH) to Tiruppur PCB.

Final EIA will be submitted to TNSEAC for further appraisal of the project and obtaining Environment 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.4052/2015 & Proposal No. SIA/TN/MIN/27269/2018 dated 24.08.2017.

The TAMIN has obtained precise area communication letter vide Government letter No. 3500834/MME.1/2022-1, dated: 13.01.2023. Precise area communication letter is enclosed as **Annexure-I.** The mining plan has been submitted and approved by the Director of Geology and Mining, Chennai vide Rc.No.2445/MM4/2022, dated: 05.11.2022. Mining approval letter is enclosed as **Annexure-III.**

The proposal was appraised during 339th SEAC meeting held on 22.12.2022 and ToR was issued vide Lr No. SEIAA-TN/F.No.4052/2015/SEAC/ToR-1319/2023, dated: 12.01.2023.

1.7.2 Size of the Project

The Proposed Black Granite Quarry over an extent of 17.09.0 Ha is located at SF.No.1456 & 1458, Sivanmalai Village, Kangeyam Taluk, Tiruppur District, Tamil Nadu State.

Colour Granite Quarry area is over an extent of 17.09.0 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 40m from the surface level and the top surface of the granite body works out to 51,28,140m^3. By applying 25% recoveries the effective Geological reserves works out to 9,84,007m^3.

Mineable Reserves have been computed as 99,36,028 m^3 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 5,700 m^3 by applying the recovery factor 25%. The average annual production per year would be 22,800m^3 of ROM of saleable and 5700m^3 of ROM during the first five year of Mining plan period at the rate of 25% 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 (Granite Waste+Side Burden) to be generated during the five years of Mining Plan period will be around 17,100 m^3. These wastes are proposed to be dumped on the Southest side of lease area with dimensions of 674.4m x 68.3m x 4.35m. The method of mining is Open cast semi mechanized.

Table 1-2 Ultimate Pit Dimensional Details

S. No	S.F No	Ultimate Pit Dimensional Details at top (m)		Ultimate Pit Dimensional Details at bottom (m)		
		Length	Width	Length	Width	Depth
1	1456	445.00	237.78	421.00	208.42	31.00
2	1458	242.00	75.670	212.00	49.67	31.00

Table 1-3 Geological Reserves

S.No	Geological Reserves	Mineable Reserves	Mineable Saleable reserves at 25% recovery
1.	51,28,140	39,36,028	9,84,007

1.7.3 Location of the project

Sivanmalai Colour Granite Quarry area is over an extent of 17.09.0 Ha, the lease area is located at at S.F. 1456 and 3.57.0Ha at S.F.No.1458 at Sivanmalai Village, Kangeyam Taluk, Tiruppur 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	Boundary Mark Point	Latitude	Longitude
1.	BP1	11° 02'31.53190"	77°32'39.27592"
2.	BP2	11° 02'31.23171"	77°32'41.81680"
3.	BP3	11° 02'30.62852"	77°32'44.26402"
4	BP4	11° 02'31.96881"	77°32'45.41320"
.5.	BP5	11° 02'31.67012"	77°32'46.52813"
6.	BP6	11° 02'30.47332"	77°32'46.64223"
7.	BP7	11° 02'30.46282"	77°32'47.27432"
8.	BP8	11° 02'27.82392"	77°32'47.16311"
9.	BP9	11° 02'25.59471"	77°32'48.64562"
10	BP10	11° 02'25.58710"	77°32'49.34370"
11.	BP11	11° 02'22.95353"	77°32'50.88992"
12.	BP12	11° 02'20.37530"	77°32'51.47621"
13	BP13	11° 02'19.33431"	77°32'51.64231"
14	BP14	11° 02'19.12621"	77°32'50.84741"
15	BP15	11° 02'19.36081"	77°32'50.48551"
16	BP16	11° 02'18.76391"	77°32'49.11650"
17.	BP17	11° 02'18.18431"	77°32'49.37540"
18.	BP18	11° 02'17.25500"	77°32'48.03811"
19	BP19	11° 02'16.45862"	77°32'46.68823"
20.	BP20	11° 02'17.40590"	77°32'46.05470"
21.	BP21	11° 02'16.82921"	77°32'43.46160"
22.	BP22	11° 02'16.64612"	77°32'42.93581"
23.	BP23	11° 02'15.92640"	77°32'40.96740"
24.	BP24	11° 02'17.68391"	77°32'40.39250"
25.	BP25	11° 02'20.83771"	77°32'39.68442"
26.	BP26	11° 02'25.48941"	77°32'38.49402"
27.	BP27	11° 02'28.68702"	77°32'38.25701"
28.	BP28	11° 02'28.23782"	77°32'53.70832"
29.	BP29	11° 02'28.40831"	77°32'55.96982"
30.	BP30	11° 02'29.25850"	77°32'56.24581"
31.	BP31	11° 02'29.07761"	77°32'57.12372"
32.	BP32	11° 02'28.07761"	77°32'58.70061"
33.	BP33	11° 02'27.73352"	77°32'58.97292"
34.	BP34	11° 02'24.03921"	77°32'58.65182"
35.	BP35	11° 02'22.16071"	77°32'58.32492"
36.	BP36	11° 02'20.01370"	77°32'57.04501"
37.	BP37	11° 02'20.40241"	77°32'56.29872"
38.	BP38	11° 02'21.24041"	77°32'54.21122"
39.	BP39	11° 02'23.96082"	77°32'53.62372"
40.	BP40	11° 02'24.68840"	77°32'54.08650"

41	BP41	11° 02'24.94932"	77°32'53.30331"

1.7.4 Connectivity of the Project

The project is situated at a distance of ~0.24 km to Velan Nagar Village towards South direction and ~0.59 km South West of Sivanmalai Village, one approach road is running from SH 96 (Erode-Kangeyam) ~2.26 km towards (East) side of the lease area. The project site has well established connection facilities. The nearest railway station is Uttukuli Railway station located at ≃ 16.44 km towards NW direction. NH 81 (Chidambaram-Kangeyam-Coimbatore) situated at distance of ≃ 4.20 km (SSE).

1.7.5 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.

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.

1.7.5.1 Demand –Supply Gap

As of now there is good demand for this colour 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 s]

labs, tiles, fancy items, monuments, sawn slabs or local sales as raw block etc.

1.7.5.2 Imports Vs Indigenous

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

1.1.1.1 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 slaps etc. Apart from

TAMIN so many private enterprises are exporting the granite material as raw blocks, polished slab and monuments etc.

1.1.1.2 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.

1.8 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 B1category 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.

1.9 EIA Cost

EIA study was undertaken by HECS for an amount of Rs.1,54,225.00/- Lakhs.The base line monitoring was done by M/s. HECS lab, Chennai, an NABL and MoEF& CC Accredited Laboratory.

1.10 Scope of the Study

The scope of the work mentioned includes an assessment study of proposed black Granite Quarryproject 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 negativethat, themining 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 14thSeptember 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.

Chapter 6: Environmental Monitoring Program

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.

1.10.1 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.

1.10.2 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.

1.10.3 Applicable Regulatory Framework

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

1. Studyof 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.

1.10.4 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.

1. The Water (Prevention and Control of Pollution) Act, 1974 as amended
2. The Water (Prevention and Control of Pollution) Cess Act, 1977, as amended
3. The Air (Prevention and Control of Pollution) Act, 1981 as amended (Air Act)
4. The Noise Pollution and Regulation Act: 2000as amended
5. The Environment (Protection) Act, 1986 (EPA)as amended
6. The Wildlife (Protection) Act, 1972
7. The Forest (Conservation) Act, 1980
8. The Public Liability Insurance Act, 1991
9. The Mines and Minerals (Regulation and Development) Act, 1957 as amended
10. Circulars issued by the Director-General Mines Safety (DGMS) as amended
11. Contract Labor Regulation and Abolition Act 1970as amended
12. The Motor Vehicles Act – 1989as amended
13. PESO – Explosives and handling of Hazardous Material: 1934

1.1.1.3 Terms of Refernce Compliance

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

Additional TOR Specified by the SEAC to deal with violation aspects of the mining projects		
Section A		
As per the MoEF & CC Notification S.O.1030 (E) dated 08.03.2018		
S. No	**ToR details**	**Compliance**

1.	"The cases of violations will be appraised by the Expert Appraisal Committee at the Central level or State or Union territory level Expert Appraisal Committee constituted under sub section (3) if section 3 of the environment (Protection)Act, 1986 with a view to assess that the project has been constructed at a site which under prevailing laws is permissible and expansion has been done which can run sustainably under compliance of environmental norms with adequate environmental safeguards, and in case, where the findings of Expert Appraisal Committee for projects under category A or state or union territory level Expert Appraisal Committee for projects under category B is negative, closure of the project will be recommended along with actions under the law.	Noted.
2.	In case, where the findings of the Expert Appraisal Committee or State or Union territory level Expert Appraisal Committee on point at sub-paragraph (4) above are affirmative, the projects will be granted the appropriate Terms of Reference for undertaking Environment Impact Assessment and preparation of Environment Management Plan and the Expert Appraisal Committee or State or Union territory level Expert Appraisal Committee, will prescribe specific Terms of Reference for the project on assessment of ecological damage, remediation plan and natural and community resource augmentation plan and it shall be prepared as an independent chapter in the environment impact assessment report by the accredited consultants, and the collection and	Noted.

	analysis of data for assessment of ecological damage, preparation of remediation plan and natural and community resource augmentation plan shall be done by an environmental laboratory duly notified under the Environment (Protection) Act, 1986, or a environmental laboratory accredited by the National Accreditation board for Testing and Calibration Laboratories, or a laboratory of the council of Scientific and Industrial Research institute working in the field of environment."	

After the appraisal of the project, the SEAC decided that the **Para no 2**. Stated above is applicable to the project. Hence the proponent is directed to prepare appropriate reports as contained in the **Para 2**.

While complying with the specific aspects of the MoEF & CC directions as stated in the Para 2 above, the following steps should be followed:

S. No	ToR details	Compliance
Step1: Enumerate the aspects of Violation:		
a	The proponent should enumerate the violation as applicable to the project.	Enumeration of the aspects of Violation study is conducted. The information given in **Chapter 7 and Section 7.1.2. To 7.1.6.**
b	Furnish a description of each violation with quantitative and qualitative data.	
c	Violation categories are to be decided taking into consideration the stage at which the project execution stands.	
Step 2: Ecological Damage Assessment:		
a	For each aspect of violation enumerated in step (1), identify the resultant environmental damage that may have been caused.	The information given in **Chapter 7 and Section 7.1.2 To 7.1.6.**
b	Furnish a description of the environmental damages with	

S. No	ToR details	Compliance
Step1: Enumerate the aspects of Violation:		
	quantitative and qualitative data.	
Step 3: Remediation plan:		
a	For the Environmental damage (s) identified in the step (2) above, prepare the remediation plan for each or combination of damages.	Identification of Impacts and mitigation measures and Remediation plan furnished in **Chapter 7 and Section 7.1.4 To 7.1.6.**
b	The remediation plan should essentially consists of problem statement, target to be achieved (quantity), standards, technology/procedure for remediation, equipment and machinery to be used, time schedule and remediation cost (direct and indirect cost, capital as well as O & M costs).	
Section B		
1	**Natural resource Augmentation**	
a	The resource that should be considered for augmentation should essentially consist of land, biota, air water and other resources as applicable.	The information about Natural resources augmentation Plan furnished in **Chapter 7** and **Section 7.1.5 to 7.1.6.**
b	Proponent may choose one or more of the resource augmentation as applicable and provide a description of the augmentation proposal in details for each resource.	
c	The proponent should also furnish the cost for each augmentation scheme.	
2	**Community resource Augmentation**	

S. No	ToR details	Compliance
Step1: Enumerate the aspects of Violation:		
a	The proponent should prepare a plan of action for addressing the needs of the community in terms of resources in the sectors of education, health and sports primarily and other such resources as applicable to the community in the vicinity of the project.	The information about Community augmentation Plan furnished in **Chapter 7** and **Section 7.1.6**
b	The community resource augmentation plan should consist of rehabilitation of house and people, budget allocation and time schedule for completing the activity.	
	Section C	
Section C	The proponent should prepare content for the ecological damage assessment, remediation plan, natural resource augmentation and community resource augmentation separately in a chapter and include in the EIA/EMP Report.	Ecological damage assessment, remediation plan, natural resource augmentation and community resource augmentation are prepared as separate **Chapter 7** Sections **7.1.2** to **Section 7.1.6.**
	Section D	
a	After the appraisal of the EIA/EMP report submitted by the proponent, SEAC will make a judgment of the quality of the content in the EIA/EMP report specifically with reference to the chapter covering the ecological damage assessment, remediation plan, natural resource augmentation and community resource augmentation.	EIA Prepared as per ToR and enclosed the Ecological damage assessment, remediation plan, natural resource augmentation and community resource augmentation are prepared as a separate **Chapter 7 Section 7.1.2** to**Section 7.1.6**
b	In the judgement of SEAC, if the quality of the content in the chapter is not satisfactory, the	Noted

S. No	ToR details	Compliance
Step1: Enumerate the aspects of Violation:		
	SEAC may direct the proponent to further revise the chapter and resubmit the EIA/EMP report.	
c	If SEAC concludes that the technical part is satisfactory and the costing aspect is not satisfactory then the SEAC may revert to legal provisions, MoEF & CC guidelines and similar expert committee recommendations for finalizing the cost aspects or the SEAC may use its own expertise and experience in finalizing the cost.	Noted
		Section E
Section E	The proponent is directed to furnish data as per the questionnaire appended in Annexure I. It will help the SEAC in arriving the ecological damage and the associated cost.	Noted.
		Section F
Section F	In compliance with the Supreme Court order stated in MoEF & CC letter F.No. 3-50/2017 IA.III-pt dated 05th January 2018, the proponent is required to submit the No Objection certificate obtained from the Department of Geology and Mining, Government of Tamil Nadu regarding payment of 100% cost of illegally mined mineral under section 21(5) of MMDR Act 1957 which would account for mining operation in violation of the following:	No Objection certificate obtained from the Department of Geology and Mining is attached as **Annexure 17**
a	Without Environment Clearance (EC) Or in excess of the quantity	**Chapter 2 and Section 2.7.**

<table>
<tr><th>S. No</th><th>ToR details</th><th>Compliance</th></tr>
<tr><td colspan="3">Step1: Enumerate the aspects of Violation:</td></tr>
<tr><td></td><td>approved in EC.</td><td></td></tr>
<tr><td>b</td><td>Without Consent of Operate (CTO) or in excess of the quality approved in CTO.</td><td>No Consent of Operate (CTO).</td></tr>
<tr><td>c</td><td>Without mining plan/scheme of mining or in excess of the quantity approved in mining plan/scheme of mining.</td><td>The production details given in Chapter 2. Section 2.7.</td></tr>
<tr><td>d</td><td>Without Forest Clearance.</td><td>Not Applicable</td></tr>
<tr><td>e</td><td>Any other violation.</td><td>Quarry is in operation from 2006 to 2016 without Environmental Clearance (EC), thus though this project comes under violation category as per MoEF&CC Violation notification vide S. No. 804 (E) dated 14th March, 2017.</td></tr>
<tr><td>f</td><td>List out the details of reserve forest and wild life sanctuary nearby the project site (the details should also include other districts which are nearby the project site and reserve forest/wildlife sanctuary.</td><td><u>Reserve Forests</u>

<table><tr><th>S.No</th><th>Reserve Forests</th><th>Distance (km)</th><th>Direction</th></tr><tr><td>1</td><td>Villikaradu RF</td><td>11.96</td><td>N</td></tr><tr><td>2</td><td>Chennimalai RF</td><td>12.28</td><td>N</td></tr></table>
Wildlife Sanctuary: Nil

The details of environmental sensitive areas covering within 15 km from project boundary are given in Chapter 3 and Section 3.4</td></tr>
<tr><td>g</td><td>Whether the project site attracts HACA clearance? If so, also furnish the HACA clearance for the mining from the competent authority.</td><td>Project site does not attract the HACA clearance</td></tr>
<tr><td>h</td><td>The proponent is instructed to fill in the form contained in Annexure I to work out the details of the ecological damage</td><td>The details of the ecological damage during the violation period are discussed in Chapter 7, Section 7.1.4, and Table 7.6.</td></tr>
</table>

S. No	ToR details	Compliance
Step1: Enumerate the aspects of Violation:		
	during the violation period.	Ecological Damage due to mining Activities & Remediation Plan and Cost is Rs.4,71,079 Natural Augmentation Cost is Rs.1,00,000/- Community Augmentation Cost is Rs1,00,000/-

1.1.1.4 Standard Terms of Reference

<table>
<tr><th>S. No</th><th>Terms of Reference</th><th>Compliance</th></tr>
<tr><td>1</td><td>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.</td><td>Government has issued Precise area communication letter to grant of lease for 20 years vide Lr.No. 3500834/MME.1/2022-1, dated: 13.01.2023

Precise area communication letter is enclosed as Annexure-1.
Granite Quarry Reserves
<table>
<tr><th>S. No</th><th>Description</th><th>Granite (m³)</th><th>Recovery 25% (m³)</th></tr>
<tr><td>1</td><td>Geological Resource</td><td>51,28,140</td><td>9,84,,007</td></tr>
<tr><td>2</td><td>Mineable Reserves</td><td>39,36,028</td><td>5700</td></tr>
</table>
Yearwise Production details
<table>
<tr><th>S. No</th><th>Year</th><th>ROM (m³)</th><th>Recovery @25% (m³)</th><th>Granite Waste @ 75 % (m³)</th><th>Side Burden (m³)</th></tr>
<tr><td>1</td><td>1st Year</td><td>3600</td><td>900</td><td>2700</td><td>-</td></tr>
<tr><td>2</td><td>2nd Year</td><td>7200</td><td>1800</td><td>5400</td><td>-</td></tr>
<tr><td>3</td><td>3rd Year</td><td>4000</td><td>1000</td><td>3000</td><td>-</td></tr>
<tr><td>4</td><td>4th Year</td><td>4000</td><td>1000</td><td>3000</td><td>-</td></tr>
<tr><td>5</td><td>5th Year</td><td>4000</td><td>1000</td><td>3000</td><td>-</td></tr>
<tr><td colspan="2">Total</td><td>22,800</td><td>5700</td><td>17,100</td><td>-</td></tr>
</table>
The production details are provided in Chapter 2 Section 2.7.</td></tr>
<tr><td>2</td><td>A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.</td><td>It is a Government Poromboke Land
Tamil Nadu Minerals limited has leased for 20 years.
Precise area communication letter from Industries (MME.1) Department, Chennai vide Letter No. 3500834/MME.1/2022-1, dated: 13.01.23 is enclosed as Annexure–1.</td></tr>
<tr><td>3</td><td>All documents including approved mine plan, EIA</td><td>Mining Plan Approval by Director, Department of Geology and Mining vide</td></tr>
</table>

	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.	Rc.No. Rc.No.2445/MM4/2022, dated: 05.11.2022 attached as **Annexure-II**. Mine Lease Area: 17.09.0 Ha **Yearwise Production details** **S. No / Year / ROM (m^3) / Recovery @25% (m^3) / Granite Waste @ 75 % (m^3)** 1 / 1st / 3600 / 900 / 2700 2 / 2nd / 7200 / 1800 / 5400 3 / 3rd / 4000 / 1000 / 3000 4 / 4th / 4000 / 1000 / 3000 5 / 5th / 4000 / 1000 / 3000 **Total / 22,800 / 5700 / 17,100** **Mining Technology**: Open cast semi mechanized mining. All the above mentioned documents are obtained in the name of Tamil Nadu Minerals only.
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).	

S.No	Boundary Mark Point	Latitude	Longitude
1.	BP1	11° 02'31.53190"	77°32'39.27592"
2.	BP2	11° 02'31.23171"	77°32'41.81680"
3.	BP3	11° 02'30.62852"	77°32'44.26402"
4	BP4	11° 02'31.96881"	77°32'45.41320"
.5.	BP5	11° 02'31.67012"	77°32'46.52813"
6.	BP6	11° 02'30.47332"	77°32'46.64223"
7.	BP7	11° 02'30.46282"	77°32'47.27432"
8.	BP8	11° 02'27.82392"	77°32'47.16311"
9.	BP9	11° 02'25.59471"	77°32'48.64562"
10	BP10	11° 02'25.58710"	77°32'49.34370"
11.	BP11	11° 02'22.95353"	77°32'50.88992"
12.	BP12	11° 02'20.37530"	77°32'51.47621"
13	BP13	11° 02'19.33431"	77°32'51.64231"
14	BP14	11° 02'19.12621"	77°32'50.84741"
15	BP15	11° 02'19.36081"	77°32'50.48551"
16	BP16	11° 02'18.76391"	77°32'49.11650"
17.	BP17	11° 02'18.18431"	77°32'49.37540"
18.	BP18	11° 02'17.25500"	77°32'48.03811"
19	BP19	11° 02'16.45862"	77°32'46.68823"
20.	BP20	11° 02'17.40590"	77°32'46.05470"
21.	BP21	11° 02'16.82921"	77°32'43.46160"
22.	BP22	11° 02'16.64612"	77°32'42.93581"
23.	BP23	11° 02'15.92640"	77°32'40.96740"
24.	BP24	11° 02'17.68391"	77°32'40.39250"

		25. BP25 11° 02'20.83771" 77°32'39.68442" 26. BP26 11° 02'25.48941" 77°32'38.49402" 27. BP27 11° 02'28.68702" 77°32'38.25701" 28. BP28 11° 02'28.23782" 77°32'53.70832" 29. BP29 11° 02'28.40831" 77°32'55.96982" 30. BP30 11° 02'29.25850" 77°32'56.24581" 31. BP31 11° 02'29.07761" 77°32'57.12372" 32. BP32 11° 02'28.07761" 77°32'58.70061" 33. BP33 11° 02'27.73352" 77°32'58.97292" 34. BP34 11° 02'24.03921" 77°32'58.65182" 35. BP35 11° 02'22.16071" 77°32'58.32492" 36. BP36 11° 02'20.01370" 77°32'57.04501" 37. BP37 11° 02'20.40241" 77°32'56.29872" 38. BP38 11° 02'21.24041" 77°32'54.21122" 39. BP39 11° 02'23.96082" 77°32'53.62372" 40. BP40 11° 02'24.68840" 77°32'54.08650" 41 BP41 11° 02'24.94932" 77°32'53.30331" Topo sheet: C43F8,12 $ C43L5,9 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 2-8.** Geology and Geomorphology of the area is provided in **Chapter 3 Section 3.5.6, Figure 3.12.**
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.	It is a fresh quarry and It is a government poramboke land. Topo map prepared in 1:50000 scale and given as **Figure 2-8.** Geomorphology Map of Study Area if given in **Figure 3-12** Geomorphology pattern of the study area is shown in **Chapter 3, Section 3.5.6, Figure 3-11.** Hydrogeology of district is given in **Chapter 3, Section 3.5.6 Figure 3-13**. Drainage map is shown in **Chapter 3, Section 3.5.8**, **Figure 3-14.**

S.No	Places	Distance (~km)	Direction
1.	Canal	Within the Site	
2.	Canal	Within the Site	
3.	Canal near Chinnayipudur	2.03	S
4.	Parambikulam Main Canal	3.27	SSW
5.	Kadaiyur Distributary	4.80	SW
6.	Alagumalai Branch Canal	5.95	W

		7.	Noyil Orattuppalaiyam Reservoir	6.11	N
		8.	Lower Bhavani Main Canal	6.70	N
		9.	Noyil R	7.29	N
		10.	Kattangani Kulam	9.32	NW
		11.	Mudalaimadai Ar	9.60	NNE
		12.	Nelali Karai	9.62	S
		13.	Vada Channaripalaiyam Distributary	9.91	SW
		14.	Karattu Distributary	11.14	W
		15.	Nagalingapuram Distributary	12.54	WSW
		16.	Palatoluvu Tank	12.69	N
		17.	Lake near Anaipalaiyam	12.70	NW
		18.	Peruntoluvu Distributary	12.8	WNW
		19.	Avaraikkarai Nadi	13.90	NNW
		20.	Manikkapurampudur Kulam	14.00	NW

6	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.	It is a fresh quarry. Government has issued precise area communication letter for 20 years vide Lr.No3500834/MME.1/2022-1, dated: 13.01.2023. Precise area communication letter is enclosed as **Annexure-1.** Director of Geology and Mining has approved the Mining Plan to carryout the mining activities. Mining Plan is enclosed as **Annexure-2 (Annexure page no. 20).**

S. No	Description	Granite (m^3)	Recovery 25% (m^3)
1	Geological Resource	51,28,140	9,84,,007
2	Mineable Reserves	39,36,028	5700

S. No	Year	ROM (m^3)	Recovery @25% (m^3)	Granite Waste @ 75 % (m^3)
1	1st	3600	900	2700
2	2nd	7200	1800	5400
3	3rd	4000	1000	3000
4	4th	4000	1000	3000

		5 | 5th | 4000 | 1000 | 3000 **Total | 22,800 | 5700 | 17,100** The production details are provided in **Chapter 2 Section 2.7.**
7	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.	Environmental Policy of TAMIN is given in **Chapter 10 Section 10.15.** Also enclosed as **Annexure-6.** ➢ We develop safe working methods and practices, with as an 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 employeesand contract workmen to ensure safe production and achieve the target of zero accidents. We are committed for 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.
8	Issues relating to Mine safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should be provided.	**Mine Saftey 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	➢ 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	➢ Accidents are known to happen due to overburden collapse. ➢ Therefore, slope stabilization and dump stability are critical issues for safety and environment. Adequate measures will be taken care.
		5	Worker's health surveillance	➢ Health survey programmes for workers and local community. ➢ Regular training and awareness of employees to be conducted to meet health and safety objectives.

No underground mining method is proposed. It is a Black Granite quarry an open cast Mining methodology will be followed.
Workable depth of mining will be 40m AGL.

Mining methodology is provided in **Chapter 2** and **Section 2.9 and Section 2.10.**

Safeguard measures are provided in **Chapter-4**, **Section 7.2.2.8.**

- ➢ 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.

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 considered for the EIA study comprises of 10km zone of radial distance from the lease periphery. The data contained within the EIA including 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. The study area of 10km zone around the mines lease from lease periphery and furnished in **Chapter 3.** The production and waste generation details such as Mineable Reserves have been worked out as 17,100m^3 by applying the recovery factor 25%. The annual peak production per year would be 1,800 m^3 of ROM of saleable and 22,800 m^3 of ROM during the first five year of Mining plan period at the rate of 25% recovery. The total waste (Granite waste + Side Burden) to be generated during the 5

<table>
<tr><td></td><td></td><td>years of Mining plan period will be around 99,238 m³. These wastes are proposed to be dumped on the North eastern side of lease area with dimensions of 674.4m X 68.3m X 4.35m.
Life time of the mine is 547years.</td></tr>
<tr><td>10</td><td>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.</td><td>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:
<table>
<tr><th>Description</th><th>Area (sq.km)</th><th>Area (Acres)</th><th>Area (Hectares)</th><th>Area (%)</th></tr>
<tr><td>Fallow</td><td>184.40</td><td>45566.16</td><td>18440</td><td>55.04</td></tr>
<tr><td>Plantation</td><td>59.13</td><td>14611.32</td><td>5913</td><td>17.65</td></tr>
<tr><td>Crop land</td><td>34.84</td><td>8609.14</td><td>3484</td><td>10.40</td></tr>
<tr><td>Grass / Grazing land</td><td>14.02</td><td>3464.41</td><td>1402</td><td>4.18</td></tr>
<tr><td>Rural</td><td>13.33</td><td>3293.91</td><td>1333</td><td>3.98</td></tr>
<tr><td>Scrub land</td><td>11.81</td><td>2918.31</td><td>1181</td><td>3.52</td></tr>
<tr><td>Urban</td><td>8.30</td><td>2050.97</td><td>830</td><td>2.48</td></tr>
<tr><td>Waterbodies</td><td>3.71</td><td>916.76</td><td>371</td><td>1.11</td></tr>
<tr><td>Mining</td><td>3.47</td><td>857.45</td><td>347</td><td>1.04</td></tr>
<tr><td>River / Stream / Canals</td><td>1.78</td><td>439.85</td><td>178</td><td>0.53</td></tr>
<tr><td>Barren rocky</td><td>0.25</td><td>61.78</td><td>25</td><td>0.07</td></tr>
<tr><td>Total</td><td>335.04</td><td>82790.06</td><td>33504</td><td>100.00</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
</table>
Land use/land coverof Study Areais given in Chapter 3 and Section 3.5.4.1, Table 3-4, Figure 3-7 & Figure 3-8.

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-</td></tr>
</table>

<table>
<tr><td></td><td></td><td>aid centre and other service facilities.
• Exposure of topsoil to wind and water erosion.
The details are provided in Chapter 4 Section 4.1.2.

Land use details of the quarry area:
<table>
<tr><th>S. No</th><th>Land Use</th><th>Area to be required during the mining plan (Ha)</th></tr>
<tr><td>1</td><td>Area under Quarry</td><td>13.18.5</td></tr>
<tr><td>2</td><td>Waste Dump</td><td>2.56.5</td></tr>
<tr><td>3</td><td>Infrastructure</td><td>0.00.5</td></tr>
<tr><td>4</td><td>Mine Approach Road</td><td>0.11.0</td></tr>
<tr><td>5</td><td>Afforestation</td><td>0.46.5</td></tr>
<tr><td>6</td><td>Un utilized Area</td><td>0.76.0</td></tr>
<tr><td colspan="2">Total</td><td>17.09.0</td></tr>
</table>
A Land use detail of the quarry areas provided in Chapter 2, Section 2.6, Table 2.6.</td></tr>
<tr><td>11</td><td>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.</td><td>As it is a new project 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.</td></tr>
<tr><td>12</td><td>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</td><td>No Forest land involved in this project area.

The proposed lease area is classified as Government poramboke land.

TAMIN obtained Precise area communication from Industries (MME.1) Department, Chennai vide Letter No. 3500834/MME.1/2022-1, dated: 13.01.2023 is enclosed as Annexure–1 to obtainlease period ofmining for 20 years.</td></tr>
</table>

<table>
<tr><td></td><td>the Expert Appraisal Committees.</td><td></td></tr>
<tr><td>13</td><td>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.</td><td>No forest clearance is required. As there is no forest land involved in the lease applied area.</td></tr>
<tr><td>14</td><td>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.</td><td>No scheduled tribes and other traditional forest dwellers are observed.</td></tr>
<tr><td>15</td><td>The vegetation in the RF/ PF areas in the study area, with necessary details, should be given.</td><td>Environmental sensitive areas covering within 15 km from project boundary.

<table><tr><th>S.No</th><th>Description</th><th>Distance (~km)</th><th>Direction</th></tr><tr><td>1</td><td>Villikaradu RF</td><td>11.96</td><td>N</td></tr><tr><td>2</td><td>Chennimalai RF</td><td>12.28</td><td>N</td></tr></table>
The details of environmental sensitive areas covering within 15 km from project boundary are given in Chapter 3, Section 3.4, Table 3-1 and Figure 3-3.</td></tr>
<tr><td>16</td><td>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.</td><td>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.</td></tr>
<tr><td>17</td><td>Locations of National parks, Sanctuaries, Biosphere Reserves, Wildlife</td><td>There are no National parks, Sanctuaries, Biosphere Reserves; There is no Wildlife Corridors, Ramsar site Tiger/ Elephant Reserveswithin the 10km</td></tr>
</table>

<table>
<tr><td></td><td>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.</td><td>radius.

These are the only reserve forests within 15 km of the project site.

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.

<table><tr><th>S.No</th><th>Description</th><th>Distance (~km)</th><th>Direction</th></tr><tr><td>1</td><td>Villikaradu RF</td><td>11.96</td><td>N</td></tr><tr><td>2</td><td>Chennimalai RF</td><td>12.28</td><td>N</td></tr></table></td></tr>
<tr><td>18</td><td>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.</td><td>Detailed study on Biological Environment of the study area is given in Chapter 3, Section 3.11.

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 inhabitantsThe details are provided in Chapter 3, Section 3.11.3

The lists of floral species are provided in Chapter 3. Section 3.11.3.1, Table 3.21.

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-I species, listed in The Wildlife Protection Act 1972, as well as in Red List of IUCN. List of Fauna in the Study Area are provided in Chapter 3, Section 3.11.4, Table 3.22 to Table 3.27.</td></tr>
<tr><td>19</td><td>Proximity to Areas declared</td><td>Ranipet (CEPI)- This is located at 15.7km in the SW direction.</td></tr>
</table>

	as "Critically Polluted" or the Project areas likely to come under the 'Aravali Range', (attracting court restriction for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.	
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)	There is no Coastal Zone within 15km radius of the project site.
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	The lease area is classified as Government Poramboke land. Precise area communications from Industries (MME.1) Department, Chennai vide Letter 3500834/MME.1/2022-1, dated: 13.01.2023 is obtained from Govt.of Tamil Nadu for 20 years. There will be no Rehabilitation and Resettlement involved. Precise area communication letter is enclosed as **Annexure-1.**

	programmes prepared submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R & R and socio-economic aspects should be discussed in the Report.	
22	One season (non-monsoon) [i.e March–May (Summer Season); October-December (Post Monsoon Season); December-February (Winter Seasons)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil nd 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. The mineralogical composition of PM10,	The primary baseline data monitored covered three (3) months i.e., from **mid of January 2023 – mid of April 2023**, and secondary data was collected from Government and Semi-Government organizations. The primary baseline data results and discussions are furnished in **Chapter 3**. **Ambient Air Quality:** **Monitoring Locations** **Station Code / Location / Type of Wind / Distance (~km) from Project boundary / Directions** A1 – Near Project Site – - – 0.20 – W A2 – Kovilpalaiyam – d/w – 1.22 – N A3 – Kiranur – d/w – 3.75 – N A4 – Virankuttaivalasu – c/w – 2.84 – NE A5 – Neykkaranpalaiyam – c/w – 1.67 – ESE A6 – Kangayam – u/w – 3.31 – S A7 – Sivamalai – c/w – 0.71 – SW A8 – Arasampalaiyam – c/w – 3.01 – NW The details of Ambient Air Quality Monitoring Locations, Results and Maps are provided in **Chapter 3, Section 3.7, Table 3.8- Table 3.10, Figure 3.18 & Figure 3.19.** The average baseline levels of PM_{10} (52.4-57.6 µg/m³). **Noise:** **Monitoring Locations** **Station Code / Location / Distance (~km) from Project boundary / Directions** N1 – **Near Project** – Within Site

particularly for free silica, should be given.

	Site		
N2	Kovilpalayam	1.07	E
N3	Kiranur	2.49	E
N4	Virankuttaivalasu	9.59	SSW
N5	Neykkaranpalaiyam	8	SW
N6	Kangayam	5.32	WSW
N7	Sivamalai	1.69	W
N8	Arasampalaiyam	3.71	N

The details of Noise Monitoring Locations, Results and Maps are provided in **Chapter 3, Section 3.8, Table 3.11, Figure 3.20.**

Water:

i. Surface Water:

Location Code	Locations	Distance from Project Boundary (~km)	Direction
SW1	Canal	7.48	N
SW2	Noyil r	9.34	NE
SW3	Lower Bhavani Main Canal	4.93	S
SW4	Parambikulam Main Canal u/s	9.68	S
SW5	Nelali Karai	3.97	SSW
SW6	Parambikulam Main Canal U/S	3.97	SSW
SW7	Kattangani Kulam	9.42	NW
SW8	Noyil Orattuppalaiyam Reservoir	6.78	N

The details of Surface Water Monitoring Locations, Results and Maps are provided in **Chapter 3, Section 3.9.1, Table 3.12 &Table 3.13, Figure 3.21.**

ii. Ground Water:

Station Code	Location	Distance (km) from Project boundary	Directions
GW1	Near Project Site	0.20	W

		GW2	Kovilpalayam	1.22	N
		GW3	Kiranur	3.75	N
		GW4	Virankuttaivalasu	2.84	NE
		GW5	Neykkaranpalaiyam	1.67	ESE
		GW6	Kangayam	3.31	S
		GW7	Sivamalai	0.71	SW
		GW8	Arasampalaiyam	3.01	NW

The details of Ground Water Monitoring Locations, Results and Maps are provided in **Chapter 3, Section 3.9.3, Table 3.17 to Table 3.18, Figure 3.22.**

Soil:

Location Code	Location	Distance (~km) from Project boundary	Directions
S1	Near Project Site	Within the site	
S2	Kovilpalayam	1.22	N
S3	Kiranur	3.75	N
S4	Virankuttaivalasu	2.84	NE
S5	Neykkaranpalaiyam	1.67	ESE
S6	Kangayam	3.31	S
S7	Sivamalai	0.71	SW
S8	Arasampalaiyam	3.01	NW

The details of soil Monitoring Locations, Results and Maps are provided in **Chapter 3, Section 3.10, Table 3.19 & Table 3.20, Figure 3.23.**

23	Air quality modelling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of Vehicles for transportation of mineral. The details of the model used and input parameters	**Total maximum GLCs from emissions:**

Pollutant	Max. Base Line Conc. (µg/m³)	Estimated Incremental Conc. (µg/m³)	Total Conc. (µg/m³)	NAAQ standard	% contribution of concentration above Base line
TSPM	142.98	5.43	148.41	500	3.80
PM10	57.19	1.14	58.33	100	1.99
PM2.5	32.84	0.68	33.52	60	2.07

	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.	

SO2	12.14	0.06	12.20	80	0.49
NOX	30.70	0.24	30.94	80	0.78

The maximum ground level concentration observed due to mining activities and traffic movement through Air Modelling for TSPM, PM_{10}, $PM_{2.5}$, SO_2 and NO_x are 142.98µg/m³, 57.19µg/m³, 32.34µg/m³ 12.14µg/m³, and 30.70µg/m³respectively.

The details are provided in **Chapter 4, Section 4.2.5, Table 4.15.**
Predominent wind direction South west.

Map showing the Ambient Air Quality monitoring locations are given in **Chapter 3, Secion 3.7.1 Figure 3.18.**

Wind rose diagram considered for dispersion modeling is shown in **Chapter 4, Section 4.2.3 Figure 4.1.**

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.
The details are provided in **Chapter 4, Section 4.2.5, Table 4.16 & Table 4.17.**

<table>
<tr><td>24</td><td>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.</td><td>The water requirement for the project is addressed in Chapter 2 and Section 2.11.2. Table 2.12.
<table>
<tr><th>S. No</th><th>Description</th><th>Water Requirement (KLD)</th></tr>
<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">Total</td><td>1.5</td></tr>
</table>
The total water requirement is sourced from Private tank suppliers.
The Scehmatic Diagram of Water requirement:
The details are shown in Chapter 4, Section 4.3, Figure 4.49.</td></tr>
<tr><td>25</td><td>Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.</td><td>No ground water withdrawal to meet the water requirement is proposed.

The total water requirement will be sourced from Private tank suppliers.</td></tr>
<tr><td>26</td><td>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.</td><td>Water conservation measures:
Ground water occurrence in this area is 10.35m BGL The quarry operation is 31m from the top of the hill which is well above the water table for the entire lease period; hence the quarry operation will not be affected by the ground water in any manner.
<u>Rainwater harvesting:</u>
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.
Rainwater harvesting details are provided in Chapter 4 Section 4.3.4.2</td></tr>
<tr><td>27</td><td>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.</td><td>The Proposed depth the quarry is 31m AGL of a hill of 55m and the ground water is in 10.35m. 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.

Surface Water Pollution Control Measures:
➢ Odai is passes through the site. As per the mining plan, a safety distance of 50mts shall be maintained for the odai.
➢ 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</td></tr>
</table>

		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. **Ground Water Pollution Control Measures** ➢ 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. The details are provided in **Chapter 4, Section 4.3.4.2**.
28	Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should be	The mining activity proposed in depth of 31m from the top of the hill. (AGL as per mining plan) Ground water table is available at 10.35m BGL as per Mining plan. 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 31m from the top of the hill of 55 m height.

<table>
<tr><td></td><td>obtained and copy furnished.</td><td></td></tr>
<tr><td>29</td><td>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.</td><td>➢ A safety distance of 10m shall be maintained for the Siva Subramania Swami temple land situated .in S.F No 1455 to the west of the applied area in S.F No. 1456
➢ A safety distance of 50m shall be maintained for the PWD Canal passing to the periphery of S,F,No 1456 and to the eatern [periphery of S.F.No 1458respectively and qurrying operations shall be carried out without causing any hinderanceto the canals.
➢ Details are provided in area precise communication letter is provided as Annexure-2.</td></tr>
<tr><td>30</td><td>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.</td><td>Site Elevation: 360m above MSL
Groundwater level is 10.35m depth from ground level (As per mining plan).

Proposed Depth of Mining is 31m AGL given in the Mining Plan enclosed as Annexure-4.</td></tr>
<tr><td>31</td><td>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</td><td>About 0.06.5 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

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.

<table>
<tr><th>Year</th><th>No. of trees proposed to be planted</th><th>Name of the species</th><th>Area((Ha)</th><th>Survival rate expecte d</th><th>No. of trees expected to be grown</th></tr>
<tr><td>IstYea r</td><td>200</td><td>Neem/ Pungam</td><td>0.46.0</td><td>50%</td><td>100</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td>to pollution.</td><td></td></tr>
<tr><td>32</td><td>Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.</td><td>Traffic volume after implementation of the project
<table><tr><th>For the Road</th><th>Volume of Traffic</th><th>Volume (V)</th><th>Road Capacity (C)</th><th>V/C Ratio</th><th>LOS Category*</th><th>Traffic Classification</th></tr><tr><td>Existing</td><td>252</td><td>457.85</td><td>1500</td><td>0.31</td><td>“A”</td><td>Free Flow Traffic</td></tr><tr><td>After implementation</td><td>272</td><td>505.8</td><td>1500</td><td>0.34</td><td>“A”</td><td>Free Flow Traffic</td></tr></table>*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.

Impact and Mitigation on local transport:
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.

Impacts and mitigation measures on transportation is given in Chapter 4. Section 4.2.5.1.</td></tr>
<tr><td>33</td><td>Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.</td><td>Sanitation facilities are provided to mines workers. The details are provided in Mining plan and the same is enclosed as Annexure-2 (Table 2.5).
An area of 0.04.0 Ha, of land is allocated for infrastructure within the lease area.
Land use details of the quarry area:
<table><tr><th>S. No</th><th>Land Use</th><th>Area to be required during the mining plan(Ha)</th></tr><tr><td>1</td><td>Area under Quarry</td><td>13.18.5</td></tr><tr><td>2</td><td>Waste Dump</td><td>2.56.5</td></tr><tr><td>3</td><td>Infrastructure</td><td>0.00.5</td></tr><tr><td>4</td><td>Road</td><td>0.11.0</td></tr><tr><td>5</td><td>Green Belt</td><td>0.46.5</td></tr></table></td></tr>
</table>

		<table><tr><td>6</td><td>Un utilized Area</td><td>0.76.0</td></tr><tr><td colspan="2">Total</td><td>17.09.0</td></tr></table> Land use details of the quarry area are given in **Chapter-2, Section 2.6.**
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.	There will be no reclamation and restoration. It is proposed not to fill back the ultimate pit, in as much as good quantity of reserve is available below the workable depth.
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.	**Impacts on Occupational Health due to project operations:** Anticipated occupational illness sequel to mining activities involved in the project. Occupational health problems due todust&noise and Occupational illness by quarry activities as follows; ➢ Dust related pneumonia ➢ Tuberculosis ➢ Rheumatic arthritis ➢ Segmental vibration **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 emergencyresponse 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. Occupational Health impacts & preventive measures detail given in **Chapter 4 Section 4.7.3** 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.

<table>
<tr><td></td><td></td><td>
Provide workers with training that includes information about health effects, work practices, and use of protective equipments.
The EMP details are given separately as Chapter 10 along with EMP Cost details are provided in Section 10.14.
</td></tr>
<tr><td>36</td><td>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.</td><td>
Occupational Health impacts & preventive measures details are given in Chapter 4 Section 4.7.1.

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.

The EMP details are given as a separately as Chapter 10 along with EMP Cost details are provide in Section 10.14.
<table>
<tr><th colspan="3">EMP COST</th></tr>
<tr><th>S.No</th><th>Description</th><th>Amount in Rs.</th></tr>
<tr><td>1</td><td>Afforestation</td><td>30,000/-</td></tr>
<tr><td>2</td><td>Water Sprinkling</td><td>50,000/-</td></tr>
<tr><td>3</td><td>Water Quality Test</td><td>25,000/-</td></tr>
<tr><td>4</td><td>Air Quality Test</td><td>25,000/-</td></tr>
<tr><td>5</td><td>Noise / Vibration Test</td><td>25,000/-</td></tr>
<tr><td>6</td><td>CSR Activity</td><td>50,000/-</td></tr>
<tr><td colspan="2">Total EMP Cost</td><td>2,05,000/-</td></tr>
</table>
</td></tr>
<tr><td>37</td><td>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.</td><td>
A socio-economic study was undertaken in assessing aspects which are dealing with social and cultural conditions, and economic status with secondary sources in the study area. 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.
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 got employed in the mines as skilled and unskilled workers.

</td></tr>
</table>

<table>
<tr><td>38</td><td>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.</td><td>The EMP details are given as a separately as Chapter 10 along with EMP Cost details are provided in Section 10.14.
<table>
<tr><th colspan="3">EMP COST</th></tr>
<tr><th>S.No</th><th>Descriptions</th><th>Amount in Rs.</th></tr>
<tr><td>1</td><td>Afforestation</td><td>30,000/-</td></tr>
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<tr><td>6</td><td>CSR Activity</td><td>50,000/-</td></tr>
<tr><td colspan="2">Total EMP Cost</td><td>2,05,000/-</td></tr>
</table></td></tr>
<tr><td>39</td><td>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.</td><td>Public Hearing points raised and commitment of the Project Proponent is discussed in Chapter 7, Section 7.2 and Table 7.1</td></tr>
<tr><td>40</td><td>Details of litigation pending against the project, if any, with direction/order passed by any Court of Law against the Project should be given.</td><td>No litigation pending against the project as per Project Proponent.</td></tr>
<tr><td>41</td><td>The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.</td><td>
<table>
<tr><th>S. No</th><th>Description of the Cost</th><th>Amount in Rs.</th></tr>
<tr><td>A.</td><td colspan="2">Fixed Cost</td></tr>
<tr><td>1</td><td>Land Cost</td><td>Nil. Because Govt. land</td></tr>
<tr><td>2</td><td>Labour shed</td><td>50,000/-</td></tr>
<tr><td>3</td><td>Sanitary facilities</td><td>50,000/-</td></tr>
<tr><td>4</td><td>Fencing Cost</td><td>1,25,000/-</td></tr>
<tr><td colspan="2">Total</td><td>2,25,000/-</td></tr>
<tr><td>B.</td><td colspan="2">Operational Cost</td></tr>
<tr><td>1</td><td>Jack Hammers</td><td>1,98,000/-</td></tr>
<tr><td>2</td><td>Compressor</td><td>19,82,000/-</td></tr>
<tr><td>3</td><td>Diamond wire saw</td><td>4,87,000/-</td></tr>
<tr><td>4</td><td>Diesel General</td><td>4,00,000/-</td></tr>
<tr><td>5</td><td>Excavators</td><td>6,00,000/-</td></tr>
<tr><td>6</td><td>Tippers</td><td>58,00,000/-</td></tr>
<tr><td>7</td><td>Drinking water facilities for the labours</td><td>50,000/-</td></tr>
<tr><td>8</td><td>Safety kits</td><td>50,000/-</td></tr>
</table></td></tr>
</table>

		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)**
		The project Cost is **Rs.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.	**Disaster Management Plan:** ➢ 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. 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.	➢ 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. ➢ 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.

