DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

For

BLACK GRANITE QUARRY

OVER AN EXTENT OF 15.47.5 Ha

At

Survey No: 331 of Veeramangalam 'B'&

148 (Part) of Mahankalikapuram

Villages: Veeramangalam 'B'& Mahankalikapuram

Taluk: R.K. Pettai

District: Tiruvallur

State: Tamil Nadu

By

M/s. Tamil Nadu Minerals Limited

(Project termed under Schedule 1(a) Mining of Minerals 'B1' category as per EIA Notification 2006 and its Amendments)

ToR File No.9982/SEAC/ToR-1483/2023 Dated: 22.06.2023

Baseline Period: Mid of January 2023- Mid of April 2023

EIA Consultant

HUBERT ENVIRO CARE SYSTEMS (P) LTD, CHENNAI

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

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

July 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 Black Granite Quarry, over an extent of 15.47.5 Ha at S.F.331 of Veeramangalam 'B' & 148 (Part) of Mahankalikapuram at Veeramangalam 'B' & Mahankalikapuram village, R.K Pettai taluk, Tiruvallur District, Tamil Nadu State.

M/s Tamil Nadu Minerals Limited,

- Dr. E Ganesan- Deputy Manager (ML)

M/s Hubert Enviro Care System Private Limited

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

Declaration by the Project Proponent

I, 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 **"Black Granite Quarry over the extent of 15.47.5Hectares at S.F.331 of Veeramangalam 'B' & 148 (Part) of Mahankalikapuram at Veeramangalam'B'& Mahankalikapuram Village, R.K.Pettai Taluk, Tiruvallur District,Tamil Nadu State".**and the information and content provided in the report are factually correct.

for Tamil Nadu Minerals Ltd,

Authorised signatory
Deputy Manager (ML)
TAMIN - Chennai

Declaration by the Head of the Accredited Consultant Organization

I, Dr.J.R. Moses, hereby, confirm that the below mentioned experts prepared the EIA/EMP report for **"Black Granite Quarry over the extent of 15.47.5Hectares at S.F.331 of Veeramangalam 'B' & 148 (Part) of Mahankalikapuram at Veeramangalam'B'& Mahankalikapuram Village, R.K.Pettai Taluk, Tiruvallur District,Tamil Nadu State".** I also confirm that I shall be fully accountable for any misleading information mentioned in this statement.

Signature:

Date: 18.07.2023

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/SA0190, valid up to 27.07.2024.

Declaration of Experts contributing to the EIA

I, hereby, certify that I was involved in the EIA report for the project titled **"Black Granite Quarry over the extent of 15.47.5Hectares at S.F.331 of Veeramangalam 'B' & 148 (Part) of Mahankalikapuram at Veeramangalam'B'& Mahankalikapuram Village, R.K.Pettai Taluk, Tiruvallur District,Tamil Nadu State"**. I was a part of the EIA team in the following capacity that developed the above EIA with the support of the following functional area experts.

EIA Coordinator
Name: Mr. Vamsee Krishna Navooru
Signature: 
Date: 18.07.2023

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

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Tamilnadu, India.
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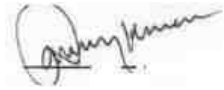
Website: *www.hecs.in*

Functional Area Experts (FAEs):

S. No.	Functional Areas	Name of the Expert	Period of Involvemen	Signature
1.	WP	Mr. Vamsee Krishna Navooru	Period : January 2023 to Upto EIA submission **Task:** Selection of water monitoring station, interpretation of analysis results, collection of inputs and development of EMP with respect to the wastewater treatment and produced water management.	
2.	SE	Mr. V. Dhivakar	Period: Mid of January 2023 to Mid of April 2023 **Task:** Site visit, Collection of secondary data, discussion with stake holders and Preparation of socio -economic status of the study area. Review of demographic characteristics, and supervision of baseline data collection. Collection and analysis of perception study carried out for the proposed project.	
3.	EB	Dr. Rajkumar Samuel	Period: January 2023 to Upto EIA submission **Task:** Primary ecological survey and assessment of flora and fauna with respect to the core and buffer zone in study area and development of EMP. Collection of data from secondary sources and comparing with field data, compilation of Ecology and bio diversity data.	
4.	LU	Mr. Venkateswarlu	Period: Mid of January 2023 to Mid of April 2023 **Task :** Development of land use maps of study area using GIS / related tools, site visit for ground reality survey, finalization of land use maps and studying the ecologically sensitive details in the study area as per Topo map and Gazette notifications.	
5.	AP	Mr. Vamsee Krishna Navooru	Period: January 2023 to Upto EIA submission **Task:** Selection of air quality monitoring location, discussion with client on various air pollution control aspects, collection of inputs and development of	

S. No.	Functional Areas	Name of the Expert	Period of Involvemen	Signature
			EMP.	
6.	AQ	Dr. J R Moses	**Period: 2019-2023** **Task:** Collecting Micro metrological data from secondary sources and emission from the proposed DG with the modeling inputs data and development of EMP for the project.	
7.	NV	Mr. Vamsee Krishna Navooru (N)	January 2023 to Upto EIA submission **Task:** Selection of noise sampling location for baseline monitoring, interpretation of results and development of EMP	
8.	GEO	B. Mallikarjuna Rao	Period : Mid of January 2023 to Mid of April 2023 **Task:** Studying the site topograpghy, existing available mineral resources. Studiying ground profile.	
9.	HG	Mr. Mallikarjuna Rao	Period: Mid of January 2023 to Mid of Apr 2023 **Task**: Identification of ground water pote of the study area, Collection of secondary and preparation of report with respect to Hydrogeological condition in and around t study area.	
10.	SC	Dr. B.C. Nagaraja	Period: Mid of January 2023 to Mid of April 2023 **Task:** Identification of soil quality monitoring locations for the project, study of soil nutrients in the study area., proposing the soil management practices during construction and operation phase of project, nutrients for green belt development	
11.	SHW	Mr. Vamsee Krishna Navooru	Period: January 2023 to Upto EIA submission **Task :** Quantification of Municipal solid waste generation and management measures, quantification of hazardous waste generation with management measures.	

S. No.	Functional Areas	Name of the Expert	Period of Involvemen	Signature
12.	RH	Dr. J R Moses	**Period:** April 2023- Upto EIA Submission **Task:** Identification of hazards materials, Fire accidents and & Disaster management plan along with the preparation of risk for the proposed project and development of EMP.	

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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5	RQP Certificate
6	Terms of Reference

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
IMD	India Meteorological Department
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
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 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 block sand 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 background

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,.

Precise area communication letter has been issued to grant lease for 20 years for extent of 15.47.5 Ha which incl;udes 8.17.5 Ha,S.F.No.331 of Veeramangalam 'B' & 7.30.0Ha 148 (Part) of Mahankalikapuram at Veeramangalam 'B' & Mahankalikapuram Village, R.K Pettai Taluk, Tiruvallur District, and Tamil Nadu State.TAMIN obtained precise area communication letter vide Letter No.3162481/MME.1/2022-1, dated: 31.10.2022. Accordingly, mining plan has been submitted and approved by the Director of Geology and Mining, Chennai vide Rc.No.3178/MM4/2022, dated: 21.01.2023. Precise area communication letter is enclosed as **Annexure-I.** Mining plan approval letter is enclosed as **Annexure-II.**

The area lies in the Eastern Longitude from 79°21'50.43990"E to 79°22'19.99560"E and Northern latitude from 13° 08'31.39320"N to 13°08'45.55966"N enclosed sectional plates as **Annexure-IV.** The area does not falls under forest land of any category. It is a Government Poramboke land.

The Geological reserves of Black granite have been computed based on the Geological Plan & Sections up to the economically workable average depth of 40m from the surface level and the top surface of the granite body works out to 13,11,180 m^3.

Mineable Reserves have been computed as 6,46,064 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 1,29,213 m^3 by applying the recovery factor 20%. The annual peak production per year would be 7,500m^3 of ROM of saleable and 33,000m^3 of ROM during the five year of Mining plan period at the rate of 20% 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 to be generated during the five years of Mining Plan period will be around 1,32,000m^3. These wastes are proposed to be dumped on the South side of lease area.The total water requirement is 3.5KLD (Drinking & Domestic purpose-1.5 KLD, Wire Saw cutting -0.5 KLD, Dust suppression -1.0 KLD & Greenbelt-0.5KLD). The total water requirement will be met from private tankers. Power requirement 60 kVA will be met through 125 kVA DG Set. Diesel consumption will be 200lits/day. Man power requirement will be 30 Nos directly. Municipal Solid waste will be disposed into local municipal bins. Hazardous waste like waste oil will be disposed through TNPCB authorized dealers. Sewage will be disposed through septic tank followed by soak pit. Septic Tank will be cleaned periodically.

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

1.3 Identification of Project & Project Proponent

1.3.1 Project

The proposed Black Granite Mine is over an extent of 15.47.5Ha located at S.F.331 of Veeramangalam 'B' & 148(Part) of Mahankalikapuram, Veeramangalam 'B' & Mahankalikapuram village, R.K. Pettai Taluk, Tiruvallur District, Tamil Nadu State.TAMIN is obtaining Environmental Clearance from SEIAA-Tamil Nadu.Since, the project falls under B1 Category, Schedule 1(a) Mining of Minerals as per MoEF&CC Notification and its amendment vide S. O. 3977(E) dated; 14th Aug 2018. The land use classification of the project site is government poramboke land. TAMIN obtained precise area communication letter vide Government letter No. 3162481/MME.1/2022-1, dated: 31.10.2022. Precise area communication letter is enclosed as **Annexure-I.**

The Mining Plan has been prepared for quarrying Black Granite (Dolerite) over an extent of 15.47.5Ha located at S.F.331 of Veeramangalam 'B' & 148(Part) of Mahankalikapuram, Veeramangalam 'B' & Mahankalikapuram village, R.K. Pettai Taluk, Tiruvallur District, Tamil Nadu State. Tamil Nadu obtained lease for 20 years. Mining plan approval letter is enclosed as **Annexure-II.**

The area applied for quarry lease is exhibits hillock with height of about 165m surrounded by plain lands (~257m AMSL), The area lies in the Eastern Longitude from 79°21'50.43990"E to 79°22'19.99560"E and Northern latitude from 13°08'31.39320"N to 13°08'45.55966"N enclosed sectional plates as **Annexure-IV**. The area is marked in the survey of India Topo sheet No. D44N8.

1.3.2 Project Proponent

Tamil Nadu Minerals Limited (TAMIN) (An Undertaking of Government of Tamil Nadu) has been established in the year1978. 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.No. 3162481/MME.1/2022-1, dated: 31.10.2022. Precise area communication letter is enclosed as **Annexure-I.**

ii. The Mining Plan has been prepared for quarrying Black Granite (Dolerite) over an extent of 15.47.5 Ha. in S.F.331 of Veeramangalam 'B' & 148 (Part) of Mahankalikapuram

Veeramangalam 'B'& Mahankalikapuram Village, R.K.Pettai Taluk, Tiruvallur.

iii. District, Tamil Nadu State, for 20 years. Mining plan was approved by the Director of Geology and Mining, Chennai vide Rc.No.3178/MM4/2022, dated: 21.01.2023 and letter is enclosed as **Annexure-II.**

1.5 Land Acquisition Status

The entire mine lease area of 15.47.5Ha is Government land which is leased by TAMIN. TAMIN obtained precise area communication letter vide Lr.No.3162481/MME.1/2022-1,dated: 31.102022. Precise area communication letter is enclosed as **Annexure-I.**

Table 1-1 Land Use Description

District and State	Taluk	Village	S.F. No	Area in (Ha)	Land Classification
Tiruvallur District, Tamil Nadu	R.K. Pettai	Veeramangalam'B' & Mahankalikapuram	S.F.No.331& 148(Part)	15.47.5 (8.17.5 Ha of Veeramanagalam B & 7.30.0 Ha of Mahakalingapuram)	Government Land

1.6 Purpose and Status of the Report

The Veeramangalam'B'& Mahankalikapuram Black Granite Quarry isover an extent of 15.47.5 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.9982/2023.The proposal was appraised during 382nd SEAC meeting held on 09.06.2023 and 632nd SEIAA meeting held on 21.06.2023 and ToR was issued vide Lr No. SEIAA-TN/F.No.9982/ToR-1483/2023, dated: 22.06.2023 for the preparation of EIA/EMP report. The draft EIA/EMP report will be submitted for Public Hearing (PH). After completion of Public Hearing, the minutes issued will be incorporated in the EIA report along with proponent action plan. Final EIA report will be submitted to TN-SEAC for further appraisal of the project and obtaining Environmental Clearance.

1.7 Brief Description of the Project

1.7.1 Nature of the Project

The project falls under B1 Category, Schedule 1(a) Mining of Minerals as per EIA Notification and its amendment. Hence, the project will appraise for Environmental Clearance from State Expert Appraisal Committee, Tamil Nadu. The EC application was submitted to TN SEIAA vide File No.9982/2023 & Proposal No. SIA/TN/MIN/425553/2023 dated 13.04.2023

The TAMIN has obtained precise area communication letter vide 3162481/MME.1/2022-1, dated 31.10.2022. 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.3178/MM4/2022, dated: 2101.2023. Mining approval letter is enclosed as **Annexure-II.**

1.7.2 Size of the Project

The Proposed Black Granite Quarry over an extent of 15.47.5Ha which incl;udes 8.17.5 Ha,S.F.No.331 of Veeramangalam 'B' & 7.30.0Ha 148 (Part) of Mahankalikapuram at Veeramangalam 'B' & Mahankalikapuram Village, R.K.Pettai Taluk, Tiruvallur District, Tamil Nadu State.

Black Granite Quarry area is over an extent of 15.47.5 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 13,11,180 m^3.

Mineable Reserves have been computed as 6,46,064 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 1,29,213 m^3 by applying the recovery factor 20%. The average annual production per year would be 7,500m^3 of ROM of saleable and 33,000m^3 of ROM during the five year of Mining plan period at the rate of 20% recovery.Open cast Semi mechanized method will be followed for proposed mining as per mining plan. Sectional plates are enclosed as **Annexure-IV.**

Total waste (GraniteWaste+SideBurden) to be generated during the five years of Mining Plan period will be around 1, 32,000m3. These wastes are proposed to be dumped on the South side of lease area. The method of mining is Open cast semi mechanized.

Table 1-2 Ultimate Pit Dimensional Details

S. No	Description	Average Ultimate Pit Dimensional(m)		
		Length	Width	Depth
1	Top	486.50	71.90	40
2	Bottom	420.50	38.10	

Table 1-3 Geological Reserves

S. No	Geological Reserves	Mineable Reserves	Mineable Saleable reserves at 20% recovery (m^3)
1.	13,11,180	6,46,064	1,29,213

1.7.3 Location of the project

Veeramangalam 'B'& Mahankalikapuram Black Granite Quarry area is over an extent of 15.47.5 Ha, the lease area is located at S.F.No.331 Veeramangalam'B' &148(Part) Mahankalikapuram of Veeramangalam'B' & Mahankalikapuram village, R.K.Pettai taluk, Tiruvallur District, and Tamil Nadu State.The boundary co-ordinates of the mine lease area are tabulated in**Table 1-4.**

Table 1-4 Boundary Coordinates of the project

S. No	Bourndary mark point	Latitude (N)	Longitude(E)
1	TM1	13° 08' 43.78885"	79° 22' 19.99560"
2	TM2	13° 08' 43.12050"	79° 22' 17.38983"
3	TM3	13° 08' 42.55537"	79° 22' 15.46697"
4	TM4	13° 08' 36.45017"	79° 22' 09.98429"
5	TM5	13° 08' 35.95086"	79° 22' 07.62999"
6	TM6	13° 08' 31.39320"	79° 21' 55.70592"
7	TM7	13° 08' 37.48106"	79° 21' 52.79036"
8	TM8	13° 08' 38.00054"	79° 21' 52.74116"
9	TM9	13° 08' 38.63447"	79° 21' 50.43990"
10	TM10	13° 08' 44.04464"	79° 22' 09.30544"
11	TM11	13° 08' 45.55966"	79° 22' 10.86256"
12	TM12	13° 08' 44.30443"	79° 22' 14.73641"
13	TM13	13° 08' 44.99091"	79° 22' 19.27821"

1.7.4 Connectivity of the Project

The project is situated at a distance of ~0.27km to Mahankalipuram Village towards North East direction one Major District Road- 580 is running from (Veeramangalam – Mahankalikapuram Ammayarkuppam Road) ~0.45km towards East of North East side of the lease area. The project site has well established connection facilities. The nearest railway station is Thalangai Railway station located at ≃ 17.07km towards South of South East direction. NH-40 (Kurnool-Ranipet) situated at distance of ≃ 20.03km in South of South West direction.

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

The granite dimensional stone material by virtue of its pleasing colour and texture and its best ability to take polishing and appealing looking polished product has attracted the consumers in the building

constructionandinteriordecorationindustries.Thedomesticmarketcapabilitieshavealsobeenexploredinrecentperiods. Bulk quantity of the blocks is produced and exported as raw block sand 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.

1.8.1 Demand –Supply Gap

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

1.8.2 Imports Vs Indigenous

There isno import of this granite material at present in India as we are having huge resources of this granite material particulary in South India.

1.8.3 Export possibility

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

1.8.4 Domestic/export markets

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

1.9 EIA Study

As a part of compliance to the regulatory requirement i.e., to obtain Environmental Clearance from SEIAA-TN, TAMIN has appointed Environmental Consultant accredited by National Accreditation

Board for Education and Training (NABET)-Quality Council of India (QCI), New Delhi. The work of undertaking field studies and preparation of EIA/EMP report under 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.

1.10 EIA Cost

EIA study was undertaken by HECS for an amount of Rs.1, 54, 225/- Lakhs.The base line monitoring was done by M/s. HECS lab, Chennai, an NABL and MoEF& CC Accredited Laboratory.

1.11 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 negative that, 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.

1.11.1 Objectives of the Study

- To ensure environmental considerations are explicitly addressed and incorporated into the development decision-making process.
- To anticipate and avoid, minimize or offset the adverse significant biophysical, social and other relevant effects of the above project proposal.
- To protect the productivity and capacity of natural systems and the ecological processes which maintain their respective functions
- To promote development that is sustainable and optimizes resource use as well as management opportunities.
- To fully recognize the scope and requirements of the ToR and comply with the same.
- The major objective of this study is to prepare a detailed Environmental Impact Assessment study within the study area i.e 10 km radius from the project.

1.11.2 Methodology adopted for the Study

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

1.11.3 Applicable Regulatory Framework

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

1. 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.

1.11.4 Legal Complicability

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

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

1.11.5 Terms of Refernce Compliance

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

1.11.5.1 Additional Terms of Reference:

<table>
<tr><th>S. No</th><th>Terms of Reference</th><th>Compliance</th></tr>
<tr><td>1.</td><td>The proponent shall submit the details of utilization of total quantity of granite Waste till the life of the quarry period for beneficial purpose.</td><td>As per the Mining Plan the Total quantity of waste till the life of the quarry is 132000 m³
The details of reserves given below:
<table>
<tr><th>S.No</th><th>Geological reserves (m³)</th><th>Mineable Reserves (m³)</th><th>Mineable saleable reserves @ 20% recovery (m³)</th></tr>
<tr><td>1.</td><td>13,11,180</td><td>6,46,064</td><td>1,29,213</td></tr>
</table>
<table>
<tr><th>Year</th><th>Overburden</th><th>ROM (m³)</th><th>Saleable Mineral (m³)</th><th>Mineral rejects (m³)</th></tr>
</table>
</td></tr>
</table>

			First	5349	25000	5000	20000
			Second	4585	30000	6000	24000
			Third	8803	35000	7000	28000
			Fourth	6962	37500	7500	30000
			Fifth	1270	37500	7500	30000
			Total	**26970**	**165000**	**33000**	**132000**

2.	The proponent shall submit the progressive mine closure & rehabilitation plan for the proposed granite mine.	Mine closure plan is discussed in **Chapter 7, Section 7.2.4.1** There is no proposal for back filling reclamation and rehabilitation in the proposed project as per the mining plan.
3.	The PP shall submit the Long term and short term ecological and environmental impacts due to storage, handling, and transportation of granite waste for beneficial purpose (or) otherwise.	Ecological and Environmental impacts due to proposed mining activity has been identified and the site specific impacts are discussed in Chapter 4
4.	The PP shall deliberate the possibility of utilizing the waste and any tailings obtained from the processing plant for the land back filling operations.	Waste Generation and its management: 1,32,000 m^3. These wastes will be proposed to dump on the South side of the lease area. The space available in the lease area for waste dump has been identified in the barren area. Mining Technology: Open cast semi mechanized mining.
5.	The PP shall provide the details on impact due to transportation of the granite waste on the access road and the equipments, and social impacts	**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. **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.**
6.	Proponent shall furnish the letter received from DFO concerned stating the proximity details of Reserve Forests, Protected Areas, Sanctuaries, Tiger reserve etc., up to a radius of 25 km from the proposed site.	DFO letter will be submitted during final EIA submission.
7.	Detailed study report on flora and fauna in and nearby the quarry site	Flora and Fauna study is discussed in **Chapter 3, Section 3.11**
8.	The Proponent shall develop greenbelt and garland drain around the boundary of the proposed quarry and the photographs indicating the same shall be shown during the EIA appraisal.	Proponent will provide the report for green belt developed with necessary photographs at the time of Final EIA submission.
9.	The Proponent shall carry out Bio diversity study through reputed Institution and the same shall be included in EIA Report.	Bio diversity study is discussed in **chapter 3,section 3.11.2**
10.	The structures within the radius of (i) 100 m, (ii) 300 m, and (iii) 500 m shall be enumerated with details such as dwelling houses with number of occupants, whether it belongs to the owner	Environmentally Sensitive Areas within 15km from Project Boundary is explained in **Table 3-1**.

	(or) not, places of worship, industries, factories, sheds, etc.	
11	The project proponent shall submit approved mining plan for the next spell of mining along with the EIA/EMP report.	The project proponent shall submit approved mining plan with the EIA/EMP report.
12	In the case of proposed lease in an existing (or old) quarry where the benches are not formed (or) partially formed as per the approved Mining Plan, the Project Proponent (PP) shall prepare and submit an 'Action Plan' for carrying out the realignment of the benches in the proposed quarry lease after it is approved by the concerned Asst. Director of Geology and Mining during the time of appraisal for obtaining the EC.	
13	The Proponent shall submit a conceptual 'Slope Stability Assessment' for the proposed quarry during the appraisal while obtaining the EC, when the depth of the proposed working is extended beyond 30 m below ground level.	Noted. The slope stability Assessment report will be submitted for the proposed quarry during the appraisal meeting of EC
14	The Proponent shall furnish the affidavit stating that the blasting operation in the proposed quarry is carried out by the statutory competent person as per the MMR 1961 such as blaster, mining mate, mine foreman, II/I Class mines manager appointed by the proponent	The blasting affidavit will be provided along with final EIA/ EMP report. Blasting operation will be discussed in **chapter 7 section 7.2.2.2 & 7.2.2.3**
15	TheProponent shall present a conc eptual design for carrying out only controlled blasting operation involving line drilling in the proposed quarry such that the blast-induced ground	The conceptual design for controlled blasting will be provided along with final EIA report. Open cast, semi-mechanized mining with 6m vertical bench with a bench width is 6m with vertical slope.Drilling and blasting operations are discussed in **chapter 7 section 7.2.2.**
16	The EIA Coordinators shall obtain and furnish the details of quarry/quarries operated by the	Noted

	proponent in the past, either in the same location or elsewhere in the State with video and photographic evidences.	
17	If the proponent has already carried out the mining activity in the proposed mining lease arca after 15.01.2016, then the proponent shall furnish the following details from AD/DD, mines, a. What was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines b. Quantity of minerals mined out. c. Highest production achieved in any one year d. Detail of approved depth of mining. e. Actual depth of the mining achieved earlier. f. Name of the person already mined in that leases area g. If EC and CTO already obtained, the copy of the same shall be submitted. h. Whether the mining was carried out as per the approved mine plan (or EC if issued). with stipulated benches.	Noted. The details mentioned will be obtained from AD/DD Mines and will be submitted along with final EIA report.
18	All comer coordinates of the mine lease area, superimposed on a High Resolution Imagery/Topo sheet, topographic sheet, geomorphology, lithology and geology of the mining lease area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	The boundary coordinate of the site is discussed in **Table2-2.** Topo map shown in **Figure 2-9.** Land use pattern is discussed in **chapter 2 Table 2-1.** Geomorpology map is discussed in **chapter 3,Section 3.5.7,Figure 3-13**
19	The Proponent shall carry out Drone video survey covering the cluster, Green belt, fencing	Proponent will provide the report for green belt developed with necessary videos done by drone survey at the time of Final EIA submission.
20	The proponent shall furnish	Site photographs of the proposed site are furnished in **Chapter 2,**

<table>
<tr><td></td><td>photographs of adequate fencing, green belt along the peripher including replantation of existing trees & safety distance between the adjacent quarries & water bodies nearby provided as per the approved mining plan</td><td>Section 2.3, Figure 2.2</td></tr>
<tr><td>21</td><td>The Project Proponent shall provide the details of mineral reserves and mineable reserves, planned production capacity, proposed working methodology with justifications, the anticipated impacts of the mining operations on the surrounding environment and the remedial measures for the same.</td><td>
<table>
<tr><th>S.No</th><th>Geological reserves (m^3)</th><th>Mineable Reserves (m^3)</th><th>Mineable saleable reserves @ 20% recovery (m^3)</th></tr>
<tr><td>1.</td><td>13,11,180</td><td>6,46,064</td><td>1,29,213</td></tr>
</table>
Yearwise Production details
<table>
<tr><th>S. No</th><th>Year</th><th>ROM (m^3)</th><th>Recovery @20% (m^3)</th><th>Granite Waste @ 80 % (m^3)</th></tr>
<tr><td>1</td><td>1st Year</td><td>25000</td><td>5000</td><td>20000</td></tr>
<tr><td>2</td><td>2nd Year</td><td>30000</td><td>6000</td><td>24000</td></tr>
<tr><td>3</td><td>3rd Year</td><td>35000</td><td>7000</td><td>28000</td></tr>
<tr><td>4</td><td>4th Year</td><td>37500</td><td>7500</td><td>30000</td></tr>
<tr><td>5</td><td>5th Year</td><td>37500</td><td>7500</td><td>30000</td></tr>
<tr><td colspan="2">Total</td><td>165000</td><td>33000</td><td>132000</td></tr>
</table>
Production Details:
Mineable Reserves have been worked out as 6,46,064 m^3 by applying the recovery factor 20%. The annual peak production per year would be 37,500m^3 of ROM of saleable and 33,000m^3 of ROM during the first five year of mining plan period at the rate of 20% recovery.

Waste Generation and its management: 1,32,000 m^3. These wastes will be proposed to dump on the South side of the lease area.

The space available in the lease area for waste dump has been identified in the barren area.

Mining Technology: Open cast semi mechanized mining. Impacts due to proposed Mining activity has been identified and the site specific impacts are discussed in Chapter 4
</td></tr>
<tr><td>22</td><td>The Project Proponent shall provide the Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of Mines Act 1952 and the MMR, 1961 for carrying out the quarrying operations scientifically</td><td>System Organistion chart and hierarchical System of the TAMIN is discussed in Chapter 10 and in Figure 10-1.</td></tr>
</table>

<table>
<tr><td></td><td>and systematically in order to ensure safety and to protect the environment.</td><td></td></tr>
<tr><td>23</td><td>The Project Proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within 1 km (radius) along with the collected water level data for both monsoon and non-monsoon seasons from the PWD/TWAD so as to assess the impacts on the wells due to mining activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided</td><td>Hydrogeological Study shall conducted and thje report will be submitted during EIA submission</td></tr>
<tr><td>24</td><td>The Proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality & flora/fauna including traffic/vehicular movement study.</td><td>Base line monitoring has been done for the period of Mid of January to Mid of April 2023 and the details of baseline study has been discussed in Chapter 3 Section 3.1.1
Traffic Stusdy is discussed iin Section 4.2.5
<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></tr><tr><td>Existing</td><td>252</td><td>457.85</td><td>1500</td><td>0.31</td></tr><tr><td>After implementation</td><td>272</td><td>505.8</td><td>1500</td><td>0.34</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.</td></tr>
<tr><td>25</td><td>The Proponent shall carry out the Cumulative impact study due to mining operations carried out in the quarry specifically with reference to the specific environment in terms of soil health, biodiversity, air pollution,</td><td>Impacts due to proposed Mining activity has been identified and the site specific impacts are discussed in Chapter 4 in Section 4.2</td></tr>
</table>

<table>
<tr><td></td><td>water pollution, climate change and flood control & health impacts. Accordingly, the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind.</td><td></td></tr>
<tr><td>26</td><td>Rain water harvesting management with recharging details along with water balance (both monsoon & non-monsoon) be submitted.</td><td>Water conservation measures:
Ground water occurrence in this area is 10.2m BGL due to scanty rainfall and subtropical climate. The quarry operation confined to 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.
Rainwater harvesting:
The rainwater will be diverted towards the middle of the mine to prevent water entering the mine working. The rainwater flows will also contain fines both from surface and waste dumps during seasonal flows. As such, it is proposed to have structures in such a way to act as settling pond and also for rainwater harvesting.
➢ 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>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>Crop land</td><td>159.96</td><td>39526.916</td><td>15996</td><td>47.59</td></tr>
<tr><td>Scrub land</td><td>66.13</td><td>16341.054</td><td>6613</td><td>19.67</td></tr>
<tr><td>Deciduous</td><td>28.34</td><td>7002.9557</td><td>2834</td><td>8.43</td></tr>
<tr><td>Scrub Forest</td><td>23.27</td><td>5750.1334</td><td>2327</td><td>6.92</td></tr>
<tr><td>Rural</td><td>21.48</td><td>5307.8154</td><td>2148</td><td>6.39</td></tr>
<tr><td>Water bodies</td><td>12.88</td><td>3182.7124</td><td>1288</td><td>3.83</td></tr>
<tr><td>Fallow</td><td>9.36</td><td>2312.9028</td><td>936</td><td>2.78</td></tr>
<tr><td>Barren rocky</td><td>4.78</td><td>1181.1619</td><td>478</td><td>1.42</td></tr>
<tr><td>Salt affected land</td><td>3.04</td><td>751.1992</td><td>304</td><td>0.90</td></tr>
<tr><td>Urban</td><td>2.64</td><td>652.3572</td><td>264</td><td>0.79</td></tr>
<tr><td>Mining</td><td>2.3</td><td>568.3415</td><td>230</td><td>0.68</td></tr>
</table></td></tr>
</table>

		Plantation | 1.88 | 464.5574 | 188 | 0.56 River/Stream/Canal | 0.08 | 19.7684 | 8 | 0.02 Total | 336.14 | 83061.875 | 33614 | 100 Land use/land coverof Study Areais given in **Chapter 3** and **Section 3.5.4.1, Table 3-3, 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-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:** **S. No | Land Use | Area to be required during the mining plan (Ha) | Area at the end of the quarrying period (Ha)** 1 | Area under Quarry | 2.57.0 | 3.59.0 2 | Road | 0.21.0 | 0.21.0 3 | ApproachRoad (Existing) | 0.16.5 | 0.16.5 4 | ApproachRoad Proposed | 0.46.5 | 0.21.5 5 | infrastructure | 0.10.0 | 0.10.0 6 | Waste Dump | 0.10.0 | 4.27.0 7 | Green belt | 0.06.0 | 0.28.5 8 | Un Utilizedarea | 12.37.0 | 6.64.0 **Total** | **15.47.5** | **15.47.5** A Land use detail of the quarry areais provided in **Chapter 2, Section 2.6, and Table 2.6**
28	Details of the land for storage of Overburden/Waste Dumps (or) Rejects outside the mine lease, such as extent of land area, distance from mine lease, its and use, R&R issues, if any, should be provided.	Waste Generation and its management: 1,32,000 m^3. These wastes will be proposed to dump on the South side of the lease area. The space available in the lease area for waste dump has been identified in the barren area. Mining Technology: Open cast semi mechanized mining. All the above mentioned documents are obtained in the name of Tamil Nadu Minerals only.
29	Proximity to Areas declared as 'Critically Polluted' (or) the Project areas which attracts the court restrictions for mining	There is no critical polluted area within 15km radius of the project site.

	operations, should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the TNPCB (or) Dept. of Geology and Mining should be secured and furnished to the effect that the proposed mining activities could be considered.	
30	Disscription 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.	**Water conservation measures:** Ground water occurrence in this area is 10.2m BGL due to scanty rainfall and subtropical climate. The quarry operation confined to 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. **Rainwater harvesting:** The rainwater will be diverted towards the middle of the mine to prevent water entering the mine working. The rainwater flows will also contain fines both from surface and waste dumps during seasonal flows. As such, it is proposed to have structures in such a way to act as settling pond and also for rainwater harvesting. ➢ 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**
31	Impact on local transport infrastructure due to the Project should be indicated.	Impact on local transport infrastructure due to the Project is discussed in Chapter 4 Section 4.2
32	A tree survey study shall be carried out (nos., name of the species, age, diameter etc.,) both within the mining lease applied area & 300m buffer zone and its management during mining activity.	Detailed study on Biological Environment of the study area is given in **Chapter 3, Section 3.11.**
33	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific.	Mine closure plan is discussed in **Chapter 7, Section 7.2.4.1** There is no proposal for back filling reclamation and rehabilitation in the proposed project as per the mining plan.
34	Public Hearing points raised and commitments of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be	Noted. The Action Plan with budgetary provision to implement the public hearing points and raised comments will be provided in final EIA report.

	provided and also incorporated in the final EIA/EMP Report of the Project and to be submitted to SEIAA/SEAC with regard to the Office Memorandum of MoEF& CC accordingly.	
35	The Public hearing advertisement shall be published in one major National daily and one most circulated vernacular daily.	The Public hearing advertisement will be published in National daily and in most circulated vernacular daily and the same will be attached in final EIA
36	The Proponent shall produce/display the EIA report, Executive summery and other related information with respect to public hearing in Tamil Language also.	Noted
37	As a part of the study of flora and fauna around the vicinity of the proposed site, the EIA coordinator shall strive to educate the local students on the importance of preserving local flora and fauna by involving them in the study, wherever possible.	Flora and Fauna study is discussed in **Chapter 3, Section 3.11**
38	The purpose of Greenbelt around the project is to capture the fugitive emissions, carbon sequestration and to attenuate the noise generated, in addition to improving the aesthetics. A wide range of indigenous plant species should be planted as given in the Aappendix-I in consultation with the DFO, & Tamil Nadu Agriculture University. The plant species with dense/moderate canopy of native origin should be chosen. Species of small/medium/tall trees alternating with shrubs should be planted in a mixed manner.	Proponent will provide the report for green belt developed with necessary photographs at the time of Final EIA submission.
39	Taller/one year old Saplings raised in appropriate size of bags, preferably eco-friendly bags should be planted as per the advice of local forest authorities/botanist/Horticulturist with regard to site specific choices. The proponent shall earmark the greenbelt area with GPS coordinates all along the boundary of the project site with at least 3 meters wide and in	Noted The GPS co-ordinates will be provided in final EIA report

	between blocks in an organized manner	
40	A Disaster management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period.	**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.**
41	A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period.	Risk Assessment and management Plan is discussed in Chapter 7 in Scetion 7.2
42	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	Occupational Health impacts and Safety Measures discussed in Chapter 10 in Section 10.12
43	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 detaled along with budgetary allocations	Occupational Health impacts & preventive measures details are given in **Chapter 4Section 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.

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

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></td><td>Total EMP Cost</td><td>2,05,000/-</td></tr>
</table>
</td></tr>
<tr><td>44</td><td>The Socio-economic studies should be carried out within a 5 km buffer zone from the mining activity. Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.</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.

Detailes of socio economic study is discussed in Chapter 3 in section 3.12
</td></tr>
<tr><td>45</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>Not Applicable</td></tr>
</table>

46	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.
47	If any quarrying operations were carried out in the proposed quarrying site for which now the EC is sought, the Project Proponent shall furnish the detailed compliance to EC conditions given in the previous EC with the site photographs which shall duly be certified by MOEF&CC, Regional Office, Chennai (or) the concerned DEE/TNPCB.	Noted
48	The Proponent shall prepare the EMP for the entire life of mine and also furnish the sworn affidavit stating to abide the EMP for the entire life of mine.	
49	Concealing any factual information or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this Terms of Conditions besides attracting penal provisions in the Environment (Protection) Act, 1986.	Noted

1.11.5.2 Standard Terms of Reference

S. No	Terms of Reference	Compliance
1	Year-wise production details since 1994 should be given, clearly stating the highest	It is fresh quarry. Government has issued Precise area communication letter to grant of lease for 20 years vide Letter .No.3162481/MME.1/2022-1, dated: 31.10.2022.

<table>
<tr>
<td></td>
<td>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>Precise area communication letter is enclosed as Annexure-I.
Granite Quarry Reserves

<table>
<tr><th>Description</th><th>Black Granite (m3)</th></tr>
<tr><td>Geological Resources</td><td>13,11,180</td></tr>
<tr><td>Mineable Reserves</td><td>6,46,064</td></tr>
<tr><td>Total production for five years as per the mining plan Granite</td><td>33,000</td></tr>
<tr><td>Granite Waste @ 80%</td><td>1,32,000</td></tr>
</table>

Yearwise Production details
<table>
<tr><th>S. No</th><th>Year</th><th>ROM (m³)</th><th>Saleable Mineral (m³)</th><th>Overburden (m³)</th><th>Mineral Rejects</th></tr>
<tr><td>1</td><td>First</td><td>25000</td><td>5000</td><td>5349</td><td>20000</td></tr>
<tr><td>2</td><td>Second</td><td>30000</td><td>6000</td><td>4585</td><td>24000</td></tr>
<tr><td>3</td><td>Third</td><td>35000</td><td>7000</td><td>8803</td><td>28000</td></tr>
<tr><td>4</td><td>Fourth</td><td>37500</td><td>7500</td><td>6962</td><td>30000</td></tr>
<tr><td>5</td><td>Fifth</td><td>37500</td><td>7500</td><td>1270</td><td>30000</td></tr>
<tr><td colspan="2">Total</td><td>165000</td><td>33000</td><td>26970</td><td>132000</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. 3162481/MME.1/2022-1, dated: 31.10.2022 is enclosed as Annexure–I.</td>
</tr>
<tr>
<td>3</td>
<td>All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.</td>
<td>Mining Plan Approval by Director, Department of Geology and Mining vide Rc.No.3178/MM4/2022, dated: 21.01.2023 attached as Annexure-II.

Mine Lease Area: 15.47.5 Ha

Yearwise Production details
<table>
<tr><th>S. No</th><th>Year</th><th>ROM (m³)</th><th>Recovery @20% (m³)</th><th>Granite Waste @ 80 % (m³)</th></tr>
<tr><td>1</td><td>1st Year</td><td>25000</td><td>5000</td><td>20000</td></tr>
<tr><td>2</td><td>2nd Year</td><td>30000</td><td>6000</td><td>24000</td></tr>
<tr><td>3</td><td>3rd Year</td><td>35000</td><td>7000</td><td>28000</td></tr>
</table>
</td>
</tr>
</table>

<table>
<tr><td></td><td></td><td>
<table>
<tr><td>4</td><td>4thYear</td><td>37500</td><td>7500</td><td>30000</td></tr>
<tr><td>5</td><td>5thYear</td><td>37500</td><td>7500</td><td>30000</td></tr>
<tr><td colspan="2">Total</td><td>165000</td><td>33000</td><td>132000</td></tr>
</table>
Production Details:
Mineable Reserves have been worked out as 6,46,064 m³ by applying the recovery factor 20%. The annual peak production per year would be 37,500m³ of ROM of saleable and 33,000m³ of ROM during the first five year of mining plan period at the rate of 20% recovery.

Waste Generation and its management: 1,32,000 m³. These wastes will be proposed to dump on the South side of the lease area.

The space available in the lease area for waste dump has been identified in the barren area.

Mining Technology: Open cast semi mechanized mining.
All the above mentioned documents are obtained in the name of Tamil Nadu Minerals only.
</td></tr>
<tr><td>4</td><td>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).</td><td>
<table>
<tr><th>S.No</th><th>Bourndary mark point</th><th>Latitude (N)</th><th>Longitude(E)</th></tr>
<tr><td>1</td><td>TM1</td><td>13° 08' 43.78885"</td><td>79° 22' 19.99560"</td></tr>
<tr><td>2</td><td>TM2</td><td>13° 08' 43.12050"</td><td>79° 22' 17.38983"</td></tr>
<tr><td>3</td><td>TM3</td><td>13° 08' 42.55537"</td><td>79° 22'15.46697"</td></tr>
<tr><td>4</td><td>TM4</td><td>13° 08' 36.45017"</td><td>79° 22' 09.98429"</td></tr>
<tr><td>5</td><td>TM5</td><td>13° 08'35.95086"</td><td>79° 22' 07.62999"</td></tr>
<tr><td>6</td><td>TM6</td><td>13° 08' 31.39320"</td><td>79° 21' 55.70592"</td></tr>
<tr><td>7</td><td>TM7</td><td>13° 08' 37.48106"</td><td>79° 21' 52.79036"</td></tr>
<tr><td>8</td><td>TM8</td><td>13° 08'38.00054"</td><td>79° 21'52.74116"</td></tr>
<tr><td>9</td><td>TM9</td><td>13° 08'38.63447"</td><td>79° 21'50.43990"</td></tr>
<tr><td>10</td><td>TM10</td><td>13° 08'44.04464"</td><td>79° 22' 09.30544"</td></tr>
<tr><td>11</td><td>TM11</td><td>13° 08'45.55966"</td><td>79° 22'10.86256"</td></tr>
<tr><td>12</td><td>TM12</td><td>13° 08' 44.30443"</td><td>79° 22'14.73641"</td></tr>
<tr><td>13</td><td>TM13</td><td>13° 08' 44.99091"</td><td>79° 22' 19.27821"</td></tr>
</table>
Topo sheet:D44N8

All corners co-ordinates of the mine lease area are given in Chapter 1 and Section 1.7.3, Table 1-4, Topo map inFigure 2-9
.
</td></tr>
<tr><td>5</td><td>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</td><td>It is a fresh quarry and It is a government poramboke land.Topo map prepared in 1:50000 scale and given as Figure 2-9.
Geomorphology Map of Study Area if given in Figure 3-13Geomorphologypattern of the study area is shown in Chapter 3, Section 3.5.5, Figure 3-12.
Hydrogeology of district is given in Chapter 3, Section 3.5.6 Figure 3-14.

Drainage map is shown in Chapter 3, Section 3.5.7,Figure 3-15.</td></tr>
</table>

<table>
<tr>
<td></td>
<td>characteristics.</td>
<td>
<table>
<tr><th>S.No</th><th>Places</th><th>Distance (≈km)</th><th>Direction</th></tr>
<tr><td>1.</td><td>Kalvai</td><td>Adjacent to Site</td><td>N</td></tr>
<tr><td>2.</td><td>Periya Nagapundi Lake</td><td>1.01</td><td>S</td></tr>
<tr><td>3.</td><td>Lake near Mahankalipuram</td><td>1.56</td><td>NNW</td></tr>
<tr><td>4.</td><td>Lake near Viramangalam</td><td>1.66</td><td>SSE</td></tr>
<tr><td>5.</td><td>Sholinghur Lake</td><td>5.06</td><td>SE</td></tr>
<tr><td>6.</td><td>Ramakrishnarajupet Lake</td><td>7.80</td><td>ENE</td></tr>
<tr><td>7.</td><td>Lake near Viranattur</td><td>8.67</td><td>E</td></tr>
<tr><td>8.</td><td>Nandi River</td><td>9.38</td><td>E</td></tr>
<tr><td>9.</td><td>Perunganji Lake</td><td>9.6</td><td>SSE</td></tr>
<tr><td>10.</td><td>Lake near Kondareddipalli</td><td>10.16</td><td>W</td></tr>
<tr><td>11.</td><td>Ponnai River</td><td>11.26</td><td>WSW</td></tr>
<tr><td>12.</td><td>Ponnai East Bank Main Canal</td><td>11.51</td><td>WSW</td></tr>
<tr><td>13.</td><td>Kallar River</td><td>12.06</td><td>SSE</td></tr>
</table>
</td>
</tr>
<tr>
<td>6</td>
<td>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.</td>
<td>It is a fresh quarry. Government has issued precise area communication letter for 20 years vide Government Industries,Investment Promotion & Commerce (MME.1) department,Letter No.3162481/MME.1/2022-1, dated: 31.10.2022. 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-III.
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 13,11,180 m^3.
Mineable Reserves have been computed as 6,46,064 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 1,29,213 m^3 by applying the recovery factor 20%. The annual peak production per year would be 37,500m^3 of ROM of saleable and 33,000m^3 of ROM during the first five year of Mining plan period at the rate of 20% recovery.
The peak annual production per year would be 7,500 m^3 of ROM during the first five year of Mining plan period at the rate of 20% recovery.</td>
</tr>
</table>

<table>
<tr><td></td><td></td><td>
<table>
<tr><th>S. No</th><th>Year</th><th>ROM (m^3)</th><th>Recovery @20% (m^3)</th><th>Granite Waste @ 80 % (m^3)</th></tr>
<tr><td>1</td><td>1st Year</td><td>25000</td><td>5000</td><td>20000</td></tr>
<tr><td>2</td><td>2nd Year</td><td>30000</td><td>6000</td><td>24000</td></tr>
<tr><td>3</td><td>3rd Year</td><td>35000</td><td>7000</td><td>28000</td></tr>
<tr><td>4</td><td>4th Year</td><td>37500</td><td>7500</td><td>30000</td></tr>
<tr><td>5</td><td>5th Year</td><td>37500</td><td>7500</td><td>30000</td></tr>
<tr><td colspan="2">Total</td><td>165000</td><td>33000</td><td>132000</td></tr>
</table>
The production details are provided in Chapter 2 Section 2.7.
</td></tr>
<tr><td>7</td><td>It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/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.</td><td>Environmental Policy of TAMIN is given in Chapter 10 Section 10.15.
➢ 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.</td></tr>
<tr><td>8</td><td>Issues relating to Mine safety, including subsidence study in</td><td>Mine Saftey and Mitigation Measures:</td></tr>
</table>

<table>
<tr>
<td></td>
<td>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.</td>
<td>
<table>
<tr><th>S. No</th><th>Activity</th><th>Mitigation measures</th></tr>
<tr><td>1</td><td>Excavation</td><td>➢ Planned excavation, avoid haphazard mining.</td></tr>
<tr><td>2</td><td>Drilling and blasting</td><td>➢ In addition, the operators and other workers should be provided with masks, helmets, gloves and earplugs.</td></tr>
<tr><td>3</td><td>Safety zone</td><td>➢ 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.</td></tr>
<tr><td>4</td><td>Overburden stabilization</td><td>➢ 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.</td></tr>
<tr><td>5</td><td>Worker’s health surveillance</td><td>➢ Health survey programmes for workers and local community.
➢ Regular training and awareness of employees to be conducted to meet health and safety objectives.</td></tr>
</table>

No underground mining method isproposed. 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 4.2.2.8.
➢ 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.
</td>
</tr>
<tr>
<td>9</td>
<td>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.</td>
<td>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</td>
</tr>
</table>

<table>
<tr><td></td><td></td><td>periphery and furnished in Chapter 3.

