

# **DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT**

**For**  
**VEERANAM BLACK GRANITE QUARRY**  
**OVER AN EXTENT OF 13.74.0 Ha.**  
**(Schedule 1(a) Mining of Minerals 'B1' Category)**

**Located at**

**Survey No's : 74(P), 126/1A, 127, 144/1**  
**Village : Veeranam**  
**Taluk : Thandarampattu**  
**District : Thiruvannamalai**  
**State : Tamil Nadu**

**By**



**M/s. Tamil Nadu Minerals Limited**  
**No. 31, Kamarajar Salai, Chepauk, Chennai-600005.**

**ToR Id No. TO25B0108TN5444492N dated: 13.05.2025**

**Baseline period: Feb 2025 to April 2025**

**Baseline Carried out by: M/s. Mats India Pvt Ltd**

**Purpose of report: Submission for SEAC**

**Document No. EHSL/EIA/1(a)/036/June/2025**

**EIA Consultant**

**M/s. EHS360 Labs Private Limited**

**Ashok Nagar, Chennai**



**NABET Certificate No. NABET/EIA/22-25/SA 0233 validity 24<sup>th</sup> June 2025**

**June 2025**

## PREFACE

### DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

For

**“VEERANAM BLACK GRANITE QUARRY OVER AN EXTENT OF 13.74.0 Ha.”**

Government Poramboke Land

Located in SF No. 74(P), 126/1A, 127, 144/1, Veeranam Village,  
Thandarampattu Taluk, Thiruvannamalai District, Tamil Nadu, India.

For and on behalf of M/s. EHS360 Labs Pvt. Ltd.,

**Approved by:** Santhosh kumar. A

**Signature:** A. S. 7

**Designation:** CEO

**Date:** 14.06.2025

| Document Control            |                                                                                                                                                                                                                                                                                 |                  |            |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------|
| <b>Name of the Document</b> | Draft Environmental Impact Assessment report for M/s. Tamil Nadu Minerals Limited, Veeranam Black granite quarry over an extent of 13.74.0 Ha Located at SF No. 74(P), 126/1A, 127, 144/1, Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, Tamil Nadu, India. |                  |            |
| <b>Document No.</b>         | EHSL/EIA/1(a)/036/June/2025                                                                                                                                                                                                                                                     | <b>Issue No:</b> | R0         |
|                             |                                                                                                                                                                                                                                                                                 | <b>Date:</b>     | 14.06.2025 |

### **DISCLAIMER & DECLARATION:**

This report has been prepared by M/s. EHS360 Labs Pvt. Ltd. for obtaining Environmental Clearance as per ToR along with public hearing issued by SEIAA-TN. Information provided in this report (unless attributed to references) shall not be copied or used without the written consent of M/s. EHS360 Labs Pvt. Ltd. Compliance The Environmental Impact Assessment & Environmental Management Plan have been prepared with compliance of Terms of Reference along with public hearing as per the Generic Structure and Process described in Annexure-III of EIA Notification 2006 and MoEFCC Office Memorandum J-11013/41/2006-IA. II (I) Dated.04.08.2009.

**Revision History:**

| Revision No. | Date of Revision | Revision Information                                                                                                                  | Prepared By       | Reviewed By       | Approval BY      | Dispersal Record                     |
|--------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------|------------------|--------------------------------------|
| R0           | 14.06.2025       | Draft EIA Report preparation as per obtained Terms of Reference, confirmation of the project details and proposed mitigation measures | Tatiparthi Rajani | Gaddam Raja Reddy | Santhoshkumar. A | 1st Draft report submitted to client |

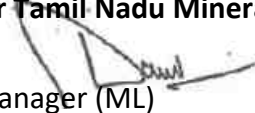
## DECLARATION BY THE PROPONENT

**(Compliance to MoEF&CC Office Memorandum J-11013/41/2006-IA. II (I) Dated.04.08.2009)**

I, Dr.E.Ganesan, Manager (Mining Lease) of M/s. Tamil Nadu Minerals Limited gives this declaration/ undertaking to the effect that the EIA report preparation has been undertaken in the compliance with Terms of Reference with public hearing (ToR for the Proposed Black granite quarry over an extent of 13.74.0 Ha Located at SF No. 74(P), 126/1A, 127, 144/1, Veeranam Village, Thandampattu Taluk, Thiruvannamalai District, Tamil Nadu and the information and content provided in the report are factually correct.

The Environmental Impact Assessment & Environmental Management Plan have been prepared as per the Generic Structure and Process described in Annexure-3 of EIA Notification 2006.

**For Tamil Nadu Minerals Ltd,**

  
Manager (ML)  
Authorized Signatory

## DECLARATION OF EXPERTS CONTRIBUTING TO THE EIA:

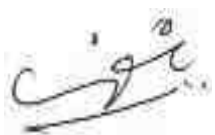
*Declaration by Experts Contributing to Draft Environmental Impact Assessment for the "M/s. Tamil Nadu Minerals Limited, Black granite quarry over an extent of 13.74.0 Ha Located at SF No. 74(P), 126/1A, 127, 144/1, Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, Tamil Nadu".*

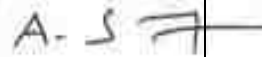
*I hereby certify that I was a part of the EIA report in the following capacity that developed the above said EIA.*

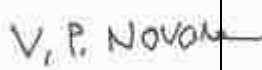
| EIA Coordinator                                                                                                                                                                                        | Team Member                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br><b>Name:</b> Tatiparthi Rajani<br><b>Date:</b> 14.06.2025<br><b>Period of Involvement:</b> Feb 2025 to till date. | <br><b>Name:</b> Mr. Santhosh kumar A<br><b>Date:</b> 14.06.2025<br><b>Period of Involvement:</b> Feb 2025 to till date. |

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**Functional Area Experts (FAEs):**

| S. No | FAs | Name of the Expert/s   | Involvement (Period & Task)                                                                                                                                                                                                                                                                                                                                                                                                                         | Signature                                                                             |
|-------|-----|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1.    | AP  | R. Rajendran           | <b>Period:</b> Feb 2025 to till now<br><b>Task:</b> Selection of monitoring locations, Supervision of air quality monitoring, identification and assessing quantum of emission, Identification of most suitable control device for reducing process emission at source and contribution to EIA documentation                                                                                                                                        |    |
|       |     | Tatiparthi Rajani (TM) | <b>Period:</b> Feb 2025 to till date<br><b>Task:</b> Site visit and Kick of meeting with client. Assisting with FAE during Selection of monitoring locations, Identification of most suitable control device for reducing process emission at source and contribution to EIA documentation                                                                                                                                                          |    |
| 2.    | AQ  | Ms. Tushali Jagwani    | <b>Period:</b> Feb 2025 to till now<br><b>Task:</b> Developing meteorological data with collected secondary data, identification of impacts, Draftization of mitigation measures and contribution to EIA documentation                                                                                                                                                                                                                              |  |
|       |     | Mr. Santhosh kumar A   | <b>Period:</b> Feb 2025 to till now<br><b>Task:</b> Assistance to FAE during Developing meteorological data with collected secondary data, Preparation of Emission Inventory, AERMOD Modelling for Proposed activities identification of impacts and contribution to EIA documentation                                                                                                                                                              |  |
| 3.    | WP  | Mrs. Tatiparthi Rajani | <b>Period:</b> Feb 2025 to till date<br><b>Task:</b> Identification of sampling locations for surface water, Coordination with Lab team during the collection of Sampling and preservation & Ground water samples, Verification of analysis results and Ionic balance/correlation of parameters. Incorporation of results in the EIA report. Identification of Impacts pollution evaluation of water control management, Draftization of mitigation |  |

|    |              |                              |                                                                                                                                                                                                                                            |                                                                                       |
|----|--------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|    |              |                              | measures and contribution to EIA documentation                                                                                                                                                                                             |                                                                                       |
|    |              | Tatiparthi Pranay Kumar (TM) | <b>Period:</b> Feb 2025 to till date<br><b>Task:</b> Assistance to FAE during auditing water use, Identification of Impacts pollution evaluation of water control management and contribution to EIA documentation.                        |    |
| 4. | SHW (SW& HW) | Mrs. Tatiparthi Rajani       | <b>Period:</b> Feb 2025 to till date<br><b>Task:</b> Identification of waste generation and suggestion disposal methods, proposed adequate Mitigation measure for management of hazardous waste and contribution to EIA documentation      |    |
|    |              | Mr. Santhosh kumar A         | <b>Period:</b> Feb 2025 to till now<br><b>Task:</b> Assistance to FAE during Studying adequacy of Mitigation measure for management of haardous waste and contribution to EIA documentation                                                |   |
| 5. | SE           | Mrs. Anitha Reddy            | <b>Period:</b> Feb 2025 to till date<br><b>Task:</b> Collection ofsecondary and primary from thesurrounding area/villages of the proposed project for Impact identification and mitigation measures for incorporating to EIA documentation |  |
|    |              | Srimathi Velu (FAA)          | <b>Period:</b> Feb 2025 to till date<br><b>Task:</b> Collection ofsecondary and primary data from thesurrounding area/villages of the proposed project for Impact identification and contributing to the EIA documentation                 |  |
| 6. | EB           | Mr. G. Raja Reddy            | <b>Period:</b> Feb 2025 to till date<br><b>Task:</b> Site visit and conduct of ecological survey, assessment ofthe impacts of proposed project activities on the biological environment and contribution to EIA documentation              |  |
|    |              | Mrs. Tatiparthi Rajani       | <b>Period:</b> Feb 2025 to till date<br><b>Task:</b> Assisting FAE during Site visit, conduct of ecological survey, and contribution to EIA documentation                                                                                  |  |
| 7. | HG           | Mr. Mallikarjuna Rao         | <b>Period:</b> Feb 2025 to till now<br><b>Task:</b> Understanding and representing groundwater conditions, Supervision of                                                                                                                  |  |

|     |     |                            |                                                                                                                                                                                                                                                                                                                              |                                                                                       |
|-----|-----|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|     |     |                            | groundwater sampling locations, Draftization of survey findings, identification of impacts, suggestion of mitigation measures and contribution to the EIA documentation.                                                                                                                                                     |                                                                                       |
| 8.  | GEO | Mr. Mallikarjuna Rao       | <b>Period:</b> Feb 2025 to till now<br><b>Task:</b> Geological features & formations, topography & Lithology of the 10 km radius area and lease area                                                                                                                                                                         |    |
| 9.  | NV  | Mr. Vivek Prabhakar Navare | <b>Period:</b> Feb 2025 to till now<br><b>Task:</b> Site visit and checking of noise sampling results and predict the vibrations due Blasting and identification of Impacts on surrounding structures and analysis of data identification of impacts and proposed mitigation measures, and contribution to EIA documentation |    |
| 10. | LU  | Mrs. Anitha Reddy          | <b>Period:</b> Feb 2025 to till date<br><b>Task:</b> Generation and analysis of data related to land use pattern, development of land use maps of study area using ArcGIS / related tools, site visit for ground truth survey, Draftization of land use maps contribution to EIA documentation                               |   |
| 11. | RH  | Mr. Santhosh kumar A       | <b>Period:</b> Feb 2025 to till now<br><b>Task:</b> Identification of hazards and hazardous substance, preparation of impacts & mitigation measures for proposed project                                                                                                                                                     |  |
|     |     | Monishadevi B (FAA)        | <b>Period:</b> Feb 2025 to till now<br><b>Task:</b> Assesting FAE during Identification of hazards and hazardous substance, preparation of impacts & mitigation measures, and contribution to EIA documentation                                                                                                              |  |
| 12. | SC  | R. Rajendran               | <b>Period:</b> Feb 2025 to till now<br><b>Task:</b> Understanding and representing soil conditions, supervision of soil sampling locations, Draftization of survey findings, identification of impacts, suggestion of mitigation measures and contribution to the ELA documentation                                          |  |

- 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** - Socioeconomics
- HG** - Hydrology, ground water and water conservation
- GEO** - Geology
- RH** - Risk assessment and hazards management
- SHW** - Solid and hazardous waste management
- SC** - Soil Conservation

**DECLARATION BY THE HEAD OF THE ACCREDITED CONSULTANT  
ORGANIZATION/AUTHORIZED PERSON**

*I, Mr. Santhoshkumar. A hereby, confirm that the above-mentioned experts prepared the Draft EIA/EMP report for "M/s. Tamil Nadu Minerals Limited, Black granite quarry over an extent of 13.74.0 Ha Located at SF No. 74(P), 126/1A, 127, 144/1, Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, Tamil Nadu".*

*I hereby certify that I was a part of the EIA in the following capacity that developed the above EIA. I also confirm that the consultant organization shall be fully accountable for any misleading information mentioned in the statement.*

**Signature**

: A-S 7 

**Date**

: 14.06.2025

**Name**

: Mr. Santhosh Kumar. A

**Designation**

: Chief Executive Officer

**Name of the EIA Consultant Organization** : M/s. EHS360 Labs (P) Ltd, Chennai

**NABET Certificate No & validity** : NABET/EIA/22-25/SA 0233 valid up to- June 24<sup>th</sup>, 2025

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| 3           | A-Register                        |
| 4           | GO – Lease Deed                   |
| 5           | TAMIN Board of Director           |
| 6           | Village Map 300M Radius           |
| 7           | Precise Area Communication Letter |
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**Note:** Annexure are provided as a separate book

**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                  |
| CSR     | Corporate Social Responsibility                         |
| DMP     | Disaster Management Plan                                |
| EIA     | Environmental Impact Assessment                         |
| EMC     | Environmental Management Cell                           |
| EMP     | Environmental Management Plan                           |
| GLC     | Ground Level Concentration                              |
| GO      | Government Order                                        |
| 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     |
| NAAQS   | National Ambient Air Quality Standard                   |
| 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                        |
| TDS     | Total Dissolved Solids                                  |
| TOR     | Terms of Reference                                      |

# Executive Summary

## 1. Introduction

M/s. Tamil Nadu Minerals Ltd. (TAMIN), an undertaking of the Government of Tamil Nadu, was established in 1978 to carry out systematic mining and development of various minerals across the state. Over the years, TAMIN has gained expertise in mining a wide range of dimensional granites including Black Granite (Dolerite), Kashmir White (Leptynite), Paradiso (Migmatite Gneiss), Green Onyx (Syenite-Porphyry), Red Wave (Pink Feldspathic Gneiss), Colombo Juparana (Pegmatitic Granite Gneiss), and Raw Silk (Yellow Feldspathic Leptynite), in addition to industrial minerals like Quartz, Feldspar, Graphite, Limestone, and Vermiculite, etc.,

The Black Granite Quarry is located over an extent of 13.74.0 hectares in S.F. No. **74(P), 126/1A, 127, 144/1**, Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, Tamil Nadu. The land is classified as Government Poramboke land, and TAMIN has obtained the lease from the Government of Tamil Nadu.

The project area does not fall in CRZ zone. There are no Western Ghats within the radius of 15 Km from project area. There are no notified bird sanctuaries or wildlife sanctuaries as per Wildlife protection Act 1972, within a radius of 15 Km. The project area does not fall in 'HACA' region.

Initially, Government of Tamil Nadu granted lease to TAMIN for quarrying Black Granite over an extent of 20.50.0 Ha of Government poramboke land in Survey Field No (SF No). 74/1(Part), 126/1A, 127, 132(Part), 144/1, 144/2, and 145/2(Part) situated in Veeranam Village in Thandarampattu Taluk of Thiruvannamalai District vide. G.O Ms. No. 28 Industries (MME1) department dated 24.05.2004 for a period of 20 years under Rule 8-C of the Tamil Nadu Minor Mineral Concession Rules, 1959. As the lease deed was executed with the District Collector on 15.06.2004, the lease period is valid up to 14.06.2024.

TAMIN has obtained Environmental Clearance for this area vide SEIAA-TN/F.No.3886/1(a)/EC.No.5567/2020, dated 01.03.2023 under violation category as per MoEF & CC Notification dated, 14.03.2017.

Since the lease period expires on 14.06.2024, TAMIN has applied for renewal of lease in stipulated time as per rule in force. Accordingly, GoTN has granted precise area communication letter to TAMIN for quarrying Black Granite (Dolerite) over an extent of 13.74.0 Ha. at SF. No. 74(P), 126/1A, 127, 144/1 of Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District. The precise area communication letter for an extent of 13.74.0Ha (instead of 20.50.0Ha) at Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, Tamil Nadu for a period of 20 years under Rule 8-C of the Tamil Nadu Minor Mineral Concession Rules, 1959 vide Govt Letter No.679, Natural Resources Department (MME-1)/2024-1, dated, 21.10.2024.

The area lies in 12°11'13.12"N to 12°11'28.05"N latitude and 78°54'35.10"E to 78°54'08.07"E Longitude. The area does not fall under forest land of any category. It is Government Poramboke land.

As directed in the precise area communication letter TAMIN has prepared the Mining Plan for quarrying Black Granite (Dolerite) over an extent of 13.74.0 Ha at SF.No. 74(P), 126/1A, 127, 144/1 of Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District and submitted the same to the authority concerned.

Subsequently, the Mining Plan has been approved by the Commissioner of the Geology and Mining vide Letter No. 8095/MM4/2023, dated: 28.02.2025.

TAMIN applied for ToR via Online Proposal No. SIA/TN/MIN/529498/2025 dated: 15.03.2025 and remitted ₹3.5 lakh as processing fee per SEIAA-TN Guidelines. The proposal was appraised in the 542nd SEAC Meeting held on 26.03.2025 (SEIAA No. 11966, Unit: VI), and ToR was issued with Public Hearing requirement under Identification No. TO25B0108TN5444492N, dated 13.05.2025, for preparation of the EIA/EMP Report.

The EIA report has been prepared in accordance with the issued ToR (Identification No. TO25B0108TN5444492N, dated 13.05.2025. Baseline environmental studies were conducted during the period from Feb 2025 to April 2025. The draft EIA report will be circulated for public review in coordination with the Tamil Nadu Pollution Control Board (TNPCB).

## 2. Project Description

### Project Salient Features

| S. No | Particulars                       | Details                                                                                                                                                        |                  |                |           |
|-------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------|-----------|
| 1     | Latitude                          | 12°11'13.12"N to 12°11'28.05"N                                                                                                                                 |                  |                |           |
| 2     | Longitude                         | 78°54'35.10"E to 78°54'08.07"E.                                                                                                                                |                  |                |           |
| 3     | The lease area height             | 30 from top of the hill.                                                                                                                                       |                  |                |           |
| 4     | Topo sheet no.                    | 57L/15, L/16, P4                                                                                                                                               |                  |                |           |
| 5     | Topography                        | Hilly terrain.                                                                                                                                                 |                  |                |           |
| 6     | Land Type                         | Government Poramboke land.                                                                                                                                     |                  |                |           |
| 7     | Extent of lease area              | 13.74.0 Ha.                                                                                                                                                    |                  |                |           |
| 8     | Nearest National highway          | NH 179B: Section of Chennai–Salem Expressway, 8.83, NNE                                                                                                        |                  |                |           |
| 9     | Nearest State highway             | NH 179B: Section of Chennai–Salem Expressway, 8.83, NNE.                                                                                                       |                  |                |           |
| 10    | Nearest railway station           | Thiruvannamalai Railway Station, 19.14, ENE                                                                                                                    |                  |                |           |
| 11    | Nearest airport                   | Salem Airport, 100.85, WSW<br>International Airport: Chennai International Airport, 160.40, ENE.                                                               |                  |                |           |
| 12    | Nearest town / city               | Town: Thandarampattu, 3.94, ESE<br>City/ District HQ: Tiruvannamalai, 14.75, ENE.                                                                              |                  |                |           |
| 13    | Hills / valleys                   | Nil in 15 Km radius.                                                                                                                                           |                  |                |           |
| 14    | Archaeologically important places | S. No                                                                                                                                                          | Name             | Distance (~km) | Direction |
|       |                                   | 1                                                                                                                                                              | Prehistoric Site | 11.0           | WSW       |
|       |                                   | <ul style="list-style-type: none"> <li>➤ Megalith site -veeranam (hero stones) 0.47, NE.</li> <li>➤ Koothandabar Temple (Anthropomorphic figure)- T</li> </ul> |                  |                |           |

| S. No | Particulars                           | Details                                                                                                                                                                                                                   |
|-------|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|       |                                       | Mottur -9.33 WSW<br><b>Note: The above mentioned two sites are not notified in the Archeological Survey of India (ASI) website (Bhuvan NRSC) but is given in the district official website – Tiruvannamalai Annex- 4.</b> |
| 15    | National parks / Wildlife Sanctuaries | Nill in 15 Km radius.                                                                                                                                                                                                     |
| 16    | Seismicity                            | Seismic zone-II (Low risk).                                                                                                                                                                                               |
| 17    | Defense Installations                 | Nill in 15 Km radius.                                                                                                                                                                                                     |
| 18    | State Boundary                        | Nill in 15 Km radius.                                                                                                                                                                                                     |

| S. No | Particulars  | Details                   |                             |           |
|-------|--------------|---------------------------|-----------------------------|-----------|
|       |              | Description               | Dist. (~Km)                 | Direction |
| 19    | Water Bodies | <i>Veernam Lake</i>       | <i>Adjacent to the site</i> |           |
|       |              | <i>Sathanur Lake</i>      | 1.08                        | N         |
|       |              | Mallikapuram Lake         | 1.39                        | WNW       |
|       |              | Naykkanur Lake            | 1.41                        | NE        |
|       |              | Sattannur Lake            | 1.85                        | NNW       |
|       |              | Taradapattu Lake          | 2.34                        | NE        |
|       |              | Govindapuram Lake         | 3.2                         | N         |
|       |              | Alal Ar                   | 3.72                        | ENE       |
|       |              | Sathanur Dam              | 3.73                        | W         |
|       |              | Taradapattu Lake          | 3.82                        | NE        |
|       |              | Thandarampattu Canal      | 3.91                        | ENE       |
|       |              | Kil Vanakkambadi Lake     | 4.31                        | E         |
|       |              | Melkarippur Lake          | 4.48                        | NNE       |
|       |              | Tandarampattu Lake        | 4.85                        | SE        |
|       |              | Kilvanakkambadi Canal     | 5.14                        | E         |
|       |              | Kolundampattu Canal       | 5.57                        | NNE       |
|       |              | Ponnaiyar River           | 5.58                        | SSW       |
|       |              | Sattanur Main Canal       | 5.77                        | S         |
|       |              | Sorappanandal Lake        | 5.8                         | NW        |
|       |              | Keelamanjanoor Canal      | 5.98                        | SSW       |
|       |              | Lake near Kilvanakkambadi | 6.16                        | ESE       |
|       |              | Lake near Melpennathur    | 6.41                        | NNW       |
|       |              | Nedungavadi Lake          | 6.9                         | NE        |
|       |              | Mudiyanur Lake            | 6.92                        | SE        |
|       |              | Lake near Pudurnattam     | 7.58                        | SW        |
|       |              | Tiruvadattanur Lake       | 7.65                        | S         |
|       |              | Pamban Ar                 | 8.51                        | SSW       |
|       |              | Erraiyur Malai RF         | 8.86                        | NNE       |
|       |              | Perumbakkam Lake          | 8.98                        | E         |
|       |              | Eraiur Lake               | 9.5                         | N         |
|       |              | Melserumbakkam Lake       | 9.7                         | E         |
|       |              | Varatta Ar                | 9.98                        | SSW       |
|       |              | Asuvangasuranai Lake      | 9.98                        | ENE       |
|       |              | Cheyar R                  | 10.32                       | NNW       |
|       |              | Pinjur Canal              | 12.46                       | NW        |
|       |              | Melmudiyanur Canal        | 12.58                       | N         |
|       |              | Munnurmangalam Canal      | 12.74                       | NNW       |
|       |              | Samudram Tank             | 13.14                       | E         |
|       |              | Muraiya Ar                | 13.25                       | NW        |
|       |              | Valaiyar Odai             | 13.5                        | W         |
|       |              | Ramakkal Odai             | 13.53                       | WSW       |

| S. No | Particulars                        | Details                                                                                                                                                                                                                                                                                                                                                                                   |                      |                       |
|-------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------|
|       |                                    | Description                                                                                                                                                                                                                                                                                                                                                                               | Dist. (~Km)          | Direction             |
| 20    | Reserve Forests/ Protected Forests | Ponnaiyar RF                                                                                                                                                                                                                                                                                                                                                                              | Adjacent to the site |                       |
|       |                                    | Uchhimalai RF                                                                                                                                                                                                                                                                                                                                                                             | 3.93                 | NNE                   |
|       |                                    | Radapuram RF                                                                                                                                                                                                                                                                                                                                                                              | 4.91                 | ENE                   |
|       |                                    | Uchimalai RF                                                                                                                                                                                                                                                                                                                                                                              | 5.71                 | N                     |
|       |                                    | Pinjur RF                                                                                                                                                                                                                                                                                                                                                                                 | 7.07                 | NW                    |
|       |                                    | Pinjur RF                                                                                                                                                                                                                                                                                                                                                                                 | 7.96                 | NW                    |
|       |                                    | Pumalai RF                                                                                                                                                                                                                                                                                                                                                                                | 8.59                 | SE                    |
|       |                                    | Erraiyur Malai RF                                                                                                                                                                                                                                                                                                                                                                         | 8.86                 | NNE                   |
|       |                                    | Rayandapuram RF                                                                                                                                                                                                                                                                                                                                                                           | 10.74                | S                     |
|       |                                    | Kavuttimalai RF                                                                                                                                                                                                                                                                                                                                                                           | 11.13                | NE                    |
|       |                                    | Pinjur RF                                                                                                                                                                                                                                                                                                                                                                                 | 12.5                 | NW                    |
|       |                                    | Rayandapuram RF                                                                                                                                                                                                                                                                                                                                                                           | 12.68                | S                     |
|       |                                    | Munnurmangalam RF                                                                                                                                                                                                                                                                                                                                                                         | 12.94                | N                     |
|       |                                    | Munnurmangalam RF                                                                                                                                                                                                                                                                                                                                                                         | 14.43                | N                     |
|       |                                    | Kannamadaai RF                                                                                                                                                                                                                                                                                                                                                                            | 14.57                | ESE                   |
| 21    | Monuments                          | <b>S. No</b>                                                                                                                                                                                                                                                                                                                                                                              | <b>Name</b>          | <b>Distance (~km)</b> |
|       |                                    | 1                                                                                                                                                                                                                                                                                                                                                                                         | Prehistoric Site     | 11.0                  |
|       |                                    | <ul style="list-style-type: none"> <li>Megalith site -veeranam (hero stones) 0.47, NE.</li> <li>Koothandabar Temple (Anthropomorphic figure)- T Mottur -9.33 WSW</li> </ul> <p><b>Note: The above mentioned two sites are not notified in the Archeological Survey of India (ASI) website (Bhuvan NRSC) but is given in the district official website – Tiruvannamalai. Annex- 4.</b></p> |                      |                       |
| 22    | Nearest Villages                   | <b>S. No</b>                                                                                                                                                                                                                                                                                                                                                                              | <b>Name</b>          | <b>Distance (~km)</b> |
|       |                                    | 1                                                                                                                                                                                                                                                                                                                                                                                         | Thandarampattu       | 3.94                  |
|       |                                    | 2                                                                                                                                                                                                                                                                                                                                                                                         | Sathanur             | 1.24                  |
|       |                                    | 3                                                                                                                                                                                                                                                                                                                                                                                         | Tharadapattu         | 3.04                  |
|       |                                    | 4                                                                                                                                                                                                                                                                                                                                                                                         | Veeranam             | 0.85                  |

### Project Summary

| S. No | Particulars                | Details                                                                                                         |
|-------|----------------------------|-----------------------------------------------------------------------------------------------------------------|
| 1.    | Project Location           | SF No. 74(P), 126/1A, 127, 144/1, Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, Tamil Nadu. |
| 2.    | Land classification        | Government Poramboke land                                                                                       |
| 3.    | Extent of lease area (Ha.) | 13.74.0                                                                                                         |
| 4.    | Quarry Lease               | Govt. Letter. No.679/MME.1/2024-1, dated: 21.10.2024                                                            |
| 5.    | Lease Period               | 20 years                                                                                                        |

|     |                                                       |                                               |
|-----|-------------------------------------------------------|-----------------------------------------------|
| 6.  | Estimated Geological Reserves (ROM)<br>M <sup>3</sup> | 14,86,816                                     |
| 7.  | Estimated Mineable Reserves (ROM)<br>M <sup>3</sup>   | 1,95,335                                      |
| 8.  | Black Granite production per annum<br>M <sup>3</sup>  | RoM 19533 with 10% recovery                   |
| 9.  | Depth of Mining                                       | 30m above ground level (from Top of the hill) |
| 10. | Method of Mining                                      | Open cast semi mechanized method              |
| 11. | Water Requirement (KLD)                               | 3.5                                           |
| 12. | Source of Water                                       | Authorized vendors and local panchayat        |
| 13. | Power requirement (kVA)                               | 60                                            |
| 14. | Power Backup (DG set) kVA                             | 1* 125                                        |
| 15. | Fuel requirements (Lts/Day)                           | 200                                           |
| 16. | Manpower (Nos)                                        | 35                                            |
| 17. | Municipal Solid Waste Generation<br>(kg/day)          | 15.75                                         |
| 18. | Waste Oil generation (Lts/Year)                       | 3.0                                           |
| 19. | Project Cost in Lakhs                                 | 99.97 (1 Cr)                                  |

### 3. Description of Environment

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

Study Period: The baseline environmental surveys were carried out during (Feb 2025 – April 2025) within the study area.

- ▶ The site has a hilly terrain with level 194m (Maximum) above MSL.
- ▶ The project site falls under Zone-III (Moderate risk) as per IS 1893(Part-I).
- ▶ The predominant wind direction is South East during study period.
- ▶ Max Temperature: 37°C, Min Temperature: 21 °C & Avg Temperature: 29.7°C
- ▶ Average Relative Humidity: 49.42 %
- ▶ Average Wind Speed: 2.47 m/s.

#### A. Ambient Air Quality:

Ambient air quality was monitored twice a week for One (01) season (it covers 12 weeks), i.e., 3 months (**Feb 2025 – April 2025**). PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>x</sub>, Pb, NH<sub>3</sub>, C<sub>6</sub>H<sub>6</sub>, C<sub>20</sub>H<sub>12</sub>, As & Ni were monitored. The ambient air quality monitoring data was compared with the National Ambient Air Quality Standards (NAAQS), as prescribed by the Ministry of Environment, Forest & Climate Change (MoEFCC), Government of India, in its 16.11.2009 notification.

- Particulate Matter (PM<sub>10</sub>): 39.7 – 57.2 µg/m<sup>3</sup> (within the NAAQS limit of 100 µg/m<sup>3</sup> for 24-hour average).
- Fine Particulate Matter (PM<sub>2.5</sub>): 21.7 – 27.8 µg/m<sup>3</sup> (within the NAAQS limit of 60 µg/m<sup>3</sup> for 24-hour average).
- Sulfur Dioxide (SO<sub>2</sub>): 7.3 – 11.3 µg/m<sup>3</sup> (well below the NAAQS limit of 80 µg/m<sup>3</sup>).
- Nitrogen Dioxide (NO<sub>2</sub>): 17.2 – 25.1 µg/m<sup>3</sup> (well below the NAAQS limit of 80 µg/m<sup>3</sup>).
- The air quality parameters monitored at different locations during the study period were within the permissible limits set by NAAQS.

- The concentration of pollutants in the study area does not exceed the regulatory thresholds, indicating that the air quality is acceptable.
- The findings suggest that the overall ambient air quality in the monitored locations is average, meaning it does not pose significant health risks based on the measured parameters.
- Since PM<sub>10</sub> and PM<sub>2.5</sub> levels remain within the limits, the air pollution from dust and fine particulate emissions is controlled within regulatory standards.
- The low levels of SO<sub>2</sub> and NO<sub>2</sub> indicate minimal emissions from industrial activities, vehicular pollution, or combustion sources in the study area.

## B. Noise Environment

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 level monitoring results were compared against the Central Pollution Control Board (CPCB) standards, which define permissible noise levels for different environmental settings (Residential, Industrial, etc.). The Noise levels recorded during the daytime (6:00 a.m to 10:00 p.m) and night-time (10:00 p.m to 6:00 a.m) at all stations are within the CPCB limits. The major source of noise in the study area is transportation and vehicular movement.

Residential Areas (N1, N2, N3, N5, N6, N7, N8):

- The daytime noise levels (48.5 – 54.0 dB(A)) are within CPCB limits (55 dB(A)).
- The nighttime noise levels (39.6 – 44.2 dB(A)) are within CPCB limits (45 dB(A)).
- No significant noise pollution: levels remain under permissible limits.

Near Project Site (N4 - Industrial Area):

- Daytime noise level: 51.5 dB(A) (within the CPCB limit of 75 dB(A)).
- Nighttime noise level: 42.8 dB(A) (well below the CPCB limit of 70 dB(A)).
- Noise levels at the project site are considerably lower than the industrial limit, indicating minimal industrial noise impact.

## C. Surface Water Quality Monitoring Results:

To establish the baseline status of water environment, the representative 08 sampling locations for surface water within a radial distance of 10 Km from project site have been selected.

The surface water samples were analyzed and compared with IS 2296:1992 standards and CPCB Water Quality Criteria for designated best use. Based on the test results, the water quality of the studied locations falls under Class E, which means it is suitable for irrigation, industrial cooling, and controlled waste disposal, but not for drinking or direct human consumption.

| Parameter                    | Observed Range        | IS 2296:1992 Limits (Class A) | Interpretation                                                                          |
|------------------------------|-----------------------|-------------------------------|-----------------------------------------------------------------------------------------|
| pH                           | 7.12 – 7.85           | 6.5 – 8.5                     | Within Limits – Indicates neutral to slightly alkaline water.                           |
| Electrical Conductivity (EC) | 625 – 1100 $\mu$ S/cm | No specific limit             | Higher EC values suggest moderate dissolved solids, which may indicate mineral content. |

|                                               |                    |                   |                                                                                                                  |
|-----------------------------------------------|--------------------|-------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Chloride (Cl<sup>-</sup>)</b>              | 113 – 220 mg/l     | 250 mg/l          | Within Limits – No immediate concern.                                                                            |
| <b>Sulphate (SO<sub>4</sub><sup>2-</sup>)</b> | 28.2 – 55.0 mg/l   | 400 mg/l          | Within Limits – Indicates low sulfate pollution.                                                                 |
| <b>Total Hardness</b>                         | 108.8 – 240.7 mg/l | 300 mg/l          | Within Limits – Water is moderately hard, but still usable for industrial and irrigation purposes.               |
| <b>Chemical Oxygen Demand (COD)</b>           | 24.6 – 40.5 mg/l   | No specific limit | Elevated COD levels indicate presence of organic matter and potential pollution.                                 |
| <b>Biochemical Oxygen Demand (BOD)</b>        | 1.1 – 4.5 mg/l     | 2 mg/l (Class A)  | Some locations exceed limits, suggesting organic contamination, possibly from agricultural or industrial runoff. |

- pH, Chloride, Sulfate and hardness levels are within acceptable limits, meaning the water does not have immediate chemical hazards.
- Higher EC values suggest moderate dissolved solids, indicating mineral presence but not necessarily harmful.
- COD and BOD levels are slightly elevated, suggesting some degree of organic pollution, likely due to agricultural runoff or nearby human activities.
- Since the water is classified as Class E, it is not fit for direct human consumption but can be used for industrial and irrigation purposes.

#### D. Ground Water Quality Monitoring Results:

Total **Eight (08)** ground water monitoring locations were identified for assessment in different villages around the project site. The groundwater results are compared with the acceptable and permissible water quality standards as per IS: 10500 (2012) for drinking water. Based on the test results, the groundwater quality in the studied locations meets the permissible limits, making it safe for drinking purposes.

| Parameter                                 | Observed Range   | IS 10500:2012 Limits                              | Interpretation                                                  |
|-------------------------------------------|------------------|---------------------------------------------------|-----------------------------------------------------------------|
| pH                                        | 7.18 – 7.68      | 6.5 – 8.5                                         | Within Limits – Indicates neutral to slightly alkaline water.   |
| Total Dissolved Solids (TDS)              | 439 – 728 mg/l   | 500 mg/l (Acceptable),<br>2000 mg/l (Permissible) | Within Limits – Slightly high but safe for consumption.         |
| Chloride (Cl <sup>-</sup> )               | 123 – 208 mg/l   | 250 mg/l (Acceptable),<br>1000 mg/l (Permissible) | Well Within Limits – No immediate concerns.                     |
| Sulphate (SO <sub>4</sub> <sup>2-</sup> ) | 30.7 – 52.1 mg/l | 200 mg/l (Acceptable),<br>400 mg/l (Permissible)  | Within Limits – No indication of sulfate-related contamination. |

- pH levels are within the permissible range, indicating good water quality.
- TDS levels are slightly elevated but within the permissible limits, suggesting moderate mineral content, which is not harmful.
- Chloride and sulfate concentrations are within acceptable limits, confirming no significant contamination from industrial or agricultural sources.
- The groundwater is suitable for drinking, as per IS 10500:2012 standards.

These interpretations relate to the sample tested for location only. To prevent ground water contamination and improving the quality and Quantity, rainwater harvesting, and groundwater recharging may be helpful.

## E. Soil Quality:

Eight locations in and around the proposed project were selected for soil sampling. At each location, soil samples were collected from three different depths viz. 30 cm, 60 cm and 90 cm below the surface. Soil analysis was carried out as per IS: 2720 methods.

- The soil quality analysis was conducted at eight locations and compared with ICAR (Indian Council of Agricultural Research) standards to determine the fertility and suitability of the soil for agriculture and environmental health.

| Parameter                    | Observed Range          | ICAR Standard Classification | Interpretation                                                                               |
|------------------------------|-------------------------|------------------------------|----------------------------------------------------------------------------------------------|
| pH                           | 6.99 – 7.77             | Neutral to Slightly Alkaline | Soils are suitable for agriculture but may require adjustments for specific crops.           |
| Electrical Conductivity (EC) | 138 – 385 $\mu$ mhos/cm | Average                      | Indicates low to moderate salinity, suitable for crop growth.                                |
| Nitrogen (N)                 | 71 – 141 kg/ha          | Less to Good                 | Some locations have low nitrogen content, requiring fertilization for improved fertility.    |
| Phosphorus (P)               | 15 – 25 kg/ha           | Less to Very Less            | Low phosphorus levels indicate a need for phosphorus fertilizers to support plant growth.    |
| Potassium (K)                | 58 – 91 kg/ha           | Very Less                    | Deficient potassium levels, requiring soil amendments for optimal agricultural productivity. |
| Organic Carbon (%)           | 0.188 – 0.342           | Low to Moderate              | Indicates low organic matter, suggesting the need for organic fertilizers or compost.        |

- Soil pH is suitable for agriculture, though slightly alkaline in some areas.
- Low nitrogen, phosphorus, and potassium levels indicate poor fertility, requiring soil enrichment through fertilization.
- Organic matter content is low, indicating the need for composting or organic farming practices.
- Moderate conductivity suggests that soil is not saline and can support plant growth.

## F. Bioological Environment:

This is a comprehensive biodiversity assessment covered flora, fauna, avifauna, mammals, reptiles, amphibians, butterflies, and fish diversity in the study area and the Cauvery North Wildlife Sanctuary.

### 1. Flora Diversity

- Study Area: 136 plant species (87% native, 13% invasive).
- Cauvery North Wildlife Sanctuary: 24 species (1 invasive - *Opuntia delleni*).
  - Dominance of native species indicates a healthy ecosystem.
  - Invasive plants (e.g., *Callistemon speciosus*, *Cordia dichotoma*) may threaten native biodiversity.
  - Presence of medicinal plants (*Neem*, *Tulsi*, *Amla*) shows economic and ecological value.
  - IUCN Status: All species are *Least Concern (LC)*.

### 2. Avifauna (Birds) Diversity

- 59 species recorded in the study area.
  - Birds represent diverse feeding groups (insectivores, frugivores, raptors).
  - Presence of water birds suggests good wetland health.
  - Conservation Concerns:
    - *Green Imperial Pigeon* is *Near Threatened (NT)* (IUCN).
    - *Indian Peafowl* is under Schedule I of WPA, 1972 (high protection).

### 3. Mammalian Fauna

- 7 mammal species recorded in the study area.
  - Includes carnivores (Jackal, Jungle Cat), rodents, primates (Bonnet Macaque), and bats.
  - No immediate conservation threats (*IUCN: LC*), but human-wildlife interactions should be monitored.
  - Ecological Role:
    - Carnivores control pest populations.
    - Bats aid pollination and seed dispersal.

### 4. Mammals in Cauvery Wildlife Sanctuary

- 21 species recorded with a mix of large mammals, herbivores, and carnivores.
- Conservation Concerns:
  - Endangered (EN): Asian Elephant, Lion-tailed Macaque, Dhole, Tree Shrew.
  - Vulnerable (VU): Leopard, Sloth Bear, Indian Bison, Nilgiri Langur, Sambar Deer.
  - Schedule I (WPA, 1972): 14 species, requiring strict legal protection.

### 5. Reptile & Amphibian Diversity

- 6 reptiles and 4 amphibians recorded.
  - Mostly common species (*IUCN: LC*).
  - Indian Cobra (*Naja naja*) is under Schedule II (WPA, 1972) – protected species.

### 6. Butterfly Diversity

- 35 species recorded, dominated by Nymphalidae family (14 species).
  - Indicates a healthy plant-pollinator network.
  - Presence of diverse butterfly families suggests good floral diversity.

### 7. Fish Diversity

- 19 species recorded, mostly from Cyprinidae family (9 species).
  - Presence of native fish species suggests a stable aquatic ecosystem.
  - Critically Endangered (CR) species: *Hypselobarbus pulchellus* (Jerdon's Carp) – requires urgent conservation.

**Socio Economic Profile:****1. Literacy Rate:**

- The overall literacy rate in the study region is 58.79%, with slight variations between the 0-5 km zone (58.63%) and the 5-10 km zone (60.56%).
- The literacy rate is moderate, indicating the need for further educational initiatives.

**2. Employment and Workforce:**

- Non-workers constitute more than 30% of the population in both impact zones (46.28% in 0-5 km, 45.84% in 5-10 km).
- Main workers account for 40.03% of the total population, while marginal workers make up 13.7%, highlighting seasonal or temporary employment patterns.
- The high non-working population (46.2%) suggests a need for employment-generating industries to improve economic conditions.

**3. Gender Distribution:**

- The male-to-female ratio is relatively balanced, with males (50.26%) and females (49.74%) in the total study area.

**4. Social Composition:**

- The Scheduled Caste (SC) population accounts for 24.25%, while the Scheduled Tribe (ST) population is 8.38%.
- The presence of SC/ST communities indicates the need for inclusive developmental programs to enhance social and economic opportunities.

## 4. Anticipated Environmental Impacts and Mitigation Measures

### A. Land Environment:

The proposed site is located at S.F.No. 74(P), 126/1A, 127, 144/1 of Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, Tamil Nadu State. The lease area for mining of color granite is 13.74.0 Ha. The quarry land is classified as Government Poramboke land. The quarry lease was applied, quarry lease vides G.O Ms. No. 28 Industries (MME1) department dated 24.05.2004 for a period of 20 years. No rehabilitation or resettlement involved in the proposed project.

#### Impact and Mitigation Measures on Land Environment:

| S. No. | Project Activity/Aspect               | Potential Environmental Impact on LU/LC | Summary of Impact                                                                           | Mitigation Measures                                                                                                                                             |
|--------|---------------------------------------|-----------------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Land Acquisition                      | Negative (-ve)                          | Change in existing land use from unused/hill terrain to mining zone.                        | Utilize barren or non-agricultural land.                                                                                                                        |
| 2      | Site Clearing/Vegetation Removal      | Negative (-ve)                          | Conversion of vegetated/hill slope land to bare area; localized loss of vegetation.         | Minimize vegetation clearance; implement greenbelt development using native species around the lease boundary and infrastructure.                               |
| 3      | Excavation                            | Negative (-ve)                          | Alteration of natural landform; formation of pits and benches in granite terrain.           | Phased excavation with designated ultimate pit limits. Use benches and systematic quarry design to stabilize slopes.                                            |
| 4      | Land Reclamation/Post-Mining Land Use | Negative (-ve)                          | Quarry pit remains as a permanent topographical change; some areas become water reservoirs. | Post-mining land use planning to include fencing of pit area and conversion to water storage. No backfilling is required due to hard rock nature.               |
| 5      | Overburden Dumping                    | Negative (-ve)                          | Erosion risk, land degradation, and potential dump instability.                             | OB dumps will be properly leveled and stabilized with a max height <10 m, 26° slope, toe wall, and garland drains. Native grass and shrub plantation on slopes. |
| 6      | Surface Infrastructure Development    | Neutral to Slight Negative              | Minor changes to LU/LC due to site office, roads, and loading zones.                        | Use minimal land area for infrastructure. Include landscaping and vegetative cover                                                                              |

|    |                                          |                |                                                                                 |                                                                                                                                                                                        |
|----|------------------------------------------|----------------|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |                                          |                |                                                                                 | around buildings and along haul roads.                                                                                                                                                 |
| 7  | Soil Stripping & Topsoil Stockpiling     | Neutral        | Temporary change in land cover; risk of erosion or compaction of topsoil.       | Topsoil will be stored with bunds and reused for greenbelt and reclamation.<br>Avoid long-term exposure of stockpiles.                                                                 |
| 8  | Water Flow Alteration During Monsoon     | Negative (-ve) | Risk of erosion, siltation, and localized flooding from stormwater runoff.      | Construct garland drains, silt traps, and proper stormwater management structures around quarry and OB dumps. Maintain existing drainage pattern.                                      |
| 9  | Abandonment and Site Safety Post-Closure | Negative (-ve) | Safety risk due to open pits; visual impact if not managed.                     | Quarry pits will be fenced after lease period. Signage and access restrictions to prevent accidental entry. Pits may serve as water storage or recharge structures.                    |
| 10 | Greenbelt Development (Progressive)      | Positive (+ve) | Improvement in visual aesthetics, dust control, and ecological value over time. | Year-wise plantation of native trees and shrubs along the lease boundary, haul roads, OB dumps, and around infrastructure. Maintenance and monitoring for survival rate to be ensured. |

## B. Air Environment:

During AERMODE Prediction studies it was observed that the maximum ground level concentration observed due to mining activities and traffic movement without control measures for PM<sub>10</sub>, PM<sub>2.5</sub> and NO<sub>x</sub> are 25.7 µg/m<sup>3</sup>, 13.0 µg/m<sup>3</sup> and 12.5 µg/m<sup>3</sup> respectively. The highest concentration levels identified at the project site only. So, it can be concluded that even during operation of quarry the impact envisaged is moderate.