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	Noted and all documents addressed with properly

	and continuous page numbering.	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 accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.	All the analysis/testing reports of Water, Soil, Air, and Noise etc. are conducted by MoEF&CC& NABL accredited laboratories. 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 perO.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.	Not Applicable, as it is a new project
j)	The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoin area.	All the Sectional Plates are enclosed as **Annexure-5**

1.1.1.5 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)	The same has been complied in the Executive Summary.
2	Process description in brief, specifically indicating the gaseous emission, liquid effluent and solid and hazardous waste.	The gaseous emission, liquid effluent and solid and hazardous wastes are discussed in **Chapter 4**
3	Measures for mitigation the impacts on the environment and mode of discharge or disposal	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. 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.
4	Capital cost of the project, estimated time of completion.	Cost of the project is **Rs.99,97,000/-**
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	Contour map is shown in **Chapter 3, Section 3.5.5, Figure 3.10**
6	A detailed study of the lithology of the mining lease area shall be furnished	Lithology details are provided in Mining plan. Mining Plan is enclosed as **Annexure-4.**
7	Detailed of village map" A" register and FMB sketch shall be furnished	Village map is shown in **Chapter 2, Figure 2.9**
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	Mine closure plan is discussed in **Chapter 7, Section 7.2.4**
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	EIA report is prepared as per Environemntal Impact Assessement Guidance Manual.

<table>
<tr><td></td><td>Mining of Minerals published February 2010</td><td></td></tr>
<tr><td>11</td><td>Details plan on rehabitation and reclamation carried out for the stabilization and restoration of the mined areas.</td><td>There will be no reclamation and restoration.

It is proposed not to fill back the ultimate pit, in as much as good quantity of reserve is available below the workable depth.</td></tr>
<tr><td>12</td><td>The EIA study report shall include the surrounding mining activity, if any.</td><td>There is no mining activity around the Proposed project site.</td></tr>
<tr><td>13</td><td>Modelling study for Air, Water and Noise shal be carried out in this field and incremental increase in the above study shall be substantiated with mitigation measures</td><td>AERMOD Software Version 8.0.5 is used for the modeling study of air and noise. The details are dicussed in Chapter 4

<table><tr><th>S. No</th><th>Description</th><th>Granite (m^3)</th><th>Recovery 25% (m^3)</th></tr><tr><td>1</td><td>Geological Resource</td><td>51,28,140</td><td>9,84,,007</td></tr><tr><td>2</td><td>Mineable Reserves</td><td>39,36,028</td><td>5700</td></tr></table></td></tr>
<tr><td>14</td><td>A study on the geological resources available shall be carried out and reported</td><td>The details of geological reserves were discussed in Chapter 2. Section 2.2</td></tr>
<tr><td>15</td><td>A specific study on agriculture and livelihood shall be carried out and reported</td><td>The details of agriculture & Livelihood is discussed in Chapter 3, Section 3.12</td></tr>
<tr><td>16</td><td>Impact of soil erosion, soil physical chemical and biological property changes may be assumed</td><td>The quality of soil is discussed in Chapter 3, Section 3.10</td></tr>
<tr><td>17</td><td>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)</td><td>The details are discussed in Chapter 3, Section 3.2, Table 3.1</td></tr>
<tr><td>18</td><td>Baseline environmental data-air quality, surface and ground water quality and soil characteristic, flora and fauna, socio economic conditions of the nearby population.</td><td>Baseline environmental data-air quality, surface and ground water quality and soil characteristic, flora and fauna, socio economic conditions of the nearby population are discussed in Chapter 3.</td></tr>
<tr><td>19</td><td>Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.</td><td>3.0 litres/year of waste oil is generated from the mining activity. The waste oil will be collected in leak proof containers and disposed to TNPCB Authorized Agencies for Reprocessing/ Recycling.</td></tr>
<tr><td>20</td><td>Likely impact of the project on Air, Water, Land, flora and fauna and nearby population.</td><td>The impacts of the project on Air, Water, Land, flora and fauna are discussed in Chapter 4</td></tr>
<tr><td>21</td><td>Emergency preparedness plan in</td><td>The emergency preparedness plan is discussed in Chapter 7, Section</td></tr>
</table>

	case of natural or in case of plant emergencies.	**7.2.3**
22	Issues raised during public hearing (if applicable) and response giving.	The public hearing minutes and compliance discussed in **Chapter 7, Section 7.1 and Table 7.1**
23	CER plan with proposed expenditure.	CER Acttivity will be implemented for an amount of Rs.1,99,940 (2% of Project Cost) as per MoEF&CC O.M dated 20th October, 2020 (F.No. 22-65/2017-IA.III). CER fund will be allotted for Public Hearing commitments.
24	Occupational Health Measures.	Occupational Health impacts & preventive measures detail given in **Chapter 4, Section 4.7.3 and Table 4.28**
25	Post project monitoring plan.	Post project monitoring plan is discussed in **Chapter 3, Section 6.3**
26	The project proponent shall carry out detailed hydro geogical study through instituitions/NABET Accredited agencies.	The Proposed depth the quarry is 40m AGL of a hill of 126m and the ground water is in 15m. So there will be no impact on the Ground water.Also there are no major surface water bodies in the surrounding the project area.
27	A detailed report on the greenbelt development already undertaken is to be furnished and also submit the proposal for greenbelt activities	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%. The project proponent will spend Rs.30,000/- for the afforestation.
28	The proponent shall propose the suitable control measure to control the fugitive emissions during the operations of the mines	The control measures to control the fugitive emissions during the operations of the mines is discussed in **Chapter 4, Section 4.2, Table 4.3**
29	A specific study should include impact on flora and fauna, disturbance to migratory pattern of animals	Flora and Fauna study is discussed in **Chapter , Section 3.11**
30	Reserve funds should be earmarked for proper closure plan	Reserve Funds will be earmarked while mining activity.
31	A detailed plan on plastic waste management shall 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 Environement (Protection) Act, 1986. Inthis connection, the project proponent has to furnish the action plan.	A sustainable plastic waste management plan by installing bins for collection/Segregation of recycleable and non-recyclable plastic waste at the proposed project site will be implemented.

1.1.1.6 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.	Compliance of the ToR with cross referencing of the relevant sections/pages of the EIA report is provided in **Chapter 1, Section 1.10.5**
b.	All documents mat be properly referenced with index,	All documents are properly referenced with index,

	page number and continuous page numbering.	page number.
c.	Where data are present in the report especially in table, the period in which the data where were collected and the sources should be indicated.	The sources are mentioned in the table. The period and locations of water, air, noise and soil samples collected from the site are discussed in **Chapter 3.**
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 4th 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 2nd December, 2009, 18th March 2010 , 28th may 2010, 28th June 2010, 31st December 2010 and 30th 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.**

2 PROJECT DESCRIPTION

2.1 Type of Project including interlinked and interdependent projects

The colour 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(~360m AMSL. Total estimated Geological reserves are 51,28,140 m^3. Total Mineable Reserves is estimated as 39,36,028 m^3. Maximum production will be 22,800 m^3 of ROM of Black Granite and 5700m^3 of recoverable production of granite per annum. Summary of quarry reserves are given in **Table 2-1.**

The extent of the Quarry lease area is 17.09.0 Ha. The Quarry is located at Sivanmalai Village, Kangeyam Taluk, Tiruppur District, Tamil Nadu State. Quarry lease area falls in the survey of India Toposheet no 58E/12, 58F/9 and the area lies in the Eastern Longitude from 77°32'38.25701"E to 77°32'58.97292"E and Northern latitude from 11° 02'28.68702"N to 11° 02'27.73352"N.

Table 2-1 Summary of Project Reserves

S. No	Description	Quantity (m^3)
Geological Reserves:		
1	Geological Reserves (ROM)	51,28,140
Mineable Reserves:		
1	Mineable Reserves (ROM)	39,36,028
2	Mineable Reserves (at 10 % Recovery)	9,84,007
3	The peak/maximum annual production per year would be	1800

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 fetch a good foreign exchange to the nation.

2.3 Location of the project

The quarry is located at S.F. 1456 and 3.57.0Ha at S.F.No.1458 at Sivanmalai Village, Kangeyam Taluk, Tiruppur District, Tamil Nadu State.Quarry lease area falls in the survey of India Topo sheet 58E/12, 58F/9 and the area lies in the eastern Longitude from 77°32'38.25701"E to 77°32'58.97292"E and Northern latitude from 11° 02'28.68702"N to 11° 02'27.73352"N The topography of the area is hilly. The elevation of the lease area is ≃360m 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	Boundary Mark Point	Latitude	Longitude
1.	BP1	11° 02'31.53190"	77°32'39.27592"
2.	BP2	11° 02'31.23171"	77°32'41.81680"
3.	BP3	11° 02'30.62852"	77°32'44.26402"
4	BP4	11° 02'31.96881"	77°32'45.41320"
.5.	BP5	11° 02'31.67012"	77°32'46.52813"
6.	BP6	11° 02'30.47332"	77°32'46.64223"
7.	BP7	11° 02'30.46282"	77°32'47.27432"
8.	BP8	11° 02'27.82392"	77°32'47.16311"
9.	BP9	11° 02'25.59471"	77°32'48.64562"
10	BP10	11° 02'25.58710"	77°32'49.34370"
11.	BP11	11° 02'22.95353"	77°32'50.88992"
12.	BP12	11° 02'20.37530"	77°32'51.47621"
13	BP13	11° 02'19.33431"	77°32'51.64231"
14	BP14	11° 02'19.12621"	77°32'50.84741"
15	BP15	11° 02'19.36081"	77°32'50.48551"
16	BP16	11° 02'18.76391"	77°32'49.11650"
17.	BP17	11° 02'18.18431"	77°32'49.37540"
18.	BP18	11° 02'17.25500"	77°32'48.03811"
19	BP19	11° 02'16.45862"	77°32'46.68823"
20.	BP20	11° 02'17.40590"	77°32'46.05470"
21.	BP21	11° 02'16.82921"	77°32'43.46160"
22.	BP22	11° 02'16.64612"	77°32'42.93581"
23.	BP23	11° 02'15.92640"	77°32'40.96740"
24.	BP24	11° 02'17.68391"	77°32'40.39250"
25.	BP25	11° 02'20.83771"	77°32'39.68442"
26.	BP26	11° 02'25.48941"	77°32'38.49402"
27.	BP27	11° 02'28.68702"	77°32'38.25701"
28.	BP28	11° 02'28.23782"	77°32'53.70832"
29.	BP29	11° 02'28.40831"	77°32'55.96982"
30.	BP30	11° 02'29.25850"	77°32'56.24581"
31.	BP31	11° 02'29.07761"	77°32'57.12372"

32.	BP32	11° 02'28.07761"	77°32'58.70061"
33.	BP33	11° 02'27.73352"	77°32'58.97292"
34.	BP34	11° 02'24.03921"	77°32'58.65182"
35.	BP35	11° 02'22.16071"	77°32'58.32492"
36.	BP36	11° 02'20.01370"	77°32'57.04501"
37.	BP37	11° 02'20.40241"	77°32'56.29872"
38.	BP38	11° 02'21.24041"	77°32'54.21122"
39.	BP39	11° 02'23.96082"	77°32'53.62372"
40.	BP40	11° 02'24.68840"	77°32'54.08650"
41	BP41	11° 02'24.94932"	77°32'53.30331"

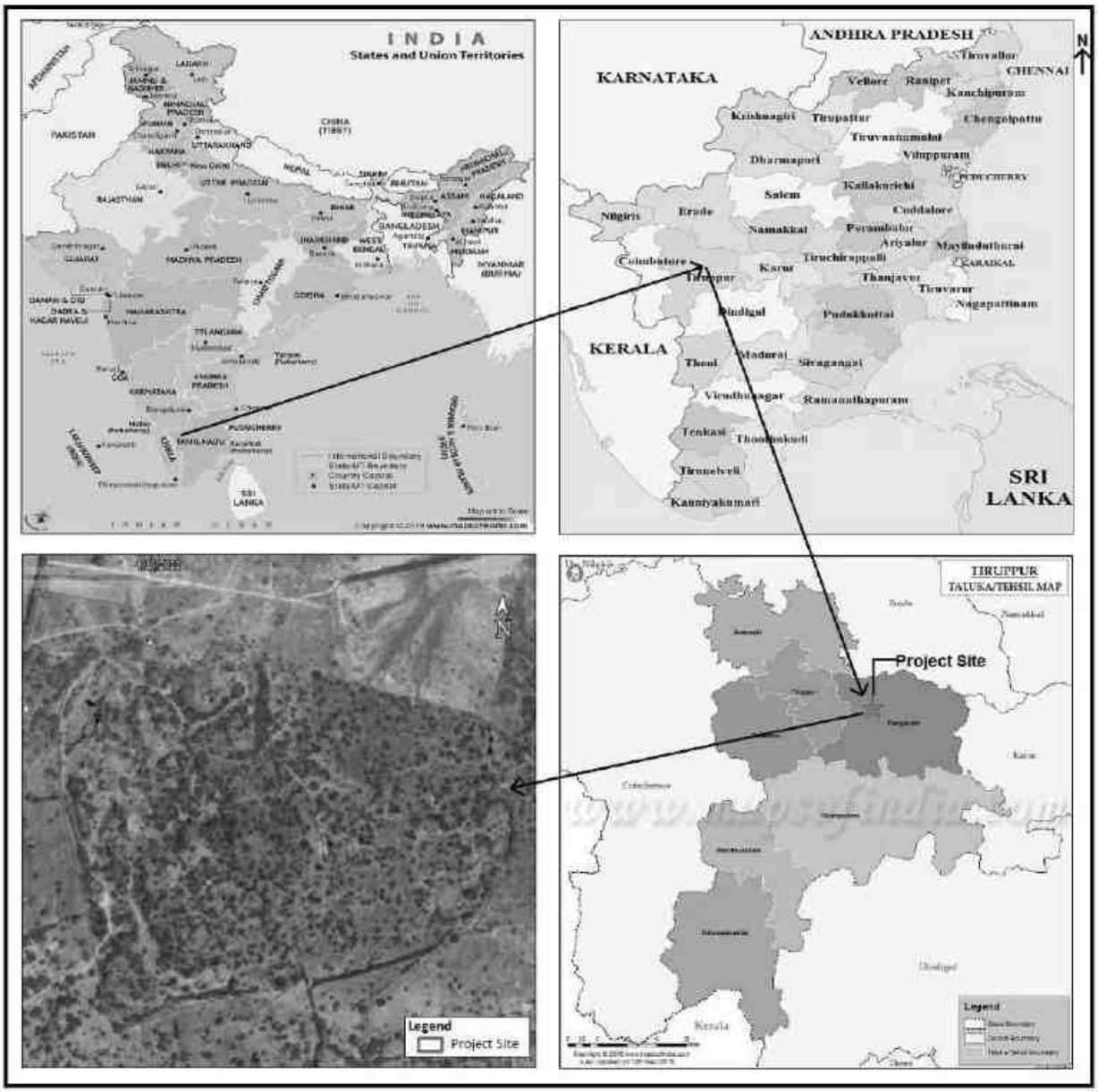

Figure 2-1 Project Location map

Figure 2-2 Google image of the lease area

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

Figure 2-4 Google Imagery of1 km radius of the lease area

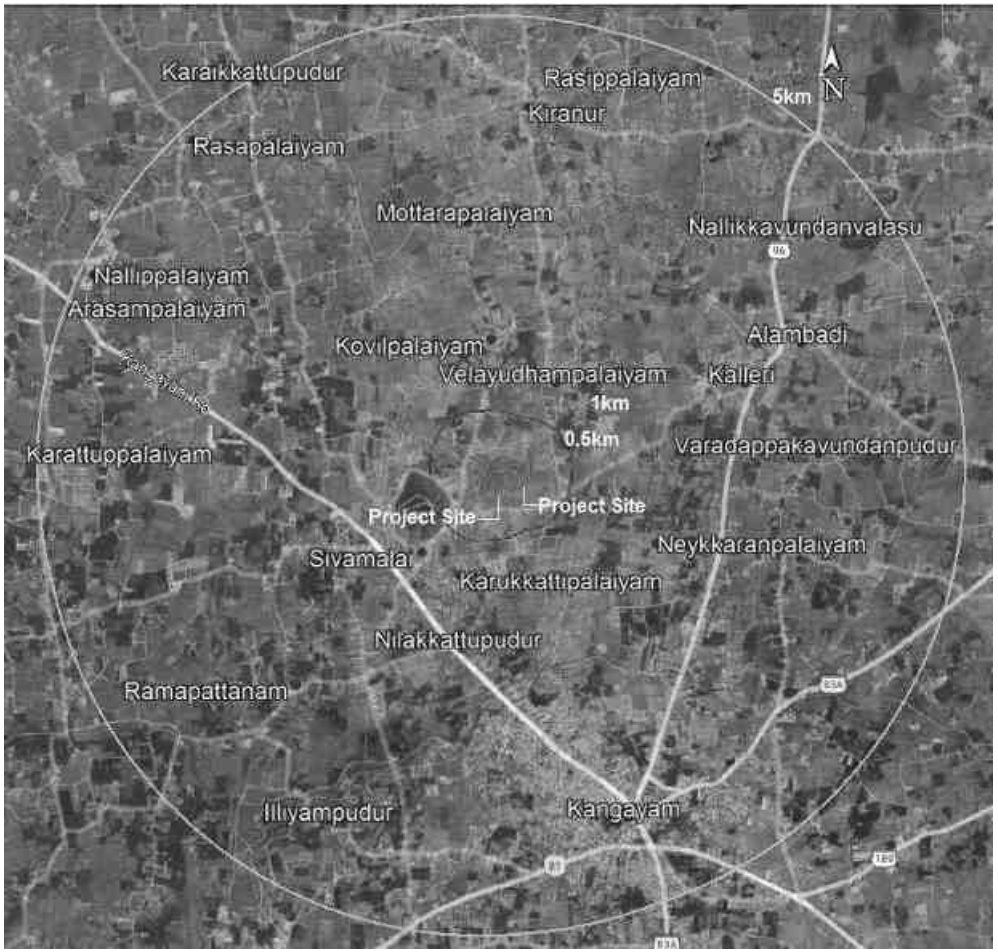

Figure 2-5 5 km Google Imagery of the project site

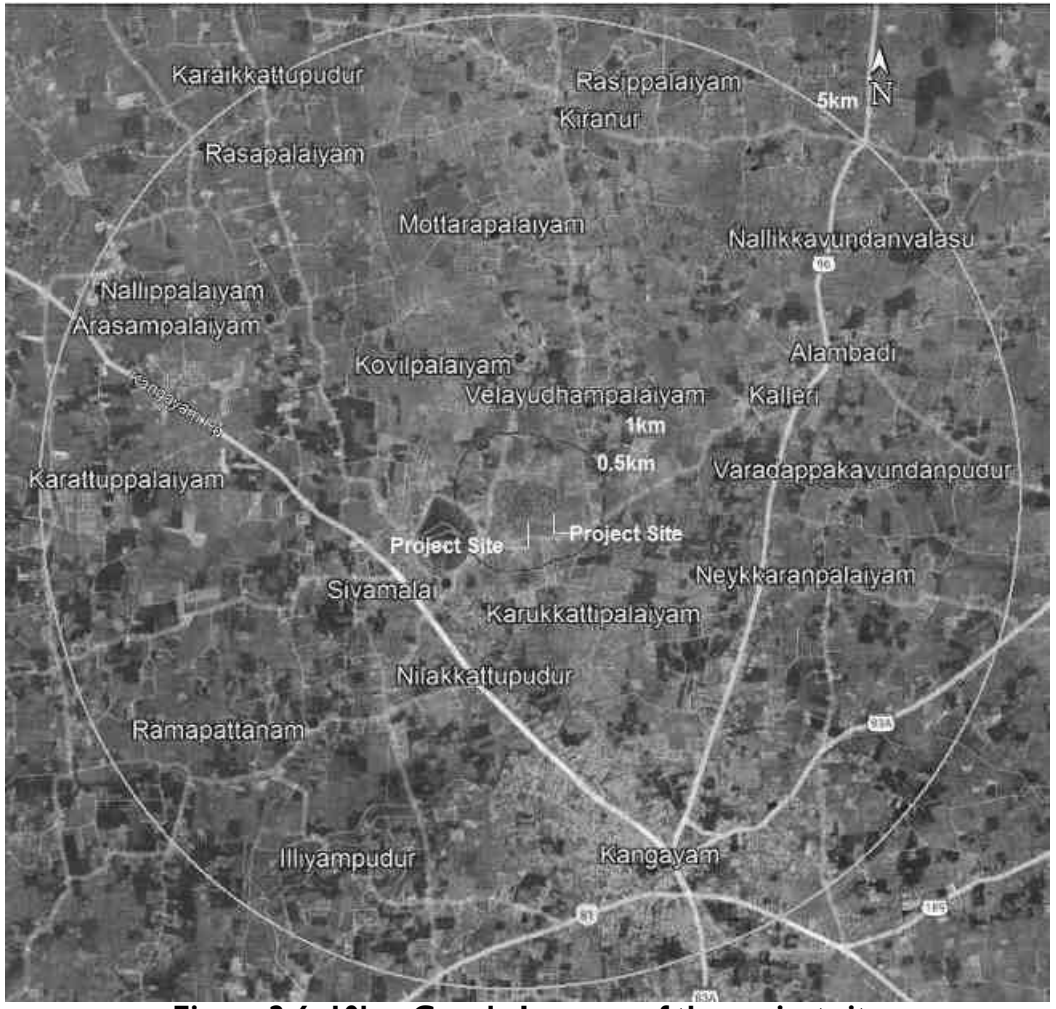

Figure 2-6 10km Google Imagery of the project site

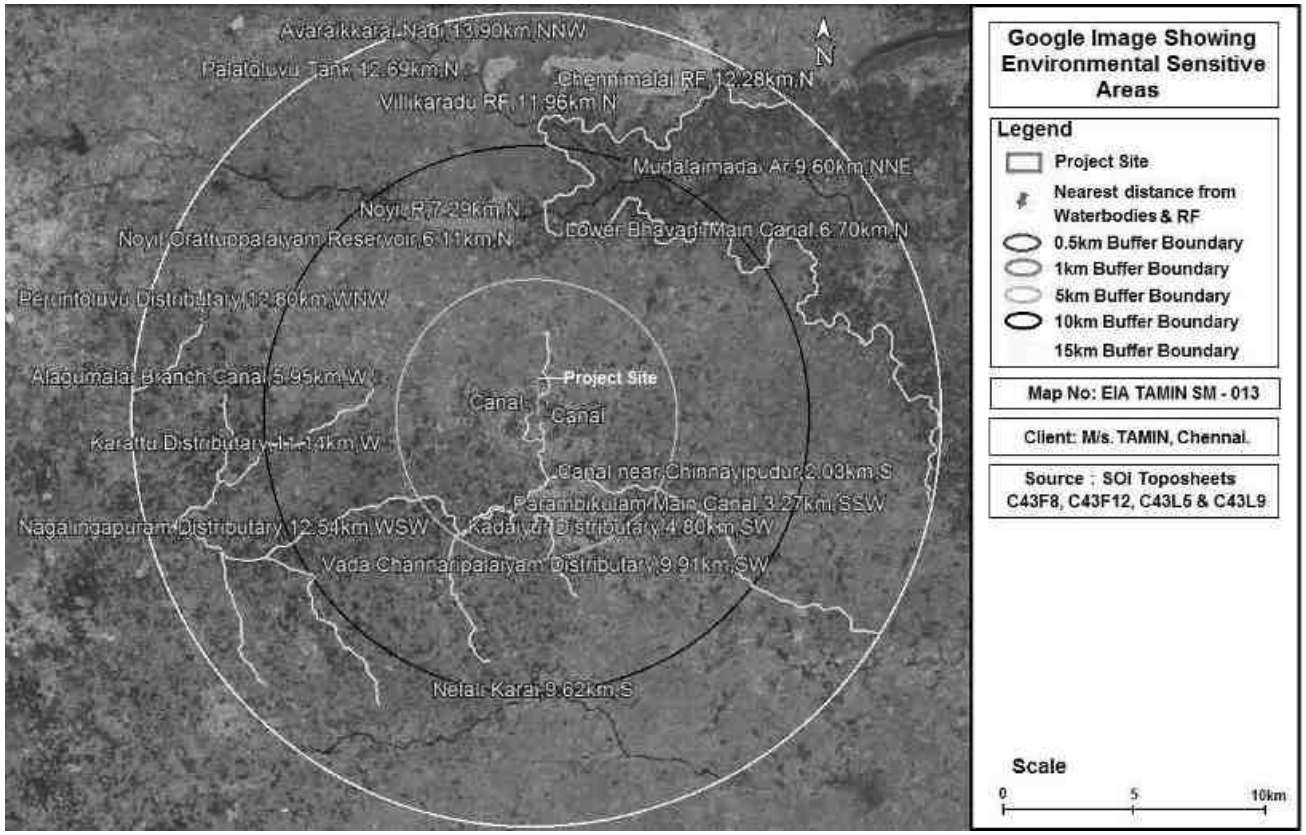

Figure 2-7 Environmental Sensitive areas within 15km radius of the lease area demarcated on Google image

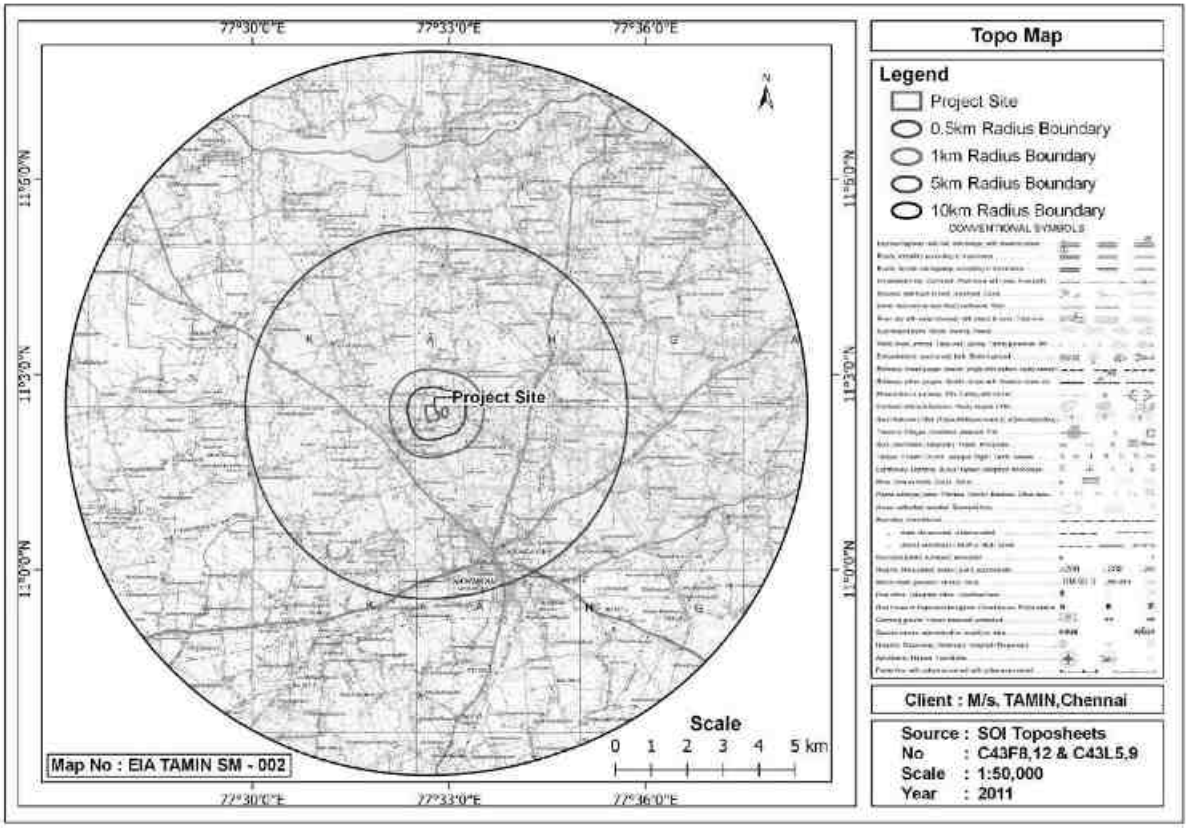

Figure 2-8 Topo map of the study area

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

S.No	Particulars	Details
1.	Latitude	77°32'38.25701"E to 77°32'58.97292"E
2.	Longitude	11° 02'28.68702"N to 11° 02'27.73352"N
3.	The lease area height	360m AMSL
4.	Topo sheet no.	58E/12, 58F/9
5.	Topography	Hilly terrain
6.	Land Type	Government Poramboke land
7.	Extent of lease area(hectares)	17.09.0 Ha 13.52.0 Ha in S.F.No: 1456 3.57.0 Ha in S.F No: 1458
8.	Nearest National highway	NH- 81(Chidambaram-Kangayam-Coimbatore) ≃ 4.20km-SSE
9.	Nearest State highway	SH-96(Erode-Kangayam Road) ≃ 2.26km-SSE
10.	Nearest railway station	Nearest Railway Line(Uttukuli RS-Vijayamangalam RS) ≃ 16.45km– NW
11.	Nearest airport	Coimbatore International Airport≃ 52.85km- W
12.	Nearest town / city	Kangeyam (Pop~32,147) ≃3km-S
13.	Hills / valleys	Nil in 15 km radius
14.	Archaeologically important Places	Nil in 15 km radius
15.	National parks / Wildlife Sanctuaries	Nil in 15 km radius from the project boundary
16.	Seismicity	Seismic zone-II (Low Damage risk Zone)
17.	Defense Installations	Nil in 15 km radius
18.	State Boundary	Nil in 15 km radius
19.	Water bodies	

S.No	Places	Distance (~km)	Direction
1.	Canal	Within the Site	
2.	Canal	Within the Site	
3.	Canal near Chinnayipudur	2.03	S
.	Parambikulam Main Canal	3.27	SSW
5.	Kadaiyur Distributary	4.80	SW
6.	Alagumalai Branch Canal	5.95	W
7.	Noyil Orattuppalaiyam Reservoir	6.11	N
8.	Lower Bhavani Main Canal	6.70	N
9.	Noyil R	7.29	N
10.	Kattangani Kulam	9.32	NW
11	Mudalaimadai Ar	9.60	NNE
12.	Nelali Karai	9.62	S
13.	Vada Channaripalaiyam Distributary	9.91	SW

		14	Karattu Distributary	11.14	W
		15	Nagalingapuram Distributary	12.54	WSW
		16.	Palatoluvu Tank	12.69	N
		17.	Lake near Anaipalaiyam	12.70	NW
		18	Peruntoluvu Distributary	12.8	WNW
		19.	Avaraikkarai Nadi	13.90	NNW
		20	Manikkapurampudur Kulam	14.00	NW
20.	Reserve Forests/ Protected Forests	**S.No**	**Reserve Forests**	**Distance (~km)**	**Direction**
		1.	Villikaradu RF	11.96	N
		2.	Chennimalai RF	12.28	N
21.	Nearest Villages	Nil in 15 km radius			

Table 2-4 Project summary

S.No	Particulars	Details
1.	Project Location	S.F.No.1456 and 1458, Sivanmalai Village, Kangeyam Taluk, Tiruppur District, Tamil Nadu State
2.	Land classification	Government Poramboke Land
3.	Extent of lease area (Ha.)	17.09.0
4.	Precise area communication	Precise area communication letter was granted vide Industries (MME.1) Department, letter No. . 3500834/MME.1/2022-1, dated: 13.01.23.
5.	Lease Period	20 years
6.	Estimated Geological Reserves (ROM) m3	51,28,140
7.	Estimated Mineable Reserves (ROM) m3	39,36,,028
8.	Black Granite production per annum m3	1800
9.	Depth of Mining	31m from the top surface of the granite body
10.	Method of Mining	Open cast semi mechanized method (Reg. 106(20(b)
11.	Water Requirement (KLD)	1.5
12.	Source of Water	Road tankers
13.	Power requirement (kVA)	Negligible
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

2.4 Nearest Human Settlement

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

Table 2-5Nearest Human Settlement

S.No	Places	Distance (≈km)	Direction	Population as per Census 2011
1.	Velan Nagar	0.24	S	200
2.	Kovilpalaiyam	0.40	N	500
3.	Sivamalai	0.59	SW	7,927
4.	Velayudhampalaiyam	0.80	N	120
5.	Karukkattipalaiyam	0.81	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 colour 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 colour 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 colour granite have been computed based on the Geological Plan &Sections up to the economically workable average depth of 31m from the surface level and the top surface of the granite body works out to 51,28,140 m^3.

Mineable Reserves have been computed as 39,36,,028 m^3 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 9,84,007 m^3 by applying the recovery factor 25%. The annual peak production per year would be 1800m^3 of ROM of saleable and 22,800m^3 of ROM during the first five year of Mining plan period at the rate of 25% recovery.

Total waste (Granite waste + Side Burden to be generated during the five years of Mining Plan period will be around 17,100m^3. These wastes are proposed to be dumped on the North eastern side of lease area with dimensions of 674.4m x 68.3 x 4.35m. The Land Use break up summarized as **Table 2.6.**

Table 2-6 Land use details of the quarry area

S.No	Land Use	Area to be required during the mining plan(Ha)
1	Area under Quarry	13.18.5
2	Waste Dump	2.56.5
3	Infrastructure	0.00.5
4	Road	0.11.0
5	Green Belt	0.46.5
6	Un utilized Area	0.76.0
	Total	**17.09.0**

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 31m from the surface level and the top surface of the granite body works out to 51,28,140m^3

Mineable Reserves have been computed as 39,36,028 m^3 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 9,84,007 m^3 by applying the recovery factor 25%. The annual peak production per year would be 1800m^3 of ROM of sateable and 22,800m^3 of ROM during the first five year of Mining plan period at the rate of 25% recovery.Sectional plates are enclosed as **Annexure-IV.**

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 2.10** Geological plan and cross section of the quarry is shown in **Figure 2.11.** Conceptual Plan of the quarry area is shown as **Figure 2.12.** Land use and afforestation of the quarry is shown as **Figure 2.14.** Year wise production plan is shown as **Figure 2.13.**

Table 2-7Granite Quarry Reserves

S. No	Description	Granite (m^3)	Mineable Reserves (m^3)	Mineable Saleable Reserves at 25% Recovery (m^3)
1	Geological Resource	51,28,140	39,36,028	9,84,007

Table 2-8Yearwise Production details

S. No	Year	ROM (m^3)	Recovery @25% (m^3)	Granite Waste @ 75% (m^3)	Side Burden (m^3)

1	1st Year	3600	900	2700	-
2	2nd Year	7200	1800	5400	-
3	3rd Year	4000	1000	3000	
4	4th Year	4000	1000	3000	-
5	5th Year	4000	1000	3000	-
	Total	**22,800**	**5700**	**17,100**	**-**

Estimated Life of the Quarry:

- Mineable ROM: 22,800 m3
- Mineable Recoverable Reserved @25%: 5700 m3
- Average Prodution per Year@25%: 1140 m3 Peak Production is 1800 m3
- Estimated Life of the Quarry: =547 years