The production and waste generation details such asMineable Reserves have been worked out as 1, 29,213 m³ by applying the recovery factor 20%. The annual peak production per year would be 7,500m³ of ROM of saleable and 33,000m³ of ROM during the first five year of Mining plan period at the rate of 20% recovery.
The total waste to be generated during the 5 years of Mining plan period will be around 1, 32,000 m³. These wastes are proposed to be dumped on the South side of lease area.
Lease Period of the mine is 20 years.</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>Crop land</td><td>159.96</td><td>39526.916</td><td>15996</td><td>47.59</td></tr>
<tr><td>Scrub land</td><td>66.13</td><td>16341.054</td><td>6613</td><td>19.67</td></tr>
<tr><td>Deciduous</td><td>28.34</td><td>7002.9557</td><td>2834</td><td>8.43</td></tr>
<tr><td>Scrub Forest</td><td>23.27</td><td>5750.1334</td><td>2327</td><td>6.92</td></tr>
<tr><td>Rural</td><td>21.48</td><td>5307.8154</td><td>2148</td><td>6.39</td></tr>
<tr><td>Water bodies</td><td>12.88</td><td>3182.7124</td><td>1288</td><td>3.83</td></tr>
<tr><td>Fallow</td><td>9.36</td><td>2312.9028</td><td>936</td><td>2.78</td></tr>
<tr><td>Barren rocky</td><td>4.78</td><td>1181.1619</td><td>478</td><td>1.42</td></tr>
<tr><td>Salt affected land</td><td>3.04</td><td>751.1992</td><td>304</td><td>0.90</td></tr>
<tr><td>Urban</td><td>2.64</td><td>652.3572</td><td>264</td><td>0.79</td></tr>
<tr><td>Mining</td><td>2.3</td><td>568.3415</td><td>230</td><td>0.68</td></tr>
<tr><td>Plantation</td><td>1.88</td><td>464.5574</td><td>188</td><td>0.56</td></tr>
<tr><td>River/Stream/Canal</td><td>0.08</td><td>19.7684</td><td>8</td><td>0.02</td></tr>
<tr><td>Total</td><td>336.14</td><td>83061.875</td><td>33614</td><td>100</td></tr>
</table>
Land use/land coverof Study Areais given in Chapter 3 and Section 3.5.4.1, Table 3-3, 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-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.</td></tr>
</table>

<table>
<tr><td></td><td></td><td>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><th>Area at the end of the quarrying period (Ha)</th></tr>
<tr><td>1</td><td>Area under Quarry</td><td>2.57.0</td><td>3.59.0</td></tr>
<tr><td>2</td><td>Road</td><td>0.21.0</td><td>0.21.0</td></tr>
<tr><td>3</td><td>ApproachRoad (Existing)</td><td>0.16.5</td><td>0.16.5</td></tr>
<tr><td>4</td><td>ApproachRoad Proposed</td><td>0.46.5</td><td>0.21.5</td></tr>
<tr><td>5</td><td>infrastructure</td><td>0.10.0</td><td>0.10.0</td></tr>
<tr><td>6</td><td>Waste Dump</td><td>0.10.0</td><td>4.27.0</td></tr>
<tr><td>7</td><td>Green belt</td><td>0.06.0</td><td>0.28.5</td></tr>
<tr><td>8</td><td>Un Utilizedarea</td><td>12.37.0</td><td>6.64.0</td></tr>
<tr><td colspan="2">Total</td><td>15.47.5</td><td>15.47.5</td></tr>
</table>
A Land use detail of the quarry areais provided in Chapter 2, Section 2.6, and 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.
The total waste (Granite waste + Side Burden+Over Burden) to be generated during the 5 years of mining plan period will be around 1, 32,000 m^3. These wastes are proposed to be dumped on the South side of lease area.</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 the Expert Appraisal Committees.</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 Lr.No.3162481/MME.1/2022-1, dated: 31.10.2022. is enclosed as Annexure–1 to obtainlease period of mining for 20 years.</td></tr>
<tr><td>13</td><td>State of forestry clearance for the broken up area and virgin</td><td>No forest clearance is required. As there is no forest land involved in the lease applied area.</td></tr>
</table>

<table>
<tr><td></td><td>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></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>Amudala RF</td><td>4.42</td><td>NW</td></tr><tr><td>2</td><td>Pullur West PF</td><td>7.68</td><td>N</td></tr><tr><td>3</td><td>Pachigunta RF</td><td>9.31</td><td>NW</td></tr><tr><td>4</td><td>Vanganur RF</td><td>10.28</td><td>NE</td></tr><tr><td>5</td><td>Ammur RF</td><td>10.73</td><td>S</td></tr><tr><td>6</td><td>Santanavenugopalapuram Ext RF</td><td>11.17</td><td>ENE</td></tr><tr><td>7</td><td>Santanavenugopalapuram RF</td><td>11.2</td><td>ENE</td></tr><tr><td>8</td><td>Nochili Ext RF</td><td>12.63</td><td>NE</td></tr><tr><td>9</td><td>Nochili RF</td><td>12.98</td><td>NE</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 Corridors, Ramsar site Tiger/ Elephant</td><td>There are no National parks, Sanctuaries, Biosphere Reserves, Ramsar site Tiger/ Elephant Reserveswithin the 10km radius.

These are the only reserve forests within 15 Km of the project site.</td></tr>
</table>

<table>
<tr>
<td></td>
<td>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>The details of environmental sensitive areas covering within 15km from project boundary are given in Chapter 3 and section 3.4, Table 3-1 &Figure 3-3(a) &Figure 3-4(b).
<table>
<tr><th>S.No</th><th>Description</th><th>Distance (~km)</th><th>Direction</th></tr>
<tr><td>1</td><td>Amudala RF</td><td>4.42</td><td>NW</td></tr>
<tr><td>2</td><td>Pullur West PF</td><td>7.68</td><td>N</td></tr>
<tr><td>3</td><td>Pachigunta RF</td><td>9.31</td><td>NW</td></tr>
<tr><td>4</td><td>Vanganur RF</td><td>10.28</td><td>NE</td></tr>
<tr><td>5</td><td>Ammur RF</td><td>10.73</td><td>S</td></tr>
<tr><td>6</td><td>Santanavenugopalapuram Ext RF</td><td>11.17</td><td>ENE</td></tr>
<tr><td>7</td><td>Santanavenugopalapuram RF</td><td>11.2</td><td>ENE</td></tr>
<tr><td>8</td><td>Nochili Ext RF</td><td>12.63</td><td>NE</td></tr>
<tr><td>9</td><td>Nochili RF</td><td>12.98</td><td>NE</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:
The ecology and diversity survey were conducted in the core area and buffer area extend 10 km radius in the study area. It is observed that human settlements present in and surround the project site and within the study area of 10 km radius vegetation area is in agricultural, horticultural land and private plantation and some natural vegetation observed near the Kallar river and Ammur reserve forest. Total 263 species and 191 genres under 68 families were found in the study area.

The 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 3.20.

Fauna:

Both direct (sighting) and indirect (evidences) observations methods were used to survey the faunal species around the study area.
➢ Bird species
➢ Mammals</td>
</tr>
</table>

		➢ Reptiles & Amphibians ➢ Butterfly Species ➢ Aquatic Ecology List of Fauna in the Study Area are provided in **Chapter 3, Section 3.11.4, Table 3.20.**
19	Proximity to Areas declared 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 whereso required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.	Nil
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	The lease area is classified as Government Poramboke land. Precise area communications from Industries (MME.1) Department, Chennai vide Lr.No, 3162481/MME.1/2022-1,dated: 31.10.2022. is obtained from Govt.of Tamil Nadu for 20 years. There will beno Rehabilitation and Resettlement involved. Precise area communication letter isenclosed as **Annexure-1.**

<table>
<tr><td></td><td>their requirements and action 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.</td><td></td></tr>
<tr><td>22</td><td>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, particularly for free silica, should be given.</td><td>The primary baseline data monitored covered three (3) months i.e., from mid January 2023 – mid 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
<table>
<tr><th>Station Code</th><th>Location</th><th>Type of Wind</th><th>Distance (~km) from Project boundary</th><th>Azimuth Directions</th></tr>
<tr><td>A1</td><td>Project Site</td><td>-</td><td colspan="2">Within the Site</td></tr>
<tr><td>A2</td><td>Mahankalipuram</td><td>D/W</td><td>0.61</td><td>NE</td></tr>
<tr><td>A3</td><td>Chinnamaderi</td><td>D/W</td><td>3.36</td><td>NE</td></tr>
<tr><td>A4</td><td>Viramangalam</td><td>C/W</td><td>1.47</td><td>SE</td></tr>
<tr><td>A5</td><td>Chinna nagapundi</td><td>C/W</td><td>3.07</td><td>S</td></tr>
<tr><td>A6</td><td>Gangamambapuram</td><td>U/W</td><td>1.54</td><td>SW</td></tr>
<tr><td>A7</td><td>Iyyavarikandriga</td><td>C/W</td><td>3.43</td><td>W</td></tr>
<tr><td>A8</td><td>Virlagudi</td><td>C/W</td><td>6.18</td><td>N</td></tr>
</table>
The details of Ambient Air Quality Monitoring Locations, Results and Maps are provided in Chapter 3, Section 3.7, Table 3.7-</td></tr>
</table>

Table 3.9, Figure 3.22& Figure 3.23.

Noise:

Monitoring Locations

Station Code	Location	Distance (~km) from Project boundary	Azimuth Directions
N1	Project Site	Within Site	
N2	Mahankalipuram	1.07	E
N3	Chinnamaderi	2.49	E
N4	Viramangalam	9.59	SSW
N5	Chinna nagapundi	8	SW
N6	Gangamambapuram	5.32	WSW
N7	Iyyavarikandriga	1.69	W
N8	Virlagudi	3.71	N

The details of Noise Monitoring Locations, Results and Maps are provided in **Chapter 3, Section 3.8, Table 3.10, Figure 3.24.**

Water:

i. Surface Water:

Location Code	Locations	Distance from Project Boundary (~km)	Direction from project boundary
SW1	Kalvai	Project site	
SW2	Vengarajukuppam Lake	6.37	NNE
SW3	Ramakrishnarajupet Lake	7.91	ENE
SW4	Nandi River	9.52	E
SW5	Sholinghur Lake	5.71	SE
SW6	Periya Nagapundi Lake	1.26	S
SW7	Lake Near Pal Valasai	7.65	SSW
SW8	Lake Near Mahankalipuram	1.58	N

The details of Surface Water Monitoring Locations, Results and Maps are provided in **Chapter 3, Section 3.9.1, Table 3.13 &Table 3.14, Figure 3.25.**

ii. Ground Water:

Station Code	Location	Distance (km) from Project boundary	Azimuth Directions
GW1	Project Site	Within site	
GW2	Mahankalipuram	0.61	NE
GW3	Chinnamaderi	3.36	NE
GW4	Veeramangalam	1.47	SE
GW5	Chinna nagapundi	3.07	S
GW6	Gangamambapuram	1.54	SW
GW7	Iyyavarikandriga	3.43	W
GW8	Virlagudi	6.18	N

The details of Ground Water Monitoring Locations, Results and Maps are provided in **Chapter 3, Section 3.9.3, Table 3.15 to Table 3.16, Figure 3.27.**

Soil:

Location Code	Location	Distance (km) from Project boundary	Azimuth Directions
S1	Project Site	Within the site	
S2	Mahankalipuram	0.61	NE
S3	Chinnamaderi	3.36	NE
S4	Veeramangalam	1.47	SE
S5	Chinna nagapundi	3.07	S
S6	Gangamambapuram	1.54	SW
S7	Iyyavarikandriga	3.43	W
S8	Virlagudi	6.18	N

The details of soil Monitoring Locations, Results and Maps are provided in Chapter 3, Section 3.10, **Table 3.17&** Ta**ble 3.18, Figure 3.28.**

23	Air quality modelling should be	**Total maximum GLCs from emissions:**

carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of Vehicles for transportation of mineral. The details of the model used and input parameters used for modelling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.

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	223.13	34.43	257.56	500	15.43
PM_{10}	89.25	6.88	96.13	100	7.71
$PM_{2.5}$	49.09	4.12	53.21	60	8.39
SO_2	10.26	0.06	10.32	80	0.58
NO_X	20.46	0.16	20.62	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 223.13µg/m³, 89.25µg/m³, 49.09µg/m³10.26µg/m³, and 20.46µg/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 3.22.**

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
Existing	252	457.85	1500	0.31
After implementation	272	505.8	1500	0.34

*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>1.5</td></tr>
<tr><td>2</td><td>Wire Saw Cutting</td><td>0.5</td></tr>
<tr><td>3</td><td>Dust suppression</td><td>1.0</td></tr>
<tr><td>4</td><td>Green Belt</td><td>0.5</td></tr>
<tr><td colspan="2">Total</td><td>3.5</td></tr>
</table>
The total water requirement is sourced from Private tank suppliers. The details are shown in Chapter 2, Section 2.11.2,</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 10.2m BGL due to scanty rainfall and subtropical climate. The quarry operation confined to 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.
Rainwater harvesting:
The rainwater will be diverted towards the middle of the mine to prevent water entering the mine working. The rainwater flows will also contain fines both from surface and waste dumps during seasonal flows. As such, it is proposed to have structures in such a way to act as settling pond and also for rainwater harvesting.
➢ 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 40m AGL and the ground water is in 10.2m. 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:</td>
</tr>
</table>

		➢ 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. **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	The mining activity proposed in depth of 40m from the top of the hill. (ABL as per mining plan) Ground water table is available at 10.2m 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

<table>
<tr><td></td><td>groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should be obtained and copy furnished.</td><td>of the hill). Workable depth will be 40m from the top of the hill of height.</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 7.5m shall be maintained for the Patta lands.
➢ A safety distance of 10m shall be maintained for the Govt Poromboke land S.F.No: 331 &148 (Part).
➢ Details are provided in area precise communication letter is provided as Annexure-1.</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: 257m
Groundwater level is 10.2m depth in the summer. (As per mining plan)
Proposed Depth of Mining is 40m AGL given in the Mining Plan enclosed as Annexure-3.</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</td><td>About 0.06.00 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 4 section 4.7

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 (M3)</th><th>Survival rate expected</th><th>No. of trees expected to be grown</th></tr>
<tr><td>1st Year</td><td>20</td><td>Neem/Pungam</td><td>600</td><td>50%</td><td>10</td></tr>
</table></td></tr>
</table>

	done should be given. The plant species selected for greenbelt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.	2nd Year	20	Neem/Pungam	600	50%	10
		3rd Year	20	Neem/Pungam	600	50%	10
		4th Year	20	Neem/Pungam	600	50%	10
		5th Year	20	Neem/Pungam	600	50%	10
32	Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.	**Traffic volume after implementation of the project** **For the Road** / **Volume of Traffic** / **Volume (V)** / **Road Capacity (C)** / **V/C Ratio** Existing: 252 / 457.85 / 1500 / 0.31 After implementation: 272 / 505.8 / 1500 / 0.34 *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.**				
33	Details of the onsite shelter and	Sanitation facilities are provided to mines workers. An area of 0.10.0					

<table>
<tr>
<td></td>
<td>facilities to be provided to the mine workers should be included in the EIA Report.</td>
<td>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><th>Area at the end of the quarrying period (Ha)</th></tr>
<tr><td>1</td><td>Mining Area</td><td>2.57.0</td><td>3.59.0</td></tr>
<tr><td>2</td><td>Road</td><td>0.21.0</td><td>0.21.0</td></tr>
<tr><td>3</td><td>Approach Road (Existing)</td><td>0.16.5</td><td>0.16.5</td></tr>
<tr><td>4</td><td>Approach Road Proposed</td><td>0.46.5</td><td>0.21.5</td></tr>
<tr><td>5</td><td>infrastructure</td><td>0.10.0</td><td>0.10.0</td></tr>
<tr><td>6</td><td>Waste Dump</td><td>0.10.0</td><td>4.27.0</td></tr>
<tr><td>7</td><td>Green belt</td><td>0.06.0</td><td>0.28.5</td></tr>
<tr><td></td><td>Un Utilized area</td><td>12.37.0</td><td>6.64.0</td></tr>
<tr><td colspan="2">Total</td><td>15.47.5</td><td>15.47.5</td></tr>
</table>
Land use details of the quarry area aregiven in Chapter-2, Section 2.6.</td>
</tr>
<tr>
<td>34</td>
<td>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.</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>35</td>
<td>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.</td>
<td>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.</td>
</tr>
</table>

- 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.

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. All measures will be taken care for stabilization of Overburden.
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.

Occupational Health impacts & preventive measures detail given in **Chapter 4Section 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

<table>
<tr><td></td><td></td><td>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 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 4Section 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.
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➢ 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></td><td>Total EMP Cost</td><td>2,05,000/-</td></tr>
</table>
</td></tr>
</table>

<table>
<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>
<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>
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<tr><td></td><td>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>Draft EIA is prepared as per obtained ToR and will be submitted for public hearing to TNPCB.

After completing Public hearing and obtaining minutes the point wise proponent compliance will be enclosed.</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>Fixed Cost</td><td></td></tr>
<tr><td>1</td><td>Land Cost</td><td>Nil. Because Govt. land</td></tr>
</table></td></tr>
</table>

		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)** The project Cost is**99,97,000/-** as addressed in **Chapter 2** and **Section 2.8**
42	A Disaster Management Plan shall be prepared and include in the EIA/EMP Report.	**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	➢ The quarrying activities in this belt will benefit to the local

	be spelt out. The benefits of the project shall clearly indicate environmental, social, economic, employment potential, etc.	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 and continuous page numbering.	Noted and all documents addressed with properly referenced with index and continuous page numbers.
c)	Where data are presented in the report especially in Tables, the period in which the data were collected and the sources should be indicated.	Noted and sources for all tables are addressed.
d)	Project Proponent shall enclose all the analysis/testing reports of Water, Soil, Air, Noise etc. using the MoEF&CC/NABL 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, 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.	Noted
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	Noted

	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.	
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-4**

1.11.5.3 In addition to the above the following shall be furnished:

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

S. No	ToR Point	Compliance
1	Project name and location (village, District, State, Industrial Estate (if applicable)	Noted and will be followed
2	Process description in brief, specifically indicating the gaseous emission, liquid effluent and solid and hazardous waste.	Noted and will be followed
3	Measures for mitigation the impacts on the environment and mode of discharge or disposal	Noted and will be followed
4	Capital cost of the project, estimated time of completion.	Noted and will be followed
5	The proponent shall furnish the contour map of the water table detailing the number of wells located around the site and impacts on the wells due to mining activity	Noted and will be followed
6	A detailed study of the lithology of the mining lease area shall be furnished	Noted and will be followed
7	Detailed of village map" A" register and FMB sketch shall be furnished	Noted and will be followed
8	Detailed mining closure plan for the proposed projects approved by the Geology of Mining department shall be shall be submitted along with	Noted and will be followed

	EIA report	
9	Obtain a letter/certificate from the Assisstant Director of Geology and Mining standing that there is no other Minerals/resources like sand in the quarrying area within the approved depth of mining and below depth of mining and the same shall be furnished in the EIA report	Noted and is followed
10	EIA report should strictly follow the Environmental Impact Assessment Guidance Manual for Mining of Minerals published February 2010	Noted and will be followed
11	Details plan on rehabitation and reclamation carried out for the stabilization and restoration of the mined areas.	Noted and will be followed
12	The EIA study report shall include the surrounding mining activity, if any.	Noted and will be followed
13	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	Noted and will be followed
14	A study on the geological resources available shall be carried out and reported	Noted and will be followed
15	A specific study on agriculture and livelihood shall be carried out and reported	Noted and will be followed
16	Impact of soil erosion, soil physical chemical and biological property changes may be assumed	Noted and will be followed
17	Site selected for the project-Nature of land Agricultural (single/double crop), barren, Govt./private land, status of is acquisition, nearby (in 2-3km) water body, population, with in 10km other industries, forest, eco-sensitive zones, accessibility, (note-incase if industrial estate this information may not be necessary)	Noted and will be followed
18	Baseline environmental data-air quality, surface and ground water quality and soil characteristic, flora and fauna, socio economic conditions of the nearby population.	Noted and will be followed
19	Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.	Noted and is followed
20	Likely impact of the project on Air, Water, Land, flora and fauna and nearby population.	Noted and will be followed
21	Emergency preparedness plan in case of natural or in case of plant emergencies.	Noted and will be followed
22	Issues raised during public hearing (if applicable) and response giving.	Noted and will be followed

23	CER plan with proposed expenditure.	Provision for CER activities will be implemented as per MoEF&CC O.M dated20th October, 2020 (F.No. 22-65/2017-IA.III):
24	Occupational Health Measures.	Noted and will be followed
25	Post project monitoring plan.	Noted and will be followed
26	The project proponent shall carry out detailed hydro geogical study through instituitions/NABET Accredited agencies.	Noted and will be followed
27	A detailed report on the greenbelt development already undertaken is to be furnished and also submit the proposal for greenbelt activities	Noted and will be followed
28	The proponent shall propose the suitable control measure to control the fugitive emissions during the operations of the mines	Noted and will be followed
29	A specific study should include impact on flora and fauna, disturbance to migratory pattern of animals	Noted and will be followed
30	Reserve funds should be earmarked for proper closure plan	Noted and will be followed
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.	Noted and will be followed

1.11.5.4 Besides the above the below mentioned general points should also be followed:

S. No	ToR Point	Compliance
a.	A note containing compliance of the ToR with cross referencing of the relevant sections/pages of the EIA report should be provided.	Noted and will be followed
b.	All documents mat be properly referenced with index, page number and continuous page numbering.	Noted and will be followed

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.	Noted and will be followed
d.	While preparing the EIA report, the instructions for the proponents and instruction for the consultant issued by the MoEF vide OM no. J-11013/41/2006-IA.II (I) dated 4th August 2009 which are available on the website of the ministry should also be followed.	Noted and will be 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 black granite quarrying operation is proposed to carry out by opencast semi mechanized method by formation of benches. Benches are proposed with a height of 6m &6 m width with vertical slopes. The area applied for quarry lease exhibits hilly terrain; the altitude of the area is above (~257) AMSL. Total estimated Geological reserves are 13,11,180 m^3. Total Mineable Reserves is estimated as 6,46,064 m^3. Maximum production will be 37,500 m^3 of ROM of Black Granite and 7500 m^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 15.47.5 Ha. The Quarry is located at Veeramangalam'B' & Mahankalikapuram Village, R.K. Pettai Taluk, Tiruvallur District, Tamilnadu State. Quarry lease area falls in the survey of India Topo sheet no D44N8 and the area lies in the Eastern Longitude from 79°22'50.43990"E to 79°22'19.99560"E and Northern latitude from 13°08'31.39320"N to 13°08'45.55996"N.

Table 2-1 Summary of Project Reserves

S. No	Description	Quantity (m^3)
Geological Reserves:		
1	Geological Reserves (ROM)	13,11180
Mineable Reserves:		
1	Mineable Reserves (ROM)	6,46,064
2	Mineable Reserves (at 20 % Recovery)	1,29,213
3	The peak/maximum annual production per year would be	7,500

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 SF.No.331 of Veeramangalam 'B' & 148 (Part) of Mahankalikapuram, Veeramangalam'B'& Mahankalikapuram village, R.K.Pettai Taluk, Tiruvallur District,Tamil Nadu State.Quarry lease area falls in the survey of India Topo sheet D44N8 and the area lies in the eastern Longitude from 79°22'50.43990"E to79°22'19.99560"E and Northern latitude from 13°08'31.39320"N to 13°08'45.55996"N. The topography of the area is hilly. The elevation of the lease area is ≃257m AMSL.The boundary coordinates of the site are shown in the **Table 2.2.**

Table 2-2 The Boundary Coordinates of the Site

S. No	Bourndary mark point	Latitude (N)	Longitude(E)
1	TM1	13° 08' 43.78885"	79° 22' 19.99560"
2	TM2	13° 08' 43.12050"	79° 22' 17.38983"
3	TM3	13° 08' 42.55537"	79° 22' 15.46697"
4	TM4	13° 08' 36.45017"	79° 22' 09.98429"
5	TM5	13° 08' 35.95086"	79° 22' 07.62999"
6	TM6	13° 08' 31.39320"	79° 21' 55.70592"
7	TM7	13° 08' 37.48106"	79° 21' 52.79036"
8	TM8	13° 08' 38.00054"	79° 21' 52.74116"
9	TM9	13° 08' 38.63447"	79° 21' 50.43990"
10	TM10	13° 08' 44.04464"	79° 22' 09.30544"
11	TM11	13° 08' 45.55966"	79° 22' 10.86256"
12	TM12	13° 08' 44.30443"	79° 22' 14.73641"
13	TM13	13° 08' 44.99091"	79° 22' 19.27821"

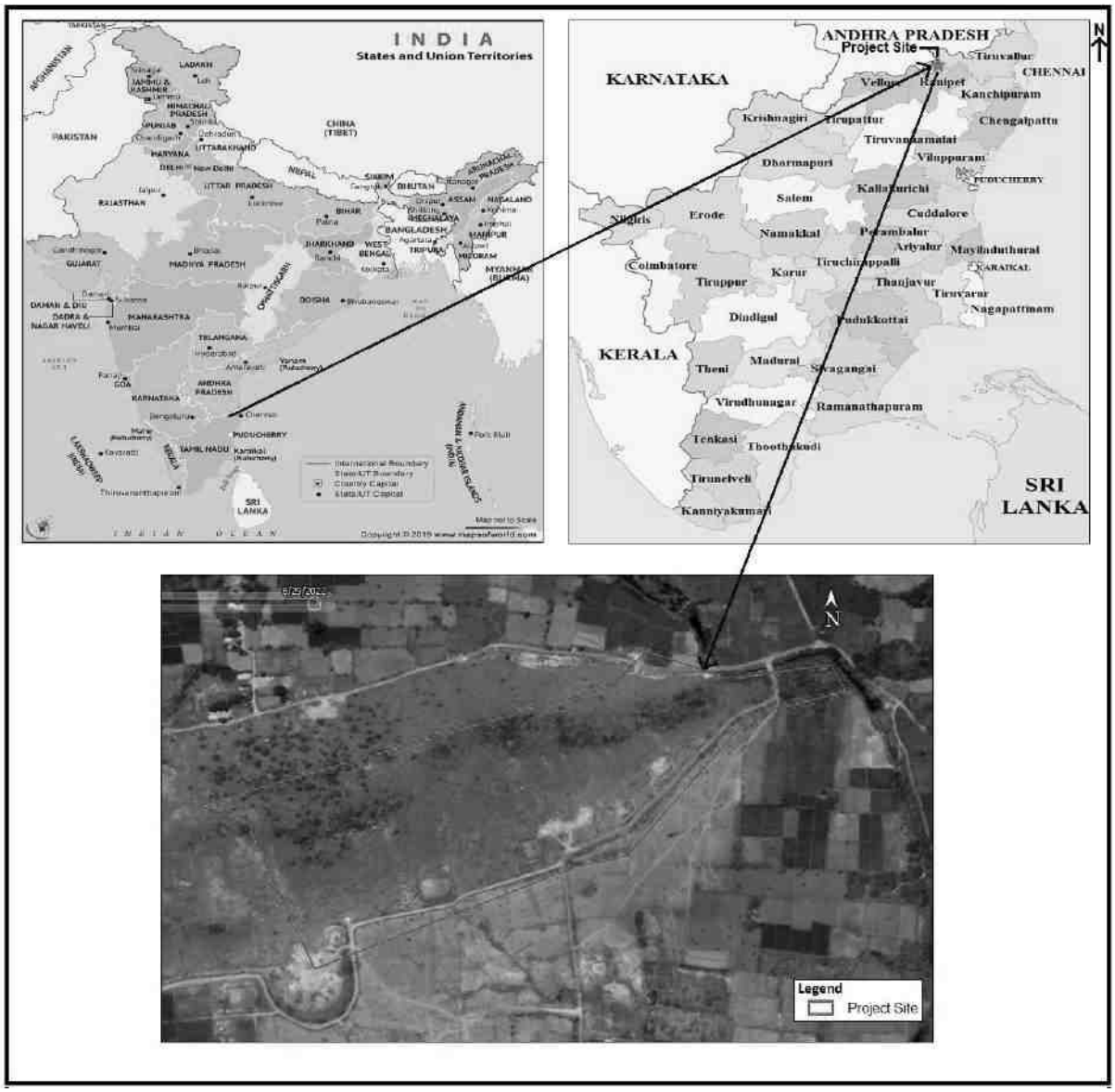


Figure 2-1Project Location map

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

Figure 2-3500m radius Google imagery of the lease area

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

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

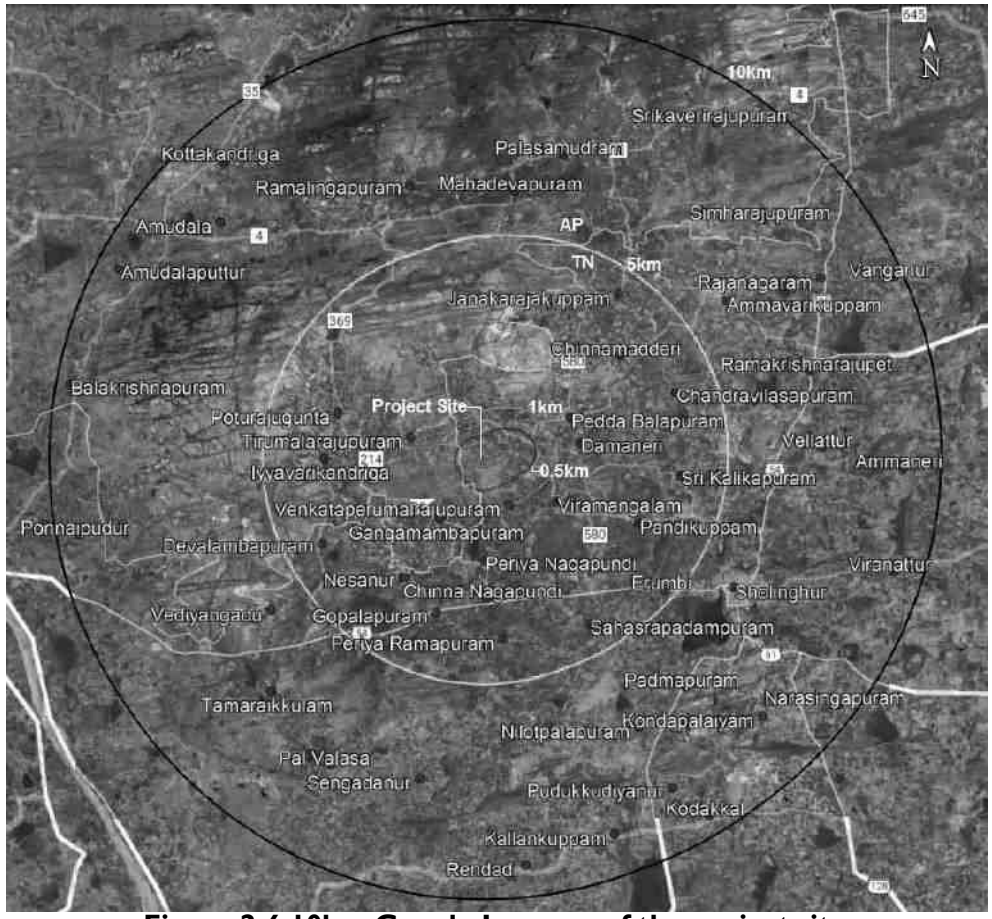


Figure 2-6 10km Google Imagery of the project site

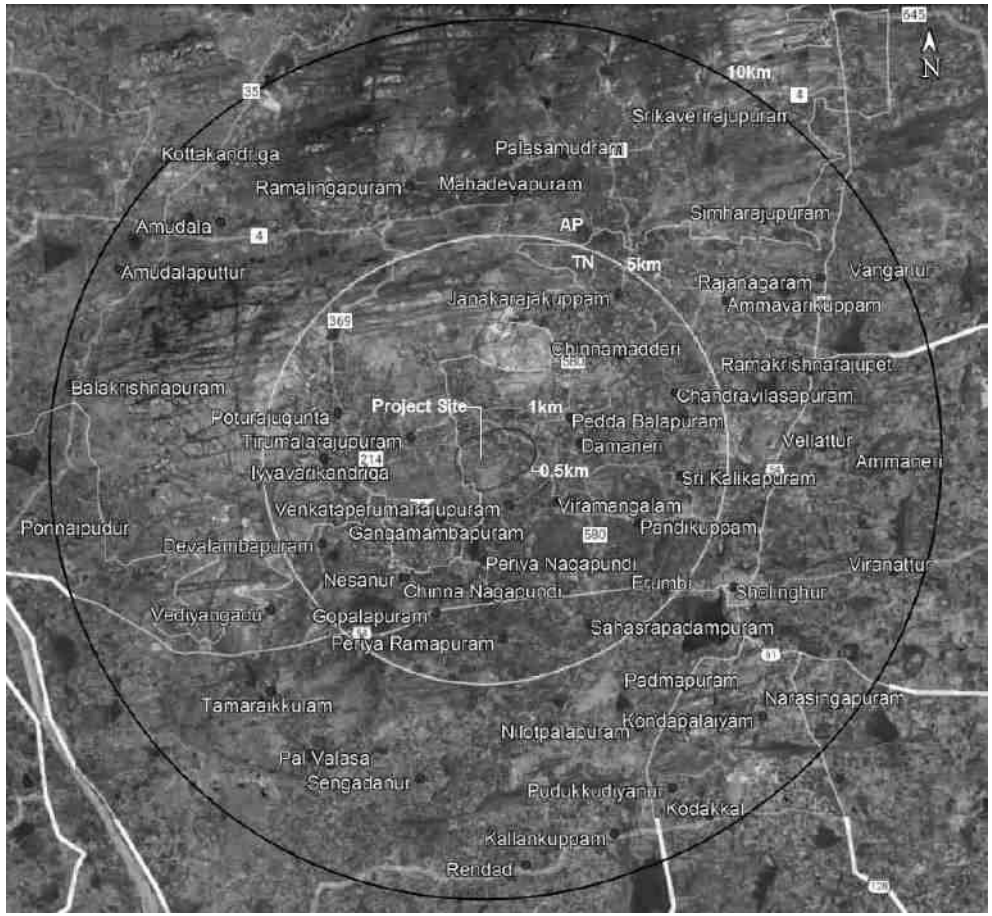


Figure 2-7 Environmental Sensitive areas within 15km radius of the lease area demarcated on Google Image

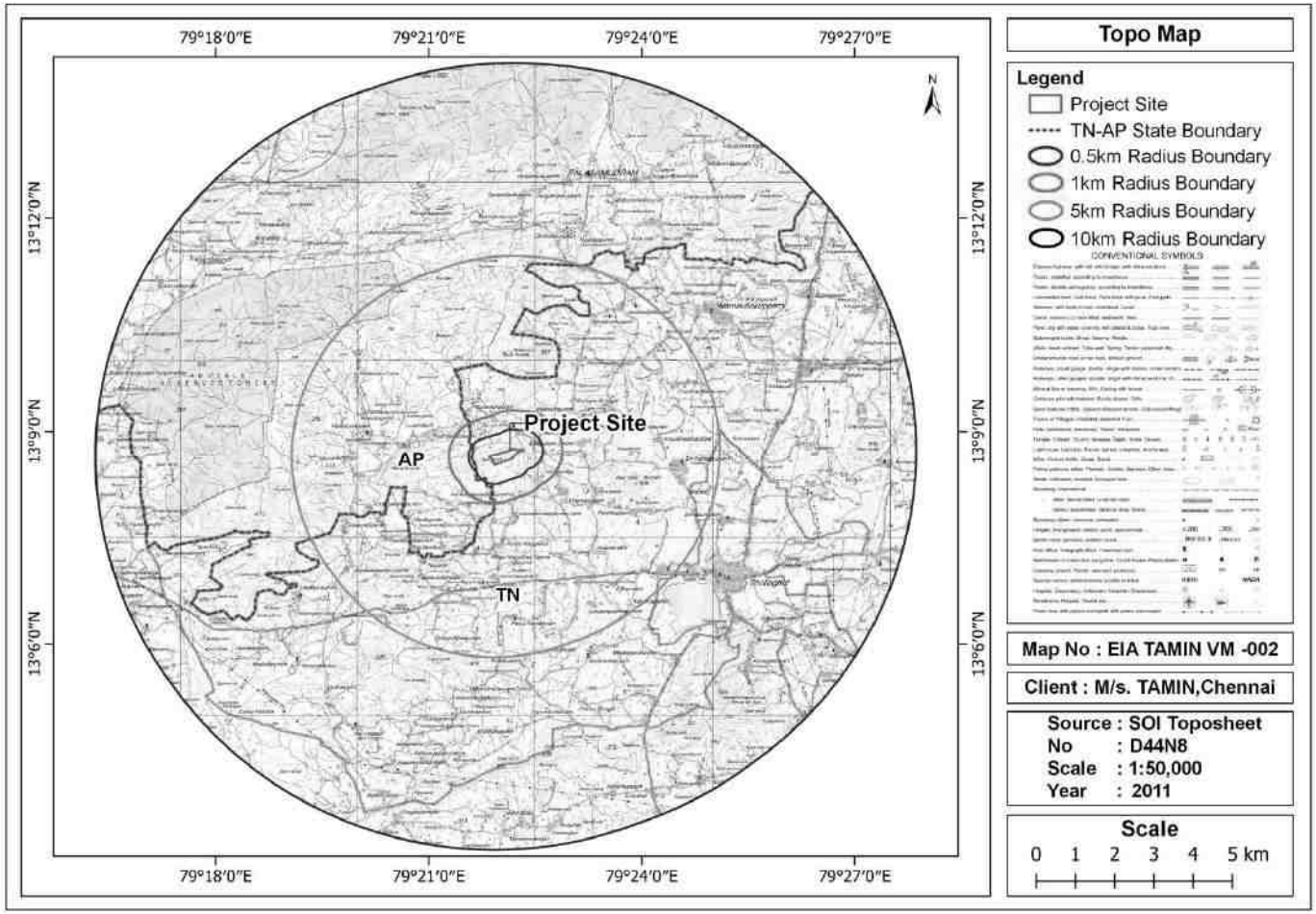


Figure 2-9 Topo map of the study area

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

S. No	Particulars	Details
1	Latitude	79°22'50.43990"E to 79°22'19.99560"E
2	Longitude	13°08'31.39320"N to 13° 08'45.55996"N
3	The lease area height	257m
4	Topo sheet no.	D44N8
5	Topography	Hilly terrain
6	Land Type	Government Poramboke land
7	Extent of lease area(hectares)	15.47.5
8	Nearest National highway	NH40(Kurnool-Ranipet) ~ 20.03km, SSW
9	Nearest State highway	SH 54 (Chittoor-Sholinghur-Thiruttani) ~ 3.10km, NNE
10	Nearest railway station	Thalangai Railway station ~ 17.07km, SSE
11	Nearest airport	Tirupati International Airport~ 55.55km, NNE Vellore Airport ~ 40.96km, SW
12	Nearest town / city	Town-Sholinghur~4.5km, SE City-Vellore~28,SW
13	Hills / valleys	Nil within 15 km radius from the project boundary
14	Archaeologically important Places	Nil within 15 km radius from the project boundary
15	National parks / WildlifeSanctuaries	Nil within 15 km radius from the project boundary
16	Reserve Forest	
17	Water Bodies	

S.No	Places	Distance (≈km)	Direction
1.	Amudala RF	4.42	NW
2.	Pullur West PF	7.68	N
3.	Pachigunta RF	9.31	NW
4.	Vanganur RF	10.28	NE
5.	Ammur RF	10.73	S
6.	Santanavenugopala puram Ext RF	11.17	ENE
7.	Santanavenugopala puram RF	11.2	ENE
8.	Nochili Ext RF	12.63	NE
9.	Nochili RF	12.98	NE

S.No	Places	Distance (≈km)	Direction
1.	Kalvai	Adjacent to Site	N
2.	Periya Nagapundi Lake	1.01	S
3.	Lake near Mahankalipuram	1.56	NNW
4.	Lake near Viramangalam	1.66	SSE
5.	Sholinghur Lake	5.06	SE
6.	Ramakrishnarajupet Lake	7.80	ENE
7.	Lake near Viranattur	8.67	E
8.	Nandi River	9.38	E
9.	Perunganji Lake	9.6	SSE

S. No	Particulars	Details			
		10.	Lake near Kondareddipalli	10.16	W
		11.	Vanganur RF	10.28	NE
		12.	Ammur RF	10.73	S
		13.	Santanavenugopalapuram Ext RF	11.17	ENE
		14.	Santanavenugopalapuram RF	11.2	ENE
		15.	Nochili Ext RF	12.63	NE
		16.	Nochili RF	12.98	NE

18	Nearest Villages	S. No	Places	Distance (≈km)	Direction	Population
		1.	Mahankalipuram	0.27km	NE	2,215
		2.	Ramrajkandigai	0.69km	SSE	50
		3.	Venkataperumalrajupuram	0.91km	S	400
		4.	Viramangalam	1.18km	SE	4,754
		5.	Pedda Balapuram	1.19km	NE	1,000
19	Seismicity	Seismic zone-III (moderate risk)				
20	Defense Installations	Nil within 15 km radius				
21	State Boundary	TN – AP State Boundary ~ 0.39km, W				
22	Monuments	Nil within 15 km radius				

Table 2-4 Project summary

S. No	Particulars	Details
1.	Project Location	S.F.No.331&148(Part), Veeramangalam'B' & Mahankalikapuram village, R.K.Pettai Taluk, Tiruvallur District, TamilNadu State.
2.	Land classification	Government Land
3.	Extent of lease area (Ha.)	15.47.5
4.	Precise area communication	Precise area communication letter was granted vide Industries (MME.1) Department, Rc. No. 3178/MM4/2022, dated: 21.01.2023.
5.	Lease Period	20 years
6.	Estimated Geological Reserves (ROM) m^3	13,11,180
7.	Estimated Mineable Reserves (ROM) m^3	6,46,064
8.	Black Granite production per annum m^3	7,500
9.	Depth of Mining	40m from the surface level and the top surface of the granite body
10.	Method of Mining	Open cast semi mechanized method
11.	Water Requirement (KLD)	3.5
12.	Source of Water	Road tankers
13.	Power requirement (kVA)	60
14.	Power Backup (DG set)Kva	1* 125

15.	Fuel requirements (Lts/Day)	200
16.	Direct Manpower (Nos)	30
17.	Municipal Solid Waste Generation (kg/day)	13.5
18.	Waste Oil generation (Lts/Year)	3.0
19.	Project Cost in Lakhs	99.97
20.	EMP Cost in Lakhs	2.05

2.4 Nearest Human Settlement

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

Table 2-5 Nearest Human Settlement

S.No	Places	Distance (~km)	Direction	Population
1.	Mahankalipuram	0.27km	NE	2,215
2.	Ramrajkandigai	0.69km	SSE	50
3.	Venkataperumalrajupuram	0.91km	S	400
4.	Viramangalam	1.18km	SE	4,754
5.	Pedda Balapuram	1.19km	NE	1,000

2.5 Details of alternate sites considered

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

2.6 Size or Magnitude of operation

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

The Geological reserves of Black granite have been computed based on the Geological Plan &Sections up to the economically workable average depth of 40m from the surface level and the top surface of the granite body works out to 13,11,180 m^3.

Mineable Reserves have been computed as 6,46,064 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 1,29,213 m^3 by applying the recovery factor 20%. The annual peak production per year would be 7,500m^3 of ROM of saleable and 33,000m^3 of ROM during the first five year of Mining plan period at the rate of 20% recovery.

Total waste(Granite waste + Side Burden to be generated during the five years of Mining Plan period will be around 1,32,000m³. These wastes are proposed to be dumped on the South eastern side of lease area. The Land Use break up summarized as **Table 2.6.**

Table 2-6 Land use details of the quarry area

S. No	Land Use	Area to be required during the mining plan(Ha)	Area at the end of the quarrying period (Ha)
1	Mining Area	2.57.0	3.59.0
2	Road	0.21.0	0.21.0
3	Approach Road (Existing)	0.16.5	0.16.5
4	Approach Road Proposed	0.46.5	0.21.5
5	infrastructure	0.10.0	0.10.0
6	Waste Dump	0.10.0	4.27.0
7	Green belt	0.06.0	0.28.5
8	Un Utilized area	12.37.0	6.64.0
	Total	**15.47.5**	**15.47.5**

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 40m from the surface level and the top surface of the granite body works out to 13,11,180 m³.

Mineable Reserves have been computed as 6,46,064 m³ after deleting the reserves locked up in safety barrier and benches based on the Conceptual Plan and sections, the effective(Saleable) Mineable Reserves have been worked out as 1,29,213 m³ by applying the recovery factor 20%. The annual peak production per year would be 7,500m³ of ROM of saleable and 33,000m³ of ROM during the first five year of Mining plan period at the rate of 20% recovery.Sectional plates are enclosed as **Annexure-IV.**

The generation of total waste estimated about 1, 32,000m3 and the dumps will be maintained not exceeding 5m height and the angle of slope of dumps will be at 45° from horizontal.The area for disposal of waste rock has been identified by extending the existing waste dump on south side of the lease area.The unsold blocks are kept within the boundary on the country rock area.