### Sources of Air Pollution, Impacts and Mitigation Measures

| S. No. | Source of Emission           | Primary Pollutants      | Anticipated Impacts                                                                                                        | Mitigation Measures                                                                                                       |
|--------|------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| 1      | Excavation / Mining Activity | Particulate Matter (PM) | Dust emissions affecting air quality and visibility; potential respiratory health impacts to workers and nearby residents. | Water sprinkling at excavation sites; phased excavation; covering exposed surfaces; dust suppression using water tankers. |

|   |                                            |                                    |                                                                                                                                                       |                                                                                                                                                                         |
|---|--------------------------------------------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2 | Drilling with compressors & jackhammers    | PM, Noise, Minor Gaseous Emissions | Fine dust generation and local air quality degradation; occupational exposure for operators.                                                          | Use of dust aprons, wet drilling methods; regular maintenance of drilling equipment; PPE (masks, goggles) for workers.                                                  |
| 3 | Blasting Activities                        | PM, NOx, CO, SOx                   | Short-term high concentration of dust and gases; potential irritation, visibility reduction, and risk to nearby flora/fauna.                          | Use of controlled blasting techniques (e.g., NONEL detonators); proper stemming; use of adequate boosters/primers for complete detonation to minimize fumes.            |
| 4 | Loading & Unloading of Granite Blocks      | PM                                 | Dust generation at handling points; risk of fugitive dust emissions near stockpiles and transfer points.                                              | Minimize drop heights; regular water spraying at loading points; shielding of transfer points; paved loading zones.                                                     |
| 5 | Transportation of Mined Material           | PM, NOx, CO                        | Dust raised from haul roads and emissions from diesel trucks; dispersion of pollutants along the route impacting roadside vegetation and habitations. | Water sprinkling on haul roads; regular maintenance of vehicles; use of covered trucks; limiting vehicle speed; scheduling movement to avoid peak human activity hours. |
| 6 | Operation of Diesel Machinery & Generators | NOx, CO, HC, PM                    | Emissions from fossil fuel combustion; minor contribution to ambient air pollution load.                                                              | Regular engine maintenance; use of low-sulfur diesel; shifting to fuel-efficient or electric equipment where feasible.                                                  |
| 7 | Wind Erosion from Topsoil/Overburden Dumps | PM                                 | Airborne dust during dry and windy conditions; potential contribution to ambient particulate levels.                                                  | Compaction and covering of topsoil stockpiles; use of native grass cover; bund construction; periodic water spraying.                                                   |
| 8 | Lack of Vegetation Cover (Initial Phase)   | --                                 | Less absorption of pollutants; enhanced dispersion of dust and heat.                                                                                  | Greenbelt development over 1.57.0 ha using native species (~800 saplings); planting along approach roads, lease boundaries, and around infrastructure                   |

|  |  |  |  |                                   |
|--|--|--|--|-----------------------------------|
|  |  |  |  | using topsoil for<br>nourishment. |
|--|--|--|--|-----------------------------------|

### C. Water Environment:

There are no surface sources and ground water regime will not be altered during mining. The mine surface runoff along with the chemicals, lubricants and granite particle sediments may enter the canal which will affect the water quality.

#### Impact Identification and Mitigation Measures on Water Environment

| S. No | Source of Water Pollution             | Potential Impact                                                                                                                                         | Mitigation Measures                                                                                                                                                                    |
|-------|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1     | Domestic Sewage from Mine             | Untreated sewage from mining activities can contaminate nearby water bodies and soil, leading to waterborne diseases and environmental degradation.      | Implement a proper sewage treatment system such as a septic tank or bio-toilets to manage domestic wastewater efficiently.                                                             |
| 2     | Surface Runoff Carrying Pollutants    | Runoff from mining activities may contain chemicals, lubricants, and granite particle sediments, which can enter nearby canals and affect water quality. | Construct settling ponds to trap sediments, use oil-water separators for hydrocarbons, and implement proper drainage channels to prevent contamination of surface water.               |
| 3     | Impact on Surface/Groundwater Quality | Seepage of mining-related pollutants into groundwater or surface water bodies may alter water quality and make it unfit for consumption.                 | Regular monitoring of water quality, adoption of controlled chemical usage, and ensuring proper storage of lubricants and fuels to prevent spills.                                     |
| 4     | Changes to Hydraulic Regime           | Excessive water extraction and quarrying activities may alter the natural flow of groundwater, affecting nearby wells and water resources.               | Use stored rainwater from quarry pits for dust suppression and mining operations instead of relying on groundwater sources. Implement water recharge pits to maintain the water table. |

### D. Noise & Vibration Management

The primary sources of noise pollution during mining operations include:

- Drilling
- Blasting
- Loading operations (which are intermittent)
- Vehicular movement (which occurs sporadically throughout working hours)

These activities contribute to increased background noise levels, particularly within the active mining zone. While noise levels tend to diminish over distance, they may still pose concerns for workers and nearby communities.

### Impact and Mitigation Measures for Noise Pollution

| S. No. | Source of Noise                | Potential Impacts                                                                                    | Mitigation Measures                                                                           |
|--------|--------------------------------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| 1      | Drilling                       | High noise levels affecting Workers<br>Noise-induced hearing loss<br>Stress and fatigue              | Use of sharp drill bits to reduce noise<br>Provide earmuffs/earplugs to workers               |
| 2      | Blasting                       | Sudden high-intensity noise<br>Vibration affecting nearby areas<br>Disturbance to local communities  | Develop a green belt to reduce noise propagation<br>Conduct controlled blasting               |
| 3      | Excavation & Material Handling | Continuous noise from heavy Machinery.<br>Increased ambient noise in the mining zone                 | Maintain equipment regularly to reduce noise<br>Periodic monitoring as per CPCB               |
| 4      | Transportation of Materials    | Noise from vehicles<br>Temporary and permanent hearing damage<br>Disturbance to residents & wildlife | Restrict vehicle speed to 25 kmph<br>Avoid unnecessary honking                                |
| 5      | Machinery Operation            | Prolonged noise exposure causing worker fatigue and communication issues                             | Proper maintenance and lubrication of machinery<br>Install silencers on equipment             |
| 6      | Community Disturbance          | Noise from mining affecting nearby schools, hospitals, and residential areas                         | Develop a green belt buffer zone<br>Schedule high-noise activities during non-sensitive hours |
| 7      | Worker Health & Safety         | Hearing impairment<br>Increased accident risk due to communication difficulties                      | Provide PPE (earmuffs, earplugs)<br>Rotate workers in high-noise areas                        |

### Impact and Mitigation Measures for Vibration

| S. No. | Aspect                          | Potential Impact                                                                                      | Mitigation Measures                                                                                                                  |
|--------|---------------------------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Drilling                        | Ground vibrations due to drilling operations.                                                         | Use controlled drilling techniques to minimize vibrations.<br>Maintain safe distances from sensitive structures.                     |
| 2      | Blasting                        | High-intensity ground vibration and air overpressure due to explosives.                               | Use appropriate stemming and delay systems.<br>Avoid overcharging of blast holes.<br>Maintain safe blasting zones around the quarry. |
| 3      | Loading & Unloading of Minerals | Short-term, localized vibrations.                                                                     | Implement proper handling techniques.<br>Use low impact loading equipment where feasible.                                            |
| 4      | Transportation Vehicles         | Continuous low-frequency vibrations affecting surrounding areas.                                      | Maintain speed limits within the quarry.<br>Ensure proper vehicle maintenance to minimize vibration levels.                          |
| 5      | Proximity to Infrastructure     | Structural damage to facilities within the mine lease area.                                           | Maintain safe distances from infrastructure.<br>Use vibration-dampening measures like greenbelt development along sensitive areas.   |
| 6      | Ground Subsidence               | Risk of soil destabilization over time.                                                               | Conduct geotechnical surveys before excavation.<br>Implement controlled blasting and excavation methods.                             |
| 7      | Human Health Effects            | Fatigue, muscle strain, joint pain, sleep disturbances, and cardiovascular problems due to vibration. | Provide workers with proper PPE (earplugs, anti-vibration gloves).<br>Implement job rotation schedules to reduce prolonged exposure. |

## E. Biological Environment

### Summary of Existing Biological Environment

- Flora: 136 species (87% native). Includes ecologically important and medicinal plants. No endangered species, but 16 invasive species are present.
- Avifauna: 57 bird species, including Indian Peafowl (Schedule I, WPA) and Green Imperial Pigeon (Near Threatened, IUCN).
- Mammals: 7 species observed. All are of Least Concern (IUCN).
- Cauvery Wildlife Sanctuary: Hosts 21 major species, including Endangered and Vulnerable ones like Asian Elephant, Sloth Bear, and Dhole.

- Reptiles & Amphibians: 10 species recorded. Only Indian Cobra is protected (Schedule II, WPA).
- Butterflies: 35 species. Dominance of nectar-feeding Nymphalidae indicates floral richness.
- Fish: 19 species, mostly native. Jerdon's Carp (Critically Endangered & Endemic) needs urgent conservation.

Most of these species fall under the 'Least Concern' category in study areas other than Cauvery Wildlife sanctuary biological data, but certain species require conservation measures based on ecological roles, conservation status, and local threats and the conservation plan is prepared based on the biological baseline data collected from the study area of the proposed project site. The objective is to ensure the safeguarding of ecologically significant and sensitive species observed in the project impact zone. All species recorded exclusively from the Cauvery North Wildlife Sanctuary (flora) and Cauvery Wildlife Sanctuary (fauna) are not to be included in conservation plans.

**Identified Species for Conservation plan**

| S. No. | Species Name                             | Ecological Importance / Status                  | Conservation Measures                                                           |
|--------|------------------------------------------|-------------------------------------------------|---------------------------------------------------------------------------------|
| 1      | Ducula aenea (Green Imperial Pigeon)     | Near Threatened (IUCN)                          | Protect fruiting trees, avoid habitat disturbance, conduct periodic monitoring. |
| 2      | Pavo cristatus (Indian Peafowl)          | Schedule I (WPA), Ecologically significant bird | Ensure nesting and foraging ground protection, avoid hunting, raise awareness.  |
| 3      | Hypselobarbus pulchellus (Jerdon's Carp) | Critically Endangered (IUCN), Endemic fish      | Prevent water pollution, restrict overfishing, habitat restoration in streams.  |
| 4      | Azadirachta indica (Neem)                | Medicinal, native tree species                  | Promote plantation in buffer areas, protect existing trees.                     |
| 5      | Ocimum tenuiflorum (Tulsi)               | Medicinal herb                                  | Encourage cultivation in greenbelt areas and awareness programs.                |
| 6      | Cynopterus sphinx (Fruit Bat)            | Pollinator and seed disperser                   | Preserve fruit trees, reduce night-time disturbances.                           |

A dedicated team should periodically monitor the status of the identified species and habitats. Adaptive management strategies should be implemented to ensure the success of the conservation efforts. This conservation plan aims to support biodiversity and ecological balance in the project area. Continued commitment and stakeholder involvement are critical to safeguarding the flora and fauna identified.

### Impacts and Mitigation Measures on Biological Environment and Biodiversity

| S. No. | Activity / Aspect                              | Examples of Aspects / Causes                   | Potential Biodiversity Impacts                                                                       | Mitigation Measures                                                                                                            |
|--------|------------------------------------------------|------------------------------------------------|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| 1      | Land Extraction / Clearing                     | Land clearing                                  | Loss of habitat, introduction of plant diseases, siltation of water bodies                           | Limit land clearing to required areas only; afforestation with native species; implement soil erosion control measures         |
| 2      | Blasting, Digging, Hauling                     | Dust, noise, vibration, water pollution        | Disruption of water courses; impact on aquatic ecosystems due to altered hydrology and water quality | Controlled blasting; water sprinkling for dust suppression; noise mitigation; sedimentation ponds to manage runoff             |
| 3      | Waste Dumping / Handling                       | Land disturbance, soil & water contamination   | Loss of habitat, contamination of soil and water, increased sedimentation                            | Designated waste disposal areas with liners; retaining walls and runoff barriers; regular monitoring of soil and water quality |
| 4      | Air Emissions from Operations                  | Air pollution (dust and gaseous emissions)     | Dust deposition on leaves, reduced photosynthesis, habitat degradation                               | Greenbelt development; regular maintenance of machinery; use of dust suppression systems (sprinklers, water tankers)           |
| 5      | Waste Disposal (hazardous/non-hazardous)       | Oil spills, contaminated runoff                | Encouragement of pests, spread of disease, groundwater contamination                                 | Secure storage of chemicals/oils; spill containment systems; proper treatment of waste; pest control measures                  |
| 6      | Infrastructure Development (e.g., Power Lines) | Land clearing                                  | Fragmentation of habitats, displacement of species                                                   | Avoid ecologically sensitive zones, replanting native flora post-construction                                                  |
| 7      | Accommodation & Worker Facilities              | Land clearing, sewage, domestic waste          | Habitat loss, pollution from sewage, spread of diseases                                              | Installation of STP/soak pits for sewage; waste segregation and disposal; plantation around facilities                         |
| 8      | Access Roads Construction                      | Clearing vegetation, altering natural drainage | Habitat fragmentation; waterlogging upslope, reduced drainage downslope                              | Route roads along existing clearings; design proper cross-drainage structures; restore vegetation along roadsides              |

|    |                                    |                                                |                                                                                        |                                                                                                     |
|----|------------------------------------|------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| 9  | Population Growth / Human Activity | Land pressure, hunting, increased resource use | Pressure on flora/fauna; introduction of invasive species; loss of native biodiversity | Community awareness programs; habitat restoration initiatives; avoid illegal poaching and grazing   |
| 10 | Water Use / Abstraction            | Groundwater extraction, mine dewatering        | Alteration in aquatic habitat; species displacement due to reduced water levels        | Controlled water extraction; water harvesting structures; recharge pits; monitoring of water levels |
| 11 | Noise from Operations              | Drilling, blasting, transport noise            | Disturbance to fauna; migration of birds and animals                                   | Noise barriers; limit noisy operations to daytime; maintenance of silencers and mufflers            |
| 12 | Dust Deposition on Vegetation      | Movement of vehicles and mining operations     | Reduced photosynthesis; leaf damage; stunted growth                                    | Regular water spraying on haul roads; roadside plantations using dust-tolerant native species       |

## F. Socio Economic Environment

### Impacts with Mitigation and Monitoring Measures on Socio-Economic Environment

| Impact Area                  | Potential Effects                                                                      | Consequences on Local Livelihood / Community            | Mitigation Measures                                                 | Monitoring Strategies                                                               |
|------------------------------|----------------------------------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Air Pollution                | Increased CO <sub>2</sub> , NO <sub>x</sub> , SO <sub>2</sub> , PM10 & PM2.5 emissions | Respiratory diseases; reduced agricultural productivity | Use low-emission machinery; dust suppression; greenbelt development | Air quality monitoring (PM10, CO <sub>2</sub> , NO <sub>x</sub> ) near mining zones |
| Water Pollution              | Acid mine drainage, heavy metal leaching                                               | Contaminated drinking water; aquatic biodiversity loss  | Water treatment plants; lined tailing storage                       | Ground and surface water quality monitoring; pH, metals                             |
| Soil Degradation             | Land clearing, loss of fertility                                                       | Reduced crop yield; dependence on external food sources | Topsoil conservation; land reclamation                              | Satellite vegetation tracking; soil quality testing                                 |
| Climate Change               | CO <sub>2</sub> emissions, land-use change                                             | Erratic rainfall; higher cooling costs; health issues   | Reduce deforestation                                                | Monitoring of climate-related indicators                                            |
| Health & Safety              | Dust, noise, and traffic-related issues                                                | Respiratory and hearing problems; accident risks        | PPEs, dust control, traffic safety                                  | Health audits; accident tracking                                                    |
| Traditional Occupation Shift | Loss of farming and grazing jobs                                                       | Livelihood loss; forced occupational shift              | Skill development; green jobs; eco-tourism promotion                | Employment audits; training participation records                                   |
| Resource Competition         | Increased use of water and local utilities                                             | Local scarcity; price inflation                         | Sustainable resource use; recycling                                 | Resource consumption tracking                                                       |
| Cultural Disruption          | Influx of migrant labor                                                                | Cultural dilution; social conflicts                     | Local hiring preference; community programs                         | Social cohesion surveys; stakeholder consultations                                  |
| Livelihood Displacement      | Shift away from agriculture and small-scale trade                                      | Income instability; out-migration                       | Compensation; alternate livelihood; CSR-based support               | Livelihood impact assessments; CSR program reviews                                  |

## G. Occupational Health Impacts, Mitigation Measures

| S. No | Impact Area     | Anticipated Impacts                    | Mitigation Measures                                                         |
|-------|-----------------|----------------------------------------|-----------------------------------------------------------------------------|
| 1     | Dust Exposure   | Dust-related pneumonia, tuberculosis   | Water sprinkling on haul roads, wet drilling systems, greenbelt development |
| 2     | Physical Strain | Rheumatic arthritis due to heavy labor | Ergonomic work practices, regular breaks, training in safe handling methods |

|    |                             |                                                                    |                                                                                                 |
|----|-----------------------------|--------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| 3  | Vibration from Equipment    | Segmental vibration syndrome from long-term use of vibrating tools | Use of anti-vibration tools, scheduled breaks, health monitoring for vibration-related symptoms |
| 4  | Noise Pollution             | Noise-induced hearing loss                                         | Use of earplugs/muffs, acoustic enclosures for equipment, regular noise level monitoring        |
| 5  | Fire and Emergency Risks    | Injuries and fatalities from fire/explosions                       | Emergency Response Plan (ERP), installation of fire extinguishers, mock drills, and training    |
| 6  | Hazardous Material Handling | Exposure-related health issues                                     | PPEs suited for materials handled, training in safe chemical handling procedures                |
| 7  | Medical Emergencies         | Lack of immediate care can worsen injuries                         | On-site first aid facilities, tie-ups with local hospitals, trained medical personnel           |
| 8  | Worker Health Monitoring    | Chronic illnesses going undetected                                 | Periodic health check-ups, occupational health surveillance, medical records maintenance        |
| 9  | Community Health Linkages   | Potential spread of occupational diseases to nearby communities    | Extension of emergency medical support to communities, awareness programs                       |
| 10 | Blasting Operations         | Increased risk of injuries due to flying debris and air shock      | Restricted entry, sirens, cordoning of the blast zone, proper training and SOPs                 |

## 5. Analysis of Alternative

| S. No | Mining Activity        | Available Technologies                  | Potential Impact                                  | Preferred Technology to be followed |
|-------|------------------------|-----------------------------------------|---------------------------------------------------|-------------------------------------|
| 1     | Rock breaking /Cutting | Burner Cutting                          | High noise levels                                 | -                                   |
|       |                        | Wire Saw Cutting                        | No significant environmental impact               | Wire Saw Cutting                    |
| 2     | Drilling               | Jackhammer Manual Drilling              | Emission of dust and noise generation             | -                                   |
|       |                        | Wet Drilling                            | Minimal dust emissions                            | Wet Drilling                        |
|       |                        | Tamrac Machine Drilling                 | Insignificant dust and noise levels               | -                                   |
|       |                        | Wagon Drill                             | Produces dust and noise                           | -                                   |
|       |                        | LD Bore                                 | Dust emission                                     | -                                   |
|       |                        | PRD Drilling                            | Low dust emissions                                | -                                   |
| 3     | Blasting               | Conventional Blasting                   | Generates noise                                   | -                                   |
|       |                        | Muffle Blasting                         | Reduced noise impact                              | -                                   |
|       |                        | Expansive Mortar / Rock Breaking Powder | Negligible noise impact                           | -                                   |
|       |                        | Controlled Blasting                     | Reduces ground vibrations and noise               | Controlled Blasting                 |
|       |                        | Hydraulic Splitting                     | No noise or vibration, water-pressure based       | Hydraulic Splitting                 |
|       |                        | Chemical Blasting                       | Non-explosive, slow rock breakage, minimal impact | Chemical Blasting                   |
|       |                        | Shock Tube Blasting                     | Controlled explosion, reduced fly rock            | -                                   |
|       |                        | Silent Blasting (Gas-Expansion Systems) | Fractures rock with gas expansion, no noise       | -                                   |

**Proposed Greenbelt Development plan**

| Local Name of the Tree           | Scientific Name of the Tree | Survival | No. of Species |
|----------------------------------|-----------------------------|----------|----------------|
| Vaagai                           | Albizia Lebbeck             | 80 %     | 800            |
| Manjadi                          | Adenaanthera Pavonina       |          |                |
| Aatru                            | Hibiscus Tiliaceous         |          |                |
| Poovarasu                        |                             |          |                |
| Panai                            | Borassus Flabellifer        |          |                |
| Yetti                            | Strychnos Nuxvomica         |          |                |
| Purangai Naari,<br>Pudanga Naari | Premna Tomentosa            |          |                |
| Magizha<br>Maram                 | Mimusops Elengi             |          |                |
| Puthranjivi                      | Puthranjiva Roxburghii      |          |                |
| Pisin Pattai                     | Litsea Glutinosa            |          |                |
| Sandhana<br>Vembu                | Toona Ciliate               |          |                |
| Eachai                           | Phoenix Sylvestre           |          |                |

**6. Environmental Monitoring Plan**

The comprehensive Environment Monitoring Plan is prepared along with a budget of **50,000/-**. The project proponent will take overall responsibility for monitoring and ensuring environmental compliance throughout the lifecycle of the project. For each environmental component, the monitoring plan will define specific parameters, monitoring locations, frequency, duration, applicable standards, and assign responsibilities for implementation and supervision, as per the Environmental Monitoring Plan.

**7. Additional Studies**

The report is covered Risk assessment with associated activities and precautionary measures, the Mining and related activities pose various potential hazards to both workers and the public. It is essential that mine workers operate in a safe and healthy environment without compromising their efficiency. The safety measures required to ensure the well-being of employees, and the security of mining operations, are outlined in the Mines Act, 1952. Fire protection system, Emergency safety equipment & Reporting and response to emergencies. Emergency Help from nearby industries and tie up with nearby industries. An adequate number of external and internal telephone connections should be installed.

- ▶ Fire Protection System
- ▶ Off Site Emergency Plan

**8. Project Benefits**

- ▶ Improvement in per capita income of the local population.
- ▶ Enhancement of the overall socio-economic conditions of nearby villages due to the proposed project.
- ▶ Approximately 30 people will be directly employed in the quarry operations as skilled and unskilled workers.

- ▶ Around 20 individuals will benefit indirectly through allied services and support activities.
- ▶ The direct beneficiaries will include local people employed in mining operations in roles such as equipment operators, laborers, and maintenance staff.
- ▶ The project is environmentally compatible, financially viable, and will support the construction industry indirectly benefiting the wider community.
- ▶ Community development initiatives under Corporate Social Responsibility (CSR) and Corporate Environmental Responsibility (CER) will benefit nearby villages.
- ▶ As per O.M. F.No. 22-65/2017-IA.III dated 01.05.2018, 2.0% of the project cost is to be allocated for Corporate Environment Responsibility (CER) activities. Accordingly, an amount of Rs. 2.0 Lakhs will be spent towards the development of Jakkery Village Government Girls Higher Secondary School. Corporate Environmental Responsibility (CER) Plan details are provided in **Table 4-30**.
- ▶ The State Government will also benefit directly from the proposed mine, through increased revenue from royalties, CESS, DMF, GST etc.
- ▶ Improvement in communication, transport, education, community development and medical facilities and overall change in employment and income opportunity.

**Corporate Environmental Responsibility**

| S. No        | CER Activities for Veeranam Village, Government Hr. Sec. School                            | Amount (Lakhs) |
|--------------|--------------------------------------------------------------------------------------------|----------------|
| 1.           | Road maintenance along with Plantation<br>(Approach Road connectivity to Veeranam village) | 0.50           |
| 2.           | Govt Girls High School- Toilet facilities                                                  | 0.50           |
| 3.           | Govt Girls High School- Providing Library Books in connection with Environmental           | 0.50           |
| 4            | Govt Girls High School-Drinking Water facility (Portable RO System with Cooling facility)  | 0.50           |
| <b>Total</b> |                                                                                            | <b>2.00</b>    |

**9. Environmental Benefit Analysis**

Not recommended during scoping stage.

**10. Environmental Management Plan**

Upon approval of the Environmental Impact Assessment (EIA) and the associated Environmental Management Plan (EMP), a comprehensive administrative framework will be established to ensure the systematic implementation of all proposed mitigation measures. A dedicated Environmental Management Cell (EMC), comprising qualified and experienced personnel, will be constituted to oversee, coordinate, and monitor all environmental protection and management activities throughout the life of the project. To facilitate the effective execution of the EMP, the following budgetary provisions have been made:

- **Capital Cost:** Rs. 26,96,800/-
- **Recurring Cost:** Rs. 9,95,780/- per annum

This financial provision encompasses all essential activities including pollution control, environmental quality monitoring, greenbelt development, occupational health and safety measures, solid and hazardous waste management, and community-related environmental initiatives. Environmental Management cost is given in **Table 9-12**.

**11. Summary and Conclusion**

The proposed granite quarry is expected to generate moderate environmental impacts, all of which can be effectively mitigated through a comprehensive Environmental Management Plan (EMP). Key concerns include emissions of particulate matter from operations like drilling, blasting, and transportation, as well as runoff-induced water pollution and habitat disturbances.

To address air quality impacts, measures such as wet drilling, controlled blasting, and routine water sprinkling on roads and work areas will be adopted. Dust and noise will be further controlled through greenbelt development within and around the lease area using native species. Surface runoff will be managed through the construction of earthen drains, catch pits, and stormwater bunds, while rainwater harvesting structures will help in groundwater recharge. Noise levels are currently within the prescribed CPCB standards, and the use of noise-compliant equipment and PPE like earplugs and earmuffs will ensure occupational

safety. In terms of biodiversity, the project site does not intersect with any ecologically sensitive zones, and protective steps such as afforestation and fencing will help reduce any localized disturbances. From a socio-economic standpoint, the project promises direct and indirect employment, improved local infrastructure, and community development through CSR and CER commitments.

To further enhance environmental safeguards, advanced methods like diamond wire saw cutting, NONEL blasting, and non-explosive rock-breaking agents will be employed to reduce vibrations, fly rock, and dust. With baseline environmental parameters well within permissible limits, the planned mitigation strategies aim to maintain environmental quality and ensure regulatory compliance throughout the quarry lifecycle.

Additionally, as discussed in Chapter 10, an Environmental Management Cell (EMC) will be constituted. This cell will be responsible for:

- Monitoring and implementing EMP measures
- Ensuring compliance with environmental regulations
- Overseeing environmental performance across air, water, and land components

With minimal anticipated impacts and robust mitigation in place, the project is expected to foster employment, improve local infrastructure, and enhance the socio-economic condition of nearby communities. Considering these benefits, the proposed project may be recommended for Environmental Clearance.

\*\*\*

# 1 INTRODUCTION

## 1.1 Project background

M/s. Tamil Nadu Minerals Ltd. (TAMIN), an undertaking of the Government of Tamil Nadu, was established in the year 1978 to carry out systematic mining and development of various minerals across the State. Since its inception, TAMIN has developed expertise in mining dimensional granite stones of different varieties, including Black Granite (Dolerite), Kashmir White (Leptynite), Paradiso (Migmatite Gneiss), Green Onyx (Syenite-Porphyry), Red Wave (Pink Feldspathic Gneiss), Colombo Juparana (Pegmatitic Granite Gneiss of magmatic origin), Raw Silk (Yellow Feldspathic Leptynite), and several other coloured granite varieties, along with industrial minerals such as Quartz, Feldspar, Graphite, Limestone, Vermiculite, etc.

The Black Granite Quarry is located over an extent of 13.74.0 hectares in S.F. No. **74(P), 126/1A, 127, 144/1**, Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, Tamil Nadu. The land is classified as Government Poramboke land, and TAMIN has obtained the lease from the Government of Tamil Nadu.

The project area does not fall in CRZ zone. There are no Western Ghats within the radius of 15 Km from project area. There are no notified bird sanctuaries or wildlife sanctuaries as per Wildlife protection Act 1972, within a radius of 15 Km. The project area does not fall in 'HACA' region.

Initially, Government of Tamil Nadu granted lease to TAMIN for quarrying Black Granite over an extent of 20.50.0 Ha of Government poramboke land in Survey Field No (SF No). 74/1(Part), 126/1A, 127, 132(Part), 144/1, 144/2, and 145/2(Part) situated in Veeranam Village in Thandarampattu Taluk of Thiruvannamalai District vide. G.O Ms. No. 28 Industries (MME1) department dated 24.05.2004 for a period of 20 years under Rule 8-C of the Tamil Nadu Minor Mineral Concession Rules, 1959. As the lease deed was executed with the District Collector on 15.06.2004, the lease period is valid up to 14.06.2024.

TAMIN has obtained Environmental Clearance for this area vide SEIAA-TN/F.No.3886/1(a)/EC.No.5567/2020, dated 01.03.2023 under violation category as per MoEF & CC Notification dated, 14.03.2017.

Since the lease period expires on 14.06.2024, TAMIN has applied for renewal of lease in stipulated time as per rule in force. Accordingly, GoTN has granted precise area communication letter to TAMIN for quarrying Black Granite (Dolerite) over an extent of 13.74.0 Ha. at SF. No. 74(P), 126/1A, 127, 144/1 of Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District. The renewal of quarry Lease has been obtained for total extent of 13.74.0Ha (instead of 20.50.0Ha) at Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, Tamil Nadu for a period of 20 years under Rule 8-C of the Tamil Nadu Minor Mineral Concession Rules, 1959 vide Govt Letter No.679, Natural Resources Department (MME-1)/2024-1, dated, 21.10.2024.

The area lies in 12°11'13.12"N to 12°11'28.05"N latitude and 78°54'35.10"E to 78°54'08.07"E Longitude. The area does not fall under forest land of any category. It is Government Poramboke land.

As directed in the precise area communication letter TAMIN has prepared the Mining Plan for quarrying Black Granite (Dolerite) over an extent of 13.74.0 Ha at SF.No. 74(P), 126/1A, 127, 144/1 of Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District and submitted the same to the authority concerned.

Subsequently, the Mining Plan has been approved by the Commissioner of the Geology and Mining vide Letter No. 8095/MM4/2023, dated: 28.02.2025.

TAMIN applied for ToR via Online Proposal No. SIA/TN/MIN/529498/2025 dated: 15.03.2025 and remitted ₹3.5 lakh as processing fee per SEIAA-TN Guidelines. The proposal was appraised in the 542nd SEAC Meeting held on 26.03.2025 (SEIAA No. 11966, Unit: VI), and ToR was issued with Public Hearing requirement under Identification No. TO25B0108TN5444492N, dated 13.05.2025, for preparation of the EIA/EMP Report.

The EIA report has been prepared in accordance with the issued ToR (Identification No. TO25B0108TN5444492N, dated 13.05.2025. Baseline environmental studies were conducted during the period from Feb 2025 to April 2025. The draft EIA report will be circulated for public review in coordination with the Tamil Nadu Pollution Control Board (TNPCB).

#### **1.1.1 Present Proposal details:**

Initially, Government of Tamil Nadu granted lease to TAMIN for quarrying Black Granite over an extent of 20.50.0 Ha of Government poramboke land in Survey Field No (SF No). 74/1(Part), 126/1A, 127, 132(Part), 144/1, 144/2, and 145/2(Part) situated in Veeranam Village in Thandarampattu Taluk of Thiruvannamalai District vide. G.O Ms. No. 28 Industries (MME1) department dated 24.05.2004 for a period of 20 years under Rule 8-C of the Tamil Nadu Minor Mineral Concession Rules, 1959. As the lease deed was executed with the District Collector on 15.06.2004, the lease period is valid up to 14.06.2024.

TAMIN has obtained Environmental Clearance for this area vide SEIAA-TN/F.No.3886/1(a)/EC.No.5567/2020, dated 01.03.2023 under violation category as per MoEF & CC Notification dated, 14.03.2017.

Since the lease period expires on 14.06.2024, TAMIN has applied for renewal of lease in stipulated time as per rule in force. Accordingly, GoTN has granted precise area communication letter to TAMIN for quarrying Black Granite (Dolerite) over an extent of 13.74.0 Ha. at SF. No. 74(P), 126/1A, 127, 144/1 of Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District. The renewal of quarry Lease has been obtained for total extent of 13.74.0Ha (instead of 20.50.0Ha) at Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, Tamil Nadu for a period of 20 years under Rule 8-C of the Tamil Nadu Minor Mineral Concession Rules, 1959 vide Govt Letter No.679, Natural Resources Department (MME-1)/2024-1, dated, 21.10.2024.

The area lies in 12°11'13.12"N to 12°11'28.05"N latitude and 78°54'35.10"E to 78°54'08.07"E Longitude. The area does not fall under forest land of any category. It is Government Poramboke land.

As directed in the precise area communication letter TAMIN has prepared the Mining Plan for quarrying Black Granite (Dolerite) over an extent of 13.74.0 Ha at SF.No. 74(P), 126/1A, 127, 144/1 of Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District and submitted the same to the authority concerned.

Subsequently, the Mining Plan has been approved by the Commissioner of the Geology and Mining vide Letter No. 8095/MM4/2023, dated: 28.02.2025.

TAMIN applied for ToR via Online Proposal No. SIA/TN/MIN/529498/2025 dated: 15.03.2025 and remitted ₹3.5 lakh as processing fee per SEIAA-TN Guidelines. The proposal was appraised in the 542nd SEAC Meeting held on 26.03.2025 (SEIAA No. 11966, Unit: VI), and ToR was issued with Public Hearing requirement under Identification No. TO25B0108TN5444492N, dated 13.05.2025, for preparation of the EIA/EMP Report.

The EIA report has been prepared in accordance with the issued ToR (Identification No. TO25B0108TN5444492N, dated 13.05.2025. Baseline environmental studies were conducted during the period from Feb 2025 to April 2025. The draft EIA report will be circulated for public review in coordination with the Tamil Nadu Pollution Control Board (TNPCB).

### **1.1.2 Project**

The Black Granite Quarry has a lease area over an extent of 13.74.0 ha located in SF. No. 74(P), 126/1A, 127, 144/1 of Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, lies in the latitude of 12°11'13.12"N to 12°11'28.05"N and longitude of 78°54'35.10"E to 78°54'08.07"E.

The area is marked in the survey of India Topo sheet No.57-L/15, L/16 & P/4. 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 and width bench not less than the height. The area applied for quarry lease is exhibits hilly terrain; the altitude of the area is 194m (Maximum) above MSL.

### **1.1.3 Project Proponent**

Tamil Nadu Minerals Ltd (TAMIN) is a wholly owned Undertaking of Government of TamilNadu has been established in the year 1978. It entered the international granite market in the year 1979 and has secured a steady market for dimensional blocks of black and other colour materials in countries like Japan, Germany, Italy, Australia, UK, Switzerland, Holland, USA, etc., TAMIN is only organization recognized by Bureau of Indian Standard for manufacture and supply of I.S. Sand all over the country.

TAMIN has developed expertise in the mining of granite dimensional stones of different varieties including black granite (Dolerite), Kashmirwhite (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 colored granite varieties apart from other industrial minerals viz. quartz and feldspar, graphite, lime stone, silica sand, vermiculite, etc.,

## 1.2 Letter of Intent (LoI) & Mining Plan approval details

- i. The Government of Tamil Nadu has issued the precise area communication letter to furnish the approved Mining plan as per Go. TN, Natural Resources (MME.1) Department for quarrying Black Granite over an extent of 13.74.0 Ha of Government poramboke land in SF No. 486(Part) & 736/4, Jakkery Village, Denkanikottai Taluk, Krishnagiri District for a period of 20 years vide Govt. Letter. No.679/MME.1/2024-1, dated: 21.10.2024. The Precise Area Communication Letter is enclosed as **Annexure-7**.
- ii. Subsequently, the Mining Plan was submitted and approved by the Commissionerate of Geology and Mining, Chennai vide Letter Rc.8095/MM4/2023 dated 28.02.2025. The mining plan approval letter is enclosed as **Annexure-8**.

## 1.3 Land Acquisition Status

The entire mine lease area of 13.74.0 Ha is Government Pormaboke land which is leased by TAMIN. The precise area communication letter is enclosed as **Annexure-7**. Details of the project site are given in the **Table 1-1**.

**Table 1-1 Land Use Description**

| District        | Taluk          | Village  | S.F No                    | Area (Ha.)     | Classification            |
|-----------------|----------------|----------|---------------------------|----------------|---------------------------|
| Thiruvannamalai | Thandarampattu | Veeranam | 74(P), 126/1A ,127 ,144/1 | 13.74.0        | Government poramboke land |
| Total           |                |          |                           | <b>13.74.0</b> |                           |

## 1.4 Purpose and status of the report

The Black Granite Quarry is located over an extent of 13.74.0 hectares in S.F. No. **74(P), 126/1A, 127, 144/1**, Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, Tamil Nadu. The land is classified as Government Poramboke land, and TAMIN has obtained the precise area communication letter from the Government of Tamil Nadu.

The project area does not fall in CRZ zone. There are no Western Ghats within the radius of 15 Km from project area. There are no notified bird sanctuaries or wildlife sanctuaries as per Wildlife protection Act 1972, within a radius of 15 Km. The project area does not fall in 'HACA' region.

Initially, Government of Tamil Nadu had granted lease to TAMIN for quarrying Black Granite over an extent of 20.50.0 Ha of Government poramboke land in Survey Field No (SF No). 74/1(Part), 126/1A, 127, 132(Part), 144/1, 144/2, and 145/2(Part) situated in Veeranam Village in Thandarampattu Taluk of Thiruvannamalai District vide. G.O Ms. No. 28 Industries

(MME1) department dated 24.05.2004 for a period of 20 years under Rule 8-C of the Tamil Nadu Minor Mineral Concession Rules, 1959. As the lease deed was executed with the District Collector on 15.06.2004, the lease period is valid up to 14.06.2024.

TAMIN has obtained Environmental Clearance for this area vide SEIAA-TN/F.No.3886/1(a)/EC.No.5567/2020, dated 01.03.2023 under violation category as per MoEF & CC Notification dated, 14.03.2017.

Since the lease period expires on 14.06.2024, TAMIN has applied for renewal of lease in stipulated time as per rule in force. Accordingly, GoTN has granted precise area communication letter to TAMIN for quarrying Black Granite (Dolerite) over an extent of 13.74.0 Ha. at SF. No. 74(P), 126/1A, 127, 144/1 of Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District for a period of 20 years under Rule 8-C of the Tamil Nadu Minor Mineral Concession Rules, 1959 vide Govt Letter No.679, Natural Resources Department (MME-1)/2024-1, dated, 21.10.2024.

The area lies in 12°11'13.12"N to 12°11'28.05"N latitude and 78°54'35.10"E to 78°54'08.07"E Longitude. The area does not fall under forest land of any category. It is Government Poramboke land.

As directed in the precise area communication letter TAMIN has prepared the Mining Plan for quarrying Black Granite (Dolerite) over an extent of 13.74.0 Ha at SF.No. 74(P), 126/1A, 127, 144/1 of Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District and submitted the same to the authority concerned.

Subsequently, the Mining Plan has been approved by the Commissioner of the Geology and Mining vide Letter No. 8095/MM4/2023, dated: 28.02.2025.

TAMIN applied for ToR via Online Proposal No. SIA/TN/MIN/529498/2025 dated: 15.03.2025 and remitted ₹3.5 lakh as processing fee per SEIAA-TN Guidelines. The proposal was appraised in the 542nd SEAC Meeting held on 26.03.2025 (SEIAA No. 11966, Unit: VI), and ToR was issued with Public Hearing requirement under Identification No. TO25B0108TN5444492N, dated 13.05.2025, for preparation of the EIA/EMP Report.

The EIA report has been prepared in accordance with the issued ToR (Identification No. TO25B0108TN5444492N, dated 13.05.2025. Baseline environmental studies were conducted during the period from Feb 2025 to April 2025. The draft EIA report will be circulated for public review in coordination with the Tamil Nadu Pollution Control Board (TNPCB).

## 1.5 Brief Description of the Project

### 1.5.1 Nature of the Project

The Black Granite Quarry is located over an extent of 13.74.0 hectares in S.F. No. **74(P), 126/1A, 127, 144/1**, Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, Tamil Nadu. The land is classified as Government Poramboke land, and TAMIN has obtained precise area communication letter from the Government of Tamil Nadu.

The project area does not fall in CRZ zone. There are no Western Ghats within the radius of 15 Km from project area. There are no notified bird sanctuaries or wildlife sanctuaries as per Wildlife protection Act 1972, within a radius of 15 Km. The project area does not fall in 'HACA' region.

Initially, Government of Tamil Nadu had granted lease to TAMIN for quarrying Black Granite over an extent of 20.50.0 Ha of Government poramboke land in Survey Field No (SF No). 74/1(Part), 126/1A, 127, 132(Part), 144/1, 144/2, and 145/2(Part) situated in Veeranam Village in Thandarampattu Taluk of Thiruvannamalai District vide. G.O Ms. No. 28 Industries (MME1) department dated 24.05.2004 for a period of 20 years under Rule 8-C of the Tamil Nadu Minor Mineral Concession Rules, 1959. As the lease deed was executed with the District Collector on 15.06.2004, the lease period is valid up to 14.06.2024.

TAMIN has obtained Environmental Clearance for this area vide SEIAA-TN/F.No.3886/1(a)/EC.No.5567/2020, dated 01.03.2023 under violation category as per MoEF & CC Notification dated, 14.03.2017.

Since the lease period expires on 14.06.2024, TAMIN has applied for renewal of lease in stipulated time as per rule in force. Accordingly, GoTN has granted precise area communication letter to TAMIN for quarrying Black Granite (Dolerite) over an extent of 13.74.0 Ha (instead of 20.50.0 Ha). at SF. No. 74(P), 126/1A, 127, 144/1 of Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District for a period of 20 years under Rule 8-C of the Tamil Nadu Minor Mineral Concession Rules, 1959 vide Govt Letter No.679, Natural Resources Department (MME-1)/2024-1, dated, 21.10.2024.

The area lies in 12°11'13.12"N to 12°11'28.05"N latitude and 78°54'35.10"E to 78°54'08.07"E Longitude. The area does not fall under forest land of any category. It is Government Poramboke land.

As per EIA Notification 2006 and its subsequent amendments, the project falls under Schedule 1(a), Category B1. The Terms of Reference (ToR) was issued along with a Public Hearing requirement, vide Identification No. TO25B0108TN5444492N, dated 13.05.2025.

Baseline studies were conducted during the period Feb 2025 – April 2025. The draft EIA report will be circulated for public review ahead of the hearing, under the guidance of the Tamil Nadu Pollution Control Board (TNPCB).

### 1.5.2 Size of the Project

The total extent area of the lease for this quarry is 13.74.0 Ha, at S.F. No. 74(P), 126/1A, 127, 144/1 of Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, Tamil Nadu State. Quarry Land is classified as Government Poramboke land and leased to by Tamil Nadu Minerals Limited (TAMIN).

The Geological reserves of Black granite have been computed based on the Geological Plan & Sections up to the economically workable average depth of 30 m from the surface level and the top surface of the granite body works out to 14,86,816 m<sup>3</sup>.

Mineable Reserves have been computed as 1,95,335 m<sup>3</sup> based on the Conceptual Plan and sections, the effective (Saleable) Mineable Reserves have been worked out as 19533.5M<sup>3</sup> by

applying the recovery factor 10%. The annual peak production is 1954 m<sup>3</sup>. Open cast Semi mechanized method will be followed for proposed mining as per Mining plan.

During the extraction of blocks, each bench will be 6m height with vertical slope for dimensional cutting. The quantum of excavation is estimated to be m<sup>3</sup> of ROM 10% recovery (19,533) up to an average workable depth of 30 m. The generation of total waste is estimated to be about 1,75,802 m<sup>3</sup> (Granite Rejects 1,75,802 m<sup>3</sup>, over burden 32,629 m<sup>3</sup> and side Burden 7,688 m<sup>3</sup>).

Total waste to be generated during the ten years of Mining Plan period will be 1,75,802 m<sup>3</sup>. The area for disposal of waste rock has been identified over the existing waste dump in north and southwest side of the lease area. The dumps will be maintained not exceeding 5m height and the angle of slope of dumps will be at 45° from horizontal. All sectional plates are enclosed as **Annexure-13**. Estimated Black Granite Reserves are given in **Table 1-2**.

**Table 1-2 Estimated Black Granite Reserves**

| S. No | Geological (m <sup>2</sup> ) | Mineable Reserves (m <sup>2</sup> ) | Mineable Saleable Granite Reserves 10% Recovery (m <sup>2</sup> ) | Granite Waste @90% Recovery (m <sup>2</sup> ) |
|-------|------------------------------|-------------------------------------|-------------------------------------------------------------------|-----------------------------------------------|
| 1     | 14,86,816                    | 1,95,335                            | 19,533                                                            | 1,75,802                                      |

**Anticipated life of the quarry:**

- ▶ Updated Mineable Reserves: 1,95,335 m<sup>3</sup>
- ▶ Anticipated life of the quarry: 19.5 ~ 19.6 years

**Table 1-3 Proposed year wise development and production plan**

| year   | Run of Mines in |        | Saleable Black Granite Recovery @10% |        | Black Granite Waste @90% |        |
|--------|-----------------|--------|--------------------------------------|--------|--------------------------|--------|
|        | M <sup>3</sup>  | Tonnes | M <sup>3</sup>                       | Tonnes | M <sup>3</sup>           | Tonnes |
| First  | 19533           | 58599  | 1953                                 | 5859   | 17580                    | 52740  |
| Second | 19533           | 58599  | 1953                                 | 5859   | 17580                    | 52740  |
| Third  | 19533           | 58599  | 1953                                 | 5859   | 17580                    | 52740  |
| Fourth | 19533           | 58599  | 1953                                 | 5859   | 17580                    | 52740  |
| Fifth  | 19533           | 58599  | 1953                                 | 5859   | 17580                    | 52740  |
| Total  | 97665           | 292995 | 9765                                 | 29295  | 87900                    | 263700 |

Note: Specific Gravity of Black Granite: 3.00

Source: IBM, Granite in India Bulletin No.21, March 1990 and in accordance with appendix - X -II of the TNMMCR, 1959.