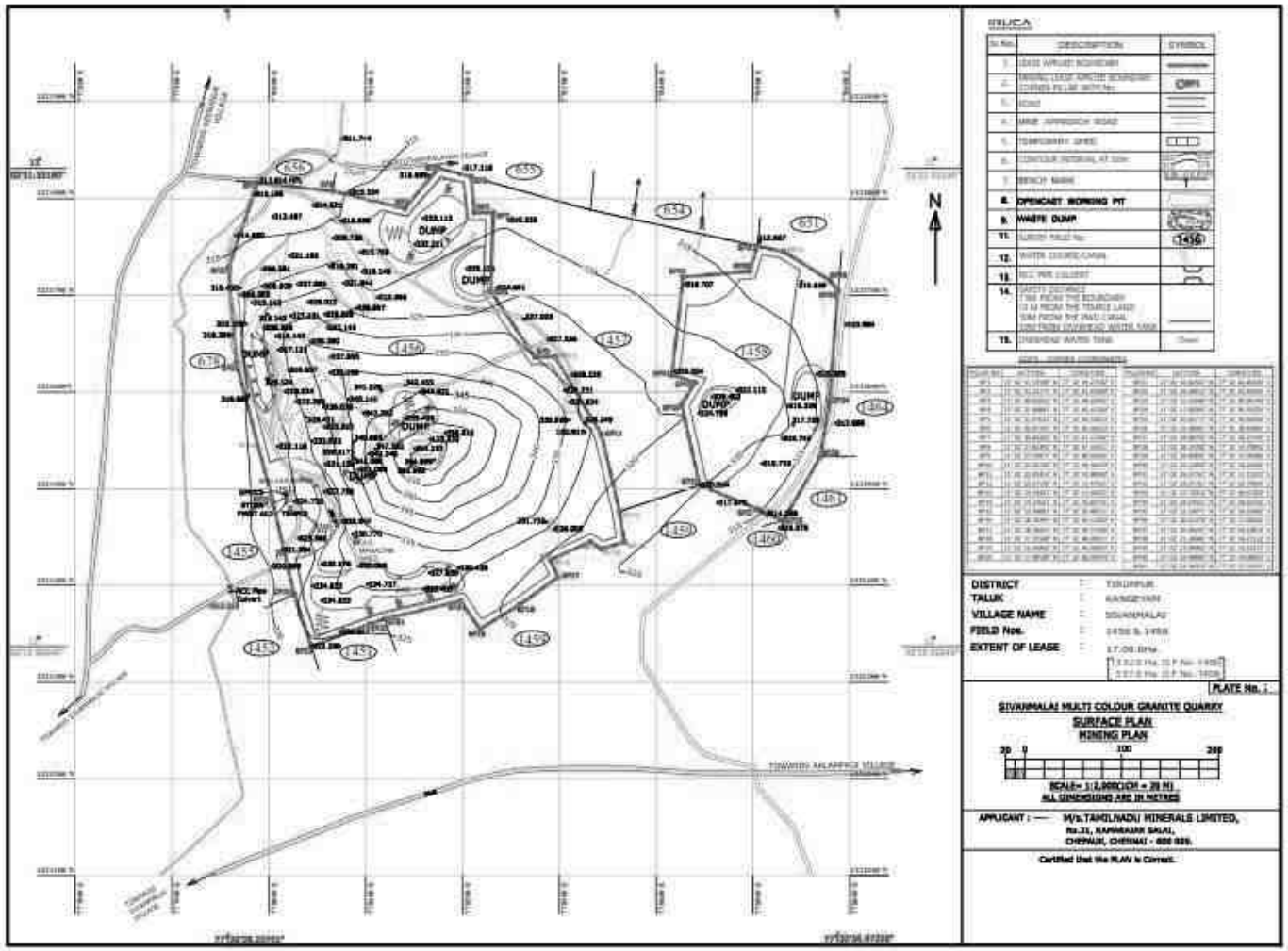

Figure 2-9 Surface Plan of the Quarry

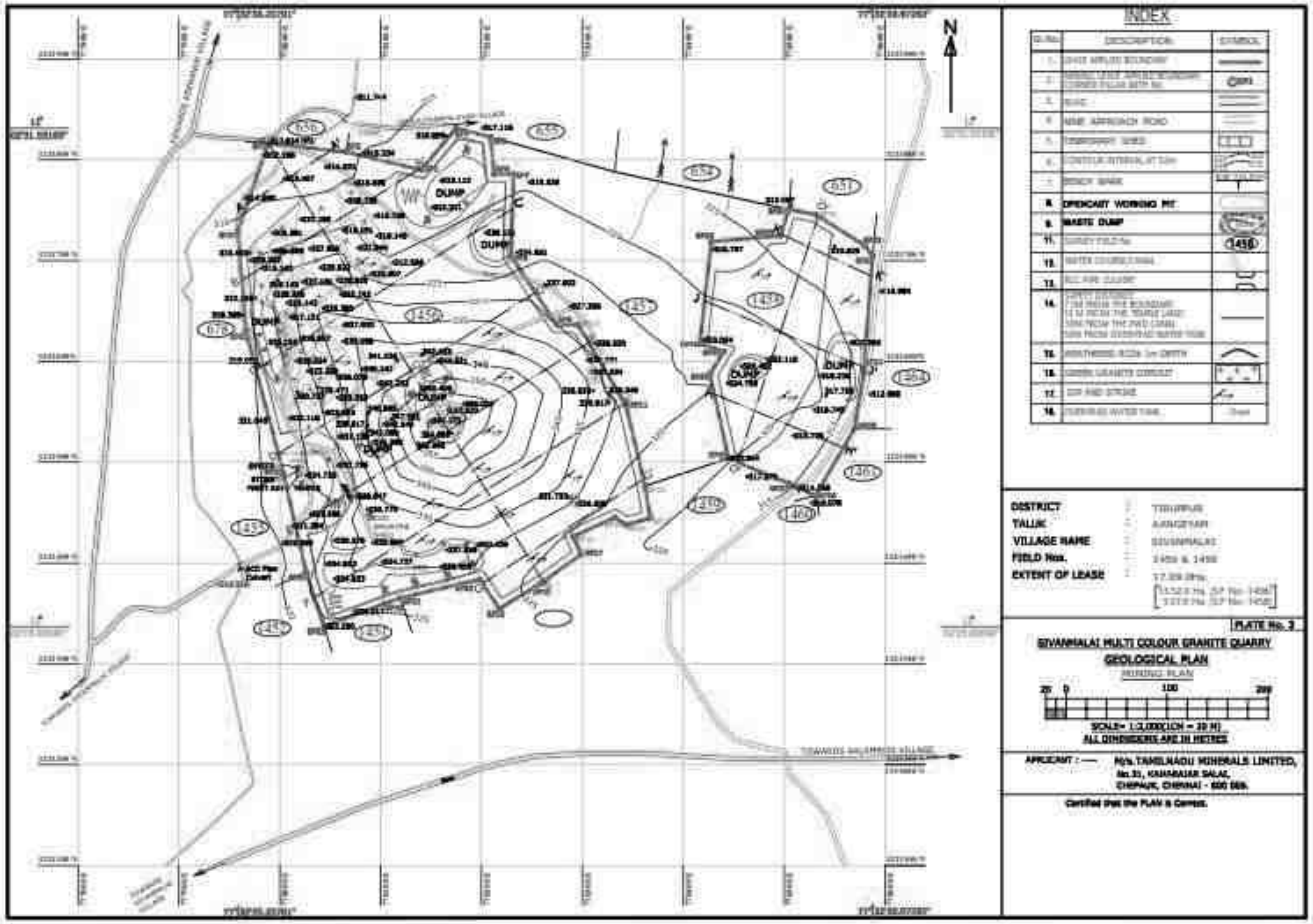

Figure 2-10 Geological plan of the quarry

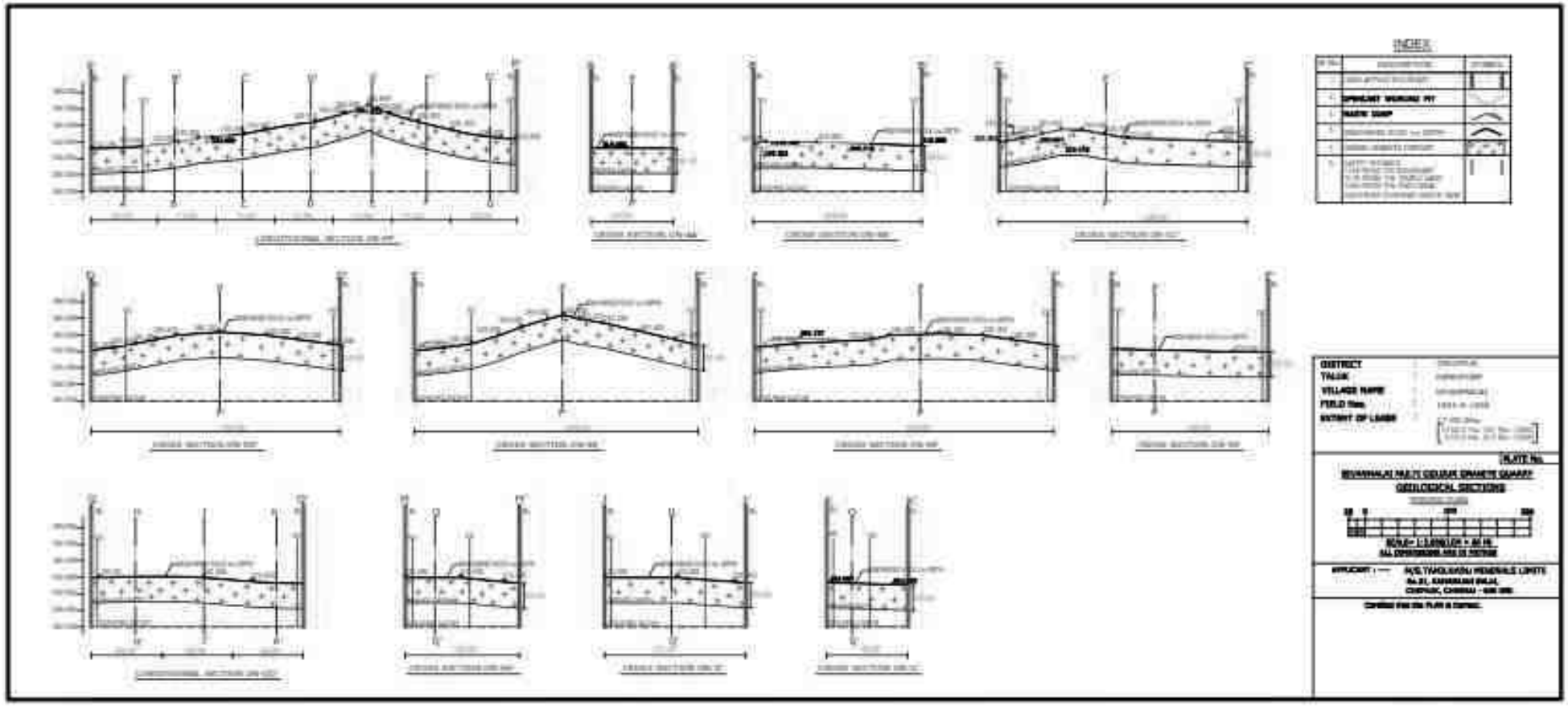

Figure 2-11 Mines Geological Sections of the lease area

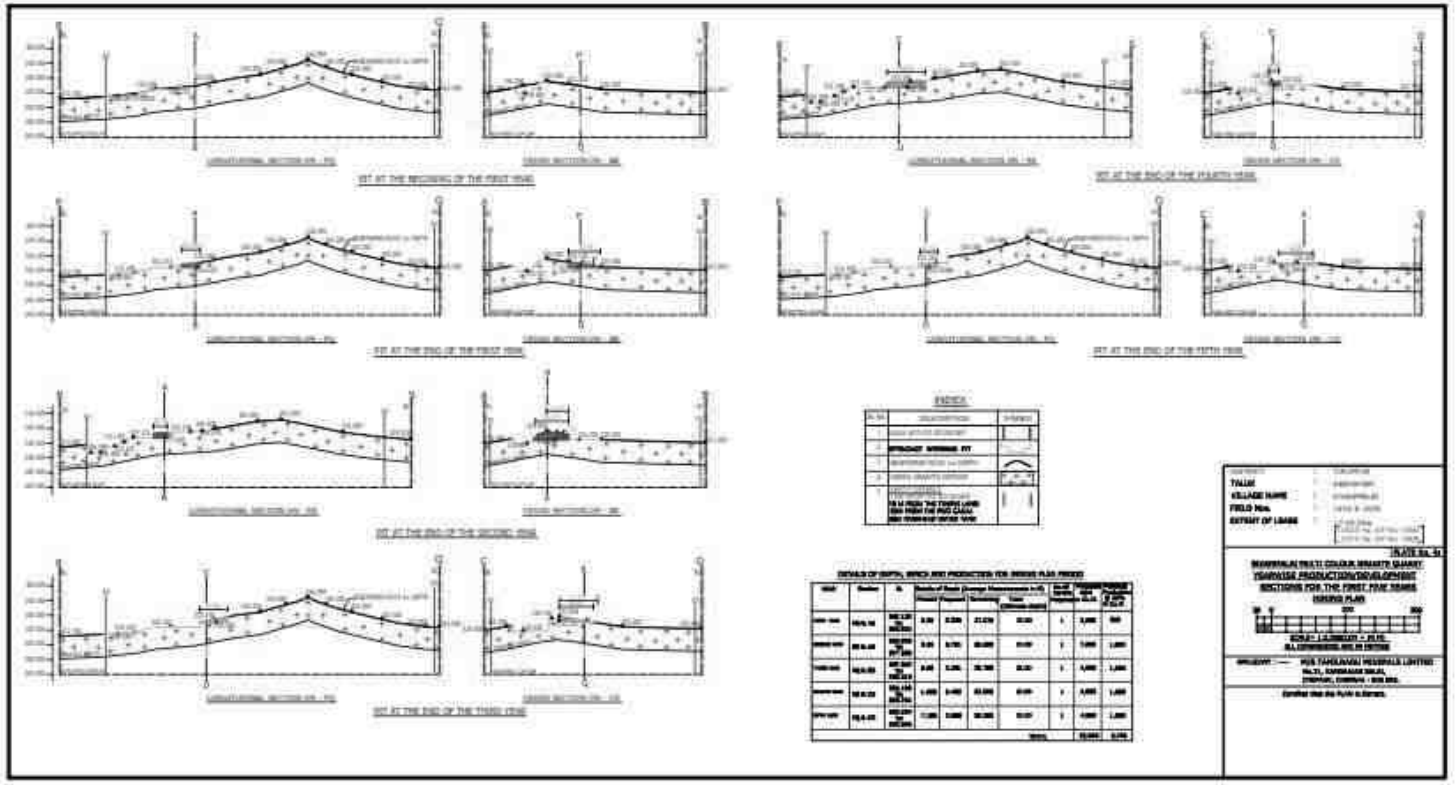

Figure 2-12 Year wise Production/Development Plan for 5 years

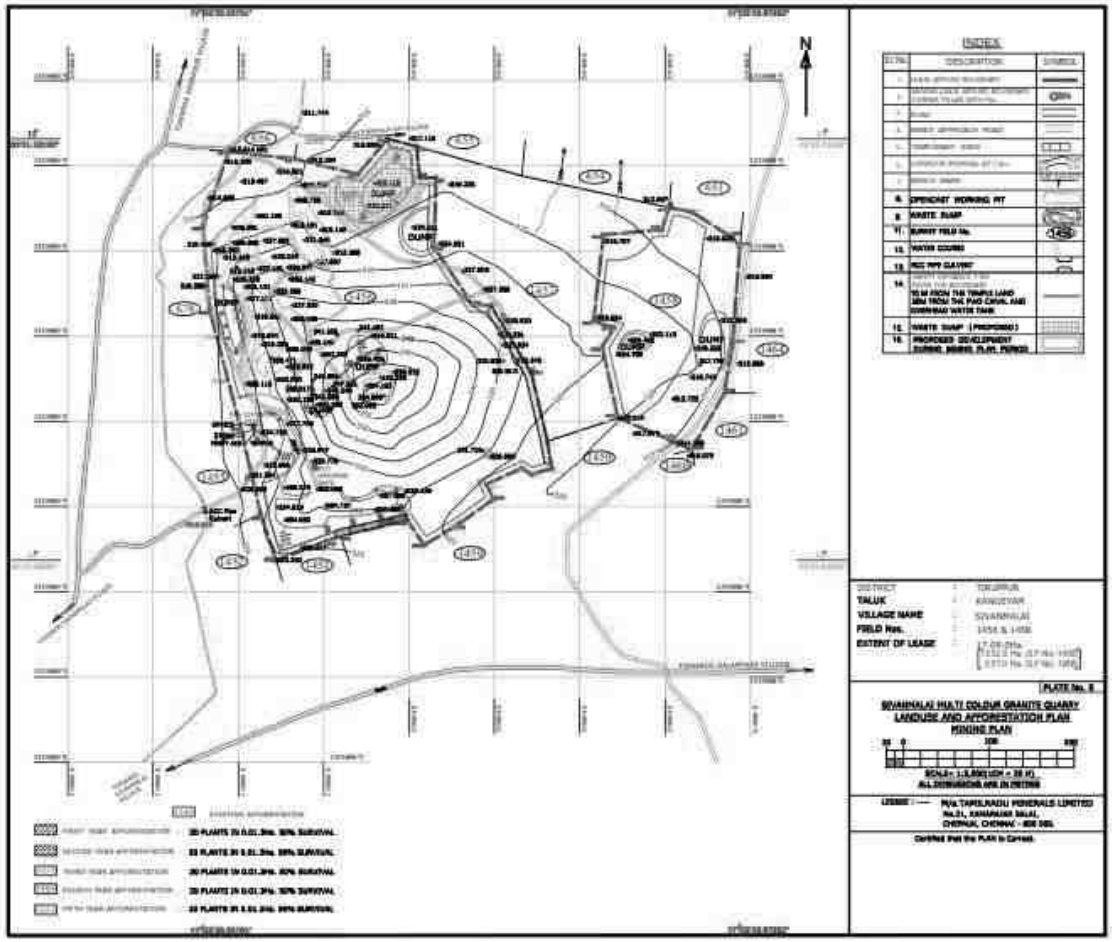

Figure 2-13 Land Use and Afforestation Plan

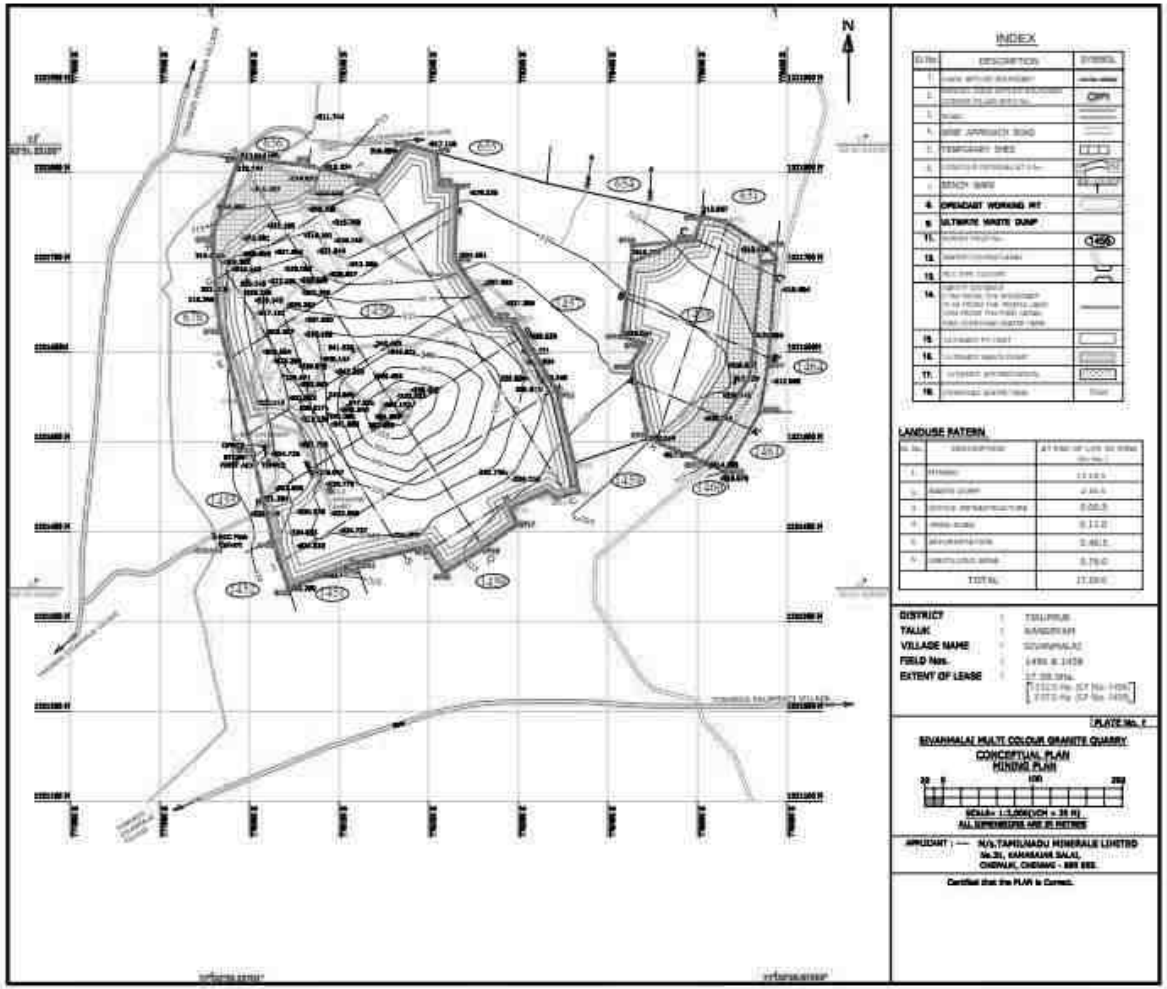

Figure 2-14 Conceptual Plan

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
ToR obtained on	12.01.2023
Baselines study started as per MoEF&CC OM F. No. IA3-22/10/2022-IA.III [E 177258] dt. 08.06.2022	Mid Jan 2023 to Mid April 2023
Submission of DRAFT EIA/EMP	June 2023
Conduciting Public Hearing and submitting final EIA/EMP and PoD	July 2023
Presentation before SEAC and Obtaining EC	August 2023

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 **Figure2.16.**

Figure 2-15 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 we 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 lease 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(length side) planes by serial blasting simultaneously along the above two plans by using 32mm dia blast holes charged with mild explosives like gunpowder or detonatincord.
c. Diamond wire cutting along the horizontal as well as two sides parallel to strict 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 [Ca (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 / TuticorinHarbours 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 40m 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 40m height with slope towards northern and southern sides. Through the area receives scanty rainfall, the ground water level is at 15m depth. The Production faces are operated at shallow depths. During the rainy seasons the surface run of water and the gorund 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**.**

Table 2-10 Quarry Land details

District and State	Taluk	Village	S.F. No	Area (Ha)	Land Classification
Tiruppur, TamilNadu	Kangeyam	Sivanmalai	1456 & 1458	17.09.0	Government land

Table 2-11Land Use Pattern of the lease area

S. No	Land Use	Area to be required during the mining plan(Ha)
1	Area under Quarry	13.18.5
2	Waste Dump	2.56.5
3	Infrastructure	0.00.5
4	Road	0.11.0
5	Green Belt	0.46.5
6	Un utilized Area	0.76.0
Total		**17.09.0**

2.11.2 Water Requirement

The total water requirement is 1.5 KLD. The total water requirement will be met throughprivate 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 2-12Water 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
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	1	-	Diesel Drive
4	Diamond wire saw	1	30m³ /day	Diesel Generator
5	Diesel Generator	1	125 kVA	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

Total	**13.5**	

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 2-16**.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 ata collection
- Impact identification, Prediction & Evaluation
- Mitigation measures & delineation of EMP
- Risk Assessment and Safety & Disaster Management plan
- 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.

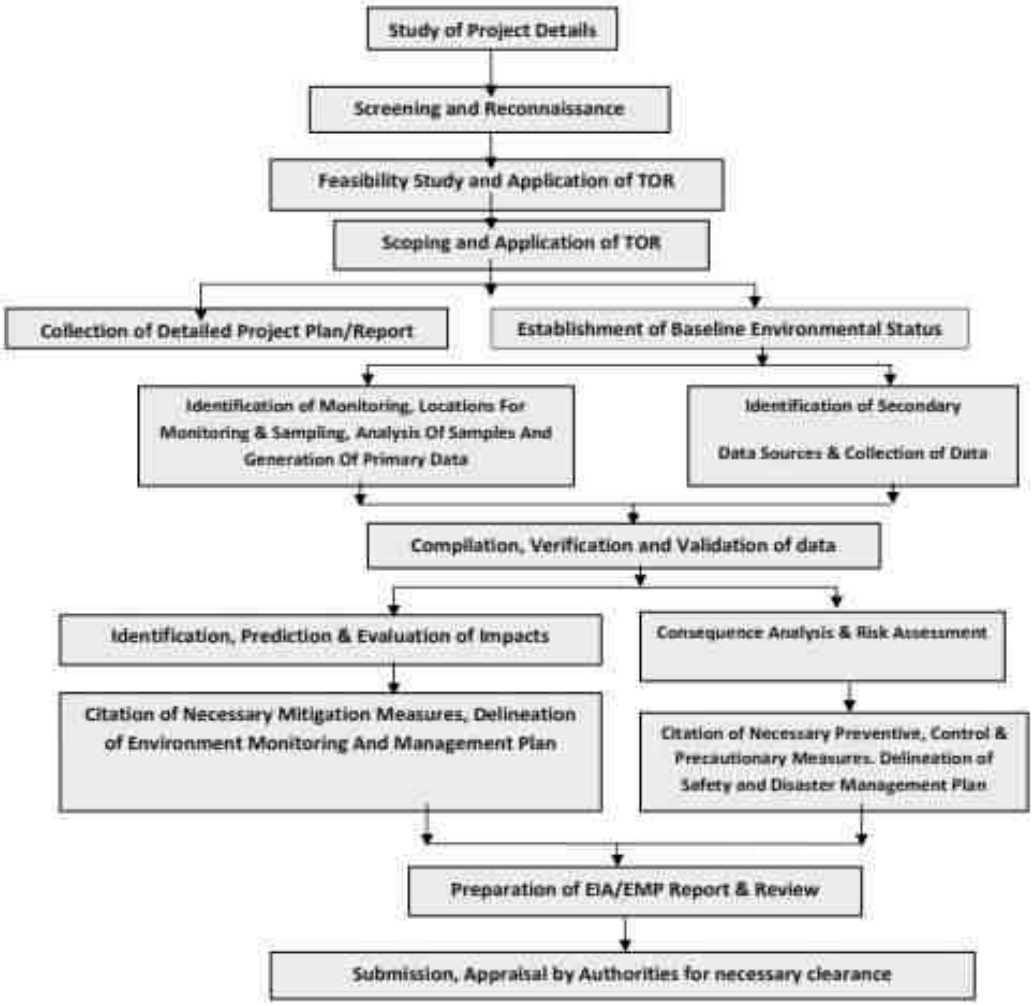

Figure 2-16 Feasibility & Environmental Assessment Process

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, SO_2 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.

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), SO_2& 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 SO_2, 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 SO_2, NO_x and Hydrocarbons due to consumption of fuel (diesel) by dumper while unloading the material.

2.16.3.5 Line sources

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.

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 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, Exacavator, &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

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.

2.16.5.1 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.

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 is negligible impact of mining on the surface water regime.

2.16.5.2 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 170m AMSL height from the ground level. Hence, there will not be any groundwater level intersect as the planned depth of mining is 40m.

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

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.

2.16.7 Solid Waste Management

2.16.7.1 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 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.

2.16.7.2 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 2-17.**

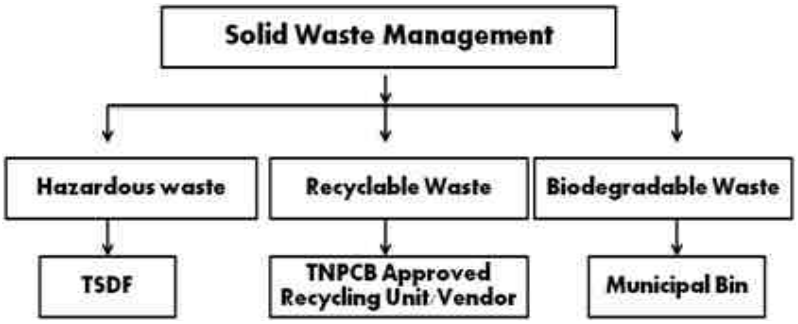

Figure 2-17 Waste Management Concepts

2.16.8 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 0.46.5 Ha 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 2-18Afforestation 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
1st Year	200	Neem/Pungam	0.46.5	50%	100

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

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.

3 DESCRIPTION OF ENVIRONMENT

3.1 Preamble

This chapter depicts the establishment of baseline for valued environmental components, as identified in and around the proposed project of **Multi Colour granite quarry** over an extent of 17.09.0 Ha in S.F. 1456 & 1458 at Sivanmalai Village, Kangeyam Taluk, Tiruppur District,Tamil Nadu by M/s. Tamil Nadu Minerals Limited. The primary baseline data monitoring covered one season (three (3) months) i.e., from **Mid of Jan 2023 – Mid of April 2023, and** the secondary data was collected from government and semi-government organization's published data. The primary baseline data has been generated by M/s. Hubert Enviro Care Systems (P) Ltd, Chennai, a MoEF&CC approved and National Accreditation Board for Testing and Calibration Laboratories (NABL) accredited environmental testing laboratory for the following terrestrial environmental components.

- **Meteorology:**
  Temperature, Relative Humidity, Rainfall, Wind Speed & Direction- **Refer Section - 3.6**
- **Ambient Air Quality:**
  Particulate matter <10 micron size (PM_{10}), Particulate matter <2.5 micron size ($PM_{2.5}$), Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), Lead (Pb), Ozone (O_3), Benzene (C_6H_6), Benzo (a) pyrene ($C_{20}H_{12}$), Arsenic (As), Nickel (Ni), Ammonia (NH_3)-**Refer Section - 3.7.**
- **Ambient Noise Levels:**
  Day equivalent noise levels, Night equivalent noise levels -**Refer Section - 3.8.**
- **Inland Water Quality:**
  Groundwater Quality, Surface Water Quality - **Refer Section - 3.9.**
- **Soil Quality - Refer Section - 3.10.**
- **Ecology - Refer Section - 3.11.**
- **Social Economic Status - Refer Section - 3.12.**

3.2 Study Area

A 10 km radial distance from the proposed project site boundary 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 10 km from the boundary of the project site which covers parts of Ranipet District, Tamil Nadu State.

3.3 Description of the Study Area

The project site is located ~2.26 km away from the state highway SH-96 in East direction and NH-81 is 16.96 km in South South East direction from the 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 3-1.**

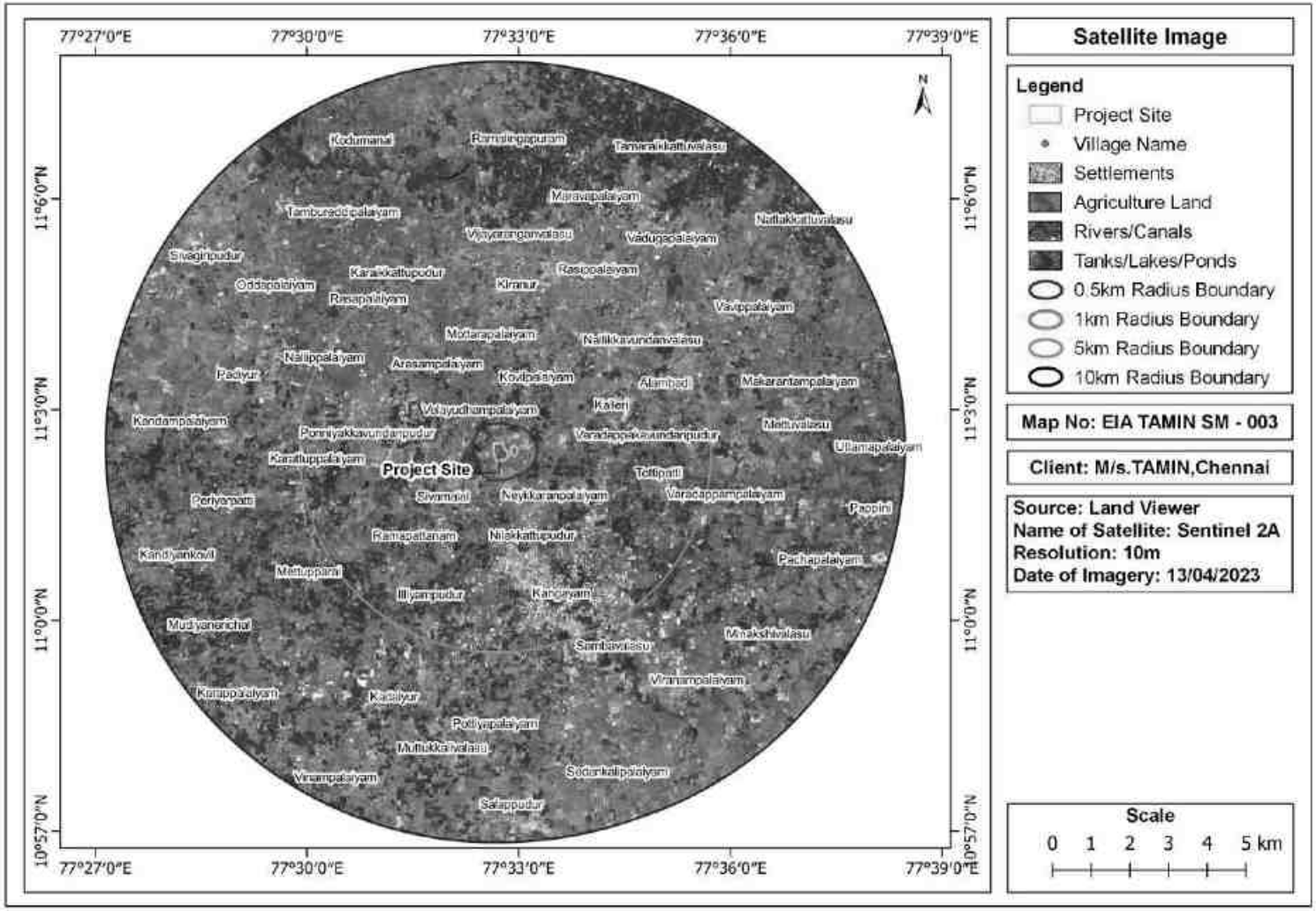

Figure 3-1 Map showing the Satellite Image of the study area of Project

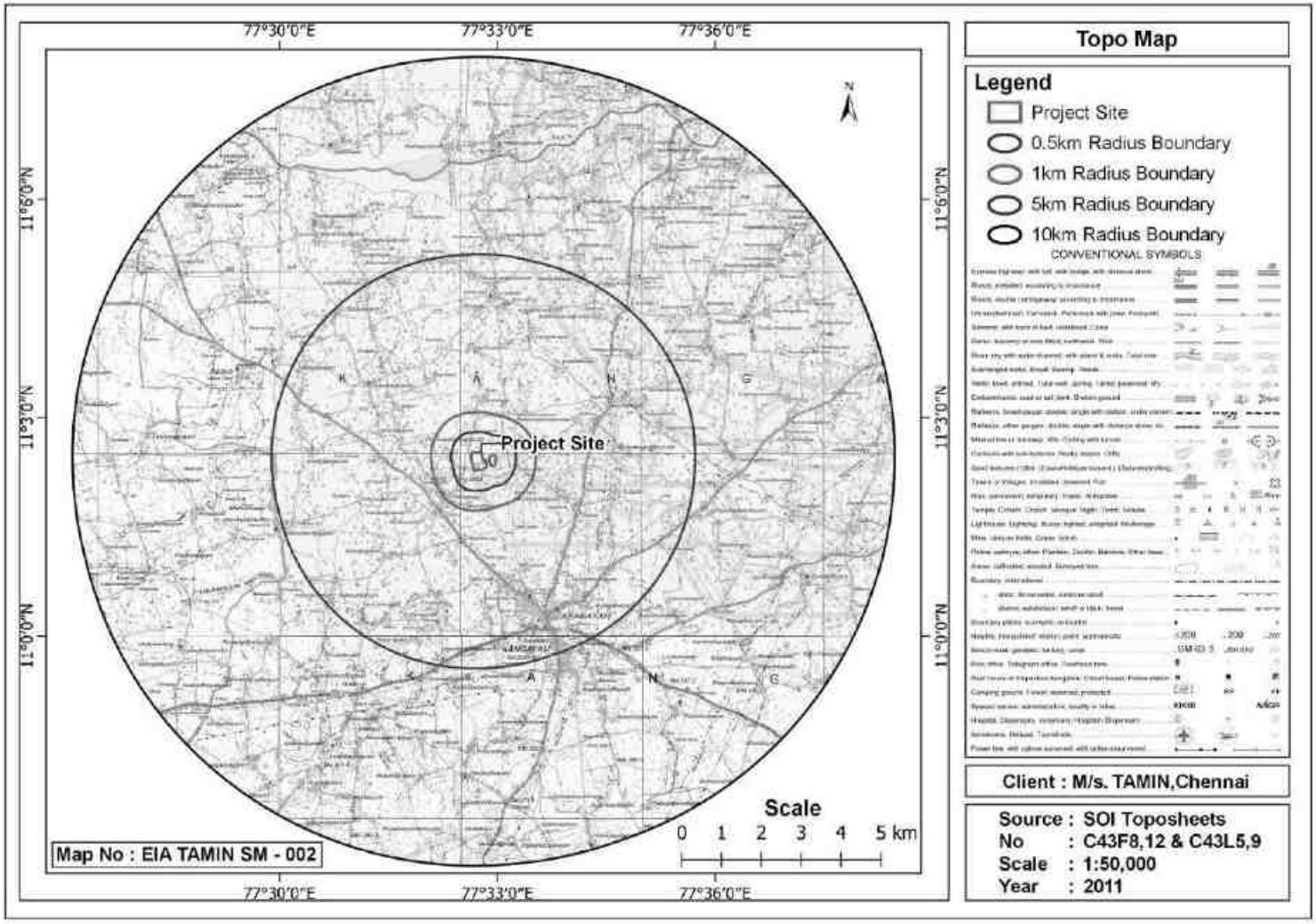

Figure 3-2 Topo Map of Study area

3.4 Environmentally Ecologically Sensitive areas

This section details with the environmental sensitive areas present within the project site and surrounding environs. The environmental sensitive areas covering an aerial distance of 15 km from the project boundary is given in **Table 3-1**.

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

<table>
<tr><th>S. No.</th><th>Areas</th><th>Distance & Direction from project boundary</th></tr>
<tr><td>1.</td><td>Monuments& Heritage</td><td>Nil</td></tr>
<tr><td>2.</td><td>Waterbodies</td><td>
<table>
<tr><th>S. No</th><th>Places</th><th>Distance (≈km)</th><th>Direction</th></tr>
<tr><td>1.</td><td>Canal</td><td colspan="2">Within the Site</td></tr>
<tr><td>2.</td><td>Canal</td><td colspan="2">Within the Site</td></tr>
<tr><td>3.</td><td>Canal near Chinnayipudur</td><td>2.03</td><td>S</td></tr>
<tr><td>4.</td><td>Parambikulam Main Canal</td><td>3.27</td><td>SSW</td></tr>
<tr><td>5.</td><td>Kadaiyur Distributary</td><td>4.80</td><td>SW</td></tr>
<tr><td>6.</td><td>Alagumalai Branch Canal</td><td>5.95</td><td>W</td></tr>
<tr><td>7.</td><td>Noyil Orattuppalaiyam Reservoir</td><td>6.11</td><td>N</td></tr>
<tr><td>8.</td><td>Lower Bhavani Main Canal</td><td>6.70</td><td>N</td></tr>
<tr><td>9.</td><td>Noyil R</td><td>7.29</td><td>N</td></tr>
<tr><td>10.</td><td>Kattangani Kulam</td><td>9.32</td><td>NW</td></tr>
<tr><td>11.</td><td>Mudalaimadai Ar</td><td>9.60</td><td>NNE</td></tr>
<tr><td>12.</td><td>Nelali Karai</td><td>9.62</td><td>S</td></tr>
<tr><td>13.</td><td>Vada Channaripalaiyam Distributary</td><td>9.91</td><td>SW</td></tr>
<tr><td>14.</td><td>Karattu Distributary</td><td>11.14</td><td>W</td></tr>
<tr><td>15.</td><td>Nagalingapuram Distributary</td><td>12.54</td><td>WSW</td></tr>
<tr><td>16.</td><td>Palatoluvu Tank</td><td>12.69</td><td>N</td></tr>
<tr><td>17.</td><td>Lake near Anaipalaiyam</td><td>12.70</td><td>NW</td></tr>
<tr><td>18.</td><td>Peruntoluvu Distributary</td><td>12.8</td><td>WNW</td></tr>
<tr><td>19.</td><td>Avaraikkarai Nadi</td><td>13.90</td><td>NNW</td></tr>
<tr><td>20.</td><td>Manikkapurampudur Kulam</td><td>14.00</td><td>NW</td></tr>
</table>
</td></tr>
<tr><td>3.</td><td>Reserved Forests</td><td>
<table>
<tr><th>S.No</th><th>Places</th><th>Distance (≈km)</th><th>Direction</th></tr>
<tr><td>1.</td><td>Villikaradu RF</td><td>11.96</td><td>N</td></tr>
<tr><td>2.</td><td>Chennimalai RF</td><td>12.28</td><td>N</td></tr>
</table>
</td></tr>
<tr><td>4.</td><td>Nearest Airport</td><td>➢ Coimbatore International Airport at a distance of ~ 52.85km towards W</td></tr>
<tr><td>5.</td><td>State, National boundaries</td><td>NIL</td></tr>
<tr><td>6.</td><td>Nearest Villages</td><td>
<table>
<tr><th>S. No</th><th>Places</th><th>Distance (~km)</th><th>Direction</th><th>Population as per Census 2011</th></tr>
<tr><td>1.</td><td>Velan Nagar</td><td>0.24</td><td>S</td><td>200</td></tr>
</table>
</td></tr>
</table>

		2.	Kovilpalaiyam	0.40	N	500
		3.	Sivamalai	0.59	SW	7,927
		4.	Velayudhampalaiyam	0.80	N	120
		5.	Karukkattipalaiyam	0.81	S	200

7. Areas occupied by sensitive man-made land uses (hospitals, schools, places of worship, community facilities)

S. No	Places	Distance (≈km)	Direction
	SCHOOLS		
1.	Jaycees Matriculation Higher Secondary School	1.50	W
2.	Neickkaranpalayam Government High School	1.59	ESE
3.	Kangeyam Panchayat Union Middle School	3.90	SSE
4.	Kangayam Government Higher Secondary School	5.06	SSE
5.	Padiyur Government Higher Secondary School	6.29	WNW
	COLLEGES		
1.	Cherraan College for Women	3.37	WNW
2.	P.S.G Ponnammal Polytechnic College	5.94	SSW
3.	Cheran Arts Science College	7.92	NNE
4.	Government Arts and Science College Kangeyam	9.58	ENE
5.	Builders Engineering College	11.38	ENE
	GOVERNMENT BUILDINGS		
1.	Sivanmalai Panchayat Office	1.05	SE
2.	Kangayam Fire Station	3.62	SSE
3.	Kangayam Taluk Office	4.36	SSE
4.	Deputy Superintendent of Police Kangayam	4.48	SSE
5.	Kangeyam Court	4.61	SSE
	HOSPITALS		
1.	Kangayam Government Hospital	3.80	SSE
2.	Saavadipalayam Govt PHC	5.93	NNW
3.	Pachapalayam Goverment Hospital	9.0	ESE
4.	KullamPalayam Veterinary Dispansary	11.88	S
5.	Nathakadaiyur Upgraded PHC	13.16	ENE
	RELIGIOUS PLACES		
1.	Sivanmalai Murugan Temple	0.67	WSW
2.	Kangeyam Mosque	4.05	SSE
3.	CSI Church	4.80	SSE
4.	Akilandeswari Samedha Agastheeswarar Temple	5.16	SSE
5.	Vattamalai Murugan Temple	10.15	S
6.	Arulmigu Alagumalai Murugan Temple	11.88	WSW
7.	Arulmigu Chennimalai Murugan Temple	13.57	NNE
	INDUSTRIES		
1.	Srinivasa Agro Industries	0.87	NNE
2.	RajaGuru Solar Plant	2.95	NNW
3.	Oriyon Natural Flavours Pvt Ltd	3.31	NE
4.	Lal agro tropical limited	3.57	NE
5.	Aadya AgroTech	3.61	NE
6.	Cethar Foods Pvt. Ltd.	5.13	ESE

		7.	NSP Knitting Mills	5.56	SE
		8.	Sri Venkateshwara Spinning Mills	5.90	SE
		9.	Santha Spinning & Weaving Mills (P) Ltd	6.60	SSW
		10.	Frontier Knitters Pvt Ltd	7.48	SW
		11.	United Carbon Solutions Pvt Ltd	9.42	SSE
		12.	Anugraha Fashion Mills Pvt limited	10.40	S
		13.	TRK Textile India Pvt Ltd	10.52	SE
		14.	Viking Textils Pvt Ltd	10.81	SE
		15.	Sakthi Murugan Roller Flour Mills Pvt. Limited	11.09	S
		16.	Viking textiles Solar Power Plant	11.68	SSW
		17.	Sri kumaran steels india pvt LTD	11.79	S
8.	Defence installations	Nill			

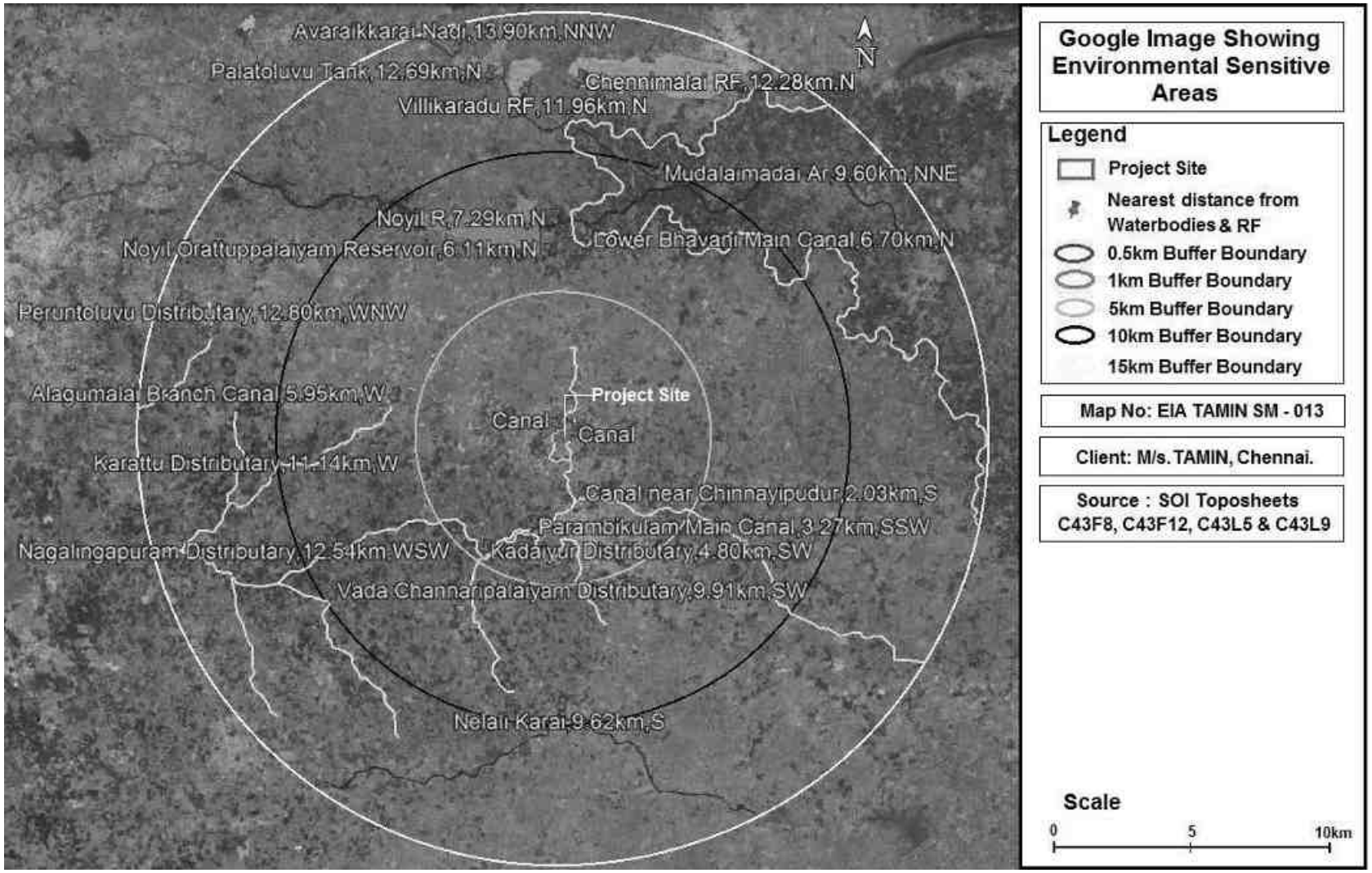

Figure 3-3 Environmental sensitive areas covering within 15 km from project boundary

3.5 Physical Conditions

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, Physiography
- Natural resources
- Climatic conditions, seismic zone characteristics and natural hazard

3.5.1 PIA District Profile

Tiruppur district lies between 11°06'27" and 11°10'75" of Northern latitude and 77°20'23" and 77°33'98" of Eastern longitude with an area of 5187 sq kms. Tiruppur district stands 8th rank in terms of area among the districts in Tamil Nadu. Tiruppur district is sharing border with Coimbatore district in the West, Idukki district (Kerala) in the South, Dindigul district in the South-East, Erode district in the North and Karur district in the East.

Source: *https://censusindia.gov.in/nada/index.php/catalog/1136*

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

3.5.2 Climatic Conditions

The mean maximum and minimum temperatures for Tiruppur city during summer and winter vary between 35°C to 18°C. The south and south-western parts of the district enjoy maximum rainfall due to the surrounding Western Ghats. The rest of the district lies in the rain shadow region of the Western Ghats and experiences salubrious climate in most parts of the year, except the extreme east part of the district. The rainfall data given below reveal that the district receives the highest rainfall during North-East Monsoon.

Source: *https://censusindia.gov.in/nada/index.php/catalog/1136*

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

3.5.3 Natural Resources of Vellore District

3.5.3.1 Flora & Fauna

It has various kinds of fauna like elephant, gaur, tiger, panther, sloth bear, deer, wild bear, wild dog, porcupine, flying squirrel, jackal, pangolin, civet cat and birds like rocket-tailed drongo, re-whiskered bulbul, black headed oriole, tree pie, spotted dove, green pigeon, etc. The Amaravathi reservoir in the Anaimalai has a large number of crocodiles. There are also many places of scenic beauty such as, Grass hills, waterfalls

(Panchalingam), river streams (Chinnar, Tenar), teak forests, dams and reservoirs (Thirumoorthy & Amaravathi).

***Source**: https://censusindia.gov.in/nada/index.php/catalog/1136*

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

3.5.3.2 Forest Resources

Indira Gandhi Wild Life Sanctuary is spread over at the altitude of 1400 meters high in the Western Ghats area of Pollachi, Valparai and Udumalaipettai. The area of the sanctuary is 958 sq kms of which only 387 sq kms is spread over in Tiruppur district. Amaravathi Reserve Forest and part of Anaimalai Reserve Forest of Anaimalai Wildlife Sanctuary falls within the Tiruppur district.

***Source**: https://censusindia.gov.in/nada/index.php/catalog/1136*

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

3.5.3.3 Irrigation

Most of the areas in the district are hard rocky terrain and the groundwater potential of the district is very limited. Deep open wells reaching 30 metre depth are common in Avanashi and Palladam taluks. The water from the black soil and Kankari tracts in parts of Palladam and Avanashi taluks are somewhat blackish. Major sources of water supply for irrigation in this district are as follows. The chief source of irrigation in this district are canals, a few rain fed tanks and a number of wells.

The fine soil being of the loamy variety requires only little irrigation. This type of irrigation normally exists in Udumalaipettai. The rainfall in this region is much less than the adjoining districts.

***Source**: https://censusindia.gov.in/nada/index.php/catalog/1136*

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

3.5.3.4 Agricultural Resources

Tiruppur district plays important role in agriculture. The food production required to be enhanced to provide food and nutritional security to the growing district population. In Tiruppur, more than 80% of the farmers belong to small and marginal category and t hey play a key role in overall development in agriculture. The major food crops are paddy, millets and pulses. The non-food or commercial crops in the district are cotton, oil seeds and coconut. Coconut is one of the major plantation crops in Tiruppur district. Coconut production plays a major role in developing the agro-based industries namely production of coconut oil and other bi-products of coconut like coir industries, husk production etc.

Source: *https://censusindia.gov.in/nada/index.php/catalog/1136*

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

3.5.3.5 Mineral Resources

The mineral wealt h of t he dist rict is considerable. The available important minerals in the district are quartz and gypsum. Quartz is found in many places, especially in the village of Padiyur near Kangeyam, Mulayampoondi near Dharapuram. In 2010-11, 70.59 tonnes of quartz feldspar and 16.4 tonnes of gypsum were mined in the district. The mineral map of Tamilnadu is shown in the **Figure 3-4**.

Source: *https://censusindia.gov.in/nada/index.php/catalog/1136*

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

Source: *Maps of India*

Figure 3-4 Mineral Map of Tamil Nadu

3.5.4 Land Use & Land Cover

Total geographic area of Erode district is 8165 Sq.Km. Urban Built-up area is 118.75 Sq.Km and Rural Built-up area is 227.41 Sq.Km. Details of land use/land cover statistics for Erode district were given in **Table 3-2** and Land cover pattern of Erode district is given in **Figure 3-5.** The Land Use and Landcover map of Erode is given in **Figure 3-6.**

Table 3-2 District land use/land cover statistics (2015-16) for Erode district

S.No	Division of Land Use/Land Cover	Area in Sq.Km	Area in Acres	Area in Ha	Total Area %
1.	Built-up, Urban	118.75	10902.27	4412	1.454
2.	Built-up ,Rural	227.41	60807.6	24608	2.785
3.	Built-up, Mining	26.03	8391.69	3396	0.319
4	Agriculture, Crop land	2617.34	891937.85	360955	32.056
5	Agriculture, Plantation	567	62347.06	25231	6.944
6	Agriculture, Fallow	2244.16	354654.98	143524	27.485
7	Forest, Evergreen/ Semi evergreen	1135.57	14033.09	5679	13.908
8	Forest, Deciduous	718.09	138643.2	56107	8.795
9	Forest, Forest Plantation	3.21	32822.96	13283	0.039
10	Forest , Scrub Forest	1.85	32822.96	13283	0.023
11	Grass/Grazing	186.13	941.47	381	2.280
12	Barren/ unculturable/ Wastelands, Salt Affected land	1.04	8142.11	3295	0.013
13	Barren/ unculturable/ Wastelands, Gullied/Ravinous Land	0.36	1368.96	554	0.004
14	Barren/ unculturable/ Wastelands, Scrub land	137.55	20576.43	8327	1.685
15	Barren/unculturable/ Wastelands, Sandy Area	0.02	2369.74	959	0.000

16	Barren/unculturable/ Wastelands, Barren rocky	5.21	3452.06	1397	0.064
17	Wetlands/Water Bodies, Inland Wetland	0.61	1003.25	406	0.007
18	Wetlands/Water Bodies, River/Stream/canals	71.77	27228.5	11019	0.879
19	Wetlands/Water Bodies, Resorvoir/Lakes/Ponds	102.89	153000	61917	1.260
Total		**8165**	**1825446.2**	**738733**	**100.000**

Source:https://bhuvan-app1.nrsc.gov.in/thematic/thematic/index.php

Note: *Tiruppur district was a part of Erode district before the bifurcation on 22nd Febuary 2009. Since secondary sources are available only for Erode district, however Erode district comprises Tiruppur district details before bifurcation.*

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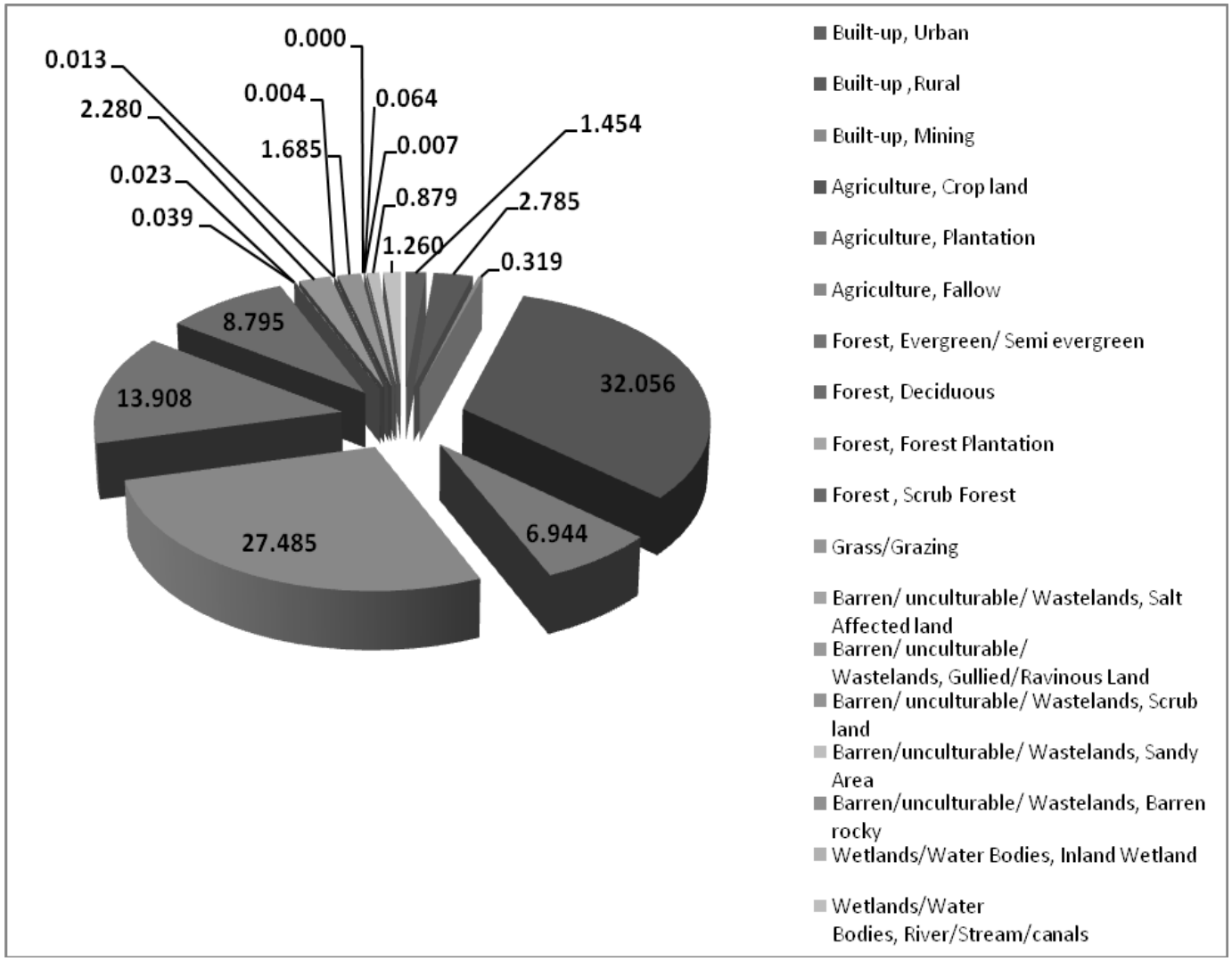