The total waste (Granite waste + Side Burden+Over Burden) to be generated during the 5 years of Mining plan period will be around 1,32,000 m³. These wastes are proposed to be dumped on the South side of lease area. Granite Quarry Reserves is given in **Table 2-7.** The yearwise production details are given in the**Table 2.8**.Surface Plan of the Quarry is given in **Figure 2.8**Geological plan and cross section of the quarry is shown in **Figure 2.9.** Conceptual Plan of the quarry area is shown as**Figure 2.14.** Land use and afforestation of the quarry is shown as **Figure 2.11.** Year wise

production plan is shown as **Figure 2.12.**

Table 2-7 Granite Quarry Reserves

S. No	Geological Resource	Mineable Reserves	Mineable Saleable Reserves @20% Recovery	Granite waste 80% (m^3)
1	13,11,180	6,46,064	1,29,213	1,32,000

Table 2-8 Yearwise Production details

S.No	Year	ROM (m^3)	Recovery@20% (m^3)	Granite Waste @ 80%
1	1st Year	25,000	5,000	20,000
2	2nd Year	30,000	6,000	24,000
3	3rd Year	35,000	7,000	28,000
4	4th Year	37,500	7,500	30,000
5	5th Year	37,500	7,500	30,000
Total		**1,65,000**	**33,000**	**1,32,000**

Estimated Life of the Quarry:

- Proposed ROM: 1,65,000 m^3
- Recoverable Reserved @20%: 33,000 m^3
- Average Prodution per Year@20%: 30,197/15 Years= 2,052 m^3
- Estimated Life of the Quarry: 30,197/2,052 m^3=15 years

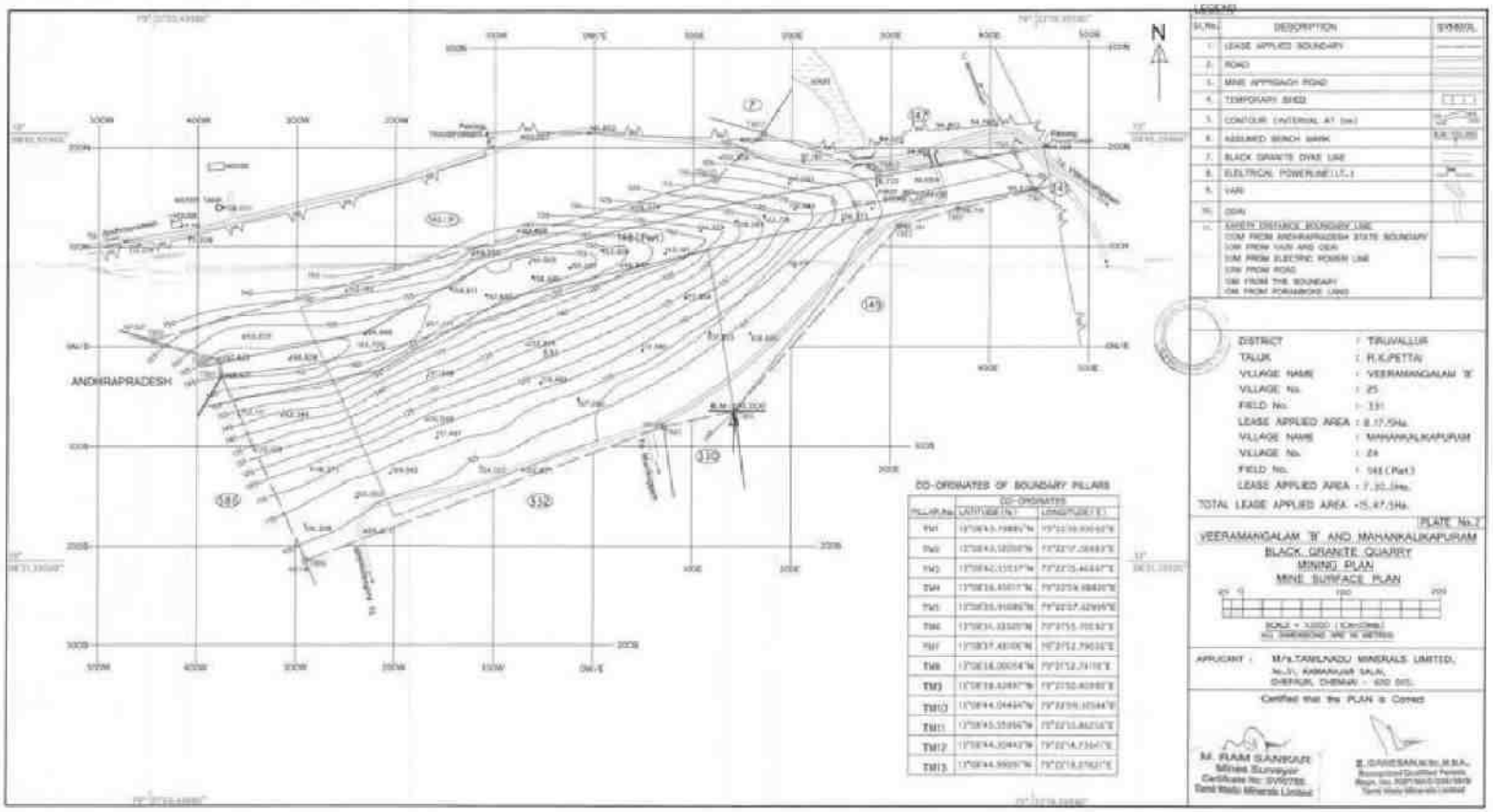


Figure 2-8 Surface Plan of the Quarry

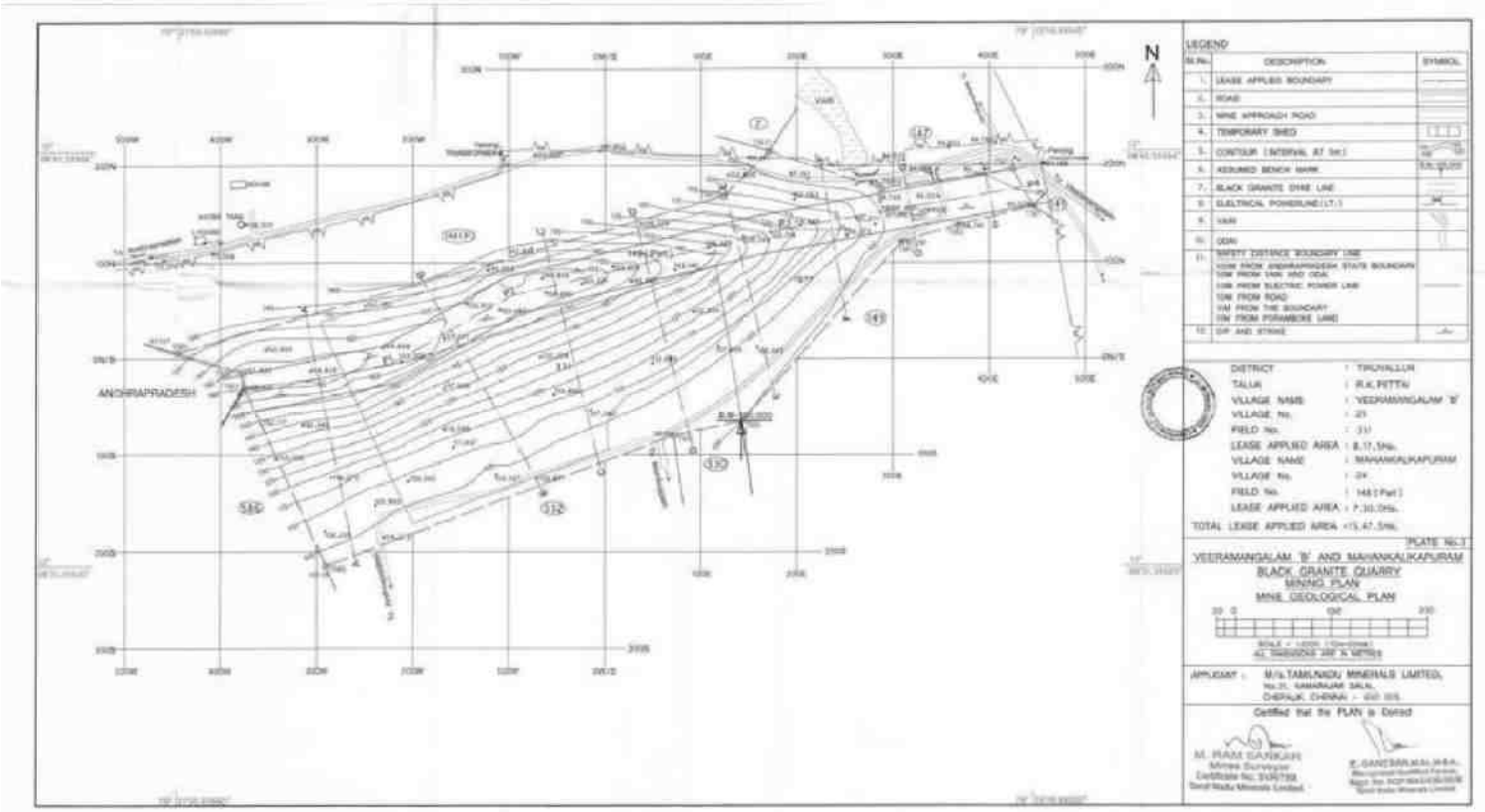


Figure 2-9 Geological plan of the quarry

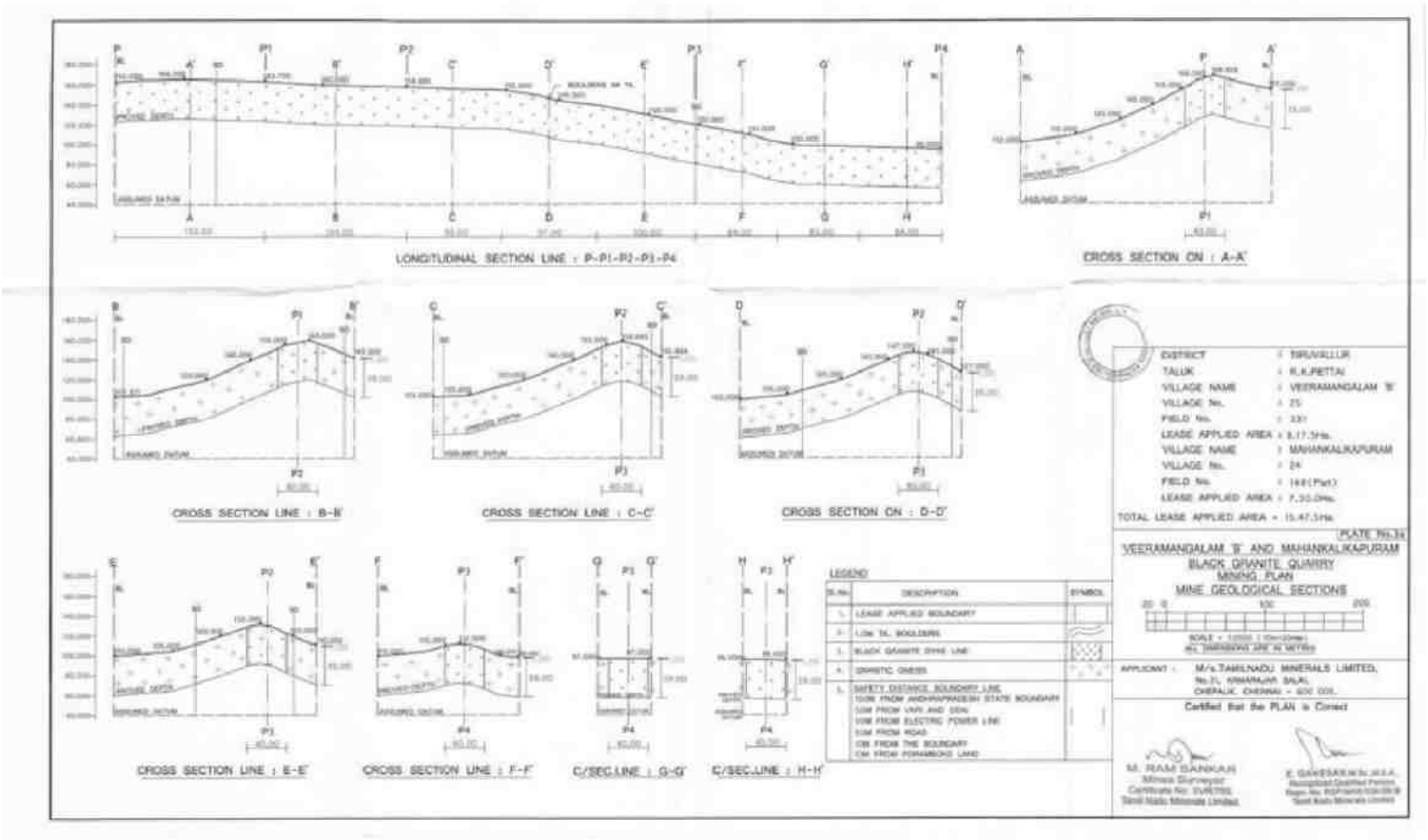


Figure 2-10 Geological Section of the quarry

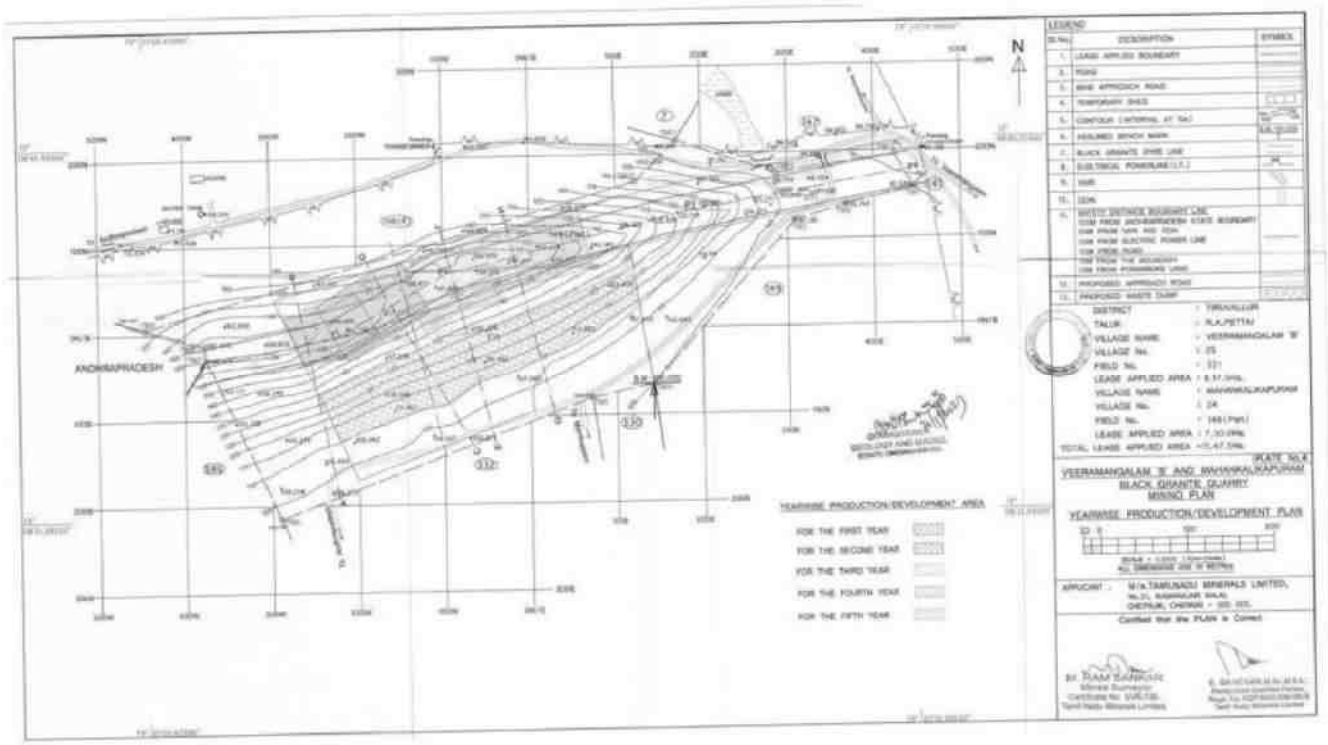


Figure 2-11 Yearwise Production/Development Plan for 5 years

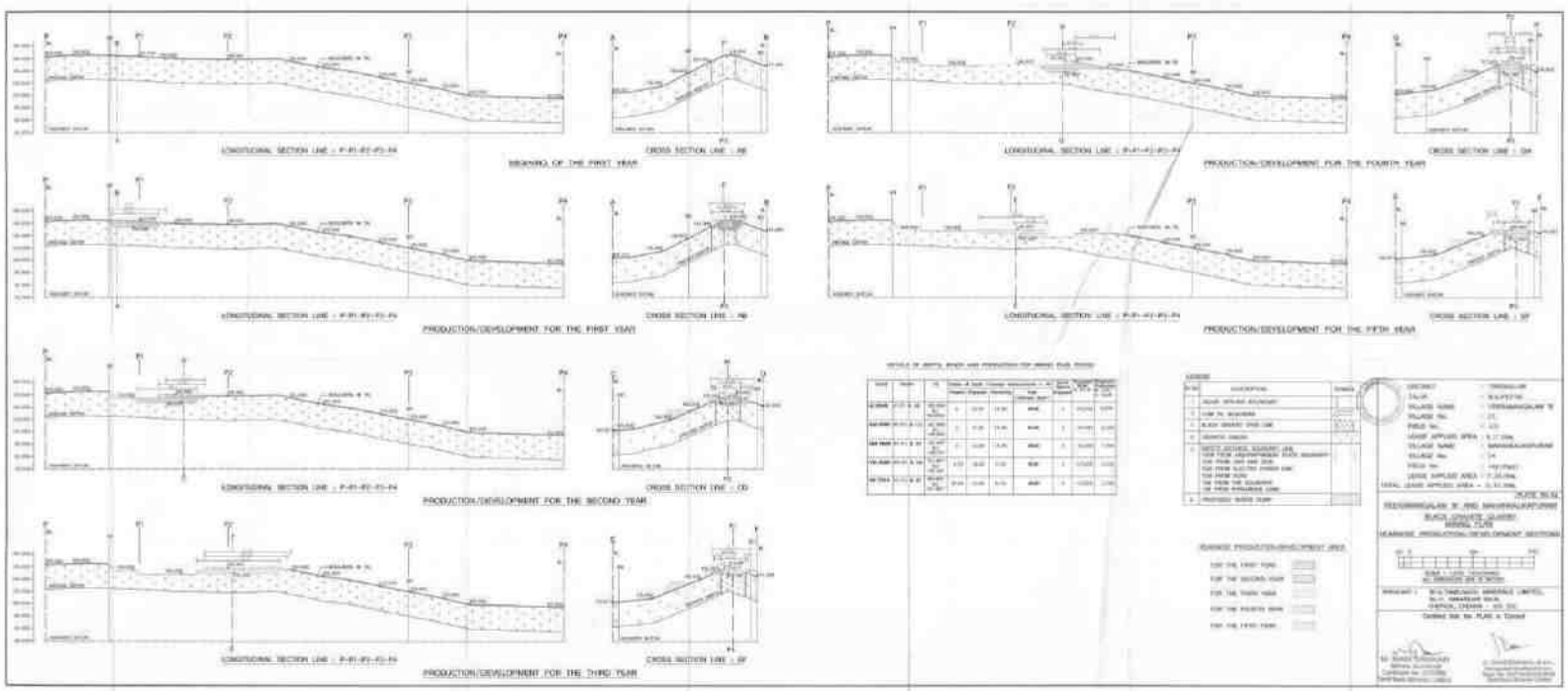


Figure 2-12 Yearwise Production/Development Section for 5 years

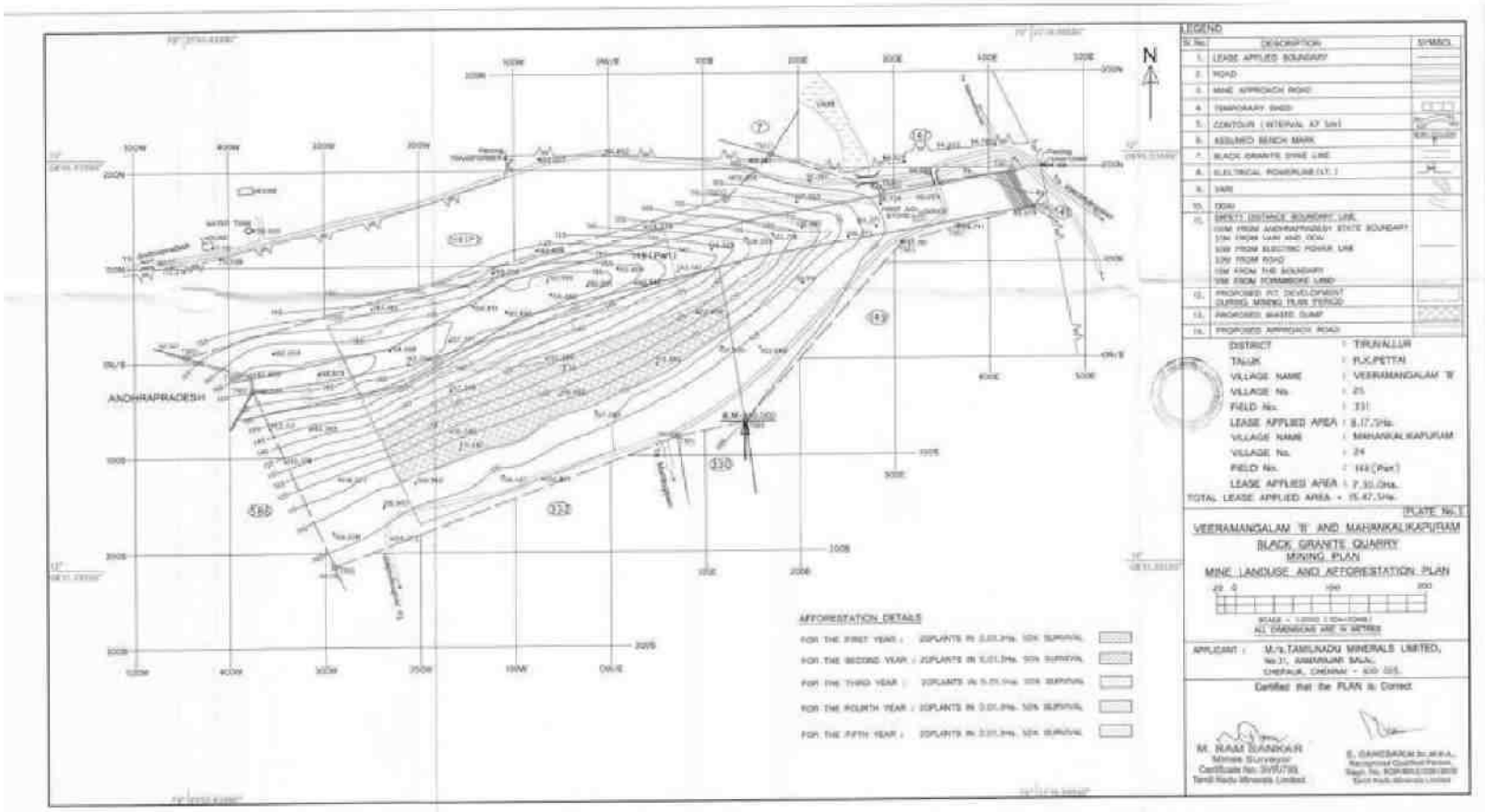


Figure 2-13 Land Use and Afforestation Plan

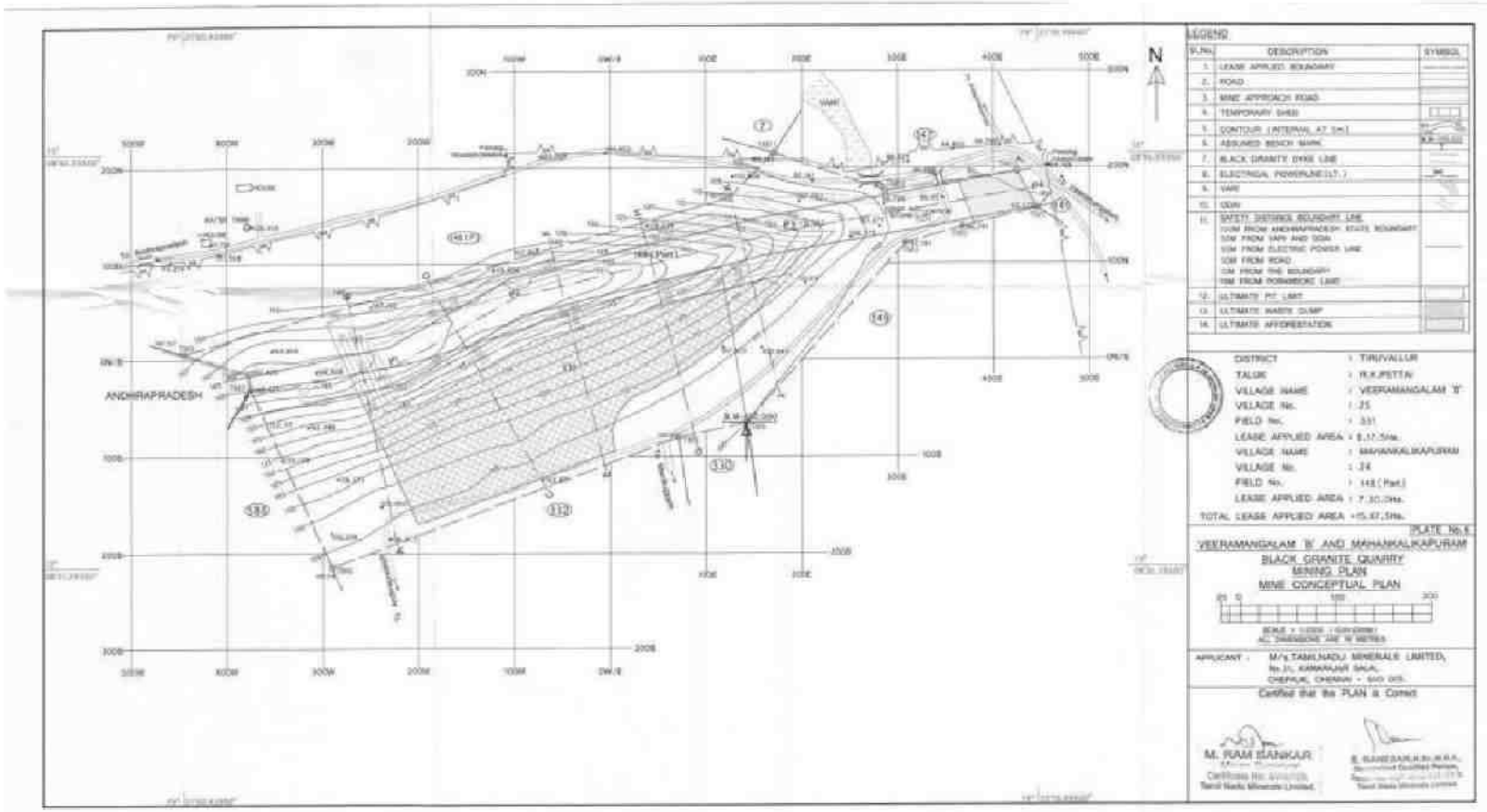


Figure 2-14 Conceptual Plan

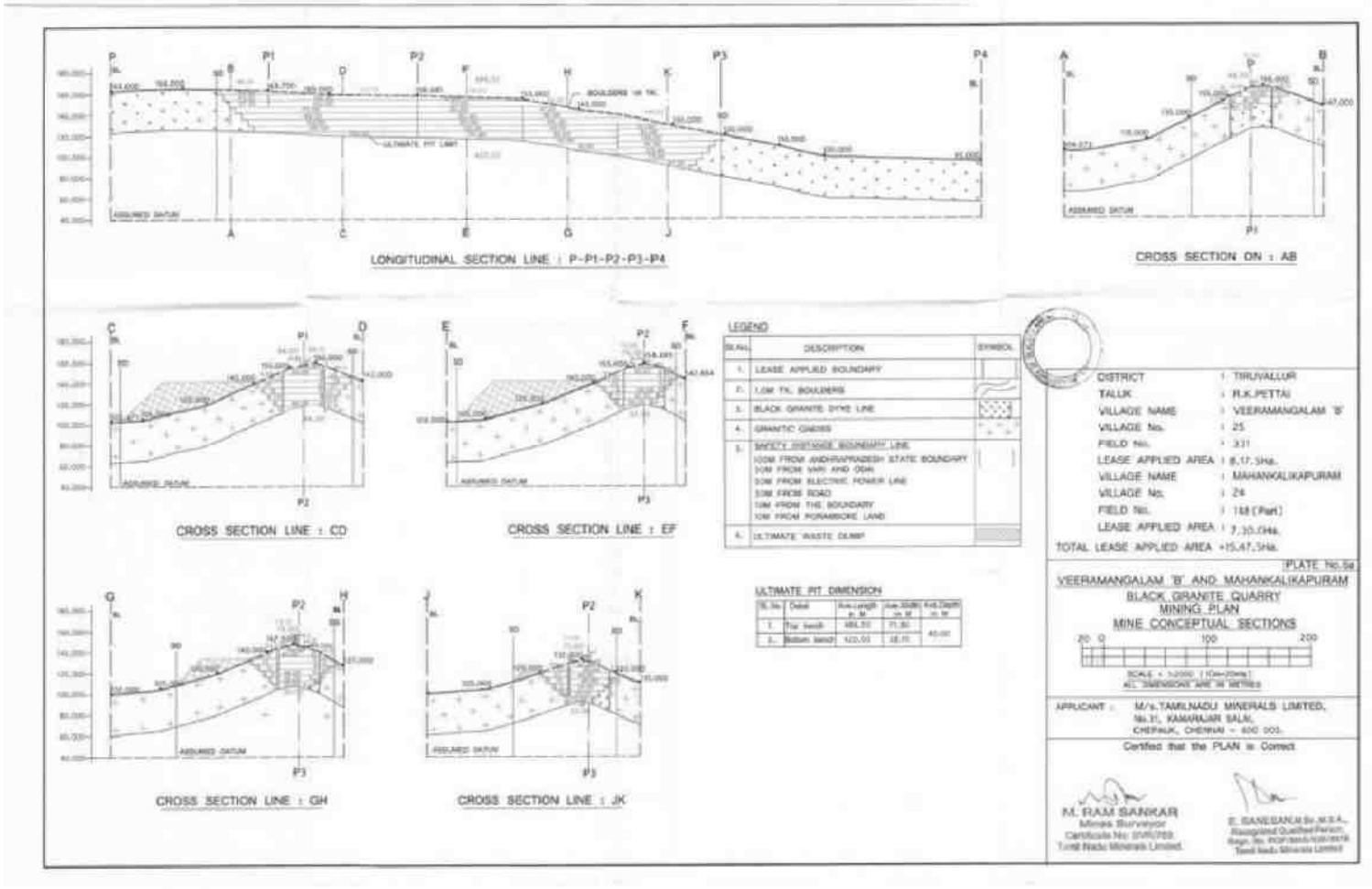


Figure 2-15 Conceptual Section

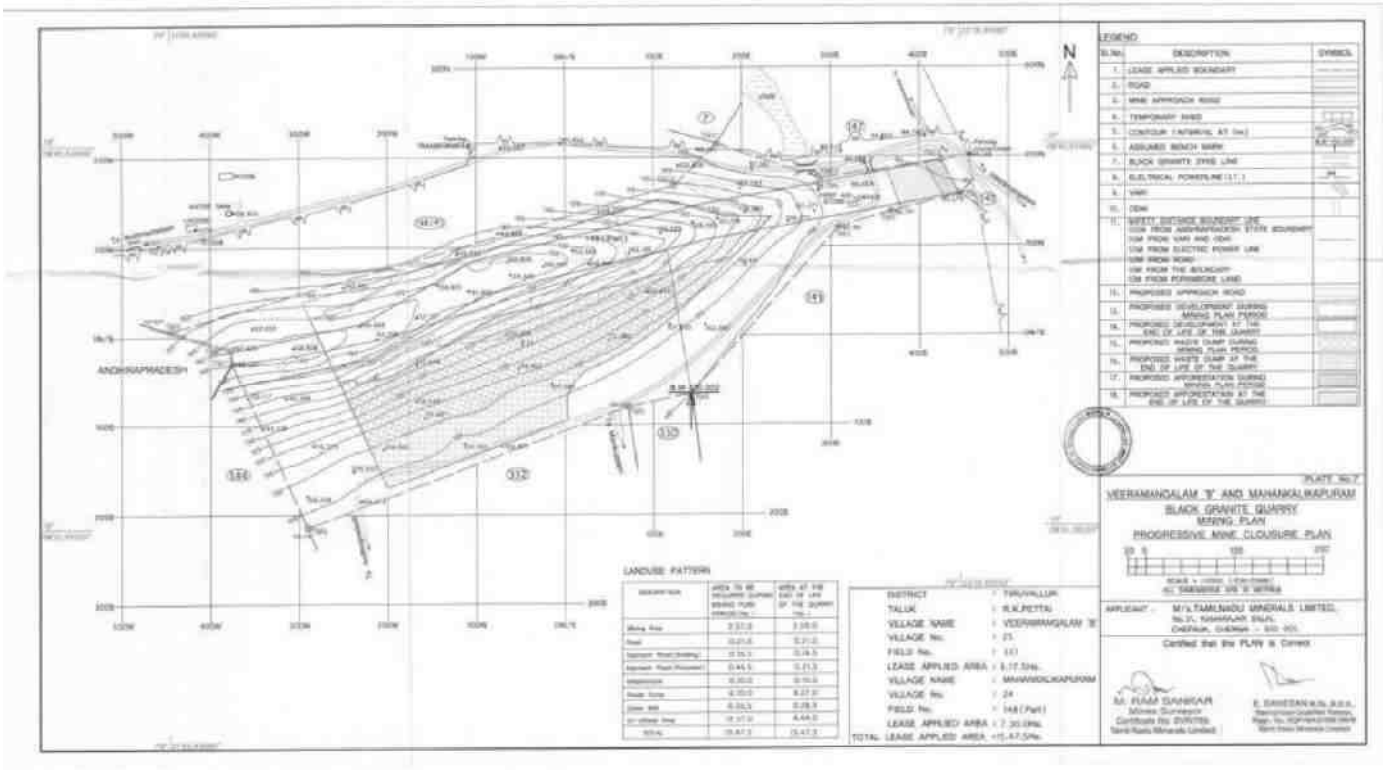


Figure 2-16 Mine Closure Plan

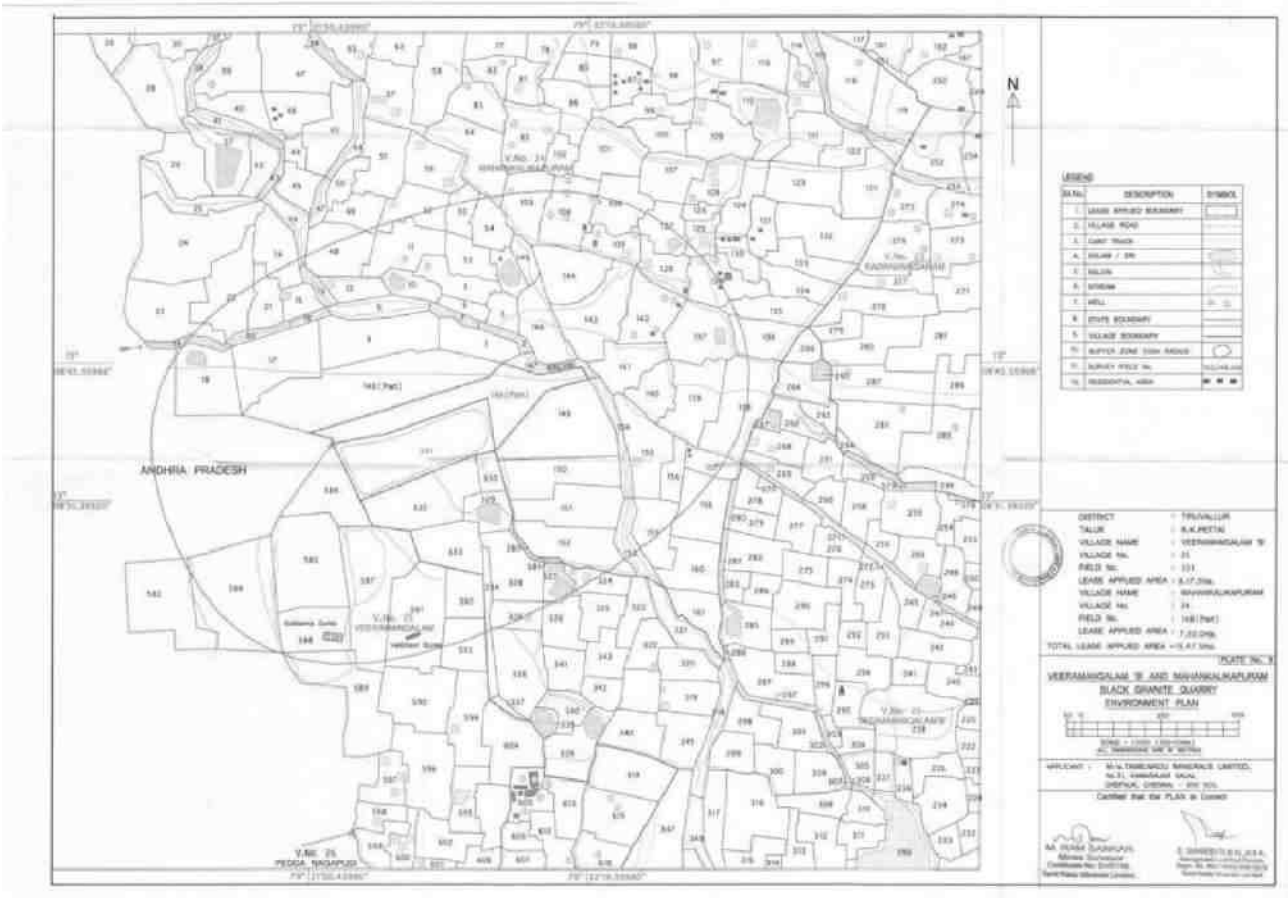


Figure 2-17 Environmental Plan

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
Preparation of PFR, FORM – I and obtaining ToR	22.06.2023
Submission of DRAFT EIA/EMP	July 2023
Conduciting Public Hearing and submitting final EIA/EMP and PoD	September 2023
Presentation before SEAC and Obtaining EC	October 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 **Figure 2.13.**

Figure 2-18 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 dimentional stone in this mine involves the following methods typical for granite mining in contrast to any other major mineral mining.

Splitting of rock mass of considerable volume from the parent sheet rock carefully avoiding any kind of damage in the form of cracks in the deposit by adopting the following methods.

a. Separation of two vertical ends along the width side by diamond wire cutting.
b. Separation of the horizontal (bottom) and the vertical (lengthside) planes by serial blasting simultaneously along the above two plans by using 32mm dia blast holes charged with mild explosives likegun powder or detonatin cord.
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 'primarycutting'.

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 30m from the surface level and the top surface of the granite body works.
3. The recovery of the saleable granite stones has been established as 5% from the visual exploration and from the data available by actual mining practices during the past mining in this area. As the sale of granite dimensional stone is in terms of volumes (cubic meter) only and not in terms of tonnage as in the case of the mining of Industrial minerals, the

geological reserves, mineable reserves and quantum of waste generation etc., are given in terms of cubic meter (volume) only.

2.10.5 Storage of Explosives

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

2.10.6 Mine Drainage

The lease applied area is hillock 165m height with slope towards northern and southern sides. Through the area receives scanty rainfall, the ground water level is at 10.2m 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
Tiruvallur, TamilNadu	R.K.Pettai	Veeramangalam'B' & Mahankalikapuram	331&148(Part)	15.47.5	Government land

Table 2-11 Land Use Pattern of the lease area

S. No	Land Use	Area to be required during the mining plan(Ha)	Area at the end of the quarrying period (Ha)
1	Mining Area	2.57.0	3.59.0
2	Road	0.21.0	0.21.0
3	Approach Road (Existing)	0.16.5	0.16.5
4	Approach Road Proposed	0.46.5	0.21.5
5	infrastructure	0.10.0	0.10.0
5	Waste Dump	0.10.0	4.27.0
6	Green belt	0.06.0	0.28.5
	Un Utilized area	12.37.0	6.64.0
	Total	**15.47.5**	**15.47.5**

2.11.2 Water Requirement

The total water requirement is 3.5 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 2-12 Water requirement breakup

S. No	Description	Water Requirement(KLD)
1	Drinking &Domestic purpose	1.5
2	Wire Saw Cutting	0.5
3	Dust suppression	1.0
4	Green Belt	0.5
	Total	**3.5**

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 Compressor	1	-	Diesel Drive
4	Diamond wire saw	1	30m³ /day	Diesel
5	Diesel Generator	1	125 kVA	Diesel
6	Excavator	1	300Lc	Diesel
7	Dumper	2	25Tonnes	Diesel

2.11.5 Man power Requirement

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

Table 2-15 Manpower Details

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

2.11.6 Solid Waste Management

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

Table 2-16 Municipal Solid Waste generation & Management

S.No	Type	Quantity	Disposal Method

		Kg/day	
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 2-14**.The EIA process is composed of the following stages:

- Study of project information
- Screening & Scoping
- Environmental Pre-Feasibility study & application for approval of TOR
- Collection of detailed project management plan/report
- Baseline 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.

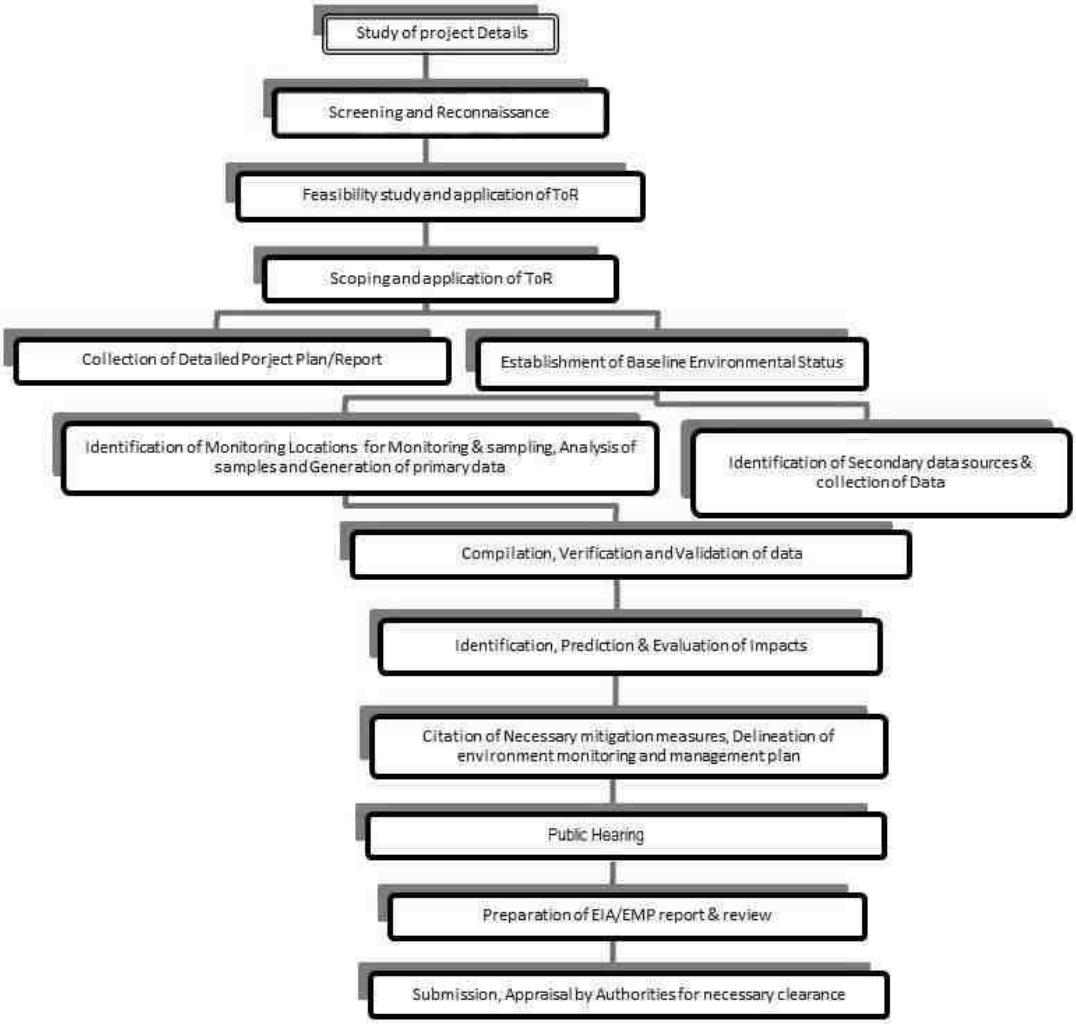


Figure 2-19 Feasibility & Environmental Assessment Process

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.

2.17 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 top soil/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 air pollution due to wind erosion incase they are not properly rehabilitated. Top soil and over burden 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.

2.17.1 AirEnvironment

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.

2.17.2 Sources of Air Pollution

2.17.2.1 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.

2.17.2.2 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.

2.17.2.3 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.

2.17.2.4 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.

2.17.2.5 Linesources

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

2.17.2.6 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.

2.17.2.7 Areasources/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.

2.17.2.8 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.

2.17.3 Noise & Vibration environment

The sound pressurelevel 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

2.17.3.1 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.

2.17.3.2 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, DGsets, Exacavator, &Tippersetc, 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.

2.17.4 Water Environment

2.17.4.1 Impact on Existing Water Resources

The total water requirement for quarry is 3.5 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.

2.17.4.2 Impacts on Surface Water Bodies

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

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, apparenttothatthere will is negligible impact of mining on the surface water regime.

2.17.4.3 Impact on Ground Water

There will not be any ground water withdrawal, as the total water requirement will be met by private water tankers. As, the mine lease area is a Hilly area, elevated at 257m 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.

2.17.5 Biological Environment

2.17.6 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.

2.17.7 Solid Waste Management

2.17.7.1 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.

2.17.7.2 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 2-15.**

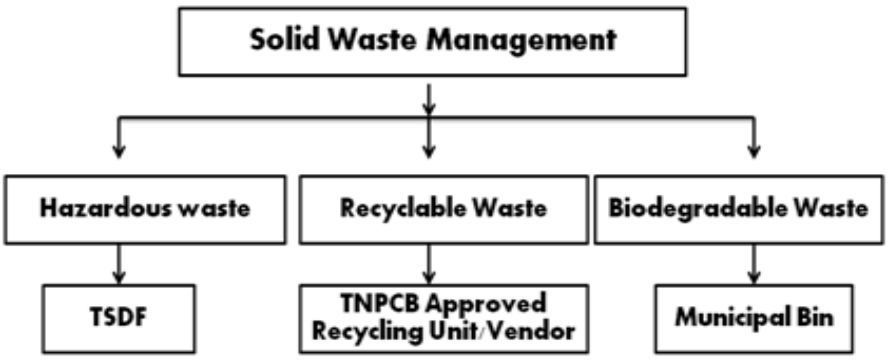


Figure 2-20 Waste Management Concepts

2.17.8 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 650m^2 portion of the lease area in a phase manner. Native species will be planted in phased manner as given in table below **Table 2-18**.