**Table 1-4 Ultimate dimension of the Quarry at the top and bottom level**

| S. No | Ultimate Pit Description Position |       | Ultimate Pit Description Position |       | Depth | Pit No SF. No  |
|-------|-----------------------------------|-------|-----------------------------------|-------|-------|----------------|
|       | Length                            | With  | Length                            | Width |       |                |
| 1     | 334.00                            | 63.00 | 232.00                            | 24.00 | 30.00 | 127 & 74(Part) |

### 1.5.3 Location of the project

The Black Granite Quarry is located over an extent of 13.74.0 hectares in S.F. No. **74(P), 126/1A, 127, 144/1**, Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, Tamil Nadu, lies in the latitude of 12°11'13.12"N to 12°11'28.05"N and longitude of 78°54'35.10"E to 78°54'08.07"E. The area falls in topo sheet No. 57L/15, L/16, P4. The altitude of the area is 194m (Maximum) above MSL. The boundary co-ordinates of the mine lease area are tabulated in **Table 1-5**.

**Table 1-5 Boundary Coordinates of the project**

| Boundary Pillar no | Latitude           | Longitude          |
|--------------------|--------------------|--------------------|
| 1                  | 12° 11' 13.1273" N | 78° 54' 35.1014" E |
| 2                  | 12° 11' 12.4787" N | 78° 54' 33.5849" E |
| 3                  | 12° 11' 11.8302" N | 78° 54' 32.0683" E |
| 4                  | 12° 11' 11.1817" N | 78° 54' 30.5518" E |
| 5                  | 12° 11' 10.5568" N | 78° 54' 29.0906" E |
| 6                  | 12° 11' 09.2389" N | 78° 54' 29.2196" E |
| 7                  | 12° 11' 08.7133" N | 78° 54' 27.6544" E |
| 8                  | 12° 11' 08.1877" N | 78° 54' 26.0895" E |
| 9                  | 12° 11' 07.6621" N | 78° 54' 24.5246" E |
| 10                 | 12° 11' 07.1365" N | 78° 54' 22.9597" E |
| 11                 | 12° 11' 06.6109" N | 78° 54' 21.3948" E |
| 12                 | 12° 11' 06.3527" N | 78° 54' 20.6263" E |
| 13                 | 12° 11' 07.6317" N | 78° 54' 21.6480" E |
| 14                 | 12° 11' 08.9108" N | 78° 54' 22.6694" E |
| 15                 | 12° 11' 10.1898" N | 78° 54' 23.6911" E |
| 16                 | 12° 11' 11.4689" N | 78° 54' 24.7129" E |
| 17                 | 12° 11' 12.7479" N | 78° 54' 25.7346" E |
| 18                 | 12° 11' 14.0270" N | 78° 54' 26.7563" E |
| 19                 | 12° 11' 15.3061" N | 78° 54' 27.7781" E |
| 20                 | 12° 11' 16.0312" N | 78° 54' 28.3576" E |
| 21                 | 12° 11' 16.6330" N | 78° 54' 26.8210" E |
| 22                 | 12° 11' 17.2348" N | 78° 54' 25.2847" E |
| 23                 | 12° 11' 17.8366" N | 78° 54' 23.7485" E |
| 24                 | 12° 11' 18.4384" N | 78° 54' 22.2122" E |
| 25                 | 12° 11' 18.4691" N | 78° 54' 22.1343" E |
| 26                 | 12° 11' 19.8944" N | 78° 54' 22.7851" E |
| 27                 | 12° 11' 21.5190" N | 78° 54' 22.6999" E |
| 28                 | 12° 11' 21.7668" N | 78° 54' 22.6869" E |
| 29                 | 12° 11' 21.3443" N | 78° 54' 23.0983" E |
| 30                 | 12° 11' 21.2379" N | 78° 54' 24.7481" E |
| 31                 | 12° 11' 21.1790" N | 78° 54' 25.6620" E |
| 32                 | 12° 11' 20.9076" N | 78° 54' 27.2921" E |
| 33                 | 12° 11' 20.8662" N | 78° 54' 27.5415" E |
| 34                 | 12° 11' 20.3654" N | 78° 54' 28.6234" E |

|    |                    |                    |
|----|--------------------|--------------------|
| 35 | 12° 11' 19.2029" N | 78° 54' 29.5306" E |
| 36 | 12° 11' 18.3754" N | 78° 54' 30.9537" E |
| 37 | 12° 11' 17.5480" N | 78° 54' 32.3778" E |
| 38 | 12° 11' 17.3787" N | 78° 54' 32.6694" E |
| 39 | 12° 11' 16.4841" N | 78° 54' 34.0502" E |
| 40 | 12° 11' 16.0145" N | 78° 54' 34.7753" E |
| 41 | 12° 11' 14.4181" N | 78° 54' 34.8166" E |
| 42 | 12° 11' 27.2679" N | 78° 54' 07.5824" E |
| 43 | 12° 11' 27.4516" N | 78° 54' 07.3983" E |
| 44 | 12° 11' 27.9674" N | 78° 54' 05.8297" E |
| 45 | 12° 11' 28.4833" N | 78° 54' 04.2615" E |
| 46 | 12° 11' 28.9806" N | 78° 54' 02.7499" E |
| 47 | 12° 11' 29.3165" N | 78° 54' 01.8184" E |
| 48 | 12° 11' 30.0207" N | 78° 54' 00.3278" E |
| 49 | 12° 11' 30.3051" N | 78° 53' 59.7255" E |
| 50 | 12° 11' 30.7956" N | 78° 53' 58.1485" E |
| 51 | 12° 11' 31.2860" N | 78° 53' 56.5721" E |
| 52 | 12° 11' 31.6377" N | 78° 53' 55.4410" E |
| 53 | 12° 11' 33.0918" N | 78° 53' 56.1821" E |
| 54 | 12° 11' 33.3910" N | 78° 53' 56.3349" E |
| 55 | 12° 11' 34.0094" N | 78° 53' 54.8054" E |
| 56 | 12° 11' 34.6277" N | 78° 53' 53.2759" E |
| 57 | 12° 11' 35.2462" N | 78° 53' 51.7461" E |
| 58 | 12° 11' 35.5058" N | 78° 53' 51.1040" E |
| 59 | 12° 11' 36.0751" N | 78° 53' 52.4068" E |
| 60 | 12° 11' 36.7085" N | 78° 53' 53.9299" E |
| 61 | 12° 11' 36.7492" N | 78° 53' 54.0278" E |
| 62 | 12° 11' 37.2041" N | 78° 53' 54.1327" E |
| 63 | 12° 11' 36.9314" N | 78° 53' 55.5318" E |
| 64 | 12° 11' 36.2716" N | 78° 53' 57.0433" E |
| 65 | 12° 11' 35.6117" N | 78° 53' 58.5544" E |
| 66 | 12° 11' 34.9928" N | 78° 53' 59.9722" E |
| 67 | 12° 11' 34.1014" N | 78° 53' 59.5366" E |
| 68 | 12° 11' 33.1802" N | 78° 54' 00.8992" E |
| 69 | 12° 11' 32.5279" N | 78° 54' 01.8644" E |
| 70 | 12° 11' 32.1052" N | 78° 54' 03.4612" E |
| 71 | 12° 11' 31.6825" N | 78° 54' 05.0584" E |
| 72 | 12° 11' 31.2598" N | 78° 54' 06.6549" E |
| 73 | 12° 11' 30.9715" N | 78° 54' 07.7443" E |
| 74 | 12° 11' 30.4823" N | 78° 54' 08.1891" E |
| 75 | 12° 11' 29.4480" N | 78° 54' 08.9285" E |
| 76 | 12° 11' 28.0576" N | 78° 54' 08.0700" E |

#### 1.5.4 Connectivity of the Project

Existing road is available to from quarry ends with SH-6B (Thandrampet - Kottakulam Road) at  $\approx 24.04$  m towards W. The nearest railway station is Tiruvannamalai Railway station located at  $\approx 16.25$  km towards ENE direction. NH-179B (NH-179A near Harur, NH-32 (Bangalore Highway)) situated at distance of  $\approx 10.03$  Km (NNE).

#### 1.5.5 Need for the project and its importance to the country and or region

The Black granite dimensional stone material by virtue of its pleasing colour and texture and its best ability to take polishing and appealing look in polished product has attracted the consumers in the building construction and interior decoration industries. The domestic market capabilities have also been explored in recent periods. Bulk quantity of the blocks is produced and exported as raw block sand 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. Through this project will give employment opportunities to 30 employees. This material is well known in the international supermarket of Granite which will fetch a good foreign exchange to the nation.

##### 1.5.5.1 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.,

##### 1.5.5.2 Imports Vs Indigenous

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

##### 1.5.5.3 Export possibility.

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

##### 1.5.5.4 Domestic/export markets

As of now there is good demand for this granite blocks in foreign as well as local market. The quarries 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. Parts from TAMIN so many private enterprises are exporting the granite material as raw blocks, polished slab and monuments etc.,

#### 1.6 EIA Study

As a part of compliance to the regulatory requirement i.e., to obtain Environmental Clearance from SEIAA, TN, TAMIN has appointed Environmental Consultants 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 Draft EIA/EMP report under

B1 category as per obtained Terms of Reference from SEIAA-TN, was assigned to M/s. EHS360 Labs Pvt. Ltd., Chennai is accredited by NABET, vide possession of Certificate No. NABET/EIA/22-25/SA 0233, valid up to 24.06.2025.

## 1.7 EIA Cost

EIA Studies including Baseline undertaken by EHSL for an amount of INR Rs.1,34,400/-

## 1.8 Scope of the Study

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

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

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

### Structure of Environmental Impact Assessment Report:

| Chapter No       | Description of Content                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Chapter 1</b> | <b>Introduction</b><br>Give the brief outline of the project as details of need of the EIA report, project proponent, nature and size of the project, location of the project, and need of project, scope of EIA study and applicable environmental regulations and standards                                                                                                                                                                  |
| <b>Chapter 2</b> | <b>Project Description</b><br>The chapter gives details about the type and capacity of the project, need of the project, project location, layout & area break up, details of product, raw materials, manufacturing process and technology description, details of machinery and equipment, resource requirements, details on aspects of the project causing environmental impacts and mitigation measures incorporated to meet the standards. |
| <b>Chapter 3</b> | <b>Description of the Environment</b><br>The chapter describes the study area, study period, methodology and components selected for baseline studies, baseline status for ambient air, water, soil, socioeconomic, land use and meteorology of the study area within 10km radius.                                                                                                                                                             |
| <b>Chapter 4</b> | <b>Anticipated Environmental Impacts and Mitigation Measures</b><br>In this chapter, the anticipated environmental impacts due to proposed project activities are identified, analyzed, and assessed and thereafter the mitigation measures for the adverse impacts are proposed. The significance of impacts is determined. This chapter is prepared based on                                                                                 |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   | Chapter 2 & Chapter 3 by correlating the activities under proposed project and their impacts on receiving environmental attributes.                                                                                                                                                                                                                                                                             |
| <b>Chapter 5</b>  | <b>Analysis of Alternatives (Technology/site)</b><br>The chapter describes the alternative sites and the proposed factors for locating at the mentioned location. This would also describe the alternative technologies if any for manufacturing proposed products.                                                                                                                                             |
| <b>Chapter 6</b>  | <b>Environmental Monitoring Programme</b><br>The chapter proposes the post project monitoring plan and the budgetary provisions for the various environmental components.                                                                                                                                                                                                                                       |
| <b>Chapter 7</b>  | <b>Additional Studies</b><br>This chapter is provided the Public Consultation. Risk Assessment, Disaster Management Plan, and R&R Studies and any additional recommended during the Scope stage/ToR.                                                                                                                                                                                                            |
| <b>Chapter 8</b>  | <b>Project Benefits</b><br>Highlights the direct and indirect benefits on the physical infrastructure and social infrastructure due to proposed projects.                                                                                                                                                                                                                                                       |
| <b>Chapter 9</b>  | Environmental Cost Benefit Analysis not recommended during scoping stage for this project,<br>Hence, consider for <b>Environmental Management Plan</b><br>The chapter proposes the Environmental Management Plan highlighting the mitigation measures and roles and responsibilities of the management. This would include specific time frames for completion, resources required and specific responsibility. |
| <b>Chapter 10</b> | <b>Assessment of ecological damage, remediation plan and natural and community resource augmentation plan</b> as project falls under violation category due operational without prior EC                                                                                                                                                                                                                        |
| <b>Chapter 11</b> | <b>Summary and Conclusion</b><br>Summarize the entire report and conclude the summary of the EIA report.                                                                                                                                                                                                                                                                                                        |
| <b>Chapter 12</b> | <b>Disclosure of Consultants Engaged</b><br>Provides the brief profile of the EIA consultant organization and EIA project team for the current study.                                                                                                                                                                                                                                                           |

### 1.8.1 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 10km radius from the project.

### 1.8.2 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.

### 1.8.3 Applicable Regulatory Framework

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

- ▶ Study of project information.
- ▶ Screening & Scoping.
- ▶ Environmental pre-feasibility study & application for approval of ToR.
- ▶ Collection of detailed project management plan/report.
- ▶ Baseline data collection.
- ▶ Impact identification, Prediction & Evaluation.
- ▶ Mitigation measures & marking out of EMP.
- ▶ Risk assessment and safety & disaster management plan.
- ▶ Review & Draftization 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.

### 1.8.4 Legal Completeness

The establishment and functioning of the mining industry will be governed by following Environmental acts/regulations besides the local zoning and landuse laws of the States.

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

**1.8.5 Terms of Reference Compliance**

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

| S. No | Terms of Reference                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Compliance                                                                                                                                          |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.1   | The authority noted that the subject was placed in the 542nd SEAC-I meeting held on. After detailed discussions, the Authority accepts the recommendation of SEAC-I and decided to grant Terms of Reference (ToR) along with Public Hearing for the quantity of 19,533 m <sup>3</sup> of Black Granite Recovery @10% up to the depth of 30m as per the approved mining plan, under cluster for undertaking the combined Environment Impact Assessment Study and preparation of separate Environment Management Plan subject to the conditions as recommended by SEAC-I & normal conditions & the conditions mentioned below. | Noted.                                                                                                                                              |
|       | <b>2. Seac Conditions - Site Specific</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                     |
| 2.1   | 1. The Project Proponent shall furnish the revised EMP based on the study carried out on impact of the dust & other environmental impacts due to proposed quarrying operations on the nearby agricultural lands for the life of the mine in the format prescribed by the SEAC considering the cluster situation.                                                                                                                                                                                                                                                                                                             | The EMP cost is provided in the <b>Table 9-12</b> .                                                                                                 |
|       | 2. The PP shall submit the slope stability action plan incorporating the methodology of working in the remaining depth by maintaining the benches of adequate bench geometry in the hilly terrain (above ground level) along with a conceptual working plan for maintaining the safety aspects within the lease.                                                                                                                                                                                                                                                                                                             | Slope stability action plan will be submitted during the final EIA submission.                                                                      |
|       | 3. The PP shall undertake Hydrogeology study considering nearby existing wells, Aquifers, Ground water & surface water levels etc., within the radius of 1km.                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Ground water table is available at 6.30m as per the Mining plan. The PP will provide the Hydro Geological Study report during Final EIA Submission. |
|       | The study on impact of the proposed quarrying operations on the surrounding environment which includes water bodies, Odai etc., shall be furnished.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Noted and will be complied.                                                                                                                         |
|       | <b>3. Seac Standard Conditions</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                     |

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| 1. In the case of existing/operating mines, a letter obtained from the concerned AD (Mines) shall be submitted and it shall include the following:<br>(i) Original pit dimension<br>(ii) Quantity achieved Vs EC Approved Quantity<br>(iii) Balance Quantity as per Mineable Reserve calculated.<br>(iv) Mined out Depth as on date Vs EC Permitted depth<br>(v) Details of illegal/illicit mining<br>(vi) Violation in the quarry during the past working.<br>(vii) Quantity of material mined out outside the mine lease area<br>(viii) Condition of Safety zone/benches<br>(ix) Revised/Modified Mining Plan showing the benches of not exceeding 6 m height and ultimate depth of not exceeding 50m. | Will be furnished at the time of submission of final EIA                                                                                                                                                                                                                                                |
| 2. Details of habitations around the proposed mining area and latest VAO certificate regarding the location of habitations within 300m radius from the periphery of the site.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | The PP will furnish VAO certificate with reference to 300m radius regard to approved habitations during Final EIA Submission.                                                                                                                                                                           |
| 3. The proponent is requested to carry out a survey and enumerate on the structures located within the radius of (i) 50 m, (ii) 100 m, (iii) 200 m and (iv) 300 m (v) 500m shall be enumerated with details such as dwelling houses with number of occupants, whether it belongs to the owner (or) not, places of worship, industries, factories, sheds, etc with indicating the owner of the building, nature of construction, age of the building, number of residents, their profession and income, etc.                                                                                                                                                                                              | The structures are located within 50m, 100m, 150m, 200m, 250m, 300m and 500m from the boundary of the mine lease area is provided in <b>Chapter 2</b> .<br>There are no sensitive structures located within the 500m radius from the project site other than Pump houses and Brick Manufacturing units. |
| 4. The PP shall submit a detailed hydrological report indicating the impact of proposed quarrying operations on the waterbodies like lake, water tanks, etc are located within 1 km of the proposed quarry.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Hydro-geological study is carried out and submitted during the Final EIA Submission.                                                                                                                                                                                                                    |
| 5. The Proponent shall carry out Bio diversity study through reputed Institution and the same shall be included in EIA Report.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Biodiversity Study details are provided in the Chapter 3, Section 3.10.                                                                                                                                                                                                                                 |
| 6. The DFO letter stating that the proximity distance of Reserve Forests, Protected Areas, Sanctuaries, Tiger reserve etc., up to a radius of 25 km from the proposed site.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | PP will provide the DFO letter during the Final EIA submission.                                                                                                                                                                                                                                         |

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|  | <p>7. In the case of proposed lease in an existing (or old) quarry where the benches are not formed (or partially formed as per the approved Mining Plan, the Project Proponent (PP) shall the PP shall carry out the scientific studies to assess the slope stability of the working benches to be constructed and existing quarry wall, by involving any one of the reputed Research and Academic Institutions - CSIR-Central Institute of Mining &amp; Fuel Research / Dhanbad, NIRM/Bangalore, Division of Geotechnical Engineering-IIT-Madras, NIT-Dept of Mining Engg, Surathkal, and Anna University Chennai-CEG Campus. The PP shall submit a copy of the aforesaid report indicating the stability status of the quarry wall and possible mitigation measures during the time of appraisal for obtaining the EC.</p> | <p>Not applicable as benches has been formed as per mining plan.</p>                                                                                             |
|  | <p>8. However, in case of the fresh/virgin quarries, the Proponent shall submit a conceptual 'Slope Stability Plan' for the proposed quarry during the appraisal while obtaining the EC, when the depth of the working is extended beyond 30 m below ground level.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p>PP will provide the Slope Stability Plan during the Final EIA submission.</p>                                                                                 |
|  | <p>9. The PP 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.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <p>Noted and will be followed in accordance with MMR, 1961.</p>                                                                                                  |
|  | <p>10. The PP shall present a conceptual design for carrying out only controlled blasting operation involving line drilling and muffle blasting in the proposed quarry such that the blast-induced ground vibrations are controlled as well as no fly rock travel beyond 30 m from the blast site.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p>Blasting operation details are provided in the <b>Chapter 7, Section 7.1.2.5.</b></p>                                                                         |
|  | <p>11. The EIA Coordinators shall obtain and furnish the details of quarry/quarries operated by the proponent in the past, either in the same location or elsewhere in the State with video and photographic evidences.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <p>Not Applicable. It is a fresh quarry proposed by the M/s. Tamil Nadu Minerals Ltd, (An undertaking of Government of Tamil Nadu).</p>                          |
|  | <p>12. If the proponent has already carried out the mining activity in the proposed mining lease area after 15.01.2016, then the proponent shall furnish the following details from AD/DD, mines,</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>The quarry was operated after 15.01. 2016. Hence, TAMIN had applied for EC uner violation category as per MoEF&amp;CC Notification 14.03.2017 and got EC.</p> |
|  | <p>13. What was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines?</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <p>-do-</p>                                                                                                                                                      |

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|  | <p>14. Quantity of minerals mined out.</p> <ul style="list-style-type: none"> <li>· Highest production achieved in any one year</li> <li>· Detail of approved depth of mining.</li> <li>· Actual depth of the mining achieved earlier.</li> <li>· Name of the person already mined in that leases area.</li> <li>· If EC and CTO already obtained, the copy of the same shall be submitted.</li> <li>· Whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches.</li> </ul> | <p>Will be submitted at the time of submission of final EIA</p>                                                                                                                                                                                                                                                                          |
|  | <p>15. All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/Topo sheet, topographic sheet, geomorphology, lithology and geology of the mining lease area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).</p>                                                                                                                                                            | <p>All corner coordinates of the mine lease area are provided in <b>Chapter 1, Table 1-5</b>. Topo map is provided in <b>Chapter 3 Figure 2-9</b>. The land use and other ecological features of the study area (core and buffer zone) are provided in <b>Figure 3-6</b>.</p>                                                            |
|  | <p>16. The PP shall carry out Drone video survey covering the cluster, green belt, fencing, etc.,</p>                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>The PP will be provided the Drone Video survey covering the cluster, Greenbelt and fencing during the Final EIA submission.</p>                                                                                                                                                                                                       |
|  | <p>17. The proponent shall furnish photographs of adequate fencing, green belt along the periphery including replantation of existing trees &amp; safety distance between the adjacent quarries &amp; water bodies nearby provided as per the approved mining plan.</p>                                                                                                                                                                                                                                                       | <p>The PP will furnish photographs of adequate fencing, green belt along the periphery including replantation of existing trees &amp; safety distance between the adjacent quarries &amp; water bodies nearby provided as per the approved mining plan during the Final EIA Submission.</p>                                              |
|  | <p>18. The Project Proponent shall provide the details of mineral reserves and mineable reserves, planned production capacity, proposed working methodology with justifications, the anticipated impacts of the mining operations on the surrounding environment, and the remedial measures for the same.</p>                                                                                                                                                                                                                 | <p>The details of mineral reserves and mineable reserves, planned production capacity, proposed working methodology with justifications is provided in <b>Chapter 2 Section 2.7</b>.<br/>The anticipated impacts of the mining operations on the surrounding environment and the remedial measures are provided in <b>Chapter 4</b>.</p> |
|  | <p>19. 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 the Mines Act'1952 and the MMR, 1961 for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment.</p>                                                                                                                                               | <p>The proposed Organization chart indicating the appointment of various statutory officials and other competent people is provided in Chapter 10.</p>                                                                                                                                                                                   |

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| <p>20. The Project Proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of groundwater pumping &amp; 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.</p> | <p>Noted &amp; will be provided during Final EIA submission.</p> |
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| 21. The proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality & flora/fauna including traffic/vehicular movement study.                                                                                                                                                                                                     | S. No                                                                                                                                                                                                                                                                                                                                                                 | Description of Section | Section                                                       | Parameters                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1                                                                                                                                                                                                                                                                                                                                                                     | Meteorology            | Section 3.5.2                                                 | Temperature, Relative Humidity, Rainfall, Wind Speed & Direction                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2                                                                                                                                                                                                                                                                                                                                                                     | Ambient Air Quality    | Section 3.5.4                                                 | As per NAAQS, 2009 as per ToR                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | 3                                                                                                                                                                                                                                                                                                                                                                     | Ambient Noise Levels   | Section 3.6                                                   | Day equivalent noise levels, Night equivalent noise levels (As per CPCB Standards)                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | 4                                                                                                                                                                                                                                                                                                                                                                     | Water Quality          | Surface water – Section 3.7.2<br>Ground water – Section 3.7.3 | Ground Water – IS 10500:2012<br>Surface Water – IS 2296 (Class – A)                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | 5                                                                                                                                                                                                                                                                                                                                                                     | Soil Quality           | Section 3.8                                                   | ICAR (Indian Council of Agricultural research)                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6                                                                                                                                                                                                                                                                                                                                                                     | Ecology                | Section 3.9                                                   | Flora and Fauna                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                              | 7                                                                                                                                                                                                                                                                                                                                                                     | Social Economic Status | Section 3.10                                                  | Socio Economic Profile of Study area (Population Profile, Employment and Livelihood, Education and Literacy, etc.,) |
| 22. The Proponent shall carry out the Cumulative impact study due to mining operations carried out in the quarry specifically with reference to the specific environment in terms of soil health, biodiversity, air pollution, water pollution, climate change and flood control & health impacts. Accordingly, the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind. | The Cumulative impact study due to mining operations carried out in the quarry specifically with reference to the specific environment in terms of soil health, biodiversity, air pollution, water pollution, climate change and flood control & health impacts is provided in Chapter 4. The Environment Management plan is prepared and provided in the Chapter 10. |                        |                                                               |                                                                                                                     |

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|  | <p>23. Rain water harvesting management with recharging details along with water balance (both monsoon &amp; non-monsoon) be submitted</p>                                                                                                                                                                                                                                                                                                          | <p>The total water requirement is 3.5 KLD, Balance during the non-monsoon is provided in Chapter 4, Section 4.3.1 and <b>Figure 4-5</b>.</p> <p>The monsoon water requirement is only drinking water is about 0.5 KLD. Rainwater will be stored in a pond in the lease area and will be used for mining activities including greenbelt. Rainwater harvesting management details are provided in Chapter 4, Section 4.3.2.3.</p> |
|  | <p>24. Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.</p> | <p>Complied.</p> <p>The Information/data presented in Chapter 3, Figure 3-5. Topo map is provided in Chapter 3 Figure 3-2. The land use and other ecological features of the study area (core and buffer zone) is provided in Figure 3-6.</p>                                                                                                                                                                                   |
|  | <p>25. Details of the land for storage of Overburden/Waste Dumps (or) Rejects outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&amp;R issues, if any, should be Provided.</p>                                                                                                                                                                                                                          | <p>Total waste to be generated during 10 years period will be 1,75,802m<sup>3</sup>. The area for disposal of waste rock has been identified over the existing waste dump in north and southwest side of the lease area. The dumps will be maintained not exceeding 5m height and the angle of slope of dumps will be at 45° from horizontal.</p> <p>The Land breakup is provided in <b>Chapter 2 &amp; Table 2-4</b>.</p>      |
|  | <p>26. Proximity to Areas declared as 'Critically Polluted' (or) the Project areas which attracts the court restrictions for mining operations, should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the TNPCB (or) Dept. of Geology and Mining should be secured and furnished to the effect that the proposed mining activities could be considered.</p>                             | <p>Not Applicable.</p>                                                                                                                                                                                                                                                                                                                                                                                                          |
|  | <p>27. Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.</p>                                                                                                                                                                                                                                                   | <p>Water conservation measures proposed to be adopted in the Project as Rainwater storage ponds/tanks &amp; Storage cum recharge ponds in possible areas.</p>                                                                                                                                                                                                                                                                   |

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|  | <p>28. Impact on local transport infrastructure due to the Project should be indicated.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>The metallic Road located to the adjacent to the project site. The road will be damaged due to Heavy vehicle movement with materials; However, the PP will be maintained the roads with proper dust suppression measures and regular repairs.</p> <p>The average annual production is estimated at 19533 m<sup>3</sup> (approximately 6898 metric tons) of granite. Based on an operating schedule of 240 working days per year, the average saleable production will be around 10.4 m<sup>3</sup> per day (or 23 metric tons per day). Assuming an average truck carrying capacity of 10 tons, this translates to approximately 2–3 truck trips per day, depending on market conditions. This minimal level of traffic is not expected to have a significant impact on the existing transportation infrastructure.</p> |
|  | <p>29. A tree survey study shall be carried out (nos., name of the species, age, diameter etc.,) both within the mining lease applied area &amp; 300m buffer zone and its management during mining activity.</p>                                                                                                                                                                                                                                                                                                                    | <p>Few trees are available in the lease area and 300m buffer zone. Most small bushes and shrubs are available.</p> <p>List of Trees located within the 300 m from the boundary of the mine lease area are provided in Chapter 2.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|  | <p>30. A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific.</p>                                                                                                                                                                                                                                                                                                                                                                                                 | <p>Noted &amp; will be provided during Final EIA submission.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|  | <p>31. As a part of the study of flora and fauna around the vicinity of the proposed site, the EIA coordinator shall strive to educate the local students on the importance of preserving local flora and fauna by involving them in the study, wherever possible.</p>                                                                                                                                                                                                                                                              | <p>Noted.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|  | <p>32. The purpose of Green belt around the project is to capture the fugitive emissions, carbon sequestration and to attenuate the noise generated, in addition to improving the aesthetics. A wide range of indigenous plant species should be planted as given in the appendix-I in consultation with the DFO, State Agriculture University. The plant species with dense/moderate canopy of native origin should be chosen. Species of small/medium/tall trees alternating with shrubs should be planted in a mixed manner.</p> | <p>Noted &amp; will be complied.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

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| 33. Taller/one year old Saplings raised in appropriate size of bags, preferably ecofriendly bags should be planted as per the advice of local forest authorities/botanist/Horticulturist with regard to site specific choices. The proponent shall earmark the greenbelt area with GPS coordinates all along the boundary of the project site with at least 3 meters wide and in between blocks in an organized manner. | Noted & will be complied.                                                                                                                                                                                                              |
| 34. A Disaster management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period.                                                                                                                                                                                                                                                 | A Disaster management Plan is provided in Chapter 7, Section 7.1.3.                                                                                                                                                                    |
| 35. A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period.                                                                                                                                                                                                                                      | Risk Identification and Management details are provided in the Chapter 7 Section 7.1.2.                                                                                                                                                |
| 36. Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.                          | Complied. The details are provided in <b>Chapter 6, Section 6.3.1 and Table 6-1.</b>                                                                                                                                                   |
| 37. Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.                                                                                                                                                                                   | The Impacts on public health including employees due to project related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures are provided in Chapter 4, Section 4.8. |
| 38. 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.                                                               | The Socio-economic studies are provided in Chapter 3 Section 3.11.<br><br>The socio-economic significance and influence/impact and mitigation measures details are provided in Chapter 4, Section 4.7.                                 |
| 39. Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.                                                                                                                                                                                                                                                                    | No of litigation pending against the project.                                                                                                                                                                                          |
| 40. Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.,                                                                                                                                                                                                                          | Benefits of the Project is provided in Chapter 8 EIA report.                                                                                                                                                                           |

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|                                      | 41. If any quarrying operations were carried out in the proposed quarrying site for which now the EC is sought, the Project Proponent shall furnish the detailed compliance to EC 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/TNPCCB. | Not applicable, since it is a Greenfield project.                                                                                                                                                                                                                         |
|                                      | 42. The PP shall prepare the EMP for the entire life of mine and also furnish the sworn affidavit stating to abide the EMP for the entire life of mine.                                                                                                                                                                                           | The PP will be provided the sworn affidavit stating to abide the EMP for the entire life of mine is provided during the Final EIA.                                                                                                                                        |
|                                      | 43. Concealing any factual information or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this Terms of Conditions besides attracting penal provisions in the Environment (Protection) Act, 1986.                                                                | Noted.                                                                                                                                                                                                                                                                    |
| <b>4. Seiaa Standard Conditions:</b> |                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                           |
| <b>Cluster Management Committee</b>  |                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                           |
|                                      | 1. Cluster Management Committee shall be framed which must include all the proponents in the cluster as members including the existing as well as proposed quarry.                                                                                                                                                                                | The Cluster Management Committee will be formed which include all the proponents in the cluster as members including the existing as well as proposed quarry and do all the works as directed in the EC letter while commencement of quarry operation after obtaining EC. |
|                                      | 2. The members must coordinate among themselves for the effective implementation of EMP as committed including Green Belt Development, Water sprinkling, tree plantation, blasting etc.,                                                                                                                                                          | Noted.                                                                                                                                                                                                                                                                    |
|                                      | 3. The List of members of the committee formed shall be submitted to AD/Mines before the execution of mining lease and the same shall be updated every year to the AD/Mines.                                                                                                                                                                      | Noted.                                                                                                                                                                                                                                                                    |
|                                      | 4. Detailed Operational Plan must be submitted which must include the blasting frequency with respect to the nearby quarry situated in the cluster, the usage of haul roads by the individual quarry in the form of route map and network.                                                                                                        | Blasting details are provided in the Chapter 7, Section 7.1.2.5.                                                                                                                                                                                                          |
|                                      | 5. The committee shall deliberate on risk & emergency management plan, fire safety & evacuation plan and sustainable development goals pertaining to the cluster in a holistic manner especially during natural calamities like intense rain and the mitigation measures considering the inundation of the cluster and evacuation plan.           | Noted.                                                                                                                                                                                                                                                                    |

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|  | 6. The Cluster Management Committee shall form Environmental Policy to practice sustainable mining in a scientific and systematic manner in accordance with the law. The role played by the committee in implementing the Environmental policy devised shall be given in detail in the EIA Report. | PP will provide the Environmental policy during the final EIA submission.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|  | 7. The committee shall furnish action plan regarding the restoration strategy with respect to the individual quarry falling under the cluster in a holistic manner.                                                                                                                                | Noted & will be complied.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|  | 8. The committee shall deliberate on the health of the workers/staff involved in the mining as well as the health of the public in the vicinity.                                                                                                                                                   | Noted & will be complied.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|  | <b>Agriculture &amp; Agro-Biodiversity</b>                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|  | 9. Impact on surrounding agricultural fields around the proposed mining Area.                                                                                                                                                                                                                      | No. of trees detail are provided in Chapter 2. <b>Error! Reference source not found.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|  | 10. Impact on soil flora & vegetation around the project site.                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|  | 11. Details of type of vegetation including no. of trees & shrubs within the proposed mining area and If so, transplantation of such vegetation all along the boundary of the proposed mining area shall committed mentioned in EMP.                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|  | 12. The Environmental Impact Assessment should study the agro-biodiversity, agro- forestry, horticultural plantations, the natural ecosystem, the soil micro flora, fauna and soil seed banks and suggest measures to maintain the natural Ecosystem.                                              | The Impact on surrounding agricultural fields, soil flora & vegetation, no. of trees & shrubs are provided in Chapter 4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|  | 13. Action should specifically suggest for sustainable management of the area and restoration of ecosystem for flow of goods and services                                                                                                                                                          | The entire mine lease area of 13.74.0 Ha is Government land which is leased by TAMIN. The quarry the precise area communication letter is enclosed as Annexure-7. The land is barren land and deposited with granite minerals. There is no requirement of restoration of ecosystem. However, TAMIN proposed not to back fill the ultimate pit. In as much as good quality of reserves is available below the workable depth of 30m and there is possibility of technology of up gradation in granite mining for greater depths in course of time for safe mining at economic cost beyond 30m depth. Th Environmental policy pit boundaries will be fenced and used for agricultural purposes when the pit is filled with underground seepage or rainwater |

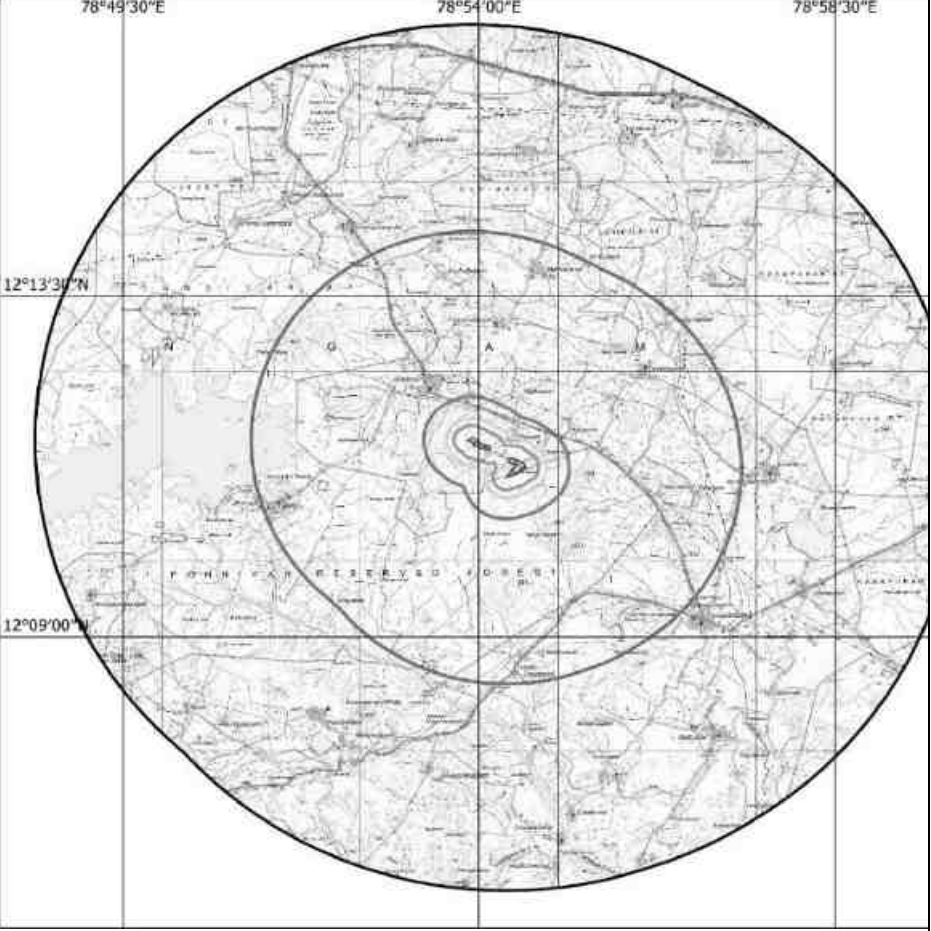
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|  | <p>14. The project proponent shall study and furnish the impact of project on plantations in adjoining patta lands, Horticulture, Agriculture and livestock.</p>    | <ul style="list-style-type: none"> <li>• Safety distance of 50 m on the eastern side of SF.No.127 and western side of SF.No.74 should be maintained for the "Periya Eri" in SF.No.132.</li> <li>• Safety distance of 50 m has to be maintained to the Murugan, Pillaiyar and Ponmudirayar Temples and no hindrance shall be caused to the Public for their worshipping.</li> <li>• Safety distance of 7.5 m should be maintained to the patta lands surrounding the applied area on the northern side of SF.Nos.126/1A &amp; 127. The applicant company should not make any hindrance to the adjacent pattadars during quarry operation.</li> <li>• A safety distance of 50 m on either side for the powerlines should be maintained.</li> <li>• A safety distance of 50 m to the "Sitheri" and 60 m should be maintained to the nearby Reserve Forest.</li> <li>• Public shall not be disturbed for using the village road on the northern side of SF.Nos. 126/1A &amp; 127.</li> </ul> |
|  | <b>Forests</b>                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|  | <p>15. The project proponent shall detailed study on impact of mining on Reserve forests and free ranging wildlife.</p>                                             | <p>The entire mine lease area of 13.74.0 Ha is Government land which is leased by TAMIN. The quarry the precise area communication letter is enclosed as Annexure-7. There is no forest land is involved in the lease area.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|  | <p>16. The Environmental Impact Assessment should study impact on forest, vegetation, endemic, vulnerable and endangered indigenous flora and fauna.</p>            | <p>Complied.</p> <ul style="list-style-type: none"> <li>• There are no National Parks, Sanctuary, Biosphere Reserve, Tiger Reserve, Elephant Reserve, wildlife migratory routes in core and buffer zones within the 1km radius of the project.</li> <li>• No wildlife is found in the quarry Lease area. To minimize the impacts and to improve up on the existing eco system Afforestation plan will be envisaged with native plants.</li> </ul> <p>Detailed biodiversity study is provided in the Chapter 3, Section 3.10.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|  | <p>17. The Environmental Impact Assessment should study impact on standing trees and the existing trees should be numbered and action suggested for protection.</p> | <p>Complied.</p> <p>Standing trees and the existing trees are provided in Chapter 2, within 300m radius. TAMIN Mining activities will not disturb the any existing plant. However regular dust suppression will be maintained in and around the mining area and additional plants will be provided under afforestation program with native species.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

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|  | 18. The Environmental Impact Assessment should study impact on protected areas, Reserve Forests, National Parks, Corridors and Wildlife pathways, near project site.                                                                                                                                                                                                                                                                                                                                                   | Complied.<br>The Environmental Impact Assessment covers Reserve Forests in nearby project sites. There is no National Parks, Corridors and Wildlife pathways, near project site.                                                                                                                                                                                                                                                                                                                         |
|  | <b>Water Environment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|  | 19. 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) so as to assess the impacts on the nearby waterbodies due to mining activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided, covering the entire mine lease period. | The number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within 1 km (radius) with depth of wells and water availability is provided in Chapter 2.<br><br>Hydro-geological study is carried out and submitted during the Final EIA Submission.                                                                                                                                                                                                |
|  | 20. Erosion Control measures.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Erosion Control measures are provided in Chapter 4 Section 4.3.2.1 under surface water pollution control measures.                                                                                                                                                                                                                                                                                                                                                                                       |
|  | 21. Detailed study shall be carried out in regard to impact of mining around the proposed mine lease area on the nearby Villages, Water-bodies/ Rivers, & any ecological fragile areas.                                                                                                                                                                                                                                                                                                                                | Complied.<br>The details are provided in Chapter 4, Section 4.3.                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|  | 22. The project proponent shall study impact on fish habitats and the food WEB/ food chain in the water body and Reservoir.                                                                                                                                                                                                                                                                                                                                                                                            | There is no major fish habitats and the food chain in the water body and Reservoir in nearby project site.                                                                                                                                                                                                                                                                                                                                                                                               |
|  | 23. The project proponent shall study and furnish the details on potential fragmentation impact on natural Environment, by the activities.                                                                                                                                                                                                                                                                                                                                                                             | Complied.<br>The study details are provided in Chapter 4, Section 4.2.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|  | 24. The project proponent shall study and furnish the impact on aquatic plants and animals in water bodies and possible scars on the landscape, damages to nearby caves, heritage site, and archaeological sites possible land form changes visual and aesthetic impacts.                                                                                                                                                                                                                                              | There is no aquatic plants and animals in water bodies and landscape and there are no damages to nearby caves, heritage site, and archaeological sites possible landform changes visual and aesthetic impacts since there are no nearby caves, heritage sites, and archaeological sites within the core area other than Prehistoric Site is located at ~11.05km (SW).<br>Sathanur Dam is located at distance of ~3.73km (W) which may have aquatic plants. There is no impact by the project activities. |
|  | 25. The Terms of Reference should specifically study impact on soil health, soil erosion, the soil physical, chemical components and microbial components.                                                                                                                                                                                                                                                                                                                                                             | Complied.<br>The soil physical, chemical components of soil health details are provided in Chapter 3, Section 3.9.                                                                                                                                                                                                                                                                                                                                                                                       |
|  | 26. The Environmental Impact Assessment should study on wetlands, water bodies, rivers streams, lakes and farmer sites.                                                                                                                                                                                                                                                                                                                                                                                                | There are no major wetlands, water bodies, rivers streams, lakes in nearby project site.                                                                                                                                                                                                                                                                                                                                                                                                                 |

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|  | 27. The EIA shall include the impact of mining activity on the following:<br>a) Hydrothermal/Geothermal effect due to destruction in the Environment.<br>b) Bio-geochemical processes and its foot prints including Environmental stress.<br>c) Sediment geochemistry in the surface streams. | Will be complied.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|  | <b>Energy</b>                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|  | 28. The measures taken to control Noise, Air, Water, Dust Control and steps adopted to efficiently utilise the Energy shall be furnished.                                                                                                                                                     | Complied.<br>The proposed black granite quarry will be operated with the Open Cast Semi Mechanized method. Drilling and blasting and excavation are carried out through diesel drive machinery. The methodology of mining is provided in provided in Chapter 2.                                                                                                                                                                                                                                                                                                  |
|  | <b>Climate Change</b>                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|  | 29. The Environmental Impact Assessment shall study in detail the carbon emission and also suggest the measures to mitigate carbon emission including development of carbon sinks and temperature reduction including control of other emission and climate mitigation activities.            | The emission like PM10, PM2.5, NOX and SO2 are major pollution contribution to the atmosphere by the mining activities.<br>It was observed that the maximum ground level concentration observed due to mining activities and traffic movement without control measures for PM10, PM2.5 and NOx are 25.7 µg/m <sup>3</sup> , 13.0 µg/m <sup>3</sup> and 12.5 µg/m <sup>3</sup> respectively. The highest concentration levels identified at the project site only. So, it can be concluded that even during operation of quarry the impact envisaged is moderate. |
|  | 30. The Environmental Impact Assessment should study impact on climate change, temperature rise, pollution and above soil & below soil carbon stock, soil health and physical, chemical & biological soil features                                                                            | Study impact on climate change, temperature rise, pollution, and above soil & below soil carbon stock will be provided during Final EIA Submission.                                                                                                                                                                                                                                                                                                                                                                                                              |
|  | 31. Impact of mining on pollution leading to GHGs emissions and the impact of the same on the local livelihood.                                                                                                                                                                               | Impact of mining on pollution leading to GHGs emissions and the impact of the same on the local livelihood details are provided in the Chapter 4, <b>Table 4-18.</b>                                                                                                                                                                                                                                                                                                                                                                                             |
|  | <b>Mine Closure Plan</b>                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|  | 32. Detailed Mine Closure Plan covering the entire mine lease period as per precise area communication order issued.                                                                                                                                                                          | Complied.<br>The details are provided in Chapter 7, Section 7.1.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|  | <b>EMP</b>                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|  | 33. Detailed Environment Management Plan along with adaptation, mitigation & remedial strategies covering the entire mine lease period as per precise area communication order issued and the scope for achieving SDGs.                                                                       | Complied.<br>The Environment Management Plan along with adaptation, mitigation & remedial strategies are provided in Chapter 10.                                                                                                                                                                                                                                                                                                                                                                                                                                 |