Figure 3-5 Land use/Land cover pattern for Erode district

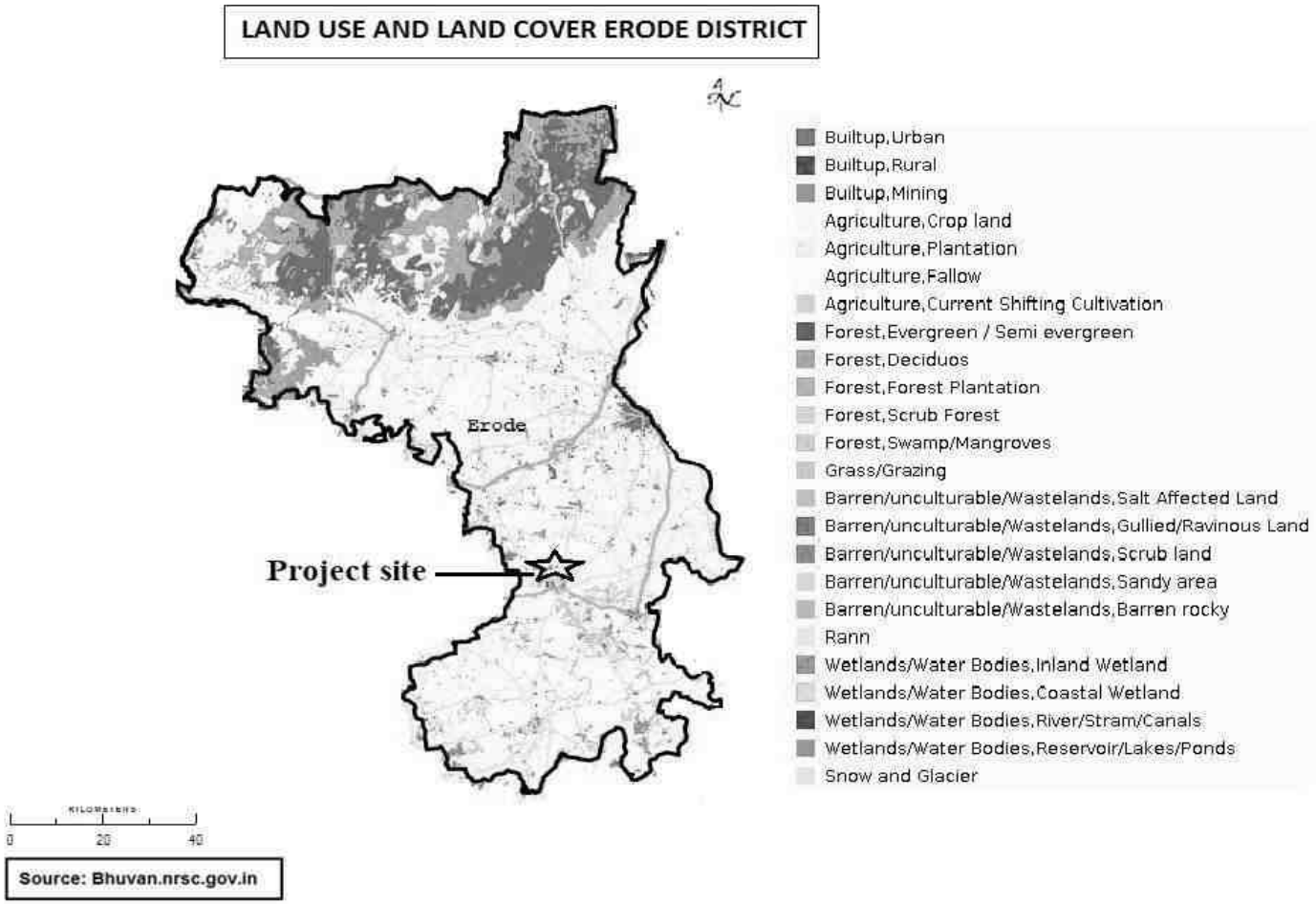

Figure 3-6 Land use/Land cover Map of Erode district

Note: *Tiruppur district was a part of Erode district before the bifurcation on 22nd Febuary 2009. Since secondary sources are available only for Erode district, however Erode district comprises Tiruppur district details before bifurcation.*

3.5.4.1 Land use land cover for the study area

The land use pattern of the study area is 335.04 Sq.Km given in **Table 3-3** Land use pattern and land use map of the study area is given in **Figure 3-7** and **Figure 3-8** respectively

Table 3-3 Land use pattern of the Study Area

S.No.	Description	Area (Sq.Km)	Area (Acres)	Area (Hectares)	Percentage (%)
1	Fallow	184.40	45566.16	18440	55.04
2	Plantation	59.13	14611.32	5913	17.65
3	Crop land	34.84	8609.14	3484	10.40
4	Grass / Grazing land	14.02	3464.41	1402	4.18
5	Rural	13.33	3293.91	1333	3.98
6	Scrub land	11.81	2918.31	1181	3.52
7	Urban	8.30	2050.97	830	2.48
8	Waterbodies	3.71	916.76	371	1.11
9	Mining	3.47	857.45	347	1.04
10	River / Stream / Canals	1.78	439.85	178	0.53
11	Barren rocky	0.25	61.78	25	0.07
	Total	**335.04**	**82790.06**	**33504**	**100.00**

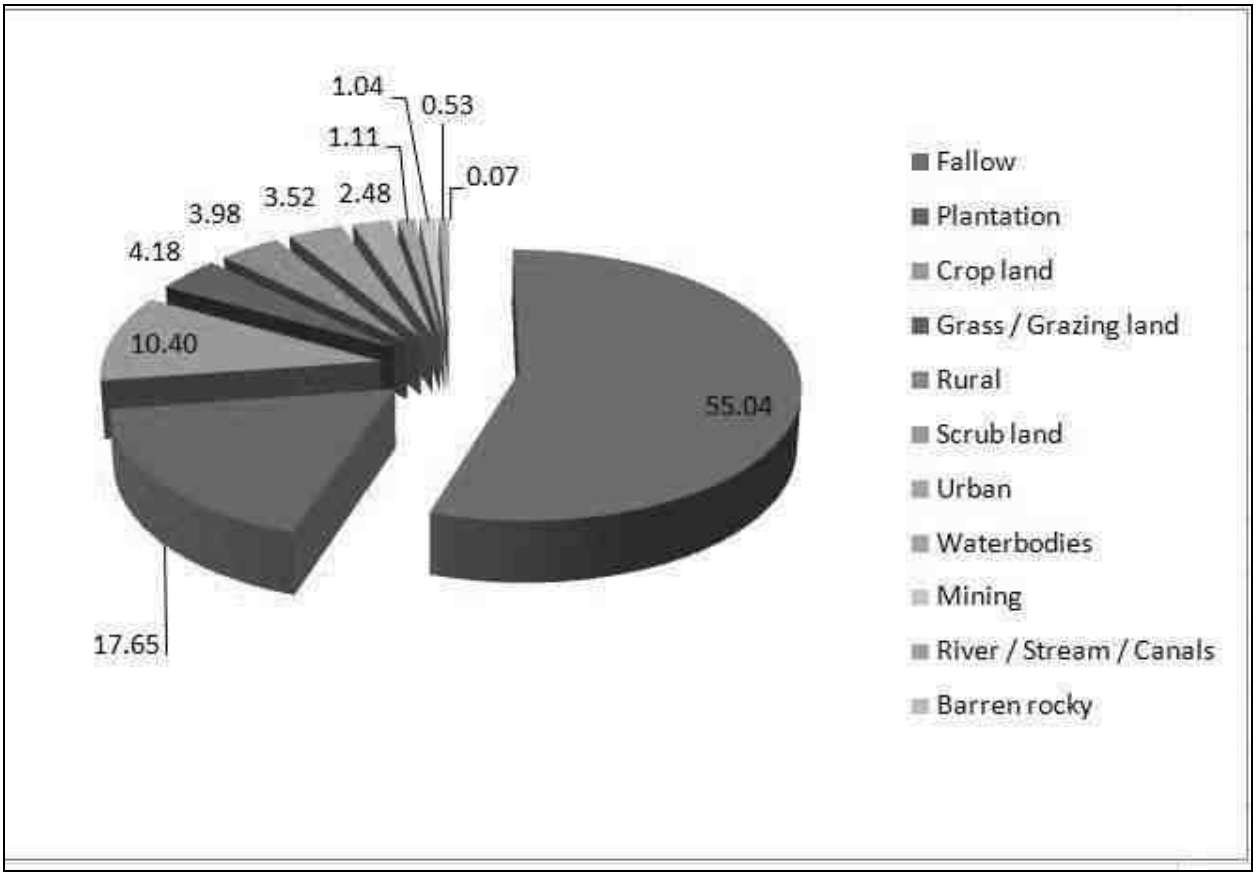

Figure 3-7 Land use/Land Cover pattern of the Study Area

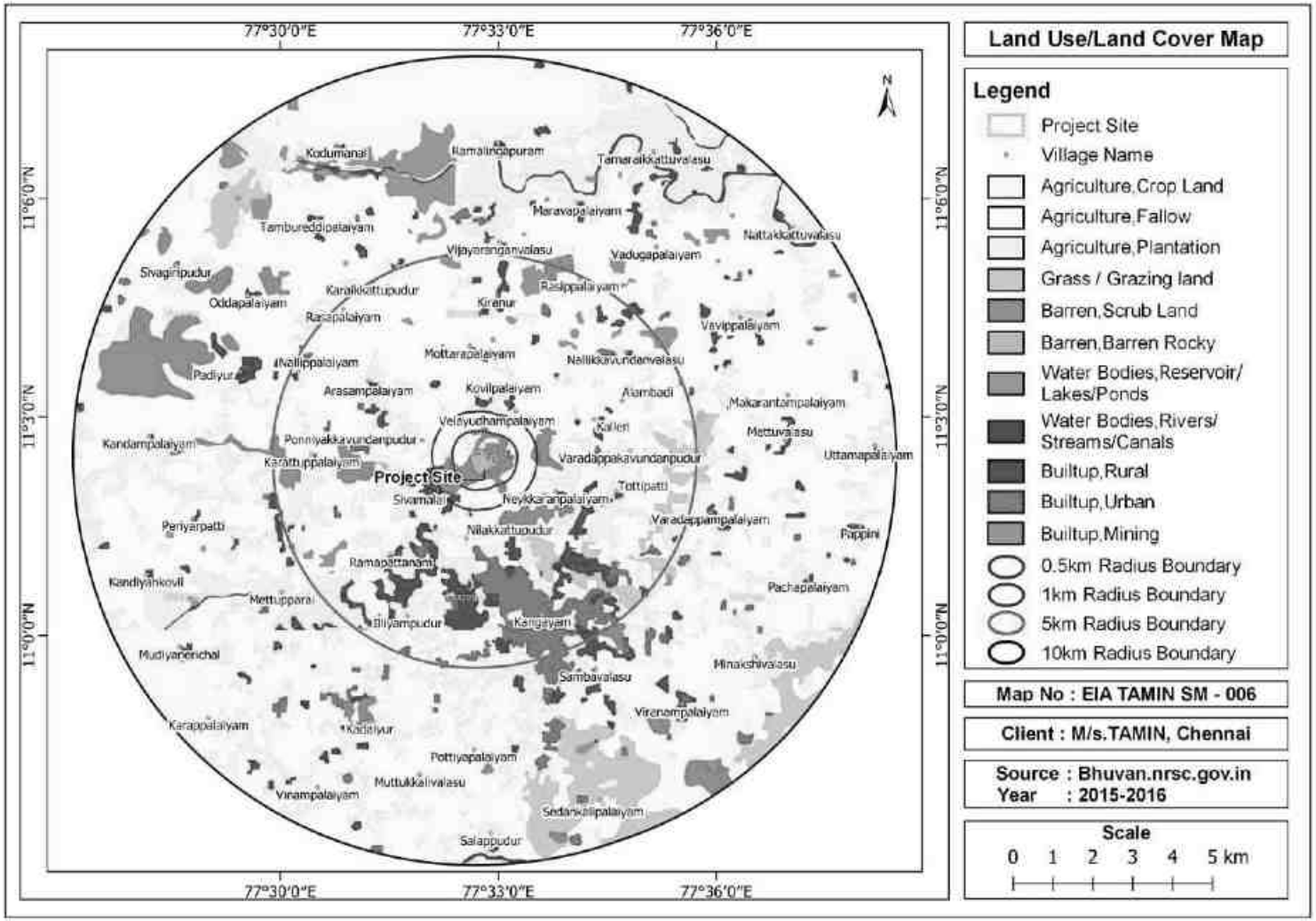

Figure 3-8 Land use/Land Cover map of the Study Area

3.5.5 Topography

Tiruppur district lies on the western part of Tamil Nadu bordering the Western Ghats. The scenic beauty of the Anamalai hill range of Western Ghats includes the cascading water to the Thirumoorthy reservoir from the Panchalingam Falls. A perennial stream flows by the side of the Sri Amanalingeswarar temple. The Sivanmalai is about 25 kms from Tiruppur and there is a temple dedicated to Lord Subramanian. The temple is built on the hillock of Sivanmalai and is accessed through a flight of 200 steps. In Sivanmalai, the Pre-Cambrian rocks are associated with Syenite and Nepheline Syenite. Here, it forms crystals of good size up to 3 or 4 inches long and is of greenish grey colour. The Physical map of Tamilnadu is given as **Figure 3-9** and Topo map of study area is given as **Figure 3-2** and contour map of the study area is given as **Figure 3-10**.

***Source**: https://censusindia.gov.in/nada/index.php/catalog/1136*

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

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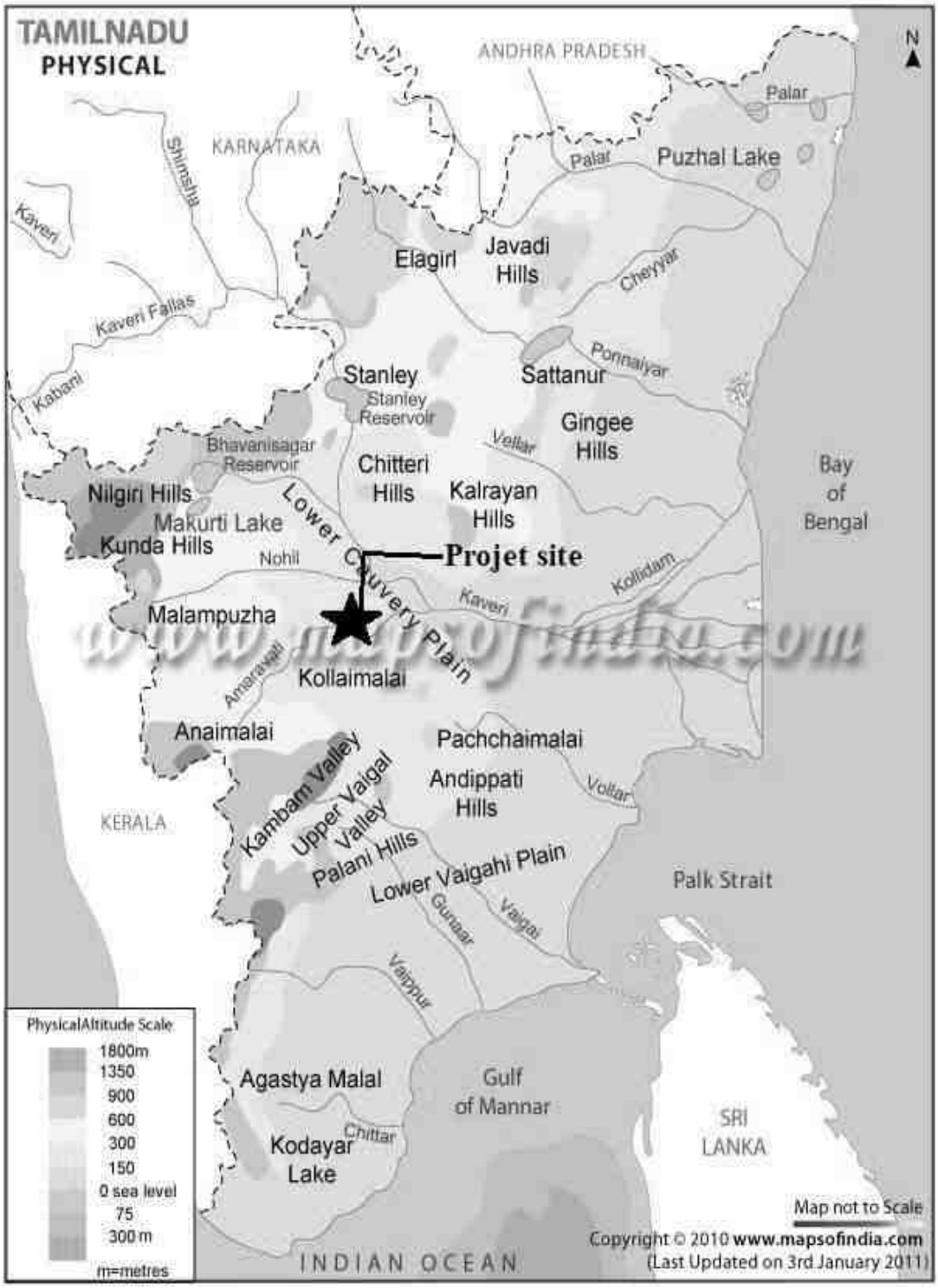


Figure 3-9 Physical map of Tamil Nadu State

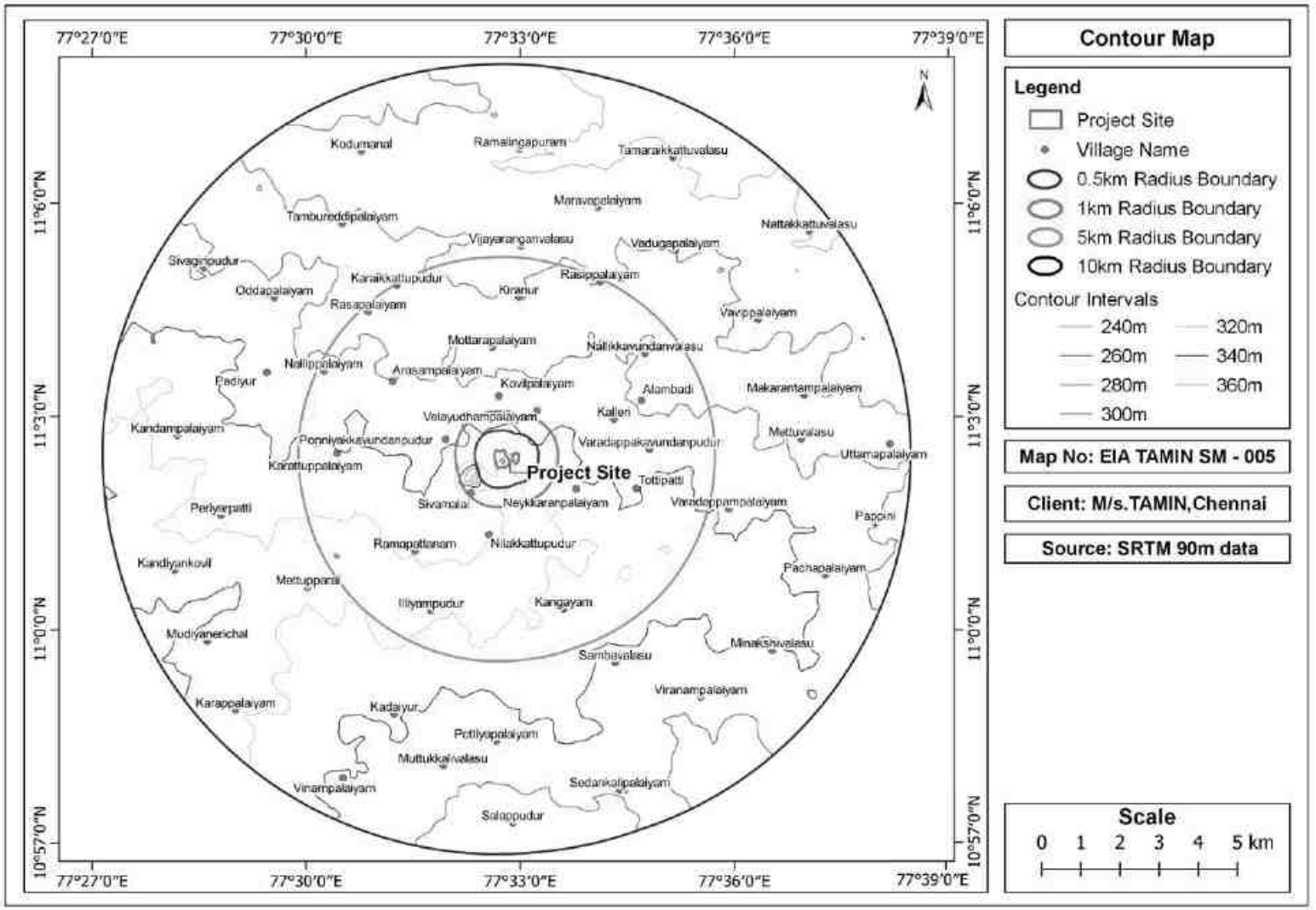


Figure 3-10 Contour map of Study Area

3.5.6 Geomorphology of PIA District

The Erode district forms part of the uplands of the state. Physiographically the district can be divided into hilly area, the upland area and plains area. The prominent geomorphic units identified in the district through interpretation of Satellite imagery are 1) Structural hills, 2) Inselberg, 3) Ridges, 4) Valley fill, 5) Pediments, 6) Shallow Pediments,. The hilly area is represented by the Western Ghats in the northwestern part of the district, the Biligiri Rangan hills in the north, Bodamalai Betta hills in the northwestern parts and Konbattarayan hills in the north central part of the district. Konbattarayan hill (1699 m above MSL) is the highest peak in the district while Moyar Gorge is a picturesque gorge in the Western Ghats through which Moyar river traverses. The Kongunadu uplands lie south of Bhavani River and the Lower Bhavani canal passes through these uplands. Scattered hillocks and knolls of moderate elevations occur within these uplands. The plains area is characterised by an undulating topography with a general gradient due east and southeast. The plains are limited to the east and southwestern border of the district. The plains west of Cauvery River are known as Lower Cauvery plains. The Geomorphology Map of the Thiruppur District is shown as **Figure 3-12**.

Source: **http://cgwb.gov.in/District_Profile/TamilNadu/Erode.pdf**

(Ref**: Government of India Ministry of Water Resources Central Ground Water Board South Eastern Coastal Region Chennai, "District Ground Water Brochure Tiruvallur District")**

Note: *Tiruppur district was a part of Erode district before the bifurcation on 22nd Febuary 2009. Since secondary sources are available only for Erode district, however Erode district comprises Tiruppur district details before bifurcation.*

3.5.6.1 Geomorphology of the Study Area

Total geographical area of the study area is 335.04 Sq.Km. The Geomorphology pattern of the study area is given in **Table 3-4 ,** Geomorphology pattern of the study area is given in **Figure 3-11.** Geomorphology map of the study area is given in **Figure 3-12.** The Geomorphology map of the study area is shown in the **Figure 3-13.**

Table 3-4 Geomorphology of the study area

S. No.	Geomorphology	Area in sq.km	Area in Acre	Area in Hectare	Total Area %
1.	Denudational Origin-Pediment-PediPlain Complex	326.52	80684.72	32652	97.46
2.	Waterbodies	6.95	1717.38	695	2.07
3.	Anthropogenic Origin-Anthropogenic Terrain	1.57	387.95	157	0.47

4.	**Total**	**335.04**	**82790.06**	**33504**	**100.00**

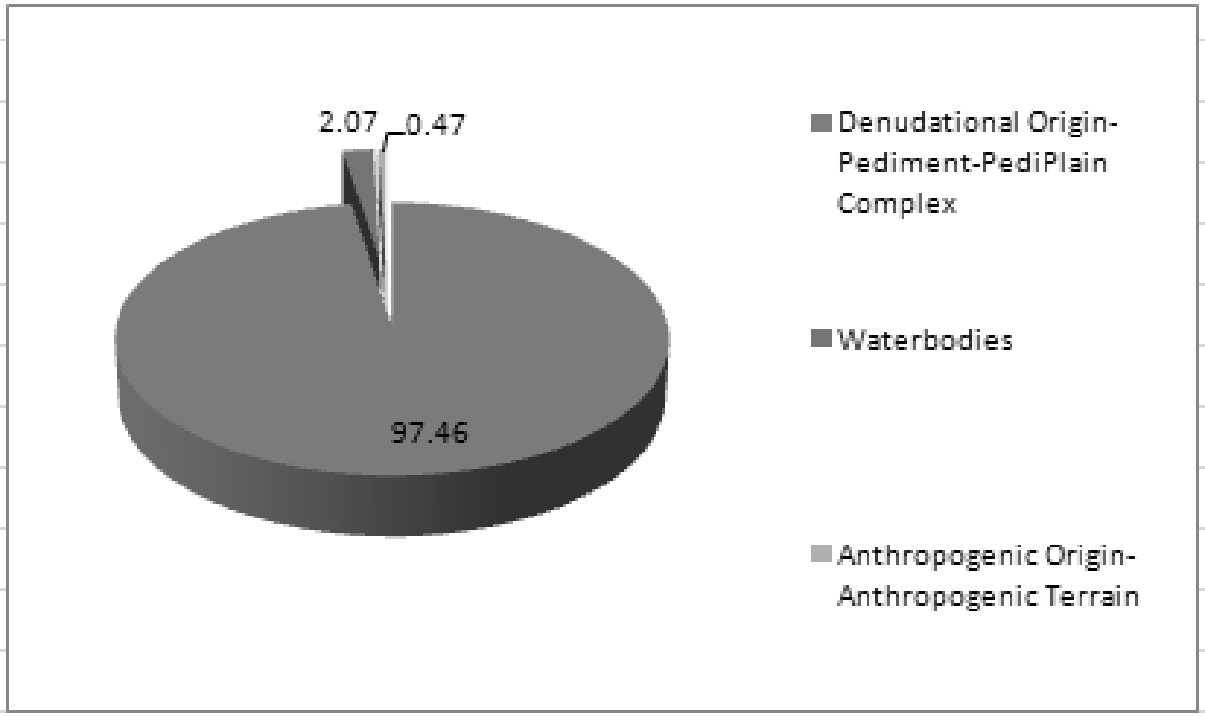


Figure 3-11 Geomorphology Pattern of the Study Area

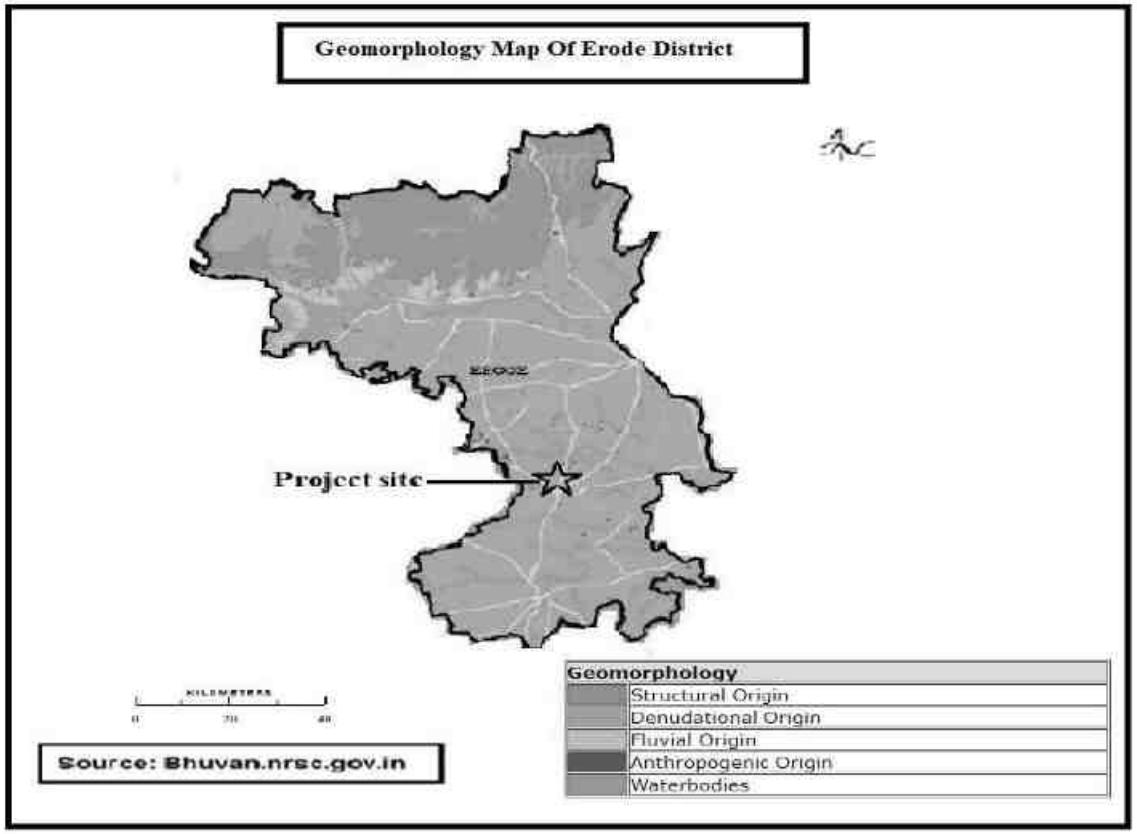


Figure 3-12 Geomorphology Map of the Erode District

Note: *Tiruppur district was a part of Erode district before the bifurcation on 22nd Febuary 2009. Since secondary sources are available only for Erode district, however Erode district comprises Tiruppur district details before bifurcation.*

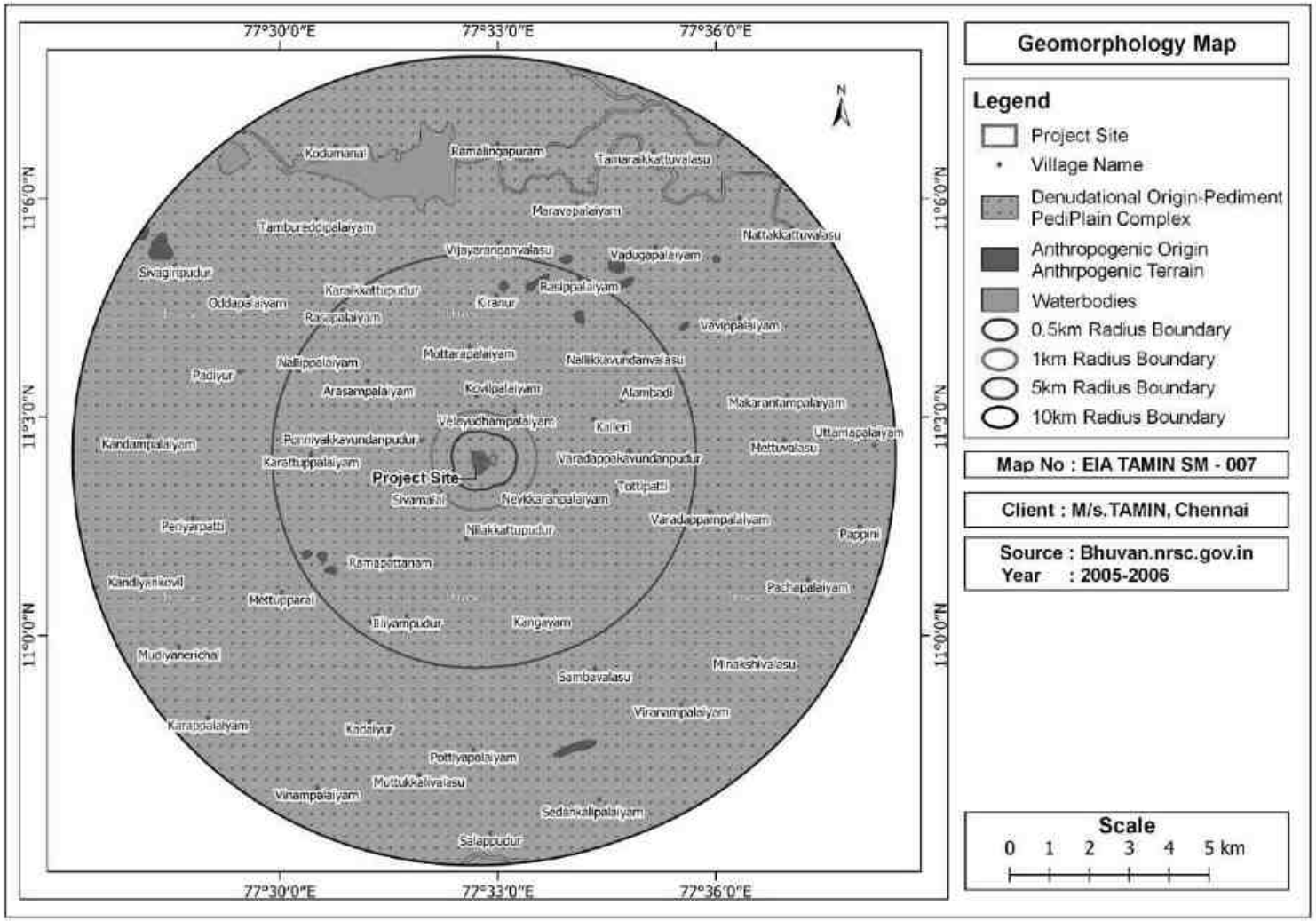


Figure 3-13 Geomorphology Map of Study Area

3.5.7 Hydrogeology of PIA District

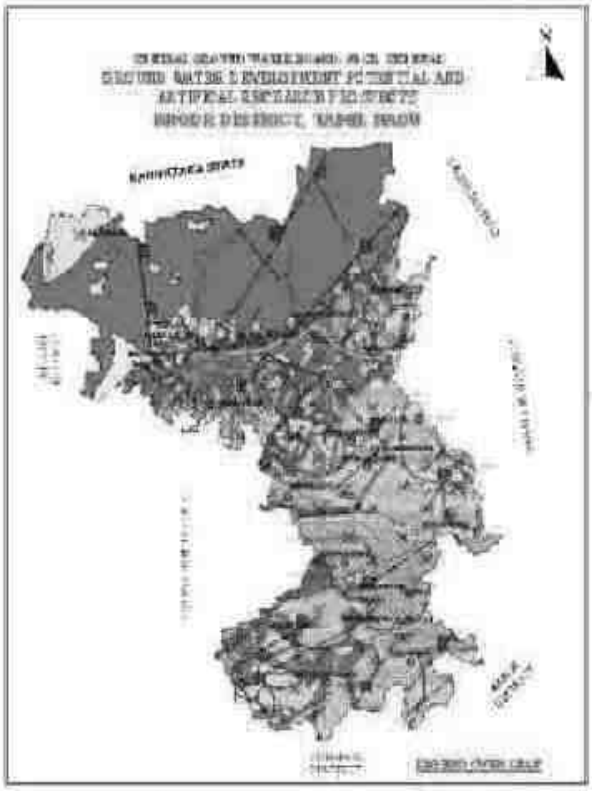
Tiruppur District is underlain by crystalline metamorphic complex in the western parts of district and sedimentary tract in eastern side. An area of 4551 Sq.km is covered by crystalline rocks (63%)and 2671 Sq.km is covered by sediments(37%). The general geological sequence of formation is given below:

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

The major part of the area is covered by metamorphic crystalline rocks of charnockite, granitic gneiss of Archaean age intruded by dolerite dykes and pegmatite veins. These rocks are highly metamorphosed and have been subjected to very severe folding, crushing and faulting.Ground Water occurs under the phreatic condition and wherever there are deep seated fractures, it occurs under semi-confined to confined conditions. Occurrence of Ground Water in hard rock depends upon the intensity and depth of weathering, fractures and fissures present in the rocks. Granites and gneisses yield moderately compared to the yield in Charnockites. Depth of well in hard rock generally ranges between 8 and 15m below ground level. Generally yield in open wells ranges from 30 to 250m3/day and in bore well between 260 and 430 m3/day.The weathered thickness varies from 2.5 m to 42m in general there are 3 to 5 fracture zones within 100 m and 1 to 4 fracture zones between 100 and 200 m.The hydrogeology map of Erode District is given in **Figure 3-14.**

Source: ***https://nwm.gov.in/sites/default/files/Notes%20on%20Trippur%20District.pdf***

(Ref: **National Water Mission,"Notes on Tiruppur District")**



	Wells Feasible	Rigs Suitable	Depth of Well (M)	Discharge (LPM)	Suitable Artificial Recharge Structures
Hard Rock Aquifer	Dug Well Bore Well	Manual DTH	15 - 20 60 – 150	10 - 60 20 – 100	Check Dams/ Gully Plug
Hard Rock Aquifer	Dug Well Bore Well	Manual Dth	15 - 20 75 - 180	60 – 100 80 – 120	Check Dams/ Farm Pond /Gully Plug
Hard Rock Aquifer	Dug Well Bore Well	Manual Dth	15 - 20 75 - 180	100 – 200 100 - 250	Check Dams/ Farm Pond /Gully Plug
	State Boundary			District Boundary	
	Hilly Area			Block Boundary	
	District Headquarter			Block Headquarters	
5	Water Level-Pre-Monsoon (Decadal Mean 1993-2002) Mbgl			EC In Microsiemens / Cm At 25°C	
	River			Lineament	
	Fluoride Greater Than Maximum Permissible Limit (1.5 mg/L)			Nitrate Greater Than Maximum Permissible Limit (45 mg/L)	
R	Recommended Site For Artificial Recharge Structure				

Figure 3-14 Hydrogeology map of the PIA district

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

Note: *Tiruppur district was a part of Erode district before the bifurcation on 22nd Febuary 2009. Since secondary sources are available only for Erode district, however Erode district comprises Tiruppur district details before bifurcation.*

3.5.8 Drainage Pattern in PIA District

The main rivers of the district are the Noyyal and Amaravathi, the tributaries of Cauvery flowing towards east. Palar, Nallar and other small rivers are flowing towards west. Noyyal River takes its rise in the Bolampatti valley of the Vellingiri hills, and comes to be called the Swami, until further south, it is joined by the Periyar. It runs past Perur assuming another name as the "Kanchi Mahanadi", and then flows into Coimbatore town and flows, for a short distance, the boundary of the Coimbatore and Avanashi taluks. Here it receives on the left Vannathankaraipallam, a drainage course which has its sources in the north of Coimbatore town and, after flowing past Tiruppur it receives the Nallar stream on the left. In the remaining part of its course, it forms the boundary of the Kangeyam and Erode taluks and after entering the Karur district, it joins the Cauvery. It is little more than a jungle stream being altogether dry for months in the year. At its sources it does not receive much supply from the south-west monsoon and is largely fed by petty affluent from the plains during the northeast monsoon. A Dam was constructed near Orathupalayam of Perundurai and Kangeyam taluks boundary.The drainage map of the Study Area is given as **Figure 3-15.**

Source*: https://censusindia.gov.in/nada/index.php/catalog/1136*

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

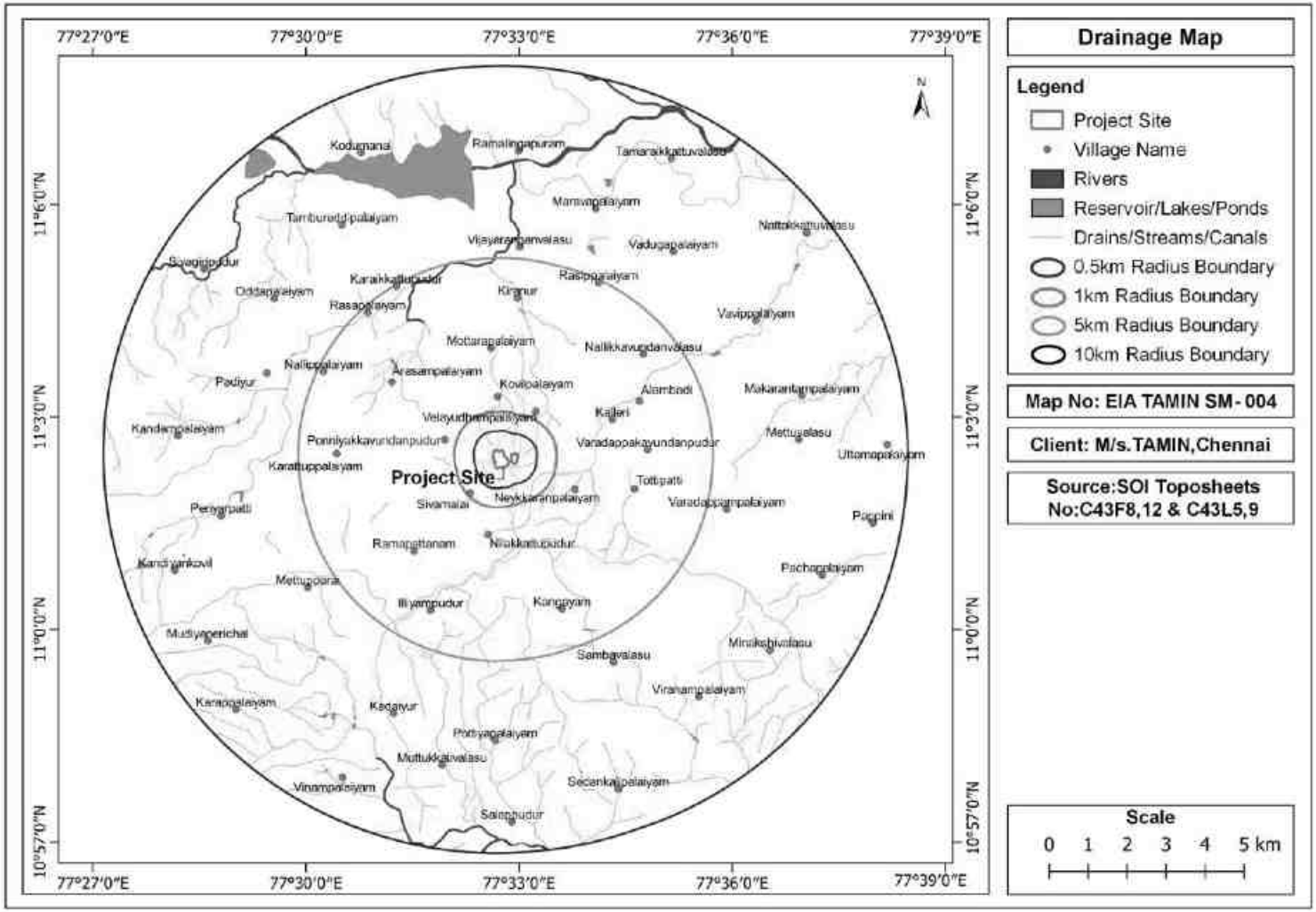


Figure 3-15 Drainage map of the study area

3.6 Geology

Tiruppur district of Tamil Nadu forms a part of southern Granulitic terrain and is predominantly occupied by crystalline rocks of Archaean to late Proterozoic age..Regionally, the rocks can be grouped under five categories namely

i. Charnockite Group represented by Charnockite, Pyroxene Granulite and Magnetite Quartzite,

ii. Peninsular Gneissic Complex (II) comprising hornblende-biotite gneiss,

iii. Basic intrusive include Pyroxinite/Dunite

iv. Younger intrusive comprising, Nepheline-Syenite,Pink Granite, Pegmatite and Quartz veins and

v. Quaternary sediments of Kankar and soil.Geological map of Tirupur is given as **Figure 3-16.**

Source: *https://tnmines.tn.gov.in/pdf/dsr/22.pdf*

(**Ref**:District Survey Report for Rough Stone, Tiruppur District)

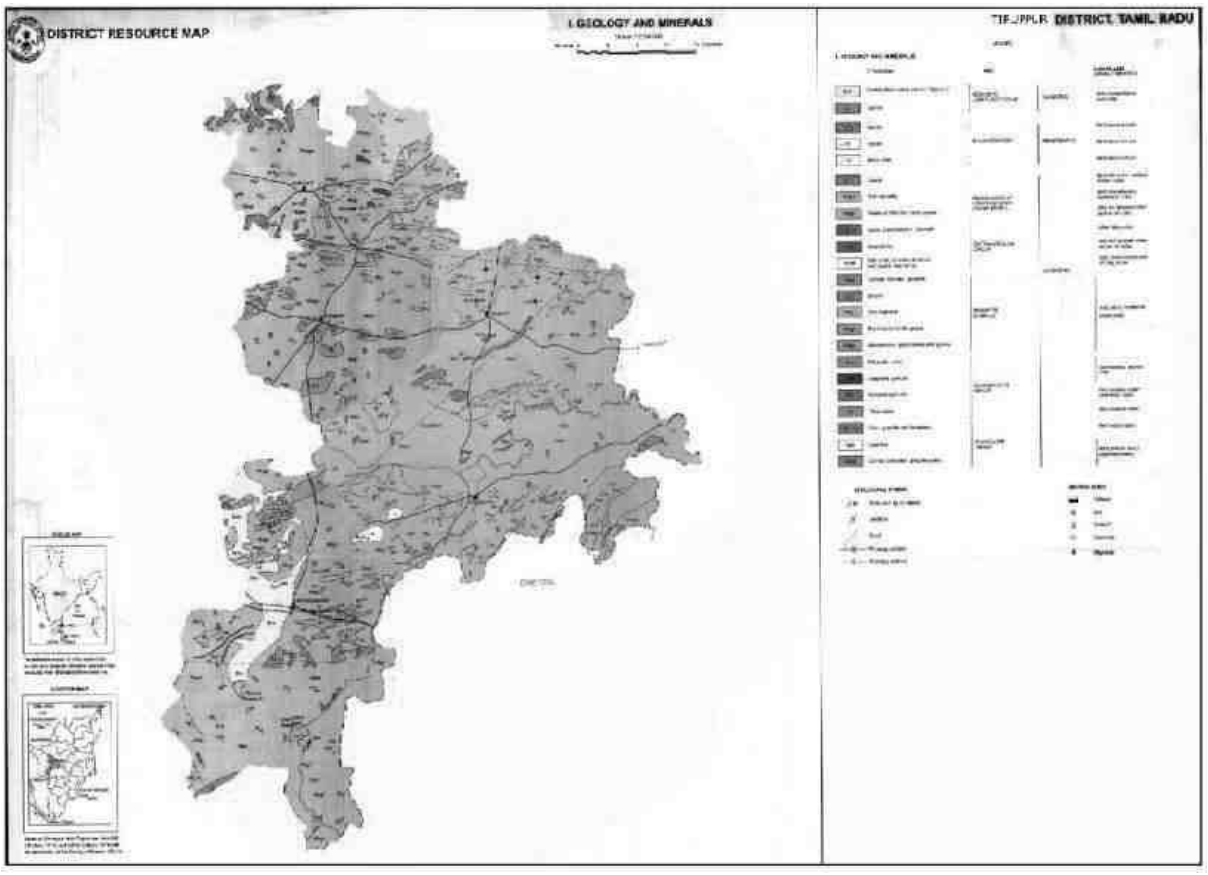


Figure 3-16 Geology Map of Tirupur District

3.6.1 Seismicity

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

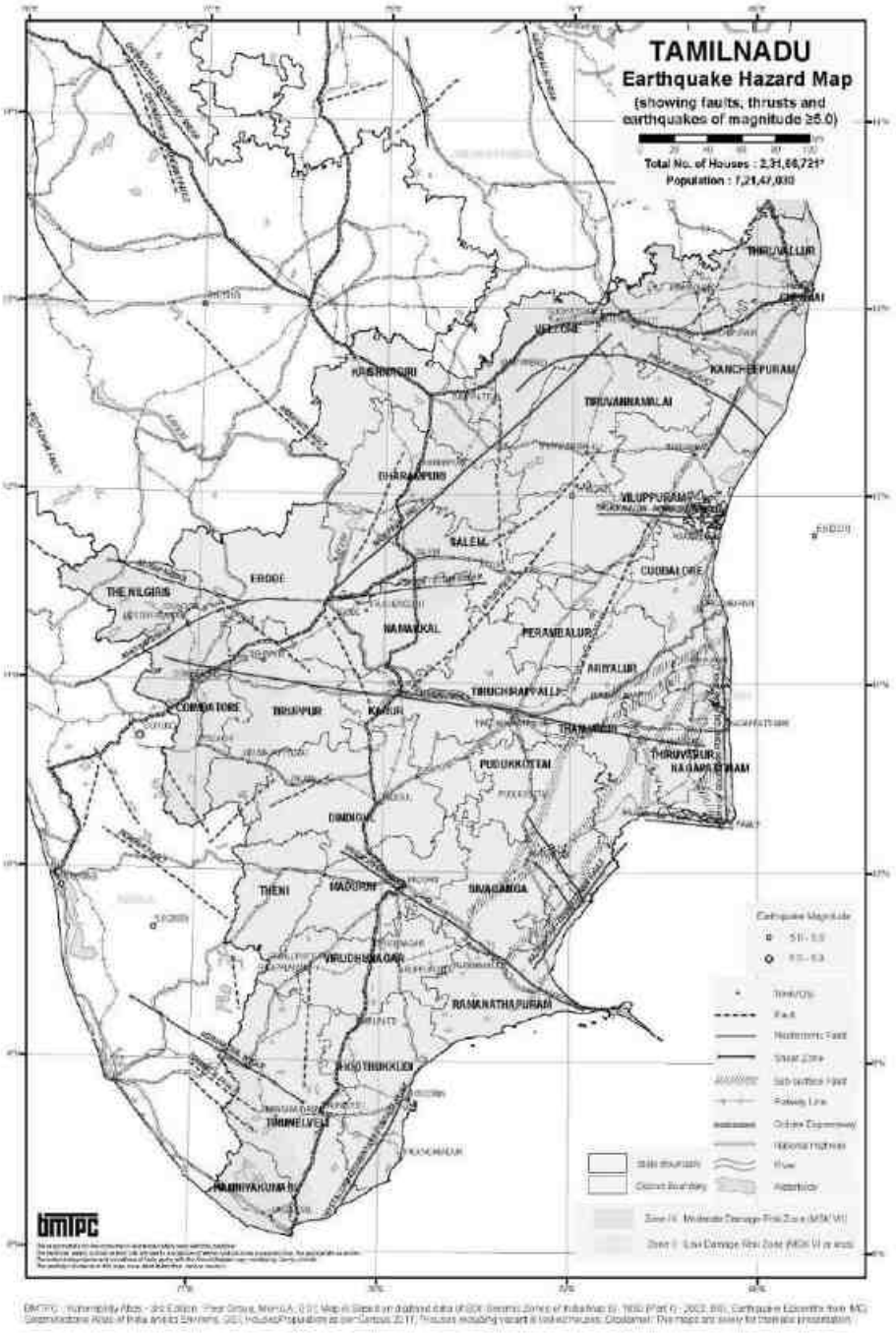


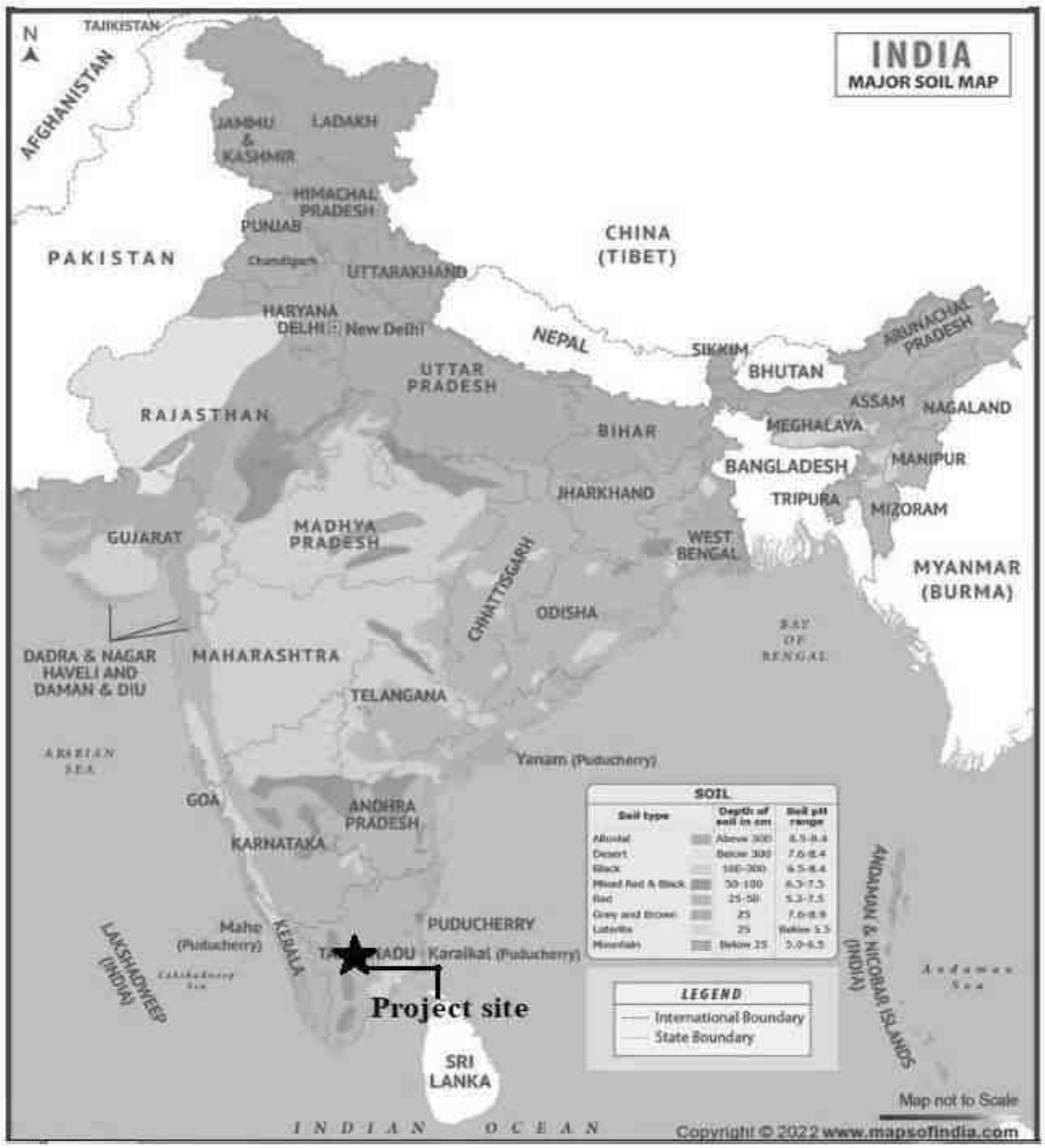
Figure 3-17 Seismicity Map of Tamil Nadu

3.6.2 Soils in PIA District

Major portion of Tiruppur district is constituted by red gravel, clay loamy soils. The fine soil being of loamy variety requires only little irrigation and this type of soil is found in Udumalaipettai taluk and it is fit for cotton cultivation. There are 5 major types of soils found in the district. Red loam is mainly found in Avinashi, Palladam, Tiruppur and Udumalaiapettai Blocks. Laterite soil is mainly found in Kangeyam and Dharapuram Blocks. Black soil is mainly found in Dharapuram, Avinashi, Palladam, Tiruppur and Udumalaipettai Blocks. Sandy Coastal Alluvium is mainly found in Palladam Block. Red Sandy Soil is mainly found in Dharapuram and Avinashi Blocks. Calcareous Soil is mainly found in Avinashi, Palladam and Tiruppur Blocks. The Soil map of India is given in **Figure 3-18.**

***Source**: https://censusindia.gov.in/nada/index.php/catalog/1136*

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



(Source: Mapsof India)

Figure 3-18 Soil map of India

3.6.3 Natural Hazards in PIA District

A Heat Wave is a period of abnormal high temperatures, more than the normal maximum temperature that occurs during the (Hot weather) summer season. Heat Waves typically occur between March and June. The extreme temperatures and resultant atmospheric conditions adversely affect people living in these regions as they cause physiological stress, sometimes resulting in death.