Table 2-18 Afforestation Plan details

Year	No. of trees proposed to be planted	Name of the species	Area(M3)	Survival rate expected	No. of trees expected to be grown
1stYear	20	Neem/Pungam	130	50%	10

2nd Year	20	Neem/Pungam	130	50%	10
3rd Year	20	Neem/Pungam	130	50%	10
4th Year	20	Neem/Pungam	130	50%	10
5th Year	20	Neem/Pungam	130	50%	10

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

The project is aexpansiongranite 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 **Black granite quarry** over an extent of 15.47.5 Ha in S.F. No. 331&148(Part) Veeramangalam 'B' & Mahanklikapuram Village,R.K.Pettai Taluk, Tiruvallur 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 January 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 – **ReferSection - 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 ~3.10 km away from the state highway SH-54 in South direction and NH40 is 20.03 km in SSW 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 3-2.**

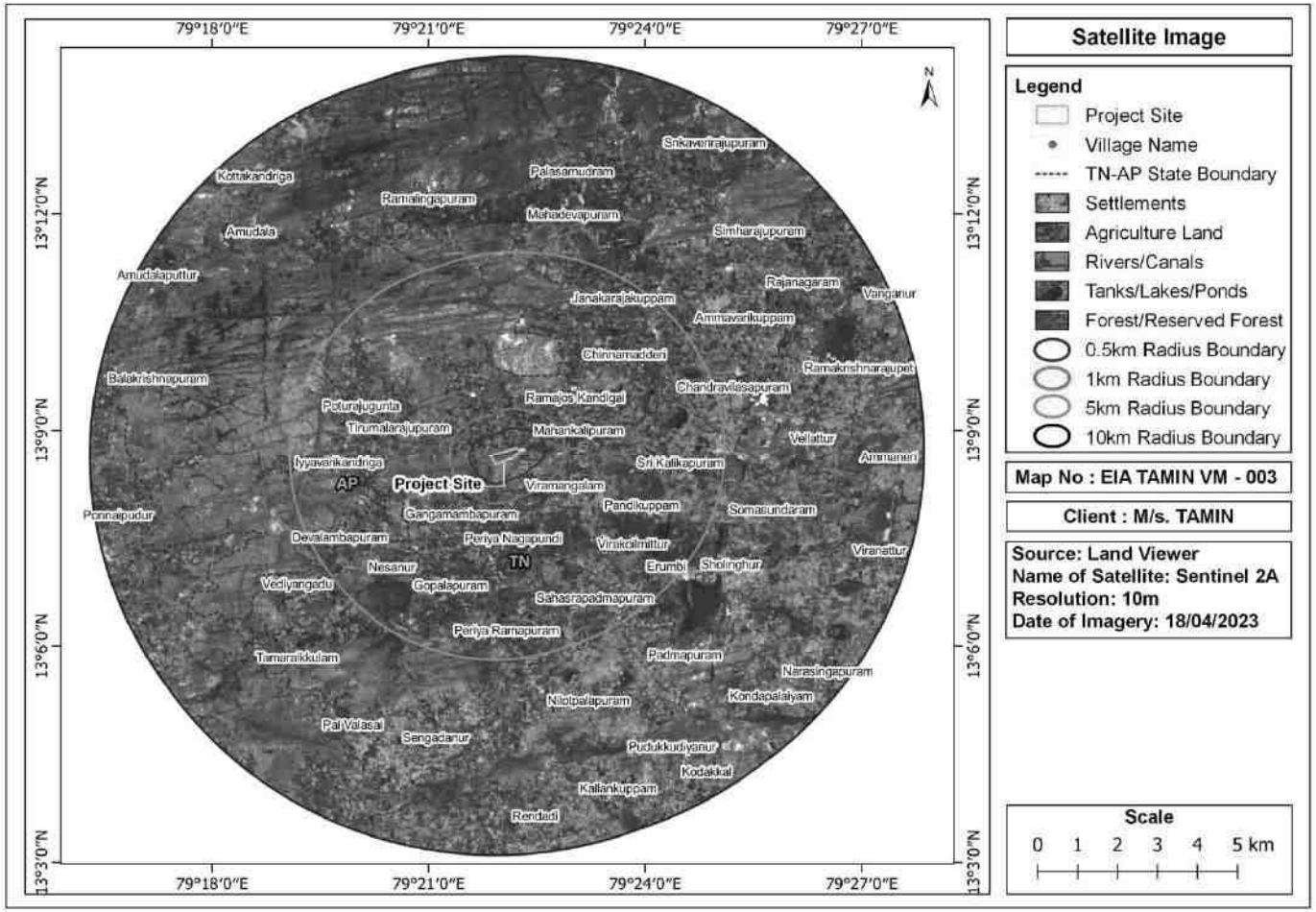


Figure 3-1 Mapshowing the Satellite Image of the study area of Project

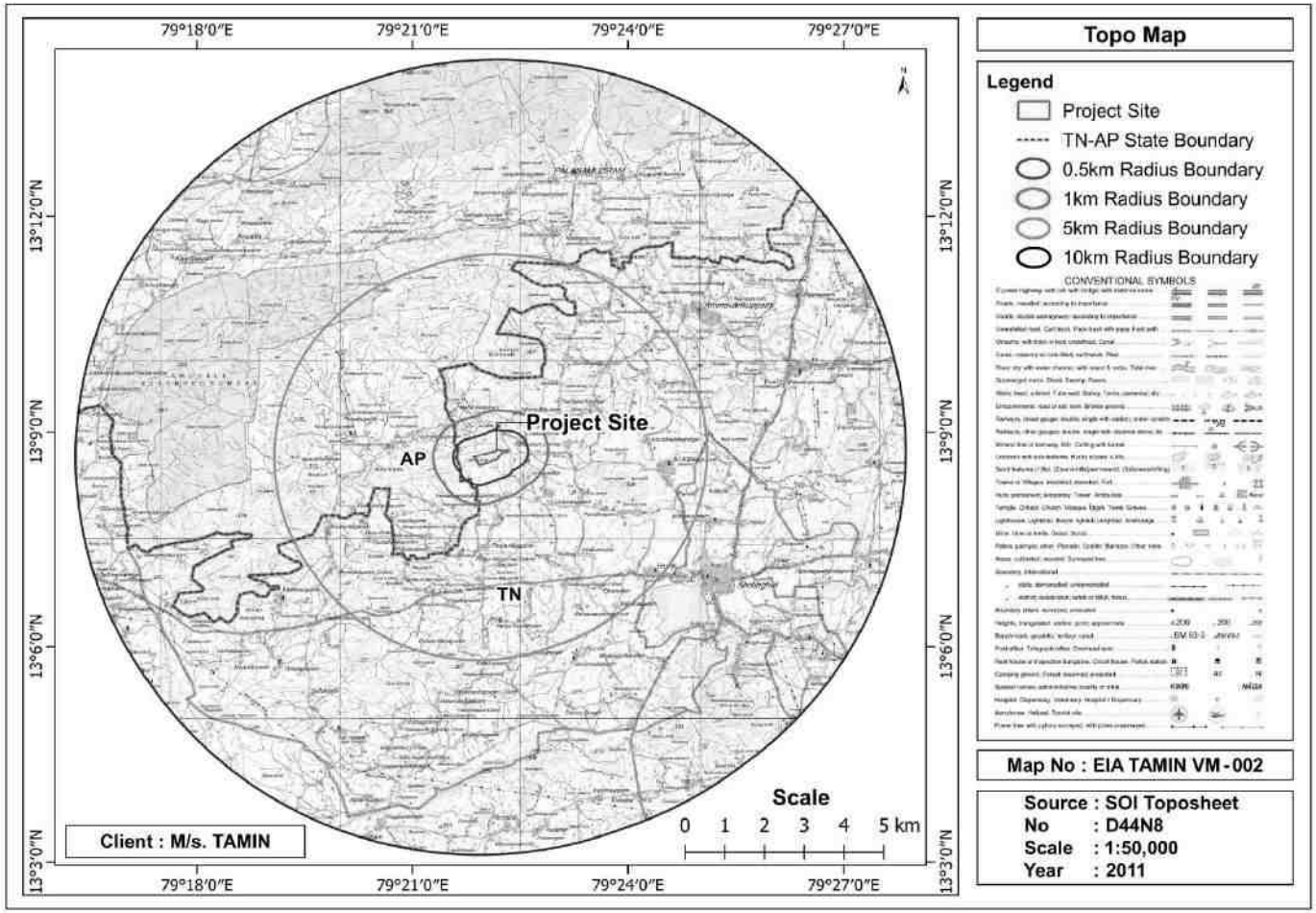


Figure 3-2 Topo Map of Study area

3.4 Environmentally/Ecologically Sensitive areas

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

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

<table>
<tr><th>S.No</th><th>Areas</th><th colspan="4">Distance & Direction from project boundary</th></tr>
<tr><td>1</td><td>Monuments</td><td colspan="4">Nill</td></tr>
<tr><td>2</td><td>Waterbodies &Reserve Forest</td><td colspan="4">
<table>
<tr><th>S.No</th><th>Water bodies</th><th>Distance (~km)</th><th>Direction</th></tr>
<tr><td>1.</td><td>Kalvai</td><td>Adjacent to Site</td><td>N</td></tr>
<tr><td>2.</td><td>Periya Nagapundi Lake</td><td>1.01</td><td>S</td></tr>
<tr><td>3.</td><td>Lake near Mahankalipuram</td><td>1.56</td><td>NNW</td></tr>
<tr><td>4.</td><td>Lake near Viramangalam</td><td>1.66</td><td>SSE</td></tr>
<tr><td>5.</td><td>Sholinghur Lake</td><td>5.06</td><td>SE</td></tr>
<tr><td>6.</td><td>Ramakrishnarajupet Lake</td><td>7.80</td><td>ENE</td></tr>
<tr><td>7.</td><td>Lake near Viranattur</td><td>8.67</td><td>E</td></tr>
<tr><td>8.</td><td>Nandi River</td><td>9.38</td><td>E</td></tr>
<tr><td>9.</td><td>Perunganji Lake</td><td>9.6</td><td>SSE</td></tr>
<tr><td>10.</td><td>Lake near Kondareddipalli</td><td>10.16</td><td>W</td></tr>
<tr><td>11.</td><td>Ponnai River</td><td>11.26</td><td>WSW</td></tr>
<tr><td>12.</td><td>Ponnai East Bank Main Canal</td><td>11.51</td><td>WSW</td></tr>
<tr><td>13.</td><td>Kallar River</td><td>12.06</td><td>SSE</td></tr>
<tr><td colspan="4">Reserved Forest</td></tr>
<tr><td>1.</td><td>Amudala RF</td><td>4.42</td><td>NW</td></tr>
<tr><td>2.</td><td>Pullur West PF</td><td>7.68</td><td>N</td></tr>
<tr><td>3.</td><td>Pachigunta RF</td><td>9.31</td><td>NW</td></tr>
<tr><td>4.</td><td>Vanganur RF</td><td>10.28</td><td>NE</td></tr>
<tr><td>5.</td><td>Ammur RF</td><td>10.73</td><td>S</td></tr>
<tr><td>6.</td><td>Santanavenugopalapuram Ext RF</td><td>11.17</td><td>ENE</td></tr>
<tr><td>7.</td><td>Santanavenugopalapuram RF</td><td>11.2</td><td>ENE</td></tr>
<tr><td>8.</td><td>Nochili Ext RF</td><td>12.63</td><td>NE</td></tr>
</table>
</td></tr>
</table>

		9.	Nochili RF	12.98	NE

		S. No	Places	Distance (~km)	Direction
3	Manmade	**Schools**			
		1	Kattur P.U.M.school	1.30	NNW
		2	Periyanagapoondi Govt High School	2.01	S
		3	Srikalikapuram Govt Higher Secondary School	3.85	E
		4	Sholinghur Govt Boy's Higher Secondary School	6.31	ESE
		5	R.K.Pet Government Girls Higher Secondary School	7.26	ENE
		6	R.K.Pet Government Boys Higher Secondary School	7.46	ENE
		7	Amudala Z.P.H.S	7.77	NW
		8	Vanganur Government Higher Secondary School	9.71	ENE
		9	Kondapuram Govt Hgh School	10.27	E
		10	Bukkapatnam Z.P.H.S	11.70	WNW
		College			
		1	C M Annamalai group of Institution	5.79	E
		2	Sri Bharathivelu Arts & Science College	6.06	E
		3	Kalai Bharathi B.Ed College	6.62	SE
		4	Sholinghur Government Arts and Science College	6.67	ESE
		5	Meera Collage of Education	6.82	ESE
		6	Sri Venkateswara College of Education	10.86	ENE
		7	Sri Bharathi Velu Polytechnic College	12.65	S
		8	Saraswathi Velu College of Engineering	12.75	S
		9	Vethathiri Maharishi Institute of Technology	13.02	NNE
		Hospitals			
		1	Balapuram Govt PHC	1.28	ENE
		2	Peddaramapuram Govt Veterinary Hospital	3.19	S
		3	Chanurmallavaram Govt Sub Health Centre	5.41	SSE
		4	Ammavarikuppam Govt Hospital	6.35	ENE
		5	Sholinghur Govt Hospital	6.38	SE
		6	Milakaikuppam Govt Hospital	9.71	WSW
		7	Sengalnatham Govt Hospital	10.4	SSW

		8	Thugundram Govt PHC	11.85	WNW	
		9	Ponnai Upgraded PHC	12.02	W	
		10	Vengupattu Health Sub Centre	13.02	E	
		Government Buildings				
		1	Mahankalikapuram VAO office	0.36	N	
		2	Balapuram Post Office	1.68	ENE	
		3	Chinna Nagapoondi Gram Panchayat Office	3.12	S	
		4	Srikalikapuram VAO Office	3.93	E	
		5	Sholinghur Court	6.32	SE	
		6	R.K Pet Taluk Office	6.40	E	
		7	Sholinghur Sub Registrar Office	6.43	SE	
		8	Palasamudram Tasildhar office	7.37	NNE	
		9	Palasamudram MRO	7.40	NNE	
		10	R K Pet Sub Registrar Office	7.61	ENE	
		11	Sholinghur Fire Station	8.54	SE	
		Religious Place				
		1	Mahakali Amman Tenmple	0.39	N	
		2	Selvaganapati Vinayagar Temple	0.77	NE	
		3	Jaamiya Masjid	3.45	SSW	
		4	Chandravilasapuram Church	3.93	ENE	
		5	Thoppilamman Kovil	5.91	SE	
		6	Lakshmi Narasimha Temple	6.11	SE	
		7	Sozhapureeswarar Temple	6.26	SE	
		8	Sivan Temple	7.01	SE	
		9	Sivan Temple	7.01	SE	
		10	Sivan Temple	7.01	SE	
		11	Arulmigu Sri Yoga Narasimha Swamy Temple	8.02	SE	
		12	Ganesh Temple	12.01	W	
		Industries				
		1	Brakes India Private Limited Brake Division	7.39	SE	
		2	Brakes India Private Ltd - Foundry Division	7.84	SE	
		3	Brakes India Private Ltd Unit-2	10.02	SE	
		4	Turbo Energy Pvt Ltd	10.30	SE	
		5	Aarush Manufacturing Solutions Pvt Ltd	13.42	SSE	
		6	ABI Soorai Green	14.49	SE	

<table>
<tr><td>4</td><td>State, National boundaries</td><td>TN-AP state boundary~0.39km,W</td></tr>
<tr><td>5</td><td>Nearest Highway/Railway/Town and city</td><td>
<table>
<tr><th>S. No</th><th>Description</th><th>Distance (~km)</th><th>Direction</th></tr>
<tr><td>1</td><td>MDR-580(Veeramangalam - Mahankalikapuram - Ammayarkuppam Rd)</td><td>0.45km</td><td>ENE</td></tr>
<tr><td>2</td><td>SH-54(Chittoor-Sholinghur-Thiruttani)</td><td>3.10km</td><td>S</td></tr>
<tr><td>3</td><td>NH-40(Kurnool-Ranipet)</td><td>20.03km</td><td>SSW</td></tr>
<tr><td>4</td><td>Nearest Railway st- Thalangai</td><td>17.07km</td><td>SSE</td></tr>
<tr><td>5</td><td>Nearest Railway line(Thalangai-Walajah Road Junction)</td><td>16.30km</td><td>SSE</td></tr>
<tr><td>6</td><td>Nearest Town - Sholinghur(Pop~30,856)</td><td>4.50km</td><td>SE</td></tr>
<tr><td>7</td><td>Nearest City - Vellore(Pop~1,85,803)</td><td>28km</td><td>SW</td></tr>
</table>
</td></tr>
<tr><td>6</td><td>Nearest port/ Airport</td><td>➢ Tirupati International airport at a distance of ~ 55.55km towards NNE
➢ Vellore Airport (Domestic) at a distance of ~ 40.96km towards SW</td></tr>
<tr><td>7</td><td>Near by villages and Population</td><td>
<table>
<tr><th>S. No</th><th>Villages</th><th>Distance (~km)</th><th>Direction</th><th>Population</th></tr>
<tr><td>1</td><td>Mahankalipuram</td><td>0.27km</td><td>NE</td><td>2,215</td></tr>
<tr><td>2</td><td>Ramrajkandigai</td><td>0.69km</td><td>SSE</td><td>50</td></tr>
<tr><td>3</td><td>Venkataperumalrajupuram</td><td>0.91km</td><td>S</td><td>400</td></tr>
<tr><td>4</td><td>Viramangalam</td><td>1.18km</td><td>SE</td><td>4,754</td></tr>
<tr><td>5</td><td>Pedda Balapuram</td><td>1.19km</td><td>NE</td><td>1,000</td></tr>
</table>
</td></tr>
<tr><td>7</td><td>Defence installations</td><td>Nill</td></tr>
</table>

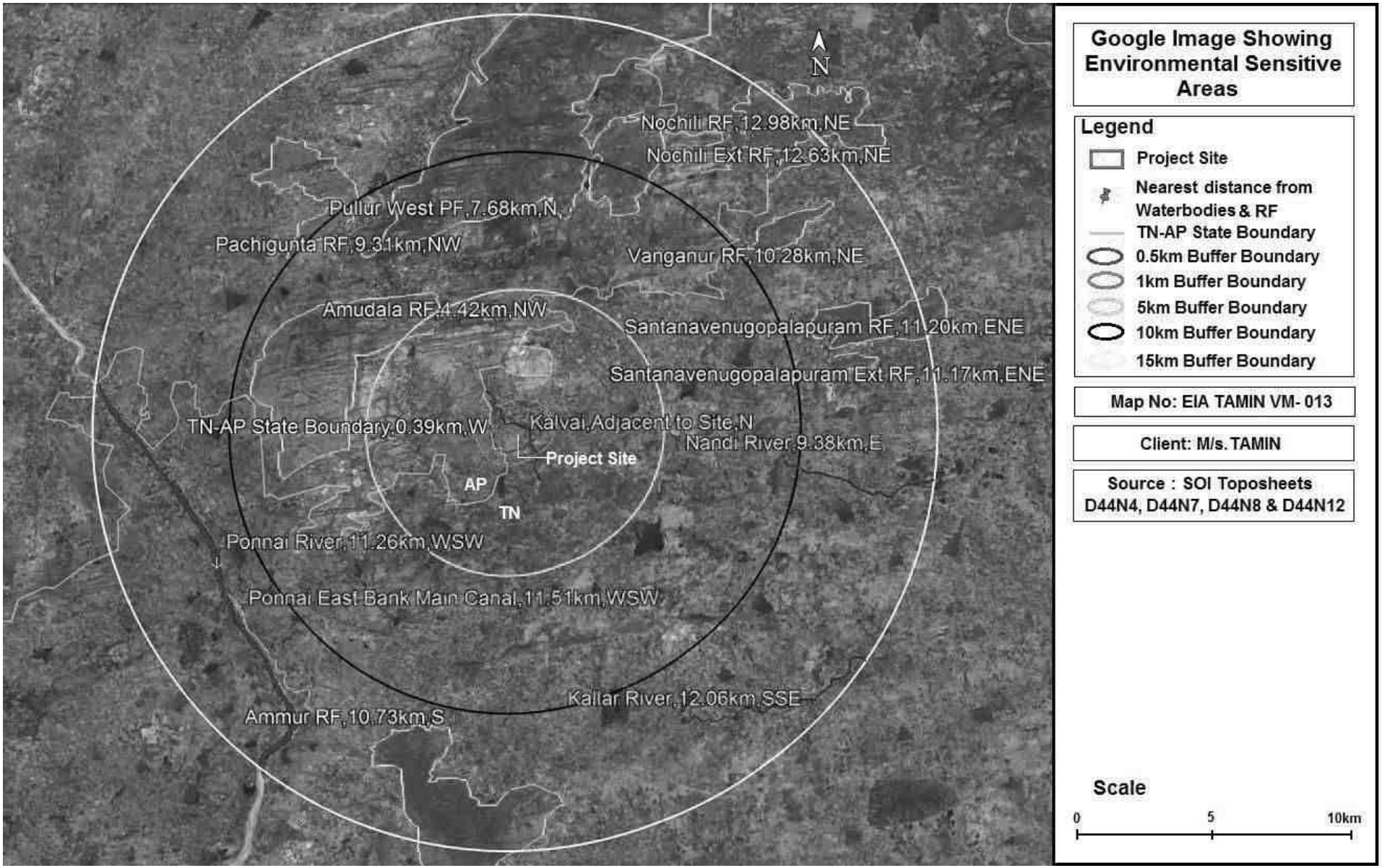


Figure 3-3 Environmental sensitive areas covering within 15 km from project boundary

3.5 Physical Conditions of PIA district

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

- District profile
- Drainage, land use, geology, Physiographic
- Natural resources

Climatic conditions, seismic zone characteristics and natural hazard

3.5.1 PIA District Profile

Thiruvallur is a coastal district lies between 12◦ 10' and 13◦ 15'Northern latitude and between 79◦ 15' and 80◦ 20' Eastern longitude and spreads over an area of 3394 sq.kms. The district has Chennai and Bay of Bengal as its boundary on the east flanked to the north and west by Andhra Pradesh and to the south by Vellore and Kancheepuram districts. The land area is flat while some parts of the district are undulated and some of them are even hilly. The taluks of Ponneri, Gummidipoondi and Tiruvallur do not have any landscape worth to mention while a number of hillocks are seen scattered in and around Tiruttani taluk.The sandy strip of the coast is replete with casuarina plantations.

Source:*https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3301_PART_A_DCHB_THIRUVALLUR.pdf*
(**Ref**:Directorate of Census Operations-Tamil Nadu, "District Census Handbook-2011,Thiruvallur District",Series-34 Part XII-A)

3.5.2 Climatic Conditions

It may be noted that the district gets more rainfall during the North East Monsoon though it gets the influence of South West Monsoon (June - September) and North West Monsoon (October - December). During the year 2009-10, there was a rainfall of 589.9 mm in the district due to the influence of North East Monsoon as against the normal rainfall of 604.1 mm. The South West Monsoon has contributed to the extent of 331.7 mm during the year, the normal rainfall being 449.5 mm. The rainfall during winter in 2009-10 was much below normal. The actual rainfall was 2.3 mm as against normal rainfall of 33.5 mm in winter. In the summer (Hot weather), the actual rainfall was 138.1 mm in 2009-10 as against the normal amount of 65.7 mm. In 2009-10, Thiruvallur district received 1062 mm of rainfall as compared to a normal of 1152.8 mm. The table below gives the actual and normal rainfall in the district during the South West and North East monsoons, winter and hot weather seasons in 2009-10 (in mm).

Source:*https://censusindia.gov.in/2011census/dchb/DCHB_A/33/3301_PART_A_DCHB_THIRUVALLUR.pdf*
(**Ref**:Directorate of Census Operations-Tamil Nadu, "District Census Handbook-2011,Thiruvallur District",Series-34 Part XII-A)

3.5.3 Natural Resources of PIA District

3.5.3.1 Flora & Fauna

Thiruvallur coast has a very vast coastal plain, which extends from North of Toppala Palayam to South of Sattangadu. There are three strand lines, with intervening broad tidal flats occurring in the coastal plains. Lagoons, mangrove swamps, salt marshes, estuaries, creeks, sand dunes, and beach terraces represent the marine landforms. The Pulicate brackish water lake of Bay of Bengal in Ponneri block is a potential hot spot along the coast. It was the site of old Dutch settlement. Migratory birds from various countries flock here every year between December and February. Pulicate Lake was identified as a site of international importance by the International Union for the Conservation of Nature (IUCN) and is rich in mangroves. Flora and fauna of PIA are discussed in **section 3.11.**

Source: *http://tnenvis.nic.in/files/THIRUVALLUR%20%20.pdf*

3.5.3.2 Forest Resources

Forest occupies 5.8 % of the total area. The total extent of Reserved Forests and Reserve lands are 19791 ha, about 1800 ha of Reserve lands, notified under section 26 of Tamil Nadu Forest Act is also under active consideration for declaration as Reserve forest. These lands are in bits and pieces spread over the district are tropical in nature and they fall under dry thorn and dry evergreen types. Much of the natural forests have been converted into man-made forests since the late 1950s. However, chunks of natural forests still exist.

Source: http://tnenvis.nic.in/files/THIRUVALLUR%20%20.pdf

3.5.3.3 Irrigation

Apart from seasonal rivers like Kosasthalaiyar, Araniar, Nandi, Kallar, Coovum and Buckingham canal, there is no perennial river in the district. The agricultural operations in the district depends mainly on tanks and lakes. They get water mainly during two monsoon periods viz., South-West monsoon (June to September) and North-East monsoon (October to December). The North-East monsoon brings more water compared to the others.

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

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

3.5.3.4 Agricultural Resources

The main occupation of the district is agriculture and allied activities. Nearly 47% of the total work force is engaged in the agricultural sector. Around 86% of the total population is in rural areas engaged in agriculture and allied activities. The major crops grown in the district are rice, cumbu - ragi, green gram, black gram, sugar cane and groundnut. Apart from this, certain horticultural crops like mango, guava and vegetables have also been cultivated successfully. Total cultivated Area is 184198 ha, Net Area Sown is 136648 ha, Area Sown more than once is 50550 ha and Cropping Intensity is 134.8%.

Source: http://tnenvis.nic.in/files/THIRUVALLUR%20%20.pdf

3.5.3.5 Mineral Resources

The district does not contain any precious mineral. However it has a few varieties of major and minor minerals.

Minor Minerals

Lime Shell: Pulicut Lake, Sunnambukulam,Annamalaicherry

Silica Sand: Elavoor, Eravanoor, Ennore,Gummidipoondi and Ponneri.

Stoneware Clay: Adhigathur, Odhapal,Gudapakkam Kandigai

Major Minerals

River Sand: Kosasthalaiyar, Araniar, Kallar,Nandi, Coovam

Blue Metal: Pallipattu and Tiruttani Taluks

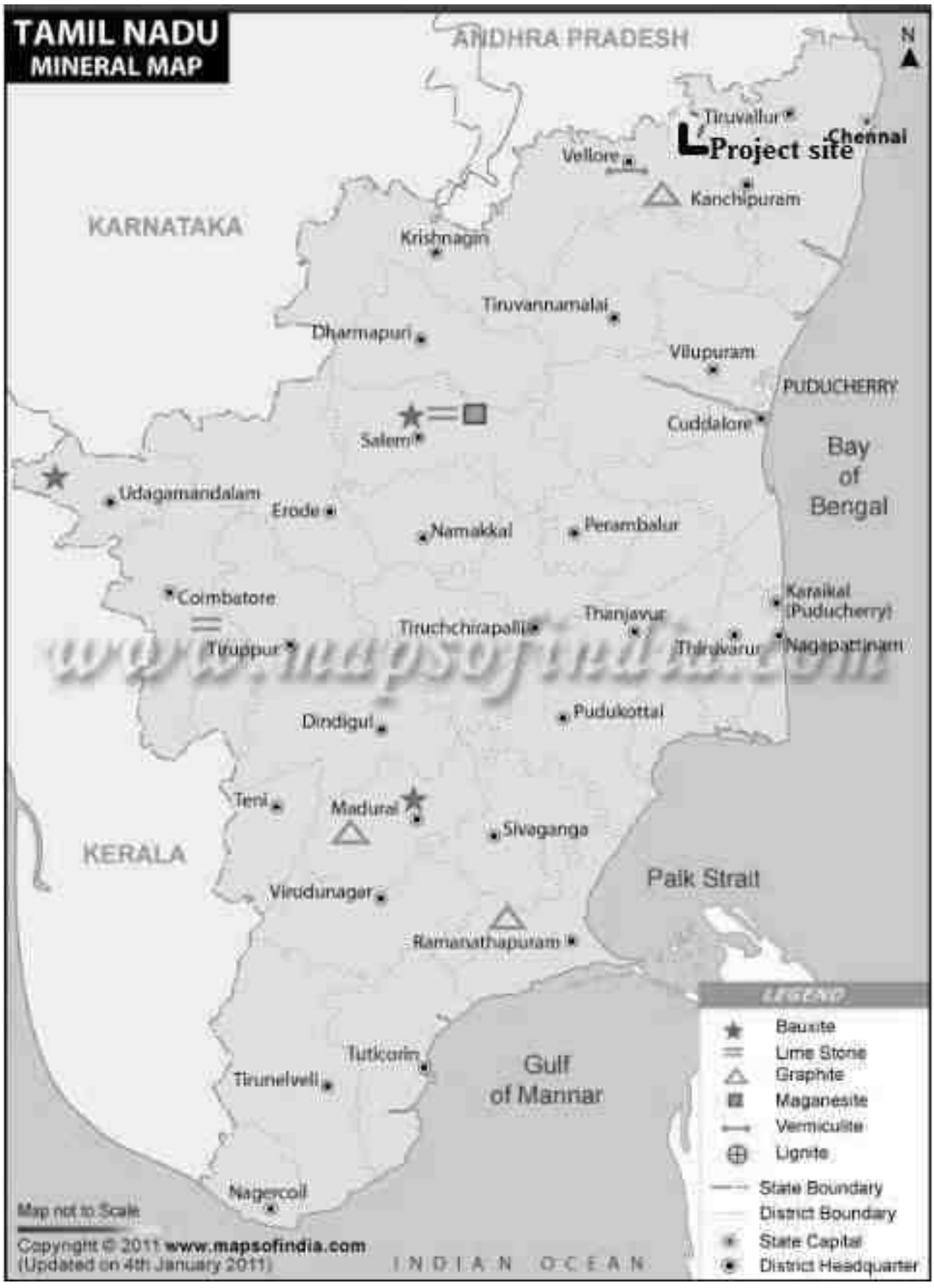
Gravel: Ponneri and Gummidipoondi Taluks

Brick Clay: Tiruvallur and Ponneri Taluks

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

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

The mineral map of Tamilnadu is shown in the **Figure 3-4**



Source: *Maps of India*

Figure 3-4 Mineral Map of Tamil Nadu

3.5.4 Land Use & Land Cover

Total geographic area of Tiruvallur district is 3423 Sq.Km. Urban Built-up area is 295.16 Sq.Km and Rural Built-up area is 272.76 Sq.Km. Details of land use/land cover statistics for Tiruvallur district were given in **Table 3-2** and Land cover pattern of Tiruvallur district is given in **Figure 3-5.** Land Use map of Tiruvallur is given in **Figure 3-6.**

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

S.No	Division of Land Use/Land Cover	Area in Sq.Km	Area in Acres	Area in Ha	Total Area %
1	Agriculture,Crop land	1834.25	453252.35	183425	53.59
2	Agriculture,Plantation	87.77	21688.41	8777	2.56
3	Agriculture,Fallow	115.92	28644.41	11592	3.39
4	Barren/unculturable/ Wastelands, Salt Affected land	7.42	1833.52	742	0.22
5	Barren/unculturable/ Wastelands, Scrub land	190.58	47093.27	19058	5.57
6	Barren/unculturable/ Wastelands, Sandy area	12.83	3170.36	1283	0.37
7	Barren/unculturable/Wastelands, Gullied/Ravinous Land	0.11	27.18	11	0.00
8	Barren/unculturable/ Wastelands, Barren rocky	2.39	590.58	239	0.07
9	Builtup,Urban	295.16	72935.51	29516	8.62
10	Builtup,Rural	272.76	67400.36	27276	7.97
11	Builtup,Mining	7.54	1863.17	754	0.22
12	Forest,Evergreen/ Semi evergreen	18.22	4502.25	1822	0.53
13	Forest,Deciduous	68.13	16835.26	6813	1.99
14	Forest,Forest Plantation	10.57	2611.90	1057	0.31
15	Forest,Swamp/ Mangroves	3.03	748.73	303	0.09
16	Forest,Scrub Forest	0.03	7.41	3	0.00
17	Wetlands/Water Bodies, Inland Wetland	0.65	160.62	65	0.02
18	Wetlands/ Water Bodies, Reservoir/Lakes/Ponds	341.57	84403.65	34157	9.98
19	Wetlands/Water Bodies, River/Stream/canals	67.33	16637.58	6733	1.97
20	Wetlands/Water Bodies,Coastal Wetland	86.74	21433.89	8674	2.53
Total		**3423**	**845840.415**	**342300**	**100**

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

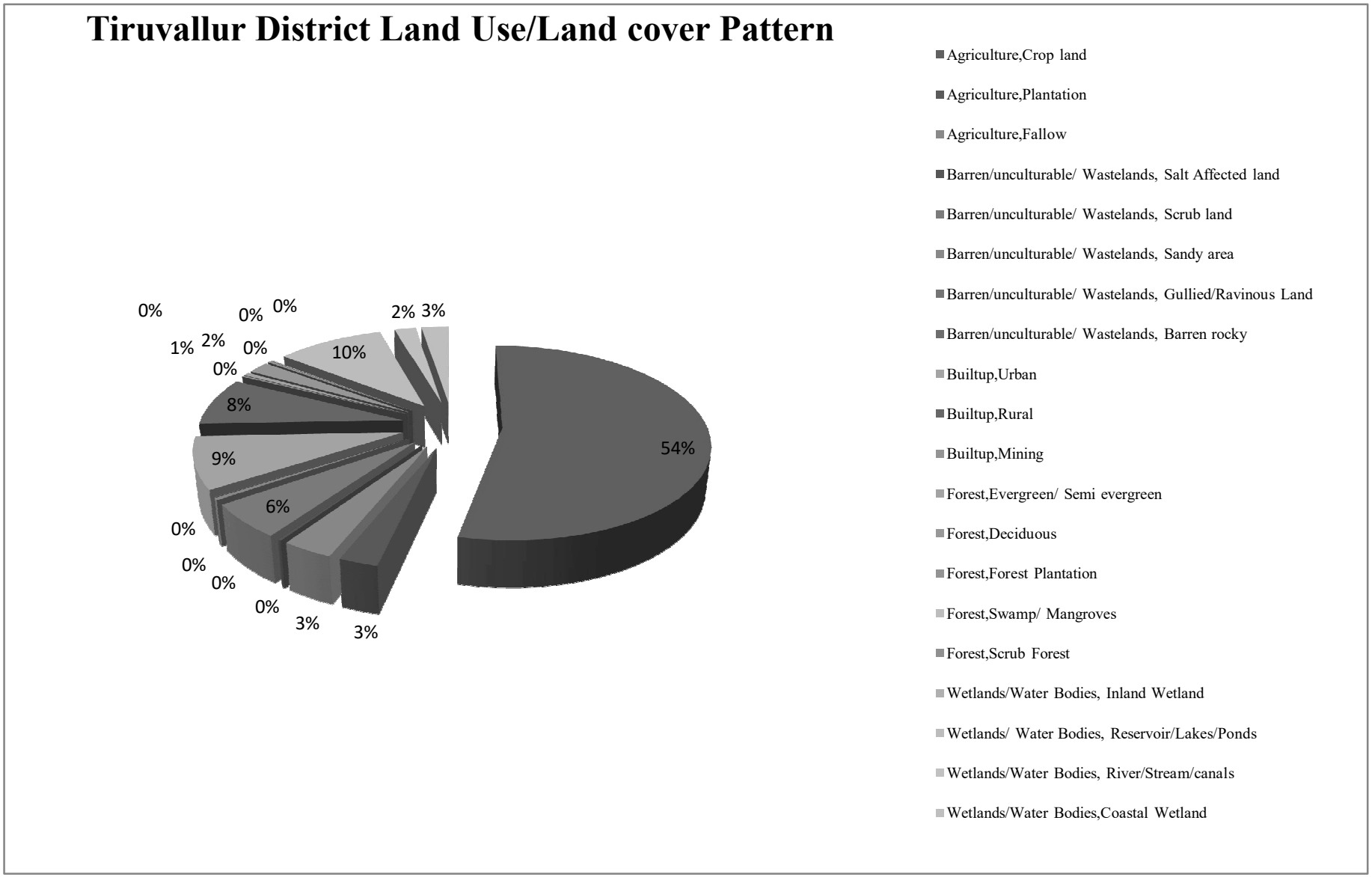


Figure 3-5 Land use/Land cover pattern for Tiruvallur district

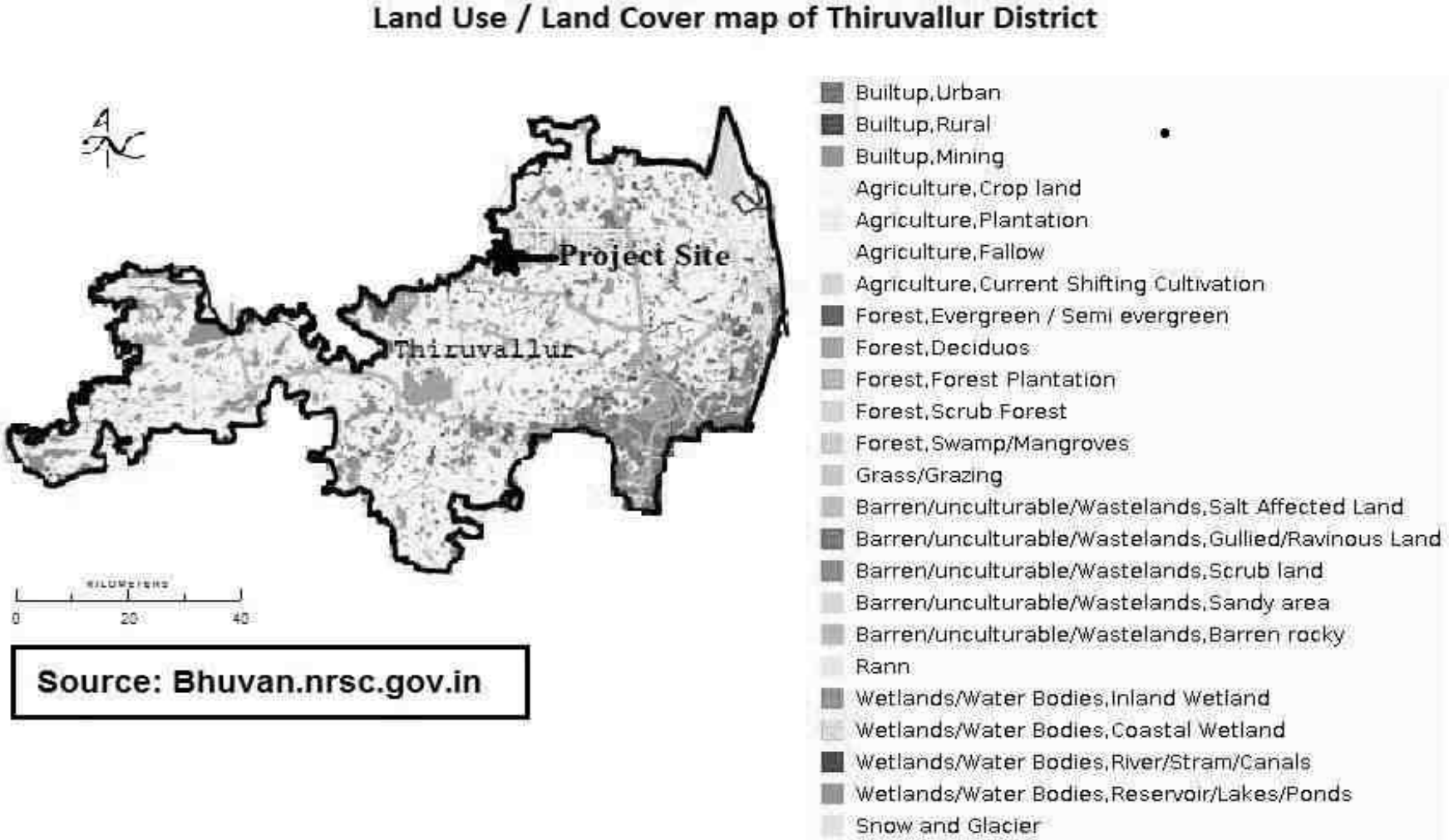


Figure 3-6 Land use/Land cover Map of Thiruvallur district

3.5.4.1 Land use land cover for the study area

The land use pattern of the study area is 332.14 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	Crop land	159.96	39526.916	15996	47.59
2	Scrub land	66.13	16341.054	6613	19.67
3	Deciduous	28.34	7002.9557	2834	8.43
4	Scrub Forest	23.27	5750.1334	2327	6.92
5	Rural	21.48	5307.8154	2148	6.39
6	Waterbodies	12.88	3182.7124	1288	3.83
7	Fallow	9.36	2312.9028	936	2.78
8	Barren rocky	4.78	1181.1619	478	1.42
9	Salt affected land	3.04	751.1992	304	0.90
10	Urban	2.64	652.3572	264	0.79
11	Mining	2.3	568.3415	230	0.68
12	Plantation	1.88	464.5574	188	0.56
13	River / Stream / Canals	0.08	19.7684	8	0.02
	Total	**336.14**	**83061.875**	**33614**	**100**

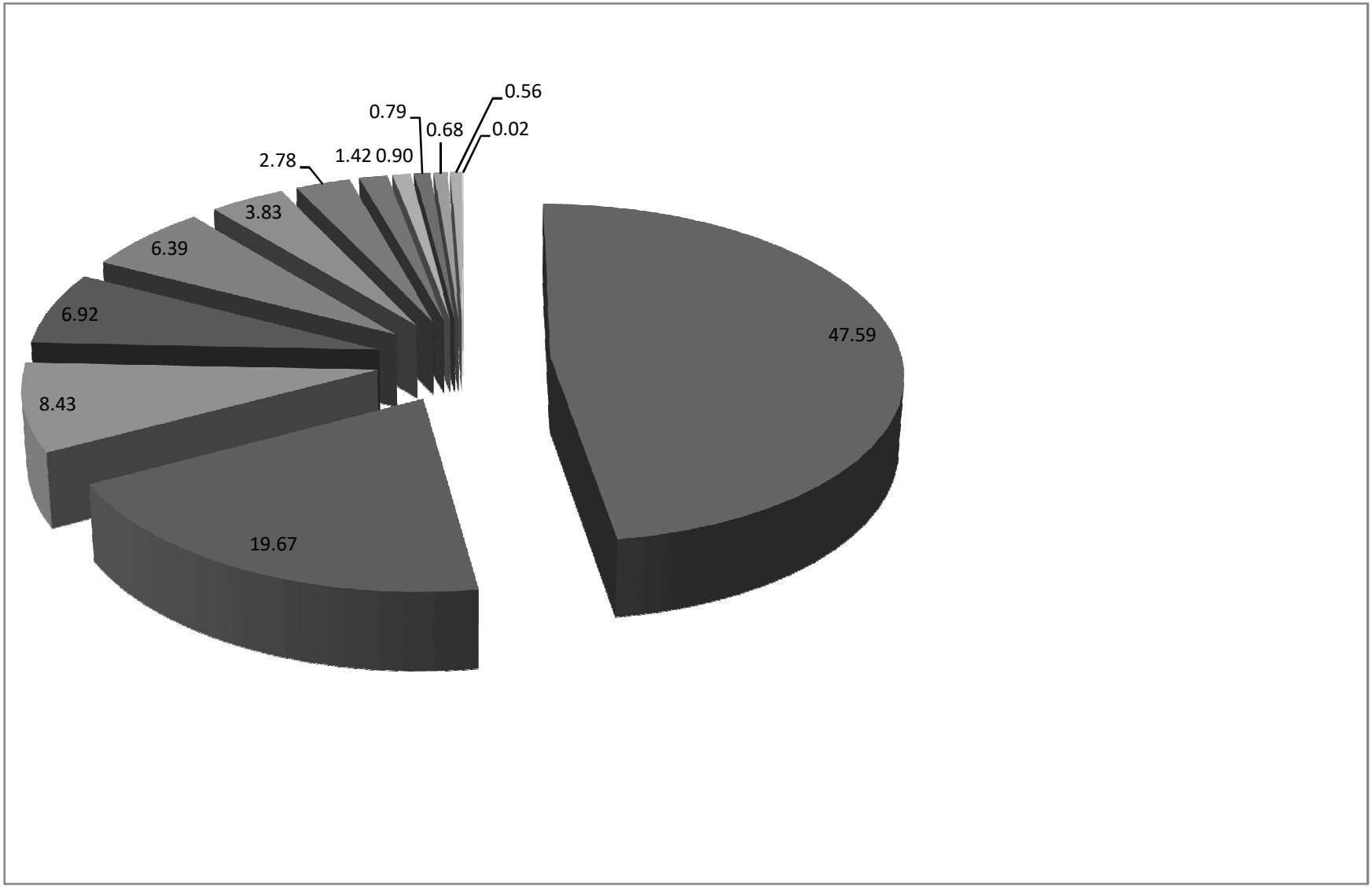


Figure 3-7 Land use pattern of the Study Area

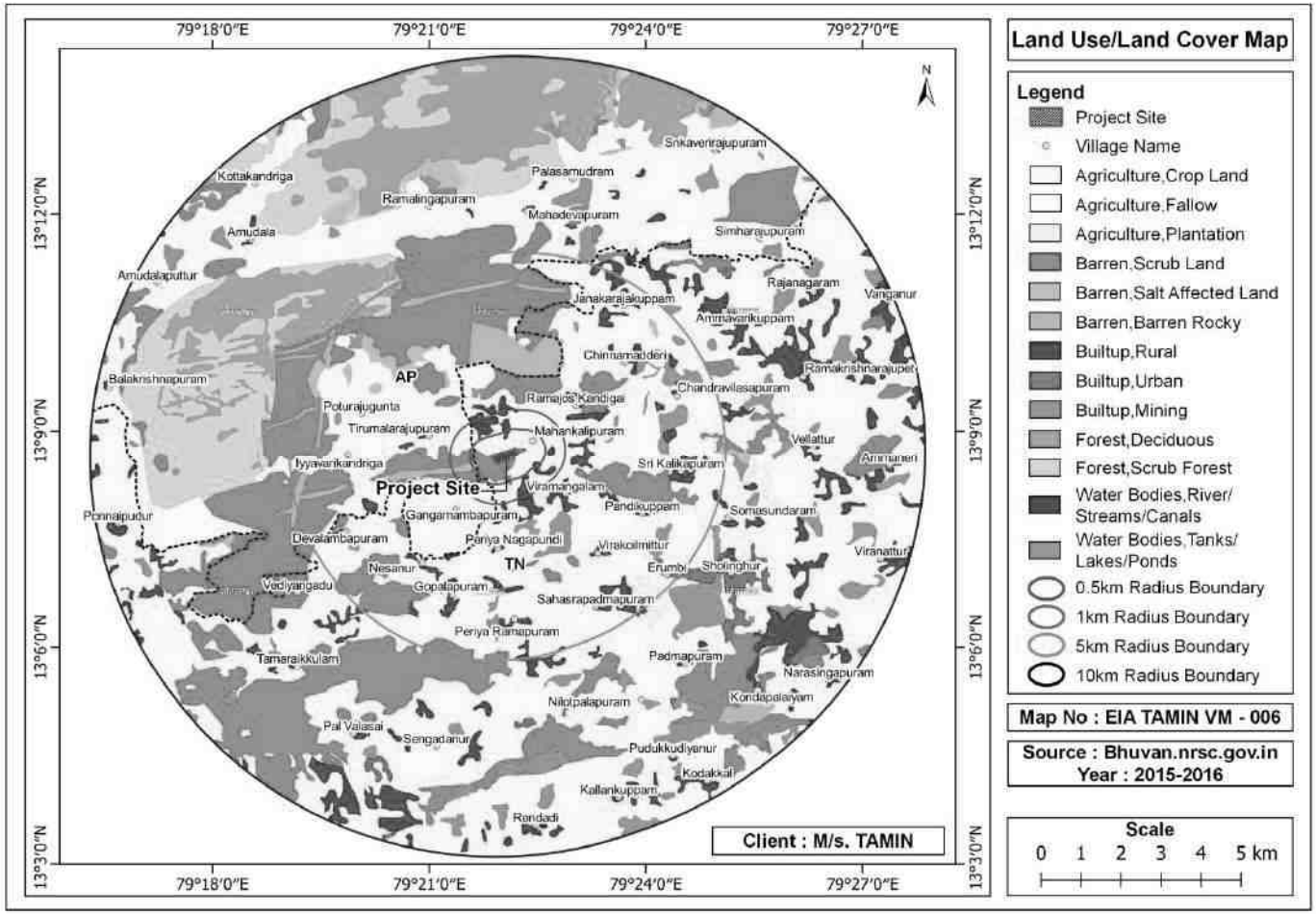


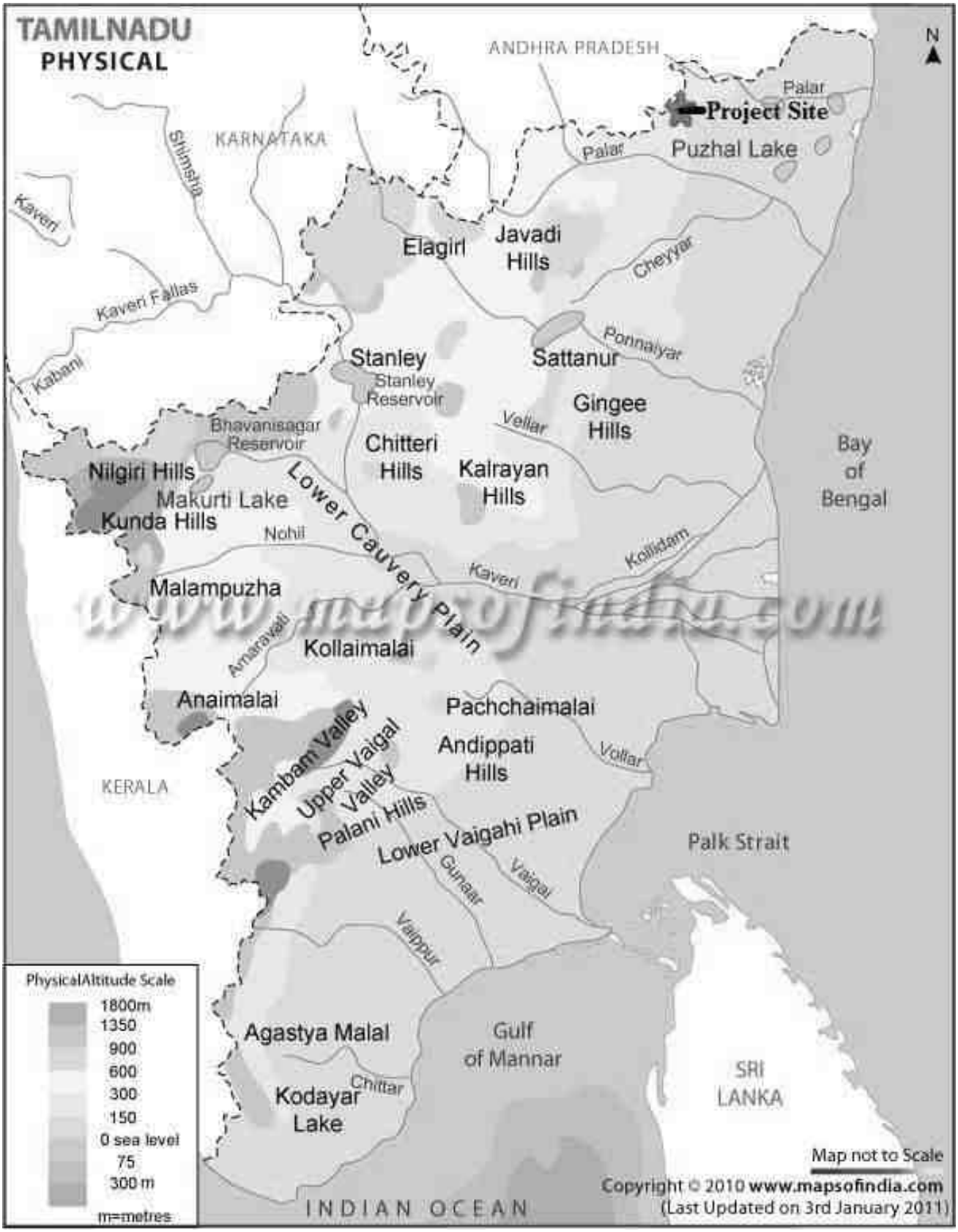
Figure 3-8 Land use/Land cover map of the Study Area

3.5.5 Topography

The coastal region is mostly flat while certain areas in Tiruttani and Pallipet taluks are undulated and even hilly. However, there are not many hills of any considerable height in this district. There are a few conical hills or ridges of small elevation, like the St. Thomas Mount. Most of the hills and hillocks are rocky and no verdant vegetation is seen in the slopes of these hills. The area under forests, all of 19,736 sq. km., is only 5.8 % of the total geographical area of the district. 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: *http://www.spc.tn.gov.in/Exe_Summary_DHDR/Thiruvallur.pdf*

(Ref: State planning Comission –Tamil Nadu, "District Human Development Report-2017, Thiruvallur District")



(Source: Maps of India)

Figure 3-9 Physical Map of Tamilnadu

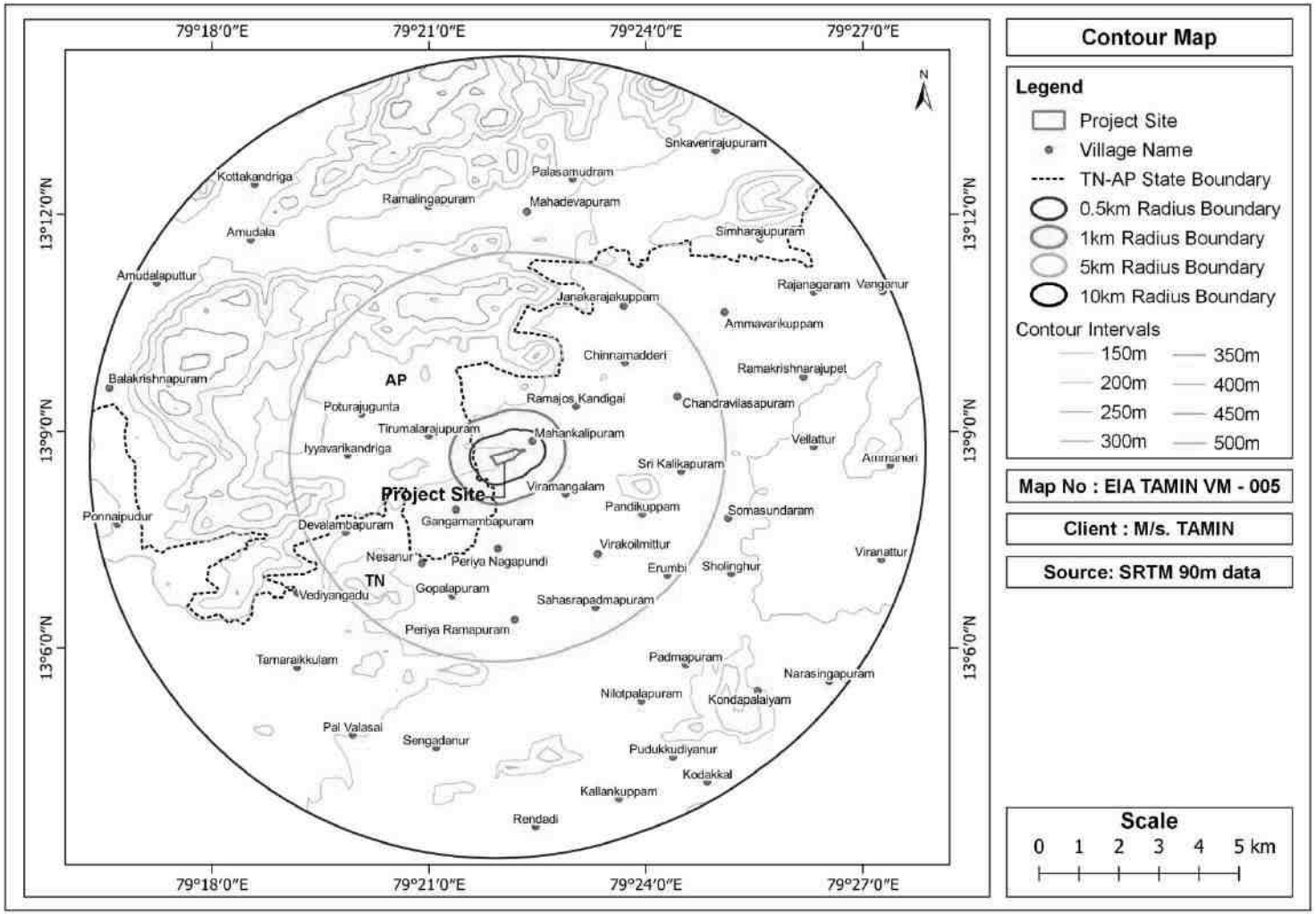


Figure 3-10 Contour map of the Study Area

3.5.6 Geomorphology of PIA District

The prominent geomorphic units identified in the district through interpretation of Satellite imagery are Alluvial Plain, Old River Courses, Coastal plains, Shallow & deep buried Pediments, Pediments and Structural Hills. The elevation of the area ranges from 183 m amsl in the west to sea level in the east. Four cycles of erosion gave rise to a complex assemblage of fluvial, estuarine and marine deposits. The major part of the area is characterised by an undulating topography with innumerable depressions which are used as irrigation tanks. The coastal tract is marked by three beach terraces with broad inter-terrace depressions. The coastal plains display a fairly lower level or gently rolling surface and only slightly elevated above the local water surfaces or rivers. The straight trend of the coastal tract is resultant of development of vast alluvial plains. There are a number of dunes in the coastal tract. The Geomorphology Map of the Thiruvallur District is shown as Figure 3-12**.**

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

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

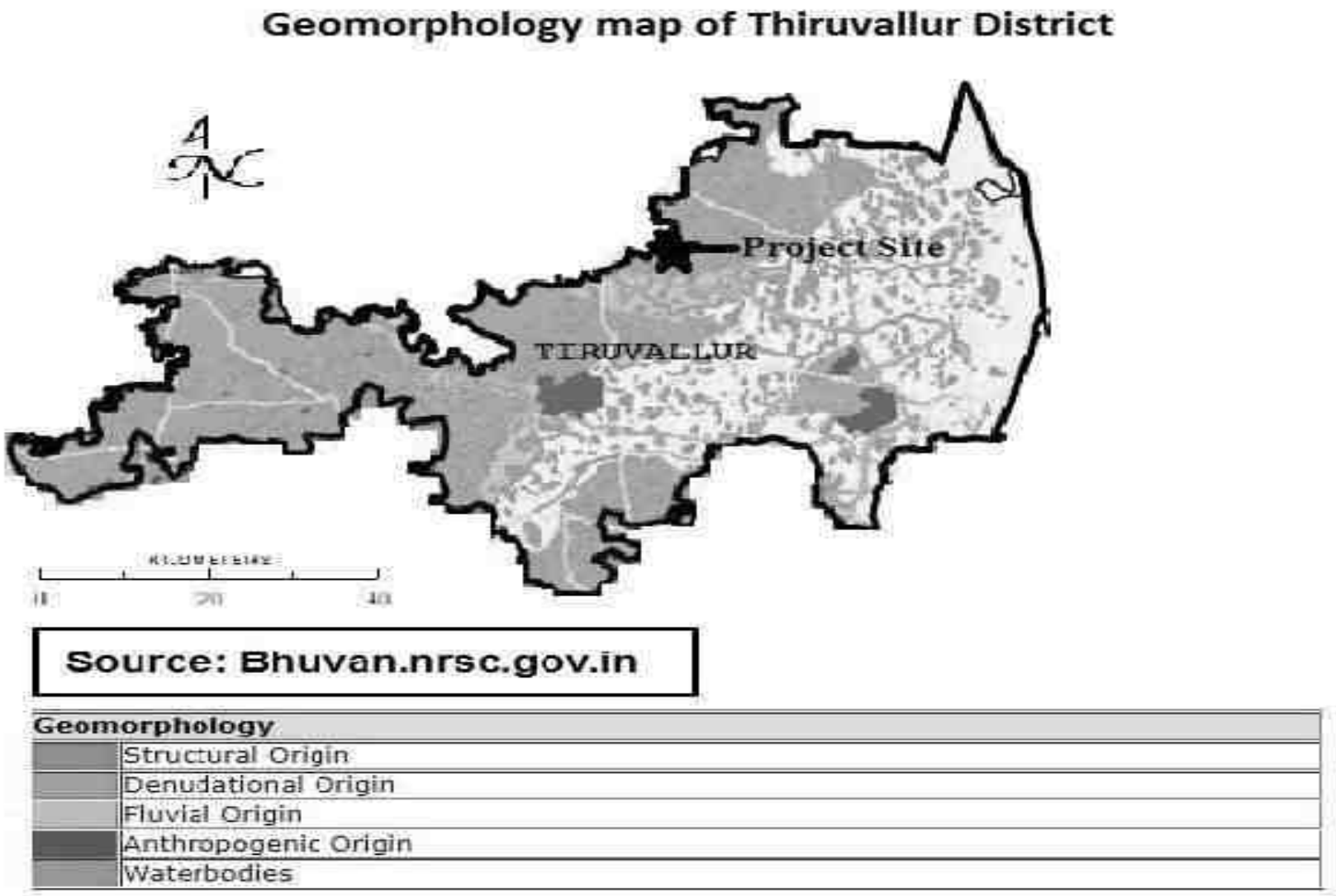


Figure 3-11 Geomorphology Map of the study area

3.5.7 Geomorphology of the study area

Total geographical area of the study area is 332.14 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 3-12.** Geomorphology map of the study area is given in **Figure 3-11.** The Geomorphology map of the study area is shown in the **Figure 3-13**.