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|  | 34. The Environmental Impact Assessment should hold detailed study on EMP with budget for Green belt development and mine closure plan including disaster management plan.                                                                                                                                                                                                                  | Complied.<br>EMP with budget for green belt development and mine closure plan including disaster management plan is provided in Chapter 10.                                                                                                                                           |
|  | <b>Risk Assessment</b>                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                       |
|  | 35. To furnish risk assessment and management plan including anticipated vulnerabilities during operational and post operational phases of Mining.                                                                                                                                                                                                                                          | Complied.<br>The Environment Management Plan along with adaptation, mitigation & remedial strategies are provided in Chapter 7, Section 7.1.2.                                                                                                                                        |
|  | <b>Disaster Management Plan</b>                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                       |
|  | 36. To furnish disaster management plan and disaster mitigation measures in regard to all aspects to avoid/reduce vulnerability to hazards & to cope with disaster/untoward accidents in & around the proposed mine lease area due to the proposed method of mining activity & its related activities covering the entire mine lease period as per precise area communication order issued. | Complied.<br>A disaster management plan and disaster mitigation measure are provided in Chapter 7, Section 7.1.3.                                                                                                                                                                     |
|  | <b>Others</b>                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                       |
|  | 37. The project proponent shall furnish VAO certificate with reference to 300m radius regard to approved habitations, schools, Archaeological sites, Structures, railway lines, roads, water bodies such as streams, odai, vaari, canal, channel, river, lake pond, tank etc.,                                                                                                              | The PP will furnish VAO certificate with reference to 300m radius regard to approved habitations, schools, Archaeological sites, Structures, railway lines, roads, water bodies such as streams, odai, vaari, canal, channel, river, lake pond, tank etc during Final EIA Submission. |
|  | 38. As per the MoEF& CC office memorandum F.No.22-65/2017-IA.III dated: 30.09.2020 and 20.10.2020 the proponent shall address the concerns raised during the public consultation and all the activities proposed shall be part of the Environment Management Plan.                                                                                                                          | The concerns raised during the public consultation and all the activities proposed will be included in the Environment Management Plan after public Hearing.                                                                                                                          |

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| <p>39. The project proponent shall study and furnish the possible pollution due to plastic and microplastic on the Environment. The ecological risks and impacts of plastic &amp; microplastics on aquatic Environment and fresh water systems due to activities, contemplated during mining may be investigated and reported. Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to</p> | <p>During quarry operations, Municipal solid waste and waste oil are likely to be generated and categorized as Hazardous Waste and Non-hazardous Waste. Further, the generation of waste may include Biodegradable, Recyclable and Inert compounds. Yearwise production details are provided in the <b>Table 1-3</b></p>                                                                                                                                                                                                       | <p>be ge<br/>nerat</p>                               |
| <p>Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.</p>                                                                                                                                                                                                                                                                                                                       | <p>Yearwise production details are provided in the <b>Table 1-3.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                      |
| <p>A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>Government of Tamil Nadu granted lease to TAMIN for quarrying Black Granite on Government poramboke land in Survey Field No (SF No). 74/1(Part), 126/1A, 127, 145/2(Part) situated in Veeranam Village in Thandarampattu Taluk of Thiruvannamalai District, Tamil Nadu under Industries (MME1) department dated 24.05.2004 for a period of 20 years under Rule 10 of Mineral Concession Rules, 1959. As the lease deed was executed with the District Collector, Thiruvannamalai, the period is valid up to 14.06.2024.</p> | <p>ite o<br/>A, 127<br/>nama<br/>er Ru<br/>ct Co</p> |

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| <p>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.</p>                                                            | <p>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.</p>                               |  |
| <p>All corner coordinates of the mine lease area, superimposed on a HighResolution Imagery/toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone)</p> | <p>All corners co-ordinates of the mine lease area is given in Chapter 1 and Section 3-9.</p>  <p>Figure 2-9. Geology and Geomorphology of the area is provided in Chapter 3, Section 3-9.</p>                      |  |
| <p>Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.</p>                                         | <p>Topo map with existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics are prepared in 1:50000 scale and is given as Figure 3-2. Geomorphology pattern of the study area is shown in Chapter 33.4.7, Figure 3-9 &amp; Figure 3-10.</p> |  |

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| <p>Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p>The renewal of quarry Lease has been obtained for total extent of 13.74.0Ha (instant) at Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, Tamil Nadu for a period of 10 years from 21.10.2024 to 20.10.2034, vide Tamil Nadu Minor Mineral Concession Rules, 1959 vide Govt Letter No.679, Madras 1)/2024-1, dated, 21.10.2024.</p> <p>The area lies in 12°11'13.12"N to 12°11'28.05"N latitude and 78°54'35.10"E to 78°54'45.10"E longitude. The area does not fall under forest land of any category. It is Government Poramboke land.</p> <p>As directed in the precise area communication letter TAMIN has prepared the Mining Plan (Dolerite) over an extent of 13.74.0 Ha at SF.No. 74(P), 126/1A, 127, 144/1 of Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District and submitted the same to the authority concerned. Subsequently, the Mining Plan has been approved by the Commissioner of the Geological Survey of India, Chennai vide No. 8095/MM4/2023, dated: 28.02.2025.</p> | <p>(inst<br/>od of<br/>Natura<br/>p 78°<br/>nd.<br/>Mining<br/>of Veer<br/>rned.<br/>Geo</p> |
| <p>It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/ violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of noncompliances/ violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.</p> | <p>Environmental Policy of TAMIN is given in Chapter 10, Section 10.11.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                              |
| <p>Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <p>It is a Black Granite quarry and open cast Mining methodology will be followed within 30m from the top of the hill.</p> <p>Mining methodology is provided in Chapter 2 and Section 2.9 and Section 2.10 and Chapter-4, Section 4.10.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>The v<br/>Safe</p>                                                                        |

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| <p>The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc. should be for the life of the mine / lease period.</p>                                                                                                                                                                                                                                                                                                                                                                                                                          | <p>10 Km radius from the project periphery area is considered as study area. The Chapter 3. The production and waste generation from quarry activities is estimated in Chapter 2 Section 2.7.</p>                                                                                                                                                                                                                                    | <p>baseline<br/>ated</p>                  |
| <p>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.</p>                                                                                                                                                                                          | <p>The environmental sensitive areas covering an aerial distance of 15km from the Section 3.2 and Table 3-1.</p> <p>Land use of the study area is provided in Figure 3-6 and Table 3-3 with delineating grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies and ecological features.</p>                                                                                                        | <p>project<br/>delineating<br/>bodies</p> |
| <p>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&amp;R issues, if any, should be given.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p>It is a government poramboke land lease obtained lease for 20 years by the T. MIN. no R&amp;R issues are involved in the proposed project.</p> <p>Total waste to be generated during ten years period will be 1,75,802 M<sup>3</sup>. The area for identified over the existing waste dump in north and southwest side of the lease area not exceeding 5m height and the angle of slope of dumps will be at 45° from horizon.</p> | <p>MIN.<br/>area for<br/>area</p>         |
| <p>A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.</p> | <p>Not applicable.<br/>No forest land is involved in the lease area.</p>                                                                                                                                                                                                                                                                                                                                                             |                                           |

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| Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.                                                                                                                                                                                                                                                                  | Not applicable since, no forest land is involved in the lease area.                                                                                                                                                                                                                                                                                                                                                                            |
| Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.                                                                                                                                                                                                                                                                                                                                                   | Not applicable.<br>No scheduled tribes and other traditional forest dwellers are observed in the study area. The land is a non-forest government poramboke land.                                                                                                                                                                                                                                                                               |
| The vegetation in the RF / PF areas in the study area, with necessary details, should be given                                                                                                                                                                                                                                                                                                                                                                                                                                         | The list of Reserve forests available within the 15km radius is provided in Chapter 3, Figure 3-3.                                                                                                                                                                                                                                                                                                                                             |
| 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.                                                                                                                                                                                                  | Baseline Biological survey was carried out to assess the ecology of the study area. The survey identified various trees, shrubs, climbers, and herbs. Similarly, the faunal diversity is grouped into various categories including amphibians. There are no extinct flora and fauna species found in the study area. The details are provided in the Chapter 3, Section 3.10.<br>The mitigation measure is provided in Chapter 4, Section 4.7. |
| Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished. | No Biosphere Reserves, Wildlife Corridors, Tiger/Elephant Reserves are available within the 15km radius of the project site.<br>The detailed Environmental Sensitivity areas within the 15km radius of the project site are provided in Chapter 3.3, Table 3-1 and Figure 3-3.                                                                                                                                                                 |

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| <p>A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled- I fauna found in the study area, the necessary plan alongwith budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.</p> | <p>Detailed Biological Study of the Study Area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] was carried out and list of Flora &amp; Fauna is detailed is given in Chapter , Sect</p> |  |
| <p>Proximity to Areas declared as Critically Polluted or the Project areas likely to come under the Aravali Range, (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Dept. Should be secured and furnished to the effect that the proposed mining activities could be considered.</p>                                                                                                                                                                                                                                                                                                      | <p>Not applicable, Since the proposed project area does not falls under Critically Polluted</p>                                                                                                                       |  |
| <p>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).</p>                                                                                                                                                                                                                                                                                                                                                         | <p>Not applicable since proposed lease does not fall under CRZ area.</p>                                                                                                                                              |  |

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| <p>R&amp;R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&amp;R Plan, the relevant State/National Rehabilitation &amp; Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&amp;R and socio-economic aspects should be discussed in the Report.</p> | <p>Not applicable.</p> <p>The lease area is classified as Government Poramboke land. TAMIN has obtained the letter is obtained from Govt. of Tamil Nadu for 20 years. There is no Rehabilitation and Resettlement Plan.</p> <p>Precise area communication letter is enclosed as Annexure-7.</p> |  |
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One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season); December-February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Sitespecific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.

One season (Feb 2025 – April 2025) the primary baseline data on ambient air quality and water quality, noise level, soil and flora and fauna, Site- specific meteorological data shall be furnished in Chapter-3.

1. Meteorology Section 3.5.2 Temperature, Relative Humidity, Rainfall, Wind
  2. Ambient Air Quality Section 3.5.4. As per NAAQS, 2009
  3. Ambient Noise Levels Section 3.6 Day equivalent noise levels, Night equivalent noise levels (Standards)
  4. Water Quality Surface water – Section 3.7.2 Ground water – Section 3.7.3 Surface Water -IS 2296 (Class – A)
  5. Soil Quality Section 3.8 ICAR (Indian Council of Agricultural research)
  6. Ecology Section 3.9 Flora and Fauna
- Social Economic Status Section 3.11 (Socio Economic Profile of Study area Population, Livelihood, Education and Literacy, etc.,)

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| <p>Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.</p> | <p>AERMOD Air quality modeling has been carried out to predict the air quality during the activities impacts within the 10km radius of the project site for PM<sub>10</sub>, PM<sub>2.5</sub> and NO<sub>x</sub>. The details are provided in Chapter 4, Section 4.2.4.</p> <p>The maximum ground level concentration observed due to mining activities and modeling for PM<sub>10</sub>, PM<sub>2.5</sub>, and NO<sub>x</sub> are 25.7 µg/m<sup>3</sup>, 13.0 µg/m<sup>3</sup> and 12.5 µg/m<sup>3</sup> respectively. The details are given in Chapter 4, Section 4.2.3. Predominant wind direction is as shown in Figure 4-1.</p> |  |
| <p>The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.</p>                                                                                                                                                                                                                                                                                                                                                                | <p>The water requirement for the project is addressed in Chapter 2 Section 2.11.2 and Table 2.11.2.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |
| <p>Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>No ground water withdrawal to meet the water requirement. The total water requirement is sourced from Vendor or village panchayat.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |
| <p>Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.</p>                                                                                                                                                                                                                                                                                                                                                                                | <p>Water conservation measures are proposed in Chapter 4 and Section 4.3. Rainwater harvesting detailed are provided in Chapter 3 Section 4.3.2.3.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
| <p>Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.</p>                                                                                                                                                                                                                                                                                                                                                                                                   | <p>Impacts on water environment &amp; water conservation measures are proposed in Chapter 4 and Section 4.3.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |

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| <p>Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from State Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.</p> | <p>The proposed depth of mining is 30m from the top of the hill.</p> <p>Ground water table is available at 6.30m as per the Mining plan. The PP will provide the details during Final EIA Submission.</p>                      |  |
| <p>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.</p>                                                                                                                                                                                                                                                                                                                                                                                                     | <p>Not Applicable.</p> <p>There are no streams, or seasonal streams passing through the project area since it is a quarry. However, TAMIN provided all safety measures for nearby water bodies and are provided in the PP.</p> |  |
| <p>Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.</p>                                                                                                                                                                                                                                                                                                                                                                                                                              | <p>The altitude of the area is 194m (Maximum) above MSL and average annual rainfall is 1200mm. The ground water level is at 6.30m depth from ground level.</p> <p>Site Salient features are given in Chapter 2, Table 2-2.</p> |  |

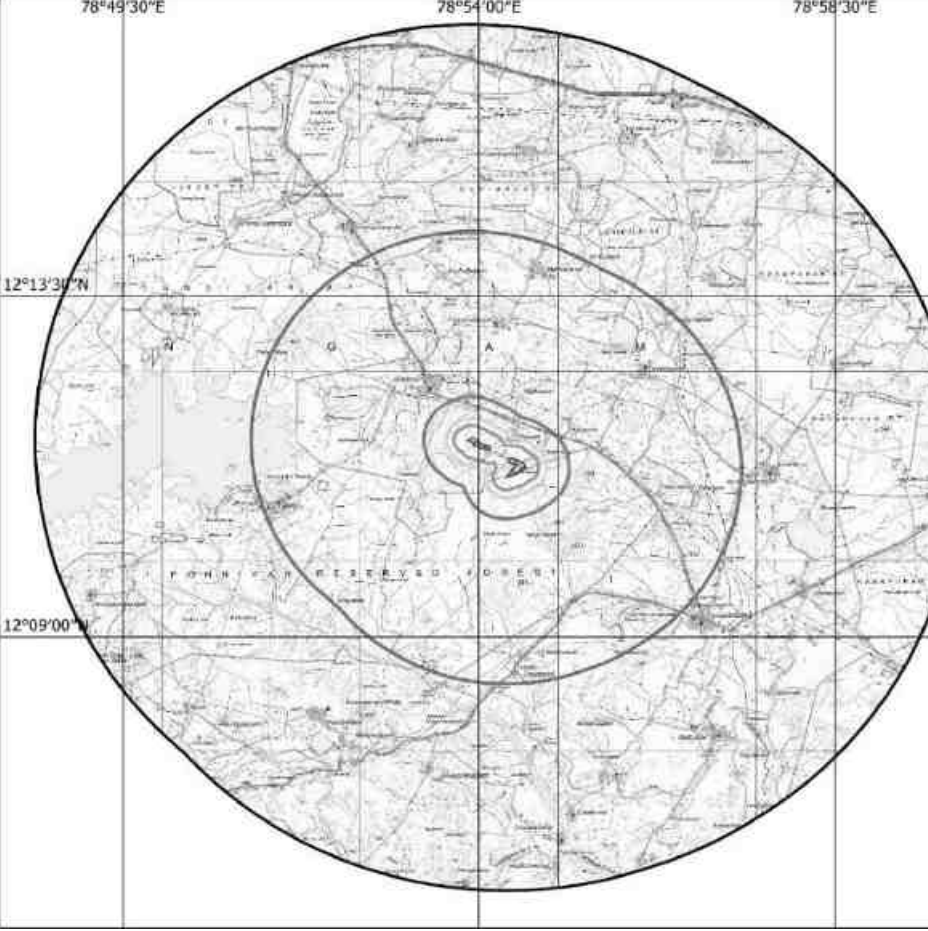


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| Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.                                                                                                                                                                                                                    | Conceptual post mining land use and Reclamation and restoration sectional plans and with adequate number of sections are provided in <b>Error! Reference source not found.</b> |
| 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 & preventive measures detailed given in Chapter 4 and<br>The EMP details are given as a separately as Chapter 10 along with EMP Cost details       |
| 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.                                                                                                                                                          | Occupational Health impacts & preventive measures detailed given in Chapter 4 and<br>The EMP details are given as a separately as Chapter 10 along with EMP Cost details       |
| 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.                                                                                                                                           | Impacts and measures are addressed in Chapter 4 and Section 4.5 and Section 4.9.                                                                                               |
| 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.                                                                                                  | The EMP details are given as a separately as Chapter 10.                                                                                                                       |

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| Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project. | The draft EIA is prepared as per obtained ToR and will be submitted for public hearing and obtaining minutes the point wise proponent compliance will be e |
| Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.                                                                                                        | There is no litigation pending against the project.                                                                                                        |
| The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.                                                                                                                | The project Cost is addressed in Chapter 2, Section 2.8 & Table 2-9.                                                                                       |
| A Disaster management Plan shall be prepared and included in the EIA/EMP Report.                                                                                                                                                                        | Disaster Management Plan is given in Chapter 7 and Section 7.1.2.                                                                                          |
| 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.,                                                              | Project benefits are given in Chapter 8.                                                                                                                   |
| <b>Besides the above, the below mentioned general points are also to be followed:-</b>                                                                                                                                                                  |                                                                                                                                                            |

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| <p>a) All documents to be properly referenced with index and continuous page numbering. b) Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.</p> <p>c) Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&amp;CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.</p> <p>d) Where the documents provided are in a language other than English, an English translation should be provided.</p> <p>e) The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.</p> <p>f) While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF 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.</p> <p>g) 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&amp;CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail</p> | <p>All documents addressed with properly referenced with index and continuous page numbering. Yes, sources for all tables are addressed.</p> <p>All the analysis/testing reports of Water, Soil, Air, Noise etc. are conducted by laboratories.<br/>The disclosure of consultant is given in Chapter 12.</p> <p>The entire document is prepared in English only.</p> <p>Questionnaire for environmental appraisal of mining projects will be prepared as per SEAC.</p> <p>EIA is Prepared as per generic structure prescribed in Appendix–III of EIA Notification, 2009. Compliance.</p> <p>Noted.</p> <p>Not Applicable, as it is a new project.<br/>All the Sectional Plates are enclosed as Annexure- 13.</p> |
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| <p>conducting the PH again with the revised documentation. h) As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project.</p> <p>Certified Compliance Report should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.</p> <p>i) The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                      |
| <p><b>A. STANDARD TERMS OF REFERENCE</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                      |
| <p>Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.</p>                                                                                                                                                                                                                                                                                                                                                                                                                       | <p>Yearwise production details are provided in the <b>Table 1-3</b>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                      |
| <p>A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>Government of Tamil Nadu granted lease to TAMIN for quarrying Black Granite on Government poramboke land in Survey Field No (SF No). 74/1(Part), 126/1A, 127, 145/2(Part) situated in Veeranam Village in Thandarampattu Taluk of Thiruvannamalai District, Tamil Nadu under Industries (MME1) department dated 24.05.2004 for a period of 20 years under Mineral Concession Rules, 1959. As the lease deed was executed with the District Collector, Thiruvannamalai, the period is valid up to 14.06.2024.</p> | <p>White o<br/>A, 127<br/>namal<br/>er Ru<br/>Co</p> |

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| <p>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.</p>                                                                | <p>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.</p>                                                            |  |
| <p>All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/ topo sheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).</p> | <p>All corners co-ordinates of the mine lease area is given in <b>Chapter 1 and Section 3-9.</b></p>  <p>Figure 2-9. Geology and Geomorphology of the area is provided in <b>Chapter 3, Section 3-9.</b></p>                                     |  |
| <p>Information should be provided in Survey of India Topo sheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.</p>                                            | <p>Topo map with existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics are prepared in 1:50000 scale and is given as <b>Figure 3-2.</b> Geomorphology pattern of the study area is shown in <b>Chapter 3, Section 3.4.7</b> and is shown as <b>Figure 3-10.</b></p> |  |

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| Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Government of Tamil Nadu granted lease to TAMIN for quarrying Black Granite on Government poramboke land in Survey Field No (SF No). 74/1(Part), 126/1A, 127, 144/1, 145/2(Part) situated in Veeranam Village in Thandarampattu Taluk of Thiruvannamalai District, Tamil Nadu Industries (MME1) department dated 24.05.2004 for a period of 20 years under Rule 10 of Mineral Concession Rules, 1959. As the lease deed was executed with the District Collector, the period is valid up to 14.06.2024.<br>The production details are provided in <b>Chapter 1 Section 1.6.2.</b> |
| It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/violation of the environmental or forest norms/conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report. | Environmental Policy of TAMIN is given in <b>Chapter 9 Section 9.2.1.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | It is a Black granite quarry and open cast. Mining methodology will be followed as per the approved design 30m from the top of the hill.<br>Mining methodology is provided in <b>Chapter 2 and Section 2.9 and Section 2.10. Chapter-4, Section 4.10.</b>                                                                                                                                                                                                                                                                                                                         |
| The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc. should be for the life of the mine / lease period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 10 Km radius from the project periphery area is considered as study area. The baseline data is provided in <b>Chapter 3.</b> The production and waste generation from quarry activities is estimated in <b>Chapter 2, Section 2.7.</b>                                                                                                                                                                                                                                                                                                                                            |

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| <p>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.</p>                                                                                                                                                                                        | <p>The environmental sensitive areas covering an aerial distance of 15km from the project area are provided in <b>Section 3.2 and Table 3-1</b>.</p> <p>Land use of the study area is provided in <b>Figure 3-6 and Table 3-3</b> with delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features.</p>   | <p>project area</p>                                       |
| <p>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&amp;R issues, if any, should be given.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                             | <p>It is a government poramboke land lease obtained lease for 20 years by the TAMIN. No R&amp;R issues are involved in the proposed project. Total waste to be generated during the project period will be 1,75,802m<sup>3</sup>. The area for disposal of waste rock has been identified on the north and southwest side of the lease area. The dumps will be maintained not exceeding a maximum slope of 45° from horizontal.</p> | <p>land use, R&amp;R issues, if any, should be given.</p> |
| <p>Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.</p> | <p>Not applicable.<br/>No forest land is not involved in the lease area.</p>                                                                                                                                                                                                                                                                                                                                                        |                                                           |
| <p>Status of forestry clearance for the broken-up area and virgin forestland involved in the Project including deposition of Net Present Value (NPV) and Compensatory Afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.</p>                                                                                                                                                                                                                                                                                                                                                           | <p>Not applicable.<br/>No forest land is not involved in the lease area.</p>                                                                                                                                                                                                                                                                                                                                                        |                                                           |

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| Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.                                                                                                                                                                                                                                                                                                                                                     | Not applicable.<br>No scheduled tribes and other traditional forest dwellers are observed in the study area. The land is a non-forest government poramboke land.                                                                                                                                                                                                |                                                                                                                                                                                                    |
| The vegetation in the RF/PF areas in the study area, with necessary details, should be given.                                                                                                                                                                                                                                                                                                                                                                                                                                            | The list of Reserve forests available within the 15km radius is provided in <b>Chapter 3, Figure 3-3.</b>                                                                                                                                                                                                                                                       | Chapter 3                                                                                                                                                                                          |
| A study shall be 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.                                                                                                                                                                                                       | Baseline Biological survey was carried out to assess the ecology of the study area. The study area is rich in trees, shrubs, climbers, and herbs. Similarly, the faunal diversity is grouped into amphibians. There are no extinct flora and fauna species found in the study area. The biodiversity details are provided in the <b>Chapter 3, Section 3.9.</b> | a. The study area is rich in trees, shrubs, climbers, and herbs. Similarly, the faunal diversity is grouped into amphibians. There are no extinct flora and fauna species found in the study area. |
| Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/ (existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished. | No Biosphere Reserves, Wildlife Corridors, Tiger/ Elephant Reserves are available in the study area.<br>The detailed Environmental Sensitivity areas within the 15km radius of the project site are provided in <b>Chapter 3.3 and Table 3-1 &amp; Figure 3-3.</b>                                                                                              | a. The study area is rich in trees, shrubs, climbers, and herbs. Similarly, the faunal diversity is grouped into amphibians. There are no extinct flora and fauna species found in the study area. |

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| <p>A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.</p> | <p>Detailed Biological Study of the Study Area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] was carried out and list of Flora &amp; Fauna is detailed is given in <b>Chapter 10, Section 10.1</b></p> |  |
| <p>Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.</p>                                                                                                                                                                                                                                                                                             | <p>Not applicable, Since the proposed project area is not falls under Critically Polluted or Aravali Range.</p>                                                                                                                        |  |
| <p>be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p>Noted.</p>                                                                                                                                                                                                                          |  |

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| <p>Similarly, for Coastal Projects, a CRZ map duly authenticated by one of the authorized agencies demarcating LTL, HIL, CRZ area, location of the mine lease with respect to 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).</p>                                                                                                                                                                                                                                                                                                                                                                                                                | <p>Not applicable since proposed lease does not fall under CRZ area.</p>                                                                                                                                                                                                                   |                        |
| <p>R&amp;R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&amp;R Plan, the relevant State/National Rehabilitation &amp; 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, familywise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&amp;R and socio-economic aspects should be discussed in the Report.</p> | <p>Not applicable.</p> <p>The lease area is classified as Government Poramboke land. TAMIN has obtained the letter from Govt. of Tamil Nadu for 20 years. There is no Rehabilitation and Resettlement Plan.</p> <p>Precise area communication letter is enclosed as <b>Annexure-7</b>.</p> | <p>Not applicable.</p> |

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| <p>One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season); December-February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.</p> | <p>One season (<b>Feb 2025 – April 2025</b>) the primary baseline data on ambient air quality, water quality, noise level, soil and flora and fauna, Site- specific meteorological data shall be collected and furnished in <b>Chapter 3</b>.</p> <p>7. Meteorology <b>Section 3.5.2</b> Temperature, Relative Humidity, Rainfall, Wind Speed and Direction</p> <p>8. Ambient Air Quality <b>Section 3.5.4.</b> As per NAAQS, 2009</p> <p>9. Ambient Noise Levels <b>Section 3.6</b> Day equivalent noise levels, Night equivalent noise levels (as per IS 16750:2011 Standards)</p> <p>10. Water Quality Surface water – <b>Section 3.7.2</b> Ground water – <b>Section 3.7.3</b> Surface Water -IS 2296(Class – A)</p> <p>11. Soil Quality <b>Section 3.8</b> ICAR (Indian Council of Agricultural research)</p> <p>12. Ecology <b>Section 3.9</b> Flora and Fauna</p> <p>13. Social Economic Status <b>Section 3.10</b><br/>(Socio Economic Profile of Study area (Population Profile, Employment and Literacy, etc.,))</p> |
| <p>Air quality modelling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of Vehicles for transportation of mineral. The details of the model used, and input parameters used for modelling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.</p>                                                                                                                                                                                                                                                                                         | <p>AERMOD Air quality modeling has been carried out to predict the air quality during the construction and operation activities impacts within the 10km radius of the project site for PM10, PM2.5 and NOx. The details are provided in <b>Chapter 4, Section 4.2.4</b>.</p> <p>The maximum ground level concentration observed due to mining activities and transportation of mineral is 25.7 µg/m<sup>3</sup>, 13.0 µg/m<sup>3</sup> and 12.5 µg/m<sup>3</sup> respectively for PM10, PM2.5, and NOx. The details are given in <b>Chapter 4, Section 4.2.3</b> Predominant wind direction is South East as shown in <b>Figure 4-1</b>.</p>                                                                                                                                                                                                                                                                                                                                                                                   |

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| 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.                                                                                                                                                                                                                                                                                                                                                                                                  | The water requirement for the project is addressed in <b>Chapter 2, Section 2.11</b> and                                                                                                                                                                              |
| Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | No ground water withdrawal to meet the water requirement.<br>The required water will be procured from authorized vendors.                                                                                                                                             |
| 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.                                                                                                                                                                                                                                                                                                                                                                                                                  | Water conservation measures are proposed in <b>Chapter 4</b> and <b>Section 4.3</b> .<br>Rainwater harvesting detailed are provided in <b>Chapter 3, Section 4.3.2.3</b> .                                                                                            |
| 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.                                                                                                                                                                                                                                                                                                                                                                                                                                     | Impacts on water environment & water conservation measures are proposed in <b>Chapter</b>                                                                                                                                                                             |
| Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken, and Report furnished. The Report inter-alia shall include details of the aquifers present and the impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished. | The proposed depth of mining is 30m from the top of the hill.<br>Mining activities will not intersect with ground water table as the proposed depth of top of hill.<br>The PP will provide the Hydro Geological Study report will be submitted at the time of meetng. |
| Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.                                                                                                                                                                                                                                                                                                                                                                                                          | Not Applicable.<br>There are no streams, or seasonal streams passing through the project area since it is However, TAMIN provided all safety measures for nearby water bodies are provided                                                                            |

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| <p>Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p>The altitude of the area is 194m (Maximum) above MSL, the proposed Depth of Mining Plan. Average ground water level is at 6.30m depth from ground level. Salient features of the sites are given in <b>Chapter 2, Table 2-2.</b></p> | <p>of Mir</p> |
| <p>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. A phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.</p> | <p>About 1.57.0 Ha of area is proposed for Green Belt development. It propose to p Green Belt Development plan is given in <b>Chapter 2, Section 2.16.8, Table 2-18</b></p>                                                             | <p>to p</p>   |
| <p>Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangements for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.</p>                                                                                                                                                                          | <p>Impacts and mitigation measures on transportation is given in <b>Chapter 4, Section 4.1</b></p>                                                                                                                                      | <p>on 4.1</p> |

| Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.                                                                                                                                                                                                                                                                           | Sanitation facilities are provided to mine’s workers in temporary structures in lease area.<br>The area breakup details are given in <b>Chapter-2, Section 2.11.1,</b>                                                                       |                |          |                                 |        |                 |                |          |                                 |       |  |  |  |  |
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|                                                                                                                                                                                                                                                                                                                                                                                                 | <table><tr><th>District</th><th>Taluk</th><th>Village</th><th>S.F No</th></tr><tr><td>Thiruvannamalai</td><td>Thandarampattu</td><td>Veeranam</td><td>74(P),<br/>126/1A, 127,<br/>144/1</td></tr><tr><td colspan="4">Total</td></tr></table> | District       | Taluk    | Village                         | S.F No | Thiruvannamalai | Thandarampattu | Veeranam | 74(P),<br>126/1A, 127,<br>144/1 | Total |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                 | District                                                                                                                                                                                                                                     | Taluk          | Village  | S.F No                          |        |                 |                |          |                                 |       |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                 | Thiruvannamalai                                                                                                                                                                                                                              | Thandarampattu | Veeranam | 74(P),<br>126/1A, 127,<br>144/1 |        |                 |                |          |                                 |       |  |  |  |  |
| Total                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                              |                |          |                                 |        |                 |                |          |                                 |       |  |  |  |  |
| Table 2-11.                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                              |                |          |                                 |        |                 |                |          |                                 |       |  |  |  |  |
| 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.                                                                                                                                                                                                                         | Conceptual post mining land use and Reclamation and restoration sectional plans and with adequate number of sections are provided in Error! Reference                                                                                        |                |          |                                 |        |                 |                |          |                                 |       |  |  |  |  |
| The 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 & preventive measures detailed given in <b>Chapter 4</b> and The EMP details are given as a separately as <b>Chapter 10</b> along with EMP Cost details                                                          |                |          |                                 |        |                 |                |          |                                 |       |  |  |  |  |
| 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.                                                                                                                                                               | Occupational Health impacts & preventive measures detailed given in <b>Chapter 4</b> and The EMP details are given as a separately as <b>Chapter 10</b> along with EMP Cost details                                                          |                |          |                                 |        |                 |                |          |                                 |       |  |  |  |  |
| 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.                                                                                                                                                | Impacts and measures are addressed in <b>Chapter 4</b> and <b>Section 4.5</b> and <b>Section 4.9.</b>                                                                                                                                        |                |          |                                 |        |                 |                |          |                                 |       |  |  |  |  |

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| 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. | The EMP details are given as a separately as <b>Chapter 10</b> .                                                                                                 |
| Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project                                    | The draft EIA is prepared as per obtained ToR and will be submitted for public hearing and obtaining minutes the point wise proponent compliance with <b>7</b> . |
| Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.                                                                                                                                          | There is no litigation pending against the project.                                                                                                              |
| The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.                                                                                                                                                  | The project Cost is addressed in <b>Chapter 2</b> and <b>Section 2.8, Table 2-9</b> .                                                                            |
| A Disaster management Plan shall be prepared and included in the EIA/EMP Report.                                                                                                                                                                                                          | Disaster Management Plan is given in <b>Chapter 7</b> and <b>Section 7.1.2</b> .                                                                                 |
| The 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.                                                                                             | Project benefits are given in <b>Chapter 8</b> .                                                                                                                 |

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| <p>Besides the above, the below mentioned general points are also to be followed:-</p> <p>a) Executive Summary of the EIA/EMP Report</p> <p>b) All documents to be properly referenced with index and continuous page numbering.</p> <p>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.</p> <p>d) Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&amp;CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.</p> <p>e) Where the documents provided are in a language other than English, an English translation should be provided.</p> <p>f) The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.</p> <p>g) While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF&amp;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.</p> <p>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&amp;CC with reasons for such changes and permission should be sought, as the</p> | <p>Executive Summary of EIA Report enclosed separately.</p> <p>All documents addressed with properly referenced with index and continuous page numbering.</p> <p>Yes, sources for all tables are addressed.</p> <p>All the analysis/testing reports of Water, Soil, Air, Noise etc. are conducted by laboratories.</p> <p>The disclosure of consultant is given in <b>Chapter 12</b>.</p> <p>The entire document is prepared in English only.</p> <p>Questionnaire for environmental appraisal of mining projects will be prepared as per SEAC.</p> <p>EIA is Prepared as per generic structure prescribed in <b>Appendix-III</b> of EIA Notification.</p> <p>It is Documentation Revised.</p> <p>Not Applicable, as it is a new project.</p> <p>All the Sectional Plates are enclosed as <b>Annexure-13</b>.</p> |  |
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| <p>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.</p> <p>i) As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the Environment Clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.</p> <p>j) The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.</p> |                                     |  |
| <p>In addition to the above, the following shall be furnished:-<br/>The Executive summary of the EIA/EMP report in about 8-10 pages should be prepared incorporating the information on</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                     |  |
| <p>1. Project name and location (Village, District, State, Industrial Estate (if applicable)).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p>Noted and followed the same.</p> |  |
| <p>2. Process description in brief, specifically indicating the gaseous emission, liquid effluent and solid and hazardous wastes.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <p>Noted and followed the same.</p> |  |
| <p>3. Measures for mitigating the impact on the environment and mode of discharge or disposal.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p>Noted and followed the same.</p> |  |
| <p>4. Capital cost of the project, estimated time of completion.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p>Noted and followed the same.</p> |  |

|                                                                                                                                                                                                                                                                                       |                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| 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 followed the same.                                          |
| 6. A detailed study of the lithology of the mining lease area shall be furnished.                                                                                                                                                                                                     | Noted and followed the same.                                          |
| 7. Details of village map, "A" register and FMB sketch shall be furnished.                                                                                                                                                                                                            | FMB sketch & A-Register is attached as an Annexure – 2 & 3.           |
| 8. Detailed mining closure plan for the proposed project approved by the Geology of Mining department shall be submitted along with EIA report.                                                                                                                                       | Complied.<br>The details are provided in Chapter 7, Section 7.1.4.    |
| 9. Obtain a letter /certificate from the Assistant 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. | AD Mines Letter is attached as an Annexure – 14.                      |
| 10. EIA report should strictly follow the Environmental Impact Assessment Guidance Manual for Mining of Minerals published February 2010.                                                                                                                                             | Noted.                                                                |
| 11. Detail plan on rehabilitation and reclamation carried out for the stabilization and restoration of the mined areas.                                                                                                                                                               | Noted & will be provided during Final EIA submission.                 |
| 12. The EIA study report shall include the surrounding mining activity, if any.                                                                                                                                                                                                       | Noted and followed the same.                                          |
| 13. Modeling study for Air, Water and noise shall be carried out in this field and incremental increase in the above study shall be substantiated with mitigation measures.                                                                                                           | The details are given in Chapter 4, Section 4.2.                      |
| 14. A study on the geological resources available shall be carried out and reported.                                                                                                                                                                                                  | Estimated geological resources are provided in the <b>Table 2-6</b> . |

|                                                                                                                                                                                                                                                                                                                                                    |                                                                                                     |       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-------|
| 15. A specific study on agriculture & livelihood shall be carried out and reported.                                                                                                                                                                                                                                                                | A specific study on agriculture & livelihood will be carried out & PP will provide submission.      | vide  |
| 16. Impact of soil erosion, soil physical chemical and biological property changes may be assumed.                                                                                                                                                                                                                                                 | Complied.<br>The soil physical, chemical components of soil health details are provided in Chapter  | apter |
| 17. Site selected for the project - Nature of land - Agricultural (single/double crop), barren, Govt./ private land, status of is acquisition, nearby (in 2-3 km.) water body, population, with in 10km other industries, forest , eco-sensitive zones, accessibility, (note - in case of industrial estate this information may not be necessary) | Noted and followed the same.                                                                        |       |
| 18. Baseline environmental data - air quality, surface and ground water quality, soil characteristic, flora and fauna, socio-economic condition of the nearby population                                                                                                                                                                           | Noted and followed the same.                                                                        |       |
| 19. Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.                                                                                                                                                                                                           | Noted and followed the same.                                                                        |       |
| 20. Likely impact of the project on air, water, land, flora-fauna and nearby population                                                                                                                                                                                                                                                            | Noted and followed the same.                                                                        |       |
| 21. Emergency preparedness plan in case of natural or in plant emergencies                                                                                                                                                                                                                                                                         | Noted and followed the same.                                                                        |       |
| 22. Issues raised during public hearing (if applicable) and response given                                                                                                                                                                                                                                                                         | Noted and followed the same.                                                                        |       |
| 23. CER plan with proposed expenditure.                                                                                                                                                                                                                                                                                                            | Noted and followed the same.                                                                        |       |
| 24. Occupational Health Measures                                                                                                                                                                                                                                                                                                                   | Noted and followed the same.                                                                        |       |
| 25. Post project monitoring plan                                                                                                                                                                                                                                                                                                                   | Noted and followed the same.                                                                        |       |
| 26. The project proponent shall carry out detailed hydro geological study through intuitions/NABET Accredited agencies.                                                                                                                                                                                                                            | PP will provide the detailed hydro geological study through intuitions/NABET Accredited submission. | credi |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| 27. A detailed report on the green belt development already undertaken is to be furnished and also submit the proposal for green belt activities.                                                                                                                                                                                                                                                                                                         | Greenbelt development details are provided in the Chapter 4, Section 4.6.1.                                                                |
| 28. The proponent shall propose the suitable control measure to control the fugitive emissions during the operations of the mines.                                                                                                                                                                                                                                                                                                                        | Suitable control measure to control the fugitive emissions during the operations of the mines are provided in Chapter 2, Section 2.17.3.8. |
| 29. A specific study should include impact on flora & fauna, disturbance to migratory pattern of animals.                                                                                                                                                                                                                                                                                                                                                 | Biodiversity details are provided in the Chapter 3, Section 3.10.                                                                          |
| 30. Reserve funds should be earmarked for proper closure plan.                                                                                                                                                                                                                                                                                                                                                                                            | Complied.<br>EMP with budget for green belt development and mine closure plan including isaste in Chapter 10.                              |
| 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 one time use and throw away plastics irrespective of thickness with effect from 01.01.2019 under Environment (Protection) Act, 1986. In this connection, the project proponent has to furnish the action plan. | PP will provide a detailed plan on plastic waste management during the final EIA sub                                                       |
| <b>Besides the above, the below mentioned general points should also be followed:-</b>                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                            |
| a. A note confirming compliance of the TOR, with cross referencing of the relevant sections / pages of the EIA report should be provided.                                                                                                                                                                                                                                                                                                                 | Noted and followed the same.                                                                                                               |
| b. All documents may be properly referenced with index, page numbers and continuous page numbering.                                                                                                                                                                                                                                                                                                                                                       | Noted and followed the same.                                                                                                               |
| 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 followed the same.                                                                                                               |

d. 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 also be followed.

Noted and followed the same.

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 organization/Laboratories including their status of approvals etc. In this regard circular no F. No.J - I1013/77/2004-IA-II(I) dated 2nd December, 2009, 18th March 2010, 28th May 2010, 28th June 2010, 31st December 2010 & 30th September 2011 posted on the Ministry's website <http://www.moef.nic.in/> may be referred.

- After preparing the EIA (as per the generic structure prescribed in Appendix-III of the EIA Notification, 2006) covering the above mentioned points, the proponent will take further necessary action for obtaining environmental clearance in accordance with the procedure prescribed under the EIA Notification, 2006.
- The final EIA report shall be submitted to the SEIAA, Tamil Nadu for obtaining Environmental Clearance.
- The TORs with public hearing prescribed shall be valid for a period of three years from the date of issue, for submission of the EIA/EMP report as per OMNo.J-11013/41/2006-IA-II(I)(part) dated 29th August, 2017.

Noted and followed the same.

## 2 PROJECT DESCRIPTION

### 2.1 Type of Project including interlinked and interdependent projects

There are no Interlink and interdependent projects in this black granite quarry. Lease land/quarry land is overextend of 13.74.0 Ha. The black granite quarry follows semi mechanized open cast method by formation of benches. Benches are proposed with a height of 6m & width bench not less than the height. The area applied for quarry lease is exhibits hilly terrain; the altitude in SF No. 74(P), 126/1A, 127, 144/1 is 225-251m AMSL.

The Geological reserves of Black granite have been computed based on the Geological Plan & Sections up to the economically workable average depth of 30 m from the surface level and the top surface of the granite body works out to 14,86,816 m<sup>3</sup>. Summary of project reserves are provided in the **Table 2-1**.

The lease area falls in the survey of India Toposheet no 57L/15, L/16, P4 and lies between the GPS coordinates of 78°54'35.10"E to 78°54'08.07"E and Northern latitude from 12°11'13.12"N to 12°11'28.05"N.

**Table 2-1 Summary of Project Reserves**

| S. No                       | Description                                            | Quantity (m <sup>3</sup> ) |
|-----------------------------|--------------------------------------------------------|----------------------------|
| <b>Geological Reserves:</b> |                                                        |                            |
| 1                           | Geological Reserves (ROM)                              | 14,86,816                  |
| 2                           | Geological Reserves (at 90% Recovery)                  | 1,75,802                   |
| <b>Mineable Reserves:</b>   |                                                        |                            |
| 1                           | Mineable Reserves (ROM)                                | <b>19533</b>               |
| 3                           | Total Production for proposed 5 Year (at 90% Recovery) | 175802                     |
| 4                           | Annual Peak Production                                 | 19533.5                    |

### 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 products has attracted the consumers in the 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.

Mineral Industries of the state of Tamil Nadu provides employment opportunities for the people of the state as well as in the specific project area. The Quarrying is one among the major core sector for industries, which plays a vital process of country's economic development.

### 2.3 Location of the Quarry

The Quarry is located at S.F. No.74(P), 126/1A, 127, 144/1 of Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, Tamil Nadu State. Quarry lease area falls in the survey of India Toposheet no 57L/15, L/16, P4 and lies between the GPS coordinates of 78°54'35.10"E to 78°54'08.07"E and Northern latitude from 12°11'13.12"N to 12°11'28.05"N. The area applied for quarry lease is exhibits hilly terrain; the altitude is 225 - 251m AMSL.

The boundary coordinates of the site are shown in **Table 1-5**. The project location map is given in **Figure 2-1**. Google image of the lease area is shown **Figure 2-2**. 500m radius Google imagery of the lease area is shown in **Figure 2-3**. Google Imagery of 1, 5 & 10km radius of the lease area is shown in **Figure 2-4**, **Figure 2-5** & **Figure 2-6** respectively. Environmental Sensitive areas within 15km radius of the lease area demarcated on Google image is shown in **Figure 2-7**. The top map of the study is shown in **Figure 2-9**. Salient Features within 15km radius of the project boundary is given in **Table 2-2**. Project Summary is provided **Table 2-1**.