Some of the districts in Tamil Nadu that have witnessed impact of heat waves are Vellore, Thiruvannamalai, Krishangiri, Dharmapuri, Salem, Namakkal, Tiruppur, Coimbatore, Erode, Karur, Tiruchirapalli, Ariyalur, Perambalur, Sivaganga, Virudhunagar, Theni, Dindigul and Madurai. Natural Hazard Map of India is given in **Figure 3-19.**

Source: http://tnenvis.nic.in/Database/TN-ENVIS_898.aspx

(**Ref**: ENVIS Centre: Tammil Nadu State of Environment and Related Issues)

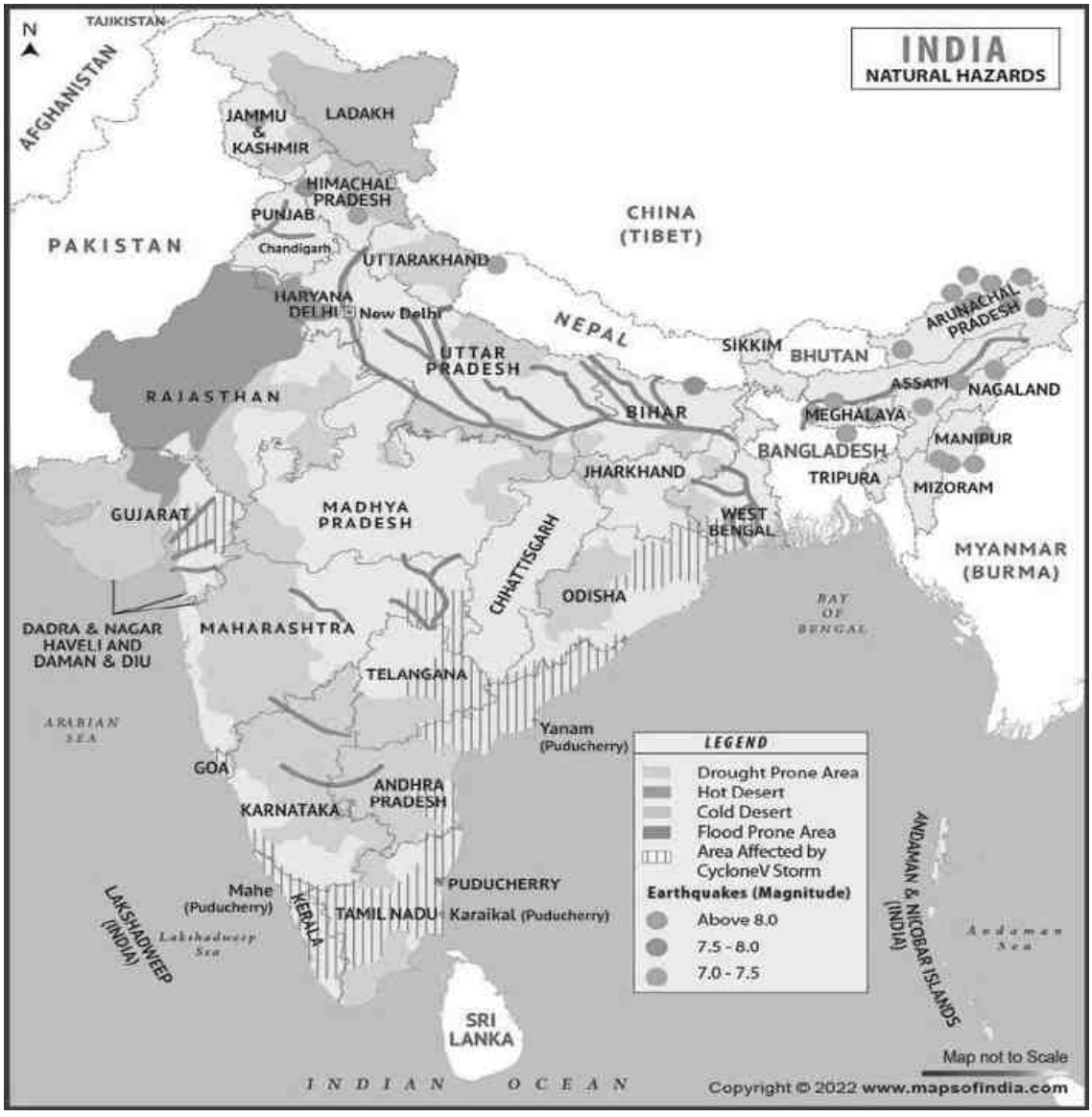


Figure 3-19 Natural hazard Map of India

3.7 Establishment of Baseline for valued environmental components

3.7.1 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.

3.6.1 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.

3.6.2 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 **mid of January 2023 to mid of April 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).

3.6.3 General Meteorological Scenario based on IMD Data

The nearest India Meteorological Department (IMD) station located to project site is Erode .The Climatological data of Erode , 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 3-5 Climatological Summary – Vellore (1991-2020)

Month	Temp (°C)		Rainfall (mm)		Relative Humidity (%)		Vapour Pressure hPa		Mean Wind Speed (kmph)	Predominant Wind Directions (From)*	
	Daily Max.	Daily Min.	Total	No. of days	08:30	17:30	08:30	17:30		08:30	17:30
Jan	32.7	20.4	1.6	0.2	67	56	23.7	23.3	1.5	NE	S

Month	Temp (°C)		Rainfall (mm)		Relative Humidity (%)		Vapour Pressure hPa		Mean Wind Speed (kmph)	Predominant Wind Directions (From)*	
	Daily Max.	Daily Min.	Total	No. of days	08:30	17:30	08:30	17:30		08:30	17:30
Feb	34.5	20.5	5.4	0.3	65	45	23.5	21.5	2.1	NE	S
Mar	36.8	22.2	12.5	0.4	64	46	25.5	24	2.1	S	S
Apr	37.8	22.9	46.4	2.2	64	49	26.6	25.9	2.1	S	S
May	38.1	23.3	84.6	4.2	64	54	26.9	25.8	2.9	S	S
Jun	37.1	23.1	15.1	1.2	62	53	25.9	26.1	4	SW	SW
Jul	36.1	22.8	19.7	1.5	64	57	25.9	26.1	3.8	W	SW
Aug	35.6	22.8	71.3	3.8	66	58	26	26.1	3.4	W	SW
Sep	35.3	22.8	66.5	4.2	66	57	26.3	25.7	2.5	W	SW
Oct	33.2	22.1	146	9.2	72	65	26.9	26.6	1.4	NE	NE
Nov	31.5	21.5	118.6	7	75	69	26.7	27	1	NE	NE
Dec	31.4	20.7	18.7	2.3	72	63	25.2	24.8	1.2	NE	NE
Max.	**38.1**	**23.3**	**146**	**9.2**	**75**	**69**	**26.9**	**27**	**4**	**Annual Predominant wind direction is SOUTH**	
Min.	**31.4**	**20.4**	**1.6**	**0.2**	**62**	**45**	**23.5**	**21.5**	**1**		
Avg. /Total.	**32.7**	**21.6**	**942**	**50.8**	**74**	**53**	**23.6**	**21.8**	**5.1**		

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

- Highest Daily maximum temperature is 38.1°C and the Lowest daily minimum temperature is 20.4°C were recorded in the months of May and January respectively
- Maximum and minimum relative humidity of 75% and 45% were recorded in the months of November and February respectively.
- Maximum and minimum rainfall of 146 mm and 1.6 mm was recorded in the months of October and January respectively.

Maximum and minimum Mean wind speed is 4.0 Km/hr and 1.0 Km/hr was recorded in the months of June and November respectively. Annual Wind predominant direction is SOUTH

3.6.4 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 **mid of January 2023 to mid of April 2023** and is presented in **Table 3-6**. The wind rose for the study period is given as **Figure 3-20.**

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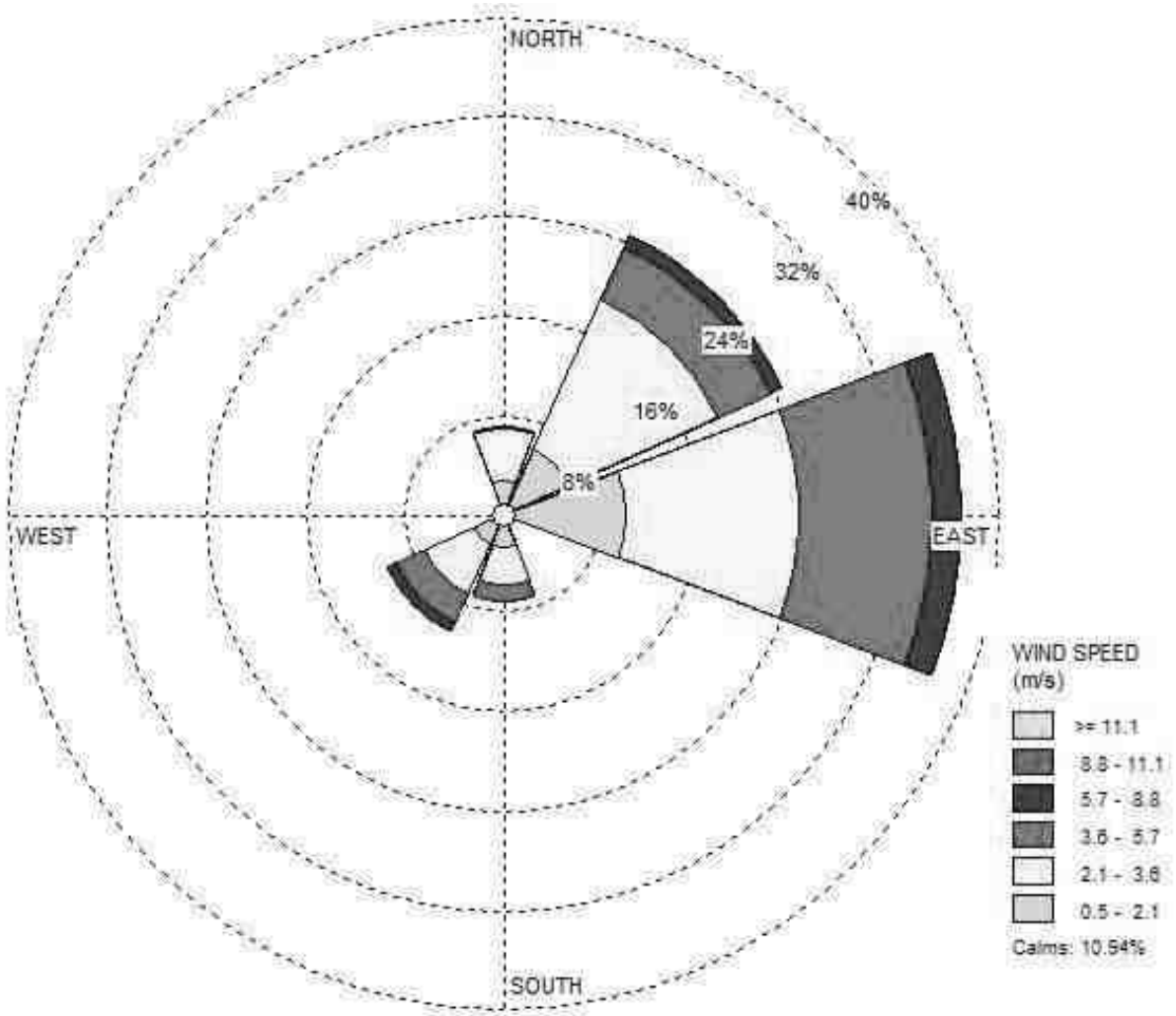


Figure 3-20 Wind rose diagram considered for Dispersion Modelling (Mid of Jan 2023 – Mid of April 2023)

Table 3-6 Meteorology Data for the Study Period (Mid of Jan 2023 – Mid of April 2023)

S. No	Parameter	Observation
1.	Temperature	Max Temperature: 38.0°C Min Temperature: 18.0°C Avg Temperature: 27.36°C
2.	Average Relative Humidity	53.93%
3.	Average Wind Speed	2.55m/s
4.	Predominant Wind Direction	East

3.6.5 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: 27.36^{0}C
- Average Relative humidity: 53.93 %
- Average Wind speed: 2.55 m/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 3839m during 6 AM to 4 PM, the maximum recorded at 4 PM, May 2023. This is shown in the following **Figure 3.17.**

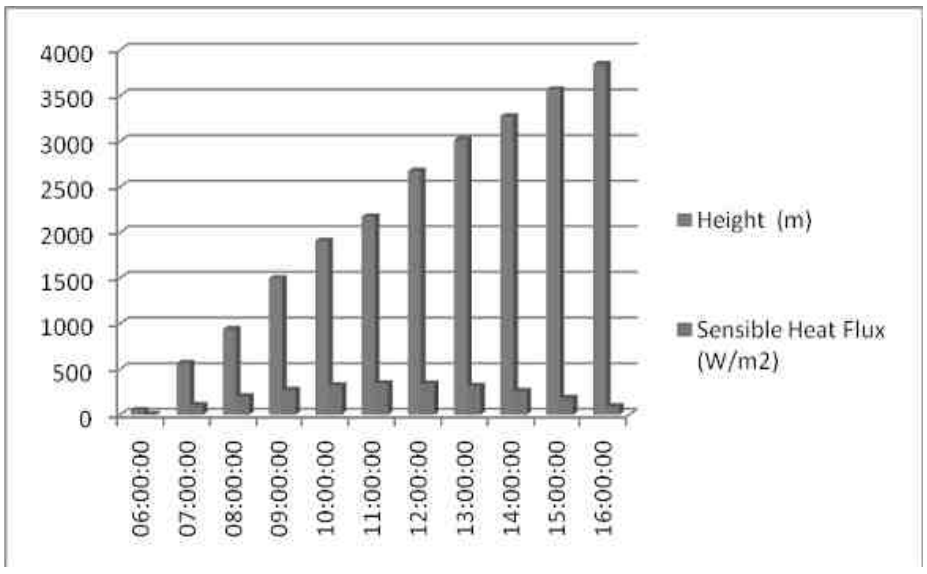


Figure 3-21 Atmospheric inversion level at the project site

3.7 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

3.7.1 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 Erode from IMD data (1991-2020). The wind predominance during study period (mid of January 2023 to mid of April 2023) is from **South**. 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 3-7 Details of Ambient Air Quality Monitoring Locations

Station Code	Location	Type of Wind	Distance (~km) from Project boundary	Azimuth Directions
A1	Near Project Site	-	0.20	W
A2	Kovilpalaiyam	d/w	1.22	N
A3	Kiranur	d/w	3.75	N
A4	Virankuttaivalasu	c/w	2.84	NE
A5	Neykkaranpalaiyam	c/w	1.67	ESE
A6	Kangayam	u/w	3.31	S
A7	Sivamalai	c/w	0.71	SW
A8	Arasampalaiyam	c/w	3.01	NW

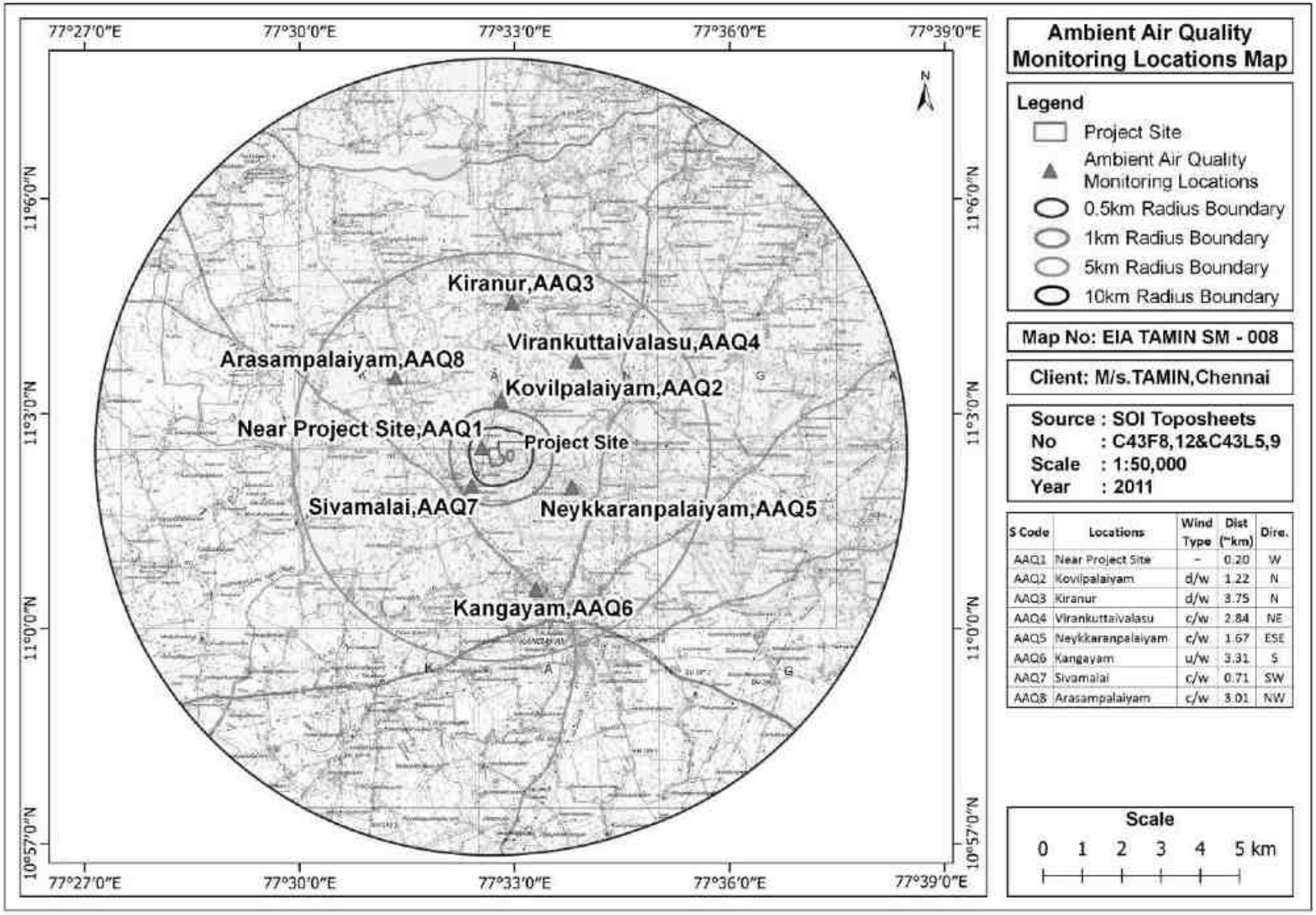


Figure 3-22 Map showing the Ambient Air Quality monitoring locations

3.7.2 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 (mid of January 2023 to mid of April 2023) . PM10, PM2.5, SO2, NOx, CO, Pb, O3, NH3, C6H6, C20H12, As, Ni, TVOC, Methane Hydrocarbon and Non-Methane Hydrocarbon were 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 3-8 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), $\mu g/m^3$	IS 11255: (Part 2) / USEPA Method 6	50 (Annual)	80(24 Hours)	1
2	Nitrogen Dioxide (NO_2), $\mu g/m^3$	IS: 5182 (Part - 6): 2006 / CPCB guidelines Volume1	40 (Annual)	80 (24 Hours)	2
3	Particulate Matter ($PM_{2.5}$), $\mu g/m^3$	In house method (Gravimetric method) based on CPCB guidelines Volume1	40 (Annual)	60 (24 hours)	3
4	Particulate Matter (PM_{10}), $\mu g/m^3$	IS:5182 (Part– 23): 2006 CPCB guidelines Volume1	60 (Annual)	100 (24 hours)	4
5	CO, mg/m^3	IS:5182(Part–10):1999 (Reaff:2006) CPCB guidelines Volume1	2 (8 hours)	4 (1hour)	5
6	Pb, $\mu g/m^3$	IS:5182(Part–22):2004 (Reaff:2006) CPCB guidelines Volume1	0.5(Annual)	1(24 hours)	6
7	O_3, $\mu g/m^3$	In house method (Spectrophotometric method) based on CPCB guidelines Volume1	100(8hours)	180 (1hour)	7
8	NH_3, $\mu g/m^3$	In house method (Spectrophotometric method) based on CPCB guidelines Volume1	100(Annual)	400(24 hours)	8
9	Benzene, $\mu g/m^3$	GC FID/ GC MS based on IS 5182 (Part:12)/ CPCB guidelines Volume1	5 (Annual)	5 (Annual)	9
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)	10
11	Arsenic, ng/ m^3	In house method (AAS method) Based on CPCB guidelines Volume 1	6 (Annual)	6 (Annual)	11
12	Nickel, ng/ m^3	In house method (AAS method) Based on CPCB guidelines Volume 1	20(Annual)	20 (Annual)	12

3.7.2.1 Results and Discussions

The variations of the pollutants Particulate matter <10 micron size (PM_{10}),Particulate matter <2.5 micron size ($PM_{2.5}$), Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2),Carbon Monoxide (CO), Lead (Pb),Ozone (O_3),Benzene (C_6H_6), Benzo (a) pyrene ($C_{20}H_{12}$), Arsenic (As), Nickel (Ni),Ammonia (NH_3) are compared with National Ambient Air Quality Standards (NAAQS), MoEF&CC Notification, November 2009. Ambient Air Quality Monitoring Data (**Mid January 2023 to Mid March 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 3-9 Summary of the average baseline concentrations of pollutants

Parameters	Conc.	NAAQ Standards	Locations							
			Project Site	Erumbi	Kondapalaiyam	Karikkal	Kattarikuppam	Perunganji	Kallankuppam	Rendadi
			AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
PM_{10} Conc. ($\mu g/m^3$)	Min.	100 (24 Hours)	40.13	35.15	38.24	35.07	39.91	35.91	37.24	36.24
	Max.		57.19	50.10	54.50	49.98	56.88	51.17	53.07	51.65
	Avg.		**48.13**	**42.16**	**45.86**	**42.06**	**47.86**	**43.06**	**44.66**	**43.46**
	98th 'tile		56.86	49.81	54.19	49.69	56.55	50.87	52.77	51.35
$PM_{2.5}$ Conc. ($\mu g/m^3$)	Min.	60 (24 Hours)	23.05	19.87	18.87	16.37	20.79	17.03	16.37	17.45
	Max.		32.84	28.32	26.89	23.32	29.63	24.28	23.32	24.87
	Avg.		**27.64**	**23.84**	**22.63**	**19.63**	**24.94**	**20.43**	**19.63**	**20.93**
	98th 'tile		32.65	28.16	26.74	23.19	29.46	24.14	23.19	24.73
SO_2 Conc. ($\mu g/m^3$)	Min.	80 (24 Hours)	8.52	6.85	5.18	5.43	5.93	6.68	5.85	6.20
	Max.		12.14	9.76	7.38	7.74	8.45	9.52	8.33	8.84
	Avg.		**10.22**	**8.22**	**6.21**	**6.51**	**7.11**	**8.02**	**7.01**	**7.44**
	98th 'tile		12.07	9.70	7.34	7.69	8.40	9.46	8.28	8.79
NO_2Conc. ($\mu g/m^3$)	Min.	80 (24	21.54	17.20	16.20	16.12	16.70	16.63	15.64	15.74

Parameters	Conc.	NAAQ Standards	Locations							
			Project Site	Erumbi	Kondapalaiyam	Karikkal	Kattarikuppam	Perunganji	Kallankuppam	Rendadi
			AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
	Max.	Hours)	30.70	24.51	23.09	22.97	23.80	23.70	22.29	22.43
	Avg.,		**25.84**	**20.63**	**19.43**	**19.33**	**20.03**	**19.95**	**18.76**	**18.88**
	98th 'tile		30.52	24.37	22.95	22.83	23.66	23.57	22.16	22.30
Pb ($\mu g/m^3$)	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)
CO (mg/m^3)	Avg.	4 (1hour)	0.87	0.86	0.62	0.61	0.66	0.62	0.69	0.64
O_3 ($\mu g/m^3$)	Avg.	180(1hour)	13.56	11.7	12.54	14.23	13.17	12.63	10.98	14.03
Benzene C_6H_6 ($\mu g/m^3$)	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 $C_{20}H_{12}$ (a), (ng/m^3)	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)
As (ng/ m^3)	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)
Ni (ng/m^3)	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)
NH_3($\mu g/m^3$)	Avg.	400 (24 hour)	9.14	7.79	8.22	7.9	8.46	7.53	8.11	6.98
TVOC (ppm)	Avg.	-	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)
Methane HC	Avg.	-	BLQ (LOQ	BLQ (LOQ	BLQ (LOQ	BLQ (LOQ	BLQ (LOQ	BLQ (LOQ	BLQ (LOQ	BLQ (LOQ

Parameters	Conc.	NAAQ Standards	Locations							
			Project Site	Erumbi	Kondapalaiyam	Karikkal	Kattarikuppam	Perunganji	Kallankuppam	Rendadi
			AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
(µg/m³)			0.1)	0.1)	0.1)	0.1)	0.1)	0.1)	0.1)	0.1)
Non-Methane HC (µg/m³)	Avg.	-	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: *BDL (Below detection limit), DL (Detection limit), BLQ (Below Limit Of Quantification), LOQ (Limit of Quantification)*

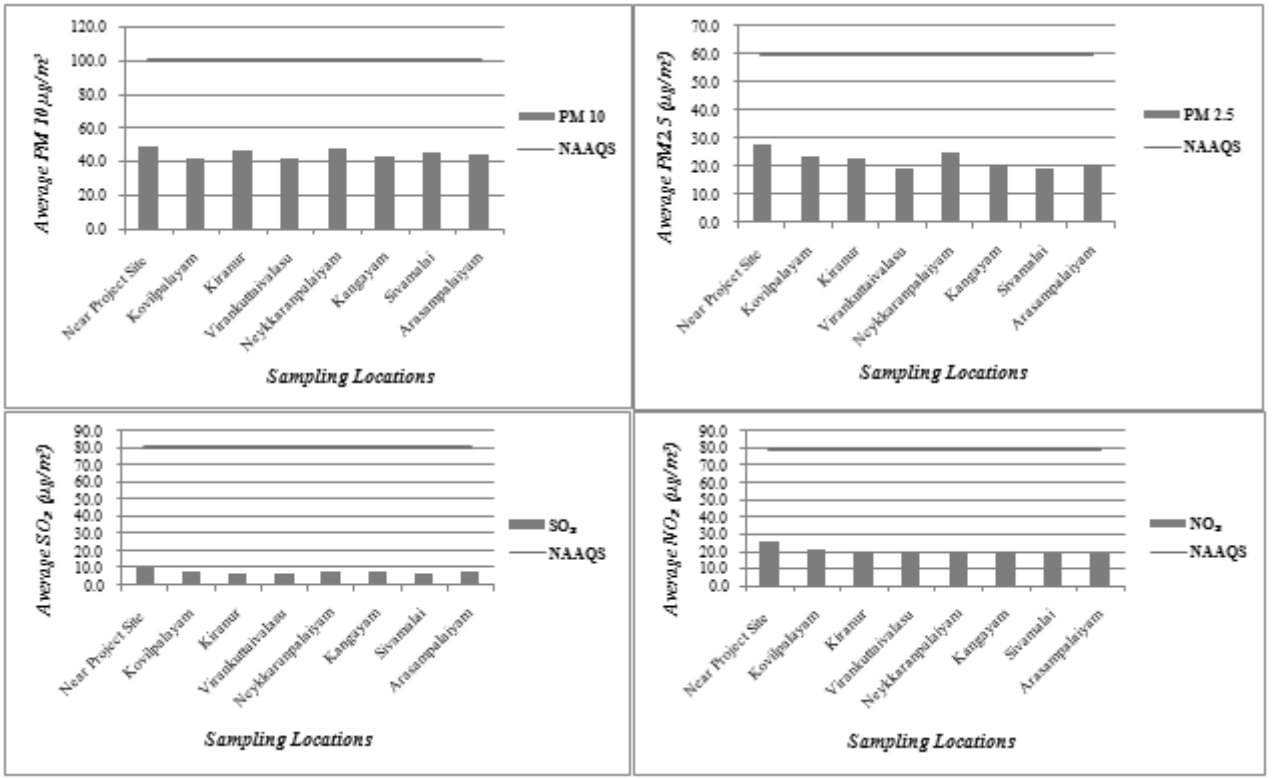


Figure 3-23 Trends of Measured Ambient Concentrations in the Study Area

3.7.2.2 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 PM_{10} vary from 46.06 to 48.13 µg/m³.
- The average baseline levels of PM2.5 vary from 19.63 µg/m³ to 27.64 µg/m³.
- The average baseline levels of SO2 vary from 6.21 µg/m³ to 10.22 µg/m³.
- The average baseline levels of NO2 vary from 18.76 µg/m³ to 25.84 µg/m³

3.8 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.**

3.8.1 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

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

Table 3-10 Day and Night Equivalent Noise Levels

Location Code	Location	Distance (~km) from Project boundary	Azimuth Direction	Noise level in dB(A) Leq		CPCB Standard		Environmental Setting
				Day	Night	Lday (Ld)	LNight (Ln)	
N1	Near Project Site	Within Site		53.2	43.1	75	70	Industrial
N2	Kovilpalayam	1.07	E	51.9	40.1	55	45	Residential
N3	Kiranur	2.49	E	54.7	41.8	55	45	Residential
N4	Virankuttaivalasu	9.59	SSW	52.4	43.1	55	45	Residential
N5	Neykkaranpalaiyam	8	SW	54.3	44.9	55	45	Residential
N6	Kangayam	5.32	WSW	54.5	44.6	55	45	Residential
N7	Sivamalai	1.69	W	53.4	44.2	55	45	Residential
N8	Arasampalaiyam	3.71	N	51.8	43.6	55	45	Residential

3.8.2 Observations

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

- In Residential area day time noise levels varied from 51.8 dB (A) to 54.7 dB (A) and night time noise levels varied from 40.1dB(A) to 44.9 dB(A) across the sampling stations. The field observations during the study period indicate that the ambient noise levels in Residential area are within the limit prescribed by CPCB for Residential area (55 dB (A) Day time & 45 dB(A) Night time).
- In Industria area (Near Project Site), Day and Night Noise level Varies from 53.2 dB(A) and 43.1 dB(A) respectively. The field observations during the study period indicate that the ambient noise levels in Industrial area are within the limit prescribed by CPCB for Industrial area (75 dB (A) Day time & 70 dB(A) Night time).

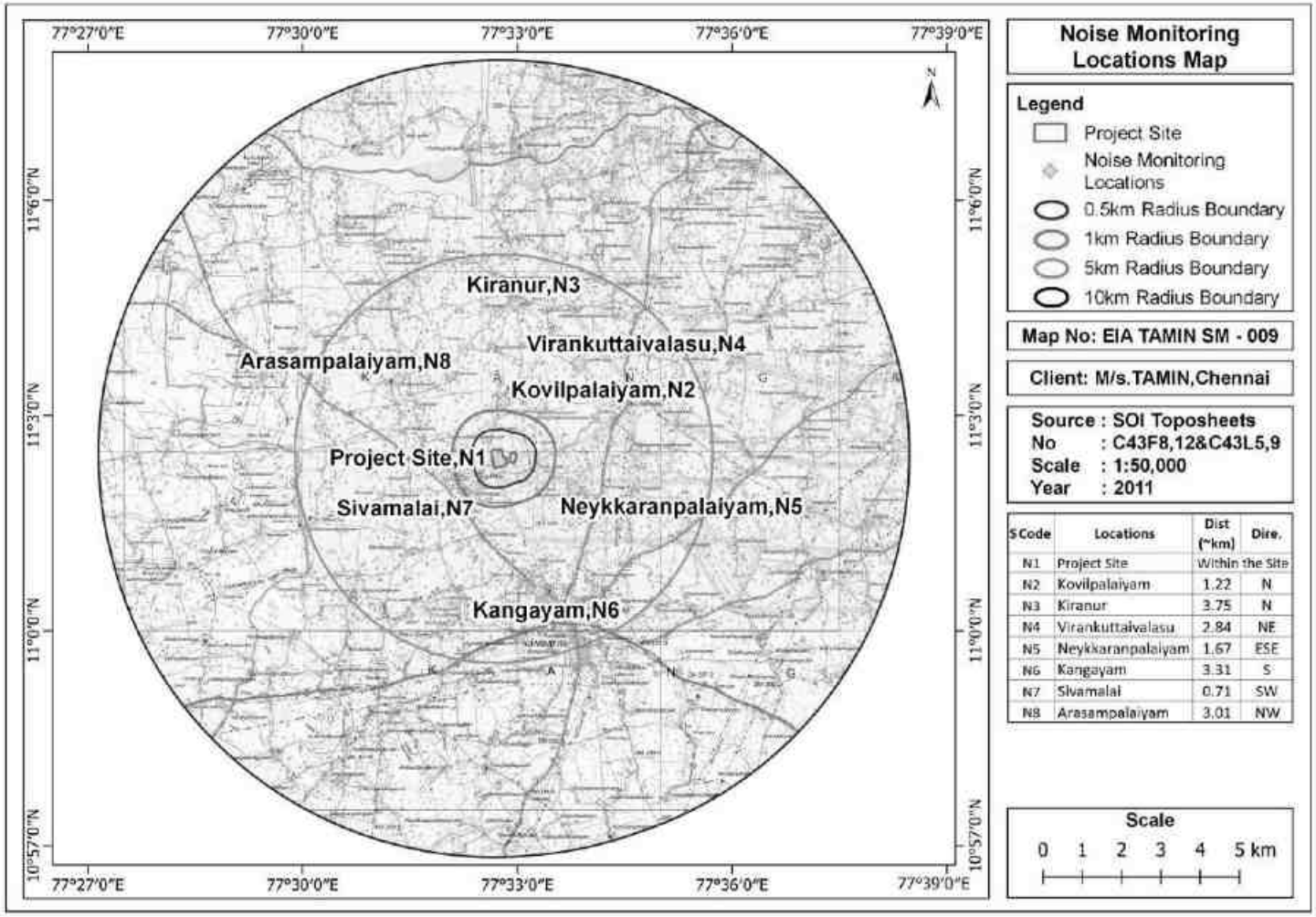


Figure 3-24 Map showing the noise monitoring location

3.9 Water Environment

The district is part of the composite East flowing river basin having Araniyar, Korattalaiyar and Cooum sub basins.

3.9.1 Surface Water Resources

The water requirements of the habitations are met with either through surface water sources or through various Mini Water Supply Schemes or Integrated water supply schemes utilising the available ground water resources. The habitants of 10 Municipalities of the district are provided with 70 - 90 Lpcd water and the habitants 24 town Panchayats and 30 rural Panchayats are provided with 30 – 70 and 40 – 70 Lpcd water respectively. Dug wells have traditionally been the most common ground water abstraction structures used for irrigation in the district, with yields ranging from.

Source: **http://cgwb.gov.in/District_Profile/TamilNadu/Erode.pdf**

(Ref: **Government of India Ministry of Water Resources Central Ground Water Board South Eastern Coastal Region Chennai, "District Ground Water Brochure Erode District")**

Note: *Tiruppur district was a part of Erode district before the bifurcation on 22nd Febuary 2009. Since secondary sources are available only for Erode district, however Erode district comprises Tiruppur district details before bifurcation.*

3.9.2 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 3-11** Water sampling and map of sampling location are given in **Table 3-12** and **Figure 3-25**. Physicochemical Parameters of Surface water samples from the study area given in **Table 3-13**.