Table 3-4 Geomorphology pattern of the study area

S.No.	Description	Area (Sq.Km)	Area (Acres)	Area (Hectares)	Percentage (%)
1	Denudational Origin-Pediment-PediPlain Complex	230.15	56871.216	23015	68.47
2	Denudational Origin-Moderately Dissected Hills and Valleys	79.31	19597.898	7931	23.59
3	Waterbodies	13.39	3308.736	1339	3.98
4	Structural Origin-Low Dissected Hills and Valleys	7.17	1771.7429	717	2.13
5	Denudational Origin-Low Dissected Hills and Valleys	4.99	1233.054	499	1.48
6	Anthropogenic Origin-Anthropogenic Terrain	1.13	279.22865	113	0.34
Total		**336.14**	**83061.875**	**33614**	100

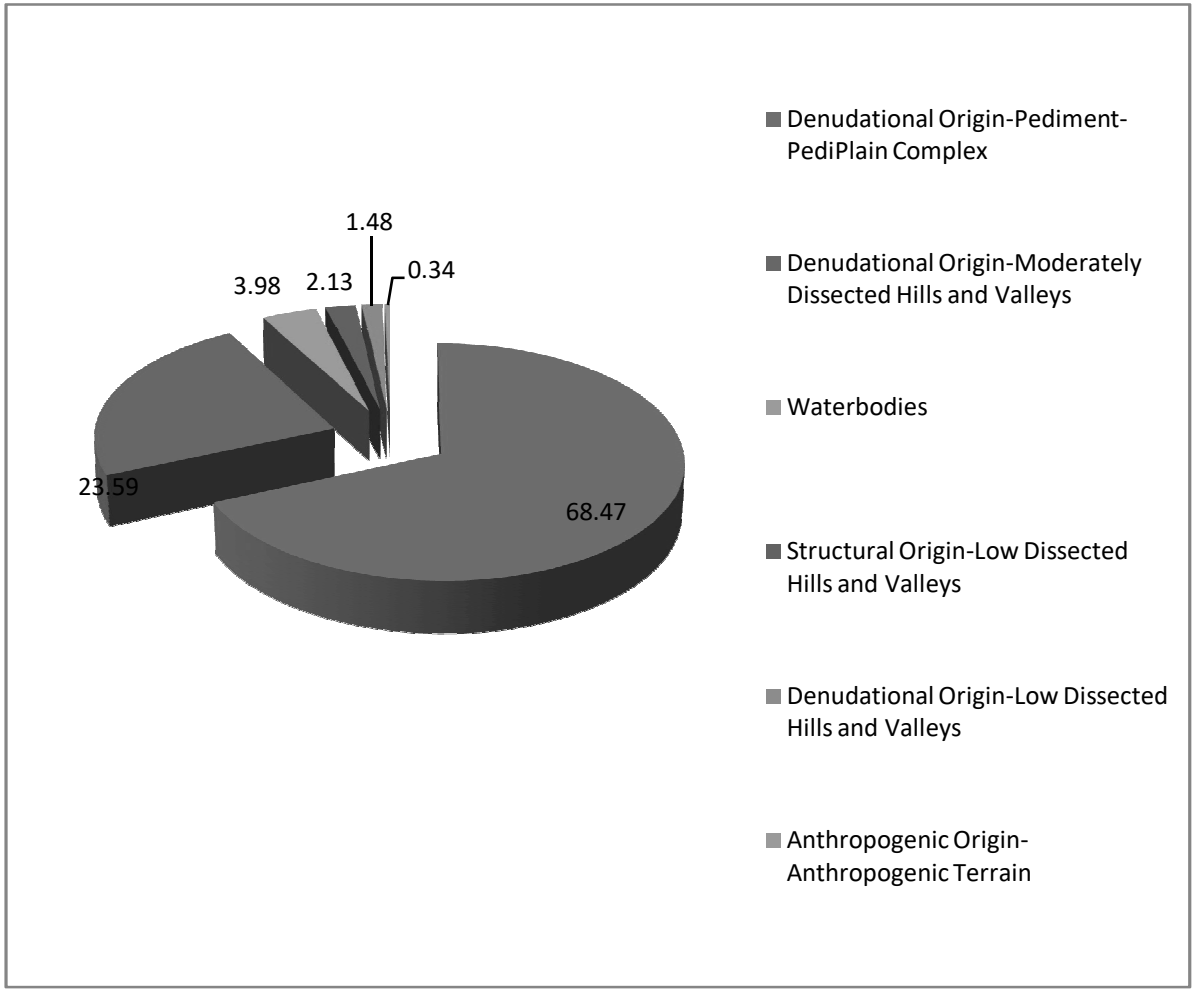


Figure 3-12 Geomorphology pattern of the study area

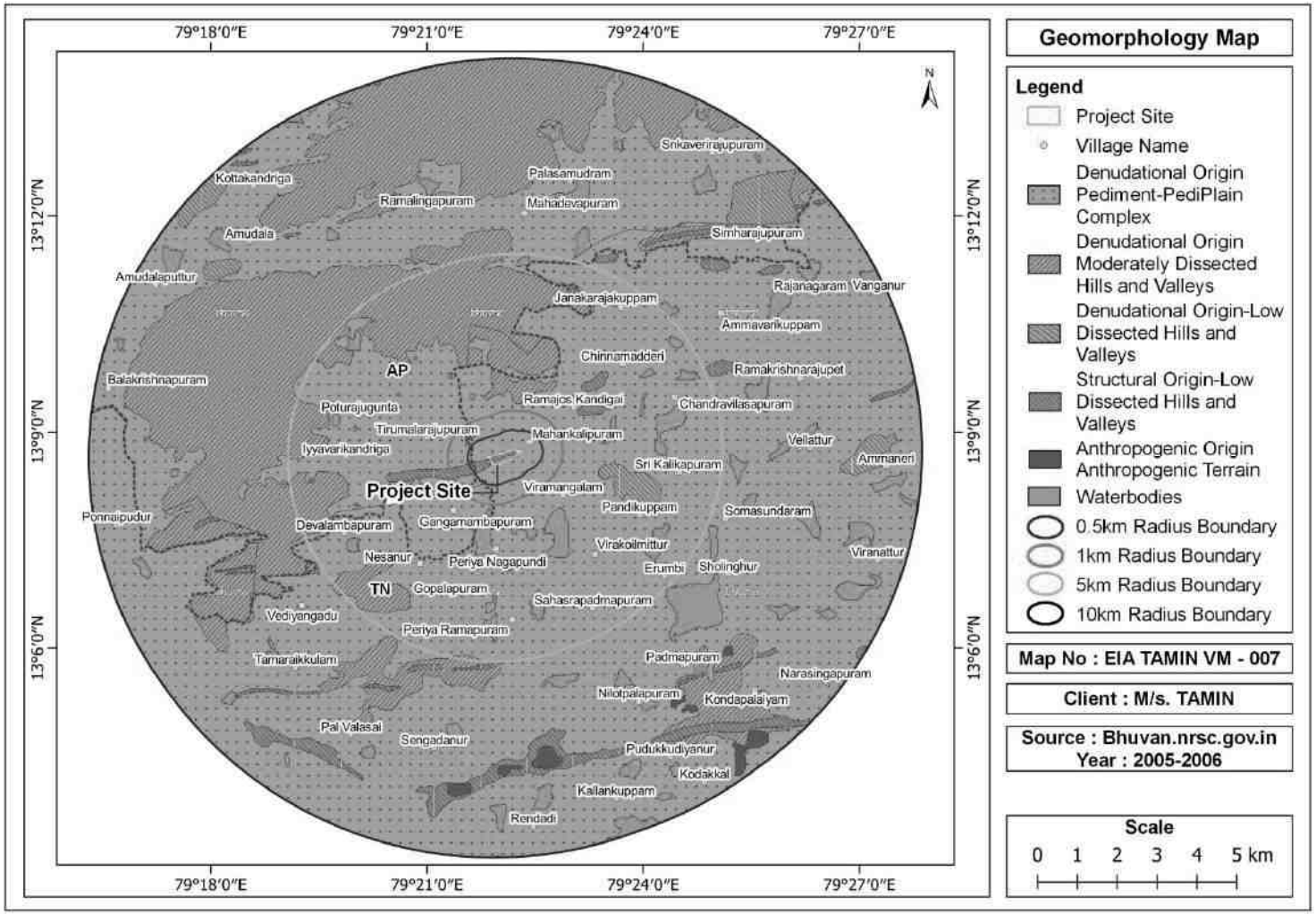


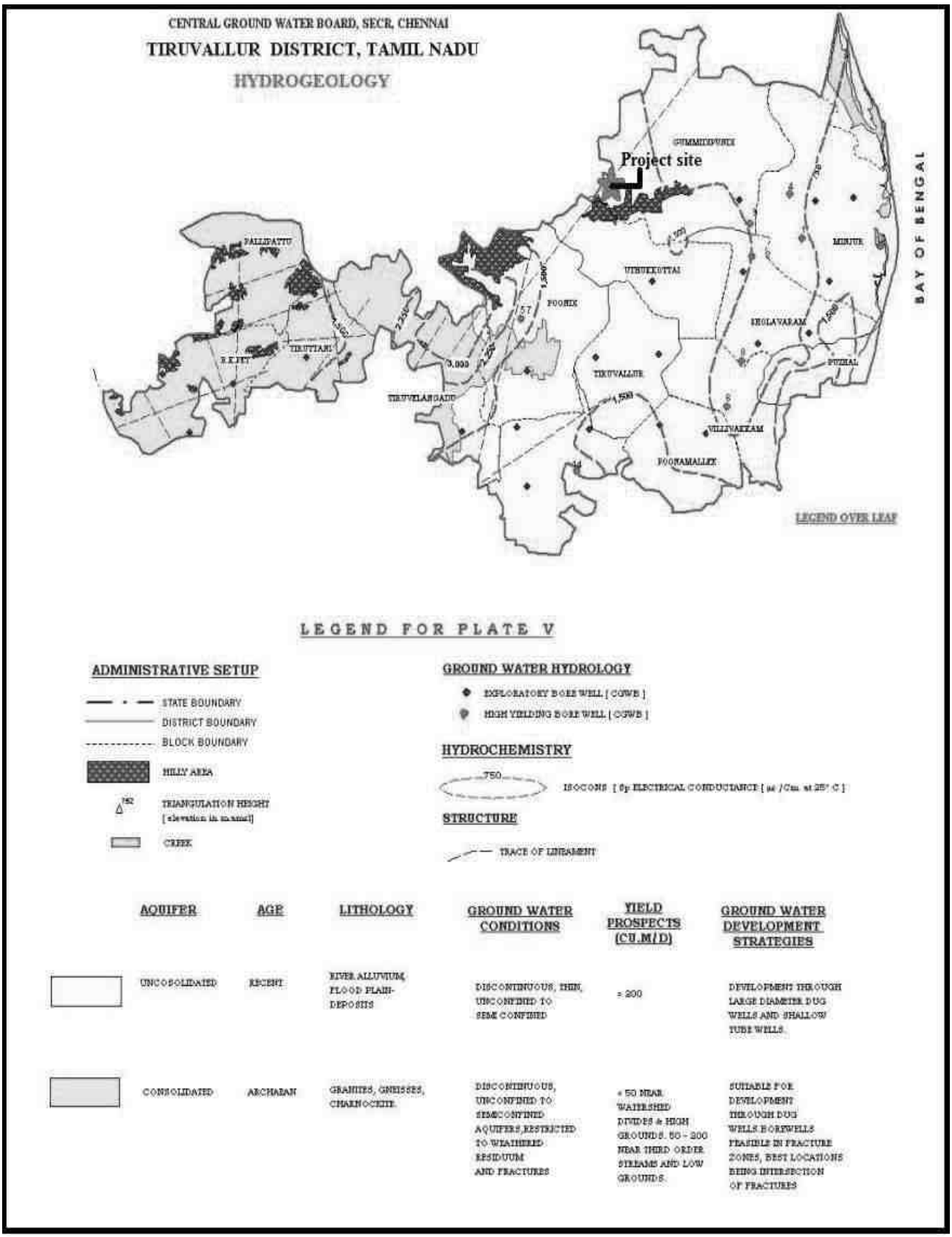
Figure 3-13 Geomorphology Map of Study Area

3.5.8 Hydrogeology of PIA District Profile

The district is underlain by both porous and fissured formations. The important aquifer systems in the district are considered by Unconsolidated & semi-consolidated formations and Weathered, fissured and fractured crystalline rocks. The porous formations in the district include sandstones and clays of Jurassic age (Upper Gondwana), marine sediments of Cretaceous age, sandstones of Tertiary age and recent alluvial formations. As the Gondwana formations are well-compacted and poorly jointed, the movement of ground water in these formations is mostly restricted to shallow levels. Ground water occurs under phreatic to semi-confined conditions in the inter-granular pore spaces in sands and sandstones and the bedding planes and thin fractures in shales. In the area underlain by Cretaceous sediments, ground water development is rather poor due to the rugged nature of the terrain and the poor quality of the formation water. Quaternary formations comprising mainly sands, clays and gravels are confined to major drainage courses in the district. The maximum thickness of alluvium is 30.0 m. whereas the average thickness is about 15.0m. Ground water occurs under phreatic to semi-confined conditions in these formations and is being developed by means of dug wells and filter points. Alluvium which forms a good aquifer system along Araniyar and Korattalaiyar river bed which is one of the major sources of water supply to urban areas of Chennai city and also to the industrial units. Ground water generally occurs under phreatic conditions in the weathered mantle and under semi-confined conditions in the fissured and fractured zones at deeper levels. The thickness of weathered zone in the district is in the range of 2 to 12 m. The depth of the wells ranged from 8.00 to 15.00 mbgl. The yield of large diameter wells tapping the weathered mantle of crystalline rocks ranges from 100 to 500 lpm and are able to sustain pumping for 2 to 6 hours per day. The yield of bore wells drilled down to a depth of 50 to 60 m ranges from 20 to 400 lpm. The yield of successful bore wells drilled down to a depth of 150 m bgl during the ground water exploration programme of Central Ground Water Board ranged from 1.2 to 7.6 lpm. The depth to water level in the district varied between 2.38 – 7.36 m bgl during pre-monsoon (May 2006) and 0.79 – 5.30 m bgl during post monsoon (Jan 2007). The seasonal fluctuation shows a rise between 0.28 and 4.80 mbgl. The piezometric head varied between 2.20 to 10.30 m bgl (May 2006) during premonsoon and 2.72 to 8.55 m bgl during post monsoon. The hydrogeology map of Thiruvallur District is given in **Figure 3-14**

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

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



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

Figure 3-14 Hydrogeology Map of Thiruvallur District

3.5.9 Drainage Pattern in PIA District

Araniyar, Korattalayar, Cooum, Nagari and Nandhi are the important rivers. The drainage pattern, in general, is dendritic. All the rivers are seasonal and carry substantial flows during monsoon period. Korattaliar river water is supplied to Cholavaram and Red Hill tanks by constructing an Anicut at Vellore Tambarambakkam. After filling a number of tanks on its further course, the river empties into the Ennore creek a few kilometres north of Chennai. The Coum River, flowing across the southern part of the district, has its origin in the surplus waters of the Cooum tank in Tiruvallur taluk and also receives the surplus waters of a number of tanks. It feeds the Chembarambakkam tank through a channel. It finally drains into the Bay of Bengal. The drainage map of the Study Area is given as **Figure 3-15**

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

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

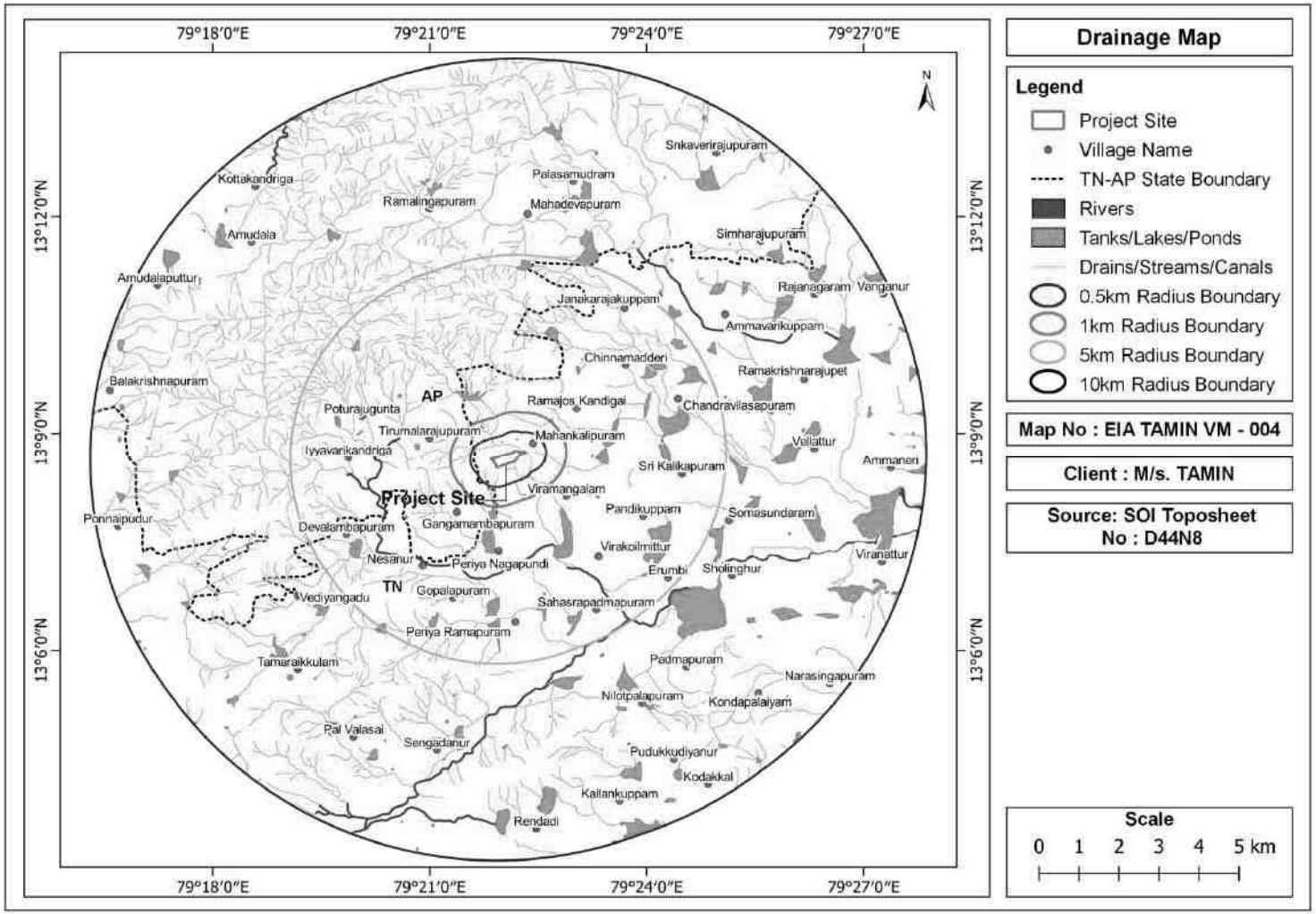


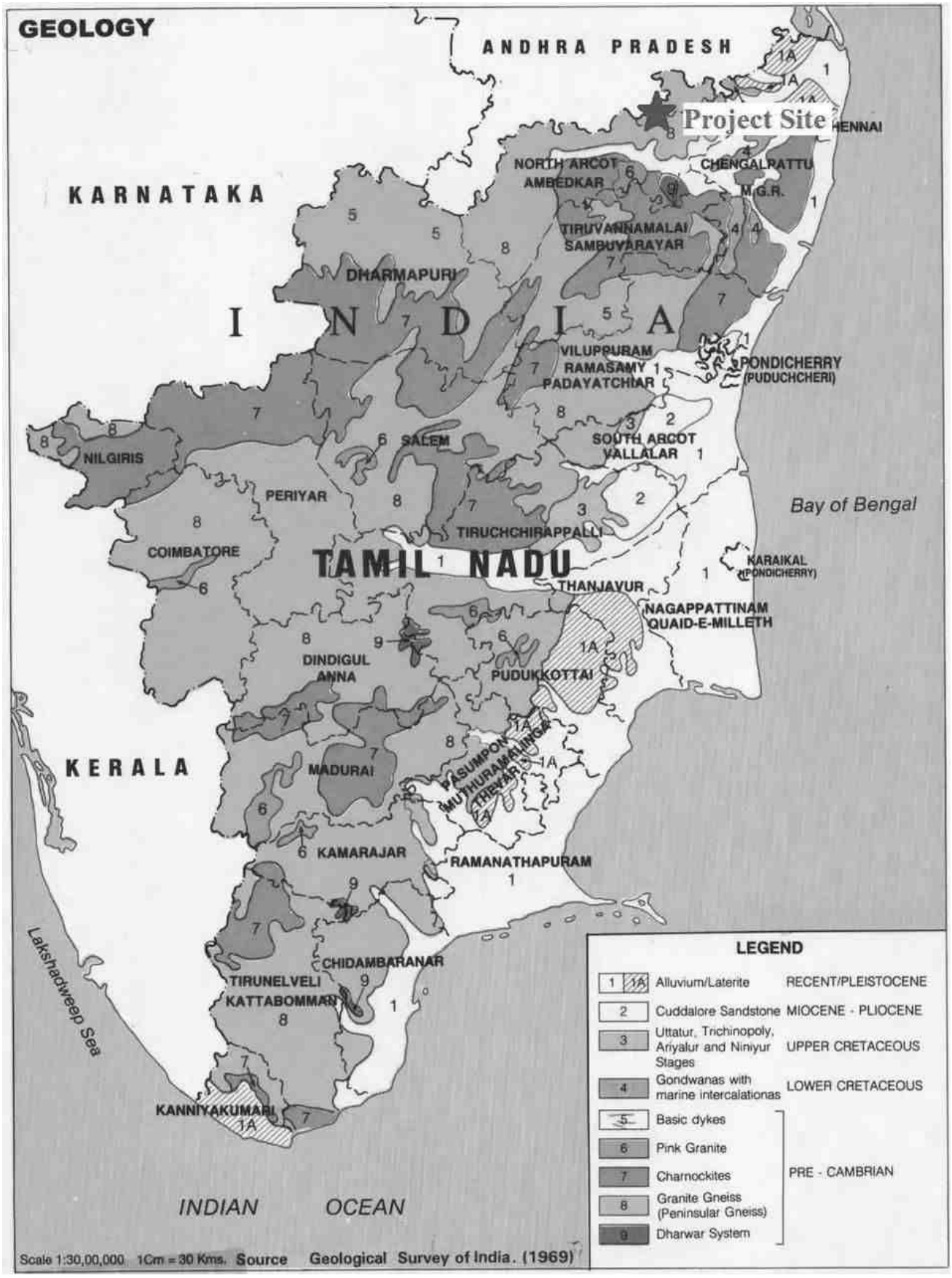
Figure 3-15 Drainage map of the study area

3.5.10 Geology

The Thiruvallur district can be geologically classified into hard rock and sedimentary (alluvial) formation. This district is principally made up of Archaean, upper Gondwana and the tertiary formations. These are over laid by laterites and alluvium. The oldest of the crystalline rocks of Archaean age are of Biotite and Hornblende Gneiss, Charnockite and granite. These are intruded by Amphibole dykes, and occasionally with veins of quartz and pegmatites. Granites and gneisses of Archaean age are mainly seen in Tiruthani taluk. Geological map of Tamilnadu is given as **Geology Survey of India**

Figure 3-16.

Source:http://nwm.gov.in/sites/default/files/Notes%20on%20Thiruvallur%20District.pdf

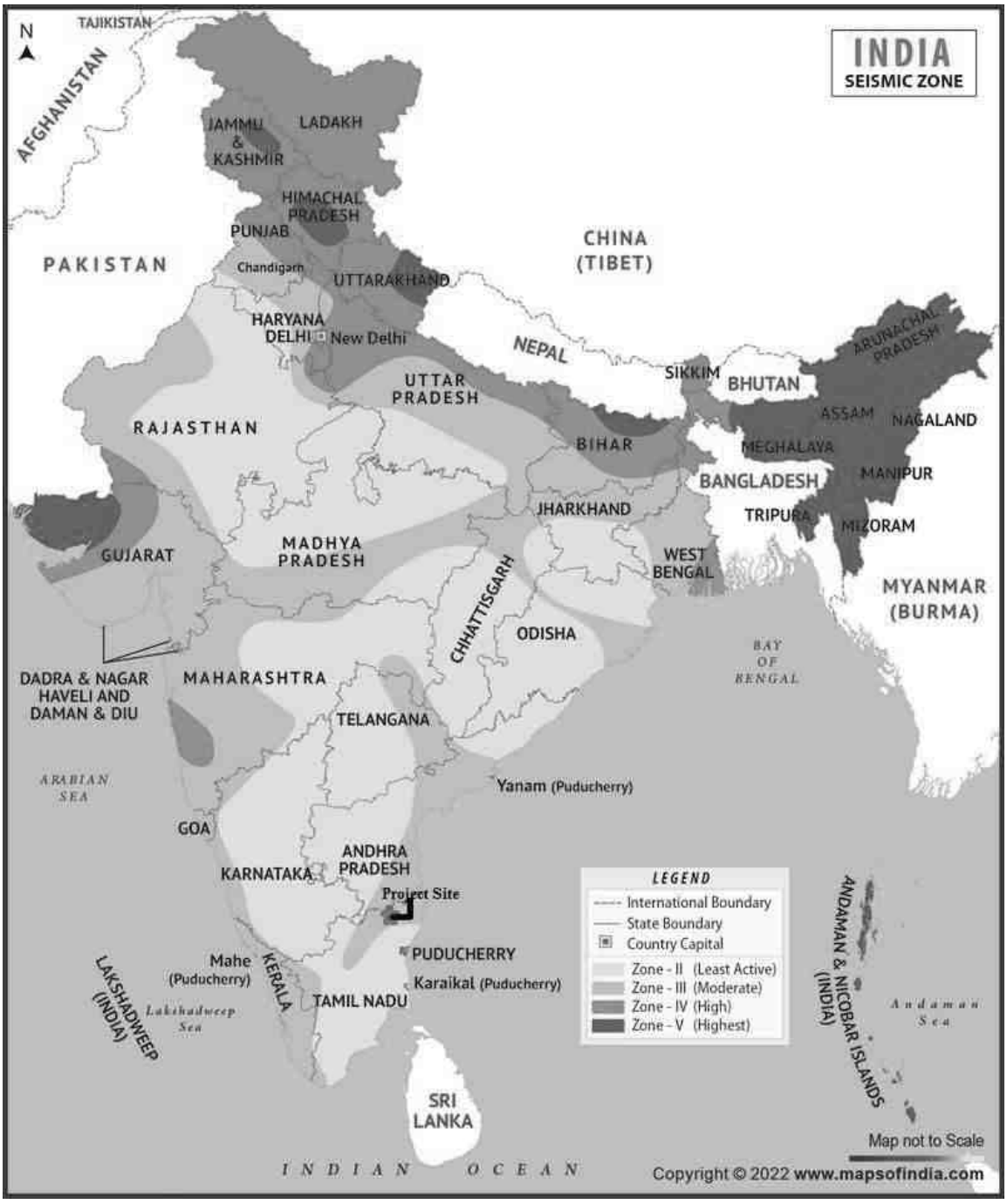


Source: Geology Survey of India

Figure 3-16 Geology Map of Tamilnadu

3.5.11 Seismicity

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



Source:Maps of India

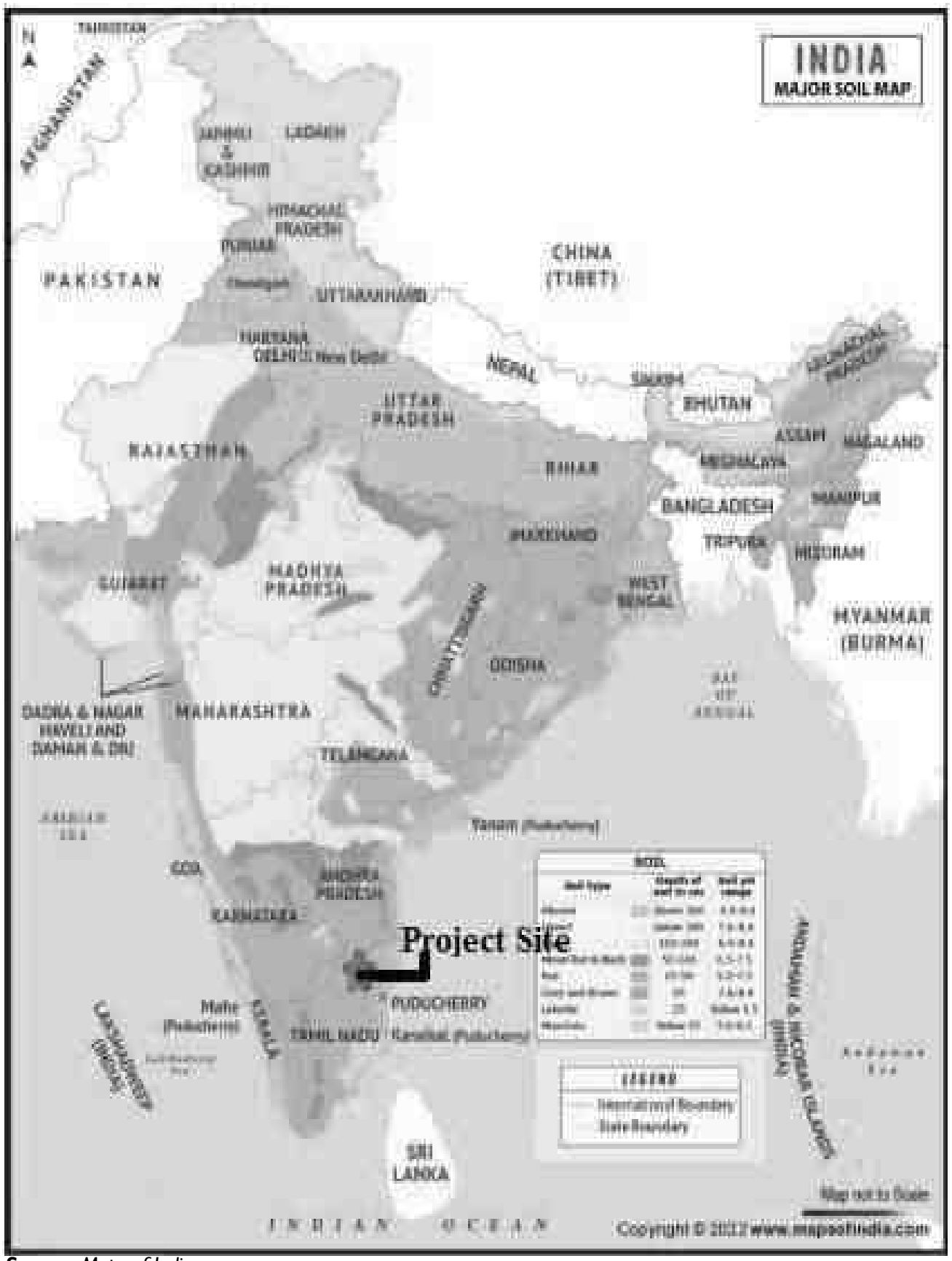
Figure 3-17 Seismicity Map of India

3.5.12 Soils in PIA District

Soils in the area have been classified into Red soil, Black soil, Alluvial soil and colluvial soil. The major part is covered by Red soil of red sandy/clay loam type. Ferruginous red soils are also seen at places. Black soils are deep to very deep and generally occurs in the depressions adjacent to hilly areas, in the western part. Alluvial soils occur along the river courses and eastern part of the coastal areas. Sandy coastal alluvium (arenaceous soil) are seen all along the sea coast as a narrow belt. Soil map of India is given in **Figure 3-18.**

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

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



Source: *Maps of India*

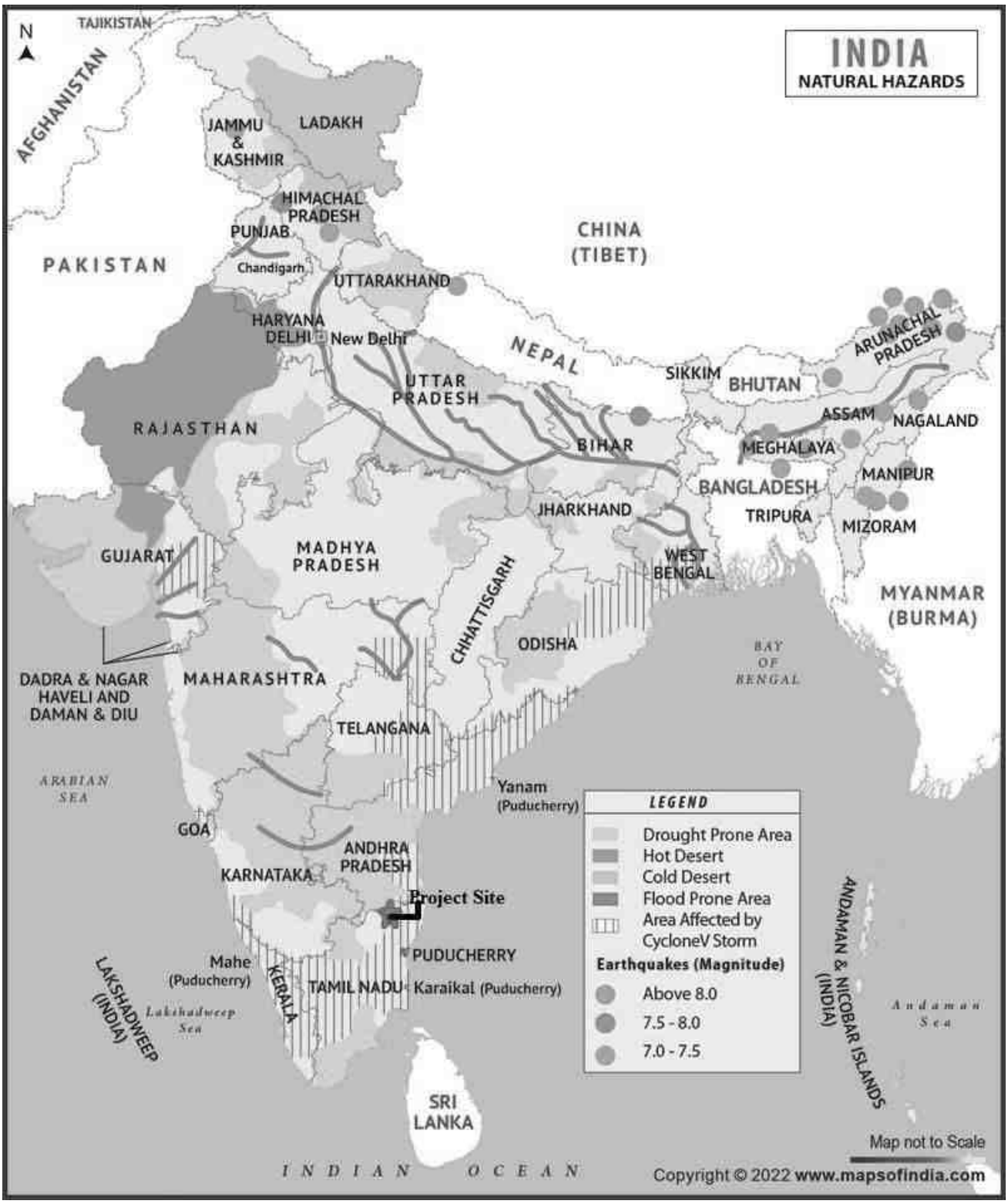
Figure 3-18 Soil map of India

3.5.13 Natural Hazards in PIA District

The coastline is mainly accreting with noticeable erosional effects particularly near Ennore. Development of offshore bars and shoals are observed near Ennore and Pulicat. Madras Thermal Power Station (MTPS) has been located near the Pulicat Lake. Boulders and Groynes were laid along a continuous stretch in this area. The strip of land between the Bay of Bengal and Pulicat Lake faces sea erosion. Generally floods occur during north east monsoon when there is heavy rainfall coupled with cyclonic storm in Bay of Bengal. Floods often occur in the basins of Kosasthalaiyar, Araniar, Coovum and Adyar and its tributaries. The entire coastal length of the district is prone to tsunami. Wind Hazard Map of India is given in Figure 3-19.

Source: *Maps of India*

Source: *http://tnenvis.nic.in/files/THIRUVALLUR%20%20.pdf*



Source: *Maps of India*

Figure 3-19 Natural hazard Map of India

3.6 Establishment of Baseline for valued environmental components

3.6.1 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

3.6.2 Meteorological Conditions

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

3.6.3 Meteorological Data Collection

Available secondary data pertaining to the meteorological parameters was obtained from the IMD Climatological tables. In addition, baseline meteorological data was generated during the study period **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 India Meteorological Department (IMD).

3.6.4 General Meteorological Scenario based on IMD Data

The nearest India Meteorological Department (IMD) station located to project site is Thiruvallur (Tirutanni). The Climatological data of Thiruvallur (Tirutani) (12° 29' N and 78° 34' E), published by the IMD, based on daily observations at 08:30 and 17:30 hour IST for a 30 year period (1991-2020), 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– Thiruvallur (Tiruttani) (1991-2020)

Month	Temp (°C)		Rainfall		Relative Humidity (%)		Vapour Pressure hPa		Mean Wind Speed (Kmph)	Predominant Wind Directions (From)*	
	Daily Max.	Daily Min.	Total (mm)	No. of days	08:30	17:30	08:30	17:30		08:30	17:30
Jan	30.3	17.3	0.3	0	83	60	21.9	22.4	1.6	SW	NE
Feb	33.3	18.6	2.7	0.2	76	51	22.7	22.5	1.9	SW	NE
Mar	36.6	20.9	7.3	0.7	69	43	24.6	22.3	2.2	SW	NE
Apr	37.3	24.1	40.9	3	70	53	29.2	27.2	2.1	SW	NE
May	37.5	25.1	85.9	5.6	68	55	29.3	28	2	SW	SW
Jun	35.3	24.6	65.8	3.9	70	57	28.2	27.5	1.9	SW	W
Jul	34.1	24.1	72.7	4.2	72	61	27.6	27.7	2.2	SW	W
Aug	33.1	23.4	136.5	6	76	64	27.4	28.1	2	SW	W
Sep	32.8	23	146.5	7.8	77	66	27.3	27.6	1.7	SW	NW
Oct	30.9	22	157.1	9.7	83	76	28	28.2	1.5	SW	NE
Nov	29.3	20.4	96.6	5.7	83	74	25.7	26.3	1.7	NE	NE
Dec	28.6	18	34.8	2.2	84	70	22.8	23.7	1.5	NE	NE
Max.	**37.5**	**25.1**	**157.1**	**9.7**	**84**	**76**	**29.3**	**28.2**	**2.2**	**Annual Predominant wind direction is SOUTH WEST**	
Min.	**28.6**	**17.3**	**0.3**	**0**	**68**	**43**	**21.9**	**22.3**	**1.5**		
Annual Avg/Total	**33.2**	**21.8**	**41**	**12.9**	**76**	**61**	**26.2**	**26**	**1.8**		

Source:

As per the above IMD climatological Data given in

Table 3-5**,** the observations drawn are as follows

- Highest Daily maximum temperature is 37.5°C and the Lowest daily minimum temperature is 17.3°C were recorded in the months of May and January respectively
- Maximum and minimum relative humidity of 84% and 43% were recorded in the months of December and March respectively.
- Maximum and minimum rainfall of 157.1 mm and 0.3 mm was recorded in the months of October and Janauary respectively.

- Maximum and minimum Mean wind speed is 2.2 Km/hr and 1.5 Km/hr were recorded in the months of March, July and October, December respectively. Annual Wind predominant direction is **South West**.