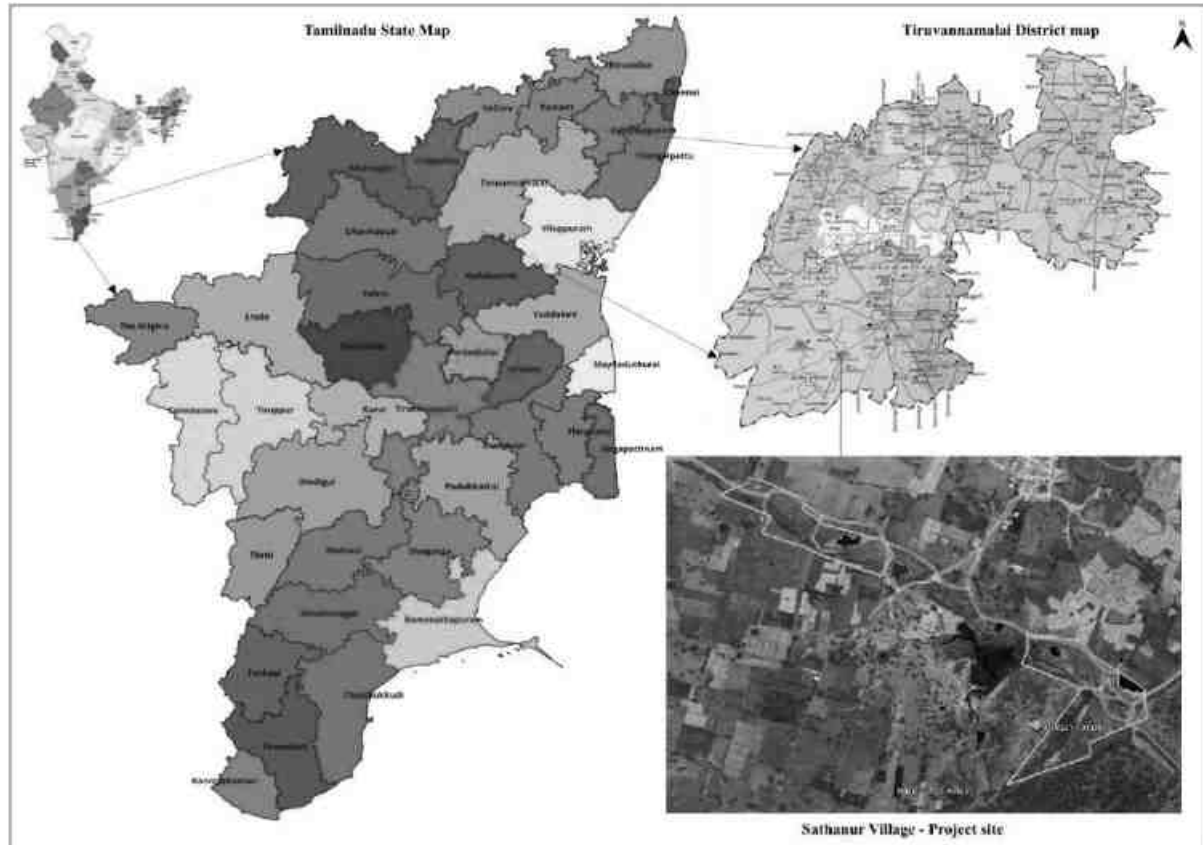


Figure 2-1 Project site Location map



Figure 2-2 Google image of the lease area



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



Figure 2-4 1km radius google imagery map of the lease area

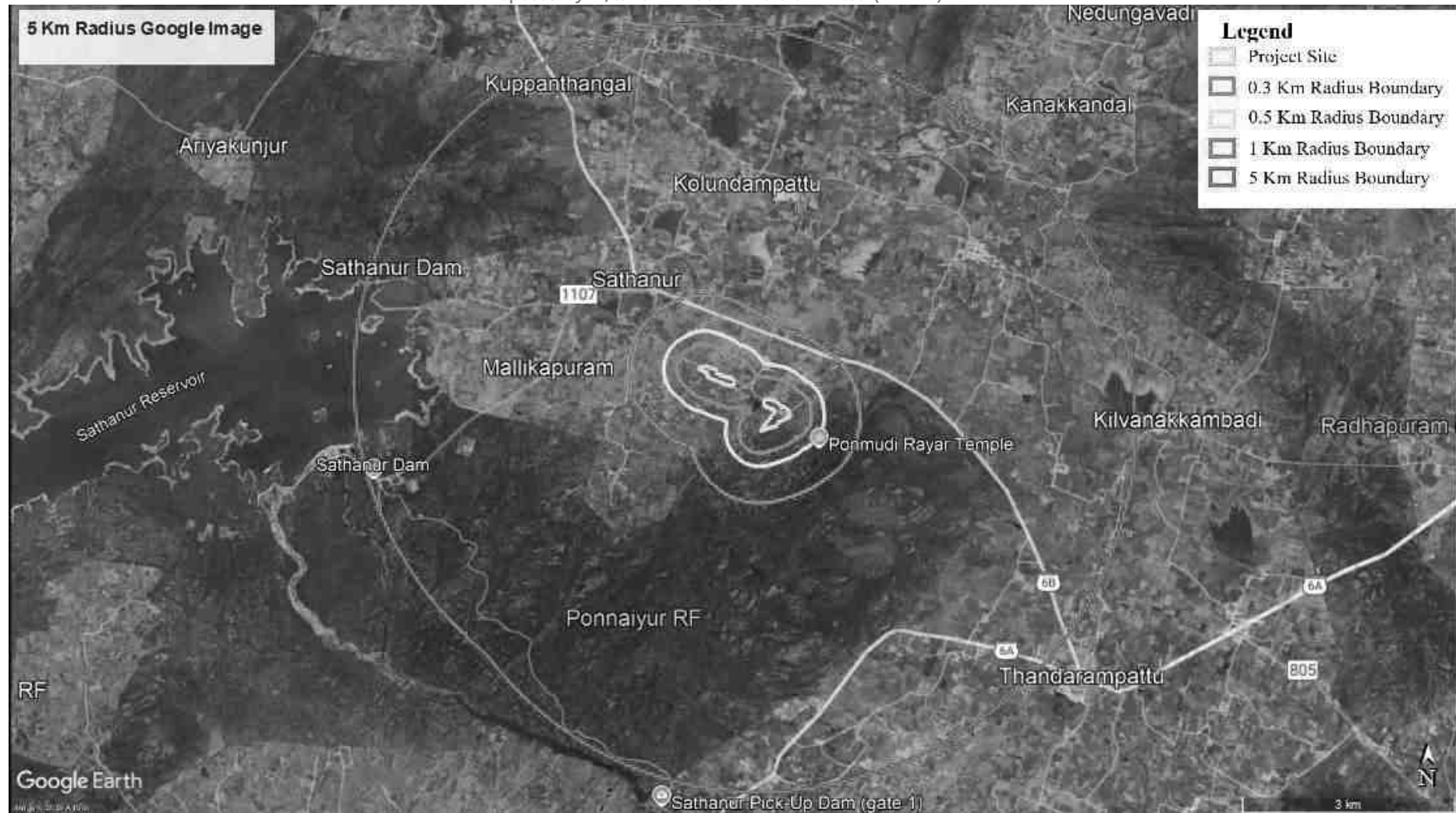


Figure 2-5 5km radius google imagery map of the lease area

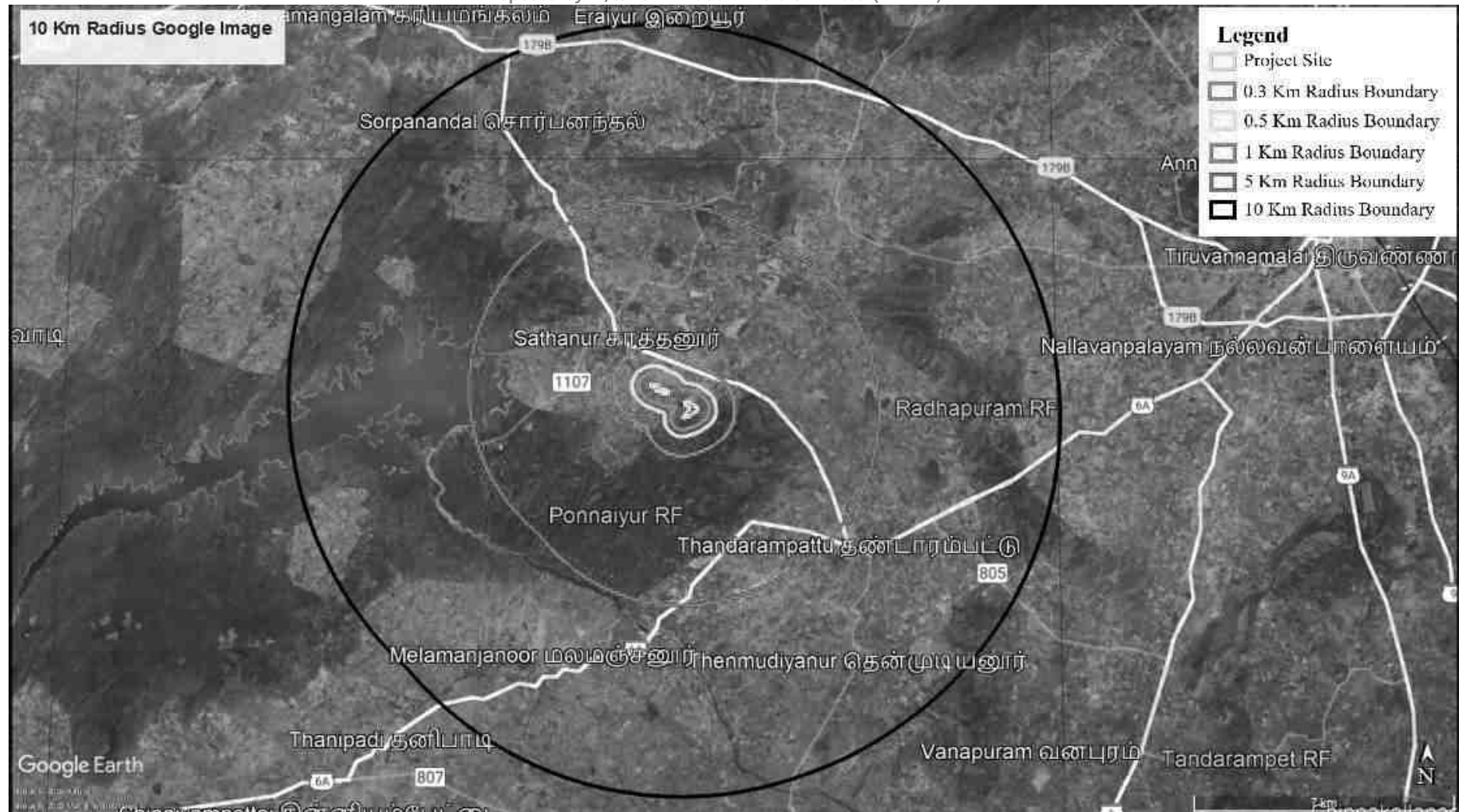


Figure 2-6 10 km radius google imagery map of the lease area

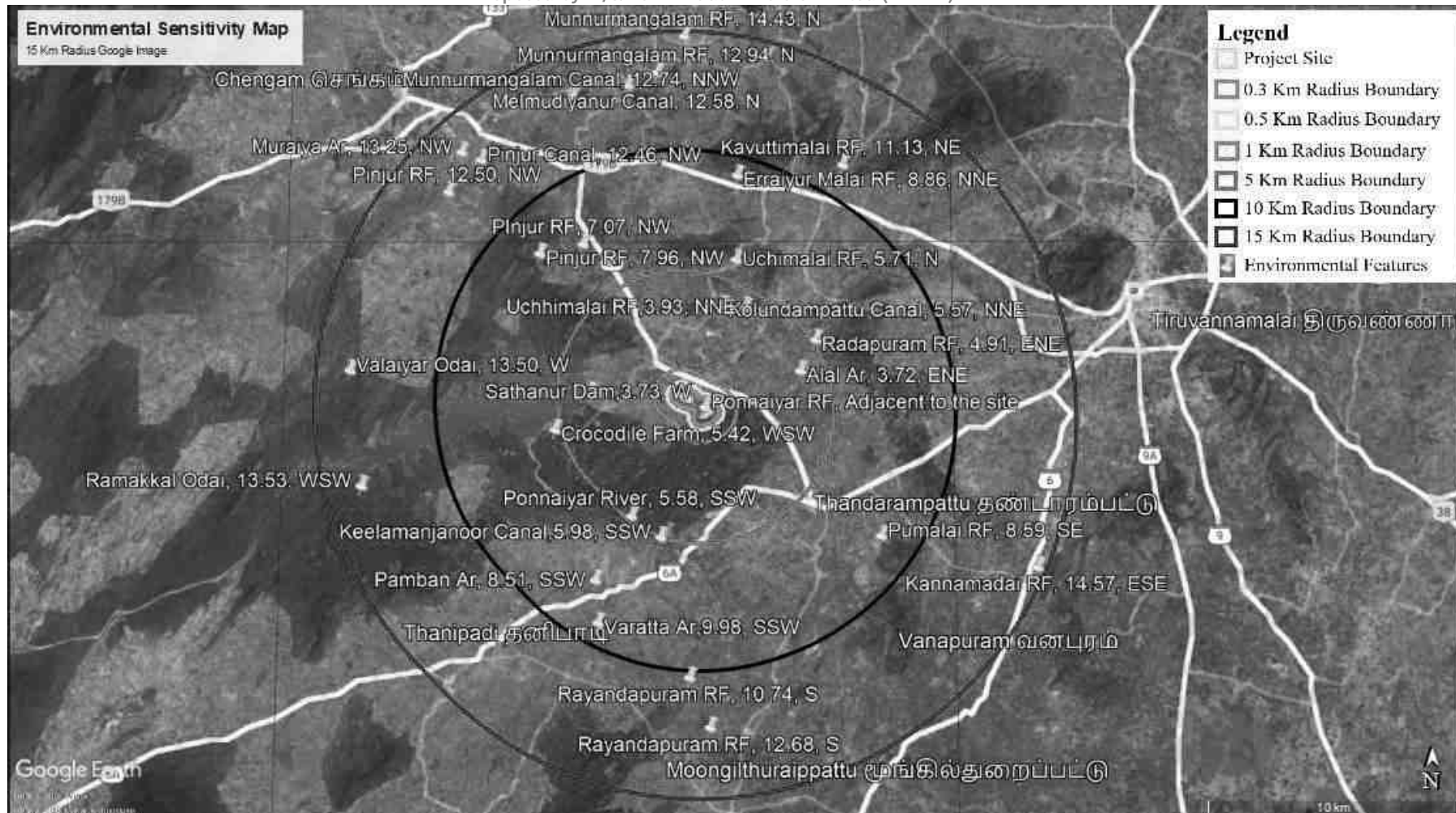


Figure 2-7 Environmental Sensitivity map of the study area



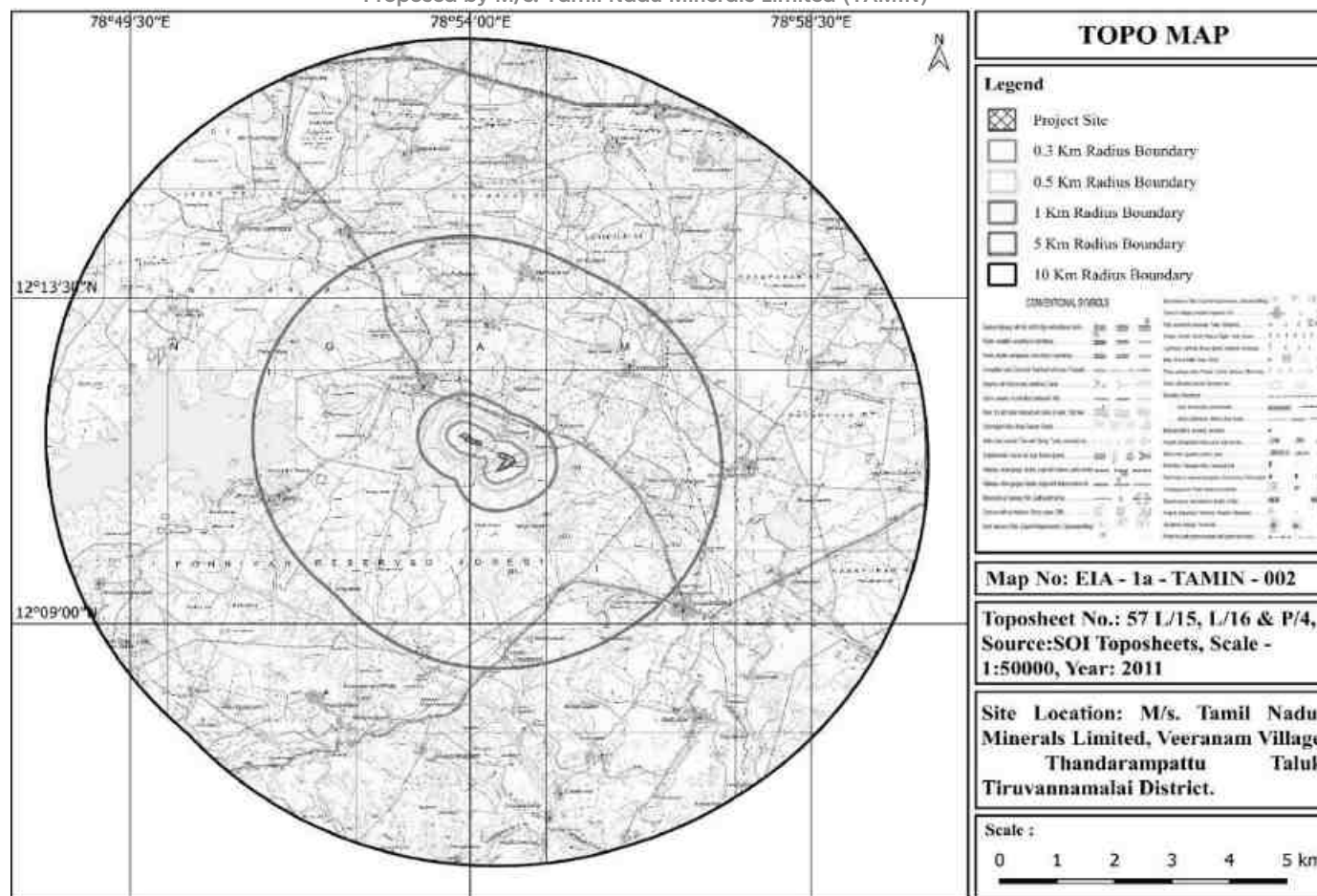


Figure 2-9 Topo map of the study area

**Table 2-2 Salient Features within 15km radius of the lease area**

| S. No | Particulars                                                                                                                                                | Details                                                                                                                          |                      |      |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|----------------------|------|
| 1     | Latitude & Longitude                                                                                                                                       | 12°11'13.12"N to 12°11'28.05"N<br>78°54'35.10"E to 78°54'08.07"E                                                                 |                      |      |
| 2     | Site Elevation above MSL (m)                                                                                                                               | 225 - 251m AMSL                                                                                                                  |                      |      |
| 3     | Topography                                                                                                                                                 | Hilly terrain                                                                                                                    |                      |      |
| 4     | Lease area Topo Sheet details                                                                                                                              | 57-H/14, H/15                                                                                                                    |                      |      |
| 5     | Land classification                                                                                                                                        | Government Poramboke land                                                                                                        |                      |      |
| 6     | Nearest highway                                                                                                                                            | <b>SH 6B:</b> Thandrampet - Kottakulam Road ~ 0.87km (NNE)<br><b>NH 179B:</b> Section of Chennai–Salem Expressway ~ 8.83km (NNE) |                      |      |
| 7     | Nearest Railway station                                                                                                                                    | Railway Station: Thiruvannamalai Railway Station ~ 19.14km (ENE)                                                                 |                      |      |
| 8     | Nearest Airport                                                                                                                                            | Domestic airport: Salem Airport ~ 100.85km (WSW)<br>International Airport: Chennai International Airport ~ 160.40km (ENE)        |                      |      |
| 9     | Nearest Town / City                                                                                                                                        | Thandarampattu ~ 3.94km (ESE)                                                                                                    |                      |      |
| 10    | Areas which are important or sensitive for ecological reasons – Wetlands, Watercourses or other water bodies, coastal zone, biospheres, mountains, forests | Description                                                                                                                      | Dist. (~Km)          | Dir. |
|       |                                                                                                                                                            | Veernam Lake                                                                                                                     | Adjacent to the site |      |
|       |                                                                                                                                                            | Sathanur Lake                                                                                                                    | 1.08                 | N    |
|       |                                                                                                                                                            | Mallikapuram Lake                                                                                                                | 1.39                 | WNW  |
|       |                                                                                                                                                            | Naykkanur Lake                                                                                                                   | 1.41                 | NE   |
|       |                                                                                                                                                            | Sattannur Lake                                                                                                                   | 1.85                 | NNW  |
|       |                                                                                                                                                            | Taradapattu Lake                                                                                                                 | 2.34                 | NE   |
|       |                                                                                                                                                            | Govindapuram Lake                                                                                                                | 3.2                  | N    |
|       |                                                                                                                                                            | Alal Ar                                                                                                                          | 3.72                 | ENE  |
|       |                                                                                                                                                            | Sathanur Dam                                                                                                                     | 3.73                 | W    |
|       |                                                                                                                                                            | Taradapattu Lake                                                                                                                 | 3.82                 | NE   |
|       |                                                                                                                                                            | Thandarampattu Canal                                                                                                             | 3.91                 | ENE  |
|       |                                                                                                                                                            | Kil Vanakkambadi Lake                                                                                                            | 4.31                 | E    |
|       |                                                                                                                                                            | Melkarippur Lake                                                                                                                 | 4.48                 | NNE  |
|       |                                                                                                                                                            | Tandarampattu Lake                                                                                                               | 4.85                 | SE   |
|       |                                                                                                                                                            | Kilvanakkambadi Canal                                                                                                            | 5.14                 | E    |
|       |                                                                                                                                                            | Kolundampattu Canal                                                                                                              | 5.57                 | NNE  |
|       |                                                                                                                                                            | Ponnaiyar River                                                                                                                  | 5.58                 | SSW  |
|       |                                                                                                                                                            | Sattanur Main Canal                                                                                                              | 5.77                 | S    |
|       |                                                                                                                                                            | Sorappanandal Lake                                                                                                               | 5.8                  | NW   |
|       |                                                                                                                                                            | Keelamanjanoor Canal                                                                                                             | 5.98                 | SSW  |
|       |                                                                                                                                                            | Lake near Kilvanakkambadi                                                                                                        | 6.16                 | ESE  |
|       |                                                                                                                                                            | Lake near Melpennathur                                                                                                           | 6.41                 | NNW  |
|       |                                                                                                                                                            | Nedungavadi Lake                                                                                                                 | 6.9                  | NE   |
|       |                                                                                                                                                            | Mudiyanur Lake                                                                                                                   | 6.92                 | SE   |
|       |                                                                                                                                                            | Lake near Pudurnattam                                                                                                            | 7.58                 | SW   |

|    |                       |                         |                      |             |
|----|-----------------------|-------------------------|----------------------|-------------|
|    |                       | Tiruvadattanur Lake     | 7.65                 | S           |
|    |                       | Pamban Ar               | 8.51                 | SSW         |
|    |                       | Erraiyur Malai RF       | 8.86                 | NNE         |
|    |                       | Perumbakkam Lake        | 8.98                 | E           |
|    |                       | Eraiur Lake             | 9.5                  | N           |
|    |                       | Melserumbakkam Lake     | 9.7                  | E           |
|    |                       | Varatta Ar              | 9.98                 | SSW         |
|    |                       | Asuvangasuranai Lake    | 9.98                 | ENE         |
|    |                       | Cheyar R                | 10.32                | NNW         |
|    |                       | Pinjur Canal            | 12.46                | NW          |
|    |                       | Melmudiyanur Canal      | 12.58                | N           |
|    |                       | Munnurmangalam Canal    | 12.74                | NNW         |
|    |                       | Samudram Tank           | 13.14                | E           |
|    |                       | Muraiya Ar              | 13.25                | NW          |
|    |                       | Valaiyar Odai           | 13.5                 | W           |
|    |                       | Ramakal Odai            | 13.53                | WSW         |
| 11 | Reserve Forests       | <b>Description</b>      | <b>Dist. (~Km)</b>   | <b>Dir.</b> |
|    |                       | Ponnaiyar RF            | Adjacent to the site |             |
|    |                       | Uchhimalai RF           | 3.93                 | NNE         |
|    |                       | Radapuram RF            | 4.91                 | ENE         |
|    |                       | Uchimalai RF            | 5.71                 | N           |
|    |                       | Pinjur RF               | 7.07                 | NW          |
|    |                       | Pinjur RF               | 7.96                 | NW          |
|    |                       | Pumalai RF              | 8.59                 | SE          |
|    |                       | Erraiyur Malai RF       | 8.86                 | NNE         |
|    |                       | Rayandapuram RF         | 10.74                | S           |
|    |                       | Kavuttimalai RF         | 11.13                | NE          |
|    |                       | Pinjur RF               | 12.5                 | NW          |
|    |                       | Rayandapuram RF         | 12.68                | S           |
|    |                       | Munnurmangalam RF       | 12.94                | N           |
|    |                       | Munnurmangalam RF       | 14.43                | N           |
|    |                       | Kannamada RF            | 14.57                | ESE         |
| 12 | Seismic Zone          | Zone-II (Low risk)      |                      |             |
| 13 | Defense Installations | Nil within 15 km radius |                      |             |
| 14 | Interstate Boundary   | Nil within 15 km radius |                      |             |

- The project area does not fall in CRZ zone.
- There are no Western Ghats within the radius of 15 Km from project area.
- There are no notified bird sanctuaries or wildlife sanctuaries as per Wildlife protection Act 1972, within a radius of 15 Km.
- The project area does not fall in 'HACA' region.

**Project Summary:**

| S. No | Particulars                                       | Details                                                                                             |
|-------|---------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| 1.    | Project Location                                  | S.F. No.74(P), 126/1A ,127 ,144/1, Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District |
| 2.    | Land classification                               | Government Poramboke land                                                                           |
| 3.    | Extent of lease area (Ha.)                        | 13.74.0                                                                                             |
| 4.    | Quarry Lease                                      | Govt. Letter. No.679/MME.1/2024-1 daTE 21.10.2024.                                                  |
| 5.    | Lease Period                                      | 20 years                                                                                            |
| 6.    | Estimated Geological Reserves M <sup>3</sup>      | 14,86,816                                                                                           |
| 7.    | Estimated Mineable Reserves M <sup>3</sup>        | 19,533                                                                                              |
| 8.    | Black Granite production per annum M <sup>3</sup> | 19533.5                                                                                             |
| 9.    | Depth of Mining                                   | 30m above ground level (from Top of the hill)                                                       |
| 10.   | Method of Mining                                  | Open cast semi mechanized method                                                                    |
| 11.   | Water Requirement (KLD)                           | 3.5                                                                                                 |
| 12.   | Source of Water                                   | Authorized vendors and local panchayat                                                              |
| 13.   | Power requirement (kVA)                           | 60                                                                                                  |
| 14.   | Power Backup (DG set) kVA                         | 1* 125                                                                                              |
| 15.   | Fuel requirements (Lts/Day)                       | 200                                                                                                 |
| 16.   | Manpower (Nos)                                    | 35                                                                                                  |
| 17.   | Municipal Solid Waste Generation (kg/day)         | 15.75                                                                                               |
| 18.   | Waste Oil generation (Lts/Year)                   | 3.0                                                                                                 |
| 19.   | Project Cost in Lakhs                             | 99.97 (1 Cr)                                                                                        |

**2.4 Nearest Human Settlement**

The details of nearest human settlement from the project site are provided below in **Table 2-3**.

**Table 2-3 Nearest Human Settlement**

| S. No | Name of the villages | Distance (~km) & Direction | Population (Census2011) |
|-------|----------------------|----------------------------|-------------------------|
| 1     | Thandarampattu       | 3.94                       | 8034                    |
| 2     | Sathanur             | 1.24                       | 4964                    |
| 3     | Tharadapattu         | 3.04                       | 4086                    |
| 4     | Veeranam             | 0.85                       | 2524                    |

**2.5 Details of alternate sites considered**

There are no alternative sites examined. Since quarry reserves are site specific.

**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.

Mineable Reserves have been computed as 1,95,335 M<sup>3</sup> based on the Conceptual Plan and sections, the effective (Saleable) Mineable Reserves have been worked out as 19533.5M<sup>3</sup> by

applying the recovery factor 10%. The annual peak production is 1954 M<sup>3</sup>. Open cast Semi mechanized method will be followed for proposed mining as per Mining plan summarized as **Table 2-4**.

**Table 2-4 Land use details of the quarry area**

| S. No        | Description     | During the Life of the Mine (Ha) |
|--------------|-----------------|----------------------------------|
| 1            | Mining (Quarry) | 1.53.0                           |
| 2            | Waste Dump      | 2.20                             |
| 3            | Infrastructure  | 0.02.0                           |
| 4            | Mine Road       | 0.10.5                           |
| 5            | Village Road    | 0.27.0                           |
| 6            | Afforestation   | 0.50.0                           |
| 7            | Old Dump        | 2.91.0                           |
| 8            | Old Pit         | 0.75.0                           |
| 9            | Unutilized Aea  | 5.45.5                           |
| <b>Total</b> |                 | <b>13.74.0</b>                   |

## 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 30 m from the surface level and the top surface of the granite body works out to 14,86,816 m<sup>3</sup>. Granite Quarry Reserves is given in **Table 2-5**. Estimation of Geological Reserves and Mineable Reserves at present availability is given in **Table 2-6**. Mineable Reserve are given in **Table 2-7**. Yearwise Production details are given in **Table 2-8**. Surface Plan of the Quarry is given in **Figure 2-10**. Environmental Plan is shown as **Figure 2-11**.

**Table 2-5 Granite Quarry Reserves**

| S. No                       | Description                           | Quantity (m <sup>3</sup> ) |
|-----------------------------|---------------------------------------|----------------------------|
| <b>Geological Reserves:</b> |                                       |                            |
| 1                           | Geological Reserves (ROM)             | 19,533                     |
| 2                           | Geological Reserves (at 90% Recovery) | 1,75,802                   |
| <b>Mineable Reserves:</b>   |                                       |                            |
| 1                           | Mineable Reserves (ROM)               | 1,95,335m <sup>3</sup>     |
| 2                           | Mineable Reserves (at 90% Recovery)   | 175802                     |
| 3                           | Total Production for proposed 5 Year  | 195335                     |
| 4                           | Annual Peak Production                | 19533.5                    |

### 2.7.1 Present Estimation

The details of estimation of Geological Reserves and estimation of Mineable Reserves as per present ground reality have been furnished with reference to the Geological Plan & Sections and Conceptual Plan & Sections as shown in Plate No.3 and Plate No.6 respectively.

**Table 2-6 Estimation of Geological Reserves and Mineable Reserves at present**

| S. No | Geological (m <sup>2</sup> ) | Mineable Reserves (m <sup>2</sup> ) | Mineable Saleable Granite Reserves 10% Recovery (m <sup>2</sup> ) | Granite Waste @90% Recovery (m <sup>2</sup> ) |
|-------|------------------------------|-------------------------------------|-------------------------------------------------------------------|-----------------------------------------------|
| 1     | 14,86,816                    | 1,95,335                            | 19,533                                                            | 1,75,802                                      |

| Sl. No                           | SECTION | LINE   | WIDTH | AVERAGE Depth                         | GEOLOGICAL RESOURCES VOLUME (M <sup>3</sup> ) | EFFECTIVE Reserves @10% | Granite Reject @90 % |
|----------------------------------|---------|--------|-------|---------------------------------------|-----------------------------------------------|-------------------------|----------------------|
| 1                                | LL'-AA' | 100.50 | 52.00 | (29.0+20.0 +29.0)/3 (26.00)           | 135876                                        | 13588                   | 122288               |
| 2                                | LL'-BB' | 100.00 | 73.00 | (29 +21.0 +29)/3 (26.33)              | 192209                                        | 19221                   | 172988               |
| 3                                | LL'-CC' | 75.00  | 84.00 | (29.0+24.0 +29.0)/3 (27.33)           | 172179                                        | 17218F                  | 1,54,961             |
| 4                                | LL'-DD' | 50.00  | 83.00 | (29.00)                               | 120350                                        | 12035                   | 108315               |
| 5                                | LL'-EE' | 50.00  | 84.00 | (29.0+20.0 +26.0+29.0)/4 (26.00)      | 109200                                        | 10920                   | 98280                |
| 6                                | LL'-FF' | 50.00  | 91.00 | (29.0+17.0 +11.0+29.0)/4 (21.50)      | 97825                                         | 9783                    | 88042                |
| 7                                | LL'-GG' | 111.00 | 86.00 | 29.0+21.0 +29.0/3 (26.33)             | 251346                                        | 25135                   | 226211               |
| 8                                | MM'-HH' | 84.00  | 49.00 | (29.00)                               | 119364                                        | 11936                   | 107428               |
| 9                                | MM'-II' | 100.00 | 42.00 | (29.0+20.0 +16.0+14.0+29.0)/5 (21.60) | 90720                                         | 9072                    | 81648                |
| 10                               | MM'-JJ' | 100.00 | 32.00 | (29.00)                               | 92800                                         | 9280                    | 83520                |
| 11                               | MM'-KK' | 120.00 | 32.00 | (29.0+24.0 +29.0)/3 (27.33)           | 104947                                        | 10494                   | 94453                |
| <b>Total Geological Reserves</b> |         |        |       |                                       | <b>14,86,816</b>                              | <b>1,48,682</b>         | <b>1338134</b>       |

### Mineable Reserves:

**Table 2-7 Mineable Reserves**

| Year    | Section   | Depth Details (m) |          |           |       | No of benches |
|---------|-----------|-------------------|----------|-----------|-------|---------------|
|         |           | Present           | Proposed | Remaining | Total |               |
| First   | LL' & DD' | 0                 | 7.5      | 22.4      | 30    | 2             |
| Second  | LL' & DD' | 7.6               | 8.6      | 13.8      | 30    | 2             |
| Third   | LL' & DD' | 16.2              | 13.8     | 0         | 30    | 3             |
|         | LL' & EE' | 4.0               | 7.0      | 19.0      | 30    | 2             |
| Fourth  | LL' & EE' | 11.0              | 19.0     | 0         | 30    | 4             |
|         | LL' & FF  | 19.0              | 3.0      | 8.0       | 30    | 1             |
| Fifth   | LL' & FF  | 21.0              | 8.0      | 0         | 30    | 2             |
|         | LL' 7 GG' | 0                 | 9.5      | 20.4      | 30    | 2             |
| Sixth   | LL' 7 GG' | 9.6               | 5.4      | 15        | 30    | 1             |
| Seventh | LL' 7 GG' | 15                | 5.3      | 9.7       | 30    | 1             |
| Eighth  | LL' 7 GG' | 20.3              | 6.7      | 3.0       | 30    | 2             |
| Ninth   | LL' 7 GG' | 22.0              | 3        | 0         | 30    | 1             |
|         | MM' & II' | 14.0              | 5.4      | 10.6      | 30    | 1             |
| Tenth   | MM' & II' | 19.4              | 10.6     | 0         | 30    | 2             |
|         | MM' & KK' | 7                 | 12       | 11        | 30    | 2             |

Total Mineable Reserves : 1,95,335m<sup>3</sup>

Annual Production : 19,533.5m<sup>3</sup>

**Table 2-8 Year wise Production details**

| Year         | Run of Mines in |               | Saleable Black Granite Recovery 25% |              | Saleable Black Granite Waste Recovery @75% |               |
|--------------|-----------------|---------------|-------------------------------------|--------------|--------------------------------------------|---------------|
|              | M <sup>3</sup>  | Tonnes        | M <sup>3</sup>                      | Tonnes       | M <sup>3</sup>                             | Tonnes        |
| First Year   | 19533           | 58599         | 1953                                | 5859         | 17580                                      | 52740         |
| Second Year  | 19533           | 58599         | 1953                                | 5859         | 17580                                      | 52740         |
| Third Year   | 19533           | 58599         | 1953                                | 5859         | 17580                                      | 52740         |
| Fourth Year  | 19533           | 58599         | 1953                                | 5859         | 17580                                      | 52740         |
| Fifth Year   | 19533           | 58599         | 1953                                | 5859         | 17580                                      | 52740         |
| <b>Total</b> | <b>97665</b>    | <b>292995</b> | <b>9765</b>                         | <b>29295</b> | <b>87900</b>                               | <b>263700</b> |

| Year         | Run of Mines in |               | Saleable Black Granite Recovery 25% |              | Saleable Black Granite Waste Recovery @75% |               |
|--------------|-----------------|---------------|-------------------------------------|--------------|--------------------------------------------|---------------|
|              | M3              | Tonnes        | M3                                  | Tonnes       | M3                                         | Tonnes        |
| Sixth        | 19533           | 58599         | 1953                                | 5859         | 17580                                      | 52740         |
| Seventh      | 19533           | 58599         | 1953                                | 5859         | 17580                                      | 52740         |
| Eighth       | 19533           | 58599         | 1953                                | 5859         | 17580                                      | 52740         |
| Ninth        | 19533           | 58599         | 1953                                | 5859         | 17580                                      | 52740         |
| Tenth        | 19538           | 58614         | 1954                                | 5862         | 17584                                      | 52752         |
| <b>Total</b> | <b>97670</b>    | <b>293010</b> | <b>9766</b>                         | <b>29298</b> | <b>87904</b>                               | <b>263712</b> |

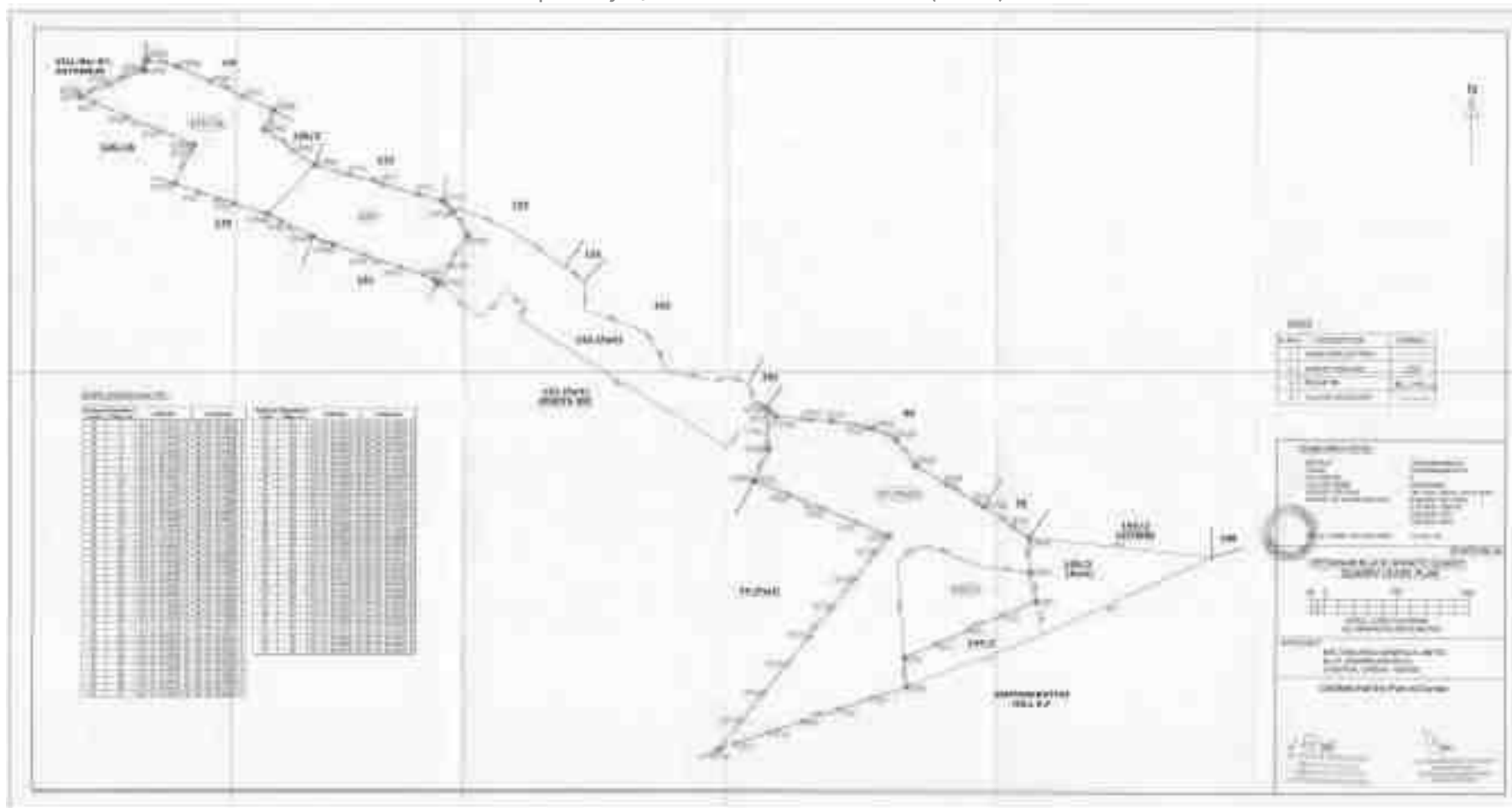


Figure 2-10 Surface Plan of the Quarry

13.74.0 Ha of Veeranam Black Granite Quarry at SF No. 74(P), 126/1A, 127, 144/1,  
Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, TamilNadu,  
Proposed by M/s. Tamil Nadu Minerals Limited (TAMIN)



Figure 2-11 Environment Plan

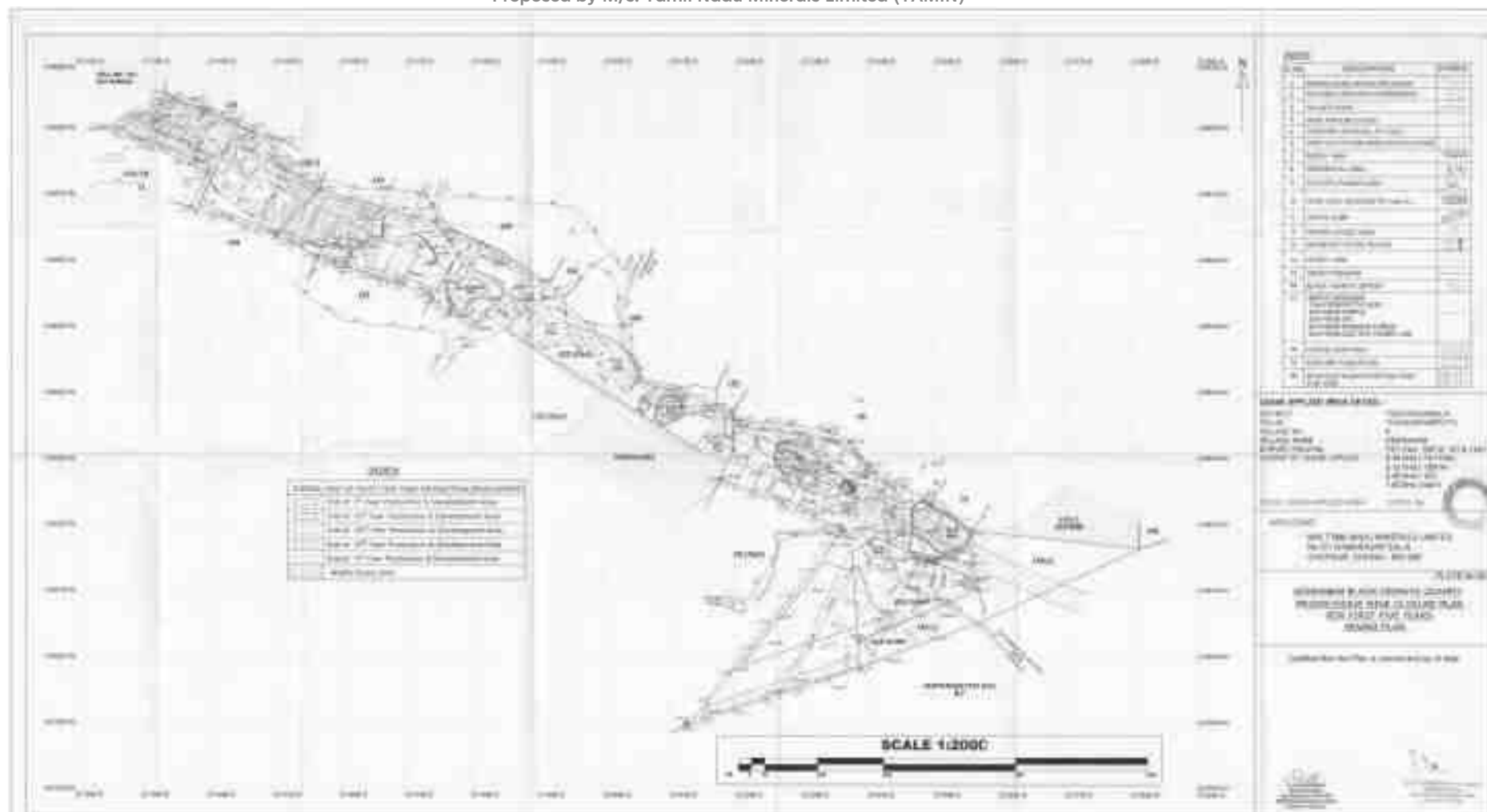


Figure 2-12 Progressive Quarry Closure Plan

## 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.           |
|------------------------------------------|-------------------------------------------|-------------------------|
| <b>A. Fixed Cost</b>                     |                                           |                         |
| 1                                        | Land Cost                                 | Nil. Because Govt. land |
| 2                                        | Labour shed                               | 50,000/-                |
| 3                                        | Sanitary facilities                       | 50,000/-                |
| 4                                        | Fencing Cost                              | 1,25,000/-              |
| <b>Total</b>                             |                                           | <b>2,25,000/-</b>       |
| <b>B. Operational Cost</b>               |                                           |                         |
| 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/-                |
| <b>Total Operational Cost</b>            |                                           | <b>95,67,000/-</b>      |
| <b>C. EMP Cost</b>                       |                                           |                         |
| 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/-                |
| <b>Total EMP Cost</b>                    |                                           | <b>2,05,000/-</b>       |
| <b>Total Cost of the Project (A+B+C)</b> |                                           | <b>99,97,000/-</b>      |

## 2.9 Technology & Process Description

### 2.9.1 Technology

The primary step of mining minerals is the removal of the deposits from the ground. Once the minerals / ore are removed, an additional preparation process is required to isolate the valuable minerals from their waste gangue minerals. There are two basic methods of mining of minerals opencast and underground mining. The choice of method depends on the geological, 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 2-13 Schematic Diagram of Mining Process

### 2.9.1.1 Method of Mining-Open Cast Working

In accordance with Regulation 106(2) (a) of the Metalliferous Mines Regulations 1961, in all open cast workings where the ore body forms a 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 must be maintained. The slope angle of such benches and sides should not exceed 60° from horizontal.

However, observance of these statutory provisions into granite dimensional stone mining is seldom possible due to the field difficulties and technical reasons as given below:

- 1) Recovery of the granite mineral should be as undamaged rectangular dimensional blocks. In the attempt to form the benches and sides with the above statutory parameters, haphazard blasting may be involved. In which case, the commercial granite body may get damaged due to generation of blasting cracks.
- 2) In the exercise of forming the benches with 60° slope within the granite deposit, the portion confined between vertical and 60° as well as its complimentary part in the extricated block will become mineral waste while shaping into rectangular blocks.
- 3) The granite industry needs blocks as huge as a few cubic meters in volume with measurements up to 3mx2mx2m. Production of such huge blocks with a moving bench of 6m height is not possible. Productions of such huge blocks in turn increase the recovery and reduce the mineral waste during dressing. Blocks of smaller size of certain varieties of granite are not marketable now-a-days.
- 4) Formation of too many benches with less height and the width equal to the height may lead to large volume of mineral locked up.

Hence to avoid mineral locked-up 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 6m width with vertical faces. Such a provision for relaxation of the Regulation has been provided within regulation 106(2). 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 back fill the pit in as much as good quantities of reserves are underlining 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 to minimize the lead from the pit to the dressing yard and stock yard. A mine office, storeroom, first-aid room and workers rest shelter will be provided within the lease area where mining is not proposed due to technical reasons and quality consideration.