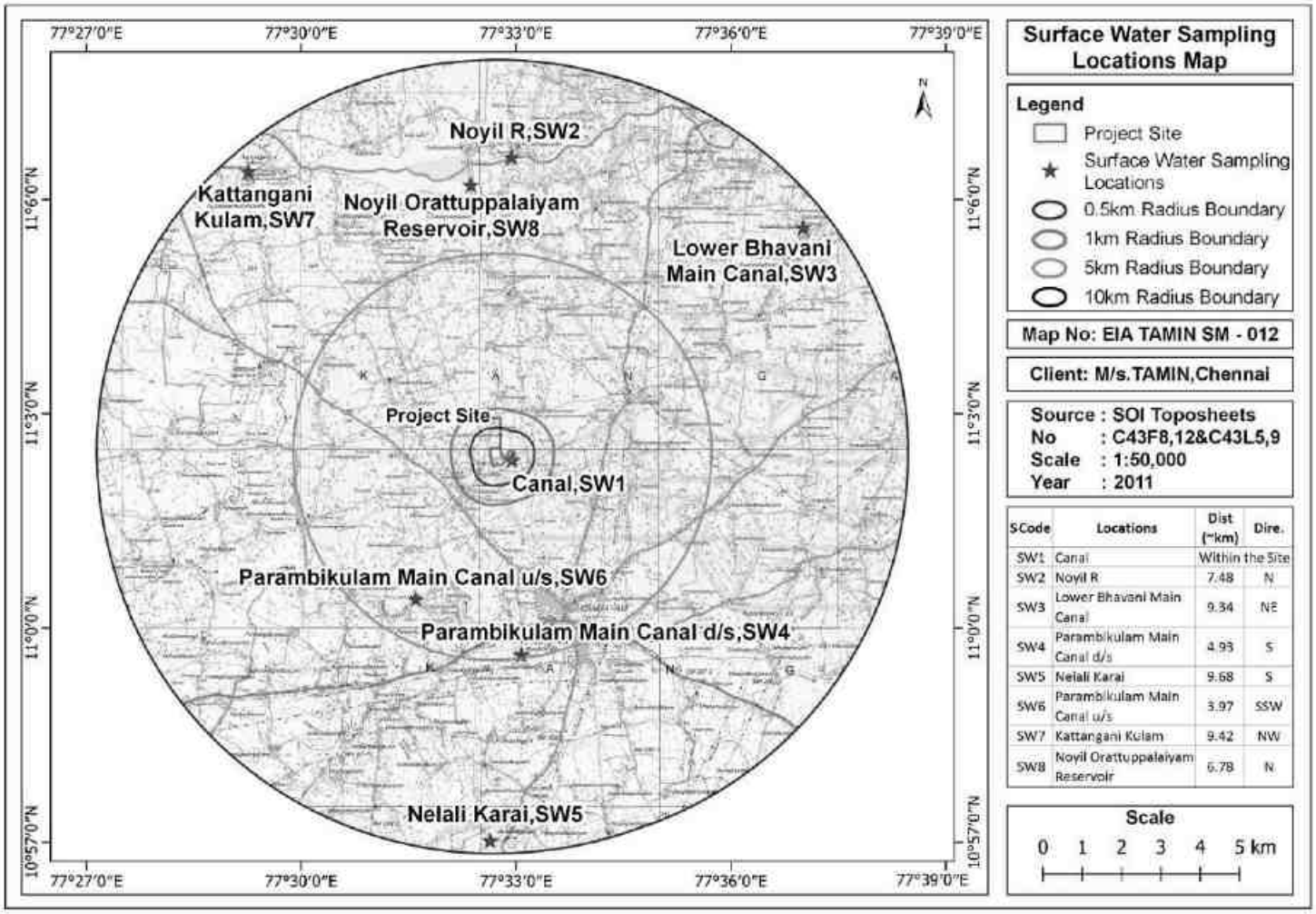
Table 3-11 Test methods used for the analysis of water quality parameters

S.No	Parameter Measured	Test Method
1.	Turbidity	IS 3025(Part - 10):1984
2.	pH	IS:3025 (Part - 11): 1983
3.	Electrical Conductivity	IS:3025 (Part - 14): 1983

S.No	Parameter Measured	Test Method
4.	Total Dissolve Solids	IS: 3025:1(Part - 16) 1984
5.	Total Suspended Solids	IS 3025 (Part - 17) 1984
6.	Total Alkalinity as CaCO3	IS:3025,1 (Part - 23) 1986
7.	Total Hardness as CaCo3	IS:3025 (Part - 21) 1983
8.	Sodium as Na	IS:3025,5(Part - 45) 1993
9.	Potassium as K	IS:3025,5(Part - 45) 1993
10.	Calcium as Ca	IS 3025 (Part - 40):1991
11.	Magnesium as Mg	IS 3025 (Part - 46) 1994
12.	Chloride as cl	IS 3025 (Part - 32):1988
13.	Sulphate as SO4	IS 3025(Part - 24):1986
14.	Nitrate as NO3	ASTM (Part - 31)1978
15.	Phosphate as PO4	IS 3025 (Pt 45) 1993 (R 2006)
16.	Fluorides as F	IS 3025 (Part - 60):2008
17.	Cyanide as Cd	IS 3025 (Part-27):1986
18.	Arsenic as As	IS 3025:(Part-37):1988
19.	Cadmium as Cd	IS 3025 (Part - 41)1991
20.	Chromium, Total	IS:3025 (Part - 52) 2003
21.	Lead as Pb	IS:3025 (Part - 47) 1994
22.	Manganese as Mn	IS 3025:(Part - 59):2006
23.	Mercury as Hg	IS 3025 (Part48):1994 RA 1999
24.	Nickel as Ni	IS 3025:(Part-54):2003
25.	Selenium as Se	IS 3025 Part (56)2003
26.	Zinc as Zn	IS:3025 (Part - 49) 1994
27.	Dissolved Oxygen (DO)	IS:3025 (Part - 38)1989
28.	BOD, 3 days @ 27°C as O_2	5210B APHA22nd Edn 2012
29.	Chemical Oxygen Demand as O_2	IS:3025 (Part-58)-2006

Table 3-12 Details of Surface water sampling locations

Location Code	Locations	Distance from Project Boundary(~km)	Direction from project boundary
SW1	Canal	7.48	N
SW2	Noyil r	9.34	NE
SW3	Lower Bhavani Main Canal	4.93	S
SW4	Parambikulam Main Canal u/s	9.68	S
SW5	Nelali Karai	3.97	SSW
SW6	Parambikulam Main Canal U/S	3.97	SSW
SW7	Kattangani Kulam	9.42	NW
SW8	Noyil Orattuppalaiyam Reservoir	6.78	N



SCode	Locations	Dist (*km)	Dire.
SW1	Canal	Within the Site	
SW2	Noyil R	7.48	N
SW3	Lower Bhavani Main Canal	9.34	NE
SW4	Parambikulam Main Canal d/s	4.93	S
SW5	Nelali Karai	9.68	S
SW6	Parambikulam Main Canal u/s	3.97	SSW
SW7	Kattangani Kulam	9.42	NW
SW8	Noyil Orattuppalaiyam Reservoir	6.78	N

Figure 3-25 Map showing the surface water monitoring locations

Table 3-13 Physicochemical Parameters of Surface water samples from study area

S. No	Parameter	Unit	Canal	Noyil r	Lower Bhavani Main Canal	Parambi kulam Main Canal u/s	Nelali Karai	Parambikulam Main Canal U/S	Kattangani Kulam	Noyil Orattuppalaiy am Reservoir
			SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
1.	pH (at 25°C)	--	7.27	7.51	7.60	7.38	7.21	7.48	7.55	7.81
2.	Electrical Conductivity	µS/cm	758	773	748	754	712	718	755	719
3.	Total Dissolved Solids	mg/l	409	335	470	359	409	450	464	405
4.	Total Suspended Solids	mg/l	17.3	34	42	29	32	14	36	31
5.	Total Alkalinity as $CaCO_3$	mg/l	134	127	179	139	144	168	179	153
6.	Total Hardness as $CaCO_3$	mg/l	193	177	209	190	175	211	186	179
7.	Sodium as Na	mg/l	47	15	64	19	44	49	59	38
8.	Potassium as K	mg/l	17	6	12	4	15	13	11	7
9.	Calcium as Ca	mg/l	36.2	34.1	35.8	36.9	30.4	32.7	31.5	33.7
10.	Magnesium as Mg	mg/l	25	22.4	29	23.7	24.0	31.4	26	23.1
11.	Chloride as Cl	mg/l	79.3	70.2	75.8	71.4	76.2	79.4	70.6	78.1
12.	Sulphate as SO_4	mg/l	24.1	17.3	15.8	18.6	26.3	19.7	27.6	20.9
13.	Nitrate as NO_3	mg/l	5.8	6.1	7.2	5.8	6.4	8.2	8.7	6.8
14.	Fluorides as F	mg/l	0.32	0.15	0.38	0.42	0.29	0.45	0.43	0.49
15.	Cyanide	mg/l	0.14	0.11	0.24	0.29	0.11	0.15	0.37	0.13
16.	Arsenic	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)

S. No	Parameter	Unit	Canal	Noyil r	Lower Bhavani Main Canal	Parambi kulam Main Canal u/s	Nelali Karai	Parambikulam Main Canal U/S	Kattangani Kulam	Noyil Orattuppalaiy am Reservoir
			SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
17.	Cadmium as Cd	mg/l	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)
18.	Chromium, Total	mg/l	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)
19.	Copper as Cu	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)
20.	Lead as Pb	mg/l	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)
21.	Manganese as Mn	mg/l	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)
22.	Mercury	mg/l	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)
23.	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)
24.	Selenium as Se	mg/l	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.	Zinc as Zn	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)
26.	Dissolved Oxygen	mg/l	5.3	4.8	5.6	5.9	5.1	4.5	6.2	5.5
27.	Chemical Oxygen Demand as O_2	mg/l	33	28	24	31.5	24.9	17.3	15.2	14.8
28.	BOD, 3 days @ 27°C as O_2	mg/l	6.5	7.1	6.8	7.3	6.3	6.9	7.2	6.4
29.	Total Coliform	MPN/ 100ml	61	33	54	21	46	41	43	39

Note: *BLQ (Below the Limit of Quantification), LOQ (Limit of Quantification),*

3.9.2.1 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 **7.21 to 7.81** which is within the limit of IS 2296:1992.
- The Total Dissolved Solids (TDS) value of collected surface water sample ranges from **388 mg/l to 418 mg/l**.
- The Total hardness value of the collected surface water sample ranges between **175 mg/l to 211 mg/l**.
- BOD value of surface water varies from **6.3 mg/l to 7.3 mg/l**
- COD value of surface water varies from **14.8 to 33 mg/l**

Table 3-14 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	µS/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 SO4	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	---	---
20	Copper	mg/l	1.5	---	1.5	---	---
21	Iron	mg/l	0.3	---	50	---	---

S.No	Parameters	Unit	A	B	C	D	E
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

3.9.3 Groundwater resources

In view of the comparatively high level of ground water development in the major part of the district and the quality problems due to geogenic and anthropogenic factors, it is necessary to exercise caution while planning further development of available ground water resources in the district. The development of ground water for irrigation in the district is mainly through dug wells tapping the weathered residuum. The yields of dug wells are improved at favorable locations by construction of extension bores, which are 40 to 75 m deep. Bore wells have also become popular as the source for irrigation in the district in recent years. Dug wells with extension bores wherever necessary is ideal for hard rock areas. Tamil Nadu, is given in **Figure 3-26.**

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

(Ref: Government of India Ministry of Water Resources Central Ground Water Board South Eastern Coastal Region Chennai, "District Ground Water Brochure Erode District")

Note: *Tiruppur district was a part of Erode district before the bifurcation on 22nd Febuary 2009. Since secondary sources are available only for Erode district, however Erode district comprises Tiruppur district details before bifurcation.*

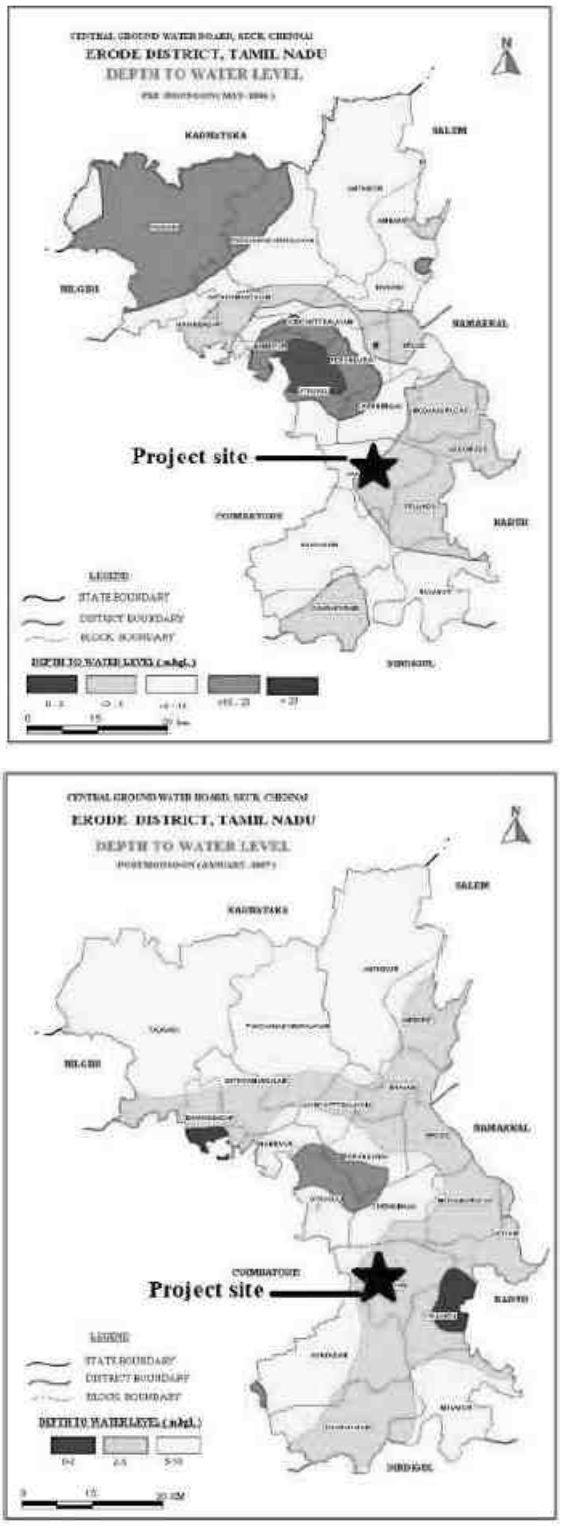


Figure 3-26 Depth to water level during Pre-Monsoon & Post Monsoon in Erode District

3.9.3.1 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 3-15 Details of Groundwater Quality Monitoring Locations

Station Code	Location	Distance (km) from Project boundary	Azimuth Directions
GW1	Near Project Site	0.20	W
GW2	Kovilpalayam	1.22	N
GW3	Kiranur	3.75	N
GW4	Virankuttaivalasu	2.84	NE
GW5	Neykkaranpalaiyam	1.67	ESE
GW6	Kangayam	3.31	S
GW7	Sivamalai	0.71	SW
GW8	Arasampalaiyam	3.01	NW

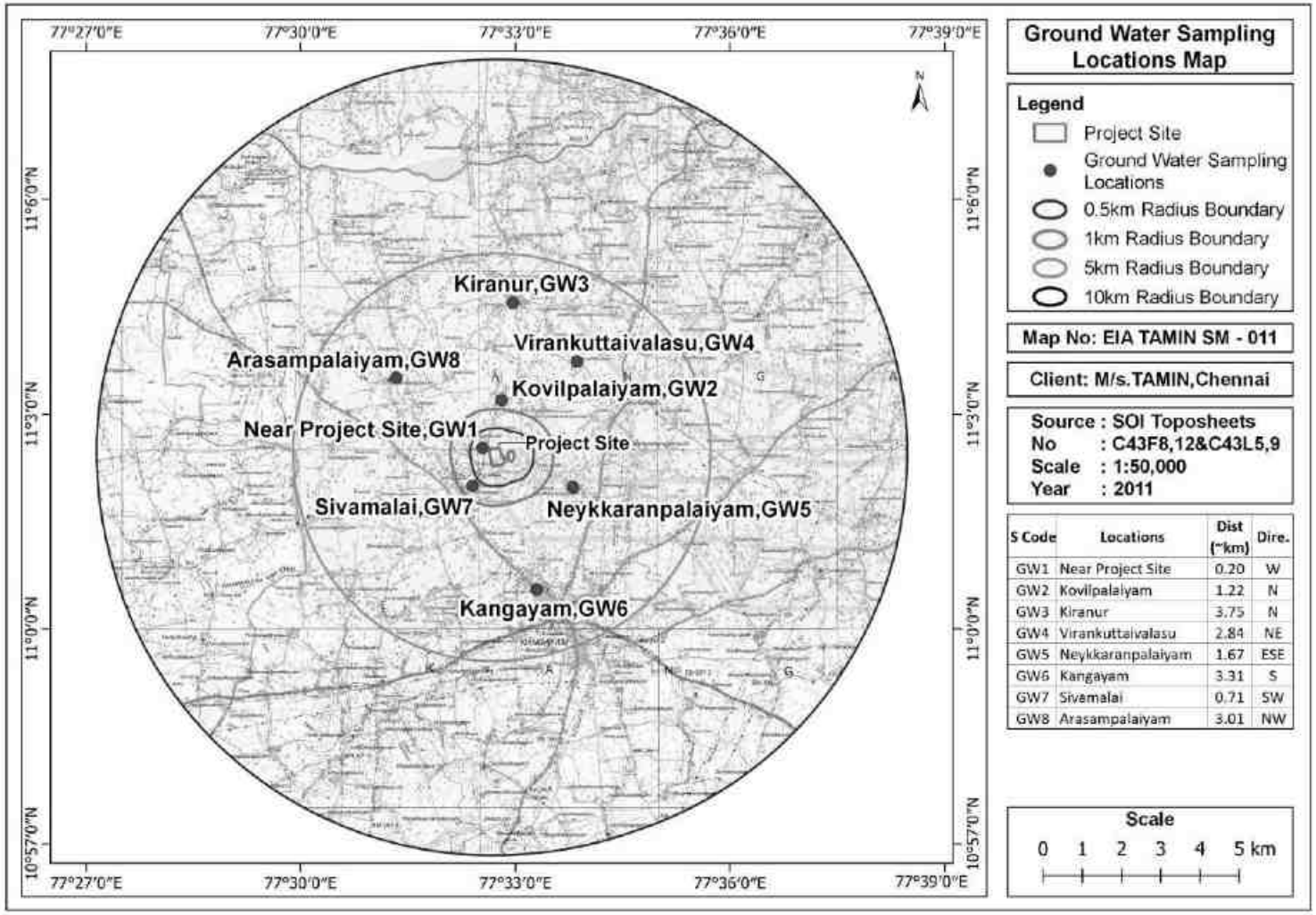


Figure 3-27 Map showing the groundwater monitoring locations

Table 3-16 Physico chemical analysis of Ground water samples from study area

S. No	Parameters	Unit	Drinking water Standard (IS 10500: 2012) Permissible Limit	Drinking water Standard (IS 10500: 2012) Acceptable Limit	Near Project Site	Kovilpalayam	Kiranur	Virankuttaivalasu	Neykkaranpaliyam	Kangayam	Sivamalai	Arasampalaiyam
					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	7.49	7.36	7.79	7.66	7.48	7.31	7.42	7.56
4.	Conductivity	µS/cm	-	-	656	684	680	697	786	614	638	681
5.	Total Dissolved Solids	mg/l	2000	500	474	497	445	473	381	329	483	326
6.	Total Suspended Solids	mg/l	-	-	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.	Alkalinity as $CaCO_3$	mg/l	600	200	214	225	177	231	150	139	203	104
8.	Total Hardness as $CaCO_3$	mg/l	600	200	257	250	243	211	218	166	256	151
9.	Sodium as Na	mg/l	-	-	25	13	22	28	13	18	25	27
10.	Potassium as K	mg/l	-	-	3	4	3	2	4	3	5	4
11.	Calcium as Ca	mg/l	200	75	84.8	72.2	69.5	74.5	47.98	45.67	72.41	27.84
12.	Magnesium as Mg	mg/l	100	30	10.9	16.8	16.9	5.9	23.8	12.6	18.3	19.7

S. No	Parameters	Unit	Drinking water Standard (IS 10500: 2012) Permissible Limit	Drinking water Standard (IS 10500: 2012) Acceptable Limit	Near Project Site	Kovilpalayam	Kiranur	Virankuttaivalasu	Neykkaranpalaiyam	Kangayam	Sivamalai	Arasampalaiyam
					GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
13.	Chloride as Cl	mg/l	1000	250	44.91	48.23	37.20	27.94	52.01	15.37	18.34	52.14
14.	Sulphate SO_4	mg/l	400	200	14.51	19.88	42.23	16.21	12.78	37.24	49.36	31.09
15.	Nitrate as NO_3	mg/l	NR	45	17.45	35.1	26.8	24.2	35.1	18.64	34.15	28.34
16.	Fluorides as F		-	-	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)
17.	Cyanide	mg/l	1.5	1	0.44	0.38	0.26	0.21	0.39	0.51	0.49	0.23
18.	Arsenic as As	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)
19.	Boron as B	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.	Cadmium as Cd	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.	Chromium as Cr	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.	Copper as Cu	mg/l	NR	0.05	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ	BQL(LOQ 0.01)	BQL(LOQ	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ

S. No	Parameters	Unit	Drinking water Standard (IS 10500: 2012) Permissible Limit	Drinking water Standard (IS 10500: 2012) Acceptable Limit	Near Project Site	Kovilpalayam	Kiranur	Virankuttaivalasu	Neykkaranpalaiyam	Kangayam	Sivamalai	Arasampalaiyam
					GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
							0.01)		0.01)			0.01)
23.	Iron as Fe	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.	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)
25.	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)
26.	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)
27.	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)
28.	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)

*(**Note:** BLQ – Below the Limit of Quantification; LOQ – Limit Of Quantification; NR – No Relaxation)*

3.9.3.2 Results and Discussions

A summary of analytical results are presented below:

- The pH of the collected ground water sample ranges from 7.31 to 7.66.
- The concentrations of Chloride in the collected ground water sample ranges from 15.37 to 52.14 mg/l.
- Total Dissolved Solids (TDS) value of the collected ground water samples are 326 mg/l to 497 mg/l.
- Total hardness of the collected ground water sample ranges from 151 mg/l to 257 mg/l.
- The concentrations of Sulphate in the collected ground water sample ranges from 12 to 49 mg/l.

3.10 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 3-17 Soil & Sediment Quality Monitoring Locations

Location Code	Location	Distance (km) from Project boundary	Directions
S1	Near Project Site	Within the Site	
S2	Kovilpalayam	1.22	N
S3	Kiranur	3.75	N
S4	Virankuttaivalasu	2.84	NE
S5	Neykkaranpalaiyam	1.67	ESE
S6	Kangayam	3.31	S
S7	Sivamalai	0.71	SW
S8	Arasampalaiyam	3.01	NW

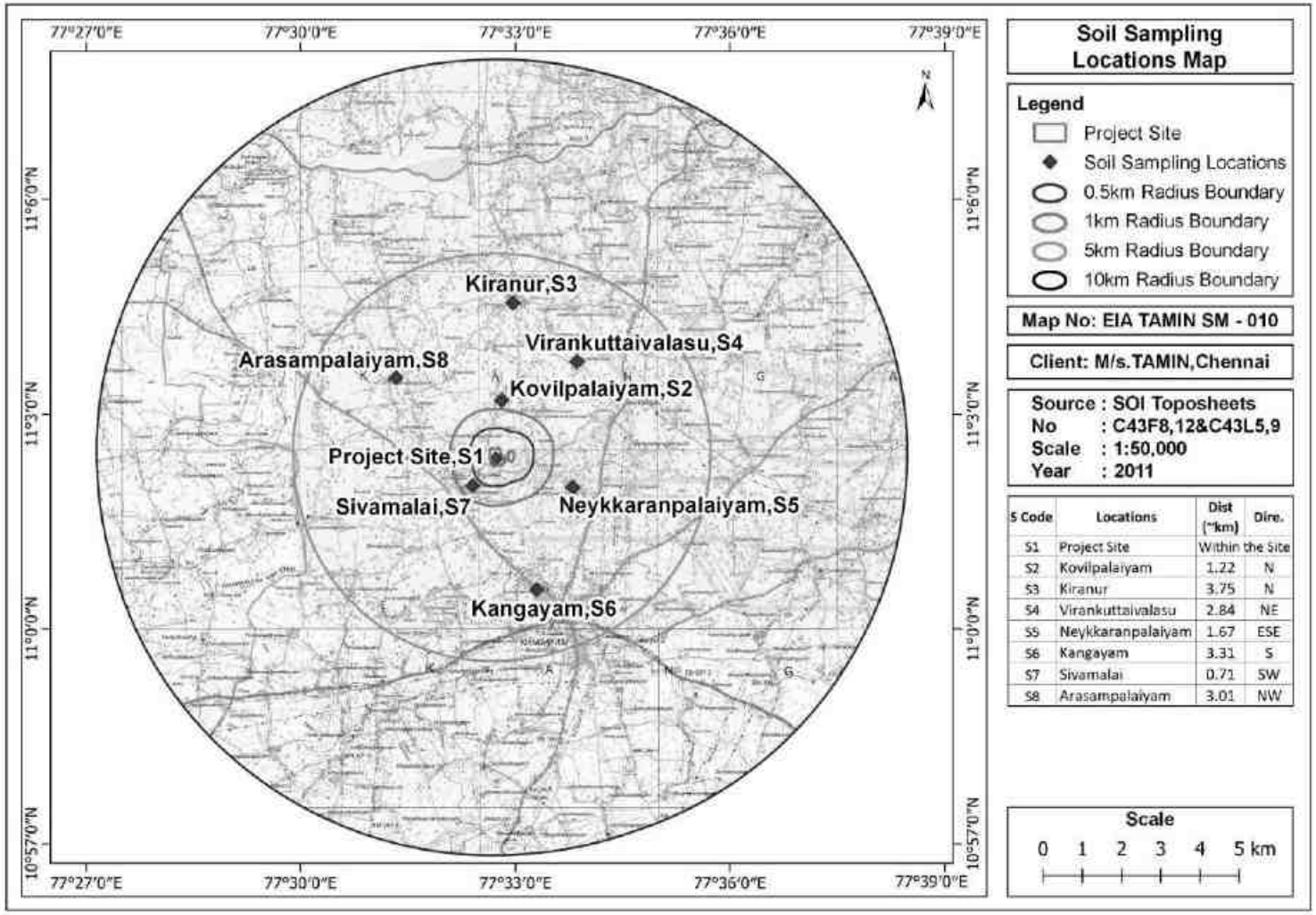


Figure 3-28 Map showing the soil monitoring location

Table 3-18 Soil Quality Monitoring Results

S. No	Parameters	Units	Project Site	Kovilpalayam	Kiranur	Virankuttaivalasu	Neykkaranpalaiyam	Kangayam	Sivamalai	Arasampalaiyam
			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	%	31.45	57.20	62.25	53.20	55.15	28.35	60.15	60.65
3.	Silt	%	36.34	29.50	18.35	17.40	28.60	39.25	15.20	18.12
4.	Clay	%	32.21	13.30	19.40	29.40	16.25	32.40	24.65	21.23
5.	pH	-	7.69	6.78	7.23	8.12	7.43	6.82	7.23	8.31
6.	Electrical conductivity	Umhos/cm	295	218	262	285	381	328	237	389
7.	Nitrogen as N	mg/kg	285	408	217	193	216	124	183	181
8.	Phosphorus as P	mg/kg	25.1	32.1	33.1	20.08	21.8	19.7	29.1	18.9
9.	Potassium as K	mg/kg	129.0	73.0	80.0	98.0	133.0	135.0	144.0	90.0
10.	Boron	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)
11.	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)
12.	Porosity	-	0.53	0.35	0.40	0.48	0.34	0.51	0.53	0.49
13.	Water Holding Capacity	Inches of water per foot of soil	19.9	17.8	19.6	18.4	21.0	16.4	17.7	18.1

Note: *BLQ (Below the Limit of Quantification), LOQ (Limit of Quantification).*

3.10.1 Results and Discussions

Summary of analytical results

- The pH of the soil samples ranged from 6.78 to 8.31.
- Conductivity of the soil samples ranged from 218 to 389µmho/cm.
- Nitrogen content ranged from 124 mg/kg to 408 mg/kg.
- Phosphorous ranged from 18.98 mg/kg to 33.05 mg/kg.
- Potassium content ranges from 73.30 mg/kg to 144.31 mg/kg.

3.11 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. A survey was conducted 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. Survey of the wild plants as well as cultivated crop plants was made and all the available information was recorded.

During survey, 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.

3.11.1 Methodology

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

3.11.1.1 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

3.11.1.2 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-I species, listed in The Wildlife Protection Act 1972, as well as in Red List of IUCN.

3.11.2Floristic composition within the study area

For secondary information based on a total 89 species under 36 family found in the study area. The detailed list of plant species found in each quadrat provided in **Table 3-19**.

Table 3-19 Cumulative List of Floral Species

S.No	Botanical Name	Family	Common Name	Habit	IUCN
1.	Abrus precatorius	Fabaceae	Kundumani	Shrub	NA
2.	Abutilon indicum	Malvaceae	Perun thuthi	Shrub	NA
3.	Acacia nilotica	Mimosaceae	Karuvelam	Tree	LC
4.	Acalypha indica	Euphorbiaceae	Kuppaimeni	Herb	NA
5.	Acanthospermum hispidum	Compositae	--	Herb	NA
6.	Achyranthes aspera	Amaranthaceae	Nayurivi	Herb	NA
7.	Aegle marmelos	Rutaceae	Vilvam	Tree	NA
8.	Aerva lanata	Amaranthaceae	Peelai, Sirupeelai	Shrub	NA
9.	Aerva persica	Amaranthaceae	Perumpeelai	Shrub	NA
10.	Aeschynomene americana	Fabaceae	--	Herb	NA
11.	Aristida adscensionis	Poaceae	--	Grass	NA
12.	Aristida hystrix	Poaceae	--	Grass	NA
13.	Aristolochia bracteolata	Aristolochiaceae	Aduthinnappalai	Herb	NA
14.	Boerhavia diffusa	Nyctaginaceae	Mookarattai	Herb	NA
15.	Boerhavia erecta	Nyctaginaceae	Seemai mookarattai	Herb	NA
16.	Carica papaya	Caricaceae	Pappali	Tree	NA
17.	Carissa carandas	Apocynaceae	Kalaa, Perun kala	Shrub	NA
18.	Cassia fistula	Caesalpiniaceae	Kondrai	Tree	NA
19.	Cissus quadrangularis	Vitaceae	Pirandai	Shrub	NA
20.	Citrullus colocynthis	Cucurbitaceae	Peikkumatti	Herb	NA
21.	Citrus aurantifolia	Rutaceae	Elumichai	Tree	NA
22.	Cleome viscosa	Capparidaceae	Nai kadugu	Herb	NA
23.	Coccinia grandis	Cucurbitaceae	Kovai	Climber	NA
24.	Croton bonplandianum	Euphorbiaceae	Rail poondu	Herb	NA

S.No	Botanical Name	Family	Common Name	Habit	IUCN
25.	Cyperus bulbosus	Cyperaceae	—	Sedge	NA
26.	Eclipta prostrata	Compositae	Karisaalai	Herb	NA
27.	Eleocharis acutangula	Cyperaceae		Sedge	NA
28.	Eragrostis tenella	Poaceae		Grass	NA
29.	Euphorbia antiquorum	Euphorbiaceae	Sadura-kalli	Tree	NA
30.	Euphorbia hirta	Euphorbiaceae	Ammanpacharisi	Herb	NA
31.	Euphorbia indica	Euphorbiaceae	Ammanpacharisi	Herb	NA
32.	Evolvulus alsinoides	Convolvulaceae	Vishnukarandi	Herb	NA
33.	Ficus benghalensis	Moraceae	Aala maram	Tree	NA
34.	Ficus religiosa	Moraceae	Arasu	Tree	NA
35.	Fimbristylis ovata	Cyperaceae		Sedge	NA
36.	Glinus lotoides	Molluginaceae	Siruseruppadai	Herb	NA
37.	Gynandropsis gynandra	Capparidaceae	Nal vaelai, Vaelai	Herb	NA
38.	Hedyotis aspera	Rubiaceae		Herb	NA
39.	Heliotropium indicum	Boraginaceae	Thael kodukku	Herb	NA
40.	Hibiscus surattensis	Malvaceae		Undershrub	NA
41.	Hybanthus enneaspermus	Violaceae	Orilai thamarai	Herb	NA
42.	Hyptis suaveolens	Labiatae		Shrub	NA
43.	Indigofera aspalathoides	Fabaceae	Sivanaar vaembu	Herb	NA
44.	Indigofera linnaei	Fabaceae		Herb	NA
45.	Indigofera tinctoria	Fabaceae	Avuri, Neeli	Herb	NA
46.	Jatropha curcas	Euphorbiaceae	Kaatu-amanakku	Shrub	NA
47.	Jatropha gossypifolia	Euphorbiaceae	Kaatu-amanakku	Shrub	NA
48.	Justicia adhatoda	Acanthaceae	Adathodai	Shrub	NA
49.	Justicia simplex	Acanthaceae		Herb	NA
50.	Kylinga bulbosa	Cyperaceae		Sedge	NA
51.	Lantana camara	Verbenaceae	Unnichedi	Shrub	NA
52.	Leucaena leucocephala	Mimosaceae	Soundil	Tree	NA
53.	Leucas aspera	Labiatae	Thumbai	Herb	NA
54.	Ludwigia perennis	Onagraceae		Herb	NA
55.	Martynia annua	Martyniaceae	Thael Kodukku	Herb	NA
56.	Melia azedarach	Meliaceae	Malai vaembu	Tree	NA
57.	Merremia hederacea	Convolvulaceae		Herb	NA
58.	Nyctanthes arbor-tristis	Nyctanthaceae	Parijaatham	Tree	NA
59.	Ocimum americanum	Labiatae	Ganjaankorai	Herb	NA
60.	Pavonia odorata	Malvaceae	Peramutti	Herb	NA
61.	Pedalium murex	Pedaliaceae	Perunerunji	Herb	NA
62.	Phyllanthus acidus	Euphorbiaceae	Aranelli	Tree	NA
63.	Phyllanthus amarus	Euphorbiaceae	Kizha-nelli	Herb	NA
64.	Phyllanthus emblica	Euphorbiaceae	Nelli, Muzhu nelli	Tree	NA
65.	Phyllanthus reticulatus	Euphorbiaceae	Inki pazham	Shrub	NA
66.	Pithecellobium dulce	Mimosaceae	Kodukkaai puli	Tree	NA
67.	Plumbago zeylanica	Plumbaginaceae	Chitthiragam	Herb	NA
68.	Polygala javana	Polygalaceae		Shrub	NA
69.	Pongamia pinnata	Fabaceae	Punga maram	Tree	NA
70.	Portulaca oleracea	Portulacaceae	Kari keerai	Herb	NA
71.	Prosopis juliflora	Mimosaceae	Velikkaathaan	Tree	NA
72.	Rhynchosia viscosa	Fabaceae		Climber	NA

S.No	Botanical Name	Family	Common Name	Habit	IUCN
73.	Rivea hypocrateriformis	Convolvulaceae	Boodhikeerai	Climber	NA
74.	Ruellia tuberosa	Acanthaceae		Herb	NA
75.	Sansevieria roxburghiana	Dracaenaceae	Marun, Mottamamji	Herb	NA
76.	Senna occidentalis	Caesalpiniaceae	Peiyavarai	Tree	NA
77.	Sida acuta	Malvaceae	Malai thangi	Herb	NA
78.	Sida cordata	Malvaceae	Pazhampaasi	Herb	NA
79.	Sida cordifolia	Malvaceae	Nilatutthi	Herb	NA
80.	Solanum americanum	Solanaceae	Manatakkali	Herb	NA
81.	Solanum melongena	Solanaceae	Kathiri	Herb	NA
82.	Solanum torvum	Solanaceae	Chundai	Shrub	NA
83.	Solanum trilobatum	Solanaceae	Thoodhuvalai	Climber	NA
84.	Solanum virginianum	Solanaceae	Kandankathiri	Herb	NA
85.	Spermacoce hispida	Rubiaceae	Nathaichoori	Herb	NA
86.	Spermacoce ocymoides	Rubiaceae		Herb	NA
87.	Tamarindus indica	Caesalpiniaceae	Puliya maram	Tree	NA
88.	Tectona grandis	Verbenaceae	Thekku	Tree	NA
89.	Tephrosia purpurea	Fabaceae	Kozhinji	Undershrub	NA

(LC-Least Concern, DD-Data deficient, CR-Critically Endangered, VU-Vulnerable, NA-Not yet assessed, EN-Endangered, NT-Near Threatened, EW- Extinct in the Wild).

Source:

Gamble, J.S. and C.E.C. Fischer. 1915-1935. Flora of Presidency of Madras, Adlard and Son, London. pp. 1-3.

Mathew, K. M. 1981. The Material for the Flora of the Tamilnadu Carnatic, Madras, India.

Matthew, K. M. 1982. Illustrations on the Flora of the Tamilnadu Carnatic. Vol. II. The Diocesan press, Madras, India.

Matthew, K. M. 1983. The Flora of Tamilnadu Carnatic. Vol. III. The Diocesan press, Madras, India.

Matthew, K. M. 1988. Further Illustrations on the Flora of the Tamilnadu Carnatic. Vol. IV. The Diocesan press, Madras, India.

Nair, N.C. and A.N. Henry. 1983. Flora of Tamil Nadu, India.Series 1, Vol. 1, Botanical Survey of India, Southern Circle, Coimbatore. 1-184.

Henry, A.N., Chithra, V.N. and Balakrishnan, P. (1989) Flora of Tamil Nadu India. Series 1: Analysis. Vol. III. Botanical Survey of India, Coimbatore.

3.11.3 Fauna Diversity

The core area is not a habitat for any Rare or endangered or threatened (RET) wildlife. Common rodents, reptiles and birds were seen. There was nothing unusual or special about the wild fauna of the core area. Within 5 Km from the core area, Elephant and Bison corridor is there. Among the

large birds, Peacocks were found both in the forest and non-forest areas. A list of vertebrates other than Aves that were either spotted or reported from the study area is given in **Table 3-20**. A list of terrestrail birds that were spotted and those that were recorded from the study area is given in **Table 3-21.**

Table 3-20 LIST OF TERRESTRIAL VERTEBRATES OTHER THAN BIRDS REPORTED

Scientific name	Common name	Family	IUCN / WPA
MAMMALS			
Bandicota bengalensis	Lesser Bandicoot Rat	Hystricidae	LC/ IV
Bandicota indica	Greater Bandicoot Rat	Hystricidae	LC/ IV
Cynopterus sphinx	Greater Short-nosed Fruit Bat	Pteropodidae	LC /IV
Felis chaus	Jungle Cat	Felidae	LC /III
Funambulus palmarum	Three-striped Palm Squirrel	Sciuridae	LC/ IV
Macaca mulatta	Rhesus Macaque	Cercopithecidae	LC/ II
Mus booduga	Little Indian Field Mouse	Hystricidae	LC/ IV
Rattus rattus	House Rat	Hystricidae	LC/ IV
Semnopithecus entellus	Common Langur	Cercopithecidae	LC/ II
REPTILES			
Calotes rouxii	Roux's Forest Calotes	Agamidae	LC /IV
Calotes versicolor	Indian Garden Lizard	Agamidae	LC /IV
Eutropis carinata	Keeled / Common GrassSkink	Scincidae	LC /IV
Eutropis macularia	Bornze Grass Skink	Scincidae	LC /IV
Hemidactylus brooki	Brooke's House Gecko	Geckonidae	LC /IV
Hemidactylus flaviviridis	House Gecko	Geckonidae	LC /IV
Hemidactylus frenatus	Asian House Gecko	Geckonidae	LC /IV
Hemidactylus leschnaulti	Bark Gecko	Geckonidae	LC /IV
Naja naja	Spectacled Cobra	Colubridae	VU /II
Ophiophagus hannah	King Cobra	Elapidae	VU /II
Ptyas mucosa	Indian Rat Snake	Colubridae	LC /II
Xenochrophis piscator	Checkered Keelback Water Snake	Colubridae	LC /II
AMPHIBIANS			
Bufo scaber	Furguson's Toad	Bufonidae	LC / IV
Clinotarsus curtipes	Bi-colored Frog	Dicroglossidae	LC / IV
Duttaphrynus melanostictus	Common Indian Toad	Bufonidae	LC / IV
Euphlyctis cyanophylyctis	Skittering Frog	Dicroglossidae	LC / IV
Euphlyctis hexadactylus	Indian green Frog	Dicroglossidae	LC / IV
Hoplobatrachus crassus	Jerdon's Bull Frog	Dicroglossidae	LC / IV
Hoplobatrachus tigerinu	Indian bull Frog	Dicroglossidae	LC / IV
Indirana brachytarsus	Short-legged Leaping frog	Ranixalidae	LC / IV
Limnonectes limnocharis	Paddyfield / Cricket Frog	Dicroglossidae	LC / IV
Microhyla ornata	Ornate Narrow-mouthedFrog	Microhylidae	LC / IV
Sphaerotheca breviceps	Indian Burrowing Frog	Dicroglossidae	LC / IV
Sphaerotheca rolandea	Southern Burrowing Frog	Dicroglossidae	LC / IV

3.11.3.1 Bird species

The bird species &families were recorded during Pre-Monsoon study period are provided in**Table 3.21.**

Table 3-21 List of Birds species in the Study Area

S.No	Scientific Name	Common Name	Family Name	IUCN
1.	*Acridotheres fuscus*	Jungle Myna	Sturnidae	LC / IV
2.	*Acridotheres tristis*	Common Myna	Sturnidae	LC / IV
3.	*Acritillas indica*	Yellowbrowed Bulbul	Pycnonotidae	LC / IV
4.	*Anthus trivialis*	Tree Pipit	Motacillidae	LC / IV
5.	*Apus affinis*	Little Swift	Apodidae	LC / IV
6.	*Athene brama*	Spotted owlet	Strigidae	LC / IV
7.	*Butastur teesa*	White-eyed Buzzard	Accipitridae	LC /IV
8.	*Cacomantis passerinus*	Greybellied Cuckoo	Cuculidae	LC / IV
9.	*Chloropsis jerdoni*	Jerdon's Leafbird	Chloropseida	LC / IV
10.	*Chrysocolaptes lucidus*	Greater Flameback	Picidae	LC / IV
11.	*Chrysomma sinense*	Yelloweyed Babbler	Timaliidae	LC / IV
12.	*Cinnyris asiaticus*	Purple Sunbird	Nectariniidae	LC / IV
13.	*Coracias benghalensis*	Indian Roller	Coraciidae	LC / IV
14.	*Coracina macei*	Large Cuckoo shrike	Campephagidae	LC / IV
15.	*Coracina melanoptera*	Blackheaded Cuckooshrike	Campephagidae	LC / IV
16.	*Corvus culminatus*	Indian Jungle Crow	Corvidae	LC / IV
17.	*Corvus splendens*	House Crow	Corvidae	LC /V
18.	*Cuculus micropterus*	Indian Cuckoo	Cuculidae	LC / IV
19.	*Cyornis tickelliae*	Tickell's Blue Flycatcher	Muscicapidae	LC / IV
20.	*Cypsiurus balasiensis*	Asian Palm Swift	Apodidae	LC / IV
21.	*Dendrocitta vagabunda*	Rufous Treepie	Corvidae	LC / IV
22.	*Dendrocopos mahrattensis*	Yellowcrowned Woodpecker	Picidae	LC / IV
23.	*Dendrocopos nanus*	Browncapped Pygmy Woodpecker	Picidae	LC / IV
24.	*Dicrurus macrocercus*	Black Drongo	Cuculidae	LC / IV
25.	*Elanus caeruleus*	Blackwinged Kite	Accipitridae	LC /IV
26.	*Eudynamys scolopaceus*	Asian Koel	Cuculidae	LC / IV
27.	*Glaucidium radiatum*	*Jungle Owlet*	*Strigidae*	*LC / IV*
28.	*Haliastur indus*	*Brahminy Kite*	*Accipitridae*	*LC /IV*
29.	*Harpactes fasciatus*	*Malabar Trogon*	*Trogonidae*	*LC / IV*
30.	*Iduna aedon*	Thickbilled Warbler	Sylviidae	LC / IV
31.	*Irena puella*	Asian Fairybluebird	Irenidae	LC / IV
32.	*Lanius cristatus*	Brown Shrike	Laniidae	LC / IV
33.	*Lonchura malacca*	Tricoloured Munia	Estrildidae	LC / IV
34.	*Lonchura punctulata*	Scaly breasted Munia	Estrildidae	LC / IV
35.	*Lonchura striata*	Whiterumped Munia	Estrildidae	LC / IV
36.	*Loriculus vernalis*	Vernal Hanging Parrot	Psittacidae	LC / IV

37.	*Luscinia svecica*	Blue throat	Muscicapidae	LC / IV
38.	*Megalaima haemacephala*	Coppersmith Barbet	Megalaimidae	LC / IV
39.	*Megalaima malabarica*	Malabar Barbet	Megalaimidae	LC / IV
40.	*Megalaima viridis*	Whitecheeked Barbet	Megalaimidae	LC / IV
41.	*Megalaima zeylanica*	Brownheaded Barbet	Megalaimidae	LC / IV
42.	*Merops orientalis*	Green Bee-eater	Meropidae	LC / IV
43.	*Merops philippinus*	Bluetailed Bee-eater	Meropidae	LC / IV
44.	*Milvus migrans*	Black Kite	Accipitridae	LC /IV
45.	*Motacilla cinerea*	Grey Wagtail	Muscicapidae	LC / IV
46.	*Muscicapa dauurica*	Asian Brown Flycatcher	Muscicapidae	LC / IV
47.	*Myophonus horsfieldii*	Malabar Whistling Thrush	Turdidae	LC / IV
48.	*Nisaetus cirrhatus*	Crested Hawk Eagle	Accipitridae	LC /IV
49.	*Nyctyornis athertoni*	Bluebearded Bee-eater	Meropidae	LC / IV
50.	*Orthotomus sutorius*	Common Tailorbird	Sylviidae	LC / IV
51.	*Parus aplonotus*	Indian Yellow Tit	Paridae	LC / IV
52.	*Passer domesticus*	House Sparrow	Passeridae	LC / IV
53.	*Pavo cristatus*	Indian Peafowl	Phasianidae	LC / I
54.	*Pellorneum ruficeps*	Puffthroated Babbler	Timaliidae	LC / IV
55.	*Phylloscopus trochiloides*	Greenish Warbler	Sylviidae	LC / IV
56.	*Picumnus innominatus*	Speckled Piculet	Picidae	LC / IV
57.	*Pitta brachyura*	Indian Pitta	Pittidae	LC / IV
58.	*Ploceus manyar*	Streaked Weaver	Ploceidae	LC / IV
59.	*Ploceus philippinus*	Baya Weaver	Ploceidae	LC / IV
60.	*Pomatorhinus horsfieldii*	Indian ScimitarBabbler	Timaliidae	LC / IV
61.	*Prinia hodgsonii*	Greybreasted Prinia	Cisticolidae	LC / IV
62.	*Prinia inornata*	Plain Prinia	Cisticolidae	LC / IV
63.	*Prinia socialis*	Ashy Prinia	Cisticolidae	LC / IV
64.	*Psittacula columboides*	Bluewinged Parakeet	Psittacidae	LC / IV
65.	*Psittacula cyanocephala*	Plumheaded Parakeet	Psittacidae	LC / IV
66.	*Psittacula krameri*	Roseringed Parakeet	Psittacidae	LC / IV
67.	*Ptyonoprogne concolor*	Dusky CragMartin	Hirundinidae	LC / IV
68.	*Pycnonotus cafer*	Redvented Bulbul	Pycnonotidae	LC / IV
69.	*Pycnonotus gularis*	Flame-throated Bulbul	Pycnonotidae	LC / IV
70.	*Pycnonotus jocosus*	Redwhiskered Bulbul	Pycnonotidae	LC / IV
71.	*Pycnonotus luteolus*	Whitebrowed Bulbul	Pycnonotidae	LC / IV
72.	*Rhipidura albogularis*	Whitespotted Fantail	Rhipiduridae	LC / IV
73.	*Rhopocichla atriceps*	Darkfronted Babbler	Timaliidae	LC / IV
74.	*Saxicola caprata*	Pied Bushchat	Muscicapidae	LC / IV
75.	*Saxicoloides fulicatus*	Indian Robin	Muscicapidae	LC / IV
76.	*Sitta frontalis*	Velvet fronted Nuthatch	Sittidae	LC / IV
77.	*Spilopelia chinensis*	Spotted Dove	Columbidae	LC / IV
78.	*Streptopelia decaocto*	Eurasian CollaredDove	Columbidae	LC / IV

79.	*Streptopelia orientalis*	Oriental Turtle Dove	Columbidae	LC / IV
80.	*Tephrodornis gularis*	Large Woodshrike	Tephrodornithidae	LC / IV
81.	*Tephrodornis pondicerianus*	Common Woodshrike	Tephrodornithidae	LC / IV
82.	*Tephrodornis sylvicola*	Malabar Woodshrike	Tephrodornithidae	LC / IV
83.	*Terpsiphone paradisi*	Asian ParadiseFlycatcher	Monarchidae	LC / IV
84.	*Treron bicinctus*	Orange breasted Green pigeon	Columbidae	LC / IV
85.	*Turdoides striata*	Jungle Babbler	Timaliidae	LC / IV
86.	*Turdus simillimus*	Indian Blackbird	Turdidae	LC / IV
87.	*Turnix suscitator*	Barred Buttonquail	Turnicidae	LC / IV
88.	*Turnix tanki*	Yellowlegged Buttonquail	Turnicidae	LC / IV
89.	*Upupa epops*	Hoopoe	Upupidae	LC / IV
90.	*Zoothera citrina*	Orange headed Thrush	Turdidae	LC / IV

3.11.3.2 Butterfly Species

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 26 species belonging to five families of butterflies recorded. The Nymphalidae were more dominant family followed by Lycaenidae, Pieridae, Papilionidae and Hesperiidae.

Table 3-22 Occurrence of butterfly species in buffer zone

S.No	Family	Species name	Common name	Status
1	Nymphalidae	Danaus chrysippus	Plain Tiger	LC
2	Nymphalidae	Danaus genutia	Striped Tiger	NA
3	Nymphalidae	Ariadne merione	Common Caster	NA
4	Nymphalidae	Neptis hylas	Common Sailor	NA
5	Nymphalidae	Phalanta phalantha	Common Leopard	NA
6	Nymphalidae	Melanitis leda	Common Evening Brown	NA
7	Nymphalidae	Mycalesis perseus	Common Bush Brown	NA
8	Nymphalidae	Ypthima asterope	Common Three Ring	LC
9	Nymphalidae	Euthala nais	Baronet	NA
10	Nymphalidae	Argynnis hyperbius	Indian Fritillary	NA
11	Nymphalidae	Byblia ilithya	Joker	NA
12	Pieridae	Colotis danae	Crimson Tip	LC
13	Pieridae	Colotis etrida	Small Orange Tip	NA
14	Pieridae	Eurema hecabe	Common Grass Yellow	NA
15	Pieridae	Catopsillia pomona	Common Emigrant	NA
16	Pieridae	Cepora nerissa	Common Gull	NA

17	Pieridae	Leptosia nina	Psyche	NA
18	Lycaenidae	Castalius rosimon	Common Pierrot	NA
19	Lycaenidae	Arhopala centaurus	Large Obakblue	NA
20	Lycaenidae	Euchrysops cnejus	Gram Blue	NA
21	Lycaenidae	Jamides celeno	Common Cerulin	NA
22	Lycaenidae	Freyeria trochylus	Grass Jewel	LC
23	Papilionidae	Papilio polytes	Common Mormon	NA
24	Papilionidae	Papilio demoleus	Lime Butterflies	NA
25	Papilionidae	Atrophaneura aristolochiae	Common Rose	LC
26	Hesperiidae	Borbo cinnara	Rice Swift	NA

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

Conservation Plan for Indian Peafowl (Peacock)

An Indian Peafowl or Peacock (Pavo cristatus) is a large pheasant justifiably declared as the National Bird of India in 1963 due to its flagship value founded on its glorious position in mythology and its widespread distribution and grandeur. In India, it is given the utmost protection by inclusion in Schedule I of Indian Wildlife Act, 1972 (2002). Being a wide spread species, apart from the various urban habitats, it is also found in agriculture field, along stream with good vegetation and close to human habitation in semi – feral conditions. In the present study area this species have been confirmed from various habitats located near the village periphery.

Appearance

Male peacock has a spectacular glossy green long tail feathers that may be more than 60% of the total body length. These feathers have blue, golden green and copper colored eyes. The long tail feathers are used for mating rituals like courtship displays. The feathers are arched into a magnificent fan shaped from across the back of the bird and almost touching the found on both sides. Female do not have these graceful tail feathers. They have to fan like crest with whites face and throat, chestnut brown crown and hind neck, metallic green upper breast and mantle, white belly and brown back rump and tail. Their primaries are dark brown.

Study Approach

Since the buffer zone of the proposed Project site unit reported with Schedule I Species named as Pavo cristatus commonly known as peacock, a systematic study was conducted to

assess their status in terms of movement and habitat use of the species. At first, a detailed biological survey of the core & buffer zone was carried out to understand the status distribution of the species in the study area. Also, questionnaire survey was carried out to understand the recent status of peacock sighting and their movements. The conclusion of the survey discussed the potential sighting & habitat use, and movement and food habitats of peacock in the study area.

Sighting and Habitat Use

From the core zone no any peacock was sighted. However, direct sighting of the peacock were located near the human dominated and associated surround habitats like agriculture fields and near water bodies. This species is well adapted to natural village environment setting. According to the villagers (interview), during day time that temporally move towards the surrounding areas like agricultural fields or water bodies for feeding while during night time roosts on the trees present in vicinity of the human settlement and also road side trees. Some villages emphasized that, sometime peacock roosts on the roof of the houses.

Food and Feeding Habitats

Peafowls are omnivores, eating plant parts, flower petals, seed heads, insects, and other arthropods, reptiles and amphibians. In the study area dense tree canopy cover supports good insect diversity which is very common food for peafowls.