3.6.5 Meteorological data during Study Period

The meteorological scenario in and around the project site is an essential requirement during study period for proper interpretation of baseline air quality status. Meteorological data was collected during the study period **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.**

Table 3-6 Meteorology Data for the Study Period (Mid of January 2023 to mid of April 2023)

S. No	Parameter	Observation
1	Temperature	Max. Temperature: 37°C Min. Temperature: 16°C Avg. Temperature: 27.33°C
2	Average Relative Humidity	65.85%
3	Average Wind Speed	2.77 m/s
4	Predominant Wind Direction	NE

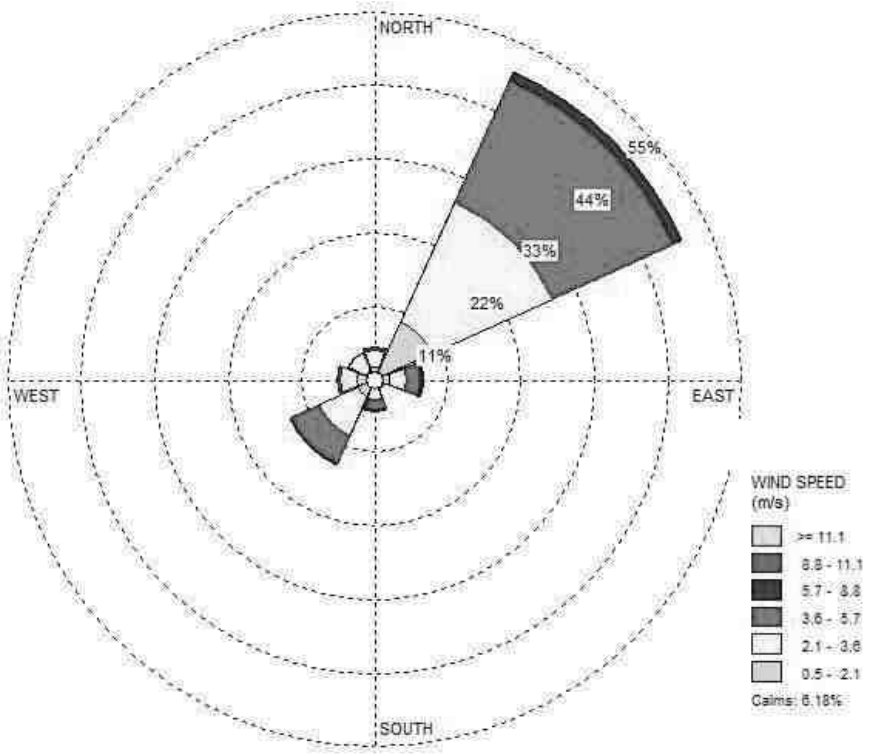


Figure 3-20 Wind Rose during mid January 2023 to mid April 2023

3.6.6 Atmospheric Inversion

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

- Average atmospheric temperature: 27.33°C
- Average Relative humidity:65.85%
- Average Wind speed: 2.77 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 3626 m during 6 AM to 4 PM, the maximum recorded at 3626 m during April 2023. This is shown in the following **Figure 3-21.**

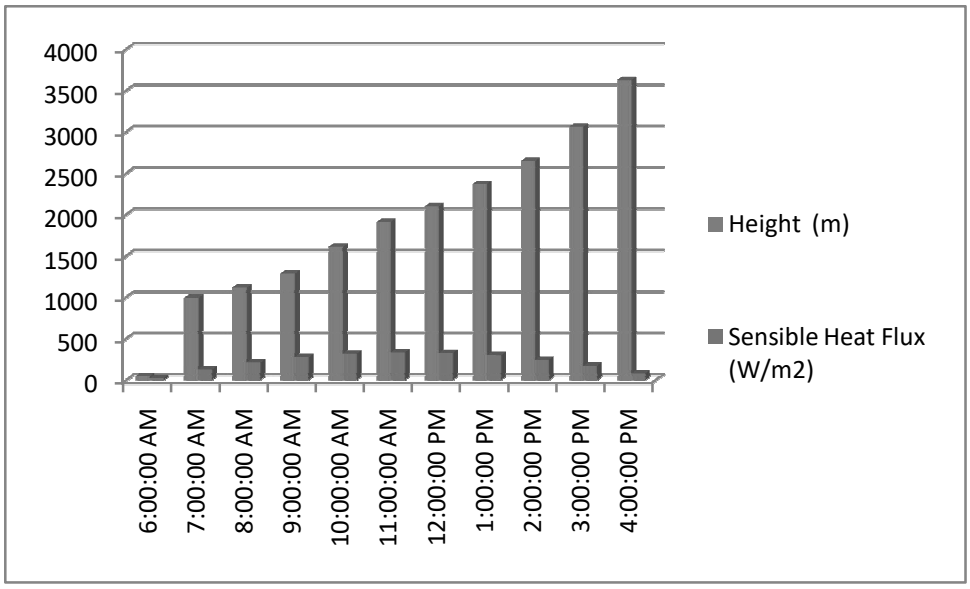


Figure 3-21 Atmospheric inversion level at the project site

3.7 Ambient Air Quality

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

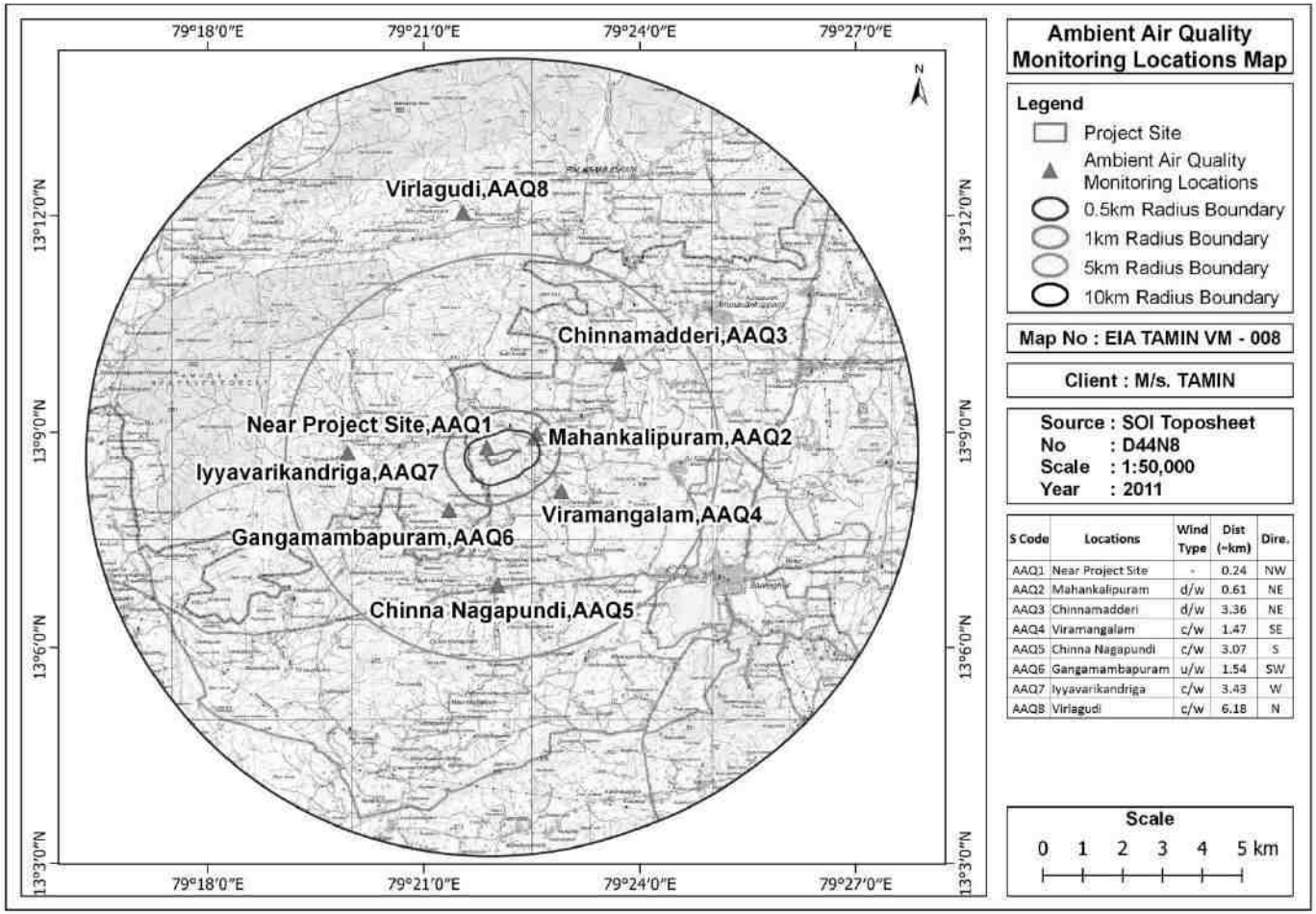
- Topography/Terrain
- Meteorological conditions
- Residential and sensitive areas within the study area
- Representatives of regional background air quality/pollution levels and
- Representation of likely impacted areas

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 Thiruvallur (Tirutanni) from IMD data (1991-2020). The wind predominance during study period **(Mid of January 2023 to mid of April 2023)** is from South West.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	Project Site	-	Within the Site	
A2	Mahankalipuram	D/W	0.61	NE
A3	Chinnamaderi	D/W	3.36	NE
A4	Viramangalam	C/W	1.47	SE
A5	Chinna nagapundi	C/W	3.07	S
A6	Gangamambapuram	U/W	1.54	SW
A7	Iyyavarikandriga	C/W	3.43	W
A8	Virlagudi	C/W	6.18	N



S Code	Locations	Wind Type	Dist (~km)	Dire.
AAQ1	Near Project Site	-	0.24	NW
AAQ2	Mahankalipuram	d/w	0.61	NE
AAQ3	Chinnamadderi	d/w	3.36	NE
AAQ4	Viramangalam	c/w	1.47	SE
AAQ5	Chinna Nagapundi	c/w	3.07	S
AAQ6	Gangamambapuram	u/w	1.54	SW
AAQ7	Iyyavarikandriga	c/w	3.43	W
AAQ8	Virlagudi	c/w	6.18	N

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, SO_2, NO_x, CO, Pb, O_3, NH_3, C_6H_6, $C_{20}H_{12}$, 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), µg/m^3	IS 11255: (Part 2) / USEPA Method 6	50 (Annual)	80 (24 Hours)	24 Hours
2	Nitrogen Dioxide (NO_2), µg/m^3	IS: 5182 (Part - 6): 2006 / CPCB guidelines Volume1	40 (Annual)	80 (24 Hours)	24 Hours
3	Particulate Matter ($PM_{2.5}$), µg/m^3	In house method (Gravimetric method) based on CPCB guidelines Volume1	40 (Annual)	60 (24 hours)	24 Hours
4	Particulate Matter (PM_{10}), µg/m^3	IS:5182 (Part– 23): 2006 CPCB guidelines Volume1	60 (Annual)	100 (24 hours)	24 Hours
5	CO, mg/m^3	IS:5182(Part–10):1999 (Reaff:2006) CPCB guidelines Volume1	2 (8 hours)	4 (1hour)	8 Hours
6	Pb, µg/m^3	IS:5182(Part–22):2004 (Reaff:2006) CPCB guidelines Volume1	0.5(Annual)	1(24 hours)	24 Hours
7	O_3, µg/m^3	In house method (Spectrophotometric method) based on CPCB guidelines Volume1	100(8hours)	180 (1hour)	8 Hours
8	NH_3, µg/m^3	In house method (Spectrophotometric method) based on CPCB guidelines Volume1	100(Annual)	400(24 hours)	8 Hours
9	Benzene, µg/m^3	GC FID/ GC MS based on IS 5182 (Part:12)/ CPCB guidelines Volume1	5 (Annual)	5 (Annual)	24 Hours
10	Benzo (a) pyrene, ng/m^3	In House Validated method By HPCL , UV & GC MS Based on IS:5182(Part–12) CPCB guidelines Volume1	1 (Annual)	1 (Annual)	24 Hours
11	Arsenic, ng/ m^3	In house method (AAS method) Based on CPCB	6 (Annual)	6 (Annual)	24 Hours

S. No	Parameters	Analytical method	NAAQ standards: 2009		Sampling Time
		guidelines Volume 1			
12	Nickel, ng/ m^3	In house method (AAS method) Based on CPCB guidelines Volume 1	20(Annual)	20 (Annual)	24 Hours

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 of January 2023 to mid of April 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	Mahankalipuram	Chinnamaderi	Viramangalam	Chinnanagapundi	Gangamambapuram	Iyyavarikandriga	Virlagudi
			A1	A2	A3	A4	A5	A6	A7	A8
PM_{10} Conc. (µg/m³)	Min.	100 (24 Hours)	62.63	45.93	41.75	33.40	29.23	37.58	41.75	58.45
	Max.		89.25	65.45	59.50	47.60	41.65	53.55	59.50	83.30
	Avg.		**75.10**	**55.07**	**50.07**	**40.06**	**35.05**	**45.06**	**50.07**	**70.09**
	98th		88.73	65.07	59.16	47.32	41.41	53.24	59.16	82.82
$PM_{2.5}$ Conc. (µg/m³)	Min.	60 (24 Hours)	34.44	26.79	24.11	19.53	17.47	20.95	23.00	32.14
	Max.		49.09	38.18	34.36	27.84	24.90	29.86	32.78	45.80
	Avg.		**41.31**	**32.13**	**28.91**	**23.43**	**20.96**	**25.13**	**27.59**	**38.54**
	98th		48.80	37.96	34.16	27.68	24.76	29.69	32.59	45.54
SO_2 Conc. (µg/m³)	Min.	80 (24 Hours)	6.80	5.65	6.53	7.09	6.19	6.81	7.05	7.20
	Max.		9.69	8.06	9.31	10.10	8.82	9.70	10.05	10.26
	Avg.		**8.16**	**6.79**	**7.84**	**8.50**	**7.43**	**8.17**	**8.46**	**8.64**
	98th		9.63	8.01	9.26	10.04	8.77	9.64	9.99	10.20
NO_2 Conc. (µg/m³)	Min.	80 (24 Hours)	13.56	10.05	12.38	14.32	12.10	13.20	13.36	14.36
	Max.		19.32	14.33	17.64	20.40	17.24	18.81	19.04	20.46
	Avg.,		**16.26**	**12.06**	**14.85**	**17.17**	**14.51**	**15.83**	**16.02**	**17.22**
	98th		19.21	14.25	17.54	20.29	17.14	18.70	18.93	20.34
Lead (Pb) (µg/m³)	Avg.	1 (24 hour)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)
Carbon monoxide (CO) (mg/m³)	Avg.	4 (1hour)	0.41	0.34	0.40	0.43	0.38	0.41	0.43	0.44
Ozone O_3 (µg/m³)	Avg.	180 (1hour)	11.42	9.50	10.97	11.90	10.40	11.43	11.84	12.09
Benzene (C_6H_6)	Avg.	5(Annual)	BLQ	BLQ (LOQ	BLQ	BLQ (LOQ	BLQ (LOQ	BLQ (LOQ 1)	BLQ (LOQ	BLQ (LOQ

Parameters	Conc.	NAAQ Standards	Locations							
			Project Site	Mahankalipuram	Chinnamaderi	Viramangalam	Chinnanagapundi	Gangamambapuram	Iyyavarikandriga	Virlagudi
			A1	A2	A3	A4	A5	A6	A7	A8
(µg/m³)			(LOQ 1)	1)	(LOQ 1)	1)	1)		1)	1)
Benzo (a) Pyrene ($C_{20}H_{12}$ (a)), (ng/m³)	Avg.	1 (Annual)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)
Arsenic (As) (ng/m³)	Avg.	6 (Annual)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)
Nickel as Ni (ng/m³)	Avg.	20 (Annual)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)
Ammonia (NH_3) (µg/m³)	Avg.	400 (24 hour)	BLQ(LOQ 5)	BLQ(LOQ 5)	BLQ(LOQ 5)	BLQ(LOQ 5)	BLQ(LOQ 5)	BLQ(LOQ 5)	BLQ(LOQ 5)	BLQ(LOQ 5)
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 (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)
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)
Free Slica	Avg.	-	BLQ(LOQ 0.04)	BLQ(LOQ 0.04)	BLQ(LOQ 0.04)	BLQ(LOQ 0.04)	BLQ(LOQ 0.04)	BLQ(LOQ 0.04)	BLQ(LOQ 0.04)	BLQ(LOQ 0.04)

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

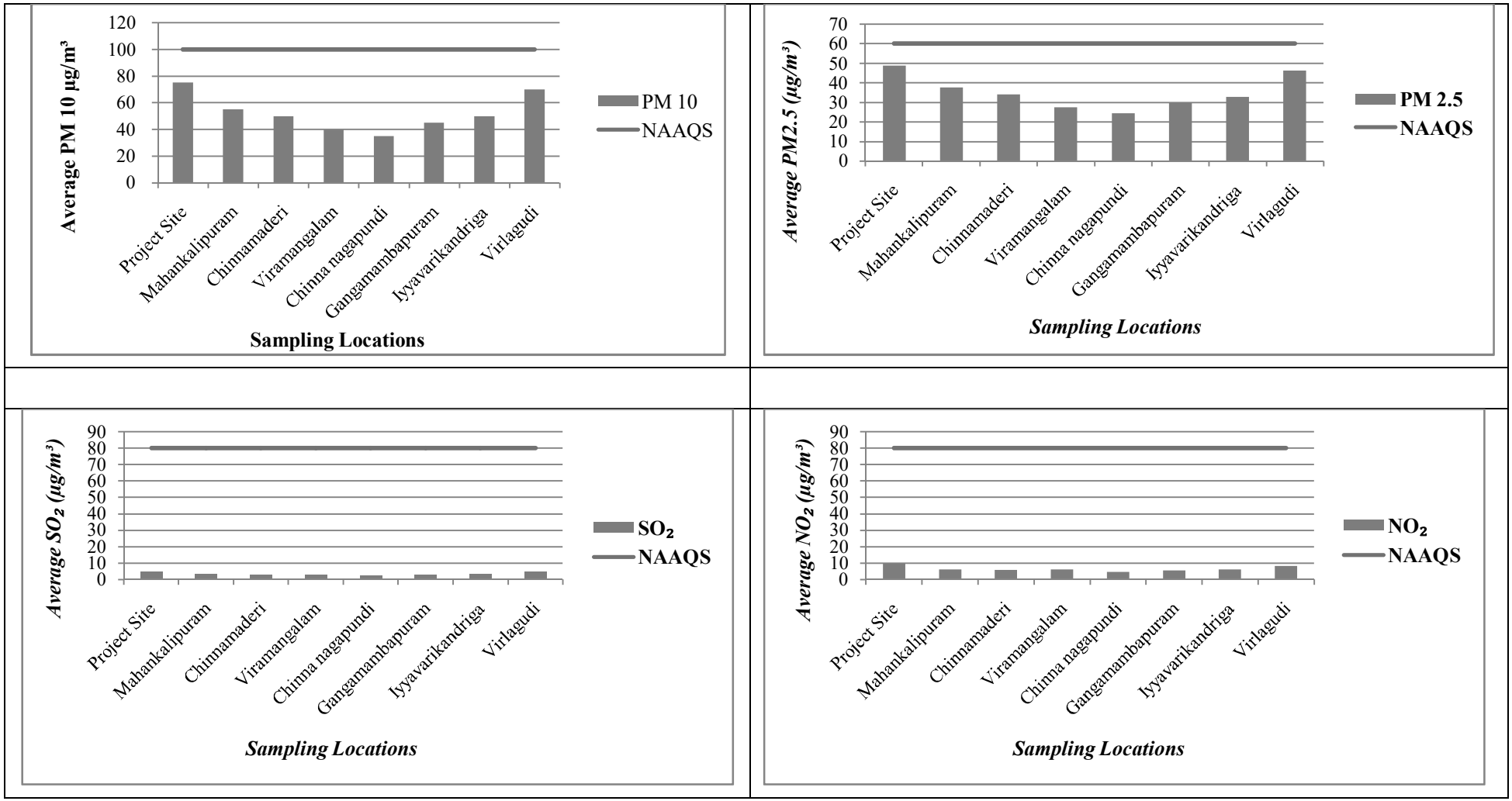


Figure 3-23 Trends of Measured Ambient Concentrations in the Study Area

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 **35.05** to **75.1 µg/m³.** These locations (A1, A8) are nearby crushing units.
- The average baseline levels of $PM_{2.5}$ vary from **20.96 t o 41.31** µg/m³.
- The average baseline levels of SO_2 vary from **6.79 to 8.64** µg/m³.
- The average baseline levels of NO_2 vary from **12.06 to 17.22** 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**

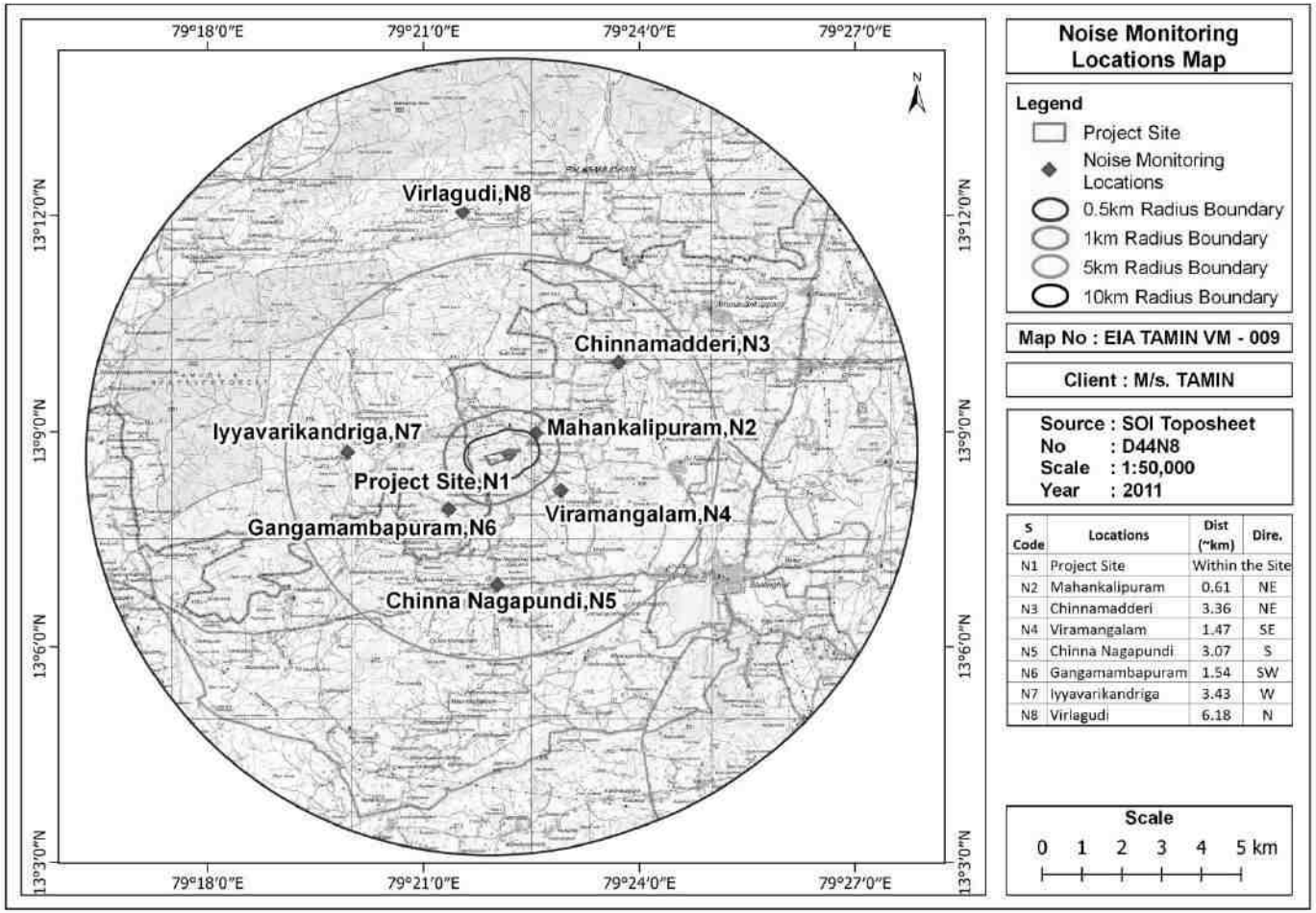
Table 3-10 Day and Night Equivalent Noise Levels

S. No	Location	Location Code	Distance (~km) from Project boundary	Azimuth Direction	Noise level in dB(A) Leq		CPCB Standard		Environmental Setting
					Day	Night	Lday (Ld)	LNight (Ln)	
1	Project Site	N1	Within Site		68.7	45	75	70	Industrial
2	Mahankalipuram	N2	1.07	E	50.3	40.6	55	45	residential
3	Chinnamaderi	N3	2.49	E	49.8	41.5	55	45	residential
4	Viramangalam	N4	9.59	SSW	50.1	42.8	55	45	residential
5	Chinna nagapundi	N5	8	SW	51.3	41.9	55	45	residential
6	Gangamambapuram	N6	5.32	WSW	50.4	40.3	55	45	residential
7	Iyyavarikandriga	N7	1.69	W	53.8	42.4	55	45	residential
8	Virlagudi	N8	3.71	N	50.2	40.1	55	45	residential

3.8.1.1 Observations

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

- In Industrial area (Project site), day time noise level was about 68.7 dB (A) and 45 dB(A) during night time, which is within prescribed limit by CPCB for Industrial area (75 dB(A) Day time & 70 dB(A)Night time).
- In Residential area day time noise levels varied from 49.8 dB (A) to 53.8 dB (A) and night time noise levels varied from40.1 dB(A) to 42.8 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).



S Code	Locations	Dist (~km)	Dire.
N1	Project Site	Within the Site	
N2	Mahankalipuram	0.61	NE
N3	Chinnamadderi	3.36	NE
N4	Viramangalam	1.47	SE
N5	Chinna Nagapundi	3.07	S
N6	Gangamambapuram	1.54	SW
N7	Iyyavarikandriga	3.43	W
N8	Virlagudi	6.18	N

Figure 3-24 Map showing the noise monitoring locations

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

Araniyar, Korattalayar, Cooum, Nagari and Nandhi are the important rivers. The drainage pattern, in general, is dendritic. All the rivers are seasonal and carry substantial flows during monsoon period. Korattaliar river water is supplied to Cholavaram and Red Hill tanks by constructing an Anicut at Vellore Tambarambakkam. After filling a number of tanks on its further course, the river empties into the Ennore creek a few kilometres north of Chennai. The Cooum River, flowing across the southern part of the district, has its origin in the surplus waters of the Cooum tank in Tiruvallur Taluk and also receives the surplus waters of a number of tanks. It feeds the Chembarambakkam tank through a channel. It finally drains into the Bay of Bengal.

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

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

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.

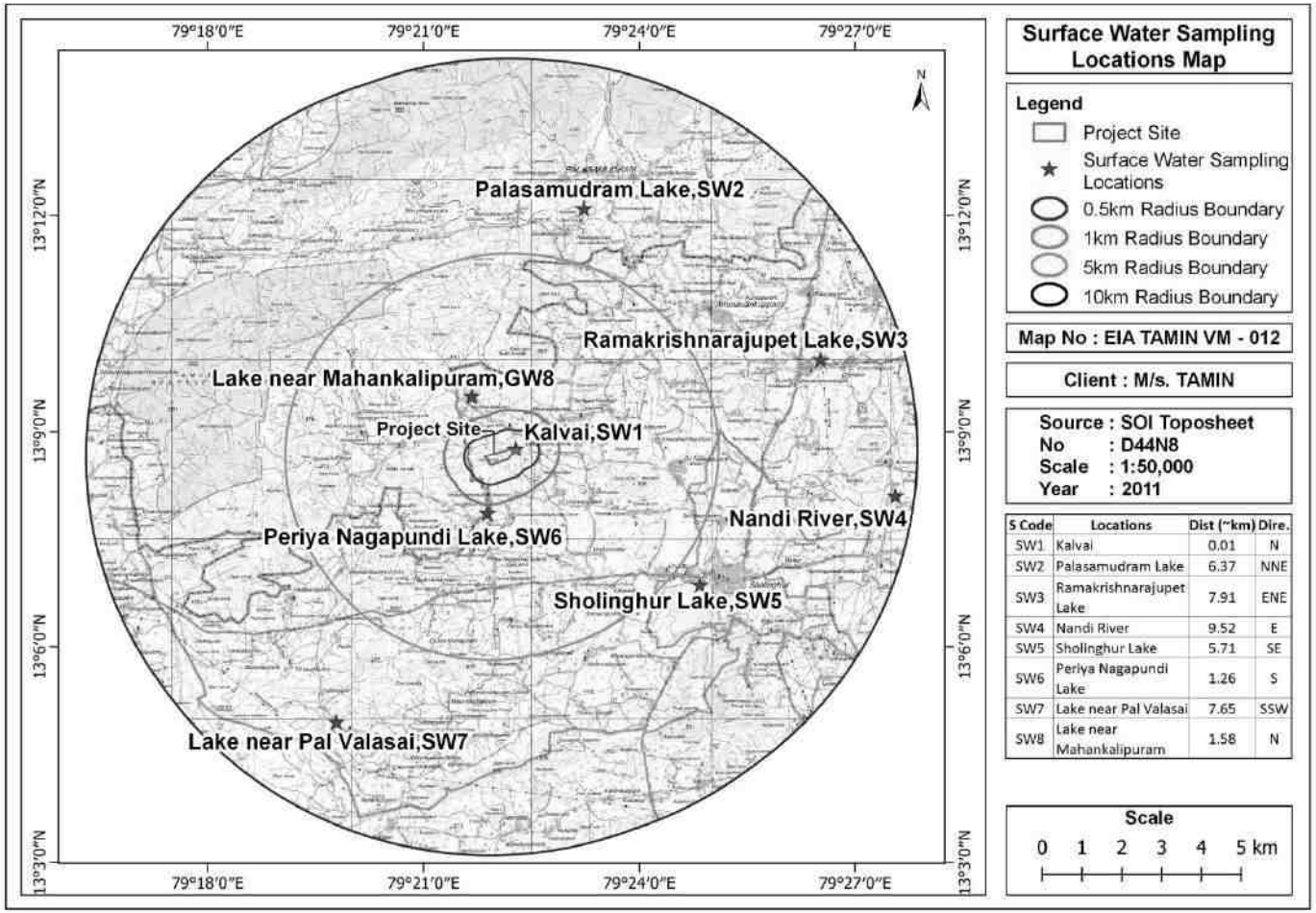
Table 3-11Test methods used for the analysis of water quality parameters

Sl. No	Parameter Measured	Test Method
1	Turbidity	IS 3025(Part - 10):1984

Sl. No	Parameter Measured	Test Method
2	pH	IS:3025 (Part - 11): 1983 (Reaff: 2006)
3	Electrical Conductivity	IS:3025 (Part - 14): 1983 (Reaff: 2006)
4	Total Dissolve Solids	IS: 3025:1(Part - 16) 1984 (Reaff 2006)
5	Total Suspended Solids	IS 3025 (Part - 17) 1984 (Reaff 1996)
6	Total Alkalinity as CaCO3	IS:3025,1 (Part - 23) 1986 (Reaff 2009)
7	Total Hardness as CaCo3	IS:3025 (Part - 21) 1983 (Reaff 2006)
8	Sodium as Na	IS:3025,5(Part - 45) 1993 (Reaff 2006)
9	Potassium as K	IS:3025,5(Part - 45) 1993 (Reaff 2006)
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(Reaff 2009)
19	Cadmium as Cd	IS 3025 (Part - 41)1991
20	Chromium, Total	IS:3025 (Part - 52) 2003 (Reaff 2009)
21	Lead as Pb	IS:3025 (Part - 47) 1994 (Reaff 2009)
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(Reaff 2009)
25	Selenium as Se	IS 3025 Part (56)2003
26	Zinc as Zn	IS:3025 (Part - 49) 1994 (Reaff 2009)
27	Dissolved Oxygen (DO)	IS:3025 (Part - 38)1989 (Reaff 2009)
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

S.No	Location	Location Code	Distance in Km	Direction
1	Kalvai	SW1	Project site	
2.	Vengarajukuppam Lake	SW2	6.37	NNE
3	Ramakrishnarajupet Lake	SW3	7.91	ENE
4	Nandi River	SW4	9.52	E
5	Sholinghur Lake	SW5	5.71	SE
6	Periya Nagapundi Lake	SW6	1.26	S
7	Lake Near Pal Valasai	SW7	7.65	SSW
8	Lake Near Mahankalipuram	SW8	1.58	N



S Code	Locations	Dist (~km)	Dire.
SW1	Kalvai	0.01	N
SW2	Palasamudram Lake	6.37	NNE
SW3	Ramakrishnarajupet Lake	7.91	ENE
SW4	Nandi River	9.52	E
SW5	Sholinghur Lake	5.71	SE
SW6	Periya Nagapundi Lake	1.26	S
SW7	Lake near Pal Valasai	7.65	SSW
SW8	Lake near Mahankalipuram	1.58	N

Figure 3-25 Map showing the surface water monitoring locations

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

SL NO	Parameter	Unit	Surface water standards (IS 2296 Class-A)	Kalvai	Vengalrajukuppam Lake	Ramakrishnarajupet Lake	Nandi R	Sholinghur Lake	Lake near Periya Nagapundi	Lake Near Pal Valasai	Lake Near Mahankalipuram
				SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
1.	**pH (at 25°C)**	--	**6.5-8.5**	7.81	7.44	7.53	7.24	7.83	7.48	7.44	7.53
2.	**Turbidity**	NTU		5.7	2.4	2.6	3.1	2.1	2.6	2.1	4.3
3.	**Electrical Conductivity**	µS/cm	**-**	855	727	697	663	863	746	863	744
4.	**Total Dissolved Solids**	mg/l	**500**	445	378	363	345	449	388	449	387
5.	**Total Suspended Solids**	mg/l	**-**	40	17	18	22	15	18	15	30
6.	**Total Alkalinity as $CaCO_3$**	mg/l	**-**	146	118	161	146	125	161	125	161
7.	**Total Hardness as $CaCO_3$**	mg/l	**200**	175.2	142	193	175	150	193	150	193
8.	**Sodium as Na**	mg/l	**-**	81	69	52	51	69	52	69	52
9.	**Potassium as K**	mg/l	**-**	6	5	4	4	5	4	5	4
10.	**Calcium as Ca**	mg/l	**-**	40.73	32.92	44.91	40.73	74.1	56.9	74.1	56.9
11.	**Magnesium as Mg**	mg/l	**-**	17.88	14.45	19.72	17.88	39.2	32.5	39.2	32.5
12.	**Chloride as Cl**	mg/l	**250**	134.7	114.6	86.5	84.7	114.6	86.5	114.6	86.5
13.	**Sulphate as SO_4**	mg/l	**400**	53.27	45.32	34.21	33.50	45.32	34.21	45.32	34.21

SL NO	Parameter	Unit	Surface water standards (IS 2296 Class-A)	Kalvai	Vengalrajukuppam Lake	Ramakrishnarajupet Lake	Nandi R	Sholinghur Lake	Lake near Periya Nagapundi	Lake Near Pal Valasai	Lake Near Mahankalipuram
				SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
14.	**Nitrate as NO_3**	mg/l	**20**	3.2	5.3	4.2	5.2	5.8	4.5	5.8	3.5
15.	**Fluorides as F**	mg/l	**1.5**	BLQ(LOQ 0.2)	BLQ(LOQ 0.2)	BLQ(LOQ 0.2)	BLQ(LOQ 0.2)	BLQ(LOQ 0.2)	BLQ(LOQ 0.2)	BLQ(LOQ 0.2)	BLQ(LOQ 0.2)
16.	**Cyanide**	mg/l	**0.05**	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
17.	**Arsenic**	mg/l	**0.05**	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
18.	**Boron as B**	mg/l	**-**	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)
19.	**Cadmium as Cd**	mg/l	**0.01**	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)
20.	**Chromium, Total**	mg/l	**0.05**	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
21.	**Copper as Cu**	mg/l	**1.5**	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
22.	**Lead as Pb**	mg/l	**0.1**	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)
23.	**Manganese as Mn**	mg/l	**0.5**	BLQ(LO	BLQ(LO	BLQ(LOQ	BLQ(LOQ	BLQ(LO	BLQ(LO	BLQ(LO	BLQ(LOQ

SL NO	Parameter	Unit	Surface water standards (IS 2296 Class-A)	Kalvai	Vengalrajukuppam Lake	Ramakrishnarajupet Lake	Nandi R	Sholinghur Lake	Lake near Periya Nagapundi	Lake Near Pal Valasai	Lake Near Mahankalipuram
				SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
				Q 0.0005)	Q 0.0005)	0.0005)	0.05)	Q 0.05)	Q 0.05)	Q 0.0005)	0.0005)
24.	**Mercury**	mg/l	**0.001**	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
25.	**Nickel as Ni**	mg/l	**-**	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
26.	**Selenium as Se**	mg/l	**0.01**	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
27.	**Zinc as Zn**	mg/l	**15**	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
28.	**Dissolved Oxygen**	mg/l	**6**	6.1	6.3	6.2	6.1	6.4	6.2	6.4	6.5
29.	**Chemical Oxygen Demand as O_2**	mg/l	**-**	32	23	33	17	23	36	21	32
30.	**BOD, 3 days @ 27°C as O_2**		**2**	4	3	5	BLQ	4	5	3	4

Note: BLQ – Below 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 7.24 to 7.83 which is within the limit of IS 2296:1992.
- The Total Dissolved Solids (TDS) value of collected surface water sample ranges from 345 mg/l to 449 mg/l.
- The Total hardness value of the collected surface water sample ranges between 142 mg/l to 193 mg/l.
- BOD value of surface water varies from 3 mg/l to 5 mg/l respectively.
- COD value of surface water varies from 17 to 36 mg/l .

Surface water standards (IS 2296:1992) given in **Table 3-14**

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	---	---
22	Lead	mg/l	0.1	---	0.1	---	---
23	Zinc	mg/l	15	---	15	---	---
24	Manganese	mg/l	0.5	---	---	---	---

S.No	Parameters	Unit	A	B	C	D	E
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.

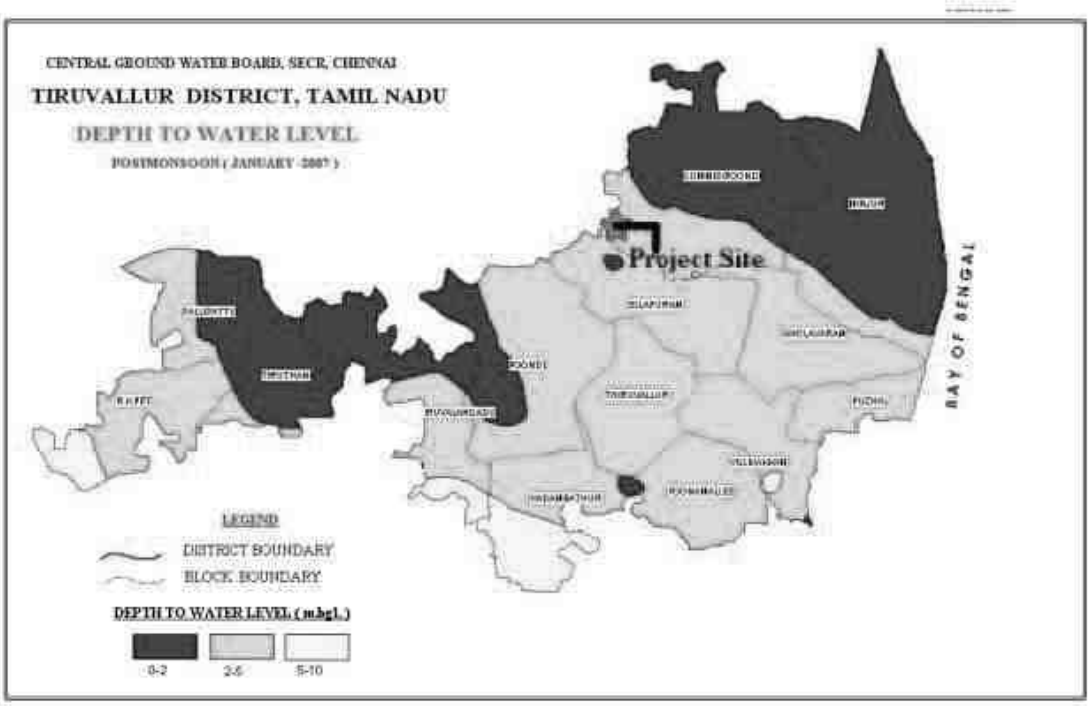
Class E – Water for irrigation, industrial cooling and controlled waste disposal

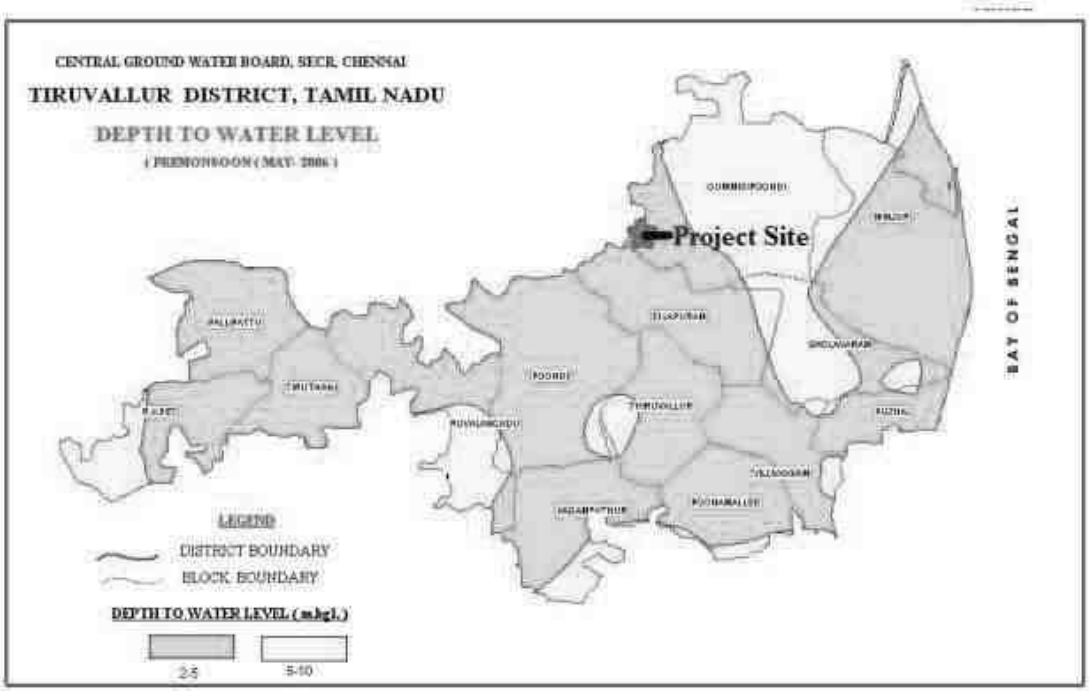
3.9.3 Groundwater resources

Ground water in phreatic aquifers in Tiruvallur district, in general, is colourless, odourless and slightly alkaline in nature. The estimation of groundwater resources for the district has shown that 6 blocks are over exploited and 2 blocks are under "critical" category. The shallow alluvial aquifers along Korattalaiyar and Araniyar rivers serve as an important source of drinking water for Chennai Metropolitan area and 5 well fields have been constructed in Tiruvallur district for the purpose. The well fields have a combined yield of 36.50 MCM/year. Dug wells are the most common ground water abstraction structures used for irrigation in the district. The yield of dug wells range from 50 to 200 m^3/day in weathered crystalline rocks, 20 to 100 m^3/day in Gondwana formations and up to 400m^3/day in recent alluvial formations along major drainage courses. Depth to water level during Pre Monsoon & Post Monsoon for Thiruvallur District, Tamil Nadu, is given in **Figure 3-26**

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

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





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

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

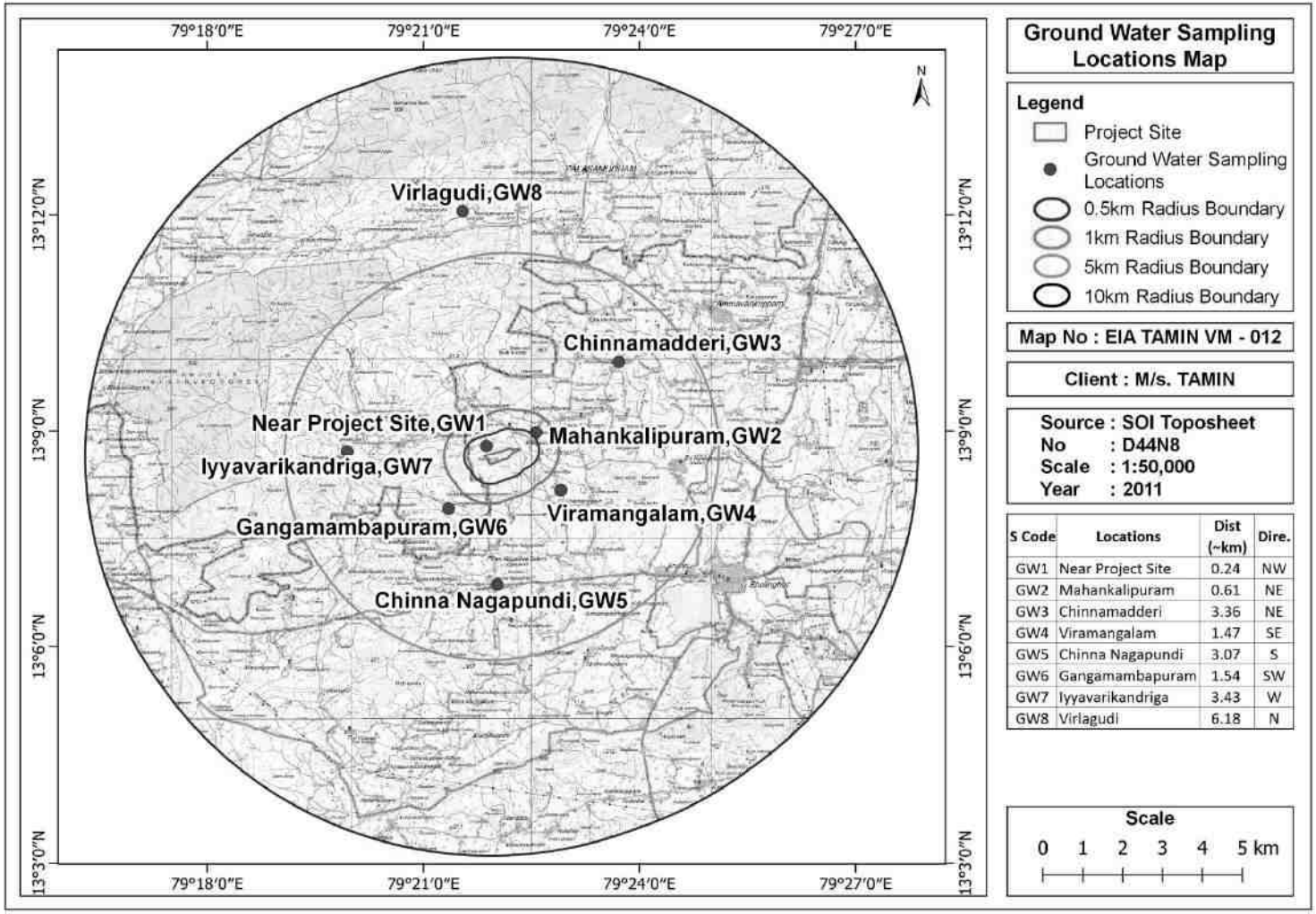
3.9.4 Groundwater Quality

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

S.No	Location	Location Code	Distance in Km	Direction
1	Project Site	GW1	Within site	
2	Mahankalipuram	GW2	0.61	NE
3	Chinnamaderi	GW3	3.36	NE
4	Veeramangalam	GW4	1.47	SE
5	Chinna nagapundi	GW5	3.07	S
6	Gangamambapuram	GW6	1.54	SW
7	Iyyavarikandriga	GW7	3.43	W
8	Virlagudi	GW8	6.18	N



S Code	Locations	Dist (~km)	Dire.
GW1	Near Project Site	0.24	NW
GW2	Mahankalipuram	0.61	NE
GW3	Chinnamadderi	3.36	NE
GW4	Viramangalam	1.47	SE
GW5	Chinna Nagapundi	3.07	S
GW6	Gangamambapuram	1.54	SW
GW7	Iyyavarikandriga	3.43	W
GW8	Virlagudi	6.18	N

Figure 3-27 Map showing the groundwater monitoring locations

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

SL NO	Parameters	Unit	Drinking water Standard (IS 10500: 2012)		Project Site	Mahankalipuram	Chinnamaderi	Veeramangalam	Chinnanagapundi	Gangambapuram	Iyyavarikandriga	Virlagudi
			Permissible Limit	Acceptable Limit	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
1	Colour	Hazen	**15**	**5**	BLQ(LOQ 1.0)	BLQ(LOQ 1.0)	BLQ(LOQ 1.0)	BLQ(LOQ 1.0)	BLQ(LOQ 1.0)	BLQ(LOQ 1.0)	BLQ(LOQ 1.0)	BLQ(LOQ 1.0)
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**	7.86	7.27	8.47	7.32	7.84	7.42	8.42	7.14
4	Electrical Conductivity	µS/cm	-	-	1281	1796	1579	867	1052	1938	1327	1263
5	Total Dissolved Solids	mg/l	**2000**	**500**	759.8	937.6	839.3	623.6	706.8	931.3	780.4	752.6
6	Total Suspended Solids		-	-	BLQ(LOQ 1.0)	BLQ(LOQ 1.0)	BLQ(LOQ 1.0)	BLQ(LOQ 1.0)	BLQ(LOQ 1.0)	BLQ(LOQ 1.0)	BLQ(LOQ 1.0)	BLQ(LOQ 1.0)
7	Total Alkalinity as $CaCO_3$	mg/l	**600**	**200**	91	131	139	141	159	117	141	108
8	Total Hardness as $CaCO_3$	mg/l	**600**	**200**	181.7	267.8	279.3	112.7	169.3	213.1	301.2	209.3
9	Sodium as Na	mg/l	-	-	106	111	87	73	73	121	54	87
10	Potassium as K	mg/l	-	-	7	8	6	5	5	8	4	6
11	Calcium as Ca	mg/l	**200**	**75**	30.59	45.08	47.02	18.97	28.50	35.87	50.70	35.23
12	Magnesium as Mg	mg/l	**100**	**30**	25.61	37.74	39.36	15.88	23.86	30.03	42.45	29.50

SL NO	Parameters	Unit	Drinking water Standard (IS 10500: 2012)		Project Site	Mahankalipuram	Chinnamaderi	Veeramangalam	Chinnanagapundi	Gangamambapuram	Iyyavarikandriga	Virlagudi
			Permissible Limit	Acceptable Limit	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
13	Chloride	mg/l	**1000**	**250**	221.3	231.2	180.7	152.6	151.3	251.6	113.5	180.3
14	Sulphate SO_4	mg/l	**400**	**200**	84.2	95.7	78.3	59.7	67.1	98.5	49.8	50.7
15	Nitrate as NO_3	mg/l	**NR**	**45**	4.1	4.7	3.7	5.3	5.1	4.2	5.4	3.7
16	Fluorides as F	mg/l	**1.5**	**1**	0.47	0.43	0.37	0.39	0.47	0.78	0.43	0.52
17	Cyanide	mg/l	**NR**	**0.05**	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
18	Arsenic as As	mg/l	**0.05**	**0.01**	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
19	Boron as B	mg/l	**1.0**	**0.5**	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
20	Cadmium as Cd	mg/l	**NR**	**0.003**	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)
21	Chromium as Cr	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)
22	Copper as Cu	mg/l	**1.5**	**0.05**	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
23	Iron as Fe	mg/l	**0.3**	**NR**	0.03	0.06	0.04	0.03	0.07	0.05	0.06	0.04
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)

SL NO	Parameters	Unit	Drinking water Standard (IS 10500: 2012)		Project Site	Mahankalipuram	Chinnamaderi	Veeramangalam	Chinnanagapundi	Gangambapuram	Iyyavarikandriga	Virlagudi
			Permissible Limit	Acceptable Limit	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
	Zinc as Zn	mg/l	15	5	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)

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

3.9.5 Results and Discussions

A summary of analytical results are presented below:

- The pH of the collected ground water sample ranges from 7.14 to 8.47.
- The concentrations of Chloride in the collected ground water sample ranges from 113.5 to 251.6 mg/l.
- Total Dissolved Solids (TDS) value of the collected ground water sample varies from 647.6 mg/l to 957.3 mg/l.
- Total hardness of the collected ground water sample ranges from 112.7 mg/l to 301.2 mg/l.
- The concentrations of Sulphate in the collected ground water sample ranges from 49.8 to 98.5 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

S.No	Location	Location Code	Distance in Km	Direction
1	Project Site	S1	Within Site	
2	Mahankalipuram	S2	0.61	NE
3	Chinnamaderi	S3	3.36	NE
4	Veeramangalam	S4	1.47	SE
5	Chinna nagapundi	S5	3.07	S
6	Gangamambapuram	S6	1.54	SW
7	Iyyavarikandriga	S7	3.43	W
8	Virlagudi	S8	6.18	N

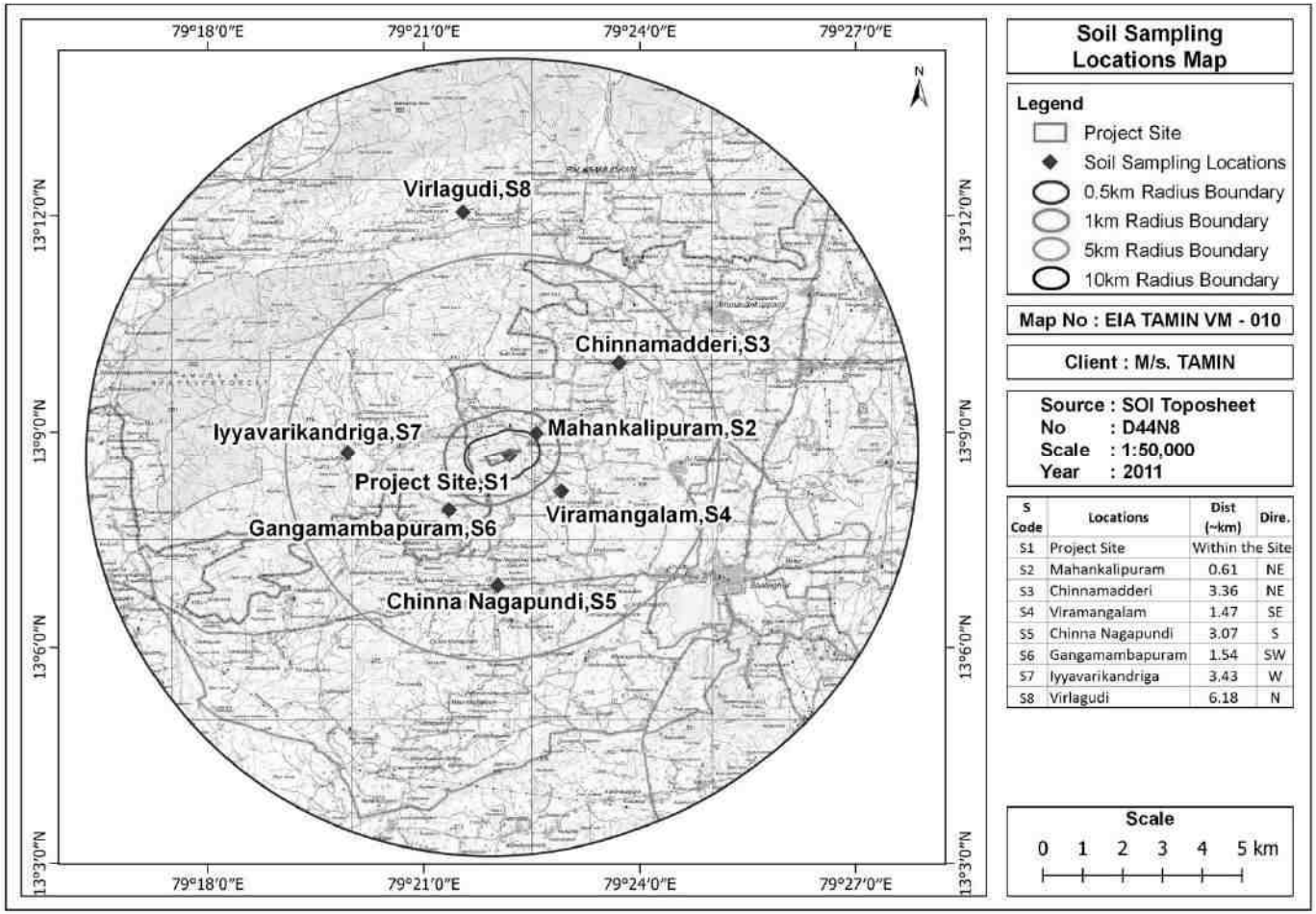


Figure 3-28 Map showing the soil monitoring location

Table 3-18 Physico Chemical parameters of soil samples from the study area

Sl. No	Parameters	Units	Project Site	Mahankalipuram	Chinnamaderi	Veeramangalam	Chinnanagapundi	Gangamambapuram	Iyyavarikandriga	Virlagudi
			S1	S2	S3	S4	S5	S6	S7	S8
1	Soil Texture	-	Clay loam	Clay Loam	ClayLoam	Clay Loam	Clay loam	Clay loam	Clay loam	Clay loam
2	Sand	%	34.2	35.6	37.6	31	28.4	39.4	38.6	29.6
3	Silt	%	33.1	36.5	29.5	32.9	37.9	26.9	30.7	38
4	Clay	%	32.7	27.9	32.9	36.1	33.7	33.7	30.7	32.4
5	pH	-	7.76	7.42	7.23	7.04	6.98	7.16	7.21	7.37
6	Electrical conductivity	µS/cm	1540	1380	1290	1080	1420	1590	1310	1630
7	Nitrogen as N	mg/kg	94	84	114	104	122	89	80	120
8	Phosphorus	mg/kg	37	28	30	21	25	17	19	34
9	Potassium	mg/kg	66	75	104	74	101	67	69	76
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	%	0.76	0.72	0.7	0.82	0.73	0.72	0.74	0.76
13	Water Holding Capacity	%	18.6	18.2	18.8	19.2	17.9	18.2	18.4	18.6

Note: *BLQ – Below 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 6.98 to 7.76.
- Conductivity of the soil samples ranged from 1080 to 1630µmho/cm.
- Nitrogen content ranged from 80 kg/ha to 120 kg/ha.
- Phosphorous ranged from 17 kg/ha to 37 kg/ha.
- Potassium content ranges from 66 kg/ha to 104 kg/ha.