## 2.10 Process Description

### 2.10.1 Mining

An open cast semi mechanized mining with a 6m vertical bench with a bench width of 6m has been proposed. The safety distance of 50 m on the eastern side of S.F.No.127 and western side of S.F.No. 74 should be maintained for the periya Eri in s.F.No.132. Safety distance of 50m has to be maintained to the Murugan pilaiyar and poomudirayar temple and no shall be the applicant company should not make any hindrance to the adjacent pattadar during quarry operation. Public shall distance of 50m to the sitheri and 60m should be maintained to the near by S.F. 126/1A & 127.

Under regulation 106(2) (a) of the Metalliferous Mines Regulations, 1961, in all open cast workings in hard ore body, the benches and sides should be properly benched and sloped. The bench height should not exceed 6m and the bench width should not be less than the bench height. The slope of the benches should not exceed 60° from horizontal.

As far as the mining of granite dimensional stones is concerned, observance of the provisions of the Regulation 106(2) (a) as above is seldom possible due to various inherent petrogenetic and mining difficulties.

Hence it is proposed to obtain relaxation to the provisions of the above regulation from the Chief Inspector of Mines, for which necessary provision is available within Regulation 106 (2) (a).

The production of black granite dimensional stone in this mine involves the following methods typical for granite stone mining, in contrast to any other major mineral mining.

- 1) Splitting of rock mass of considerable volume from the parent sheet rock carefully avoiding any kind of damage in the form of cracks adopting the following methods:
  - a) Diamond wire cutting along the horizontal as well as two parallel to strike and dip direction and the third vertical face will be free liberated by conventional serial blasting.
  - b) Separation of the horizontal (bottom) and the vertical (length side) planes by serial blasting simultaneously along the above two planes by using 32mm dia. blast holes charged with mild explosive like gun powder or detonating. The process continued aiming at the liberation of huge volume of the granite body from the parent sheet rock is called 'Primary Cutting'.
- 2) The 'Secondary Splitting' required size involves long hole drilling up to the bottom of the separated block along the required planes for which mostly rock breaking powder or expansion mortar is used for splitting. It is chemically called 'Calcium Hydroxide'  $\text{Ca}(\text{OH})_2$ .
- 3) Removing the defective portions and dressing into the useful dimensional blocks are done manually using feather and wedges and chiseling respectively by the labourers

who are skilled in this work.

The defect free rectangular shaped dimensional stones as acceptable consumers are produced by the method described above, which is constantly supervised by experienced Mining Geologist and Mining Engineer.

The waste materials generated during mining activity include the rock fragments of different angularity formed during the removal of naturally defective and uneconomical portions of the deposits and the working waste formed during dressing of the extricated blocks. During the first five years of the Mining Plan period such waste materials are proposed to be dumped along the South side of the lease area where it comprises of country rock terrain.

### 2.10.2 Blasting

The blasting parameters in the mining of Granite dimensional stone 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 industrial minerals, maximum fragmentation and crushing of the ore is essential, whereas in granite mining, the granite stones are to be extricated intact, without any damage to both the extricated part and the parent rock body.

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

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

Heavy 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 production and development of the Colour granite will be purchased from the authorized explosives dealer who has got a valid license to undertake blasting work on a contract basis under License LE3 as Explosive Rules 2008. The blasting will be carried out under the direct supervision of our Statutory Mining Personal of TAMIN as approved by the DGMS under MMR, 1961.

The secondary splitting into required size involves long hole drilling up to the bottom of the separated block along the required planes for which mostly rock breaking powder is used for splitting. It is chemically called 'Calcium Hydroxide  $\text{Ca}(\text{OH})_2$ '.

Nowadays 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 Diamond wire saw machine in this mine.

### 2.10.3 Loading & Transportation

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

### 2.11 Exploration

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

- a) Occurrence of the Granite stone in economically viable quality and quantity has been established by geological mapping and visual examination by Mining Geologists experienced in granite mining which have been proved by actual mining practice.
- b) The depth persistence of the granite stone is proved beyond the workable limits of 30 m from the petrogenetic character of the granite body as well as from the actual mining practice. Considering the deposit with sheet rock formation of 30m depth persistence from the surface level has been taken as 'economically workable' depth to include all the three categories of mineral reserves viz, proved, probable and possible reserves.
- c) The recovery of the saleable granite stones has been established as 10% from the visual exploration and from the data available by actual mining practices during the past mining in TAMIN's nearby lease area.
- d) If any drilling program is carried out in the granite formations, there are defects like cracks and fractures that will be generated and developed during drilling time. Hence, having established all the data necessary for economic exploitation in this area, no definite program for future exploration has been drawn up. The mining activities during the first five years with deep cuts may render additional data as may be required for future planning.

#### 2.11.1 Storage of Explosives

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

#### 2.11.2 Mine Drainage

The mine area is an elevated ground with gentle slope on both sides of the linear dyke. Hence there is a natural drainage system facilitating easy and comfortable drainage of rain waters. However, as a precaution, catch drains have been formed all around the working pit and it has led to natural drainage, so that the rainwater will not enter the working areas.

#### 2.11.3 Disposal of Waste

The waste generated during the mining operation is a side burden, granite rejects and the non-recoverable / unsized boulders and rubbles etc and their accommodation are easier. The area for disposal of waste rock will be identified in the South side of the lease area. The unsold blocks are kept within the boundary on the country rock area. Total waste to be generated during the ten years of Mining Plan period will be 1,75,802m<sup>3</sup>. The area for disposal of waste rock has been identified over the existing waste dump in north and southwest side of the lease area. The dumps will be maintained not exceeding 5m height and the angle of slope of dumps will be at 45° from horizontal.

### 2.11.4 Topsoil 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 areas. The top-soil 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 the 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.

### 2.11.5 Stabilization of Dump

Total waste to be generated during the ten years of Mining Plan period will be 1,75,802m<sup>3</sup>. The area for disposal of waste rock has been identified over the existing waste dump in north and southwest side of the lease area. The dumps will be maintained not exceeding 5m height and the angle of slope of dumps will be at 45° from horizontal.

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, a suitable variety of soil will be brought from outside, the same is spread out over and sides of the waste dumps and for tree sapling will be carried out to increase stability and to prevent erosion during the rainy season.

## 2.12 Requirements

### 2.12.1 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        | Taluk          | Village  | S.F No                          | Area (Ha.)     | Classification                  |
|-----------------|----------------|----------|---------------------------------|----------------|---------------------------------|
| Thiruvannamalai | Thandarampattu | Veeranam | 74(P),<br>126/1A,<br>127, 144/1 | 13.74.0        | Government<br>poramboke<br>land |
| <b>Total</b>    |                |          |                                 | <b>13.74.0</b> |                                 |

**Table 2-11 Land Use Pattern of the lease area**

| S. No | Description           | Area to be Required<br>Mining Plan Period<br>(Ha) |
|-------|-----------------------|---------------------------------------------------|
| 1     | Mining                | 1.53.0                                            |
| 2     | Approach Road         | 0.10.5                                            |
| 3     | Waste Dump            | 2.20.0                                            |
| 4     | Office Infrastructure | 0.02.0                                            |
| 5     | Afforestation         | 0.50.0                                            |
| 6     | Unutilized Area       | 5.45.5                                            |
| 7     | Old Dump              | 2.19.0                                            |
| 8     | Old pit               | 0.75.0                                            |
| 9     | Village Road          | 0.27.0                                            |

|              |                |
|--------------|----------------|
| <b>Total</b> | <b>13.74.0</b> |
|--------------|----------------|

**2.12.2 Water Requirement**

The total water requirement is 3.5 KLD. The total water requirement will be met from authorised vendors or local panchayat. 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. The water requirement details are given in **Table 2-12**.

**Table 2-12 Water requirement breakup**

| S. No        | Description                 | Water Requirement (KLD) |
|--------------|-----------------------------|-------------------------|
| 1            | Drinking & Domestic purpose | 0.7                     |
| 2            | Wire Saw Cutting            | 0.3                     |
| 3            | Dust suppression            | 1.5                     |
| 4            | Green Belt                  | 1.0                     |
| <b>Total</b> |                             | <b>3.5</b>              |

**2.12.3 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*125 kVA      |
| 3     | Fuel requirements (Lts/Day) | 200            |

**2.12.4 List of Equipment**

The list of Equipment is given in **Table 2-14**.

**Table 2-14 Lists of Machineries**

| S. No | Purpose   | Machinery                      | Numbers | Capacity               | Make          | Motive Power     |
|-------|-----------|--------------------------------|---------|------------------------|---------------|------------------|
| 1     | Drilling  | Jack Hammer (32mm dia)         | 6       | 1.2 to 6 m             | Atlas Copco   | Compressed Air   |
|       |           | Compressor                     | 2       | 400 psi                | Atlas Copco   | Diesel Drive     |
|       |           | Tractor Mounted Air Compressor | 1       | -                      | -             | Diesel Drive     |
|       |           | Diamond Wire Saw               | 1       | 30 m <sup>3</sup> /day | Optima        | Diesel Generator |
|       |           | DG                             | 1       | 125 KVA                | Powerica      | Diesel           |
| 2     | Loading   | Excavator                      | 1       | 3000 LC                | TATA Hitachi  | Diesel Drive     |
| 3     | Transport | Dumpers                        | 2       | 25 Tons                | Ashok Leyland | Diesel Drive     |

**2.12.5 Manpower Requirement****Table 2-15 Manpower Details**

| S. No                    | Description                                                         | Noof Persons |
|--------------------------|---------------------------------------------------------------------|--------------|
| <b>Direct Manpower</b>   |                                                                     |              |
| 1                        | Manager (Second Class Manager certificate of competency Restricted) | 1            |
| 2                        | Mine Foreman (Foreman Certificate of competency Restricted)         | 1            |
| 3                        | Operators & Drivers                                                 | 7            |
| 4                        | Workers (Skilled, semiskilled & unskilled)                          | 26           |
|                          | <b>Total</b>                                                        | <b>35</b>    |
| <b>Indirect Manpower</b> |                                                                     | <b>20</b>    |

**2.12.6 Solid Waste Management**

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

**Table 2-16 Municipal Solid Waste generation & Management**

| S. No | Type         | Quantity Kg/day | Disposal method                    |
|-------|--------------|-----------------|------------------------------------|
| 1     | Organic      | 6.3             | Panchayat bin including food waste |
| 2     | Inorganic    | 9.45            | TNPCB authorized recyclers         |
|       | <b>Total</b> | <b>15.75</b>    |                                    |

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

**2.12.7 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 |

**2.13 Infrastructure facilities**

Mine office, storeroom, first-aid room etc, will be provided on semi- permanent structure within the lease area.

**2.14 Resource optimization/recycling and reuse envisaged in the project.**

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

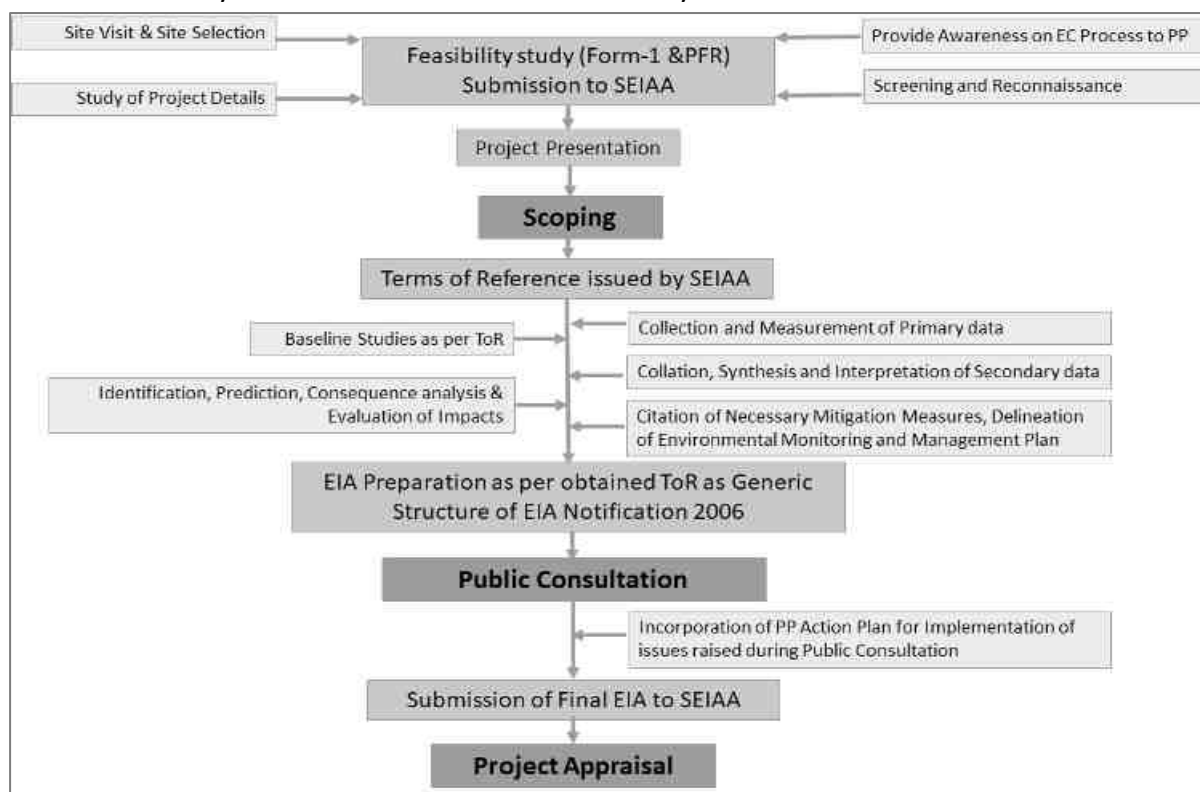
**2.15 Availability of water its source, Energy/power requirement and source**

This quarry project does not require huge water and quarry operation will be carried out during the general shift only. Limited Scale of activities entails only the negligible power requirement and the same is met from TNEB or from solar light.

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

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

- Study of project information
- Screening & Scoping
- Environmental Pre-Feasibility study & application for approval of TOR
- Collection of detailed project management plan/report
- Baseline data collection
- Impact identification, Prediction & Evaluation
- Mitigation measures & delineation of EMP
- Risk Assessment and Safety & Disaster Management plan
- Review & Draftization 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 2-14 Feasibility & Environmental Assessment Process**

## 2.17 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.,

### **2.17.1 Land Environment**

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 affected. 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.

#### **2.17.1.1 Discharges on Land-Impact**

##### **Domestic:**

Domestic wastewater is being disposed into septic tank followed by soak pit.

##### **Mitigation Measures**

- ▶ The mine waste in the mine includes the topsoil/rock fragments and rubble 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 a source of air pollution due to wind erosion if they are not properly rehabilitated. Topsoil and overburden will be generated from the mining project which will be stacked separately at the designated areas.

### 2.17.1.2 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.

#### 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 is being generated from quarry machineries and the same is disposed through TNPCB Authorized dealers.

### 2.17.2 Air Environment

Mining operations contribute towards air pollution in two ways: addition of gaseous pollutants to the atmosphere and the dust particles. The gaseous pollutants include NO<sub>x</sub>, SO<sub>2</sub> 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.

### 2.17.3 Sources of Air Pollution

#### 2.17.3.1 Point Source/Single Source

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

#### 2.17.3.2 Drilling

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

Conventional 32mm 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 depth few cm above the required horizontal planes. Sub grading drilling is not followed since the splitting will be affected up to a further distance of cm from the drill hole, because sub grade drilling may affect the underlaying granite deposit.

#### 2.17.3.3 Loading

In the proposed project, the loading of side burden and granite rejects is proposed by Hydraulic excavators. This activity is likely to contribute air pollution in the form of SPM (dust) during discharge of material from bucket and gaseous pollutants like SO<sub>2</sub>, NO<sub>x</sub> and Hydrocarbons due to combustion of fuel (diesel) in the loading machinery.

#### 2.17.3.4 Unloading

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

pollutants like SO<sub>2</sub>, NO<sub>x</sub> and Hydrocarbons due to consumption of fuel (diesel) by dumper while unloading the material.

#### **2.17.3.5 Line Sources**

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

#### **2.17.3.6 Transportation**

The generated rejects and granites from site will be transported by haul road. Transportation also includes the movement of service vehicles in the mine lease area. The traffic on the haul roads is likely to contribute towards an 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.

#### **2.17.3.7 Area Sources/Multiple Sources**

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

#### **2.17.3.8 Instantaneous Sources**

The instantaneous sources consist of air pollution due to sudden/instantaneous activities like blasting in the mine area. The 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 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 filters / mask to workers working at highly dust prone and affected areas.
  - ▶ Provision of greenbelt by vegetation for trapping dust.
  - ▶ Greenbelt development along the haul roads, dumps and along the boundaries of the lease area.
- ▶ The utmost care will be taken to prevent the spillage of sand and stone from the

trucks.

- ▶ Covered tarpaulin for transport of materials.

#### **2.17.4 Noise & Vibration Environment**

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

- ▶ Drilling and Blasting
- ▶ Excavation of the material
- ▶ Loading & unloading minerals
- ▶ Transportation vehicles

##### **2.17.4.1 Noise Levels**

Heavy Earth Moving Machineries (HEMM) are 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. Occupational hazard is envisaged if proper personal protective equipment is not provided to the operator and workers.

##### **2.17.4.2 Vibration**

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

TAMIN will follow shallow holes of 32mm dia are drilled and conventional low explosives such as gun powder, ordinary detonators etc are used for the splitting of hard rock mass. Hence, ground vibration and noise pollution will be minimal and restricted to within the mine workings. The blasting will be taken up at appointed times only and with sufficient caution from the public. By adopting controlled blasting, the problems will be greatly minimized, and the impacts will also be minimized by choosing a proper detonating system, optimizing total charge and delay.

Ground vibration, flying 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 the operation phase is classified into two categories:

- ▶ Stationary sources due to operation of heavy-duty machinery at the project site like

Compressors, DG sets, Quarry vehicles and drilling machinery etc.,

### Mitigation Measures

- ▶ The major noise generating equipment like Compressors, DG sets, Excavator, & Tippers etc, will be enclosed in an acoustic enclosure designed for an insertion loss of 25 dB (A) and silencers to other equipment etc.
- ▶ Drilling will be carried out with the help of sharp drill bits which will help in reducing noise.
- ▶ Secondary blasting will be totally avoided.
- ▶ Controlled blasting with proper spacing, burden, stemming and optimum charge/delay will be maintained.
- ▶ The blasting will be carried out during favorable atmospheric condition and less human activity timings i.e. during lunch interval or during change of shifts.
- ▶ Proper maintenance, oiling and greasing of machines at regular intervals will be done to reduce noise generation.
- ▶ Greenbelt and plantation will be developed around the mining activity area and long-haul roads. The plantation minimizes the propagation of noise.
- ▶ Periodical monitoring of noise will be done.
- ▶ The occupational noise exposure to the workers in the form of eight hourly weighted average will be maintained well within the prescribed Occupational Safety and Health Administration (OSHA) standard limits.
- ▶ Adequate PPE will be provided for the staff exposed to noise risks.
- ▶ Acoustic silencers will be provided in equipment wherever necessary.
- ▶ Use of personal protective Equipment's/devices such as earmuffs, 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 the operational phase of the project.
- ▶ Low vibration generating machines/equipment will be selected to meet international standards and foundations will be designed to minimize vibrations and secure 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.

### 2.17.5 Water Environment

#### Impact on Existing Water Resources

The total water requirement for a quarry is 3.5 KLD. The total water requirement is met by authorized vendors and local Panchayat; Domestic sewage is being disposed into Septic tank & no toxic/other effluent generation. Hence the impact due to the project is very minimal.

#### **2.17.5.1 Impacts on Surface Water Bodies**

The surface water and groundwater are the lifeline of the villages. All the ponds in the area are working as recharge sites for the underlying 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 on 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, it is apparent that there will be negligible impact of mining on the surface water regime.

#### **2.17.5.2 Impact on Ground Water**

There will not be any ground water withdrawal, as the total water requirement is being met by private tank waters. As, the mine lease area is a Hilly area. Site elevated at 225 to 251 m height from the ground level. Hence, there will not be any ground water level intersect as the planned depth of mining is 30 m from the top of the hill.

#### **Mitigation Measures**

The following measures are proposed as a part of development to improve the ground water scenario and 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 water quality and groundwater level variations in the project site.

#### **2.17.6 Biological Environment**

##### **Impact on migratory paths for wildlife and forest blocks**

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

#### **Mitigation Measures**

- ▶ Discharge of waste 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 of in an unauthorized manner, it will impact soil quality, groundwater, and air quality.

#### 2.17.7.2 Solid Waste Management

Strict guidelines will be put in place to manage solid waste generation during the operational phase of 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 waste. Waste management is given in **Figure 2-15**.



**Figure 2-15 Waste Management Concepts**

#### 2.17.8 Afforestation

The safety distance along the eastern side of the lease area has been identified to be utilized for afforestation. Native species will be planted in phased manner as given in **Table 2-18**.

**Table 2-18 Afforestation Plan details**

| Local Name of the Tree        | Scientific Name of the Tree | Survival | No. of Species |
|-------------------------------|-----------------------------|----------|----------------|
| Vaagai                        | Albizia Lebbeck             | 80 %     | 800            |
| Manjadi                       | AdenaantheraPavonina        |          |                |
| Aatru Poovarasu               | Hibiscus Tiliaceous         |          |                |
| Panai                         | Borassus Flabellifer        |          |                |
| Yetti                         | StrychnosNuxvomica          |          |                |
| Purangai Naari, Pudanga Naari | Premna Tomentosa            |          |                |
| Magizha Maram                 | MimusopsElengi              |          |                |
| Puthranjivi                   | PuthranjivaRoxburghii       |          |                |
| Pisin Pattai                  | LitseaGlutinosa             |          |                |
| Sandhana Vembu                | Toona Ciliate               |          |                |
| Eachai                        | Phoenix Sylvestre           |          |                |

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

The project is a Black Granite quarry project. The technology used for mining is made by TAMIN; in house there would not be any changes in the Mining. Mining technology is a 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 environmental components, as identified in and around the “Veeranam Black Granite Quarry” in SF No. 74(P), 126/1A, 127, 144/1, Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District. The primary baseline data monitored covered three (3) months i.e., from **February 2025 - April 2025**, and secondary data was collected from Government and Semi-Government organizations. The primary baseline data has been conducted by M/s. Ekdant Enviro Services (P) Limited, Chennai, NABL approved Environmental Testing Laboratory for following Terrestrial environmental components.

| S. No | Description of Section | Section                                                             | Parameters                                                                                                          |
|-------|------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| 1     | Meteorology            | Section 3.6.2                                                       | Temperature, Relative Humidity, Rainfall, Wind Speed & Direction                                                    |
| 2     | Ambient Air Quality    | Section 3.6.4                                                       | As per NAAQS, 2009 and TVOC as per ToR                                                                              |
| 3     | Ambient Noise Levels   | Section 3.7                                                         | Day equivalent noise levels, Night equivalent noise levels (As per CPCB Standards)                                  |
| 4     | Water Quality          | Surface water –<br>Section 3.8.2<br>Ground water –<br>Section 3.8.3 | Ground Water – IS 10500:2012<br>Surface Water – IS 2296 (Class – A)                                                 |
| 5     | Soil Quality           | Section 3.9                                                         | ICAR (Indian Council of Agricultural research)                                                                      |
| 6     | Ecology                | Section 3.10                                                        | Flora and Fauna                                                                                                     |
| 7     | Social Economic Status | Section 3.11                                                        | Socio Economic Profile of Study area (Population Profile, Employment and Livelihood, Education and Literacy, etc.,) |

### 3.2 Description of 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 10Km from the boundary of the project. The PIA covers approximately 22 villages and 1 Township. 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**.

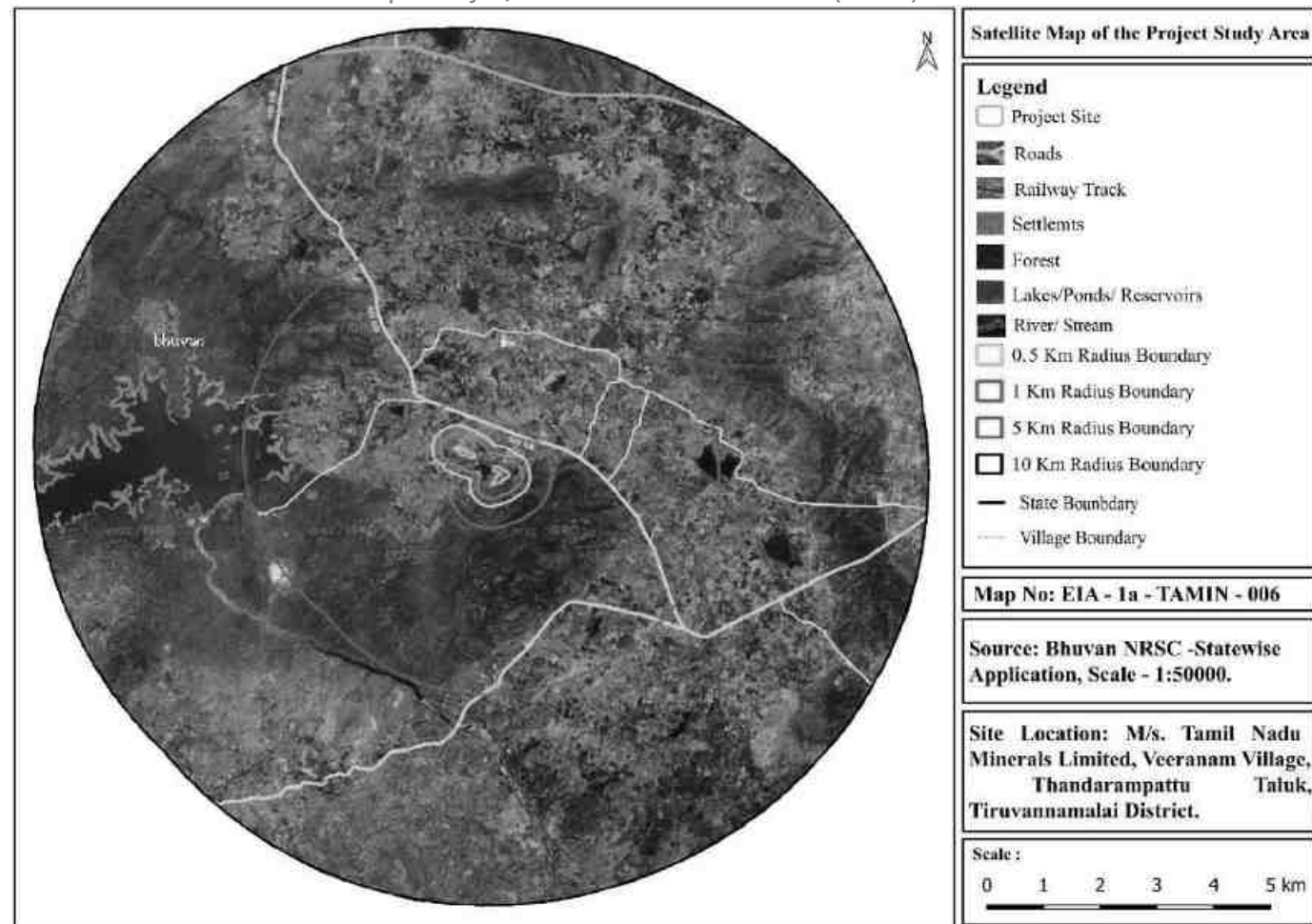


Figure 3-1 Satellite Image of the study area of Project

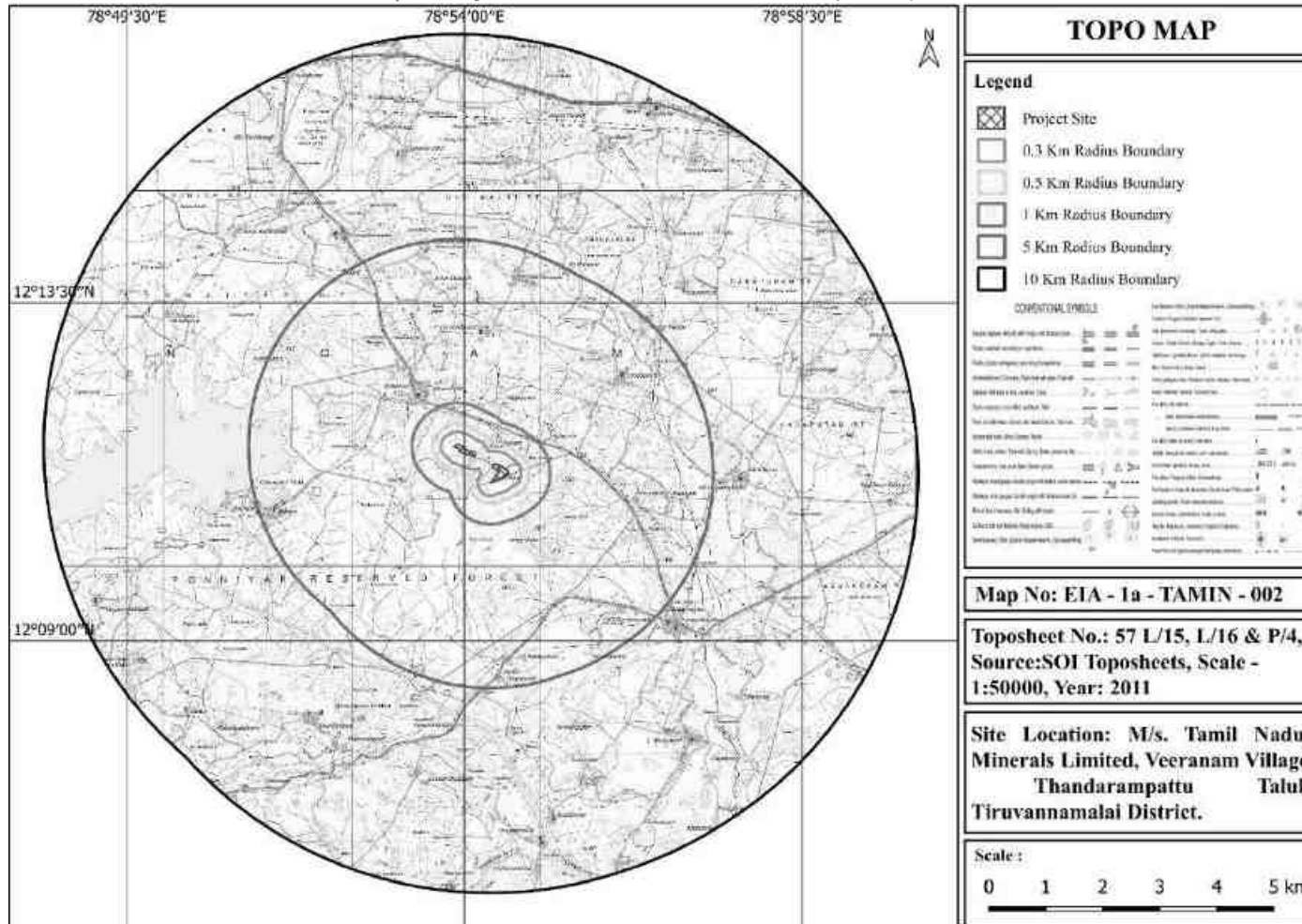


Figure 3-2 Topo Map of Study area

### 3.3 Environmentally/Ecologically Sensitive areas

The environmental sensitive areas covering an aerial distance of 15km from the project boundary is given in **Table 3-1** and Map showing Environmental sensitive areas within 15 km from project boundary is given in **Figure 3-3**.

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

| S. No. | Areas                           | Distance & Direction from project boundary |                           |                      |           |
|--------|---------------------------------|--------------------------------------------|---------------------------|----------------------|-----------|
| 1      | List of Monuments and Heritages | Nil within the 15km radius.                |                           |                      |           |
| 2      | List of Water Bodies            | S. No.                                     | Location                  | Distance (~km)       | Direction |
|        |                                 | 1                                          | Veernam Lake              | Adjacent to the site |           |
|        |                                 | 2                                          | Sathanur Lake             | 1.08                 | N         |
|        |                                 | 3                                          | Mallikapuram Lake         | 1.39                 | WNW       |
|        |                                 | 4                                          | Naykkanur Lake            | 1.41                 | NE        |
|        |                                 | 5                                          | Sattannur Lake            | 1.85                 | NNW       |
|        |                                 | 6                                          | Taradapattu Lake          | 2.34                 | NE        |
|        |                                 | 7                                          | Govindapuram Lake         | 3.2                  | N         |
|        |                                 | 8                                          | Alal Ar                   | 3.72                 | ENE       |
|        |                                 | 9                                          | Sathanur Dam              | 3.73                 | W         |
|        |                                 | 10                                         | Taradapattu Lake          | 3.82                 | NE        |
|        |                                 | 11                                         | Thandarampattu Canal      | 3.91                 | ENE       |
|        |                                 | 12                                         | Kil Vanakkambadi Lake     | 4.31                 | E         |
|        |                                 | 13                                         | Melkarippur Lake          | 4.48                 | NNE       |
|        |                                 | 14                                         | Tandarampattu Lake        | 4.85                 | SE        |
|        |                                 | 15                                         | Kilvanakkambadi Canal     | 5.14                 | E         |
|        |                                 | 16                                         | Kolundampattu Canal       | 5.57                 | NNE       |
|        |                                 | 17                                         | Ponnaiyar River           | 5.58                 | SSW       |
|        |                                 | 18                                         | Sattanur Main Canal       | 5.77                 | S         |
|        |                                 | 19                                         | Sorappanandal Lake        | 5.8                  | NW        |
|        |                                 | 20                                         | Sathanur Lake             | 1.08                 | N         |
|        |                                 | 21                                         | Keelamanjanoor Canal      | 5.98                 | SSW       |
|        |                                 | 22                                         | Lake near Kilvanakkambadi | 6.16                 | ESE       |
|        |                                 | 23                                         | Lake near Melpennathur    | 6.41                 | NNW       |
|        |                                 | 24                                         | Nedungavadi Lake          | 6.9                  | NE        |
|        |                                 | 25                                         | Mudiyanur Lake            | 6.92                 | SE        |
|        |                                 | 26                                         | Lake near Pudurnattam     | 7.58                 | SW        |
|        |                                 | 27                                         | Tiruvadattanur Lake       | 7.65                 | S         |
|        |                                 | 28                                         | Pamban Ar                 | 8.51                 | SSW       |
|        |                                 | 29                                         | Erraiyur Malai RF         | 8.86                 | NNE       |
|        |                                 | 30                                         | Perumbakkam Lake          | 8.98                 | E         |
|        |                                 | 31                                         | Eraiur Lake               | 9.5                  | N         |
|        |                                 | 32                                         | Melserumbakkam Lake       | 9.7                  | E         |

|   |                                            |                                                                                                                                                                                                        |                      |                      |           |
|---|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------|-----------|
|   |                                            | 33                                                                                                                                                                                                     | Varatta Ar           | 9.98                 | SSW       |
|   |                                            | 34                                                                                                                                                                                                     | Asuvangasuranai Lake | 9.98                 | ENE       |
|   |                                            | 35                                                                                                                                                                                                     | Cheyyar R            | 10.32                | NNW       |
|   |                                            | 36                                                                                                                                                                                                     | Pinjur Canal         | 12.46                | NW        |
|   |                                            | 37                                                                                                                                                                                                     | Melmudiyanur Canal   | 12.58                | N         |
|   |                                            | 38                                                                                                                                                                                                     | Munnurmangalam Canal | 12.74                | NNW       |
|   |                                            | 39                                                                                                                                                                                                     | Samudram Tank        | 13.14                | E         |
|   |                                            | 40                                                                                                                                                                                                     | Muraiya Ar           | 13.25                | NW        |
|   |                                            | 41                                                                                                                                                                                                     | Valaiyar Odai        | 13.5                 | W         |
|   |                                            | 42                                                                                                                                                                                                     | Ramakkal Odai        | 13.53                | WSW       |
| 3 | List of Reserved Forests                   | S. No.                                                                                                                                                                                                 | Location             | Distance (~km)       | Direction |
|   |                                            | 1                                                                                                                                                                                                      | Ponnaiyar RF         | Adjacent to the site |           |
|   |                                            | 2                                                                                                                                                                                                      | Uchhimalai RF        | 3.93                 | NNE       |
|   |                                            | 3                                                                                                                                                                                                      | Radapuram RF         | 4.91                 | ENE       |
|   |                                            | 4                                                                                                                                                                                                      | Uchimalai RF         | 5.71                 | N         |
|   |                                            | 5                                                                                                                                                                                                      | Pinjur RF            | 7.07                 | NW        |
|   |                                            | 6                                                                                                                                                                                                      | Pinjur RF            | 7.96                 | NW        |
|   |                                            | 7                                                                                                                                                                                                      | Pumalai RF           | 8.59                 | SE        |
|   |                                            | 8                                                                                                                                                                                                      | Erraiyur Malai RF    | 8.86                 | NNE       |
|   |                                            | 9                                                                                                                                                                                                      | Rayandapuram RF      | 10.74                | S         |
|   |                                            | 10                                                                                                                                                                                                     | Kavuttimalai RF      | 11.13                | NE        |
|   |                                            | 11                                                                                                                                                                                                     | Pinjur RF            | 12.5                 | NW        |
|   |                                            | 12                                                                                                                                                                                                     | Rayandapuram RF      | 12.68                | S         |
|   |                                            | 13                                                                                                                                                                                                     | Munnurmangalam RF    | 12.94                | N         |
|   |                                            | 14                                                                                                                                                                                                     | Munnurmangalam RF    | 14.43                | N         |
|   |                                            | 15                                                                                                                                                                                                     | Kannamadaai RF       | 14.57                | ESE       |
| 4 | Nearby Town, City and Head Quarters        | <b>Town:</b> Thandarampattu, 3.94, ESE<br><b>City/ District HQ:</b> Tiruvannamalai, 14.75, ENE                                                                                                         |                      |                      |           |
| 5 | Nearest Airport, Port and Railway Stations | <b>Railway Station:</b> Thiruvannamalai Railway Station, 19.14, ENE<br><b>Domestic airport:</b> Salem Airport, 100.85, WSW<br><b>International Airport:</b> Chennai International Airport, 160.40, ENE |                      |                      |           |
| 6 | Nearest Densely Populated Habitations      | S. No.                                                                                                                                                                                                 | Location             | Distance (~km)       | Direction |
|   |                                            | 1                                                                                                                                                                                                      | Sathanur             | 1.24                 | NNW       |
|   |                                            | 2                                                                                                                                                                                                      | Tharadapattu         | 3.04                 | NE        |
|   |                                            | 3                                                                                                                                                                                                      | Thandarampattu       | 3.94                 | ESE       |

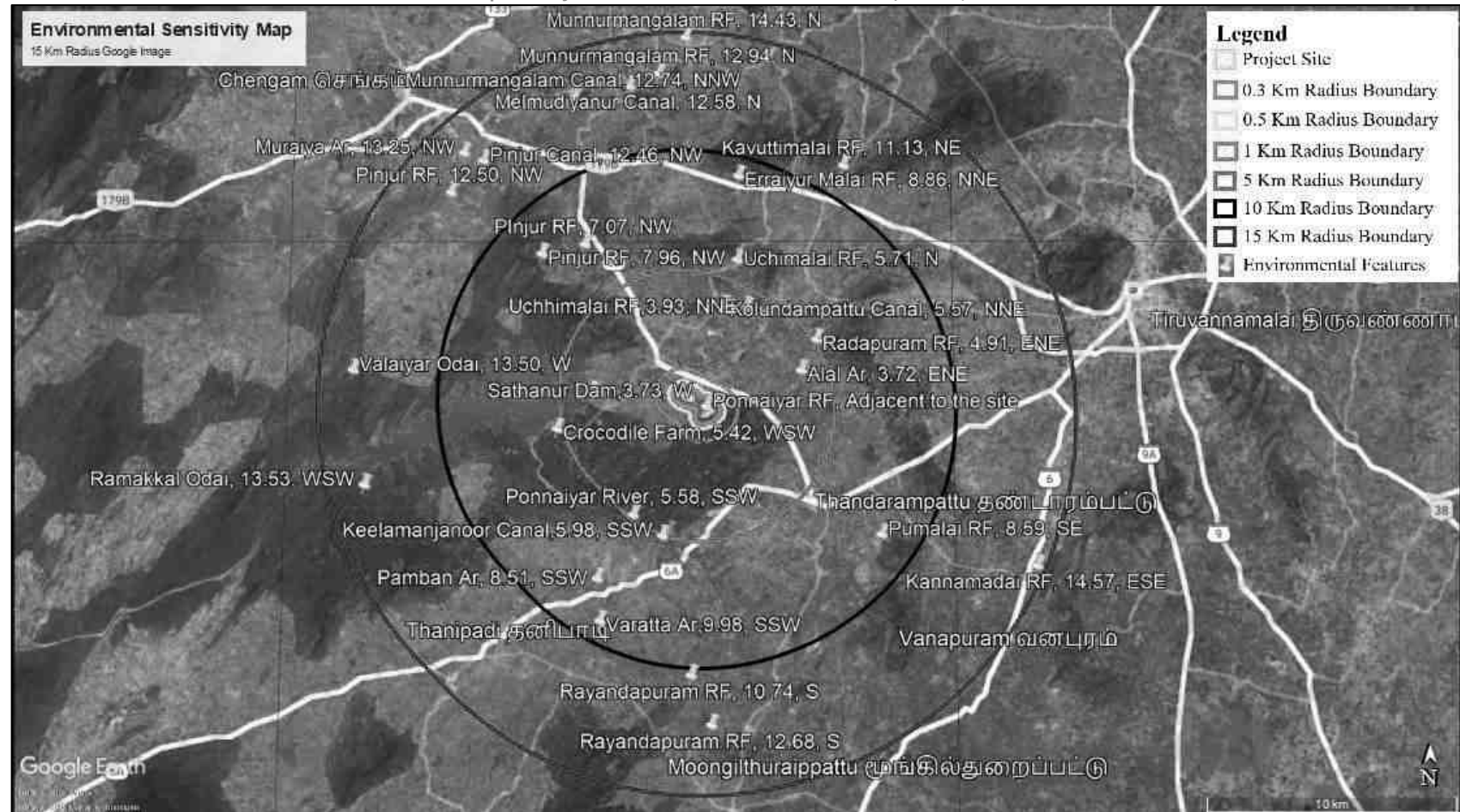


Figure 3-3 Environmental sensitive areas within 15 km from project boundary

### 3.4 Physical Conditions of PIA district

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

#### 3.4.1 PIA District Profile

Tiruvannamalai District was created from erstwhile North Arcot District on 30-09-1989. The district is surrounded by Kanchipuram district in the East, Villupuram district in the south, Dharmapuri and Krishnagiri Districts in the West and Vellore District in the North as its boundaries. Tiruvannamalai District is divided into 3 Revenue Divisions namely Tiruvannamalai, Arni and Cheyyar and 12 Taluks namely Tiruvannamalai, Kilpennathur, Chengam, Thandarampattu, Kalasapakkam Polur, Arni, Chetput, Cheyyar, Vembakkam, Vandavasi and Jamanamarathur. They are further sub-divided into 18 development blocks, 4 Municipalities and 10 Town Panchayats and 860 Village Panchayats.

Source : <https://tiruvannamalai.nic.in/district-at-a-glance/>

#### 3.4.2 Climatic Conditions and Rainfall

This district has moderate climate. In Tiruvannamalai and Chengam taluks, the climate is cool in winter and hot during summer. The district gets rainfall during both north-east monsoon and southwest monsoon. The physiographic nature prevailing in the district forces variation in the climatic conditions. The radiation of the heat from the rocky hills and the dry weather due to sandy bed of the Palar minimises the rainfall in the region. The rainfall of the region depends on the south-west and the north-east monsoons. Except southern taluks of Cheyyar and Vandavas, the district experience moderate rainfall during north-east monsoon.

In summer, from March to June, the wind is hot and uncomfortable. In the monsoon seasons, from July to November, the wind is mild and from December to February, the wind is cold.

Source : DH 2011 3305 PART A DCHB TIRUVANNAMALAI

### 3.5 Natural Resources of PIA District

#### 3.5.1 Forest Resources of PIA district

One sixth of the area of this district is covered by reserve forest. Hill ranges in the district forms part of Eastern Ghats under Jawadhu Hills. The important hills above the mean sea level in this district are Tiruvannamalai (2668 ft), Jawadhu hills (2500 ft) and Kailasagiri (2743 ft). This district has thick forest areas in Chengam and Polur taluks. The district has 79677.7 hectares of forest area which is about 14.8% to the total area of the entire district. The hilly areas of this district are “dry” deciduous type. In the low land, the ordinary vegetation like Tamarind trees, Teak wood, Sandal wood, Ven teak, Casurina, Bamboo etc. are the important trees in the district. Number of rareplant species are spread over the Tiruvannamalai hill. Of these, more than 50% of the species are used by the local people for various medicinal uses.

Regarding fauna, some wild animals are found in the mountainous tracts. Bisons are seen in small numbers in Jawadhu Hill ranges and Tigers are occasionally seen. Leopards, Black Bears, Hyena, Samburs, Spotted Deer, Jungle Sheep, Barking Deer, Antelopes, and Varieties of snakes including

Cobras are spread over at different regions. The reserved forests in the district found with sandalwood, bamboos, herbal plants, tamarind trees, teakwood, Ven teak and casurina.

**Source :** DH 2011 3305 PART A DCHB TIRUVANNAMALAI

### 3.5.2 Irrigation of PIA district

Tanks and wells are the main sources of irrigation. There has been a spurt in the installation of electrical pump-sets for irrigation. This has given a boost to agricultural techniques in the use of fertilizers, pesticides, improved seed varieties and modern agricultural implements etc. Thus, there was an increase in agricultural production. Three major rivers contribute largely to irrigation in this district, viz Palar, Pennaiyar and Cheyyar. Farmers in Chengam and Tiruvannamalai taluks receive water from Sathanur Dam for irrigation whenever the dam is filled with water.

Towards meeting the irrigation needs, the district has one reservoir. The numbers of tanks in the district are 1965. There were 144 canals running about 119 kms in the district. There were 174709 open wells (for irrigation only) besides 19266 wells used for domestic purposes during 2009-10.

The farmers have started installing bore-wells for exploiting the ground water for irrigation purpose. Dry land cultivation is common in the district. Majority of the area in the district is rain fed in nature.