Habitat Improvement Action Plan

Habitat improvement program will include plantation of various plant species like Borassus flabiliber, Mangifera Indica, Tamarindus indica and other grass species reported from the study area should be taken into priority. In order to improve vegetation cover, it is suggested to carry out extensive afforestation program in different phases. These species will help to provide habitat for faunal diversity, and also increases the species diversity and maintain the naturalness of the surrounding area.

Seed Distribution among the Villagers

During this habitat improvement programme the seed of Borassus flabiliber, Mangifera indica, Tamarindus indica and other grass seeds will be distributed in the various villages of

the study area. Compost packets will be also provided at the intervals of the every one year by the proponent (in consultation of forest department).

Water Filing in the existing Water Bodies during Summer

Water will be filled in the existing water bodies by water tankers (five numbers in each water body).

Inference – Buffer Zone as Peacock Habitat

Presented survey of the peacock in the buffer zone of the project site shows that, peafowl is well adapted to the existing rural setting of the study area. However, the following points can give an insight on the overall status of peafowl in the study area and thereby plan for better management strategies related to proposed activities.

- Local resident of the study area well aware of the movement pattern of peafowl in their surrounding habitats.
- Peafowl uses agriculture and various rural habitats as a feeding ground during day time while during night time they take shelter on the trees as well as on the roof of the houses. It clearly indicates peafowl normally uses ecosystem or habitats adjacent to village.

From the above said facts, it can be inferred that, some villages of the buffer zone provide roosting and feeding ground for peafowl, while core zone do not have potential habitat for roosting or feeding ground for peafowl. Therefore, it has been visualized that, the proposed project will not have any significant impact on peacock in terms of their normal movements and other activities. However, it is necessity to take some management option like habitat improvement in the villages located in the immediate vicinity of the project site. So, habitat improvement programme (Plantation of recommended and local plant species) will be under taken in (in consultation of forest department) different villages located in the close vicinity of the project area. Under this programme sampling will be distributed in the nearby villages with the consultation of the local forest department.

In consultation of the forest department, following conservation measures will be adapted for peacock conservation:

Habitat improvement programme in the different villages will be undertaken in the buffer zone area for shelter and roosting of peacocks. This will be achieved by plantation of local varieties of the tree species near villages in buffer area. Plantation will also be carried in some forest patches identified by local forest department.

School level awareness programme will be conducted for conservation of peacock by organizing competition during "Wildlife Week" and "Van Mahotsav" celebration.

Conservation Measures

- Community inhibiting in study area should make well aware about the importance of the insects in their daily life especially butterflies and bees which acts a very vital role in pollination which results in high and successful fruiting of crops. This can be achieved by arrangements of village wise awareness campaigns.
- Community awareness for selection of wild ornamental plants in empty spaces, home gardens, and open scrub areas which provide breeding and feeding ground for Common Pierrot and such other butterflies and insects.
- Plant saplings of flowering and fruiting plants can be distributed to local people to promote the plantation of butterfly and bee friendly species which gives breeding and feeding platform to the species.

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

Following Plants will be planted on the periphery of Project area& along the Approachable Road			
S.No	**Botanical name**	**Common Name**	**Key future of Tree**
1	*Albizia lebbeck*	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

3.12 Socio Economic profile of Project Influenced Area

Tiruppur district having a population of 1,585,280 consists of 795,110 male populations and 790,170 female populations.

Source:*http://censusindia.gov.in/2011census/dchb/DCHB_A/33/3301_PART_A_DCHB_TIRUPPUR.pdf*

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

3.12.1Socio Economic Aspects

A socio-economic study was undertaken in assessing aspects which are dealing with social and cultural conditions, and economic status with secondary sources 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 3.23** provides the certain important social indicators of Vellore District.

Table 3-23 Social Indicators of the PIA district

S.No	Social Indicators	Vellore District
1.	Decadal growth rate %	35.3
2.	Urban population %	65.1
3.	Sex ratio	987
4.	0-6 age group %	11.06
5.	Population density (Persons per square Km)	400
6.	Scheduled caste population %	22.03
7.	Scheduled tribe population %	1.26
8.	Literacy rate %	84.03
9.	Work Participation rate %	41.3
10.	Main Workers %	81.1
11.	Marginal Workers %	18.86
12.	Cultivators %	4.78
13.	Agricultural labourers %	17.59
14.	Workers in household industries %	3.79
15.	Other workers %	73.84

Source:http://censusindia.gov.in/2011census/dchb/DCHB_A/33/3301_PART_A_DCHB_TIRUPPUR.pdf

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

3.12.1.1 Population and Household Size

Tiruppur district having a population of 3,728,104 consists of 1,876,062 male populations and 1,852,042 female populations.

Source:*http://censusindia.gov.in/2011census/dchb/DCHB_A/33/3301_PART_A_DCHB_TIRUPPUR.pdf*

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

3.12.1.2 Sex Ratio

The sex ratio of the population is calculated for number of females for every 1000 males, irrespective of age. The child sex ratio is also calculated in the same manner for the children aged upto 6 years. The table below provides the density of population and sex ratio for Tamil Nadu and Tiruppur district. Likewise, sex ratio in the State has reported 996 whereas the district reported only 993.The child sex ratio in the State has reported 943 whereas the district reported 953.

Source:*http://censusindia.gov.in/2011census/dchb/DCHB_A/33/3301_PART_A_DCHB_TIRUPPUR.pdf*

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

3.12.1.3 Scheduled Castes and Scheduled Tribes

The Table I depicts the Scheduled Castes and Scheduled Tribes population in percentages in the district. The total population of the district was 2251744; out of which 369483 were Scheduled Castes (16.4%) and 21880 were Scheduled Tribes (1.00%). The rural total population of the district was 1093768, of which 215316 (19.7%) were Scheduled Castes and 20025 (1.8%) were Scheduled Tribes. The urban total population of the district was 1157976, out of which 154167 (13.3%) were Scheduled Castes and 1855 (0.2%) were Scheduled Tribes.

Source:*http://censusindia.gov.in/2011census/dchb/DCHB_A/33/3301_PART_A_DCHB_TIRUPPUR.pdf*

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

3.12.1.4 Education & Literacy

The study of the education and literacy profile in the region is relevant in order to have an understanding whether the proposed project can utilize skilled human resources available within the area. According to 2011 census data, the literacy rate in the erode district is 84.03%.The literacy rate has been the major determinant of the rise or fall of the other indicators. The accessibility of Primary and Upper Primary education has increased the literacy rate as well as reducing the dropout rate **Table 3-24** Show the details of education infrastructures in Erode District.

Table 3-24 Education Infrastructures in Erode district

Type of school	Total schools		Rural Schools	
	Government	Private	Government	Private

Type of school	Total schools		Rural Schools	
	Government	Private	Government	Private
Primary	1196	266	927	94
Primary + Upper Primary	395	21	290	11
P + UP+ Secondary + Higher Secondary	16	106	8	53
UP only	8	0	8	0
UP + Secondary + Higher Secondary	121	50	64	25
P + UP + Secondary	20	51	11	29
UP + Secondary	100	31	76	10

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

Economic Activity & Livelihood Pattern

In Census, the workers are categorised in to three types; main workers, marginal workers and non workers. The defini t ion of worker s in census enumeration has been explained elsewhere in this volume. A new clause has been included in 2011 census under marginal workers. A person engaged in economically productive work for less than 6 months has been considered as marginal worker until 2001 census.This has been further categorised in to two types; a person worked for more than 3 months but less than 6 months and a person worked less than 3 months. According to the above classification, the data has been gathered under census enumeration for 2011 census. The above table provides the percentage of main workers, marginal workers and non-workers for persons, males and females of the dist rict.The percentage of main workers, marginal workers and non-workers for persons were 92.90, 7.10 and 46.90 respectively.The percentage among males for the same category of workers were 94.80, 5.20 and 35.20. The percentages among females for these categories of workers were 90.00, 10.00, and 58.70 respectively.

Source:*http://censusindia.gov.in/2011census/dchb/DCHB_A/33/3301_PART_A_DCHB_TIRUPPUR.pdf*

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

3.12.2 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 3-25** shows the socio-economic indicators within the study area.

Table 3.25 Population profile within the study area

Sl. No	Name	Households	Total Population	Male	Female	Children below 6	Scheduled Caste	Scheduled Tribe
0-5 Km								
Kangeyam Taluk- Tiruppur District								
1.	Alambadi	816	2714	1376	1338	198	731	1
2.	Keeranur	873	2680	1364	1316	198	647	0
3.	Sivanmalai	2377	7927	3972	3955	646	2010	7
4.	Sembandampalayam	496	1566	804	762	103	357	0
5.	Kangeyam (TP) WARD NO.-0001	787	2697	1379	1318	208	165	0
6.	Kangeyam (TP) WARD NO.-0002	446	1594	794	800	146	6	0
7.	Kangeyam (TP) WARD NO.-0003	650	2212	1079	1133	177	508	0
8.	Kangeyam (TP) WARD NO.-0004	381	1302	670	632	119	116	0
9.	Kangeyam (TP) WARD NO.-0005	347	1238	643	595	104	5	0
10.	Kangeyam (TP) WARD NO.-0006	586	1984	980	1004	163	11	0
11.	Kangeyam (TP) WARD NO.-0007	595	2064	1040	1024	205	1000	0
12.	Kangeyam (TP) WARD NO.-0008	423	1474	735	739	160	258	4
13.	Kangeyam (TP) WARD NO.-0009	395	1358	675	683	118	120	1
14.	Kangeyam (TP) WARD NO.-0010	648	2181	1087	1094	156	162	0
15.	Kangeyam (TP) WARD NO.-0011	580	2012	1032	980	197	234	0
16.	Kangeyam (TP) WARD NO.-0012	271	855	402	453	85	199	0
17.	Kangeyam (TP) WARD NO.-0013	647	2223	1152	1071	202	124	3
18.	Kangeyam (TP) WARD NO.-0014	434	1436	712	724	130	21	13
19.	Kangeyam (TP) WARD NO.-0015	330	1148	566	582	103	0	0
20.	Kangeyam (TP) WARD NO.-0016	505	1646	826	820	130	9	2
21.	Kangeyam (TP) WARD NO.-0017	641	2090	1040	1050	175	17	0
22.	Kangeyam (TP) WARD NO.-0018	783	2633	1369	1264	233	45	0
5-10Km								
Kangeyam Taluk- Tiruppur District								
23.	Ganapathipalayam	325	1087	547	540	97	224	0

Sl. No	Name	Households	Total Population	Male	Female	Children below 6	Scheduled Caste	Scheduled Tribe
24.	Thammareddipalayam	324	1001	479	522	72	301	0
25.	Maravapalayam	852	2679	1328	1351	219	830	0
26.	Peranjervali	1212	3876	1973	1903	282	936	1
27.	Naalroad	810	2695	1364	1331	212	765	5
28.	Pappini	1229	3990	1995	1995	273	751	0
29.	Padiyur	759	2628	1315	1313	236	855	0
30.	Kangayampalayam	427	1328	680	648	93	225	0
31.	Vadasinnaripalayam	628	1952	983	969	107	202	0
32.	Kadaiyur	1087	3520	1790	1730	286	756	2
33.	Vattamalai	572	1804	911	893	85	130	0
34.	Veeranampalayam	1068	3459	1711	1748	271	935	0
Tiruppur Taluk- Tiruppur distrit								
35.	Nachipalayam	802	2815	1436	1379	247	585	0
36.	Peruntholuvu	1295	4631	2344	2287	414	995	1
37.	Kandiankoil	2008	6953	3453	3500	543	1898	0
Perundhurai Taluk- Erode District								
	Kodumanal	280	868	426	442	60	179	0
	Orathupalayam	133	385	194	191	28	45	0
	Ellaigramam	350	1101	558	543	85	177	0
	Ekkattampalayam	1506	4720	2360	2360	346	1268	0
	Basuvapatti	1081	3406	1715	1691	282	1255	0
	Total	30759	101932	51259	50673	8194	20057	40

(Source: Census 2011)

3.12.2.1Employment and Livelihood

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 argiven in **Table 3-26.**

Table 3.26 Summaries of Employment and Livelihood within the study area

S. 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												
Kangeyam Taluk- Tiruppur District												
1.	Alambadi	1663	1365	298	295	114	223	66	43	19	804	99
2.	Keeranur	1732	1677	55	426	2	662	22	32	4	557	27
3.	Sivanmalai	4681	4211	470	847	46	685	229	177	44	2502	151
4.	Sembandampalayam	1023	860	163	228	40	414	27	54	73	164	23
5.	Kangeyam (TP) WARD NO.-0001	1438	1410	28	3	1	2	3	620	8	785	16
6.	Kangeyam (TP) WARD NO.-0002	709	692	17	4	0	10	0	31	0	647	17
7.	Kangeyam (TP) WARD NO.-0003	1139	1124	15	81	0	86	1	4	1	953	13
8.	Kangeyam (TP) WARD NO.-0004	572	524	48	13	0	91	4	20	2	400	42
9.	Kangeyam (TP) WARD NO.-0005	594	506	88	3	1	12	1	22	2	469	84
10.	Kangeyam (TP) WARD NO.-0006	802	779	23	8	5	7	0	15	0	749	18
11.	Kangeyam (TP) WARD NO.-0007	1233	1018	215	13	4	47	66	63	15	895	130
12.	Kangeyam (TP) WARD NO.-0008	689	616	73	17	4	4	1	28	0	567	68
13.	Kangeyam (TP) WARD NO.-0009	739	668	71	48	3	9	0	71	2	540	66
14.	Kangeyam (TP) WARD NO.-0010	837	705	132	16	10	28	43	16	0	645	79
15.	Kangeyam (TP) WARD NO.-0011	828	742	86	4	0	16	6	8	2	714	78
16.	Kangeyam (TP) WARD NO.-0012	409	377	32	10	1	36	2	5	2	326	27
17.	Kangeyam (TP) WARD NO.-0013	1086	982	104	71	6	8	0	37	0	866	98
18.	Kangeyam (TP) WARD NO.-0014	851	653	198	37	21	22	7	31	15	563	155
19.	Kangeyam (TP) WARD NO.-0015	516	509	7	1	0	1	0	28	3	479	4

S. 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
20.	Kangeyam (TP) WARD NO.-0016	724	698	26	22	0	22	4	16	4	638	18
21.	Kangeyam (TP) WARD NO.-0017	1077	981	96	26	1	169	0	215	5	571	90
22.	Kangeyam (TP) WARD NO.-0018	1477	1124	353	15	6	33	17	380	164	696	166
5-10km												
Kangeyam Taluk- Tiruppur District												
	Ganapathipalayam	711	706	5	280	0	201	4	27	1	198	0
23.	Thammareddipalayam	481	476	5	141	1	241	2	4	0	90	2
24.	Maravapalayam	1665	1590	75	480	20	707	23	30	4	373	28
25.	Peranjervali	2440	2365	75	691	15	1051	31	90	3	533	26
26.	Naalroad	1700	1447	253	463	18	414	124	69	10	501	101
27.	Pappini	2366	1981	385	724	33	444	123	59	10	754	219
28.	Padiyur	1436	1234	202	264	14	166	70	12	0	792	118
29.	Kangayampalayam	978	777	201	167	26	495	80	14	16	101	79
30.	Vadasinnaripalayam	1382	1028	354	476	7	376	270	26	16	150	61
31.	Kadaiyur	2138	1542	596	705	139	378	299	31	28	428	130
32.	Vattamalai	1187	1135	52	186	5	544	10	14	1	391	36
33.	Veeranampalayam	1910	1726	184	289	18	435	48	71	6	931	112
Tiruppur Taluk- Tiruppur distrit												
34.	Nachipalayam	1437	1368	69	149	5	212	10	30	19	977	35
35.	Peruntholuvu	2319	2003	316	475	18	556	133	51	9	921	156
36.	Kandiankoil	4099	3539	560	1262	181	1417	223	77	4	783	152
Perundhurai Taluk- Erod District												
37.	Kodumanal	576	573	3	194	0	240	2	24	0	115	1
38.	Orathupalayam	248	248	0	113	0	67	0	4	0	64	0
39.	Ellaigramam	743	739	4	300	0	356	4	14	0	69	0
40.	Ekkattampalayam	2984	2936	48	600	0	1161	22	94	0	1081	26
41.	Basuvapatti	2090	2052	38	351	0	1019	14	97	5	585	19
	Total	**57709**	**51686**	**6023**	**10498**	**765**	**13067**	**1991**	**2754**	**497**	**25367**	**2770**

*(**Source:** Census 2011)*

3.12.2.2 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 3-27**.

Table 3-27 Details of Education facilities within study area

S. No	Type of School	Numbers
1	Government Pre-Primary school	35
2	Private Pre-Primary school	57
3	Government Primary school	58
4	Private Primary school	78
5	Government Middle school	72
6	Private Middle school	82
7	Government Secondary school	81
8	Private Secondary school	82
9	Government Senior Secondary school	87
10	Private Senior Secondary school	87

***(Source:** Census 2011)*

The following **Table 3-28** shows the literates population and the percentage within the study area

Table 3.28 Literates population and the percentage within the study area

Sl. No	Name	Total Population	Literates Population	Literates Population Male	Literates Population Female	Illiterates Population	Illiterates Population Male	Illiterates Population Female
0-5 Km								
Kangeyam Taluk- Tiruppur District								
1.	Alambadi	2714	1726	980	746	988	396	592
2.	Keeranur	2680	1571	939	632	1109	425	684
3.	Sivanmalai	7927	5078	2852	2226	2849	1120	1729
4.	Sembandampalayam	1566	1021	565	456	545	239	306
5.	Kangeyam (TP) WARD NO.-0001	2697	2004	1127	877	693	252	441
6.	Kangeyam (TP) WARD NO.-0002	1594	1261	658	603	333	136	197
7.	Kangeyam (TP) WARD NO.-0003	2212	1508	823	685	704	256	448
8.	Kangeyam (TP) WARD NO.-0004	1302	996	533	463	306	137	169
9.	Kangeyam (TP) WARD NO.-0005	1238	1095	575	520	143	68	75
10.	Kangeyam (TP) WARD NO.-0006	1984	1590	834	756	394	146	248
11.	Kangeyam (TP) WARD NO.-0007	2064	1528	823	705	536	217	319
12.	Kangeyam (TP) WARD NO.-0008	1474	1198	631	567	276	104	172
13.	Kangeyam (TP) WARD NO.-0009	1358	959	522	437	399	153	246
14.	Kangeyam (TP) WARD NO.-0010	2181	1666	893	773	515	194	321
15.	Kangeyam (TP) WARD NO.-0011	2012	1675	885	790	337	147	190
16.	Kangeyam (TP) WARD NO.-0012	855	625	324	301	230	78	152
17.	Kangeyam (TP) WARD NO.-0013	2223	1691	963	728	532	189	343
18.	Kangeyam (TP) WARD NO.-0014	1436	1230	618	612	206	94	112
19.	Kangeyam (TP) WARD NO.-0015	1148	887	474	413	261	92	169
20.	Kangeyam (TP) WARD NO.-0016	1646	1381	723	658	265	103	162
21.	Kangeyam (TP) WARD NO.-0017	2090	1615	848	767	475	192	283
22.	Kangeyam (TP) WARD NO.-0018	2633	2068	1151	917	565	218	347

Sl. No	Name	Total Population	Literates Population	Literates Population Male	Literates Population Female	Illiterates Population	Illiterates Population Male	Illiterates Population Female
5-10Km								
Kangeyam Taluk- Tiruppur District								
23.	Ganapathipalayam	1087	707	422	285	380	125	255
24.	Thammareddipalayam	1001	637	363	274	364	116	248
25.	Maravapalayam	2679	1695	955	740	984	373	611
26.	Peranjervali	3876	2460	1424	1036	1416	549	867
27.	Naalroad	2695	1543	872	671	1152	492	660
28.	Pappini	3990	2455	1440	1015	1535	555	980
29.	Padiyur	2628	1750	952	798	878	363	515
30.	Kangayampalayam	1328	690	401	289	638	279	359
31.	Vadasinnaripalayam	1952	1402	774	628	550	209	341
32.	Kadaiyur	3520	2117	1228	889	1403	562	841
33.	Vattamalai	1804	1027	578	449	777	333	444
34.	Veeranampalayam	3459	2226	1238	988	1233	473	760
Tiruppur Taluk- Tiruppur distrit								
35.	Nachipalayam	2815	1918	1061	857	897	375	522
36.	Peruntholuvu	4631	2929	1638	1291	1702	706	996
37.	Kandiankoil	6953	4255	2408	1847	2698	1045	1653
Perundhurai Taluk- Erod District								
38.	Kodumanal	868	474	279	195	394	147	247
39.	Orathupalayam	385	203	118	85	182	76	106
40.	Ellaigramam	1101	603	350	253	498	208	290
41.	Ekkattampalayam	4720	2818	1606	1212	1902	754	1148
42.	Basuvapatti	3406	2037	1186	851	1369	529	840

Sl. No	Name	Total Population	Literates Population	Literates Population Male	Literates Population Female	Illiterates Population	Illiterates Population Male	Illiterates Population Female
	Total	101932	68319	38034	30285	33613	13225	20388

(Source: Census 2011)

3.12.2.3 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 were 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 3-29.**

Table 3-29 Health facility within the study area

S.No	Type	Numbers
1	Community health centre	1
2	Primary health centre	5
3	Primary health sub-centre	22
4	Maternity and Child Welfare Centre	22
5	TB hospital/Clinic	13
6	Hospital Allopathic	3
7	Hospital Alternative Medicine	16
8	Dispensary Health Centre	17
9	Veterinary hospital	13
10	Mobile health clinic	0
11	Family Welfare Centre	13
12	Non-Government Medical facilities Out Patient	54

*(**Source:** Census 2011)*

3.12.2.4 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 79.82%. The people in the study area are well connected to Government primary health centres and Primary health sub-centresshows the socio-economic indicators within the study area given in **Table 3-30.**

Table 3-30 Summaries of Socio-economic indicators within the study area

S.No	Particulars	Study Area	Unit
0-5 km			
1.	Number of villages in the Study Area	4	Nos.
2.	Number of ward in the Study Area	18	Nos.
3.	Total Households	14011	Nos.
4.	Total Population	47034	Nos.
5.	Children Population (<6 Years Old)	3956	Nos.
6.	SC Population	6745	Nos.
7.	ST Population	31	Nos.
8.	Total Working Population	24819	Nos.
9.	Main Workers	22221	Nos.
10.	Marginal Workers	2598	Nos.
11.	Cultivators	2453	Nos.
12.	Agricultural labours	3086	Nos.
13.	Household Industries	2281	Nos.
14.	Other Workers	16999	Nos.
15.	Literates	34373	Nos.
16.	Illiterates	12661	Nos.
0-10 km			
17.	Number of villages in the Study Area	20	Nos.
18.	Total Households	16748	Nos.
19.	Total Population	54898	Nos.
20.	Children Population (<6 Years Old)	4238	Nos.
21.	SC Population	13312	Nos.
22.	ST Population	9	Nos.
23.	Total Working Population	32890	Nos.
24.	Main Workers	29465	Nos.
25.	Marginal Workers	3425	Nos.
26.	Cultivators	8810	Nos.
27.	Agricultural labours	11972	Nos.
28.	Household Industries	970	Nos.
29.	Other Workers	11138	Nos.
30.	Literates	33946	Nos.
31.	Illiterates	20952	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-economicenvironment 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 17.09.0 Ha. The Land is classified as a Government land. The lease area exhibits hilly terrain (~360mAMSL) topography covered by massive granite formation. Quarry lease was granted over an extent of 17.09.0Ha. In S.F.No.1456 & 1458, Sivanmalai village, Kangeyam taluk, Tiruppur District,Tamilnadu State. Precise area communication letter was granted vide Government letter No. 3500834/MME.1/2022-1, dated: 13.01.23 for 20 years of mining. Precise area communication letter is enclosed as **Annexure-2.** 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	Land Use	Area to be required during the mining plan(Ha)
1	Area under Quarry	13.18.5
2	Waste Dump	2.56.5
3	Infrastructure	0.00.5
4	Road	0.11.0
5	Green Belt	0.46.5
6	Un utilized Area	0.76.0
	Total	**17.09.0**

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 26^0. 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

Base line data reveals that ambient air quality in the study area for the Parameters PM, SO2 & NO2, are well within the permissible Limits as prescribed by the National Ambient Air Quality Standards (NAAQS) for Industrial Area, Residential, Rural & Other areas.

The major air pollution sources from the mining operations are DG sets, mining activities like blasting, drilling, cutting etc., and transportation. The DG set are provided with stacks of adequate height so as to disperse the emanating flue gases containing suspended particulate matters, oxides of sulphur and nitrogen without affecting the ground level concentrations. 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.

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 4-2 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 ➢ Water spray on blasted material prior to transportation ➢ Use of control blasting technique
3	Transportation of mined material	➢ 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 4-3 Dust control measures in quarry

S. No	Operation or source	Control options
1	Drilling	➢ Liquid injection (water or water plus a wetting agent) ➢ Capturing and venting emissions to a control device.
2	Blasting	➢ Water spray before blasting ➢ Water spray on blasted material prior to transportation ➢ Use of control blasting technique

3	Loading	➢ Water spray
4	Hauling (emissions from roads)	➢ 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 **Mid Jan 2023 to April 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 consideredformodeling is shown below.

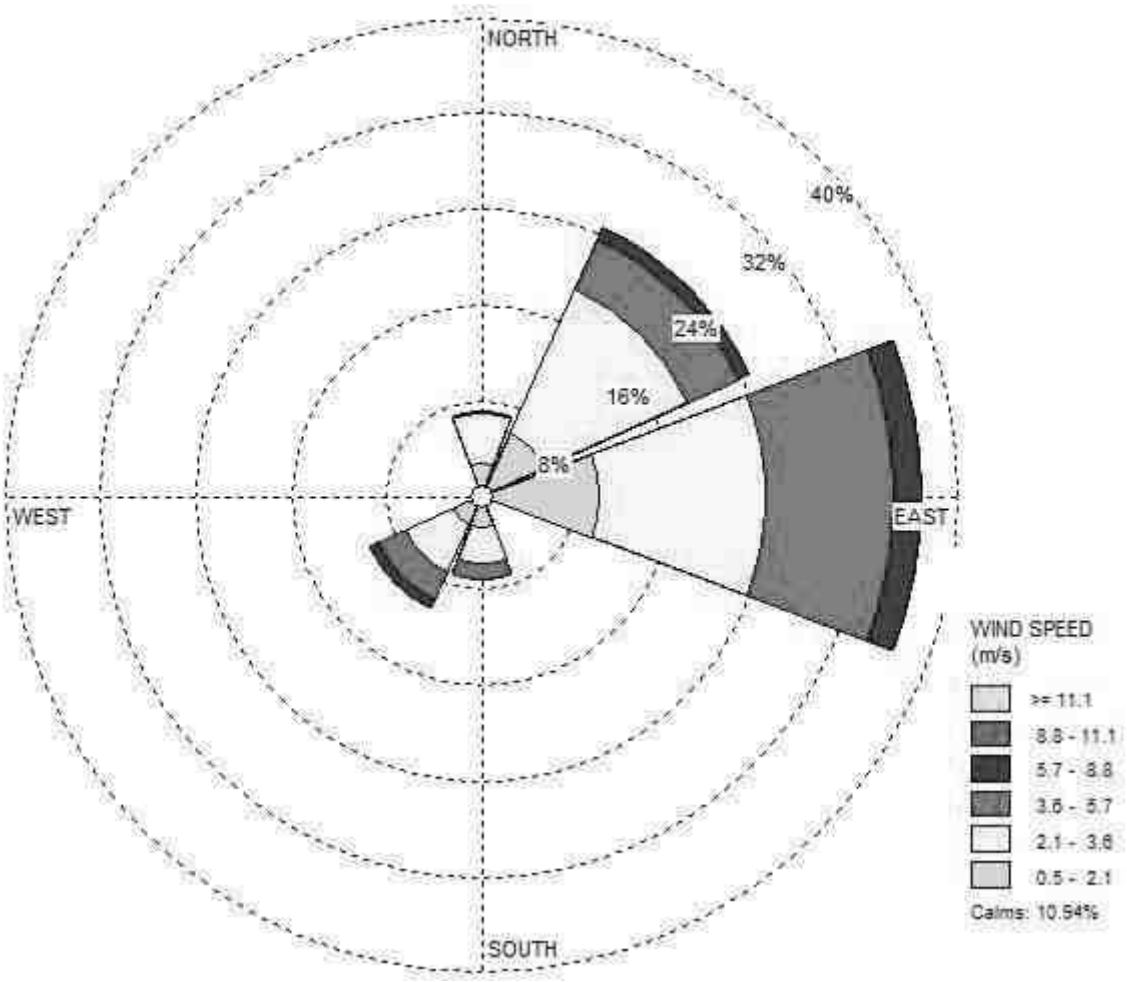


Figure 4-1 Wind rose diagram considered for dispersion modeling

(Jan mid.2023 to April mid.2023)

4.2.3.1 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.

4.2.3.2 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 4.6 to Table 4.9.**

Maximum incremental value for SO_2, 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.

4.2.3.3 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.

4.2.3.4 Mining Operational data

Table 4-4 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)		18

Source:

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

b) *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.*

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

d) *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.*

4.2.3.5 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 PM_{10} emissions contribute to $PM_{2.5}$.

Table 4-5 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}	$PM_{2.5}$	SO_2	NO_x
125 KVA DG	Diesel	1	3	0.3	180	10	5.81E-03	3.48E-03	5.38E-03	8.16E-02

Table 4-6 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 4-7 Emissions considered for mining

Activities	TSPM Emission rate	PM_{10} Emission rate	$PM_{2.5}$ Emission rate
Wet Drilling (g/s)	1.04E-04	2.08E-05	1.25E-05
Haulage (g/s)	5.25E-03	1.05E-03	6.30E-04
Waste Dumping (g/s)	2.31E-04	4.62E-05	2.77E-05
Open Pit (g/s.m2)	5.01E-06	1.00E-06	6.01E-07

Table 4-8 Emission input for modelling

Activities	TSPM	PM_{10}	$PM_{2.5}$	SO_2	NO_x
Line Source (Haul Road) (g/s)	5.25E-03	1.05E-03	6.30E-04	-	-
Area Source (Open Pit) (g/s.m^2)	5.01E-06	1.00E-06	6.01E-07	-	-
Area Source (Waste Dumping) (g/s)	2.31E-04	4.62E-05	2.77E-05	-	-
Point Source (DG) (g/s)	-	5.81E-03	3.48E-03	5.38E-03	8.16E-02
Point Source (Drilling) (g/s)	1.04E-04	2.08E-05	1.25E-05	-	-
Point Source (Vehicle)(g/s)	-	1.81E-04	1.08E-04	-	2.01E-02

Note:

a. Since emission factors are available for PM_{10} the following assumptions are made for PM_{10} and $PM_{2.5}$ estimation

1. TSPM is considered as 5 times of PM_{10}
2. 60% of PM_{10} is considered as $PM_{2.5}$

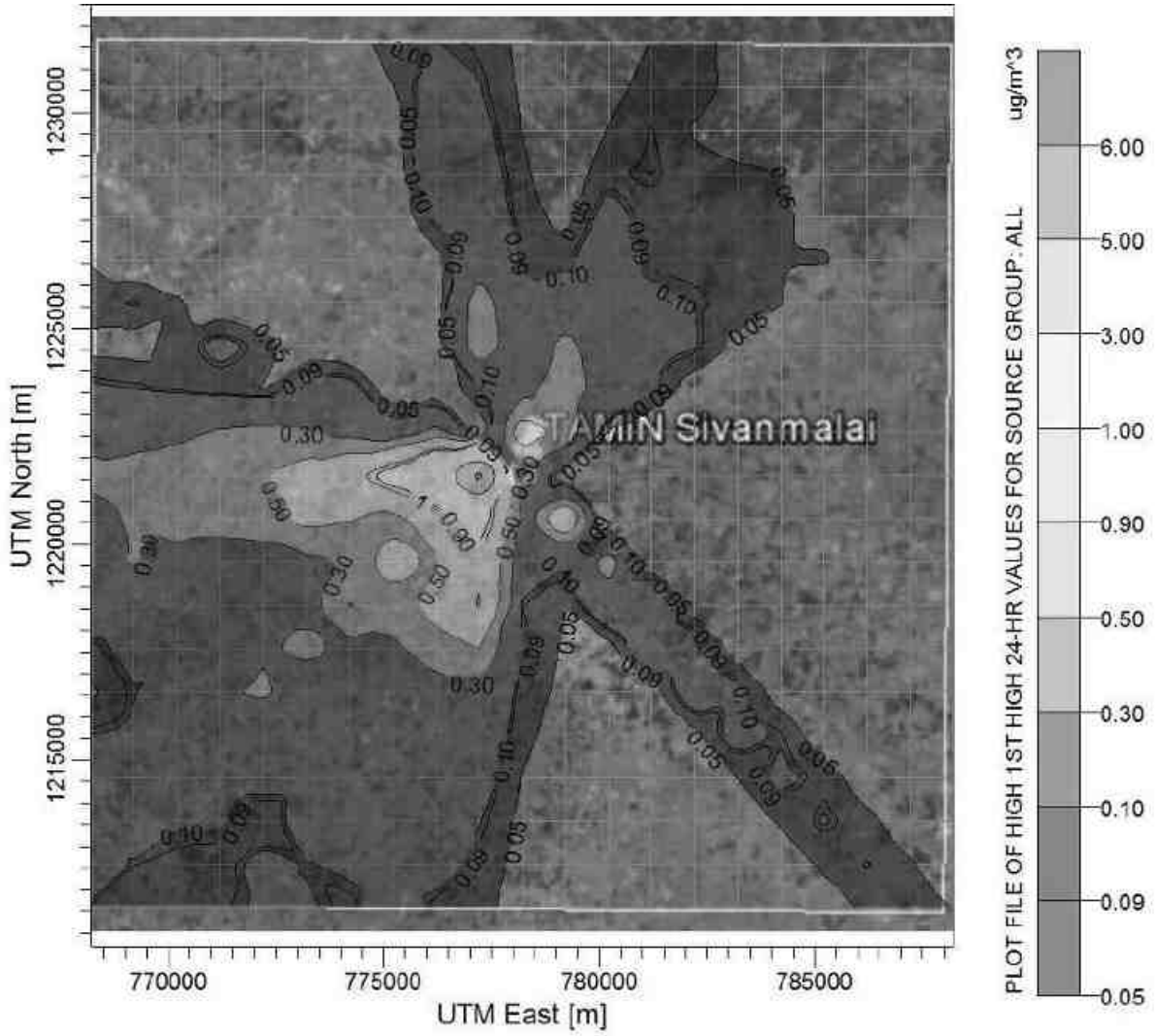


Figure 4-2 Predicted 24-Hrs GLC of Particulate matter TSPM within 10km Radius of the Study Area

Table 4-9 Predicted Top 10 Highest Concentrations TSPM

S.NO	UTM coordinates (m)		Conc. (µg/m³)	Distance from Centre of the project (km)	Direction from project Centre
	E	N			
1.	777211	1221586	5.43897	1	W
2.	776211	1221586	2.07585	2	W
3.	777211	1220586	1.24676	1.41	SW
4.	775211	1221586	1.18876	3	W
5.	777211	1218586	0.91766	3.16	SSW
6.	777211	1219586	0.86827	2.24	SSW
7.	774211	1221586	0.82156	4	W
8.	779211	1220586	0.79593	1.41	SE
9.	775211	1219586	0.70939	3.60	WSW
10.	778211	1222586	0.64827	1	N

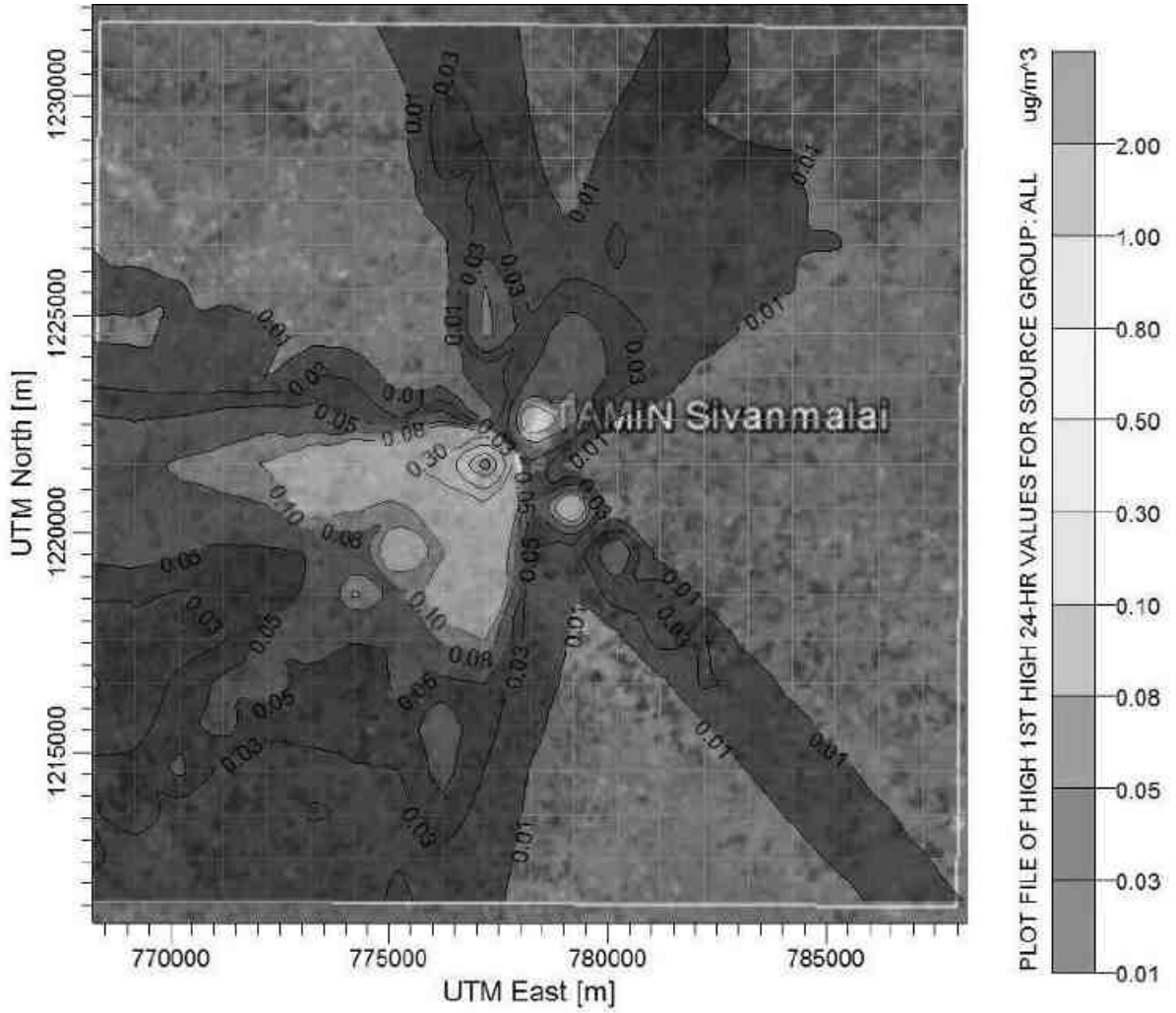


Figure 4-3 Predicted 24 Hrs GLC's of PM_{10} within 10km radius of the study area

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

S.No	UTM coordinates (m)		Conc. (µg/m³)	Distance from Centre of the project (km)	Direction from project Centre
	E	N			
1.	777211	1221586	1.14418	1	W
2.	776211	1221586	0.43027	2	W
3.	777211	1220586	0.2544	1.41	SW
4.	775211	1221586	0.24581	3	W
5.	777211	1218586	0.18773	3.16	SSW
6.	777211	1219586	0.178	2.24	SSW
7.	774211	1221586	0.16969	4	W
8.	779211	1220586	0.16017	1.41	SE
9.	775211	1219586	0.14646	3.60	WSW
10.	778211	1222586	0.1353	1	N

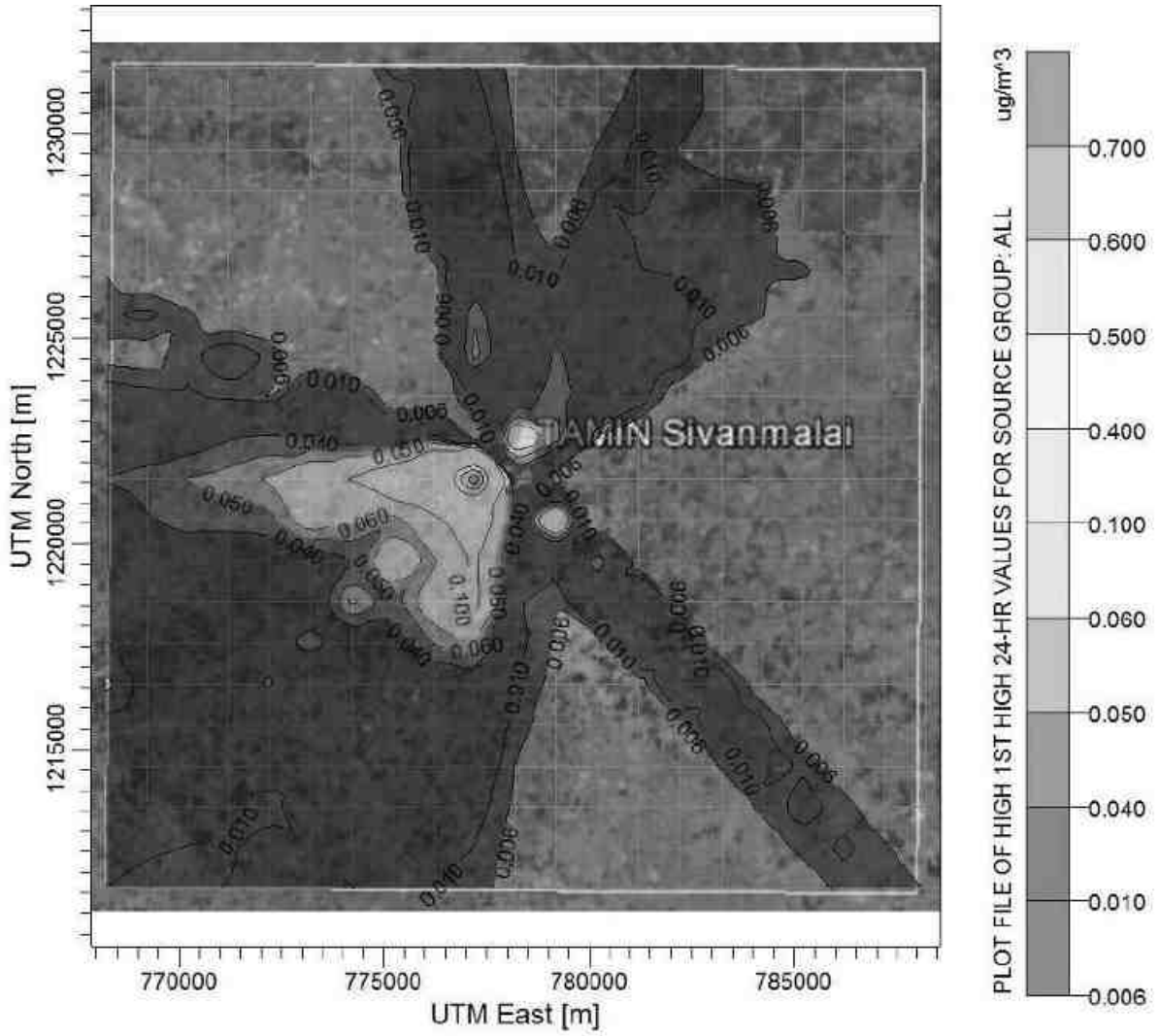


Figure 4-4 Predicted 24-Hrs GLC of Particulate matter $PM_{2.5}$ within 10 km radius of the study area

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

S.No	UTM coordinates (m)		Conc. (µg/m³)	Distance from Centre of the project (km)	Direction from project Centre
	E	N			
1.	777211	1221586	0.68722	1	W
2.	776211	1221586	0.25846	2	W
3.	777211	1220586	0.15274	1.41	SW
4.	775211	1221586	0.14765	3	W
5.	777211	1218586	0.11274	3.16	SSW
6.	777211	1219586	0.10691	2.24	SSW
7.	774211	1221586	0.10192	4	W
8.	779211	1220586	0.09619	1.41	SE
9.	775211	1219586	0.08794	3.60	WSW
10.	778211	1222586	0.08122	1	N

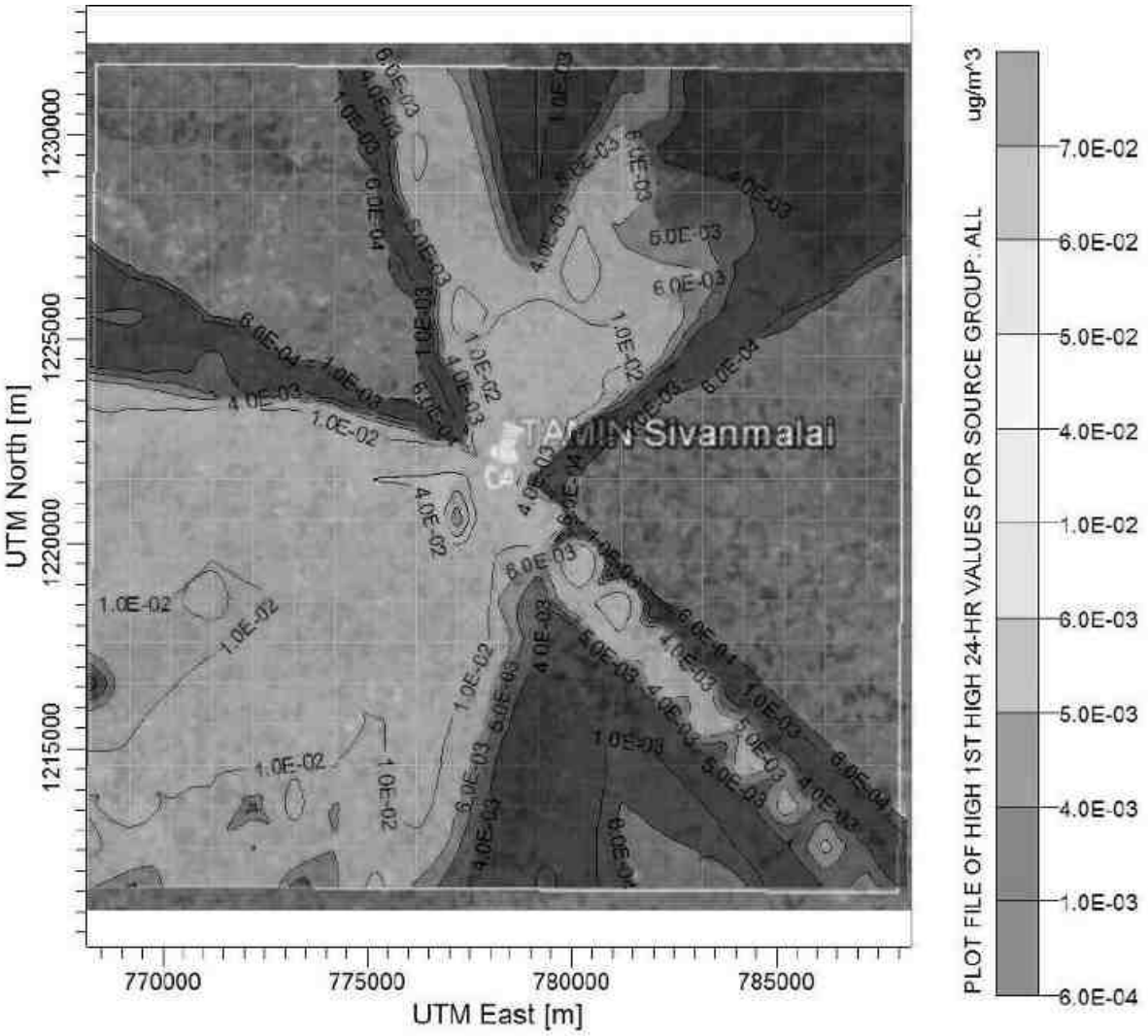


Figure 4-5 Predicted 24-Hrs' GLC's of SO_2within 10 km Radius of the Study Area

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

S.No	UTM coordinates (m)		Conc. (µg/m³)	Distance from Centre of the project (km)	Direction from project Centre
	E	N			
1.	777211	1220586	0.06679	1.41	SW
2.	777211	1221586	0.04862	1	W
3.	776211	1221586	0.04259	2	W
4.	775211	1221586	0.04054	3	W
5.	773211	1220586	0.03809	5.09	WSW
6.	776211	1218586	0.03644	3.60	SSW
7.	774211	1221586	0.03458	4	W
8.	777211	1219586	0.03412	2.24	SSW
9.	778211	1222586	0.03105	1	N
10.	774211	1220586	0.03092	4.12	WSW

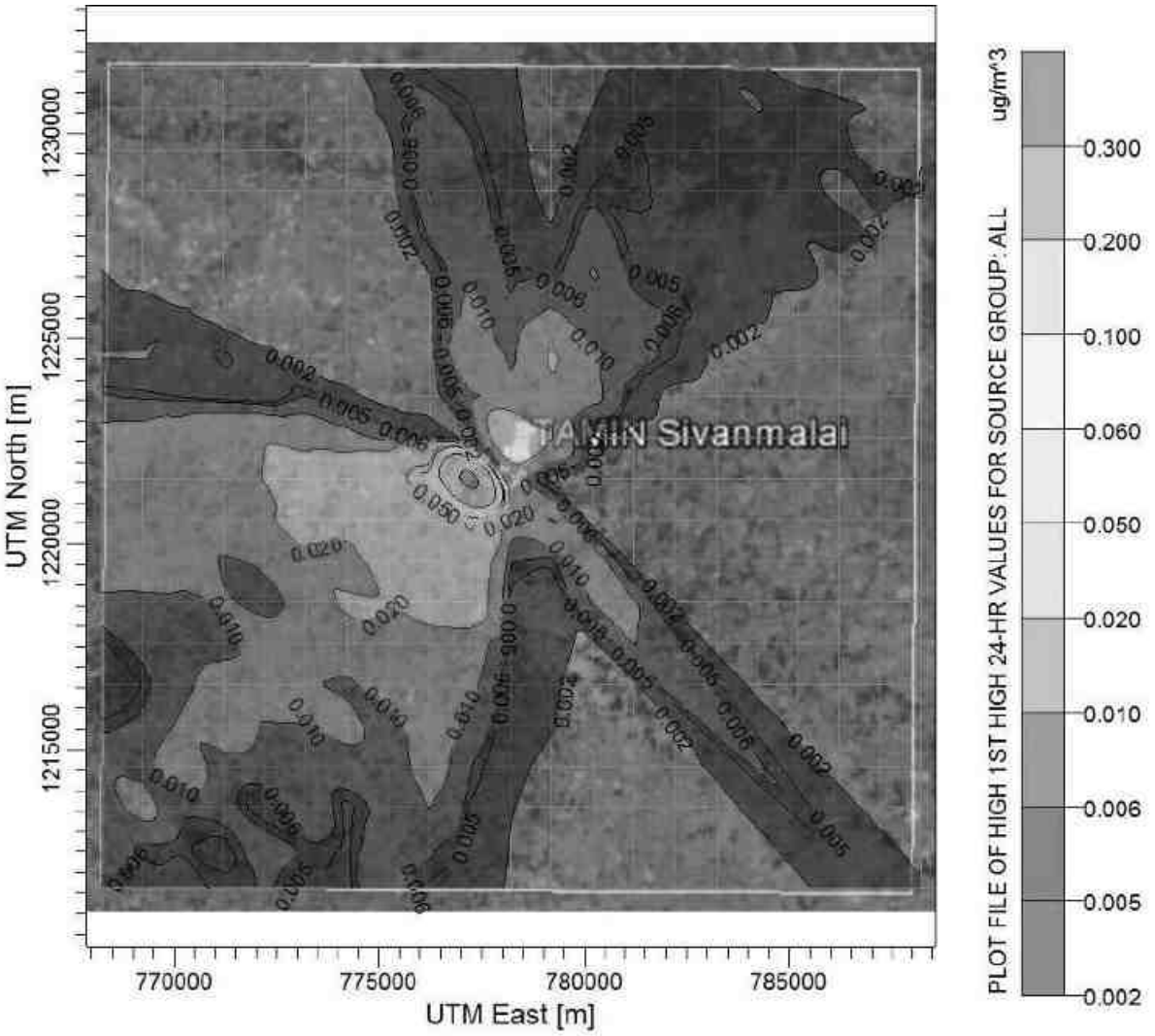


Figure 4-6 Predicted 24-Hrs' GLC's of NO_X within 10 km Radius of the Study Area

Table 4-13 Predicted Top 10 Highest Concentrations Nitrogen Oxide

S.NO	UTM coordinates (m)		Conc. (µg/m³)	Distance from Centre of the project (km)	Direction from project Centre
	E	N			
1.	777211	1221586	0.24949	1	W
2.	776211	1221586	0.06941	2	W
3.	777211	1220586	0.05689	1.41	SW
4.	778211	1222586	0.04062	1	N
5.	775211	1221586	0.04025	3	W
6.	777211	1219586	0.0343	2.24	SSW
7.	773211	1220586	0.03333	5.09	WSW
8.	777211	1218586	0.03154	3.16	SSW
9.	774211	1221586	0.03111	4	W
10.	775211	1219586	0.03082	3.60	WSW

4.2.4 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. (µg/m³)	Estimated Incremental Conc. (µg/m³)	Total Conc. (µg/m³)	NAAQ standard	% contribution of concentration above Base line
TSPM	142.98	5.43	148.41	500	3.80
PM_{10}	57.19	1.14	58.33	100	1.99
$PM_{2.5}$	32.84	0.68	33.52	60	2.07
SO_2	12.14	0.06	12.20	80	0.49
NO_X	30.70	0.24	30.94	80	0.78

4.2.5 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 4.16.**

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	457.850	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.