3.11 BIOLOGICALENVIRONMENT

An ecological study of the ecosystem is essential to understand the impact of industrialization and urbanization on existing flora and fauna of the study area. Studies on various aspects of ecosystem play an important role in identifying sensitive issues for under taking appropriate action to mitigate the impact, if any. The biological study was under taken as a part of the EIA study report to understand the present status of ecosystem prevailing in the study area, to compare it with past condition with the help of available data, to predict changes in the biological environment as a result of present activities and to suggest measures for maintaining its health. Secondary source information was conducted to study the flora & fauna in 10 km radius. Some of the information was gathered from the local habitants. The entire secondary 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 the collection of secondary information, following aspects were considered for ecological studies:

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

3.11.1 Methodology

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

❖ **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.

❖ **Faunal Study**

- ❖ Secondary information collected from published government data etc.

- List of the endangered and endemic species as per the schedule of The Wildlife Protection Act, 1972.
- Emphasis is given to identify avifauna and mammals to determine the presence and absence of Schedule-1 species, listed in The Wildlife Protection Act 1972, as well as in Red List of IUCN.

3.11.2 Floristic composition within the study area

For secondary information based on a total 51 species under 28 family found in the study area. The detailed list of plant species found in each quadrat provided in **Table 3-19.**

Table 3-19 Checklist of biodiversity

S.No	Species	Vernacular Name	Habit	IUCN
	Acanthaceae			
1	*Justicia simplex*	Water Willow	Herb	NA
	Amaranthaceae			
2	*Achyranthes aspera*	Nayurivi	Herb	NA
3	*Aerva lanata*	Peelai	Shrub	NA
4	*Aerva persica*	Perumpeelai	Shrub	NA
	Annonaceae			
5	*Annona squamosa*	Seetha	Tree	NA
	Apocynaceae			
6	*Carissa carandas*	Kalaa, Perun kala	Shrub	NA
7	*Wrightia tinctoria*	Nilapaalai	Tree	LC
	Asclepiadaceae			
8	*Calotropis gigantea*	Erukku, Arkkam	Shrub	NA
	Bignoniaceae			
9	*Tecoma stans*	Sornapatti	Shrub	NA
	Caesalpiniaceae			
10	*Cassia fistula*	Kondrai	Tree	NA
11	*Tamarindus indica*	Puliya maram	Tree	NA
12	*Cleome viscosa*	Nai kadugu	Herb	NA
	Compositae			
13	*Acanthospermum hispidum*	--	Herb	NA
14	*Tridax procumbens*	Vettukkaaya-thazhai	Herb	NA
	Convolvulaceae			
15	*Evolvulus alsinoides*	Vishnukarandi	Herb	NA
	Cucurbitaceae			
16	*Citrullus colocynthis*	Peikkumatti	Herb	NA
17	*Coccinia grandis*	Kovai	Climber	NA
	Euphorbiaceae			
18	*Acalypha indica*	Kuppaimeni	Herb	NA
	Fabaceae			
19	*Alysicarpus monilifer*	--	Herb	NA
20	*Tephrosia purpurea*	Kozhinji	Undershrub	NA
	Labiatae			

21	*Hyptis suaveolens*		Shrub	NA
22	*Leucas aspera*	Thumbai	Herb	NA
23	*Ocimum americanum*	Ganjaankorai	Herb	NA
	Malvaceae			
24	*Abutilon indicum*	Perun thuthi	Shrub	NA
25	*Sida acuta*	Malai thangi	Herb	NA
26	*Sida cordifolia*	Nilatutthi	Herb	NA
	Martyniaceae			
27	*Martynia annua*	Thael Kodukku	Herb	NA
	Menispermaceae			
28	*Tinospora cordifolia*	Seendhil	Climber	NA
	Mimosaceae			
29	*Acacia nilotica*	Karuvelam	Tree	LC
30	*Leucaena leucocephala*	Soundil	Tree	NA
31	*Prosopis juliflora*	Velikkaathaan	Tree	NA
	Moraceae			
32	*Ficus benghalensis*	Aala maram	Tree	NA
33	*Ficus religiosa*	Arasu	Tree	NA
	Nyctaginaceae			
34	*Boerhavia diffusa*	Mookarattai	Herb	NA
35	*Boerhavia erecta*	Seemai mookarattai	Herb	NA
	Pedaliaceae			
36	*Pedalium murex*	Perunerunji	Herb	NA
37	*Sesamum indicum*	Ellu	Herb	NA
	Poaceae			
38	*Alloteropsis cimicina*	bug-seed grass	Grass	NA
39	*Aristida adscensionis*	Cheevam pul	Grass	NA
40	*Aristida hystrix*	Pottapullu	Grass	NA
41	*Digitaria ciliaris*	southern crabgrass	Grass	NA
42	*Echinochloa colona*	Pullam payiru	Grass	NA
43	*Eragrostis tenella*	Feather Loveg rass	Grass	NA
	Rhamnaceae			
44	*Ziziphus mauritiana*	Illandhai	Tree	NA
	Rubiaceae			
45	*Morinda pubescens*	Manjanatti	Tree	NA
46	*Spermacoce hispida*	Nathaichoori	Herb	NA
	Rutaceae			
47	*Citrus aurantifolia*	Elumichai	Tree	NA
	Scrophulariaceae			
48	*Scoparia dulcis*	Sarakkotthini	Herb	NA
	Solanaceae			
49	*Solanum torvum*	Chundai	Shrub	NA
	Verbenaceae			
50	*Tectona grandis*	Thekku	Tree	NA
51	*Vitex negundo*	Nochi	Tree	NA

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

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., Kumari, G.R. and Chitra, V. (1987) Flora of Tamil Nadu India. Series 1: Analysis. Vol. 2, Botanical Survey of India, Coimbatore.

Hooker J.D. 1872-1897. Flora of British India. (Vol. 1-7), Ashford: Reeve and Company. 5568 p.

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

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

Birds' species

A total of 27 species belonging to 21 families have been identified from Agricultural area. A comparative chart of the total bird species belonging to different families along with their feeding preference and abundance are provided in **Table 3-20**.

Table 3-20 Birds from the site

S. No	Common Name	Scientific Name	IUCN status
	Ardeidae		
1	Indian pond heron	*Ardeola grayii*	LC
2	Cattle egret	*Bubulcus ibis*	LC
	Accipitridae		
3	Brahminy kite	*Haliastur indus*	LC
4	Black kite	*Milvus migrans*	LC
	Charadriidae		
5	Red wattled lapwing	*Vanellus indicus*	LC
	Columbidae		
6	Common pigeon	*Columba livia*	LC
	Psittaculidae		
7	Rose ringed parakeet	*Psittacula krameri*	LC
	Cuculidae		
8	Common hawk cuckoo	*Hierococcyx varius*	LC

9	Asian koel	*Eudynamys scolopaceus*	LC
	Strigidae		
10	Spotted owlet	*Athene brama*	LC
	Upupidae		
11	Common hoopoe	*Upupa epops*	LC
	Coraciidae		
12	Indian roller	*Coracias benghalensis*	LC
	Alcedinidae		
13	White throated king fisher	*Halcyon smyrnensis*	LC
14	Pied kingfisher	*Ceryle rudis*	LC
	Meropidae		
15	Green bee eater	*Merops orientalis*	LC
	Ramphastidae		
16	Copper smith barbet	*Megalaima haemacephala*	LC
	Picidae		
17	Flame back	*Dinopium benghalense?*	LC
	Dicruridae		
18	Black drongo	*Dicrurus macrocercus*	LC
	Corvidae		
19	House crow	*Corvus splendens*	LC
20	Rufous treepie	*Dendrocitta vagabunda*	LC
	Sturnidae		
21	Common myna	*Acridotheres tristis*	LC
	Estrildidae		
22	Scaly breasted munia	*Lonchura punctulata*	LC
	Motacillidae		
23	Grey wagtail	*Motacilla cinerea*	LC
24	White browed wagtail	*Motacilla maderaspatensis*	LC
	Timallidae		
25	Yellow-billed babbler	*Turdoides affinis*	LC
	Ploceidae		
26	Baya weaver	*Ploceus philippinus*	LC
	Nectariniidae		
27	Purple sunbird	*Cinnyris asiaticus*	LC

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

Mammals:

Based on secondary information**.**

Table 3-21 Mammals recorded from the Primary Survey in the Study area and their Conservation Status

S.No	Species name	Common name	IUCN Conservation Status
1	*Eutropis macularia*	Common skink	Not assessed
4	*Rana tigrina*	Common yellow frog	Least Concern
5	*Calotes versicolor*	Common Garden Lizard	Not assessed
6	*Hemidactylus sp.*	House lizard	Not assessed

7	*Ophisops leschenaultiix*	Snake-eyed lizard	Not assessed
8	*Rana hexadactyla*	Frog	Least Concern

Reptiles & Amphibians

Reptiles and amphibian species were prepared secondary information.

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

S.No	Species name	Common name	IUCN Conservation Status
1	*Mus musculus*	Common Mouse	Not assessed
2	*Funambulus pennanti*	Palm -Squirrel	Not assessed
3	*Mus rattus*	Indian rat	Not assessed
4	*Lepus nigricollis*	Indian Hare	Least Concern
5	*Rattus norvegicus*	Brown Rat	Least Concern
6	*Felis catus*	Cat	Not assessed
7	*Naja naja*	Cobra	Not assessed
8	*Ptyas mucosa*	Red snake	Not assessed

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 9 species belonging to five families of butterflies recorded.

Table 3-23 Occurrence of butterfly species in buffer zone

Sl. No	Zoological Name	Common Name	WPA-1972
1	*Danaus chrysippus*	Plain Tiger	—
2	*Danaus genutia*	Striped Tiger	—
3	*Ariadne merione*	Common Caster	—
4	*Ariadne ariadne*	Angled Castor	—
5	*Acraea terpsicore*	Tawny Caster	—
6	*Neptis hylas*	Common Sailor	—
7	*Phalanta phalantha*	Common Leopard	—
8	*Hypolimnas bolina*	Great Egg Fly	—
9	*Junonia lemonias*	Lemon Pansy	—

Source:

1. List of Birds: Ali, S. (2002). The Book of Indian Birds (13th Revised Edition). Oxford University Press, New Delhi, 326pp.
2. List of Butterflies: Kehimkar I. The Book of Indian Butterflies. Bombay Natural History Society, 2008, 497.
3. Evans WH. Identification of Indian butterflies. The Bombay Natural History Society, Bombay, 1927, 32.

4. List of Mammals: Kamalakannan, M.& P.O.Nameer (2019). A checklist of mammals of Tamil Nadu, India. Journal of Threatened Taxa 11(8): 13992–14009; https://doi.org/10.11609/jott.4705.11.8.13992–14009.
5. List of Reptiles: Aengals, R., Sathish Kumar, V.M., Palot, M.J. & Ganesh, S.R. (2018). A Checklist of Reptiles of India. 35 pp. Version 3.0. Online publication is available at www.zsi.gov.in (Last update: May 2018)

3.11.4 IMPACT AND MANAGEMENT PLAN FOR BIOLOGICAL ENVIRONMENT

The proposed plant is located at project. The proposed project will not have any impact of terrestrial and aquatic ecology of the area. Therefore in and around area were no reserve forest and natural area. In addition to that, project area decided to develop the greenbelt by planting native species to maintain the good environment.

Impact on Wildlife

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

❖ **Impact on Flora**

Plantation will be developed in the development area as per plantation programme. These activities will help to improve the floral cover of the area. The greenery and plantation development will eventually attract micro fauna, birds etc in the area. Assistance will be taken from local forest department in selection of species of plants so that green coverage may improve fast. The varieties would include those plants, which are suitable to the area. The following plant species will be planted according to CPCB guidelines: *Cassia fistula, Delbergia sisso, Mangifera indica, Acacia nilotica, Azadirachta indica, Albizza lebbek, Delonix regia, Ficus benghalensis, Butea monosperma,* etc.

❖ **Greenbelt development**

The main objective of green belt development is to provide a barrier between the source of pollution and the surrounding area. Green belt development around the various project appurtenances is proposed, this will go a long way to protect environment and mitigate pollution levels in the area. Development of green belt shall also prevent soil erosion and washing away of the topsoil besides helping in stabilizing the functional ecosystem, make the climate more conductive and restore water balance.

❖ **Plantation work**

A 20-25m wide green belt shall be proposed in the avenue plantation will be undertaken besides the project area and near village. Plantation comprising of medium height trees (7 m to 10 m) are proposed for the green belt. Selection of species for green belt Development of the green belt is one of the most sensitive issues and shall be done with due care. Selection of proper locally grown species in addition to checking of their growth rate, quality, thickness of canopy cover, etc. shall be duly done as it helps in abatement of fugitive noise, reduce the pollution level, thus making the place worth dwelling for the diversified species

flora. The plant species suitable for green belt development need to be selected based on the flowing criteria.

- Native plant species will be preferred
- Fast growing plants will be planted
- Plants having thick canopy cover will be used
- Preferably perennial and evergreen species will be selected
- Plants having large leaf area index will be considered
- Road sides will be planted with local vegetation

While making choice of plant species for cultivation in green belts, weightage has to be given to the natural factor of bio-climate. It is also presumed that the selected plants will be grown as per normal horticultural or forestry practices. Trees are important sinks for air pollutants. Trees absorb noise and by enhancing the green cover, improve the ecology and aesthetics and affect the local micrometeorology. Trees also have major long-term impacts on soil quality and the ground water table. By using suitable plant species, green belts can be developed in strategic zones to provide protection from emitted and noise. The suitable variety/species shall be finalized in consultation with local forest officer and horticultural experts. Mixed plantation shall be done keeping optimum spacing between the saplings.

❖ **Impact on Fauna**

The plant unit area is in non-forest land where presence of fauna is very rare. As such, there will be no adverse impact of the plant unit activity on fauna around the plant unit area.

A comprehensive Central Legislation Namely Wild Life (Protection) Act was enforced in 1972 to provide protection to wild animals. Schedule-I of this act contains the list of rare and endangered species, which are completely protected throughout the country. The list of wild animals and their conservation status as per Wild Life Act (1972) are species recorded/reported from study area, there are no endangered, threatened wild animal species in study area.

3.12 Socio Economic profile

Thiruvallur 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_THIRUVALLUR.pdf*

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

3.12.1 Socio Economic Aspects

A socio-economic study was undertaken in assessing aspects which are dealing with social and cultural conditions, and economic status in the study area. The study provides information such as

demographic structure, population dynamics, infrastructure resources, and the status of human health and economic attributes like employment, per-capita income, agriculture, trade, and industrial development in the study area. The study of these characteristic helps in identification, prediction and evaluation of impacts on socio-economic and parameters of human interest due to proposed project developments. The parameters are:

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

The following **Table 3-24** provides the certain important social indicators of Thiruvallur district in Tamil Nadu.

Table 3-24 Social Indicators

S.No	Social Indicators	Thiruvallur 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_THIRUVALLUR.pdf

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

3.12.1.1 Population and Household Size

Thiruvallur 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_THIRUVALLUR.pdf*

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

3.12.1.2 Sex Ratio

As per 2011 Census the sex ratio was 987 for every 1,000 males, lower when compared to the State Sex Ratio of 996 in Thiruvallur district. The sex ratio of 0-6 age group was 946 for district.

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

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

3.12.1.3 Scheduled Caste (SC)

Thiruvallur has a population of 821646 persons belonging to Scheduled Castes which represents 22% of the total population of the district. Of these, 451999 reside in rural areas and that 34.8% of the Scheduled Caste population.

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

(**Ref**:Directorate of Census Operations-Tamil Nadu, "District Census Handbook-2011,Thiruvallur 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 Thiruvallur 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 3-25** Show the details of education infrastructures in Thiruvallur District.

Table 3-25 Education Infrastructures in Thiruvallur district

Type of school	Total schools		Rural Schools	
	Government	Private	Government	Private
Primary	941	487	815	252
Primary + Upper Primary	289	60	225	35
P + UP+ Secondary + Higher Secondary	33	192	12	55
UP only	2	1	2	0
UP + Secondary + Higher Secondary	100	36	69	13
P + UP + Secondary	22	126	11	53

Type of school	Total schools		Rural Schools	
	Government	Private	Government	Private
UP + Secondary	147	18	117	7

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

3.12.1.5 Health Facilities

Primary Health Centers (PHCs) and Sub-centers (SCs) are providing the preventive, curative and rehabilitative health care services to the rural people. The district has good number of public health systems accessible and affordable apart from the private health facilities. The Health Facilities given in Thiruvallur district is given in **Table 3-26.**

Table 3-26 Socio Economic analysis: Health care

Name of the District	Type of Facility	Facilities									
		Total Facility					Active Facilities				
		Total [(A+B) or (C+D)]	Public [A]	Private [B]	Urban [C]	Rural [D]	Total [(A+B) or (C+D)]	Public [A]	Private [B]	Urban [C]	Rural [D]
Thiruvallur	SC	303	303	0	0	303	303	303	0	0	303
	PHC	58	58	0	11	47	54	54	0	11	43
	CHC	16	15	1	1	15	15	14	1	1	14
	SDH	12	12	0	10	2	11	11	0	10	1
	DH	1	1	0	0	1	1	1	0	0	1
	Total	390	389	1	22	368	384	383	1	22	362

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

*(**Source:** National Health Mission)*

3.12.1.6 Economic Activity & Livelihood Pattern

In Thiruvallur district, as per the Census 2011, there were a total of 1538054 workers, comprising 73444 cultivators, 270586 agricultural labourers, 58240 household Industry workers and 1135784 other workers.

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

(**Ref**:Directorate of Census Operations-Tamil Nadu, "District Census Handbook-2011,Thiruvallur 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 3-27** shows the list of locations which comes under the study area.

Table 3-27 Population profile within the study area

Sl. No	Name	Households	Total Population	Male	Female	Children below 6	Scheduled Caste	Scheduled Tribe
Chittoor District								
Puttur Mandal								
1.	Kumarabommarajupuram	802	3174	1580	1594	391	1133	295
2.	Vepagunta	581	2244	1096	1148	218	1388	2
3.	Parameswara Mangalam	584	2453	1158	1295	226	808	23
4.	Tirumalakuppam	1101	4227	2075	2152	441	2356	253
Karvetinagar Mandal								
5.	Surendranagaram	352	1331	667	664	114	257	13
Thiruvallur District								
Pallipattu Taluk								
6.	Mahankalikapuram	470	2215	1115	1100	300	251	0
7.	Kadananagaram	1854	7885	3991	3894	886	2332	98
8.	Srikalikapuram (Part)	517	2163	1070	1093	238	389	0
9.	Veeramangalam	1209	4754	2347	2407	459	1618	109
10.	Peddanagapudi	591	2465	1237	1228	316	1047	45
11.	Devalambapuram	575	2537	1250	1287	270	953	0
12.	Rajanagaram	1835	7553	3851	3702	906	477	0
13.	Valakanampudi	2236	9628	4845	4783	1174	1723	65
14.	Vellathur	1626	6827	3429	3398	848	1658	4
15.	Venugopalapuram	73	260	130	130	15	5	0
16.	Vediyangadu	1065	4668	2372	2296	475	1045	119
17.	Paivalasa	542	2366	1217	1149	228	597	1
18.	Peddaramapuram	592	2565	1301	1264	267	903	36
19.	Mylarwada	771	3353	1691	1662	373	734	14
20.	Meesarakandapuram	961	4247	2179	2068	456	1370	0
21.	Aswaravanthapuram	1316	5253	2616	2637	537	975	109
22.	Padmapuram	244	1033	526	507	118	22	0
23.	Veeranathur	1352	5531	2760	2771	682	2046	18
Vellore District								
Wallajah Taluk								

Sl. No	Name	Households	Total Population	Male	Female	Children below 6	Scheduled Caste	Scheduled Tribe
24.	Somasamudram	948	4190	2109	2081	501	2070	0
25.	Kalpattu	173	702	339	363	76	0	0
26.	Pandiyanellore	822	3519	1786	1733	405	1263	27
27.	Vasur	446	1829	913	916	176	118	0
28.	Palleri	207	832	430	402	100	52	33
29.	Kondakuppam	687	2915	1452	1463	305	620	15
30.	Thagarakuppam	673	2810	1397	1413	348	125	19
31.	Sengalnatham	614	2535	1255	1280	318	75	20
32.	Sekkadikuppam	263	959	499	460	133	18	0
33.	Rendadi	1128	4849	2465	2384	587	692	3
34.	Kallalan Kuppam	169	688	344	344	60	76	0
35.	Kodakkal	1833	7948	3986	3962	867	2126	4
	Total	**29212**	**122508**	**61478**	**61030**	**13814**	**31322**	**1325**

(Source: Census 2011)

3.12.2.1 Employment and Livelihood within study area

Majority of population in the study area comes under other working categories. As agriculture cannot be a main sustenance for most of farmers, they have dual professions. Farming is mostly seasonal, they involve in other livelihood activities like business, non-agriculture labour, agriculture labour and other service sectors. Fragmentation of landholding leads to adopt to have additional occupation.Summaries of employment and livelihood within the study are given in **Table 3-28.**

Table 3-28 Summaries of Employment and Livelihood within the study area

Sl. No	Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers					
					Main	Marginal	Main	Marginal	Main	Marginal	Main	Marginal
Chittoor District												
Puttur Mandal												
1.	Kumarabommarajupuram	1442	838	604	201	5	414	588	25	0	198	11
2.	Vepagunta	822	561	261	85	20	216	212	6	5	254	24
3.	Parameswara Mangalam	949	658	291	128	9	293	275	8	0	229	7
4.	Tirumalakuppam	1927	1237	690	155	4	710	672	3	6	369	8
Karvetinagar Mandal												
5.	Surendranagaram	1750	1394	356	242	12	354	168	121	76	677	100
Thiruvallur District												
Pallipattu Taluk												
6.	Mahankalikapuram	1109	1004	105	203	32	627	40	10	3	164	30
7.	Kadananagaram	4165	2682	1483	586	66	1252	1083	195	97	649	237
8.	Srikalikapuram (Part)	1053	916	137	184	5	444	96	33	5	255	31
9.	Veeramangalam	2080	966	1114	112	62	338	519	11	116	505	417
10.	Peddanagapudi	1046	833	213	78	19	314	17	29	38	412	139
11.	Devalambapuram	1406	1028	378	391	18	440	323	22	6	175	31
12.	Rajanagaram	4197	2606	1591	715	17	782	1187	395	225	714	162
13.	Valakanampudi	4785	3212	1573	391	143	953	946	603	68	1265	416

14.	Vellathur	3619	2423	1196	375	31	1134	926	49	83	865	156
15.	Venugopalapuram	146	103	43	62	14	9	12	8	6	24	11
16.	Vediyangadu	1966	852	1114	190	14	103	798	193	33	366	269
17.	Paivalasa	1352	979	373	122	1	694	313	10	1	153	58
18.	Peddaramapuram	1455	1034	421	271	6	399	383	39	3	325	29
19.	Mylarwada	1824	1378	446	489	46	620	337	21	12	248	51
20.	Meesarakandapuram	2387	1752	635	669	10	609	350	79	11	395	264
21.	Aswaravanthapuram	2137	997	1140	136	189	102	473	26	78	733	400
22.	Padmapuram	328	281	47	33	1	22	8	8	2	218	36
23.	Veeranathur	2616	2045	571	245	24	1109	461	51	13	640	73
Vellore District												
Wallajah Taluk												
24.	Somasamudram	1750	1394	356	242	12	354	168	121	76	677	100
25.	Kalpattu	349	262	87	43	1	75	19	6	4	138	63
26.	Pandiyanellore	1762	945	817	51	10	59	62	33	20	802	725

27.	Vasur	1061	640	421	156	56	89	129	41	126	354	110
28.	Palleri	504	500	4	427	1	0	0	3	0	70	3
29.	Kondakuppam	1698	1362	336	143	9	363	189	199	58	657	80
30.	Thagarakuppam	1717	834	883	208	31	151	407	42	289	433	156
31.	Sengalnatham	983	222	761	4	217	79	316	6	152	133	76
32.	Sekkadikuppam	481	453	28	199	0	101	2	8	0	145	26
33.	Rendadi	2493	1967	526	438	12	516	100	247	113	766	301
34.	Kallalan Kuppam	320	62	258	16	63	9	83	3	62	34	50
35.	Kodakkal	3344	2461	883	357	84	737	591	247	48	1120	160
	Total	**59869**	**40054**	**19815**	**8163**	**1236**	**14569**	**12108**	**2784**	**1759**	**14538**	**4712**

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

3.12.3 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 3-29**.

Table 3-29 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 3-30** shows the literates population and the percentage within the study area

Table 3-30 Literates population and the percentage within the study area

Sl. No	Name	Population	Literates Population	% Literates
Chittoor District				
Puttur Mandal				
1.	Kumarabommarajupuram	3174	1745	54.98
2.	Vepagunta	2244	1594	71.03
3.	Parameswara Mangalam	2453	1524	62.13
4.	Tirumalakuppam	4227	2712	64.16
Karvetinagar Mandal				
5.	Surendranagaram	1331	890	66.87
Thiruvallur District				

Sl. No	Name	Population	Literates Population	% Literates
Pallipattu Taluk				
6.	Mahankalikapuram	2215	1346	60.77
7.	Kadananagaram	7885	5133	65.1
8.	Srikalikapuram (Part)	2163	1359	62.83
9.	Veeramangalam	4754	3508	73.8
10.	Peddanagapudi	2465	1696	68.8
11.	Devalambapuram	2537	1680	66.22
12.	Rajanagaram	7553	5144	68.1
13.	Valakanampudi	9628	6480	67.3
14.	Vellathur	6827	4270	62.55
15.	Venugopalapuram	260	166	63.84
16.	Vediyangadu	4668	3090	66.2
17.	Paivalasa	2366	1444	61.03
18.	Peddaramapuram	2565	1863	72.63
19.	Mylarwada	3353	2251	67.13
20.	Meesarakandapuram	4247	2718	64
21.	Aswaravanthapuram	5253	3796	72.26
22.	Padmapuram	1033	747	72.31
23.	Veeranathur	5531	3604	65.16
Vellore District				
Wallajah Taluk				
24.	Somasamudram	4190	2855	68.14
25.	Kalpattu	702	475	67.66

Sl. No	Name	Population	Literates Population	% Literates
26.	Pandiyanellore	3519	2646	75.19
27.	Vasur	1829	1320	72.17
28.	Palleri	832	507	60.94
29.	Kondakuppam	2915	2006	68.82
30.	Thagarakuppam	2810	1589	56.55
31.	Sengalnatham	2535	1505	59.37
32.	Sekkadikuppam	959	563	58.71
33.	Rendadi	4849	3133	64.61
34.	Kallalan Kuppam	688	417	60.61
35.	Kodakkal	7948	5160	64.92
	Total	**122508**	**80936**	**65.63**

(Source: Census 2011)

3.12.3.1 Health facility within the study area

The majority of people visit nearby Hospitals/health services provided by the Government. The area has got good public health facilities at easily reachable distances. There was no major health issues reported in our survey. Even for any minor ailments they contact medical facilities immediately as it is very accessible to them. The local transport facilities and the communication facilities are the main reasons to get immediate medical attention. The incidents of institutional delivery are high due to awareness, education, economic development, proximity to health delivery system. The Infant mortality rate and the maternal mortality rate have significantly reduced. The health facilities within the study area are given in **Table 3-31.**

Table 3-31 Health facility within the study area

Sl.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

Sl.No	Type	Numbers
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)

3.12.4 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 3-32.**

Table 3-32 Summaries of Socio-economic indicators within the study area

S.No	Particulars	Study area	Unit
1	Number of villages in the Study Area	55	Nos.
2	Number of Wards in the Study Area	76	Nos.
3	Total Households	852565	Nos.
4	Total Population	3446360	Nos.
5	Children Population (<6 Years Old)	355826	Nos.
6	SC Population	409166	Nos.
7	ST Population	10015	Nos.
8	Total Working Population	1311153	Nos.
9	Main Workers	1151867	Nos.
10	Marginal Workers	159286	Nos.
11	Cultivators	11150	Nos.
12	Agricultural labours	15911	Nos.
13	Household Industries	29280	Nos.
14	Other Workers	1254812	Nos.
15	Literates	2754839	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 15.47.5 Ha. The Land is classified as a Government land. The lease area exhibits hilly terrain (~257mAMSL) topography covered by massive granite formation. Quarry lease was granted over an extent of 15.47.5Ha. In S.F.No.331 & 148 (Part), Veeramangalam'B'& Mahankalikapuram Village, R.k.Pettai Taluk,Tiruvallur District, and Tamil Nadu state. Precise area communication letter was granted vide Lr.No. 3162481/MME.1/2022-1, dated: 31.10.2022 for 20 years of mining. Precise area communication letter is enclosed as **Annexure-1.** The land use pattern is given in**Table 4-1.**

4.1.2 Land Degradation

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

- Land degradation due to disposal of large volume of waste materials.
- Creation of infrastructural facilities like office, rest shelter, first-aid centre and other service facilities.
- Exposure of topsoil to wind and water erosion.

Table 4-1Land Use Pattern of the lease area

S. No	Land Use	Area to be required during the mining plan(Ha)	Area at the end of the quarrying period (Ha)
1	Mining Area	2.57.0	3.59.0
2	Road	0.21.0	0.21.0
3	Approach Road (Existing)	0.16.5	0.16.5
4	Approach Road Proposed	0.46.5	0.21.5
5	infrastructure	0.10.0	0.10.0
6	Waste Dump	0.10.0	4.27.0
7	Green belt	0.06.0	0.28.5
8	Un Utilized area	12.37.0	6.64.0
	Total	**15.47.5**	**15.47.5**

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

The main source of air pollution is from open cast mining activities is dust generation from excavation of granite, movement of vehicles for transportation of product to consumers, drilling, loading and unloading operation and wind erosion of dumps and also gaseous emission due to operation of diesel driven mining equipment. The sources of air emission are detailed below in **Table 4-2.**

Table 4-2Sources of air pollution at quarry

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

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

4.2.1 Mitigation measures

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

Table 4-3Fugitive 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 4-4Dust 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 of January 2023 to Mid of 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.

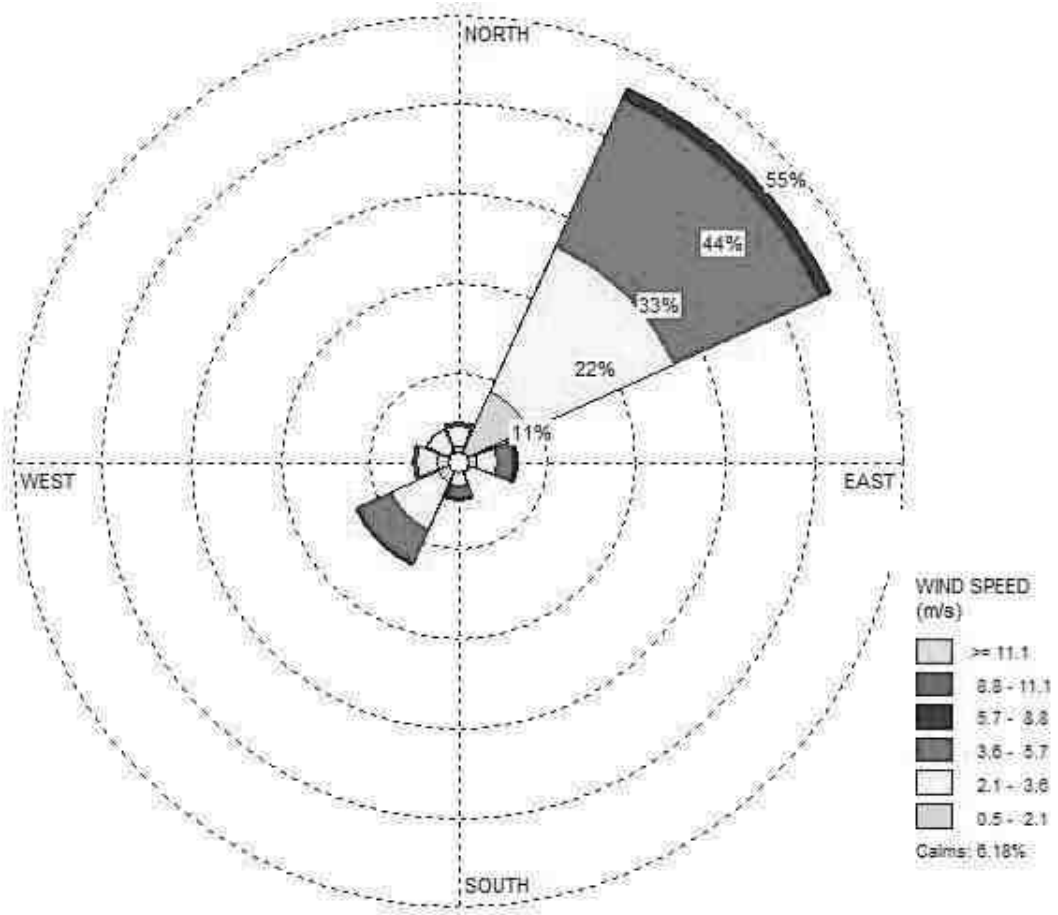


Figure 4-1Wind rose diagram considered for dispersion modeling

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 4.5 to Table 4.7.**

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.

Table 4-5 Overview of the Source Parameters

S. NO	Description	Symbol	Quantity
1	Moisture Content (%)	m	1.64
2	Silt Content (%)	s	6
3	Production / Day (Tonn/Day)		68

Source:

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

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

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

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

4.2.3.4 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 4-6 Emission from Mining Equipment's

Source	Fuel used	Stack Details					Emissions (g/s)		
		No of Stack	Height (m) AGL	Dia (m)	Temp (°C)	Exit Velocity (m/s)	PM_{10}	SO_2	NO_x
125 KVA DG	Diesel	1	3	0.3	180	10	5.81E-03	5.38E-03	8.16E-02

Table 4-7Vehicular Source Emission details

Source	Emission (g/s)		
	PM_{10}	$PM_{2.5}$	NO_x
4 Wheeler (1no.)	6.94E-05	4.17E-05	6.94E-04

Heavy Duty Vehicles (2 no.)	1.11E-04	6.67E-05	1.94E-02
Total	**1.81E-04**	**1.08E-04**	**2.01E-02**

Table 4-8 Emissions considered for mining

Activities	TSPM Emission rate	PM_{10} Emission rate	$PM_{2.5}$ Emission rate
Wet Drilling (g/s)	7.22E-06	1.44E-06	8.66E-07
Haulage (g/s)	2.66E-04	5.31E-05	3.19E-05
Waste Dumping (g/s)	7.47E-06	1.49E-06	8.97E-07
Open Pit (g/s.m2)	3.67E-06	7.34E-07	4.40E-07

Table 4-9 Emission input for modelling

Activities	TSPM	PM_{10}	$PM_{2.5}$	SO_2	NO_x
Line Source (Haul Road) (g/s)	2.66E-04	5.31E-05	3.19E-05	-	-
Area Source (Open Pit) (g/s.m^2)	3.67E-06	7.34E-07	4.40E-07	-	-
Area Source (Waste Dumping) (g/s)	7.47E-06	1.49E-06	8.97E-07	-	-
Point Source (DG) (g/s)	-	5.81E-03	3.48E-03	5.38E-03	8.16E-02
Point Source (Drilling) (g/s)	7.22E-06	1.44E-06	8.66E-07	-	-
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 $PM_{2.5}$

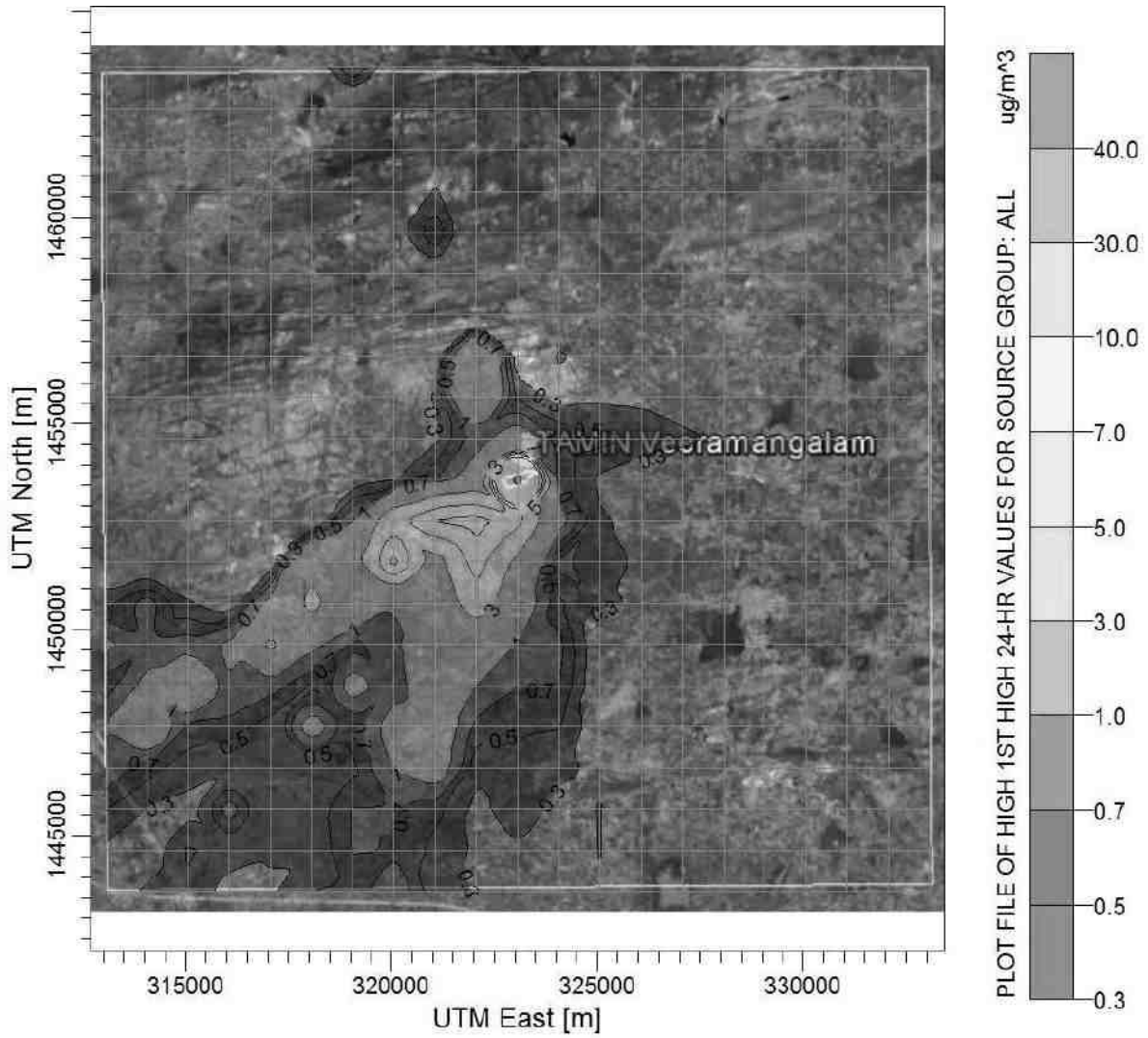


Figure 4-2 Predicted 24-Hrs GLC of Particulate matter TSPM within 10km Radius of the Study Area

Table 4-10 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.	323066	1453642	34.4308	Project Site	
2.	322066	1452642	7.89372	1.41	SW
3.	320066	1451642	7.50908	3.60	WSW
4.	321066	1452642	7.02561	2.23	WSW
5.	322066	1451642	5.76745	2.23	SSW
6.	323066	1452642	5.44836	1.00	S
7.	320066	1452642	4.46301	3.16	WSW
8.	322066	1450642	4.24189	3.16	SSW
9.	318066	1450642	3.60701	5.83	WSW
10.	317066	1449642	3.32122	7.21	WSW