**Source :** DH 2011 3305 PART A DCHB TIRUVANNAMALAI

### 3.5.3 Agricultural Resources of PIA district

Agriculture is the main source of livelihood for the people in the district. The district is dependent on seasonal rains for successful agricultural operations. Different crops in dry and wetlands are cultivated in the district. Some of the taluks, in particular, which enjoy irrigation facilities are Tiruvannamalai, Cheyyar, Polur and Vandavasi. Paddy is the main agricultural crop in this district.

**Source :** DH 2011 3305 PART A DCHB TIRUVANNAMALAI

### 3.5.4 Mineral Resources of PIA district

Quartz is available in little quantity in the border regions near Viluppuram district. Black granite and multi-coloured marble stones are available in plenty in the regions of Chengam and Vandavasi.

**Source :** DH 2011 3305 PART A DCHB TIRUVANNAMALAI

### 3.5.5 Land Use & Land Cover of PIA district

Total geographic area of Tiruvannamalai district is **6191.01 Sq. Km**. Urban Built-up area is 31.41 Sq. Km and Rural Built-up area is **174.09 Sq. Km**. Details of land use/land cover statistics for Tiruvannamalai district were given in **Table 3-2**. Land Use pattern of Tiruvannamalai district is given in **Figure 3-4**.

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

| S. No | Division of Land Use/Land Cover | Area in Sq. km. | Area (%) |
|-------|---------------------------------|-----------------|----------|
| 1     | Built up, Urban                 | 31.41           | 0.51     |
| 2     | Built up, Rural                 | 174.09          | 2.81     |
| 3     | Built up, Mining                | 8.56            | 0.14     |
| 4     | Agriculture, Crop land          | 3113.88         | 50.30    |
| 5     | Agriculture, Plantation         | 37.58           | 0.61     |

|              |                                                     |                |              |
|--------------|-----------------------------------------------------|----------------|--------------|
| 6            | Agriculture, Fallow                                 | 1006.36        | 16.26        |
| 7            | Forest, Evergreen/ Semi evergreen                   | 229.71         | 3.71         |
| 8            | Forest, Deciduous                                   | 843.11         | 13.62        |
| 9            | Forest, Forest Plantation                           | 20.02          | 0.32         |
| 10           | Forest, Scrub Forest                                | 0.08           | 0.001        |
| 11           | Barren/unculturable/ Wastelands, Salt Affected land | 8.74           | 0.14         |
| 12           | Barren/unculturable/ Wastelands, Scrub land         | 96.08          | 1.55         |
| 13           | Barren/unculturable/ Wastelands, Sandy area         | 0.24           | 0.004        |
| 14           | Barren/unculturable/ Wastelands, Barren rocky       | 57.85          | 0.93         |
| 15           | Wetlands/Water Bodies, Inland Wetland               | 0.47           | 0.01         |
| 16           | Wetlands/Water Bodies, River/Stream/canals          | 49.08          | 0.79         |
| 17           | Wetlands/Water Bodies, Reservoir/Lakes/Ponds        | 513.75         | 8.30         |
| <b>Total</b> |                                                     | <b>6191.01</b> | <b>100.0</b> |

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

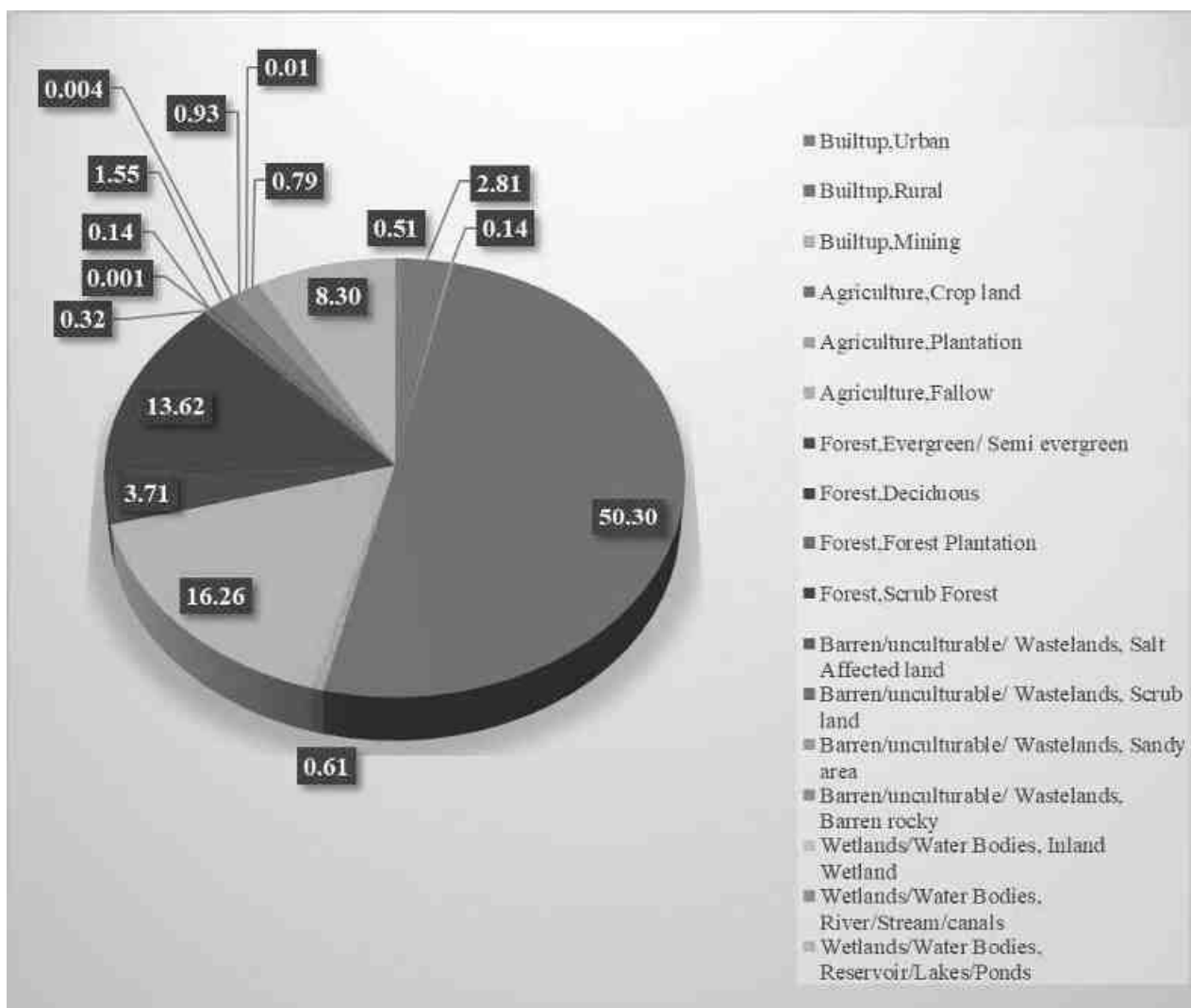


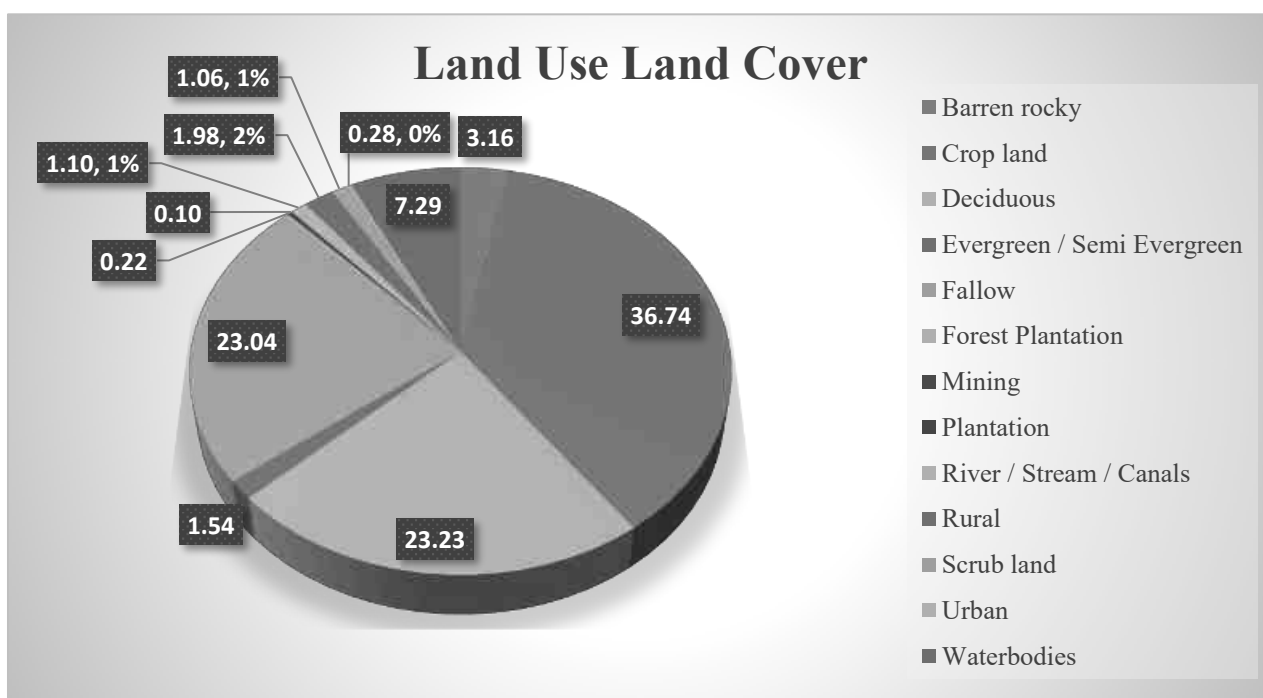
Figure 3-4 Land Use pattern of Tiruvannamalai district

### 3.5.5.1 Land Use and Land Cover of the Study Area

The total Project Study area is **347.8 Sq.km**. The Land Use Pattern is given in **Table 3-3**. The Land Use Pattern and Land Use Map of the Study area are given in **Figure 3-5** and **Figure 3-6** respectively.

**Table 3-3 Land Use Pattern of the Study Area**

| S. No        | Description                | Area (Sq. Km) | Area (Acres)    | Area (Hectares) | Percentage (%) |
|--------------|----------------------------|---------------|-----------------|-----------------|----------------|
| 1            | Barren rocky               | 10.98         | 2713.2129       | 1098            | 3.16           |
| 2            | Crop land                  | 127.77        | 31572.60585     | 12777           | 36.74          |
| 3            | Deciduous                  | 80.78         | 19961.1419      | 8078            | 23.23          |
| 4            | Evergreen / Semi Evergreen | 5.35          | 1322.01175      | 535             | 1.54           |
| 5            | Fallow                     | 80.12         | 19798.0526      | 8012            | 23.04          |
| 6            | Forest Plantation          | 0.96          | 237.2208        | 96              | 0.28           |
| 7            | Mining                     | 0.77          | 190.27085       | 77              | 0.22           |
| 8            | Plantation                 | 0.35          | 86.48675        | 35              | 0.10           |
| 9            | River / Stream / Canals    | 3.81          | 941.47005       | 381             | 1.10           |
| 10           | Rural                      | 6.88          | 1700.0824       | 688             | 1.98           |
| 11           | Scrub land                 | 3.67          | 906.87535       | 367             | 1.06           |
| 12           | Urban                      | 0.99          | 244.63395       | 99              | 0.28           |
| 13           | Waterbodies                | 25.37         | 6269.05385      | 2537            | 7.29           |
| <b>Total</b> |                            | <b>347.8</b>  | <b>85943.12</b> | <b>34780</b>    | <b>100.00</b>  |



**Figure 3-5 Land Use Pattern of the Study Area**

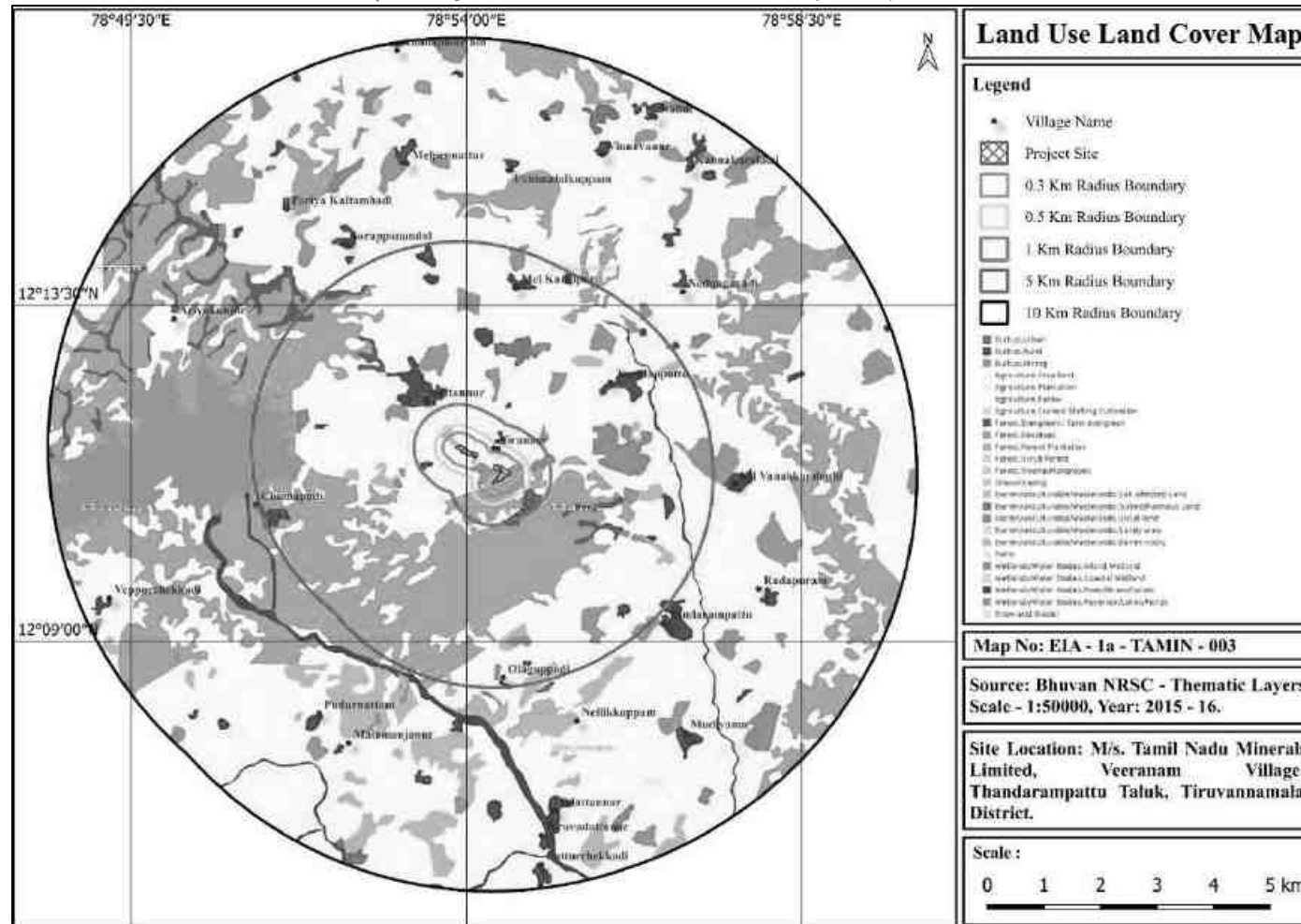


Figure 3-6 Land Use Land Cover map of the study area

### 3.5.6 Geology of PIA district

Tiruvannamalai District mainly comprises of rocks of Archaeon age. The type of rocks found in the district are Charnockite, Granitic gneiss, Epidote Hornblende Gneiss, Amphibolite, Pyroxenite, Dunite, Migmatites, Banded Magnetite Quartzite, Shale, and Clay. Dolerite dykes (Black Granite) are also noticed cutting across the country rocks. The hard rock terrain comprises predominantly of Charnockite and Khondalite groups and their migmatitic derivatives, supracrustal sequences of Sathyamangalam and Kolar groups and Peninsular Gneissic Complex (Bhavani Group), intruded by ultramafic-mafic complexes, basic dykes, granites and syenites. The sedimentary rocks of the coastal belt include fluviatile, fluvio-marine, and marine sequences, such as Gondwana Supergroup (Carboniferous to Permian and Upper Jurassic to Lower Cretaceous), marine sediments of Cauvery basin (Lower Cretaceous to Paleogene), Cuddalore /Pannambarai Formation (Mio Pliocene) and sediments of Quaternary and Recent age. Contour map of the study area is given in **Figure 3-7**.

**Source:**

<https://cdn.s3waas.gov.in/s318997733ec258a9fcdf239cc55d53363/uploads/2019/05/2019053158.pdf>

13.74.0 Ha of Veeranam Black Granite Quarry at SF No. 74(P), 126/1A, 127, 144/1,  
 Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, TamilNadu,  
 Proposed by M/s. Tamil Nadu Minerals Limited (TAMIN)

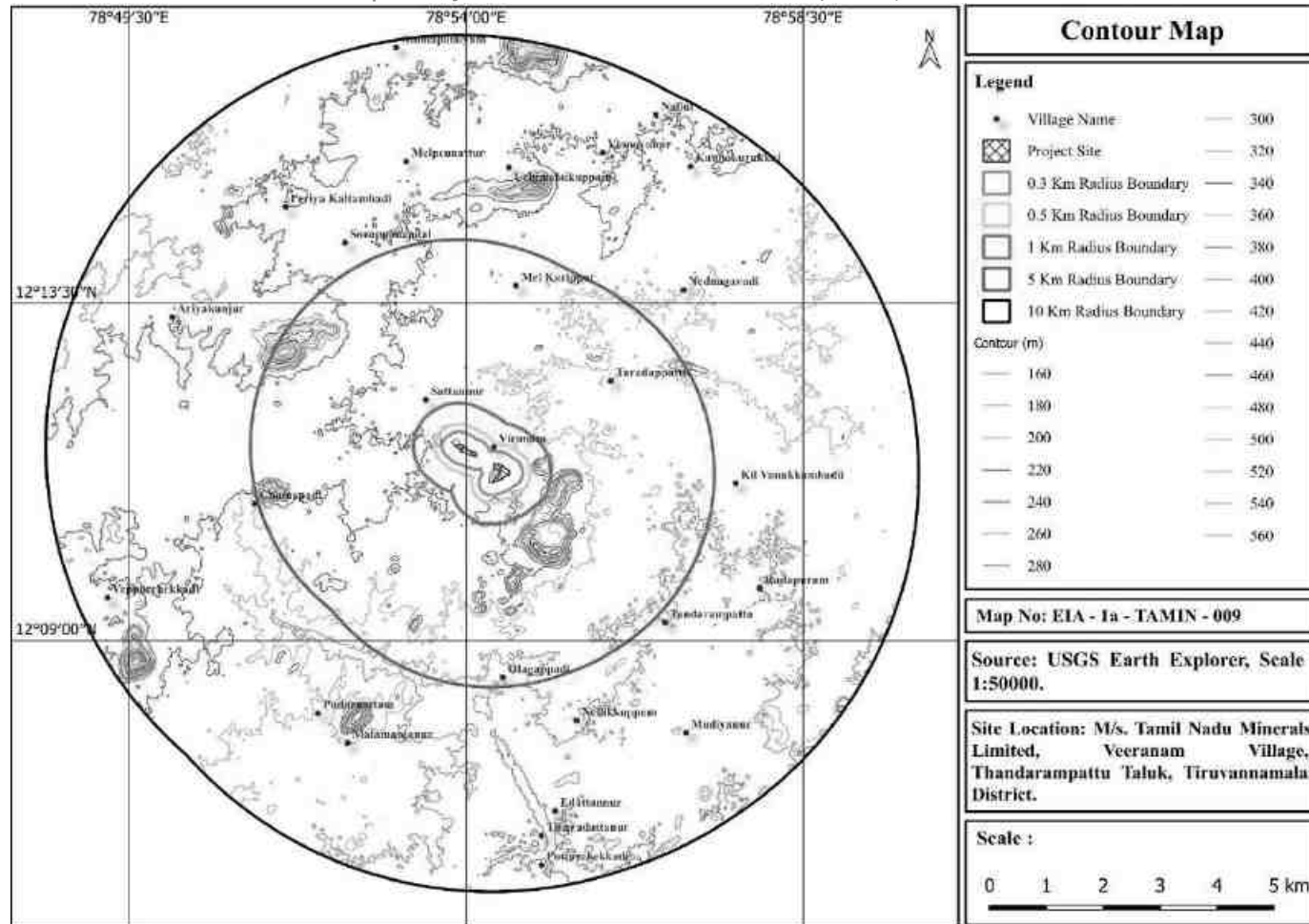


Figure 3-7 Contour map of study area

### 3.5.7 Geomorphology of PIA district

The area falls in Toposheet No. 57 L/16 and bound by the latitude of 12°14'02"N - 12° 01'41"N and longitude of 78°35'57"E - 78°59'15.83"E. It is situated in 22kms SW of Tiruvannamalai town. Geomorphologically, the area is an undulating terrain with residual hills and intermittent plain lands. The area falls a part of Ponnaiyar (South Pennar) river, that originates at Nandidurga in Chikkaballapura District of Karnataka State and flows towards south-east for 400 km through Karnataka and Tamil Nadu, emptying into the Bay of Bengal at Cuddalore. The South Pennar River is known as Dakshina Pinakini in Kannada and Thenpennai in Tamil. It is also referred to as Ponnaiyar. It has a catchment area of 3,690 km<sup>2</sup> located in Karnataka, Tamil Nadu and Andhra Pradesh States. Water flows during the monsoon season when it is fed by the south-west monsoon in catchment area and the northeast monsoon in Tamil Nadu. However, this water flow raises the water table throughout the river basin and feeds numerous reservoirs/tanks.

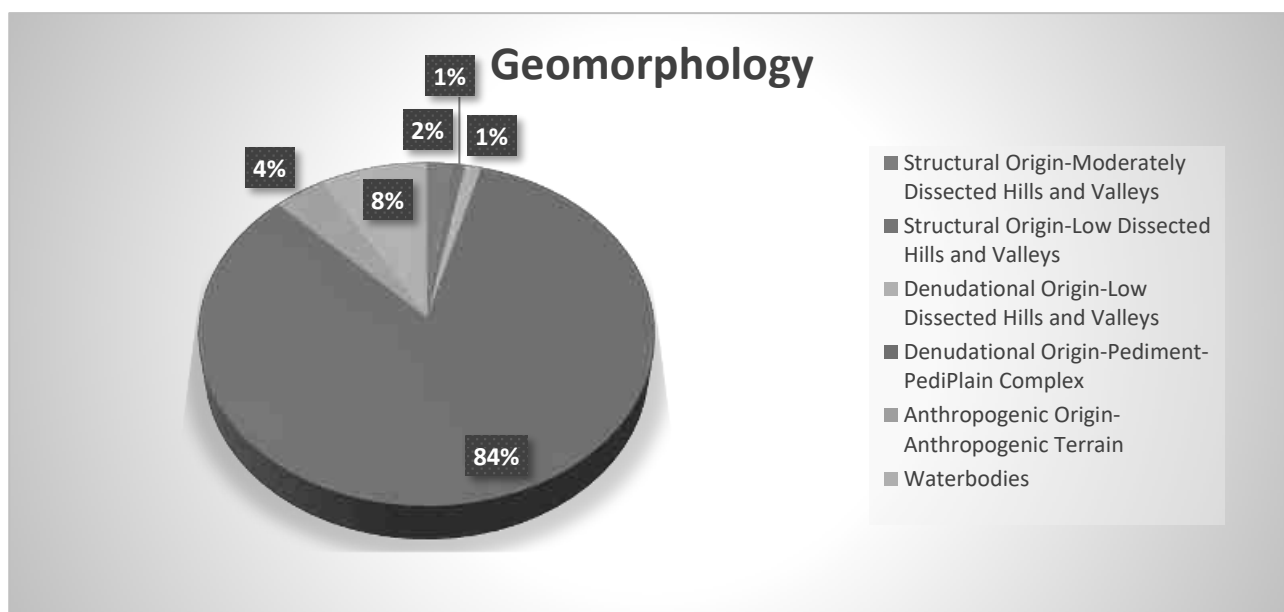
Source : <https://tnmines.tn.gov.in/pdf/dsr/12.pdf>

### 3.5.8 Geomorphology of the Study Area

The total Geographical area of the study area is **347.8 Sq.Km**. The Geomorphology of the study area is given in **Table 3-4** and Geomorphology pattern and Geomorphology Map of the study area is given in **Figure 3-8** and **Figure 3-9** respectively.

**Table 3-4 Geomorphology of the Study Area**

| S. No        | Description                                              | Area (Sq.km) | Area (Acres)    | Area (Ha)    | Percentage    |
|--------------|----------------------------------------------------------|--------------|-----------------|--------------|---------------|
| 1            | Structural Origin-Moderately Dissected Hills and Valleys | 7.7565396    | 1916.679        | 775.653      | 2.23          |
| 2            | Structural Origin-Low Dissected Hills and Valleys        | 2.5554681    | 631.46895       | 255.546      | 0.73          |
| 3            | Denudational Origin-Low Dissected Hills and Valleys      | 4.3771267    | 1081.6098       | 437.712      | 1.26          |
| 4            | Denudational Origin-Pediment-PediPlain Complex           | 290.06887    | 71677.468       | 29006.8      | 83.40         |
| 5            | Anthropogenic Origin-Anthropogenic Terrain               | 13.861993    | 3425.367        | 1386.19      | 3.99          |
| 6            | Waterbodies                                              | 29.18        | 7210.5239       | 2918         | 8.39          |
| <b>Total</b> |                                                          | <b>347.8</b> | <b>85943.12</b> | <b>34780</b> | <b>100.00</b> |



**Figure 3-8 Geomorphology Pattern of the Study Area**

13.74.0 Ha of Veeranam Black Granite Quarry at SF No. 74(P), 126/1A, 127, 144/1,  
Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, TamilNadu,  
Proposed by M/s. Tamil Nadu Minerals Limited (TAMIN)

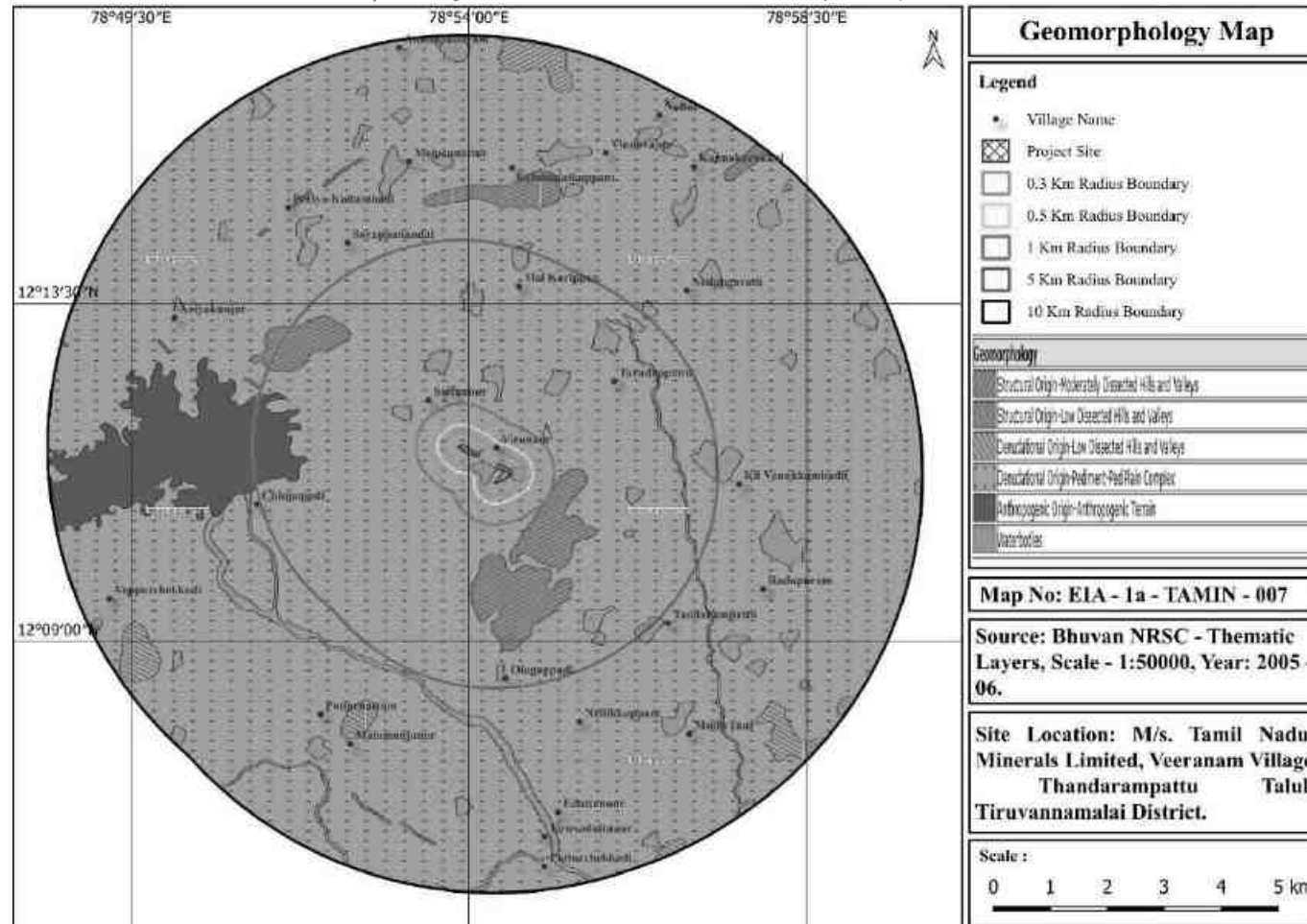


Figure 3-9 Geomorphology map of the study area

### 3.5.9 Hydrogeology of PIA district

The district is underlain by the various geological formations ranging in age from Archaean to Recent (Plate – II). Ground water occurs in six different aquifers in this district. They are Archaean aquifers, Cretaceous aquifers, Eocene Aquifers, Miocene Aquifers, Pliocene Aquifers and Quaternary Aquifers.

**Source :** <https://cgwb.gov.in/sites/default/files/2022-10/tiruvannamalai.pdf>

### 3.5.10 Drainage Pattern of PIA district

Cheyyar river which originates from Jawadhu Hills, flows in a southern direction at first, and turns south-east near Chengam after flowing through Polur, Vandavasi and Cheyyar taluks. Palar rising near Nandidurg in Mysore enters Vellore district passing through Gudiyatham, Walajah and Arakonam taluks before entering Cheyyar taluk of Tiruvannamalai district and there after enters Kancheepuram district.

Pennaiyar and South Pennaiyar originate from Nandidurg of Karnataka. They pass through Dharmapuri district and enter the southern part of Chengam Taluk before entering Viluppuram district. Draftly, the river enters the Bay of Bengal at Cuddalore. The river is dry for most of the year. Water flows during the monsoon season when it is fed by the southwest monsoon in catchment area and the northeast monsoon in Tamil Nadu. A dam has been constructed across this river at Sathanur which is a picnic spot in this district. Sathanur Reservoir provides drinking water to Tiruvannamalai town, and the water is used for irrigation when the reservoir is filled with surplus water. The drainage map of the Study Area is given in **Figure 3-10**.

**Source :** DH 2011 3305 PART A DCHB TIRUVANNAMALAI

13.74.0 Ha of Veeranam Black Granite Quarry at SF No. 74(P), 126/1A, 127, 144/1,  
Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, TamilNadu,  
Proposed by M/s. Tamil Nadu Minerals Limited (TAMIN)

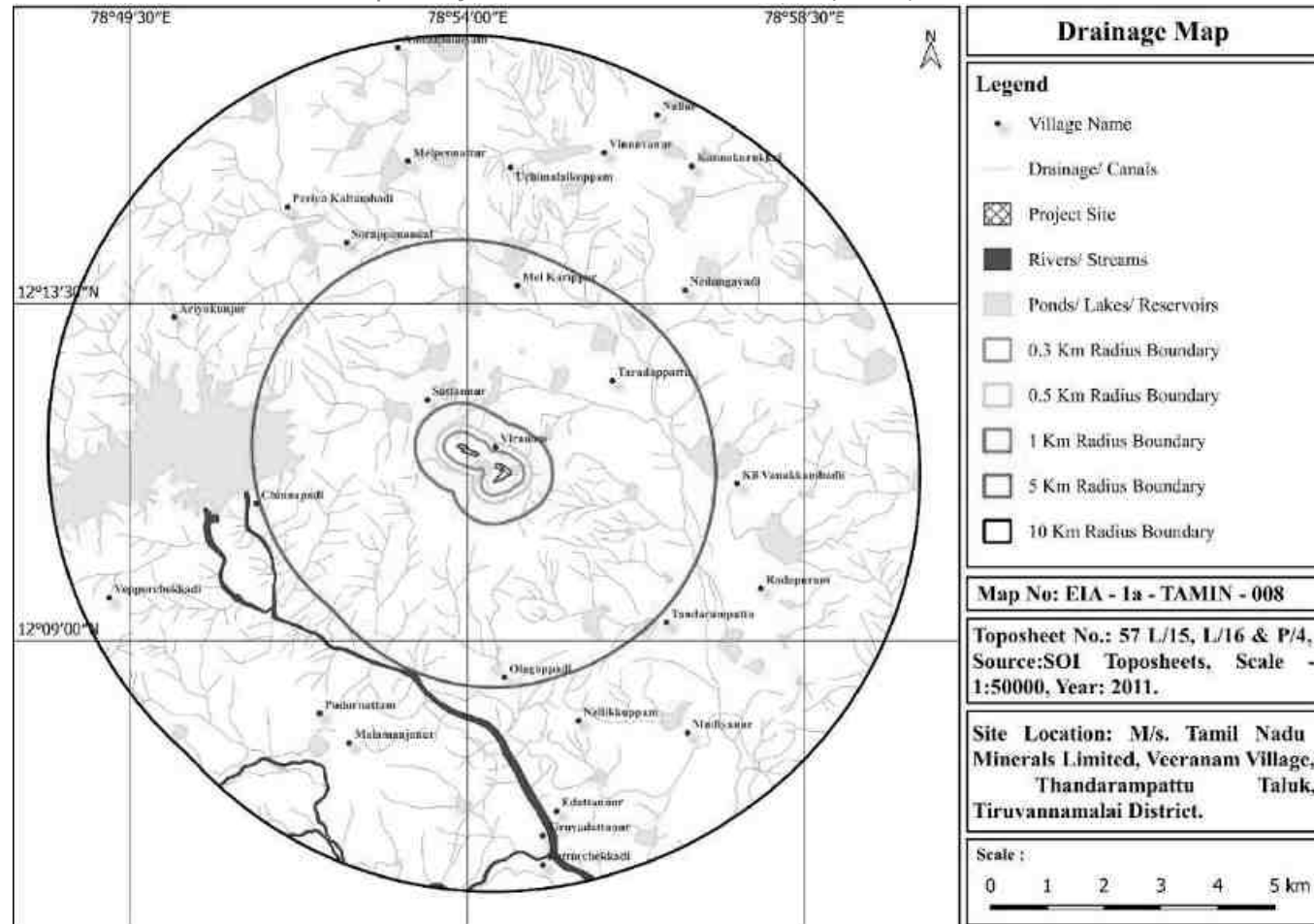
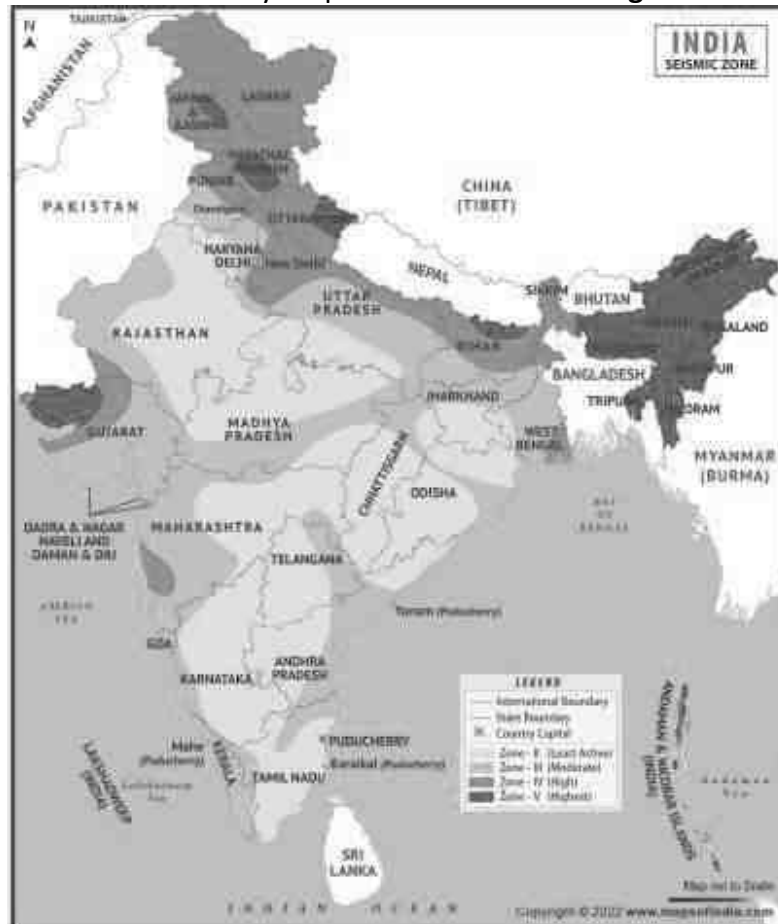


Figure 3-10 Drainage map of the study area

### 3.5.11 Seismicity

As per Seismicity Map of India, the project location/study area falls in Zone II, which is categorized as a Moderate Active zone. The Seismicity Map of India is shown in **Figure 3-11**.



**Figure 3-11 Seismicity map of India**

### 3.5.12 Soils of PIA District

The red loamy soil is predominantly found in this district but more predominant in Tiruvannamalai and Vandavasi taluks. However, Polur taluk has concentration of red series loam. The district has also different types of soils such as ferruginous loamy and sandy loamy. However, black series loam is found in tanks and riverbeds of Cheyyar and Vandavasi taluks.

**Source :** DH 2011 3305 PART A DCHB TIRUVANNAMALAI

## 3.6 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. The baseline status of air environment in the study area is assessed through a systematic air quality surveillance program.

### 3.6.1 Meteorological Conditions

The regional air quality is influenced by the meteorology of that region. The principal weather parameters that influence the concentration of the air pollutants in the surroundings are wind speed, wind direction and temperature. Meteorological data is useful for proper interpretation of the baseline data. It is used as input for air quality dispersion models for predicting the post project environmental scenario i.e., ground level concentrations due to proposed utilities like Thermic fluid Heater & DG sets etc.

### 3.6.2 General Meteorological Scenario based on IMD Data

The nearest Indian Meteorological Department (IMD) station located to project site is Kallakkurichchi. The Climatological data of Kallakkurichchi (11°44' and 78°58' E), published by the IMD, based on daily observations at 08:30 and 17:30 hour IST for a 29-year period (1971-2000), 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 – Thiruvannamalai (1971-2000)**

| Month              | Temp (°C)  |            | Rainfall   |             | Mean Wind Speed (Kmph) | Predominant Wind Directions (From)          |       |
|--------------------|------------|------------|------------|-------------|------------------------|---------------------------------------------|-------|
|                    | Daily Max. | Daily Min. | Total (mm) | No. of days |                        | 08:30                                       | 17:30 |
| Jan                | 30.1       | 19.5       | 4.9        | 0.4         | 6.6                    | NW                                          | NE    |
| Feb                | 33.2       | 20.0       | 16.0       | 0.8         | 5.1                    | NW                                          | E     |
| Mar                | 36.0       | 22.3       | 11.8       | 1.1         | 5.0                    | SE                                          | SE    |
| Apr                | 38.6       | 25.4       | 6.7        | 0.6         | 5.8                    | SE                                          | SE    |
| May                | 38.8       | 26.3       | 153.8      | 3.8         | 6.3                    | SW                                          | SE    |
| Jun                | 36.8       | 26.0       | 52.0       | 3.8         | 8.5                    | SW                                          | SW    |
| Jul                | 35.7       | 25.3       | 69.1       | 4.8         | 7.5                    | SW                                          | SW    |
| Aug                | 35.1       | 24.7       | 104.3      | 6.3         | 6.6                    | SW                                          | SW    |
| Sep                | 34.3       | 24.4       | 180.6      | 7.6         | 4.4                    | SW                                          | SW    |
| Oct                | 32.4       | 23.7       | 143.4      | 8.0         | 4.1                    | NW                                          | NE    |
| Nov                | 30.1       | 22.4       | 151.9      | 7.4         | 5.0                    | N                                           | NE    |
| Dec                | 28.9       | 21.0       | 114.0      | 4.0         | 7.4                    | NW                                          | NE    |
| Max.               | 38.8       | 26.3       | 180.6      | 8.0         | 8.5                    | The Predominant wind direction is Southwest |       |
| Min.               | 28.9       | 19.5       | 4.9        | 0.4         | 4.1                    |                                             |       |
| Annual Avg./Total. | 34.1       | 23.5       | 1008.2     | 48.5        | 6.0                    |                                             |       |

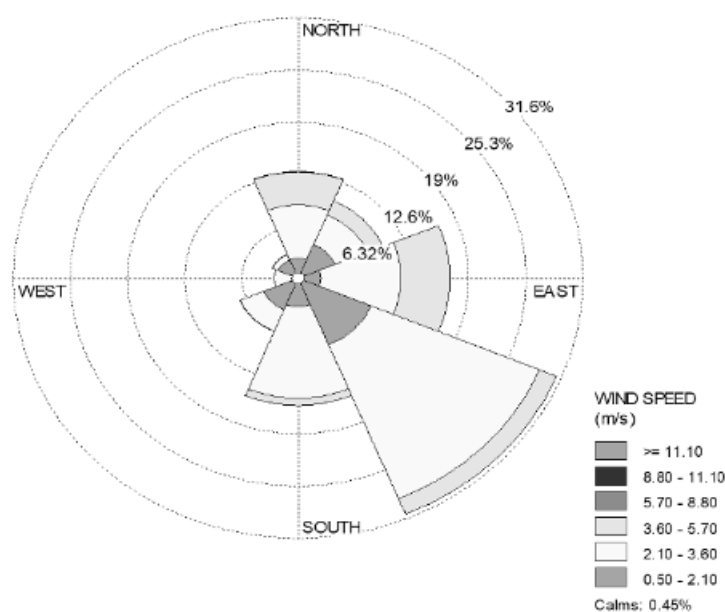
Source : IMD

### 3.6.3 Meteorological Scenario during Study Period

The meteorological scenario in and around the project site is an essential requirement during the study period for proper interpretation of baseline air quality status. Meteorological data was collected during the study period (**February 2025 –April 2025**) and is presented in **Table 3-6**. The wind rose for the study period is given in **Figure 3-12**.

**Table 3-6 Meteorological Data for the Study Period (Febraury 2025 –April 2025)**

| S. No | Parameter                                      | Observation                                                                                                      |
|-------|------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| 1.    | Temperature                                    | Max Temperature: 37 <sup>0</sup> C<br>Min Temperature: 21 <sup>0</sup> C<br>Avg Temperature: 29.7 <sup>0</sup> C |
| 2.    | Average Relative Humidity                      | 49.42 %                                                                                                          |
| 3.    | Average Wind Speed                             | 2.47 m/s                                                                                                         |
| 4.    | Predominant Wind Direction during study period | SouthEast                                                                                                        |

**Figure 3-12 Wind rose for the study period**

### 3.6.4 Ambient Air Quality

#### 3.6.4.1 Ambient Air Quality Monitoring Stations

Eight (08) monitoring locations have been identified as per annual wind predominance of Kallakurichchi from IMD. AAQ monitoring locations are selected based on Annual wind predominance, map showing the Ambient Air Quality monitoring locations is given in **Figure 3-13** 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 | Longitude   | Latitude    | Distance (km) from Project boundary | Azimuth Directions |
|--------------|-------------------|--------------|-------------|-------------|-------------------------------------|--------------------|
| A1           | Near Project Site | -            | 78.89900739 | 12.19239594 | 0.02                                | WSW                |
| A2           | Sattannur         | U/W          | 78.89310442 | 12.2046828  | 1.36                                | NNW                |
| A3           | Kil Karippur      | C/W          | 78.92187283 | 12.23088186 | 4.88                                | NNE                |
| A4           | Near Taradappattu | C/W          | 78.93063914 | 12.20851081 | 3.26                                | NE                 |
| A5           | Tandrampattu      | C/W          | 78.94425195 | 12.15265504 | 5.51                                | SE                 |
| A6           | Mottur Olagappadi | D/W          | 78.90709043 | 12.14104455 | 4.86                                | S                  |
| A7           | Near Mallikapuram | D/W          | 78.88861802 | 12.18270031 | 1.53                                | SW                 |
| A8           | Sorappanandal     | C/W          | 78.87386533 | 12.23882801 | 5.66                                | NNW                |

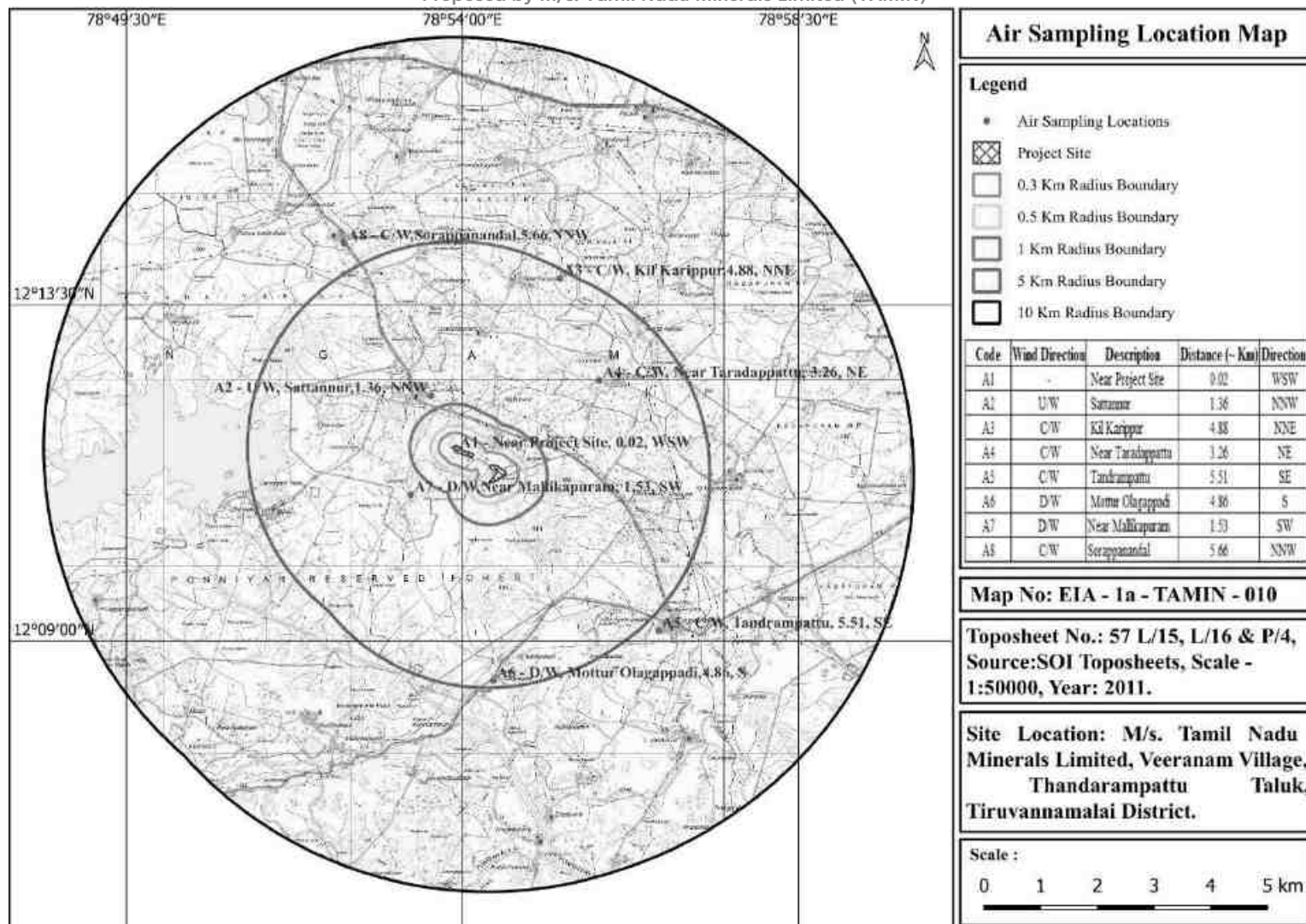


Figure 3-13 Ambient Air Quality monitoring locations

### 3.6.5 Ambient Air Quality Monitoring Techniques and Frequency

Ambient air quality was monitored twice a week for One (01) season (it covers 12 weeks), i.e., 3 months (**February 2025 –April 2025**). PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>x</sub>, Pb, NH<sub>3</sub>, C<sub>6</sub>H<sub>6</sub>, C<sub>20</sub>H<sub>12</sub>, As & Ni were monitored. Sampling was carried out as per the Central Pollution Control Board (CPCB), monitoring guidelines at each location. Analytical methods used for analysis of parameters are given in **Table 3-8** and the Summary of the average baseline concentrations of pollutants is given in **Table 3-9**.