4.2.5.1 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 1.27 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 Sivanmalai 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 mainsource 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.

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 favorable 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.

4.4.5.2 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, NOx and SO_2 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

4.6.1 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 (potableor industrial)	Water abstraction or mine dewatering	Loss or changes in habitat or species composition

4.6.2 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.

4.6.2.1 Impact

- Displacement of existing fauna.
- Lossofvegetation

4.6.2.2 Mitigation 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.

- 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 0.46.5 hectare land was earmarked for greenbelt development during first 5 years of mining plan, TAMIN proposed to plant 200 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.

4.7.1 Impacts on Occupational Health due to project operations

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

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

4.7.1.1 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 emergencyresponse 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 4-19 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	➢ 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	➢ 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	➢ Health survey programmes for workers and local community. ➢ Regular training and awareness of employees to be conducted to meet health and safety objectives.

4.7.1.2 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 inthe core zone area, norehabilitation 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.

4.8.1 Corporate Environmental Responsibility

TAMIN Sivanmalai site had no Relocation and Rehabilitation. Most villages have benefitted mutually at Sivanmalai 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. CER activity will be carried out as per MoEF&CC OM dated 20.10.2020.

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. 1456 and 1458, Sivanmalai Village, Kangeyam Taluk, Tiruppur District, Tamil Nadu State. It is Government Poramboke land the applicant has obtained lease from the Government is enclosed as **Annexure -2.**

5.4 Connectivity

SH 96 (Erode to Kangeyam) at ≃2.26km towards E. The nearest railway station is Uttukuli Railway station located at ≃ 16.44Km towards NW direction. NH 81 (Chidambaram-Kangeyam-Coimbatore) situated at distance of ≃ 4.20Km (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.

6.2.1 Ambient Air Quality

The following monitoring schedule is given for ambient air quality.

- **Parameters**

  Sulphur dioxide (SO_2), 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.

6.2.2 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.

6.2.3 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 Standard parameters

6.3.1 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 promptremedialmedicalfollow 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 proposedin 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
I	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	Afforestationprogram 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 waterspruces	Followed the Procedure as proposed in the Mining plan.
5	Meaures 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.

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.

7.1.1. Public Consultation

The proposed project is categorized as 'B1' category Schedule 1(a) as per EIA Notification 2006 and its amendments there after. The total area of the quarry is 17.09.0 Ha.

However, the project falls under violation category, Public Hearing is Mandatory for violation projects. So, EIA report has been prepared as per the obtained violation ToR vide. F. No. SEIAA-TN/F.No.4052/2015/ToR-1319/2023 dated 12.01.2023. Draft EIA report will be submitted for Public Hearing (PH) to Tiruppur PCB.

After PH, the minutes will be incorporated in the EIA report along with action plan or commitment by the proponent. Final EIA will be submitted to TNSEAC for further appraisal of the project and obtaining Environment Clearance.

7.2. Enumerate the aspects of Violation

7.2.1. Quantification of Damage cost

Table 7-1 Quantification of Damage cost

S. No	Description	Details	Unit	Mining Plan period (As per production details provided by TAMIN)					SOM-III (2018-2019 to 2022-2023)				
				2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
1	Mine Lease Area		Ha	17.09.0	17.09.0	17.09.0	17.09.0	17.09.0	Nil	Nil	Nil	Nil	Nil
2		Qty/ Mining plan	m^3/ year	3600	7200	4000	4000	4000	Nil	Nil	Nil	Nil	Nil
		Actual production	m^3/ year	900	1800	1000	1000	1000	Nil	Nil	Nil	Nil	Nil
		Total Water Consumption	KL/ year	450	450	450	450	450	Nil	Nil	Nil	Nil	Nil
3	Source of water	--	KL/Y										

4	Hazardous waste	--		0	0	0	0	0	0	0	0	0	0
	Waste oil	--	Lits/A	3	3	3	3	3			0	0	0
5	Municipal Solid Waste	--	Tonne/ Year	13.5	13.5	13.5	13.5	13.5			Nil	Nil	Nil
6	Mode of Disposal of Sewage	--	-	-	Septic tank	Septic tank	Septic tank	Septic tank	Septic tank	Septic tank	--	--	--
7	Deforestation /No of plants	--	Nos	-	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
8	Domestic Sewage Quantity	--	KLD	Nil	Nil	0.42	0.42	0.42	0.42	0.42	Nil	Nil	Nil
9	Man power	--	Nos	Nil	Nil	30	30	30	30	30	Nil	Nil	Nil

7.2.2. Enumerate the aspects of Violation

Quantification of the effects on human health of particulate matter emissions, for which inhalation is the only relevant exposure route. In this case, it is necessary to quantify the pollutant emission, describe its dispersion and the extent to which the population is exposed, apply a concentration-response function and finally evaluate the economic impact. A pathway for estimating impacts& Impact Pathway Approach is shown in **Figure 7-1.**

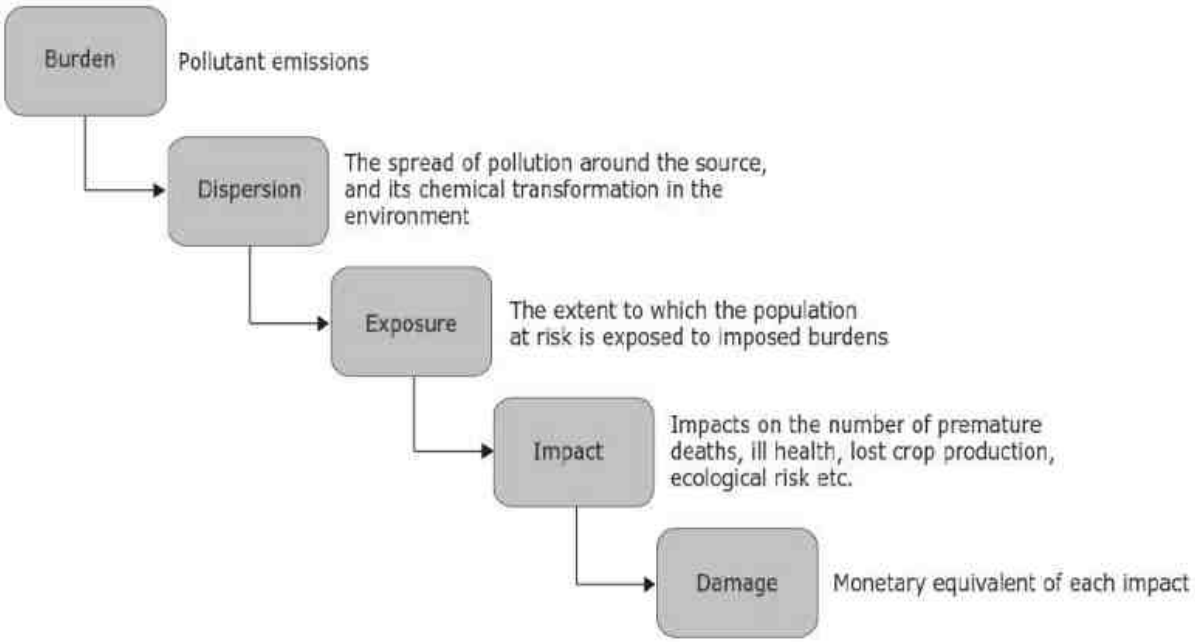


Figure 7-1 Impact Pathway Approach

Source: *European Environmental Agency - EEA Technical report N15/2011 "Revealing the costs of air pollution",*

+–

7.2.3. Quantification of Damage Cost

Assessment of the damages caused during quarry operations are given below:

7.2.4. Air Environment

The major source of air pollution due to emission generation by is quarry machineries & transportation of granite.Drilling, Haul roads, Waste dump & Open pit activities are considered for air emission generation.

Emission calculation References:

- *The drilling emission is calculated with the equation of Chakraborty, et al. (2002),*
- *The emission factors for the haul roads the equation from the literature Chaulya, (2006).*
- *Haul Roads &Waste dump emission calculated based on the literature Chakraborty, et al., (2002).*

- *Open pitEmission calculation as per the open pit estimation is another tool than the area source in AERMOD. (Neshuku, 2012).*

Table 7-2Quantification of Emissions due to quarry activities

S. No	Emission details	Emissions quantity Tonne /Year	Total Emissions quantity (Tonne) for 5 years (Violation period)
1	TSPM	2.93	14.65
2	PM10	0.59	2.93
3	PM2.5	0.35	1.76
4	SO2	0.26	1.29
5	NOx	0.88	4.39

Source for project activities: *Project proponent*

7.2.5. Water Environment

Water is being sourced from nearby road tankers for mining operations purpose is about 1.5 m^3/day of water is required for the project.

7.2.6. Water pollution

There is no wastewater generation in the quarry. The sewage generated is being collected in Septic tank followed by soak pit. Assuming 100% of the sewage is collected in soak pit contaminating.

Table 7-3Year wise Sewage generation in Violation period

S. No	Description	Mining Plan period (As per production details provided by TAMIN)					SOM-III (2018-2019 to 2022-2023)				
		2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
1	Domestic Sewage Quantity (KLD)	406.4	406.4	406.4	406.4	406.4	Nil	Nil	Nil	Nil	Nil
2	Sewage collected in soak pit(KLD)	406.4	406.4	406.4	406.4	406.4	Nil	Nil	Nil	Nil	Nil

Table 7-4 Penalty due to Sewage Disposal

S. No	Pollutants	KL/Y	Penalty cost KL/A (in rupees)	Total damage Cost/year	Total Cost / 5 year (Productive years)
1	Total Sewage collected in soak pit	406.4	50	20320	1, 21, 920

*Treatment cost of sewage is assumed 100/-

7.2.7. Noise & Vibration

Damages during Operation phase there will be minor increase in noise levels due to vehicular movement.

Table 7-5 Noise pollution damage assessment

S. No	Number of Persons	No. of Working days/year	Damage cost per day/person	Damage cost per year	Total Cost / 5 year (Productive years)

1	30	320	1	11200	48,000

Man power Source: *Project Proponent*

7.2.7. Solid Waste

Municipal solid waste will be generated. If not managed properly, waste will affect the health of staff and employees as well as locals in the surrounding areas and will also be aesthetically unpleasant.

Table 7-6Year wise Solid Waste generation in Violation period (5 years)

S. No	Description	Mining Plan period (As per production details provided by TAMIN)					SOM-III (2018-2019 to 2022-2023)				
		2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
I	MSW (Tonne/Year)	5.04	5.04	5.04	5.04	5.04	Nil	Nil	Nil	Nil	Nil

Table 7-7 Penalty due to Solid Waste generation

S. No	Pollutants	TPA	TPA INR (Rs)	Total damage Cost/year	Total Cost / 6 year (Productive years)
I	MSW (TPA)	5.04	290	1461.6	8769.6

**Treatment cost of MSW is assumed 290/-*

7.2.8. Removal of Trees

The quarry Lease area is fully rocky terrain. The quarry is in operation since, 1998. As per proponent information there is no removal of trees.

7.2.9. Natural Resources, Ecological Damage & Remediation Plan and Cost

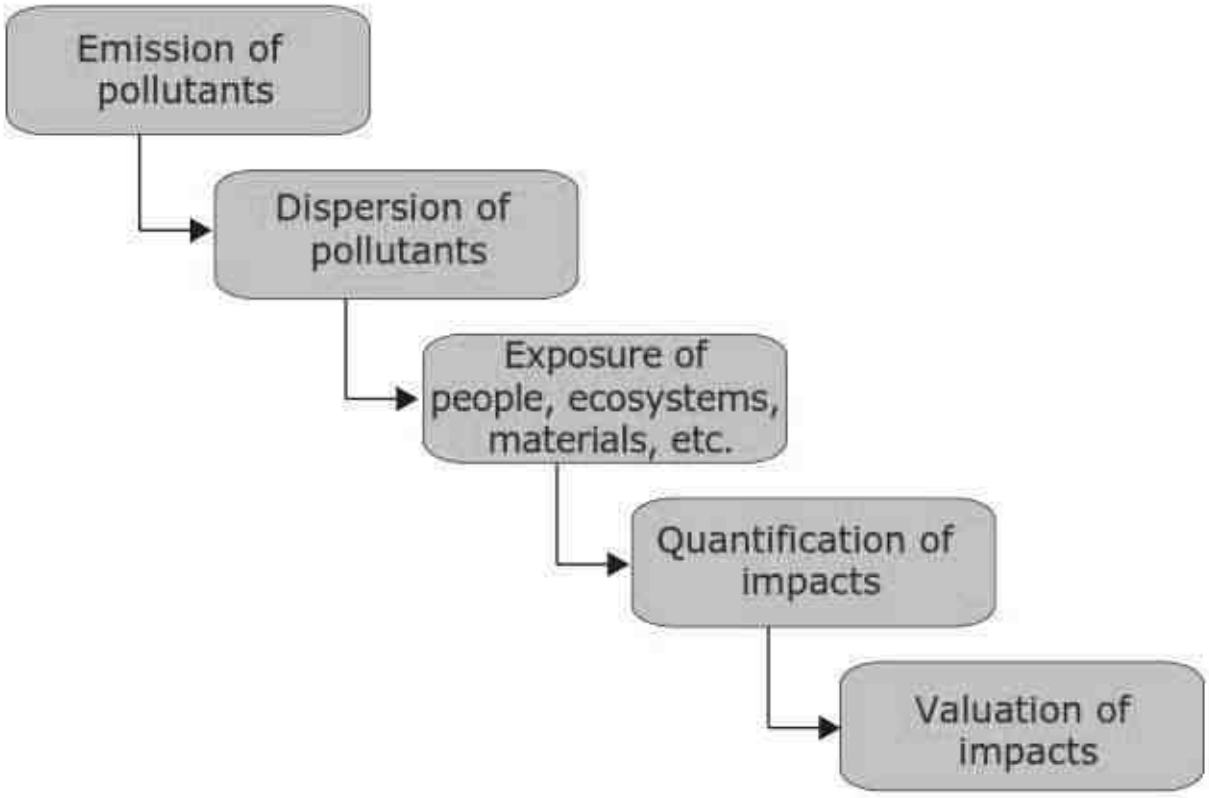


Figure 7-2 Impact pathway methodology

Source:*European Environmental Agency - EEA Technical report N15/2011 "Revealing the costs of air pollution*

7.2.10. Total Damage Assessment and Cost details

Table 7-8 Total Damage cost of the Project for 5 Years of violation

S. No	Description	Cost (INR)
I	Air Environment	3, 27, 390

2	Water Environment	21, 920
3	Noise Environment	48,000
4	Solid/Municipal Solid Waste	8769.6
	Total Cost	**4,06,079.6**

Table 7-9 Existing Investment & Recurring Cost for Environmental Management Systems

S. No	Details	Total in Rs
1	Personal Protective Equipments	60, 000
2	Emergency Siren	5000
	Total Cost	**65, 000**

Total Environmental Damage Penalty – Existing Investment on EMP = Penalty for Environmental Damage

Table 7-10 Total Penalty Details

S. No	Particulars	Cost (INR)
1	Environmental Damage Penalty charges for 12 years	**4,06,079.6**
2	Existing Investment on Environmental Management	65, 000
3	Total Environmental Damage Penalty Charges for 10 Years of violation	

Table 7-11 Total Cost Details

S. No	Cost details	Cost (INR)
1	Total Penalty for Environmental Damage	4.71.079.6
2	Natural Augmentation & Remediation Plan	1, 00, 000
3	Community Augmentation Plan	1, 00,000
	Total Cost	**6,71,079.6**

”;

Table 7-12 Ecological Damage due to mining Activities & Remediation Plan and Cost

S. No	Parameter	Activity / Source	Impact	Cause	Remediation Plan	Cost/year in INR
I	**Air Environment**	i) Drilling ii)Blasting c) Movement of Machineries d) Transportation	• Dust generation	• Particulate matter smaller than 10 microns, can settle in the bronchi and lungs and cause health problems likeBronchitis, Emphysema, Bronchial Asthma, Irritation of mucus Membranes of eyes, etc. • Particles smaller than 2.5 micrometers (PM2.5), tend to penetrate into the lungs and very Small particles (< 100 nanometers) may pass through the lungs to affect other organs. Vehicle emission can also create various health problems on human being.	• Using inbuilt dust collector system • Usage of sharp drill bits for drilling of holes. • Provision of dust filters / mask to workers working at highly dust prone and affected areas. • Proper maintenance of machineries which avoids excessive noise and vibration. • Sufficient training to operators on safety and environmental parameters. • Regular wetting of transport road using water tanker. • Avoiding overloading of tippers • Covering of loaded tippers with tarpaulins during transportation. • Development of green belt / barriers wherever possible.	50,000

2	**Water Environment**	a) Water usage b) Quarry working faces and dumps	• Generation domestic Effluents. • Soil erosion, siltation due to runoff / Storm Water. • Reduction in ground water Siltation on rainwater • drainage channel near the mine lease	• The direct impact on human beings due to poor water quality can lead to various waterborne diseaseslikediarrhoea, jaundice, dysenteryetc. • Polluted water may not be useful for human or animal consumption etc., if not treated to standards.	• Rain water harvesting ponds will develop. • Clear supernatant water after settling can be let out of this pond after passing through settling traps. • Most of the mine water will be used for green belt, dust suppression, etc. • Plantation will be carried out in the safety zone area, all possible area within the lease area • Mine sump water can also be utilized.	50000
3	**Soil Environment**	Quarrying and dumping of waste	• Loss of top soil • Loss of soil fertility & soil quality	• Affecting bioticenvironment	• The top soil will be used for afforestation &Reclamation purpose. • Application of manure to retain its fertility. • Spreading over reclaimed areas for plantation.	30000

4	**Noise** **Environment**	a)Drilling b)Movement of vehicles	• Prolonged exposure to high noise level is harmful to human auditory system	• Mental fatigue • Rebellious attitude • Annoyance • Carelessness • Hearing impairment	• Providing in-built mechanism for reducing soundemissions • Providing earplugs/earmuffs to workers exposed to high noisy areas. • Proper and regular maintenance of equipment. • Planting of trees where ever possible to act as acoustic barriers. • Conducting regular healthcheckup of workers • Including audiometric test for the workers engaged in noise prone area.	50000
5	**Vibration**	Drilling in Quarry	• Creation of Vibration effect	• Accident and injury damage to the nearby structures if appropriate technology and control measures are not adopted	• Controlling Blasting methods	30000
6	**Biological** **Environment**	Quarrying and allied operation	• Clearance of vegetation • Dust generation	• Loss of vegetative cover Retardation of tree growth, Tip burning	• Water sprinkling to arrest dust generation • Creation of green belt in all possible vacant places within the lease area. • Local species in consultationwith the state forest department can be chosen for this purpose.	40000

7	**Occupational health**	Quarrying and allied operation	• Dust generation. Noise and vibration effect	• Dust related pneumonia • Tuberculosis Rheumatic arthritis Segmental vibration Miner"sNystagamus • Loss of life /machinery	• Water sprinkling on haul roads. • Green belt creation wherever possible to arrest dust and reduce noise propagation. • Good control measures for reducing air pollution & Control of noise levels. • Conducting Initial Medical examination (IME) at pre-entry level stage of workers by qualified doctors, as per DGMS circulars. • Providing Health report to employees regularly after health checkups. • Provided Personnel Protective Equipments (PPE) to all staff and workers to guard against excess noise levels, dust generation and inhalation, etc., as per standards prescribed by DGMS. • Imparting Vocational training to all workers/ staff.	50000
Total cost proposed under Ecological Remediation plan is Rs. 49985/-						

7.2.11. Natural & Community Resource Augmentation Plan

7.2.12. Natural Resource Augmentation Plan& Mitigation measures for quarry operations for the damages caused are as below:

Table 7-13Natural Resource Augmentation Plan & Mitigation measures

S. No	Description	Augmentation Plan
1	Air Management	1. Plantation along the haul roadside to reduce effects of air/ noise pollution as part of landscape development. 2. A row of trees to be planted along the Quarry boundary periphery to screen the site from air/ noise pollution. 3. Regular maintenance and upkeep of the internal roads within project site will help to reduce air pollution. 4. The entry/ exit to the site to be with adequate curvature so that vehicles coming out/ entering the quarry do not impinge on road traffic directly.
2	Water Management	1. There is no effluent generation in existing quarry. 2. Storm water drainage system laid considering natural gradient of the site and sufficient number of recharge pits will be provided at appropriate locations to recharge ground water table. 3. Existing sewage disposed in to Septic tank followed by Soak pit. 4. Proper provision for maintenance of sewage disposal.
3	Noise & Vibration Management	1. During quarry operations important to maintain the noise levels within the site for the safety and better health of residents in the nearby area. 2. The various precautions to be taken to maintain acceptable noise level within the project area are as under smooth flow of traffic to be ensured on the internal roads to avoid idling of vehicles while transportation.
4	Solid Waste Management	1. Collection of waste, segregation, and disposal in a manner so as to cause minimal environment impact. 2. Non-degradable waste will be disposed to municipal garbage collection site.
5	Green Area Development Management	1. In order to keep a check on noise levels, particulate matter dispersion and concentration of polluting agents, a green belt is provided as part of the landscaping and it shall be maintained. 2. There shall be monitory provision made for development of green belt. 3. A horticulture officer and gardener shall be appointed for the same. 4. Maintenance shall include watering and manuring plants at appropriate time, weeding out unwanted plants, cleaning, replacing wilted/died plants etc.

6	Fire & Safety Management	1. For safety purpose of the occupants a well designed disaster management plan is prepared. 2. Emergency Assembly points will be marked. Regular mock drill to be undertaken. 3. Guidance over public address systems. 4. Sprinklers in quarry area and common areas.
7	Energy Conservation Measures	Following non-conventional energy technologies to reduce the overall energy consumption will be adopted 1. Using LED/CFL lights and energy efficient fixtures 2. Using energy efficient motors. 3. Using ISI rating motors with 60% efficiency water pumps. 4. Using ISI rating motors with 75% efficiency motors. 5. Energy metering system for internal and external light. 6. Use of automatic sprinkler system for garden area.

7.2.13. Natural &Community Augmentation Plan breakup

Project Proponent Proposed Rs.49985 for Natural &Community Augmentation Plan as below:

Table 7-14 Community Augmentation Plan

S. No.	Description of Beneficiary	Priority ranking for investment	Suggested % of Allocation out of Total Budget	Period (Financial Period)
1	**Education**		30%	2023-2024
	Providing Note books & Supply of Furniture	2		
	Additional class rooms to Schools	3		
	Construction Toilets	1		
2	**Village Level Infrastructure**		35%	2024-2025
	Sanitation Household toilets	1		
	Construction of Community Hall	3		
	Better road facility	4		
	HEALTH –Sub health centers & health camps	2		
3	**Youth Development**		15%	2025-2026
	Youth motivation programmes	1		
	Skill Training programmes	2		
	Sports Equipments	3		
4	**Environment Sustainable Development**		20%	2026-2027
	Tree plantation	2		
	Agriculture, Horticulture, Animal Husbandry support programmes	1		
	Rain water harvesting and water	3		

S. No.	Description of Beneficiary	Priority ranking for investment	Suggested % of Allocation out of Total Budget	Period (Financial Period)
	shed programmes in village			

7.1 . Risk Identification & Management

7.1.1 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 theimpact zones from the accidental scenarios
- Assess the overall suitability of the site from hazard minimization and disaster mitigation point of view
- Furnish specific recommendationson the minimization of the worst accidentpossibilities.
- 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 aqualified 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 norml 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.

7.1.2 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

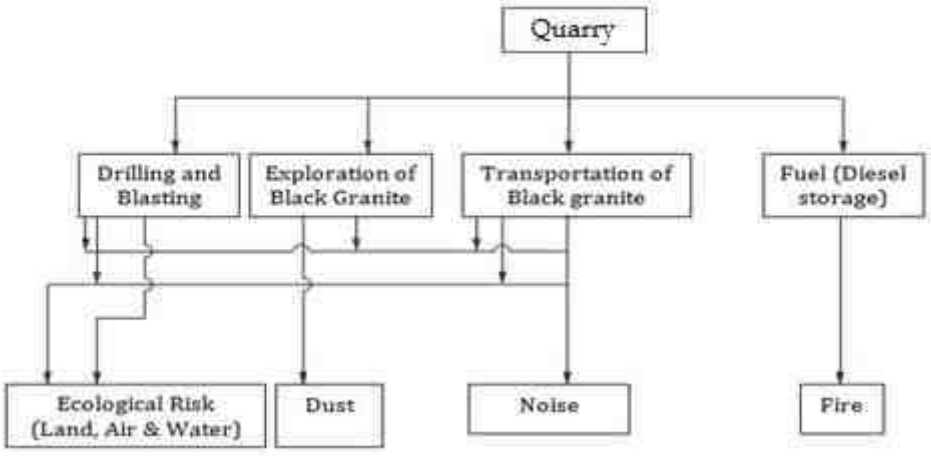


Figure 7-3 Identification of hazards in opencast mine

7.1.2.1 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 to1.5m depth having a diameter of 30-32 mm.

7.1.2.2 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.

7.1.2.3 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.

7.1.2.4 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.

7.1.2.5 Heavy Machinery

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

7.1.2.6 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.

7.1.2.7 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.

7.1.2.8 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.

7.1.3 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 isto 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.

EmergencyOrganization (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 fire fighting, 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

7.1.3.1 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

7.1.3.2 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.

7.1.3.3 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.

7.1.4 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 40m by observing the statutory of mine safety rules and regulations. Hence in the proposed mining plan, only 40m 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 40m 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

7.1.4.1 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

7.1.4.2 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.

7.1.4.3 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.

7.1.4.4 Air Quality Management

Ambient air quality was monitored twice in a week for One (01) season (shall cover 12 weeks), i.e., during Pre-Monsoon season (**Mid of Jan 2023 – Mid of April 2023**). PM_{10}, $PM_{2.5}$, SO_2, NOx,

Pb, NH_3, C6H6, $C_{20}H_{12}$, 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 weigh bridge 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.

7.1.4.5 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.

7.1.4.6 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.

7.1.4.7 Mine Drainage

The lease applied area is hillock 40m height with slope towards northern and southern sides. Through the area receives scanty rainfall, the ground water level is at 20m depth. The Production faces are operated at shallow depths. During the rainy seasons the surface run of water and the gorund water are collected at one point called as sump and dewatered nearby agricultural field with the help of 10HP oil engines.

7.1.4.8 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.

7.1.4.9 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.

7.1.4.10 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 complaint 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.

7.1.4.11 Other Infrastructure

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

7.1.4.12 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.

7.1.5 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 Sivanmalai 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 nearby 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 SO_2, 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 employeesand 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, Metalliferrous 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.**

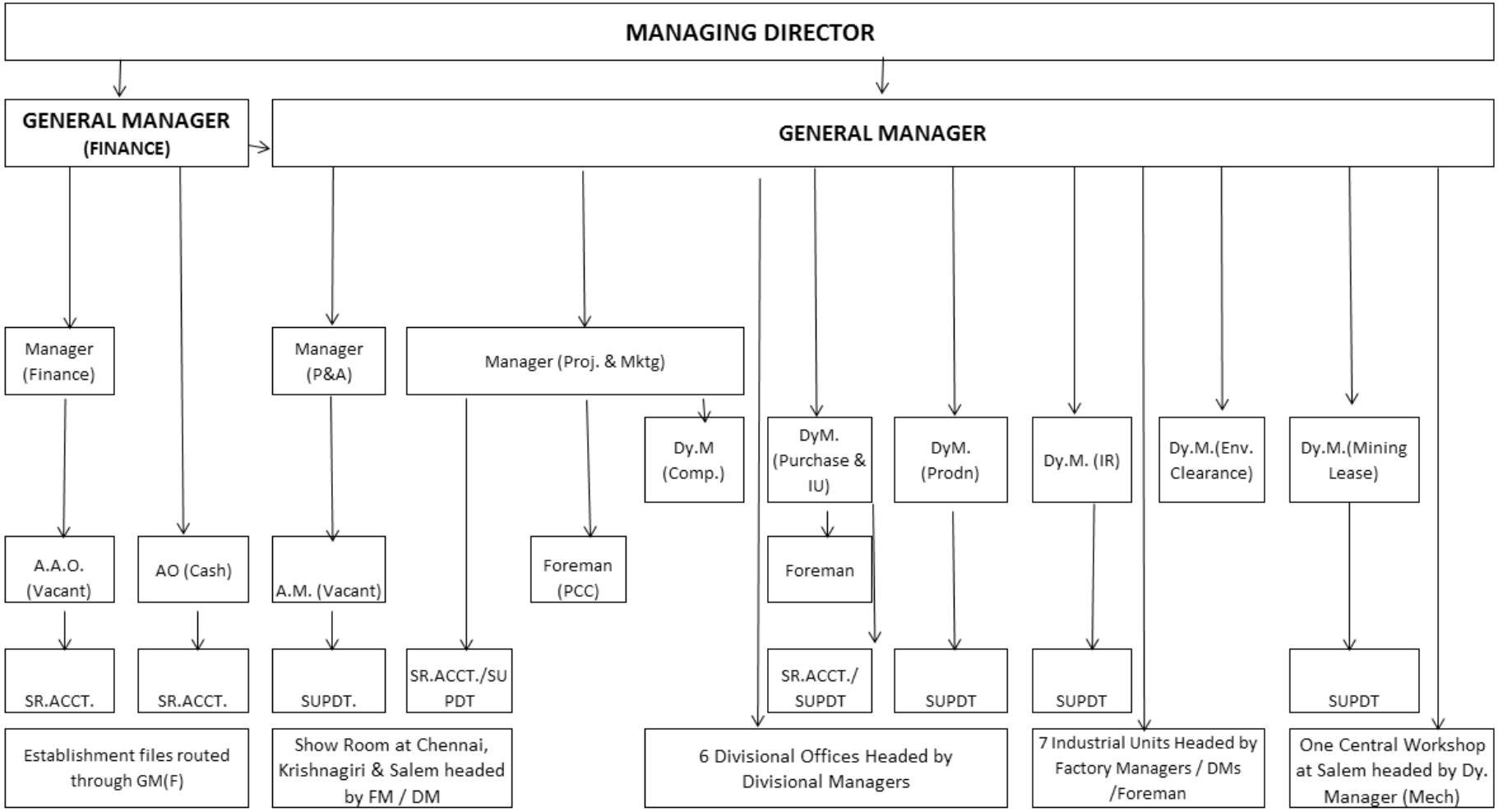


Figure 10-1 Hierarchical System of the TAMIN

11 SUMMARY & CONCLUSION

11.1 Background

The extent area of the quarry is 17.09.0 Ha S.F. 1456 and 1458 at **Sivanmalai Multi Colour Granite Quarry, over an extent of 17.09.0 Ha at S.F. 1456 & 1458 at Sivanmalai village, Kangeyam taluk, Tiruppur District, Tamilnadu State**. TAMIN has been proposed to get a fresh lease for Colour Granite (Dolerite) quarry for 20 years lease vide TAMIN's Lr. No. Lr.No. 3500834/MME.1/2022-1, dated: 13.01.23. 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 to TN SEIAA vide File No.4052/2015. The proposal was appraised during 339th SEAC meeting held on 22.12.2022 and 584th SEIAA meeting held on 12.01.2023. ToR was issued vide Lr No. SEIAA-TN/F.No.4052/2015/SEAC/ToR-1319/2023, dated: 12.01.2023 for the preparation of EIA/EMP report. Draft EIA report will be submitted for Public Hearing (PH) to Ranipet PCB. 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.

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 Pradesh State boundary as per google runs in NW direction at about ~ 6.66 km from the project boundary. Project does not 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 Multi Colour Granite Quarry Reserves

- The estimated Geological Reserves of Colour Granite estimated based on the Geological

cross sections was 51,28,140 m^3. By applying the effective Geological recoverable reserves @ 25 % 5700 m^3& granite waste @75% is 17100 m^3.

- The updated Mineable Reserves have been arrived as 39,36,,028 m^3.

11.5 Summary of the Magnitude of Operation

- The multi colout 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
- Proposed Production Capacity is 1800 m^3 per annum.
- The geological cross sections up to the economically average depth of 31m from the ground level and top surface of the granite body works out to 51,28,140 m^3
- The mineable reserves have been computed as 39,36,028 m^3.
- The effective geological reserves and mineable have been worked out as 9,94,007 m^3 and 17100 m^3 by applying the recovery factor 25%.

11.5.1 Mineable Reserves have been worked out as 17,100 m^3 by applying the recovery factor 25%. The annual peak production per year would be 1800m^3 of ROM of saleable

11.5.2 Land requirement

- The multi colour granite mine is over an extent of 17.09.0 Ha. The entire area is under possession of TAMIN.
- Lease area located at S. F. No. 1456 and 1458 Sivanmalai village, Kangeyam Taluk, Tiruppur District lies in the latitude of 77°32'38.25701"E to 77°32'58.97292"E and Northern latitude from 11° 02'28.68702"N to 11° 02'27.73352"N.
- The lease area topography is hilly terrain; site elevation is 360m (max) AMSL. The area is marked in the survey of India Topo sheet No. 58E/12, 58F/9. The TAMIN has obtained precise area communication letter vide Government letter No. 3500834/MME.1/2022-1, dated: 13.01.2023.
- Out of 17.09.0 Hectare of lease area 13.18.5 Ha is considered for mining, waste dump is 2.56.5 Ha, & for Greenbelt 0.06.5 is allocated.

11.5.3 Water Requirement

- The total water requirement is 1.5 KLD 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.

11.5.4 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.

11.5.5 Manpower

- Direct manpower will be 30 persons directly and indirectly 20 Nos.

11.5.6 Solid Waste Generation & Management

- Municipal solid waste (8.1 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.

11.6 Project Cost

- The total capital investment on the project is Rs. 99, 97,000/- Lakhs including EMP cost is 2, 05,000/-.

11.7 Baseline Study

Project Influence Area (PIA)/Study Area: An area covering 10 km radius from Sivanmalai Colour granite quarry boundary has been earmarked as study area for baseline studies.

Study Period:

The baseline environmental surveys were carried out during **(Mid of Jan 2023 – Mid of April 2023** within the study area.

Summary of Baseline Studies:

- Site has an undulating terrain with level 360m Above MSL.
- The project site falls under Zone- II (Low Damage Risk Zone) as per IS 1893 (Part- I).
- The predominant wind direction is East during study period.
- Max Temperature: 38^{0}C Min Temperature: 18^{0}C&Avg Temperature: 27.36^{0}C
- Average Relative Humidity: 53.93 %
- Average Wind Speed : 2.55 m/s

Ambient Air Quality

Maximum concentrations of PM_{10}, $PM_{2.5}$, SO_2, NO_2, CO, Pb, O_3, NH_3, C_6H_6, C_{20} H_{12}, 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 PM_{10} (46.06µg/m³- 48.13 µg/m³), $PM_{2.5}$ (19.63µg/m³ -27.64 µg/m³), SO_2 (6.21µg/m³ – 10.221 µg/m³), NO_2 (18.76µg/m³ – 25.84µg/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 residential area day time noise levels varied from 51.8 dB(A) to 54.7 dB(A) and night time noise levels varied from 40.1 dB(A) to 44.9dB(A)across the sampling stations. The field observations during the study period the ambient noise levels except one Residential area noise is not within the limit prescribed by MoEF&CC (55 dB(A) Day time & 45 dB(A) Night time).
- In Industria area (Near Project Site), Day and Night Noise level Varies from 53.2 dB(A) and 43.1 dB(A) respectively. The field observations during the study period indicate that the ambient noise levels in Industrial area are within the limit prescribed by CPCB for Industrial area (75 dB (A) Day time & 70 dB(A) Night time).

Water Environment

The prevailing status of water quality at 8 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 7.21 to 7.81.
- Total Dissolved Solids range from 388 mg/l to 418 mg/l.
- Total hardness ranges between 175 mg/l – 211 mg/l.
- The BOD value ranges from 6.3 mg/l to 7.3 mg/l
- COD value 14.8 mg/l to 33 mg/l.

Ground Water Quality

- The average pH ranges from 7.31-7.66.
- TDS value varied from varied from 326 mg/l to 497 mg/l
- The chloride concentration ranged from 15.37.1mg/l to 52.14 mg/l

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 6.78 -8.31.
- Conductivity of the soil samples ranged from 218 – 389umhos/cm
- Nitrogen content ranged from 124 mg/kg to 408 mg/kg
- Phosphorous ranged from 18.96 mg/kg – 33.05 mg/kg
- Potassium content ranges from 73.30mg/kg – 144.31 mg/kg.

Biological Environment

The floral diversity is grouped into trees, shrubs, climbers and herbs. Similarly, the faunal diversity is grouped into mammals, birds, reptiles and amphibians. There is no extinct flora and fauna species found in the study area.

Flora

It was observed that the flora, which includes herbs, shrubs and trees, were sparsely distributed within study area as per IUCN status Least concern, Not yet assessed species are observed within the study area.

Fauna

Both direct (sighting) and indirect (evidences) observations methods were used to survey the faunal species around the study area.

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 11-1 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 ➢ Water spray on blasted material prior to transportation ➢ Use of controlled blasting technique
3	Transportation of mined material	➢ 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 quarry is in operations since 1995 and extent of lease area is 17.09.0Ha. Land classifies as a Government land, Mining Lease obtained from Tamil Nadu Government for 20 yearsvideLr. No. 3040/MME.1/2022-1, dated: 02.06.22.

Wastewater Management

- Sewage (1.27KLD) 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 0.46.05Ha, out of 17.09.0Ha. 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

- CER Acttivity will be implemented for an amount of Rs.1,99,940 (2% of Project Cost) as per MoEF&CC O.M dated 20th October, 2020 (F.No. 22-65/2017-IA.III). CER fund will be allotted for Public Hearing commitments.
- TAMIN Sivanmalai site had no Relocation and Rehabilitation.
- Most villages have benefitted mutually at Sivanmalai 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

12.1 The names of the Consultants engaged with their brief resume and nature of Consultancy rendered

Brief Profile of Hubert Enviro Care Systems (P) Limited (HECS)

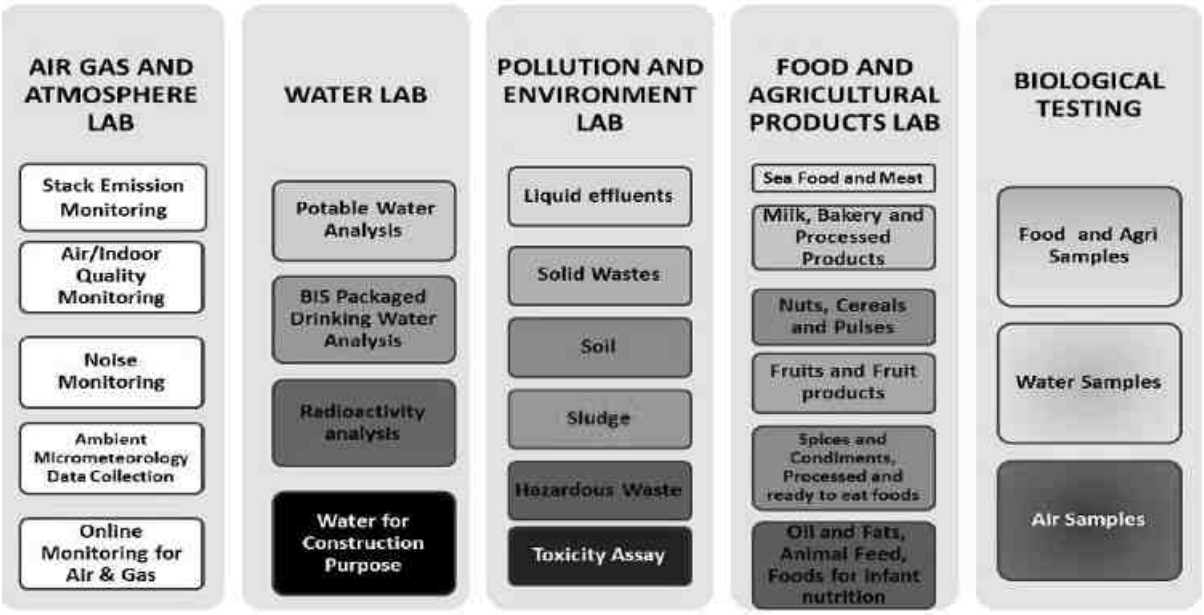
HECS is a total Environmental management company which provides Environmental consultancy services, Analytical testing services, turnkey solutions and Operation-Maintenance services for water and wastewater facilities.

The company provides solutions to several industries like Refineries, Thermal Power Plant, Pharma, R&D Facilities, Electroplating and Manufacturing, IT Parks, Residential Complexes, Mines, Dairies, Food Processing, Textile mills, Breweries, etc.

The company is specialized in executing projects right from concept development, supply, erection, commissioning and operation on turnkey basis. HECS has successfully executed more than 300 environmental engineering projects for various industrial sectors both in India and overseas.

12.2 Consultancy Profile

- HECS is accredited by QCI-NABET
- An approved consultant for carryout EIA studies across India
- India's leading multidisciplinary Environmental Consultancy organization
- HECS- Consultancy division comprises of technical skilled and competent Team of 40 people. The team consists of Three Doctorates & about thirty postgraduates
- HECS has industry specific prominent expert to provide solutions & recommendations
- Serving client more than 25 years & pan India presence in the following sectors:
    - Environmental Clearance
    - Coastal Regulation Zone
    - Risk Assessment, DMP, HAZOP studies
    - Feasibility/ treatability studies
    - Due diligence studies
    - Ground water Clearance
    - DISH, PESO and other statutory approvals
    - Consent to Establish, Consent to Operate
    - Hazardous waste, bio medical waste authorization
    - Other environmental approvals
- Has an in-house laboratory wherein the following activities are being carried out:



12.3 QCI – NABET Accreditation

Consultancy	Hubert Enviro Care Systems Pvt. Ltd., Chennai
NABET Certificate No	NABET/ EIA/ 2224/ SA0190 Valid up to 27/07/2024
MoEF Reg. Lab	F.No. Q-15018/13/2016-CPW

National Accreditation Board for Education & Training (NABET) is a constituent board of the Quality Council of India (QCI). QCI, NABET has accredited HECS for carrying out Category 'A & Category B' EIA studies in the following sectors:

QUALITY COUNCIL® OF INDIA
Creating an Ecosystem for Quality

NABET

National Accreditation Board for Education and Training

NABET

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.