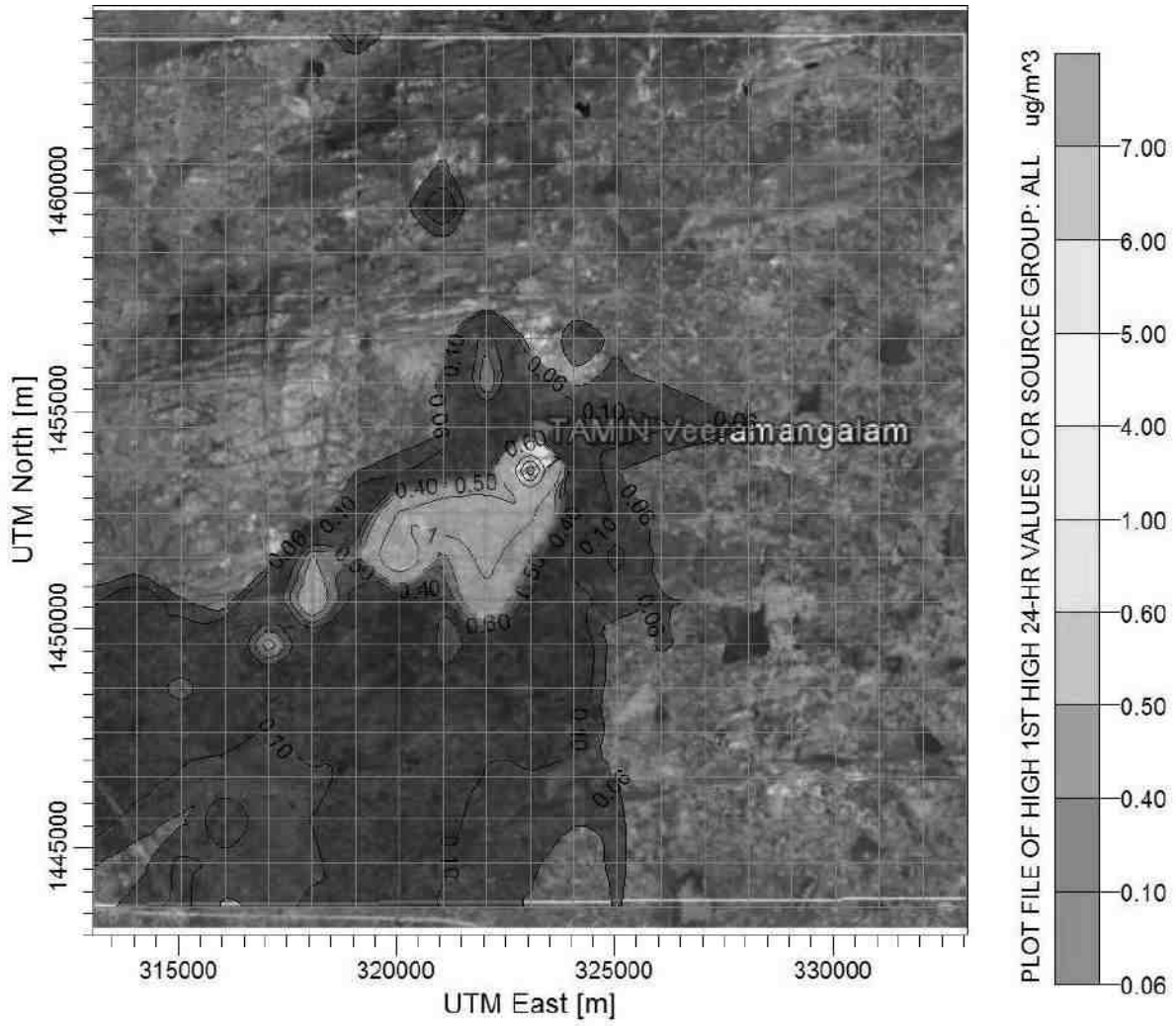


Figure 4-3Predicted 24 Hrs GLC's of PM_{10} within 10km radius of the study area

Table 4-11 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.	323066	1453642	6.88756	Project Site	
2.	322066	1452642	1.64992	1.41	SW
3.	320066	1451642	1.58952	3.60	WSW
4.	321066	1452642	1.47268	2.23	WSW
5.	322066	1451642	1.18787	2.23	SSW
6.	323066	1452642	1.11433	1.00	S
7.	320066	1452642	1.0608	3.16	WSW
8.	322066	1450642	0.89031	3.16	SSW
9.	318066	1450642	0.82205	5.83	WSW
10.	317066	1449642	0.67335	7.21	WSW

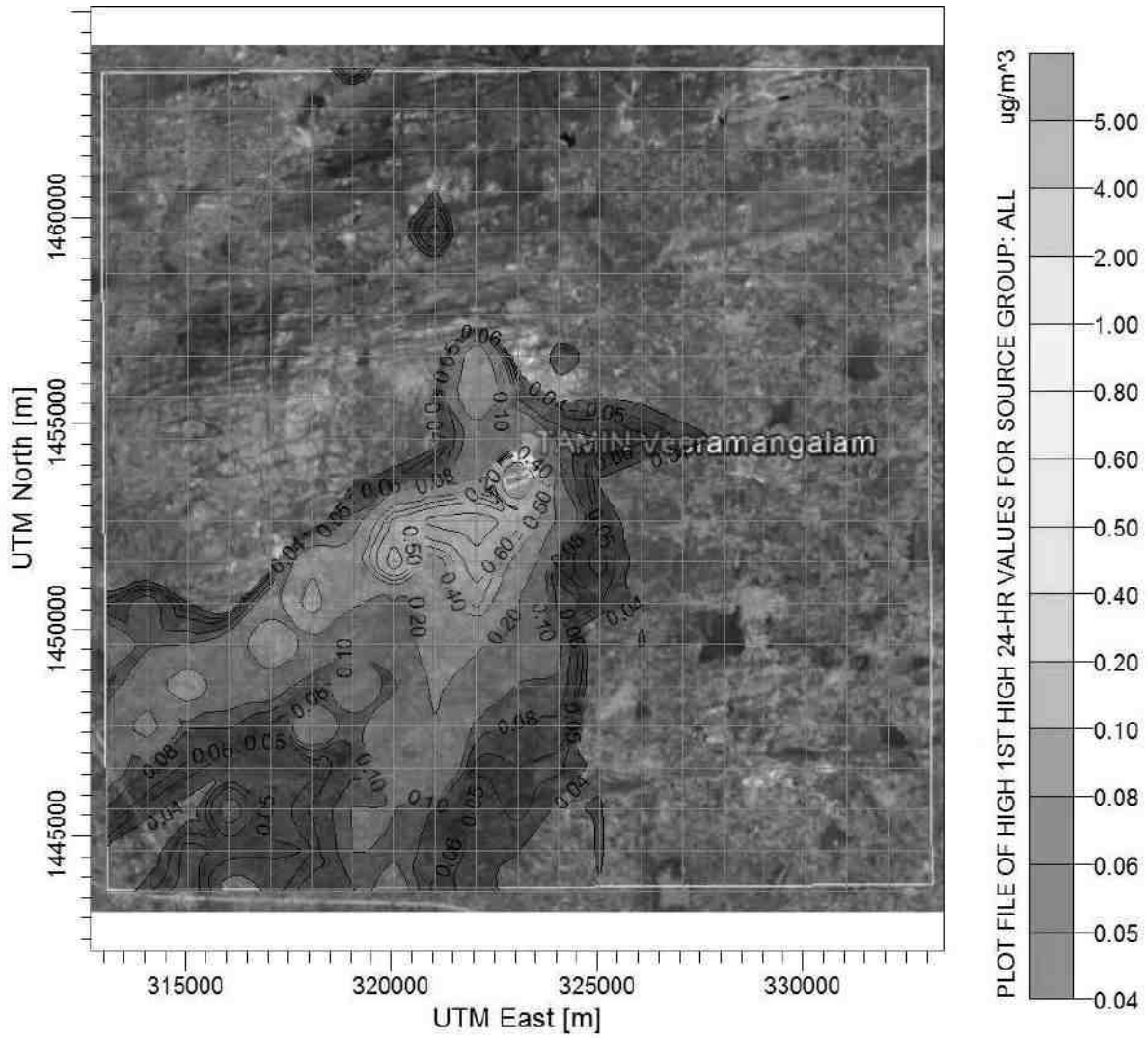


Figure 4-4Predicted 24-Hrs GLC of Particulate matter $PM_{2.5}$ within 10 km radius of the study area

Table 4-12 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.	323066	1453642	4.12878	Project Site	
2.	322066	1452642	0.9913	1.41	SW
3.	320066	1451642	0.9551	3.60	WSW
4.	321066	1452642	0.88283	2.23	WSW
5.	322066	1451642	0.71208	2.23	SSW
6.	323066	1452642	0.67173	1.00	S
7.	320066	1452642	0.63674	3.16	WSW
8.	322066	1450642	0.53811	3.16	SSW
9.	318066	1450642	0.49278	5.83	WSW
10.	317066	1449642	0.40405	7.21	WSW

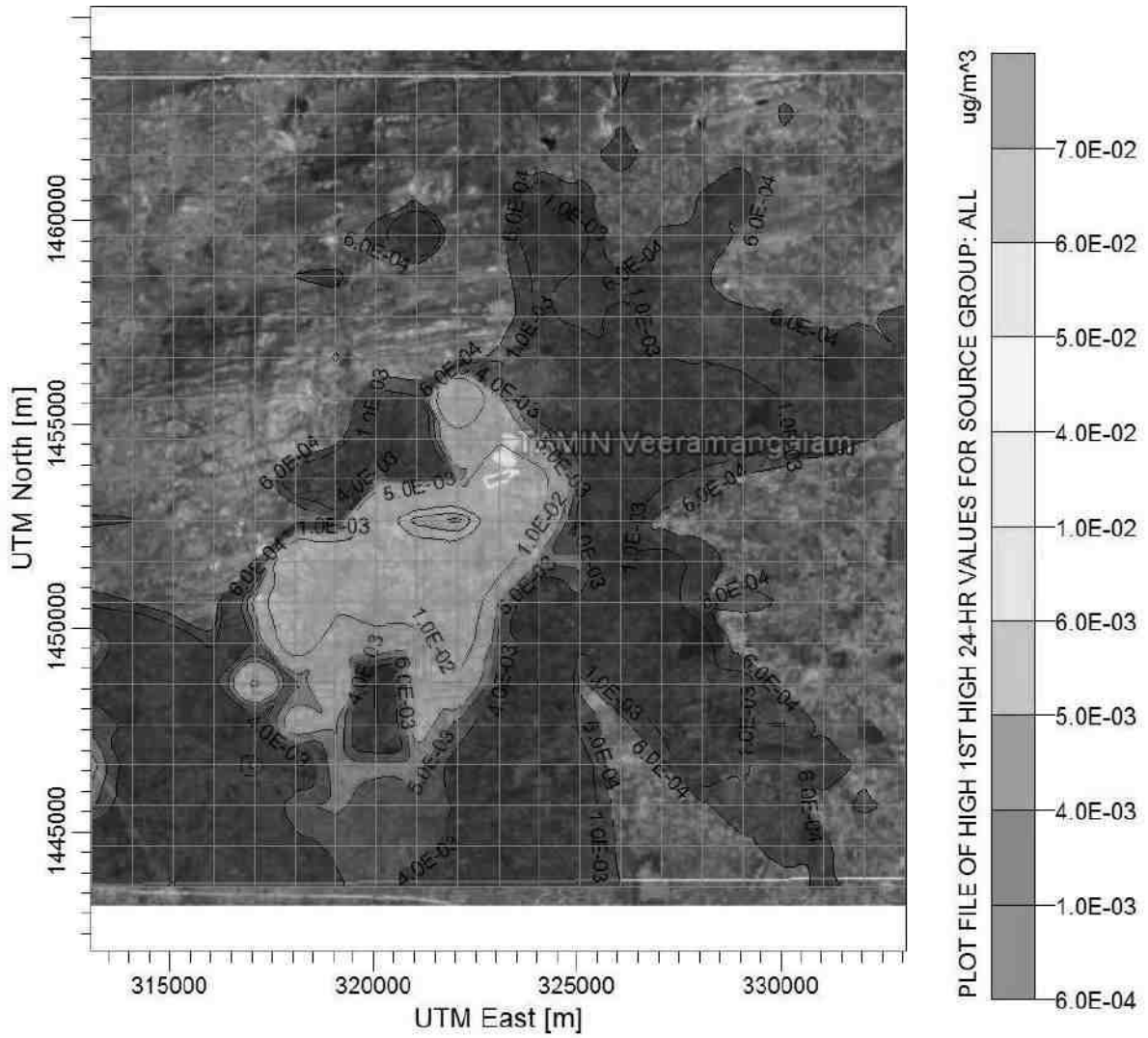


Figure 4-5Predicted 24-Hrs' GLC's of SO_2within 10 km Radius of the Study Area

Table 4-13 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.	322066	1452642	0.06287	1.41	SW
2.	321066	1452642	0.05416	2.23	WSW
3.	320066	1452642	0.03127	3.16	WSW
4.	323066	1452642	0.03018	1.00	S
5.	322066	1455642	0.02905	2.23	NNW
6.	323066	1453642	0.02448	Project Site	Project Site
7.	318066	1451642	0.02333	5.38	WSW
8.	322066	1451642	0.02232	2.23	SSW
9.	321066	1451642	0.02169	2.82	SW
10.	320066	1451642	0.02146	3.60	WSW

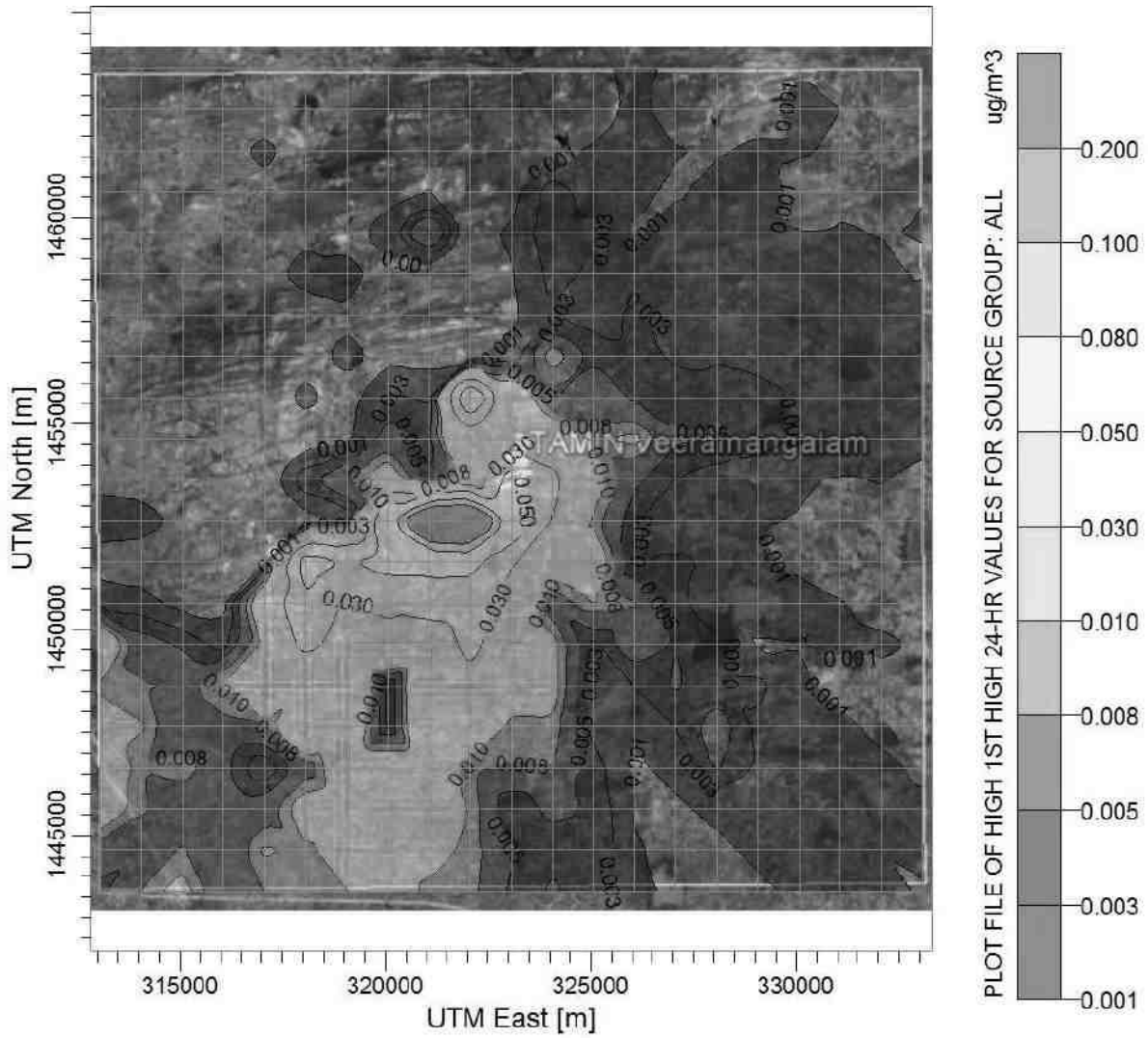


Figure 4-6Predicted 24-Hrs' GLC's of NO_X within 10 km Radius of the Study Area

Table 4-14 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.	322066	1452642	0.16036	1.41	SW
2.	321066	1452642	0.15023	2.23	WSW
3.	320066	1452642	0.07989	3.16	WSW
4.	323066	1452642	0.07649	1.00	S
5.	322066	1455642	0.07319	2.23	NNW
6.	323066	1453642	0.06166	Project Site	Project Site
7.	318066	1451642	0.05999	5.38	WSW
8.	320066	1451642	0.05894	3.60	WSW
9.	321066	1451642	0.05681	2.82	SW
10.	322066	1451642	0.05621	2.23	SSW

4.2.4 Conclusion

The total increase in concentrations above baseline status to estimate the percentage increase is summarized in the below **Table 4.15.**

Table 4-15 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	223.13	34.43	257.56	500	15.43
PM10	89.25	6.88	96.13	100	7.71
PM2.5	49.09	4.12	53.21	60	8.39
SO2	10.26	0.06	10.32	80	0.58
NOX	20.46	0.16	20.62	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 4-16 Existing & proposed vehicular movement per Hour (Peak Hour) SH-54

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 4-17 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 Govt Poramboke lands of the Veeramangalam'B'& Mahankalikapuram 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 4.18.**

Table 4-18Permissible Exposure in Cases of Continuous Noise (OSHA, Govt. of India)

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

4.4.5 Noise Due to Blasting

Blasting activities are involved in this Quarry as green belt will be developed around the mine which restricts the propagation of noise. The main sourceof 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 withproper spacing, burden and stemming will be maintained
- Nosecondaryblasting.
- Minimumquantityofdetonatingfuse will be consumedby 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 withproperspacing, burden and stemming will be maintained
- Nosecondaryblasting.
- Minimumquantityofdetonatingfuse will be consumedbyusing 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

4.6.3 Mining activities and their impact on biodiversity

Table 4-19 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

4.6.4 Existing Biological Scenario

- There will not be any adverse impact due to mining operations in this lease since only small production is involved from this lease and there will not be any major polluting source from the mining operations. Besides, all necessary mitigation measures will be implemented.
- There is no perennial water body near the site and there will be no discharge of effluent from the mine.
- In the Quarry area or its proximate areas there is no wetland and the natural flow of water not available.
- There is no rare or endangered species.
- There are no wild animals in the area. In the post mining stage, proper fencing will be carried in the mined out area to prevent fall of animals in the mine pits.
- There are no any wetlands, fish breeding grounds, marine ecology nearby the quarry area, which will be affected due to this project.
- No such significantly important medicinal value species within both the ML areas and its nearby region.
- There are no any wetlands, fish breeding grounds, marine ecology nearby the quarry area, which will be affected due to this project.

4.6.4.1 Mitigate Measures

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

4.6.5 Flora and Fauna

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

4.6.5.1 Impact

- ➢ Displacement of existingfauna.
- ➢ Lossofvegetation

4.6.5.2 Mitigation measures

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

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

- ➢ Noise abatement
- ➢ Reuse of wastewater to the extent possible
- ➢ Prevention of soil erosion
- ➢ Ecological restoration
- ➢ Aesthetic, biological and visual improvement of area due to improved vegetative and plantation covers.
- ➢ Green belt around mine, dumps, etc:
  - o Tall growing, closely spaced, evergreen trees native to the area
  - o Easy, quick early growth and establishment
  - o Uniform spreading of crown habit.
  - o Timber trees having long gestation period.
  - o Trees with high foliage density, leaves with larger leaf area
  - o Attractive appearance with both good flowering and fruit bearing.
  - o Bird and insect attracting species
  - o Suitable green cover with minimal maintenance
- ➢ Avenue Trees:
  - o Trees with conical canopy and with attractive flowering
  - o Trees with medium spreading branches to avoid obstruction to the traffic
  - o Trees with branching at 10feet and above.

4.7 Green Belt Development

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

An area of 0.06.0-hectare land is earmarked for greenbelt development during first 5 years of mining plan, at the end of life of quarry; the green belt area will be 0.06.0 Ha, TAMIN proposed to plant 20 No's of trees per year and Rs. 30,000/- per year will spend for proposed greenbelt development and maintenance.

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

4.7.3 Impacts on Occupational Health due to project operations

Anticipated occupational illness isequel 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

4.7.3.1 Mitigate Measures for Occupational Health

- Adoption of dust suppression measures like spraying water, use of drill with dust collection system or wet drills etc.
- Plantation
- Avoid blasting during unfavorable wind & atmospheric conditions.
- Use of personal protective equipment. Compliance with DGMS circulars.
- Emergency response plan that includes installation of 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 4-20 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.

4.7.3.2 Mitigate Measures for Safety Aspects

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

4.8 Impacts on Social Environment

Since the entire lease area of the project has no habitations or hutments 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.

4.8.3 Corporate Environmental Responsibility

TAMIN Veeramangalam'B' & Mahankalikapuram site had no Relocation and Rehabilitation. Most villages have benefitted mutually at Veeramangalam'B' & Mahankalikapuram 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. Provision for CER activities will be implemented as per MoEF&CC O.M dated20th October, 2020 (F.No. 22-65/2017-IA.III):

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.331&148(Part), Veeramangalam'B' & Mahankalikapuram Village, R.k.Pettai Taluk, Tiruvallur District, Tamil Nadu state. It is Government Poramboke land the applicant has obtained lease from the Government is enclosed as **Annexure -1.**

5.4 Connectivity

SH 54 (Chittoor-Sholinghur-Thiruttani) at ≃3.10km towards South direction. The nearest railway station is Thalangai Railway station located at ≃ 17.07Km towards SSE direction. NH-40(Kurnool-Ranipet) situated at distance of ≃ 20.03Km (SSW).

6 ENVIRONMENTAL MONITORING PROGRAMME

6.1 General

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

The Project proponent will be overseeing/reviewing following activities:

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

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

6.2 Monitoring Schedules for Various Environmental Parameters

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

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

6.2.3 Ambient Air Quality

The following monitoring schedule is given for ambient air quality.

- **Parameters**

  Sulphur dioxide (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.

6.2.4 Water Environment

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

6.2.5 Noise Measurement

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

Table 6-1 Environment (Protection) Rules 1986

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

Note:

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

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

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

A "decibel" is a unit in which noise is measured.

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

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

6.3 Post Project Environmental Monitoring

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

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

Table 6-2 Post Project Environmental Monitoring Program

S. No	Area of Monitoring	Number of Sampling Stations	Frequency of Sampling	Parameters to be Analyzed
1.	Meteorology	One	Hourly and Daily basis.	Wind speed and direction, Temperature, Relative Humidity, Atmospheric pressure, Rainfall.
2.	Ambient Air Quality	2 Stations (In downwind)	Twice a week:24 hourly period	PM_{10}, $PM_{2.5}$, SO_2, and NO_2
3.	Noise	2 (two within core area and two in buffer area)	Once every season	Ambient Equivalent continuous Sound Pressure Levels (Leq) at day and Night time.
4	Exhaust from DG set	Stack of DG set	Quarterly	PM_{10}, $PM_{2.5}$, SO_2 & CO
5	Vehicular Emissions	Parking area	Periodic monitoring of vehicles	Air emission and noise, PCU

6	Soil	Two Locations within the Project Site	Yearly Once	Physico chemical properties, Nutrients, Heavy metals
7	Terrestrial Ecology	Within 10km, around the project	Once in three years	Symptoms of injuries on plants
8	Surface/ Ground water quality	Two Locations Within Project Site	Yearly Once	As per ISO 10500 Standard parameters

6.3.3 Occupational Health and Safety

- Occupational health survey of staff and permanent workers will be undertaken at least once in 3 years to detect early incidence of diseases and for 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
1	Land Reclamation	The pit boundaries shall be safely fenced and used for agricuktural 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 proposedinthe 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.

Public Consultation

The proposed project is categorized as 'B1' category Schedule 1(a) as per EIA Notification 2006 and its amendments thereafter. The total area of the quarry is 15.47.5 Ha.

However, the proposed project falls under 'B1' category, Schedule 1(a), Public Hearing is Mandatory. So, EIA report has been prepared as per the obtained ToR vide. TN/F.No.9982/SEAC/ToR-1483/2022, dated: 22.06.2023. Draft EIA report will be submitted for Public Hearing (PH). After PH, the minutes obtained will be incorporated in the EIA report along with action plan by the proponent. Final EIA will be submitted to TNSEAC for further appraisal of the project and obtaining Environment Clearance.

7.2 Risk Identification & Management

7.2.1 Introduction

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

- Identification of potential hazard areas.
- Identification of representative failure cases.
- Visualization of the resulting scenarios in terms of fire (thermal radiation) and explosion.
- Assess the overall damage potential of the identified hazardous events and 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'scertificate ofcompetency. 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.

7.2.2 Identification of Hazards in Open Cast Mining

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

- Drilling
- Blasting
- Overburden handling
- Heavy Machinery

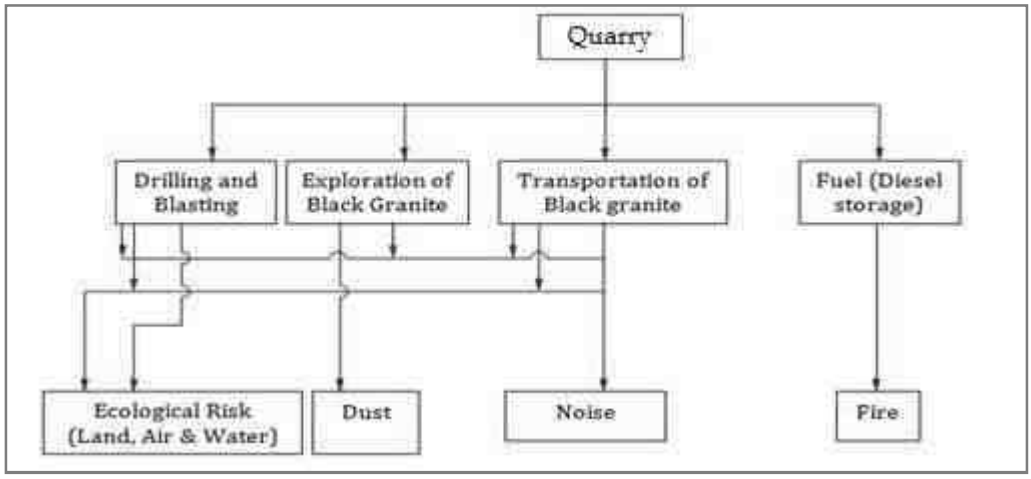


Figure 7-1Identification of hazards in opencast mine

7.2.2.1 Drilling

Drilling is an important activity in mining. This activity releases particulate matter into the air and noise in the vicinity of the operation. The particulate matter/dust can be arrested by employing dust extractor, wet or dry type. The usage of standard drill bits also reduces the dust formation. The noise is also arrested by the usage of dust extractors. The compressors which feed the compressor air to the drilling jack hammers can be covered in acoustic enclosures which reduce the dust and noise. The hard strata will be excavated after drilling and blasting. Drilling will be done with jack hammers up to 1.2 to1.5m depth having a diameter of 30-32 mm.

7.2.2.2 Blasting

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

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

7.2.2.3 Precautionary Measures to Avoid Accidents Due to Blasting

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

7.2.2.4 Overburden Handling

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

7.2.2.5 Heavy Machinery

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

7.2.2.6 Precautionary Measures to Prevent Accidents due to Trucks and Dumpers

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

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

7.2.2.7 Storage of Explosives

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

7.2.2.8 Safety Measures at the quarry

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

7.2.3 Disaster Management Plan

The disaster management plans aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities. For effective implementation of the disaster management plan, it should be widely circulated and personnel training through rehearsals/drills. The objectives of the disaster management plan 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 firefighting, rescue, rehabilitation, transport and provide essential and support services.

Emergency Communication (EC)

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

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

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

7.2.3.1 Emergency Services

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

1. Fire Protection System
2. Off Site Emergency Plan

7.2.3.2 Fire Protection System

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

7.2.3.3 Off-Site Emergency Plan

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

7.2.4 Mine Closure Plan

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

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

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

7.2.4.1 Progressive Mine Closure Plan

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

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

7.2.4.2 Water Quality Management

The ground water quality in the region indicates neutral range with pH values. Most of the analytical results for ground and surface water showed parameter concentrations well within the permissible limits. Garland drains will be provided all along the periphery of the mining pit and along the toes of

the side burden dumps. These drains will be aligned in such a way that all the surface drainage water will be carried away from the mining zone to settling tanks.

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

7.2.4.3 Mines Seepage Water

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

7.2.4.4 Air Quality Management

Ambient air quality was monitored twice in a week for One (01) season (shall cover 12 weeks), i.e., during Pre-Monsoon season (**June-August 2018**). 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 theblack granite mine area:

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

7.2.4.5 Solid waste Management

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

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

7.2.4.6 Stabilization of Dump

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

7.2.4.7 Mine Drainage

The lease applied area is hillock 40m height with slope towards northern and southern sides. Through the area receives scanty rainfall, the ground water level is at 10.2m 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.

7.2.4.8 Disposal of Waste

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

7.2.4.9 Top Soil Management

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

7.2.4.10 Disposal of Mining Machinery

Mining operations are planned to be operated using Company owned machinery. The company has its own Excavators, Mining Tippers, compressors; wire saw machine, jack hammers, and other mining equipment. These machines are 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.

7.2.4.11 Other Infrastructure

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

7.2.4.12 Safety & Security

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

7.2.5 Social Impact Assessment R & R Action plan

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

8 PROJECTBENEFITS

8.1 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.

8.2 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.

8.3 Other tangible benefits

Cultural & economic Development of the near by villages.

9 ENVIRONMENTAL COST & BENEFIT ANALYSIS

(Not recommended during scoping stage)

10 ENVIRONMENTAL MANAGEMENT PLAN

10.1 Environmental Management Plan

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

10.2 Emission Source Identification

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

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

10.3 Air Quality Management

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

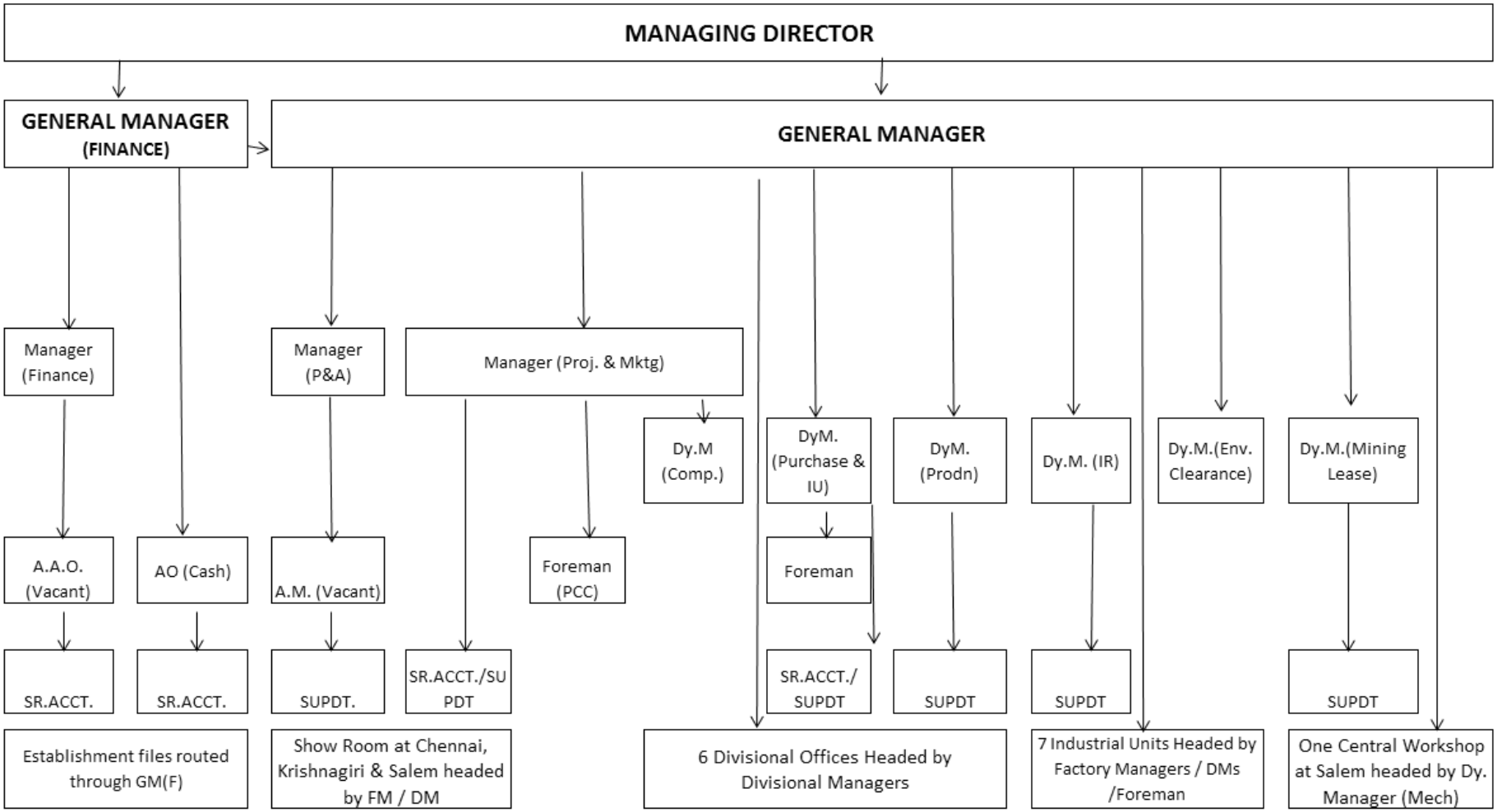


Figure 10-1Hierarchical System of the TAMIN

11 SUMMARY & CONCLUSION

11.1 Background

The extent area of the quarry is 15.47.5 Haat S.F. 331 & 148(Part) at Veeramangalam 'B'& Mahankalikapuram Village, R.K.Pettai Taluk, Tiruvallur District, Tamil Nadu.TAMIN has been proposed to get a fresh lease for Black Granite (Dolerite) quarry over an extent of 15.47.5 Ha for 20 years lease vide precise area communication letter No.3162481/MME.1/2022-1,dated:31.10.2022. Accordingly, the Government of Tamil Nadu issued the precise area communication letter under Rule, 8-C (3b) of Tamil Nadu Mineral Concession Rules, 1959.

The project falls under B1 Category, Schedule 1(a) Mining of Minerals as per EIA Notification dated 14th September 2006 and its subsequent amendments.The EC application was submitted under category B1, schedule 1(a) to TN SEIAA vide File No. 9982/2023.

The proposal was appraised during 382nd SEAC meeting held on 09.06.2023 and 632th SEIAA meeting held on 21.06.2023&22.06.2023 and ToR was issued vide Lr No. SEIAA-TN/F.No.9982/SEAC/ToR-1483/2023, dated: 22.06.2023 for the preparation of EIA/EMP report. The draft EIA/EMP report will be submitted for Public Hearing (PH). After completion of Public Hearing, the minutes issued will be incorporated in the EIA report along with action plan by the proponent. Final EIA will be submitted to TNSEAC for further appraisal of the project and obtaining Environment Clearance.

TAMIN as part of the compliance from MoEF&CC has appointed M/s Hubert Enviro Care systems (P) Ltd, Chennai as Environmental Consultants who are accredited by National Accreditation Board for Education and Training (NABET), Quality Council of India (QCI), New Delhi.

The production capacity of the quarry during the mining plan period was 33,000 m^3 Mine lease area falls in the survey of India Topo sheet D44N8 and lies between the GPS coordinates of Longitude: 79°22'50.43990"E to 79°22'19.99560"ELatitude: 13°08'31.39320"N to 13°08'45.55996"N.

11.2 Management Commitment

The company is assigning prime importance for environmental protection. The company will comply the environmental laws. TAMIN will maintain well developed Greenbelt. Also all the environmental statutory requirements will be implemented and maintained continually.

11.3 Environmental Sensitive Areas

There are no notified ecologically sensitive areas within 15km from project boundary. The Tamilnadu State / Karnataka State boundary as per google runs in W direction at about ~ 9.90km

from the project boundary. Project doesn't attract the special conditions and general conditions as per EIA notifications. The detailed Environmental Sensitivity areas within the 15km radius of the project site are given in **Chapter 3, Section 3.4** and **Table 3-1.**

11.4 Black Granite Quarry Reserves

- The estimated Geological Reserves of Black Granite estimated based on the Geological cross sections was 13,11,180 m^3. Granite waste @80% is 1,32,000 m^3.
- The Mineable Reserves have been arrived as 6,46,064 $m^3$and by applying 20% recovery, the updated mineable reserves as 1,29,213 m^3.
- Mineable Reserves have been worked out as 1,29,213 m^3 by applying the recovery factor 20%. The annual peak production per year would be 7500 m^3 of ROM of saleable and 1,65,000 m^3 of ROM during the first five year of Mining plan period at the rate of 20% recovery.

11.5 Summary of the Magnitude of Operation

- The black granite quarrying operation is proposed to carry out by opencast semi mechanized method by formation of benches. Benches are proposed with a height of 6m & width bench not less than the height. Major machineries are Compressor, Jack hammer, Diamond wire saw machine and excavator and DG set is used in proposed quarry. Tippers and dumpers will be used for transportation
- Proposed Production Capacity is 7500 m^3 per annum.
- The geological cross sections up to the economically average depth of 40m from the ground level and top surface of the granite body works out to 13,11,180 m^3
- The mineable reserves have been computed as 6,46,064m^3.
- The mineable have been worked out as 1,29,213 m^3 by applying the recovery factor 20%.

11.6 Requirements

11.6.1 Land requirement

- The Black granite mine is over an extent of 15.47.5 Ha. The entire area is under possession of TAMIN.
- Lease area located at S. F. No.331&148 Veeramangalam'B' & Mahankalikapuram Village, R.k.Pettai Taluk, Tiruvallur District lies in the latitude of 13°08'31.39320"N to 13°08'45.55996"N and longitude of 79°22'50.43990"E to 79°22'19.99560"E.
- The lease area topography is hilly terrain; site elevation is 257m (max) AMSL. The area is marked in the survey of India Topo sheet No.D44N8.
- Mining Lease obtained from Tamil Nadu Government for 20 years vide Precise area communication letter No.3162481/MME.1/2022-1,dated:31.10.2022 Out of 15.47.5 Hectare of lease area 3.59.0 Ha is considered for mining, waste dump is 4.27.0 Ha, & for Greenbelt

0.28.5 is allocated.

11.6.2 Water Requirement

- The total water requirement is 3.5KLD Drinking & Domestic purpose-1.5 KLD, Wire Saw cutting -0.5 KLD, Dust suppression -1.0 KLD & for Greenbelt-0.5KLD. The total water requirement will be met from Road tankers.
- Hazardous waste like waste oil will be disposed through TNPCB Authorized dealers.
- Sewage will be disposed through septic tank followed by soak pit. Septic Tank will be cleaned periodically.

11.6.3 Power & Fuel Requirement

- Power requirement will be 60 kVA will me through 125 kVA DG Set. Diesel consumption will be 200 liters/day.
- Diesel will be brought from nearby diesel pumps. No electricity is required for the project.

11.6.4 Manpower

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

11.6.5 Solid Waste Generation & Management

- Municipal solid waste (13.5 kg/day) will be segregated as Organic will dispse through local municipal bins and inorganic waste (5.4kg/day) will be disposed through TNPCB authorized recyclers.
- Waste diesel Oil will be collected in leak proof containers and disposed to TNPCB Authorized Agencies for Reprocessing/Recycling.

11.7 Project Cost

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

11.8 Baseline Study

Project Influence Area (PIA)/Study Area: An area covering 10 km radius from Veeramangalam'B' & Mahankalikapuram Black granite quarry boundary has been earmarked as study area for baseline studies.

Study Period:

The baseline environmental surveys were carried out during **(mid January 2023- mid April 2023)** within the study area.

Summary of Baseline Studies:

- Site has an undulating terrain with level 257m Above MSL.
- The project site falls under Zone- III (Low Risk Zone) as per IS 1893 (Part- I).
- The predominant wind direction is North East during study period.
- Max Temperature: 37^0CMin Temperature: 16^0C&Avg Temperature: 27.38^0C

- Average Relative Humidity: 65.85 %
- Average Wind Speed : 2.77 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} (35.05µg/m³-75.1µg/m³), $PM_{2.5}$(20.96µg/m³ -41.31µg/m³), SO_2(16.79µg/m³–8.64µg/m³),NO_2(12.06µg/m³–17.22µg/m³),allthe parameters are well within the National Ambient Air Quality Standards for Industrial, Commercial and Residential areas at all monitoring locations during the study period..

Noise Environment

Ambient noise levels were monitored using precision noise level meter in and around the project site at 10 km radius at 8 locations during study period.

- In Industrial area day time noise levels varied from 68.7 dB (A) to 45 dB (A) and night time noise levels varied
- In Residential area night time noise levels varied from 49.8 dB (A) to 42.9 dB (A) and night time noise levels varied from 40.1dB(A) to 42.8 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).

Water Environment

The prevailing status of water quality at 08 locations for surface water and 8 locations for ground water have been assessed during the study period. The standard methods prescribed in IS were followed for sample collection, preservation and analysis in the laboratory for various physiochemical parameters.

Surface water quality

- pH ranges from 7.24 to 7.83.
- Total Dissolved Solids range from 345 mg/l to 449 mg/l.
- Total hardness ranges between 142 mg/l – 193 mg/l.
- The BOD value ranges from 3 mg/l to 5 mg/l
- COD value 17 mg/l to 36 mg/l.

- The concentration of heavy metals like As, Cd, Cr, Pb, Mn, Hg, Ni and Se at all locations are within the limits of IS 2296:1992(Class-C: Drinking water with conventional treatment followed by disinfection)

Ground Water Quality

- The average pH ranges from 7.14-8.47.
- Total Dissolved Solids (TDS) value of the collected ground water samples are 647.6 mg/l to 957.3 mg/l
- Total hardness of the collected ground water sample ranges from 112.7 mg/l to 301.2 mg/l.
- The concentrations of Sulphate in the collected ground water sample ranges from 49.8 to 98.5 mg/l.
- The concentrations of Chloride in the collected ground water sample ranges from 113.5 to 251.6 mg/l
- It is observed that all the collected ground water samples meets the drinking water standards (IS 10500:2012) and can be used for drinking.

Land Environment

Assessment of soil characteristics is of paramount importance since the vegetation growth, agricultural practices and production is directly related to the soil fertility and quality. Soil sampling was carried out at eight (08) locations in the study area. It is observed that,

- The pH of the soil samples ranged from 6.98 -7.76.
- Conductivity of the soil samples ranged from 1080 – 1630 µS/cm.
- Nitrogen content ranged from 80 mg/kg to 120 mg/kg
- Phosphorous ranged from 17 mg/kg – 37 mg/kg
- Potassium content ranges from 66 mg/kg – 104 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

As per primary survey details, fair agro- vegetation cover in the study area. Growth of grasses in the study area is more in rainy season. The common trees in the study area are *Tamarindus indica*, *Pithoclobium dulsi*, *Prosopis julifera* and *Eucalyptus* species. The shrub vegetation consists of *Zizyphus xylopyra*, *Adathoda vassica*, *Carisa* sp and *Randia dumentorium*. The common species of grasses inthe study area are *Fimbryostylus ovata*, *Aristida funiculata*, *Pennisetum* and *Heteropogon*.

Fauna

No major fauna observed in core zone. Only some egrets, herons and drongo are observed in the plant area. Among mammals, only mongoose is observed in the core zone. There is no endangered fauna observed in the proposed plant area.

A secondary information for faunal biodiversity of the study area with respect to birds, reptiles, amphibians and butterfly species. Fauna is a gift of nature, and the different beasts and birds, forming part of wild life, need to be preserved. The wild animal and birds help in protecting crops, by praying upon worms and insects, which might damage them.

Socio Economic Environment

Thiruvallur district having a population of 1,585,280 consists of 795,110 male populations and 790,170 female populations. As per 2011 Census the sex ratio was 987 for every 1,000 males, lower when compared to the State Sex Ratio of 996 in Thiruvallur district. The sex ratio of 0-6 age group was 946 for district.

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 Thiruvallur 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 3-25**Anticipated Environmental Impacts

Air Environment

The emissions mainly generated from the mining activities are Blasting, Drilling, Scrapping, Excavation, Loading, Unloading, and transportation etc. Machinery like compressors and jack hammers are used for Drilling. Fugitive dust control in mine is shown in **Table 11-1.**

Table 11.8-1 Fugitive dust control in mine

S. No	Activities	Best practices
1	Drilling	➢ Drills should be provided with dust extractors (dry or wet system)
2	Blasting	➢ Water spray before blasting ➢ 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

- Thequarry is in operations since 1995 and extent of lease area is 15.47.5Ha. Land classifies as a Government land, Mining Lease obtained from Tamil Nadu Government for 20 years vide precise area communication letter No3162481/MME.1/2022-1, dated: 31.10.2022.

Wastewater Management

- Sewage (1.2KLD) 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 0.06.0Ha, out of 15.47.5Ha. Plants are chosen to provide aesthetic, ecological and economical value. Trees will help to arrest propagation of noise and help to lessen dust pollution due to dust arresting action.

11.10 Disaster Management Plan

The salient features of Disaster Management Plan include

- Emergency shutdown procedure
- Fire protection system, Emergency safety equipment & Reporting and response to emergency.Emergency Help from nearby industries and tie up with nearby industries

11.11 Corporate Environmental Responsibility

- TAMIN Verramanagalam & Mahankalikapuram site had no Relocation and Rehabilitation.
- Most villages have benefitted mutually at Veeramanagalam 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.
- Provision for CER activities will be implemented as per MoEF&CC O.M dated20th October, 2020 (F.No. 22-65/2017-IA.III):

11.12 Benefits of the Proposed Project

- The quarrying activities in this belt will benefit to the local people both directly 30 persons& indirect persons are 20 Nos
- Improvement in Per Capita Income.
- The socio - Economic conditions of the village and distance will enhance due to the project, hence the project should be allowed after considering all the parameters.
- It can thus be concluded that the project is environmentally compatible, financially viable and would be in the interest of construction industry thereby indirectly benefiting the masses.

12 DISCLOSURE OF CONSULTANTS

In order to assess the potential environmental impacts due to the proposed project at Survey No:331 Veeramangalam 'B' & Mahankalikapuram village, DR.k.Pettai Taluk, Tiruvallur District, Tamil Nadu State to undertake EIA study. The nature of consultancy service rendered covers terrestrial environmental assessment.

12.1 Brief Profile of HubertEnviro Care Systems (P) Limited (HECS)

Hubert Enviro Care Systems (P) Limited is a leading Environmental Management Company and service provider serving as a catalyst for environmental protection in the industrial & service sectors.

Enviro care Systems was started in 1997 as a proprietor company. In the year 2004, Enviro Care Systems became a Private Limited Company and registered as Hubert Enviro Care Systems (P) Limited.

Across two decades of operation we have developed into a matured corporate house to meet client's requirements to provide products and services of Global standards at the most competitive price within committed schedule of time.

We have full-fledged office and laboratory at Chennai, Mangalore, Trivandrum & Hyderabad.

12.2 Strengths of HECS

Number of Employees as on till date

Total No of Employees	1170
Consultancy	42
Laboratory	100
Projects	29
Operation & Maintenance	999

12.3 Copy of QCI NABET Accreditation

QUALITY COUNCIL OF INDIA
Creating an Ecosystem for Quality

National Accreditation Board for Education and Training

Certificate of Accreditation

Hubert Enviro Care Systems Pvt. Ltd.,

A-21, (Behind Lions Club School) III Phase, Thiru Vi Ka Industrial Estate, Guindy, Chennai - 600 032.

The organization is accredited as ***Category-A*** *under the QCI-NABET Scheme for Accreditation of EIA Consultant Organization, Version 3: for preparing EIA-EMP reports in the following Sectors –*

S. No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals including open cast/ underground mining	1	1 (a) (i)	A
2	Offshore and onshore oil and gas exploration, development & production	2	1 (b)	A
3	River Valley projects	3	1 (c)	A
4	Thermal power plants	4	1 (d)	A
5	Mineral beneficiation	7	2 (b)	A
6	Metallurgical industries (ferrous & nonferrous)- both primary & secondary	8	3 (a)	B
7	Cement plant	9	3 (b)	A
8	Petroleum refining industry	10	4 (a)	A
9	Pesticides industry and pesticide specific intermediates(excluding formulations)	17	5 (b)	A
10	Petro-chemical complexes (industries based on processing of petroleum fractions & natural gas and/or reforming to aromatics)	18	5 (c)	A
11	Petrochemical based processing (processes other than cracking & reformation and not covered under the complexes	20	5 (e)	A
12	Isolated storage & handling of hazardous chemicals (As per threshold planning quantity indicated in column 3 of Schedule 2 & 3 of MSIHC Rules 1989 amended 2000)	28	-	B
13	Synthetic organic chemicals industry	21	5 (f)	A
14	Industrial estates/ parks/ complexes/ Areas, export processing zones(EPZs), Special economic zones (SEZs), Biotech parks, Leather complexes	31	7 (c)	A
15	Ports, harbours, break waters and dredging	33	7 (e)	A
16	Highways	34	7 (f)	B
17	Common Effluent Treatment Plants (CETPs)	36	7 (h)	B
18	Common municipal solid waste management facility (CMSWMF)	37	7 (i)	B
19	Building and construction projects	38	8 (a)	B
20	Townships and Area development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in SAAC minutes dated Feb 3, 2023 posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no. QCI/NABET/ENV/23/2696 dated March 6, 2023. The accreditation needs to be renewed before the expiry date by Hubert Enviro Care Systems Pvt. Ltd, following due process of assessment

Sr. Director, NABET	Certificate No.	Valid up to
Dated: March 6, 2023	NABET/EIA/2224/SA 0190	July 27, 2024

For the updated List of Accredited EIA Consultant Organizations with approved Sectors please refer to QCI-NABET website.

Further details may be seen on the following URL: www.hecs.in.