**Table 3-8 Analytical Methods for Analysis of Ambient Air Quality Parameters**

| S. No | Parameters                                                 | Analytical method                                                |
|-------|------------------------------------------------------------|------------------------------------------------------------------|
| 1     | Sulphur Dioxide (SO <sub>2</sub> ), µg/m <sup>3</sup>      | IS 5182(Part 2) : 2001 RA                                        |
| 2     | Nitrogen Dioxide (NO <sub>2</sub> ), µg/m <sup>3</sup>     | IS 5182(Part 6) : 2006 RA                                        |
| 3     | Particulate Matter (PM <sub>2.5</sub> ), µg/m <sup>3</sup> | SOP – EA -001- In house validated method                         |
| 4     | Particulate Matter (PM <sub>10</sub> ), µg/m <sup>3</sup>  | IS 5182(Part 23) : 2006 RA                                       |
| 5     | CO mg/m <sup>3</sup>                                       | NIOSH- 6014                                                      |
| 6     | Pbµg/m <sup>3</sup>                                        | IS 5182(Part 22): 2004 RA                                        |
| 7     | O <sub>3</sub> , µg/m <sup>3</sup>                         | IS 5182(Part 9): 1974 RA                                         |
| 8     | NH <sub>3</sub> , µg/m <sup>3</sup>                        | SOP – EA -009 - In house validated method (Based on CPCB Method) |
| 9     | Benzene, µg/m <sup>3</sup>                                 | IS 5182(Part 11): 2006 (RA 2012)                                 |
| 10    | Benzo (a) pyrene, ng/m <sup>3</sup>                        | IS 5182(Part 12) :2004 RA                                        |
| 11    | Arsenic, ng/ m <sup>3</sup>                                | SOP –In house validated method (Based on CPCB Guideline)         |
| 12    | Nickel ng/ m <sup>3</sup>                                  | SOP –In house validated method (Based on CPCB Guideline)         |

Table 3-9 Summary of the average baseline concentrations of pollutants

| Parameters                                   | Conc.      | NAAQ Standards | Locations         |           |              |                   |               |                   |                   |               |
|----------------------------------------------|------------|----------------|-------------------|-----------|--------------|-------------------|---------------|-------------------|-------------------|---------------|
|                                              |            |                | Near Project Site | Sattannur | Kil Karippur | Near Taradappattu | Tandram pattu | Mottur Olagappadi | Near Mallikapuram | Sorappanandal |
|                                              |            |                | AAQ 1             | AAQ 2     | AAQ 3        | AAQ 4             | AAQ 5         | AAQ 6             | AAQ 7             | AAQ 8         |
| PM <sub>10</sub> Conc. (µg/m <sup>3</sup> )  | Min.       | 100 (24 Hours) | 47.9              | 42.8      | 39.7         | 43.4              | 44.7          | 42.7              | 45.4              | 43.5          |
|                                              | Max        |                | 57.2              | 52.1      | 49.0         | 52.7              | 54.0          | 52.0              | 54.7              | 52.8          |
|                                              | Avg.       |                | 52.7              | 47.6      | 44.5         | 48.2              | 49.5          | 47.5              | 50.2              | 48.3          |
|                                              | 98th 'tile |                | 57.1              | 52.0      | 48.9         | 52.6              | 53.9          | 51.9              | 54.6              | 52.7          |
| PM <sub>2.5</sub> Conc. (µg/m <sup>3</sup> ) | Min.       | 60 (24 Hours)  | 25.3              | 23.2      | 22.0         | 23.8              | 23.5          | 21.7              | 23.9              | 23.2          |
|                                              | Max        |                | 27.8              | 25.7      | 24.5         | 26.3              | 26.0          | 24.2              | 26.4              | 25.7          |
|                                              | Avg.       |                | 26.7              | 24.6      | 23.4         | 25.2              | 24.9          | 23.1              | 25.3              | 24.6          |
|                                              | 98th 'tile |                | 27.8              | 25.7      | 24.5         | 26.3              | 26.0          | 24.2              | 26.4              | 25.7          |
| SO <sub>2</sub> Conc. (µg/m <sup>3</sup> )   | Min.       | 80 (24 Hours)  | 8.8               | 7.7       | 7.6          | 7.3               | 8.3           | 7.9               | 7.4               | 7.7           |
|                                              | Max        |                | 11.3              | 10.2      | 10.1         | 9.8               | 10.8          | 10.4              | 9.9               | 10.2          |
|                                              | Avg.       |                | 9.7               | 8.6       | 8.5          | 8.2               | 9.2           | 8.8               | 8.3               | 8.6           |
|                                              | 98th 'tile |                | 11.2              | 10.1      | 10.0         | 9.7               | 10.7          | 10.3              | 9.8               | 10.1          |
| NO <sub>2</sub> Conc. (µg/m <sup>3</sup> )   | Min.       | 80 (24 Hours)  | 19.7              | 17.7      | 18.6         | 17.2              | 17.8          | 17.3              | 17.9              | 18.1          |
|                                              | Max        |                | 25.1              | 23.1      | 24.0         | 22.6              | 23.2          | 22.7              | 23.3              | 23.5          |
|                                              | Avg.       |                | 22.3              | 20.3      | 21.2         | 19.8              | 20.4          | 19.9              | 20.5              | 20.7          |
|                                              | 98th 'tile |                | 25.0              | 23.0      | 23.9         | 22.5              | 23.1          | 22.6              | 23.2              | 23.4          |
| CO (mg/m <sup>3</sup> )                      | Avg.       | 4 (1hour)      | 0.25              | 0.32      | 0.29         | 0.38              | 0.32          | 0.35              | 0.31              | 0.29          |

| Parameters                                   | Conc. | NAAQ Standards | Locations         |           |              |                   |               |                   |                   | Sorappaandal |
|----------------------------------------------|-------|----------------|-------------------|-----------|--------------|-------------------|---------------|-------------------|-------------------|--------------|
|                                              |       |                | Near Project Site | Sattannur | Kil Karippur | Near Taradappattu | Tandram pattu | Mottur Olagappadi | Near Mallikapuram |              |
|                                              |       |                | AAQ 1             | AAQ 2     | AAQ 3        | AAQ 4             | AAQ 5         | AAQ 6             | AAQ 7             |              |
| Pb ( $\mu\text{g}/\text{m}^3$ )              | Avg.  | 1 (24 hour)    | BDL               | BDL       | BDL          | BDL               | BDL           | BDL               | BDL               | BDL          |
| O <sub>3</sub> ( $\mu\text{g}/\text{m}^3$ )  | Avg.  | 180 (1hour)    | BDL               | BDL       | BDL          | BDL               | BDL           | BDL               | BDL               | BDL          |
| NH <sub>3</sub> ( $\mu\text{g}/\text{m}^3$ ) | Avg.  | 400 (24 hours) | BDL               | BDL       | BDL          | BDL               | BDL           | BDL               | BDL               | BDL          |
| Benzene ( $\mu\text{g}/\text{m}^3$ )         | Avg.  | 5 (Annual)     | BDL               | BDL       | BDL          | BDL               | BDL           | BDL               | BDL               | BDL          |
| Benzo (a) pyrene, ( $\text{ng}/\text{m}^3$ ) | Avg.  | 1 (Annual)     | BDL               | BDL       | BDL          | BDL               | BDL           | BDL               | BDL               | BDL          |
| Arsenic ( $\text{ng}/\text{m}^3$ )           | Avg.  | 6 (Annual)     | BDL               | BDL       | BDL          | BDL               | BDL           | BDL               | BDL               | BDL          |
| Nickel ( $\text{ng}/\text{m}^3$ )            | Avg.  | 20 (Annual)    | BDL               | BDL       | BDL          | BDL               | BDL           | BDL               | BDL               | BDL          |

Note: BDL (Below detectable limit)

### 3.6.6 Interpretations of Results:

The ambient air quality monitoring data was compared with the National Ambient Air Quality Standards (NAAQS), as prescribed by the Ministry of Environment, Forest & Climate Change (MoEFCC), Government of India, in its 16.11.2009 notification.

- Particulate Matter (PM10): 39.7 – 57.2  $\mu\text{g}/\text{m}^3$  (within the NAAQS limit of 100  $\mu\text{g}/\text{m}^3$  for 24-hour average).
- Fine Particulate Matter (PM2.5): 21.7 – 27.8  $\mu\text{g}/\text{m}^3$  (within the NAAQS limit of 60  $\mu\text{g}/\text{m}^3$  for 24-hour average).
- Sulfur Dioxide ( $\text{SO}_2$ ): 7.3 – 11.3  $\mu\text{g}/\text{m}^3$  (well below the NAAQS limit of 80  $\mu\text{g}/\text{m}^3$ ).
- Nitrogen Dioxide ( $\text{NO}_2$ ): 17.2 – 25.1  $\mu\text{g}/\text{m}^3$  (well below the NAAQS limit of 80  $\mu\text{g}/\text{m}^3$ ).
- The air quality parameters monitored at different locations during the study period were within the permissible limits set by NAAQS.
- The concentration of pollutants in the study area does not exceed the regulatory thresholds, indicating that the air quality is acceptable.
- The findings suggest that the overall ambient air quality in the monitored locations is average, meaning it does not pose significant health risks based on the measured parameters.
- Since PM10 and PM2.5 levels remain within the limits, the air pollution from dust and fine particulate emissions is controlled within regulatory standards.
- The low levels of  $\text{SO}_2$  and  $\text{NO}_2$  indicate minimal emissions from industrial activities, vehicular pollution, or combustion sources in the study area.

### 3.7 Noise Environment

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. Noise levels were recorded on an hourly basis for one complete day at each location using pre-calibrated noise levels. A map showing the noise monitoring locations is given in **Figure 3-14**.

#### 3.7.1 Results and Discussions

Based on the recorded hourly noise levels at each monitoring location, the day equivalent ( $L_d$ ) and night equivalent ( $L_n$ ) were calculated.

- $L_d$ : Average noise levels between 6:00 hours to 22:00 hours.
- $L_n$ : Average noise levels between 22:00 hours to 6:00 hours.

The comparison of day equivalent noise levels ( $L_d$ ) and night equivalent noise levels ( $L_n$ ) with the respective CPCB stipulated noise standards for various land use categories are shown in the **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     | Near Project Site | N1            | 0.02                                | WSW               | 51.5                     | 42.8  | 55            | 45          | Industrial            |
| 2     | Sattannur         | N2            | 1.36                                | NNW               | 51.2                     | 43.5  | 55            | 45          | Residential           |
| 3     | Kil Karippur      | N3            | 4.88                                | NNE               | 52.5                     | 41.5  | 55            | 45          | Residential           |
| 4     | Near Taradappattu | N4            | 3.26                                | NE                | 49.6                     | 40.3  | 75            | 70          | Residential           |
| 5     | Tandrapattu       | N5            | 5.51                                | SE                | 52.7                     | 41.4  | 55            | 45          | Residential           |
| 6     | Mottur Olagappadi | N6            | 4.86                                | S                 | 53.6                     | 43.6  | 55            | 45          | Residential           |
| 7     | Near Mallikapuram | N7            | 1.53                                | SW                | 48.5                     | 39.6  | 55            | 45          | Residential           |
| 8     | Sorappanandal     | N8            | 5.66                                | NNW               | 54.0                     | 44.2  | 55            | 45          | Residential           |

**3.7.2 Interpretations of Results:**

The noise level monitoring results were compared against the **Central Pollution Control Board (CPCB) standards**, which define permissible noise levels for different environmental settings (Residential, Industrial, etc.).

**Residential Areas (N1, N2, N3, N5, N6, N7, N8):**

- The daytime noise levels (48.5 – 54.0 dB(A)) are within CPCB limits (55 dB(A)).
- The nighttime noise levels (39.6 – 44.2 dB(A)) are within CPCB limits (45 dB(A)).
- No significant noise pollution: levels remain under permissible limits.

**Near Project Site (N4 - Industrial Area):**

- Daytime noise level: 51.5 dB(A) (within the CPCB limit of 75 dB(A)).
- Nighttime noise level: 42.8 dB(A) (well below the CPCB limit of 70 dB(A)).
- Noise levels at the project site are considerably lower than the industrial limit, indicating minimal industrial noise impact.

The Noise levels recorded during the daytime (6:00 a.m to 10:00 p.m) and night-time (10:00 p.m to 6:00 a.m) at all stations are within the CPCB limits. The major source of noise in the study area is transportation and vehicular movement.

13.74.0 Ha of Veeranam Black Granite Quarry at SF No. 74(P), 126/1A, 127, 144/1,  
Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, TamilNadu,  
Proposed by M/s. Tamil Nadu Minerals Limited (TAMIN)

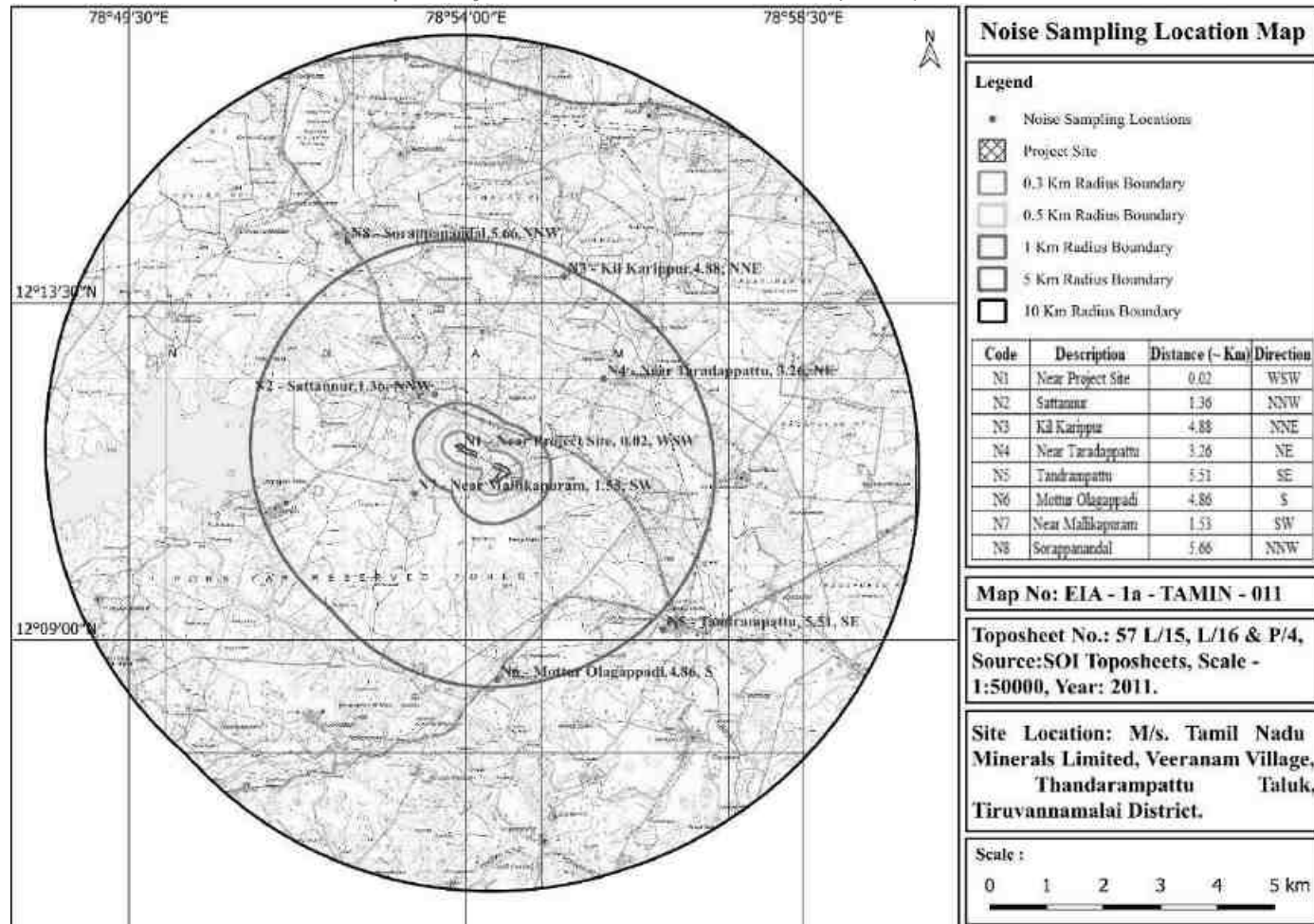


Figure 3-14 Noise Monitoring locations

### 3.8 Water Environment

#### 3.8.1 Surface Water Resources of PIA district

Cheyyar river, which originates from Jawadhu Hills, flows in a southern direction at first, and turns south-east near Chengam after flowing through Polur, Vandavasi and Cheyyar taluks. Palar rising near Nandidurg in Mysore enters Vellore district passing through Gudiyatham, Walajah and Arakonam taluks before entering Cheyyar taluk of Tiruvannamalai district and there after enters Kancheepuram district.

Pennaiyar and South Pennaiyar originate from Nandidurg of Karnataka. They pass through Dharmapuri district and enter the southern part of Chengam Taluk before entering Viluppuram district. Draftly, the river enters the Bay of Bengal at Cuddalore. The river is dry for most of the year. Water flows during the monsoon season when it is fed by the southwest monsoon in catchment area and the northeast monsoon in Tamil Nadu. A dam has been constructed across this river at Sathanur which is a picnic spot in this district. Sathanur Reservoir provides drinking water to Tiruvannamalai town, and the water is used for irrigation when the reservoir is filled with surplus water.

**Source:** DH 2011 3305 PART A DCHB TIRUVANNAMALAI

#### 3.8.2 Surface Water Quality Assessment

To establish the baseline status of water environment, the representative 08 sampling locations for surface water within a radial distance of 10 Km 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 are given in **Table 3-11**.

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

| S. No | Parameter Measured                  | Test Method                                                                                            |
|-------|-------------------------------------|--------------------------------------------------------------------------------------------------------|
| 1     | Turbidity                           | APHA 23rd Edition 2017 /2130B/P 2-9 Nephelometric Method/ IS 3025(Part 10): 1984 RA                    |
| 2     | Color                               | APHA 23rd Edition 2017 2120B /P2-2 Visual Comparison Method / IS 3025(Part 4) : 1983 RA                |
| 3     | pH                                  | APHA 23rd Edition 2017 4500 H+ / P 4-90 Electrometric Method/IS 3025(Part 11): RA                      |
| 4     | Conductivity                        | APHA 23rd Edition 2017/ 2510 B /P 2 – 47 Electrometric Method/IS3025(Part 14): 2013 RA                 |
| 5     | Total Dissolve Solids               | APHA (23rd Edition) 2017/ 2540 C / P 2-58 Gravimetric Method/IS 3025 (part 16) :1984 RA                |
| 6     | Total Suspended Solids              | APHA 23rd Edition 2017/ 2540 D /2 -58 / IS 3025(Part 17) : 1984 (RA 2012) Gravimetric Method           |
| 7     | Alkalinity as CaCO <sub>3</sub>     | APHA 23rd Edition 2017/2320 B / P 2 – 27 Titrimetric Method/IS3025(Part 23) : 1986 RA                  |
| 8     | Total Hardness as CaCO <sub>3</sub> | APHA 23rd Edition 2017 /2340 C / P 2 – 37 EDTA Titrimetric Method/IS 3025(Part 21) : 2009 RA           |
| 9     | Sodium                              | APHA 23rd Edition 2017/ 3500 Na B / P 3-98 Flame Emission Photometric Method/IS 3025(Part 45): 1993 RA |

| S. No | Parameter Measured         | Test Method                                                                                                    |
|-------|----------------------------|----------------------------------------------------------------------------------------------------------------|
| 10    | Potassium                  | APHA 23rd Edition 2017/ 3500 K B / P 3-98 Flame Emission Photometric Method/IS 3025(Part 45): 1993 RA          |
| 11    | Calcium as Ca              | APHA 23rd Edition 2017 3500 Ca B / P 3-65 Calculation Method /IS 3025(Part 40): 1991 RA                        |
| 12    | Magnesium as Mg            | IS 3025(Part 46): RA /APHA 23rd Edition 2017 2340 C / P 3-84 Calculation Method                                |
| 13    | Chloride                   | IS 3025(Part 32): 1988 / APHA 23rd Edition 2017 4500 Cl- B / P 4-70 Argemetric Method                          |
| 14    | Sulphate SO <sub>4</sub>   | APHA 23rd Edition 2017 4500 SO <sub>4</sub> - E / P 4-188 Turbidity Method/IS 3025(Part 24) : 1986 RA          |
| 15    | Nitrate as NO <sub>3</sub> | APHA 23rd Edition 2017 4500 NO <sub>3</sub> B Ultraviolet Spectro Photometric Screening Method                 |
| 16    | Phosphate                  | IS 3025 Part 31: 1988 Chapter 12                                                                               |
| 17    | Fluorides as F             | APHA23rd Edition F-D: 2017                                                                                     |
| 18    | Cyanide                    | APHA 23rd Edition 2017 4500- CN- E/ P 4-42 Calorimetric Method                                                 |
| 19    | Arsenic                    | APHA 23rd Edition 2017 3500- As / P 3-61 Silver Diethyldithiocarbamate Method                                  |
| 20    | Boron                      | APHA 23rd Edition 2017 :4500 BB/P4-23                                                                          |
| 21    | Cadmium                    | IS 3025 (Part - 41)1991                                                                                        |
| 22    | Chromium, total            | IS 3025(Part 52) RA / APHA 23rd Edition 2017/3500 Cr / P 3- 67 1,5Diphenylcarbazide Method                     |
| 23    | Copper                     | APHA 23rd Edition 2017 3500 Cu B/P 3-72 Atomic Absorption Spectrometric Method / IS 3025(Part 42): 1992 RA     |
| 24    | Iron                       | APHA 23rd Edition 2017 3500 Fe- B/ P 3-77 1,10 Phenanthroline Method /IS 3025(Part 53): 2003 RA                |
| 25    | Lead                       | APHA 23rd Edition 2017 3500 Pb B / P 3 -80 Atomic Absorption Spectrometric Method / IS 3025(Part 47): 1994 RA  |
| 26    | Manganese                  | IS 3025(Part 46): RA /APHA 23rd Edition 2017 2340 C / P 3- 84Calculation Method                                |
| 27    | Mercury                    | IS 3025 (Part48):1994 RA 1999                                                                                  |
| 28    | Nickel                     | IS 3025:(Part-54):2003(Reaff 2009)                                                                             |
| 29    | Selenium                   | IS 3025 Part (56)2003                                                                                          |
| 30    | Zinc                       | APHA 22rd Edition 2017/ 3500 Zn B / P 3 – 106 Atomic Absorption Spectrometric Method/IS 3025(Part 49): 1994 RA |
| 31    | Dissolved Oxygen           | IS:3025 (Part - 38)1989 (Reaff 2009)                                                                           |
| 32    | BOD at 27Â°C for 3 days    | IS:3025 (Part – 58): 2006                                                                                      |
| 33    | COD                        | IS:3025 (Part – 44): 1993                                                                                      |

**Classification of Surface Standard- IS 2296:**

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 wildlife propagation.

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

The prevailing status of surface water quality has been assessed during the study period. Surface water sampling Locations and Its results are given in **Table 3-12** and

**Table 3-13** respectively. A map showing the surface water monitoring locations is given in **Figure 3-15**.

**Table 3-12 Details of Surface water sampling locations**

| S. No | Water bodies           | Location code | Longitude   | Latitude    | Distance from project boundary (~Km) | Direction from project boundary |
|-------|------------------------|---------------|-------------|-------------|--------------------------------------|---------------------------------|
| 1     | Lake near Govindapuram | SW1           | 78.89897705 | 12.22325901 | 3.32                                 | N                               |
| 2     | Lake near Taradappattu | SW2           | 78.92224131 | 12.20832138 | 2.95                                 | NE                              |
| 3     | Lake near Viranam      | SW3           | 78.90504083 | 12.18942441 | 0.17                                 | W                               |
| 4     | Ponnaiyar River D/S    | SW4           | 78.9140938  | 12.11618956 | 7.72                                 | S                               |
| 5     | Ponnaiyar River U/S    | SW5           | 78.89463956 | 12.13519188 | 5.68                                 | SSW                             |
| 6     | Pamban Ar/River        | SW6           | 78.86792572 | 12.12112688 | 8.22                                 | SSW                             |
| 7     | Sathanur Reservoir     | SW7           | 78.86186983 | 12.1988989  | 4.01                                 | W                               |
| 8     | Lake near Sattannur    | SW8           | 78.88760222 | 12.19982605 | 1.36                                 | NW                              |

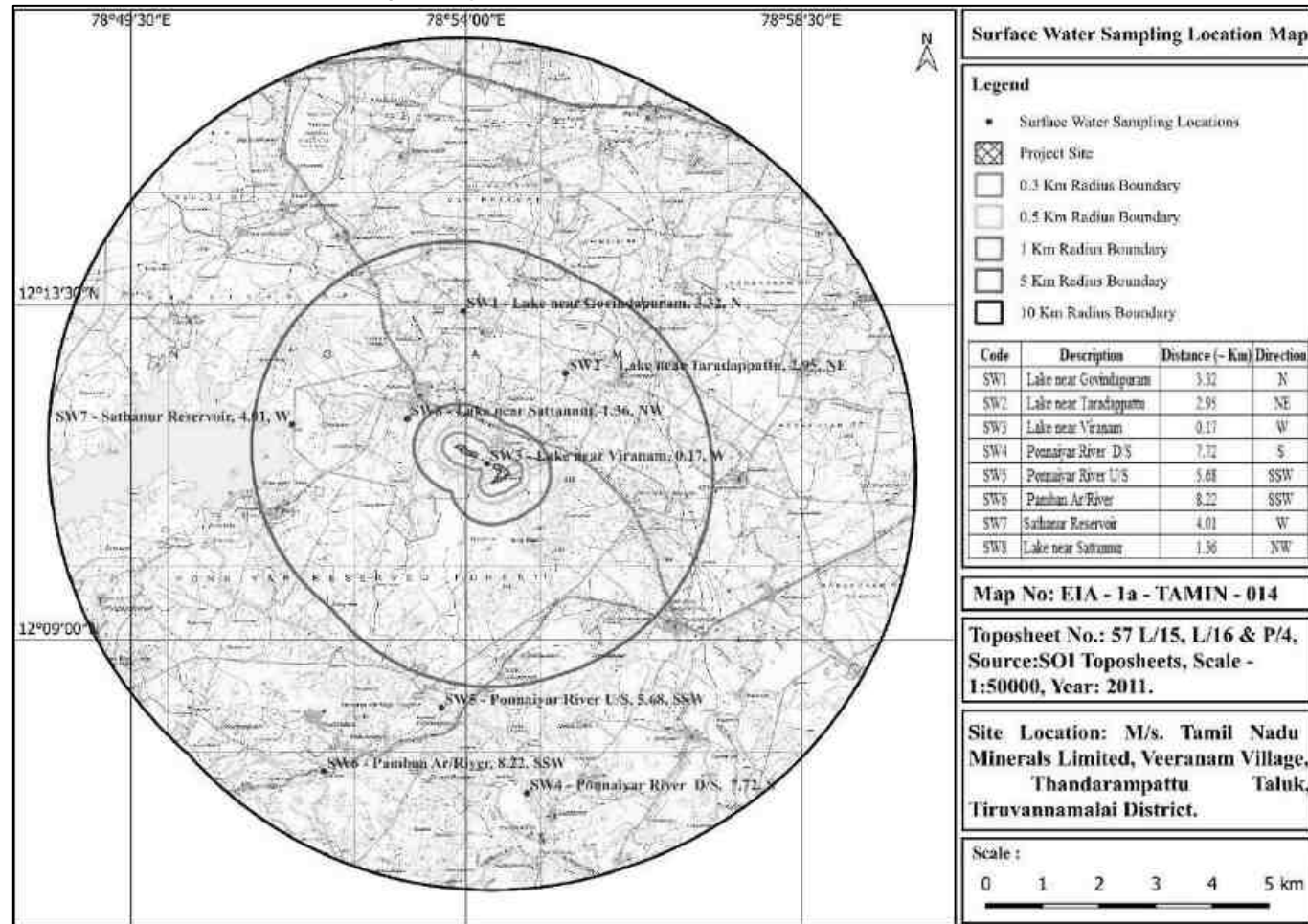


Figure 3-15 Surface water monitoring locations

Table 3-13 Surface water Monitoring Results

| S. No | Parameter                             | Unit  | Surface water standard s (IS 2296 Class-A) | Lake near Govindapuram | Lake near Taradappattu | Lake near Viranam | Ponnaiyar River D/S | Ponnaiyar River U/S | Pamban Ar/River | Sathanur Reservoir | Lake near Sattannur |
|-------|---------------------------------------|-------|--------------------------------------------|------------------------|------------------------|-------------------|---------------------|---------------------|-----------------|--------------------|---------------------|
|       |                                       |       |                                            | SW 1                   | SW 2                   | SW 3              | SW 4                | SW 5                | SW 6            | SW7                | SW8                 |
| 1     | Turbidity                             | NTU   | 1                                          | 8.1                    | 7.6                    | 7.5               | 7.9                 | 6.9                 | 7.2             | 7.2                | 8.2                 |
| 2     | pH (at 25°C)                          | --    | 6.5-8.5                                    | 7.79                   | 7.4                    | 7.46              | 7.32                | 8.1                 | 7.81            | 7.25               | 7.37                |
| 3     | Electrical Conductivity               | µS/cm | -                                          | 1950                   | 1560                   | 1320              | 1760                | 1080                | 1870            | 1210               | 1035                |
| 4     | Total Dissolved Solids                | mg/l  | 500                                        | 1238                   | 980                    | 851               | 1135                | 697                 | 1206            | 780                | 668                 |
| 5     | Total Suspended Solids                | mg/l  | -                                          | 42.3                   | 31.2                   | 17.8              | 38.9                | 23.5                | 38.9            | 31.2               | 42.3                |
| 6     | Total Alkalinity as CaCO <sub>3</sub> | mg/l  | -                                          | 216.6                  | 372.3                  | 323.5             | 431.4               | 264.7               | 458.3           | 296.6              | 216.6               |
| 7     | Total Hardness as CaCO <sub>3</sub>   | mg/l  | 300                                        | 520.1                  | 411.5                  | 357.6             | 510.8               | 313.5               | 542.8           | 351.2              | 520.1               |
| 8     | Sodium as Na                          | mg/l  | -                                          | 216.6                  | 145.4                  | 148.9             | 198.5               | 121.8               | 211.0           | 136.5              | 216.6               |
| 9     | Potassium as K                        | mg/l  | -                                          | 54.1                   | 36.3                   | 37.2              | 49.6                | 30.5                | 52.7            | 34.1               | 54.1                |
| 10    | Calcium as Ca                         | mg/l  | -                                          | 64.1                   | 73.7                   | 78.6              | 77.0                | 54.5                | 117.0           | 105.8              | 64.1                |
| 11    | Magnesium as Mg                       | mg/l  | -                                          | 34.0                   | 55.4                   | 38.9              | 77.8                | 42.8                | 61.3            | 12.6               | 34.0                |
| 12    | Chloride as Cl                        | mg/l  | 250                                        | 408.6                  | 274.3                  | 281.0             | 374.6               | 229.9               | 398.0           | 257.5              | 408.6               |
| 13    | Sulphate as SO <sub>4</sub>           | mg/l  | 400                                        | 102.2                  | 68.6                   | 56.2              | 74.9                | 46.0                | 79.6            | 51.5               | 102.2               |
| 14    | Nitrate as NO <sub>3</sub>            | mg/l  | 20                                         | 3.3                    | 4.9                    | 3.7               | 6.8                 | 3.2                 | 6.3             | 4.9                | 3.3                 |
| 15    | Phosphate as PO <sub>4</sub>          | mg/l  | -                                          | 0.91                   | 0.39                   | 0.27              | 0.48                | 0.22                | 0.48            | 0.39               | 0.91                |
| 16    | Fluorides as F                        | mg/l  | 1.5                                        | 0.62                   | 0.48                   | 0.29              | 0.56                | 0.21                | 0.57            | 0.48               | 0.62                |

|    |                                          |      |       |      |      |       |      |       |      |       |      |
|----|------------------------------------------|------|-------|------|------|-------|------|-------|------|-------|------|
| 17 | Cyanide                                  | mg/l | 0.05  | BDL  | BDL  | BDL   | BDL  | BDL   | BDL  | BDL   | BDL  |
| 18 | Arsenic                                  | mg/l | 0.05  | BDL  | BDL  | BDL   | BDL  | BDL   | BDL  | BDL   | BDL  |
| 19 | Boron as B                               | mg/l | -     | BDL  | BDL  | BDL   | BDL  | BDL   | BDL  | BDL   | BDL  |
| 20 | Cadmium as Cd                            | mg/l | 0.01  | BDL  | BDL  | BDL   | BDL  | BDL   | BDL  | BDL   | BDL  |
| 21 | Chromium, Total                          | mg/l | 0.05  | BDL  | BDL  | BDL   | BDL  | BDL   | BDL  | BDL   | BDL  |
| 22 | Copper as Cu                             | mg/l | 1.5   | BDL  | BDL  | BDL   | BDL  | BDL   | BDL  | BDL   | BDL  |
| 23 | Iron as Fe                               | mg/l | 0.3   | 0.26 | 0.18 | 0.045 | 0.25 | 0.065 | 0.21 | 0.051 | 0.28 |
| 24 | Lead as Pb                               | mg/l | 0.1   | BDL  | BDL  | BDL   | BDL  | BDL   | BDL  | BDL   | BDL  |
| 25 | Manganese as Mn                          | mg/l | 0.5   | BDL  | BDL  | BDL   | BDL  | BDL   | BDL  | BDL   | BDL  |
| 26 | Mercury                                  | mg/l | 0.001 | BDL  | BDL  | BDL   | BDL  | BDL   | BDL  | BDL   | BDL  |
| 27 | Nickel as Ni                             | mg/l | -     | BDL  | BDL  | BDL   | BDL  | BDL   | BDL  | BDL   | BDL  |
| 28 | Selenium as Se                           | mg/l | 0.01  | BDL  | BDL  | BDL   | BDL  | BDL   | BDL  | BDL   | BDL  |
| 29 | Zinc                                     | mg/l | 15    | BDL  | BDL  | BDL   | BDL  | BDL   | BDL  | BDL   | BDL  |
| 30 | Dissolved Oxygen                         | mg/l | 6     | 4.3  | 4.7  | 4.9   | 5    | 5.3   | 5.6  | 5.2   | 5.7  |
| 31 | Chemical Oxygen Demand as O <sub>2</sub> | mg/l | -     | 64.8 | 32.8 | 34.5  | 36.3 | 37.4  | 39.5 | 32.8  | 28.6 |
| 32 | BOD, 3 days @ 27°C as O <sub>2</sub>     | mg/l | 2     | 12.6 | 5.8  | 4.2   | 6.1  | 4.1   | 6.1  | 5.8   | 3.1  |

**Note:** BDL- Below Detectable Limit

**Interpretation of Surface Water Quality Monitoring Results**

The surface water samples were analyzed and compared with IS 2296:1992 standards and CPCB Water Quality Criteria for designated best use. Based on the test results, the water quality of the studied locations falls under Class E, which means it is suitable for irrigation, industrial cooling, and controlled waste disposal, but not for drinking or direct human consumption.

| Parameter                       | Observed Range               | IS 2296:1992 Limits (Class A) | Interpretation                                                                                    |
|---------------------------------|------------------------------|-------------------------------|---------------------------------------------------------------------------------------------------|
| pH                              | 7.25 – 8.1                   | 6.5 – 8.5                     | Within Limits – Indicates neutral to slightly alkaline water.                                     |
| Electrical Conductivity (EC)    | 1035 – 1950 $\mu\text{S/cm}$ | No specific limit             | Higher EC values suggest moderate dissolved solids, which may indicate mineral content.           |
| Chloride ( $\text{Cl}^-$ )      | 220.3 – 408.6 mg/l           | 250 mg/l                      | Some locations exceed limits –.                                                                   |
| Sulphate ( $\text{SO}_4^{2-}$ ) | 44.1 – 102.2 mg/l            | 400 mg/l                      | Within Limits – Indicates low sulfate pollution.                                                  |
| Total Hardness                  | 300.4 – 542.8 mg/l           | 300 mg/l                      | Exceed limits                                                                                     |
| Chemical Oxygen Demand (COD)    | 28.6 – 64.8 mg/l             | No specific limit             | Elevated COD levels indicate presence of organic matter and potential pollution.                  |
| Biochemical Oxygen Demand (BOD) | 3.1 – 12.6 mg/l              | 2 mg/l (Class A)              | Exceed limits, suggesting organic contamination, possibly from agricultural or industrial runoff. |

- pH, chloride, sulfate, and hardness levels are within acceptable limits, meaning the water does not have immediate chemical hazards.
- Higher EC values suggest moderate dissolved solids, indicating mineral presence but not necessarily harmful.
- COD and BOD levels are slightly elevated, suggesting some degree of organic pollution, likely due to agricultural runoff or nearby human activities.
- Since the water is classified as Class E, it is not fit for direct human consumption but can be used for industrial and irrigation purposes.

**3.8.3 Ground Water Quality**

Total **Eight (08)** ground water monitoring locations were identified for assessment in different villages around the project site. The groundwater results are compared with the acceptable and permissible water quality standards as per IS: 10500 (2012) for drinking water. Groundwater quality monitoring locations and results are given in **Table 3-14** and

**Table 3-15** respectively. A map showing the groundwater monitoring locations is given in **Figure 3-16**.

**Table 3-14 Details of Groundwater Quality Monitoring Locations**

| Location Code | Location             | Distance (Km)<br>w.r.t project site | Direction<br>w.r.t project site | Longitude | Latitude |
|---------------|----------------------|-------------------------------------|---------------------------------|-----------|----------|
| GW1           | Near Project Site    | 0.02                                | WSW                             | 78.89901  | 12.1924  |
| GW2           | Sattannur            | 1.36                                | NNW                             | 78.8931   | 12.20468 |
| GW3           | Kil Karippur         | 4.88                                | NNE                             | 78.92187  | 12.23088 |
| GW4           | Near<br>Taradappattu | 3.26                                | NE                              | 78.93064  | 12.20851 |
| GW5           | Tandrapattu          | 5.51                                | SE                              | 78.94425  | 12.15266 |
| GW6           | Mottur<br>Olagappadi | 4.86                                | S                               | 78.90709  | 12.14104 |
| GW7           | Near<br>Mallikapuram | 1.53                                | SW                              | 78.88862  | 12.1827  |
| GW8           | Sorappanandal        | 5.66                                | NNW                             | 78.87387  | 12.23883 |

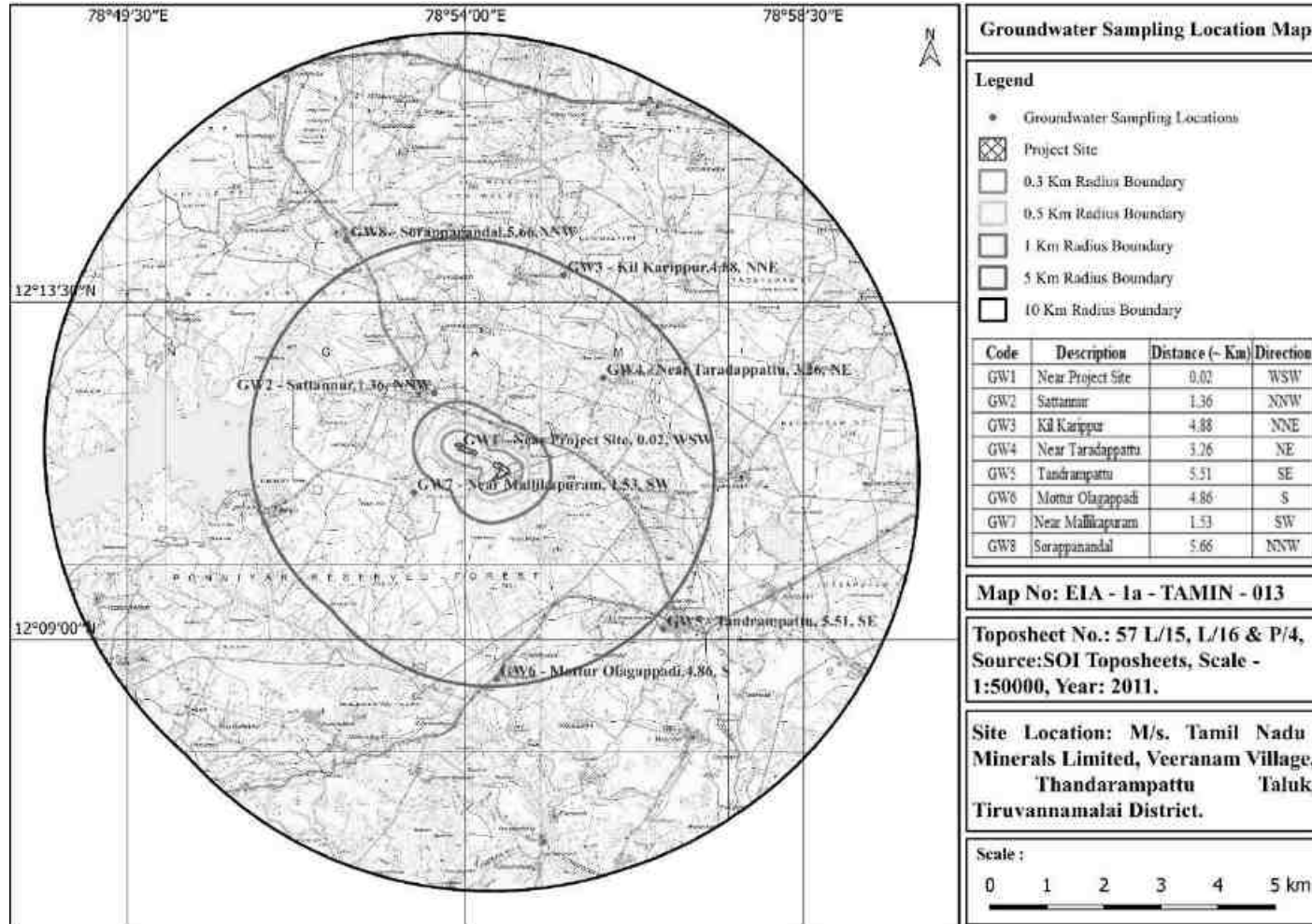


Figure 3-16 Groundwater monitoring locations

Table 3-15 Ground Water Monitoring Results

| S. No | Parameters                          | Unit  | Drinking water Standard (IS 10500: 2012) Acceptable Limit | Drinking water Standard (IS 10500: 2012) Permissible Limit | Near Project Site | Sattannur | Kil Karippur | Near Taradappattu | Tandrapattu | Mottur Olagappadi | Near Mallikapuram | Sorappanandal |
|-------|-------------------------------------|-------|-----------------------------------------------------------|------------------------------------------------------------|-------------------|-----------|--------------|-------------------|-------------|-------------------|-------------------|---------------|
|       |                                     |       |                                                           |                                                            | GW1               | GW2       | GW3          | GW4               | GW5         | GW6               | GW7               | GW8           |
| 1     | Colour                              | Hazen | 5                                                         | 15                                                         | BDL               | BDL       | BDL          | BDL               | BDL         | BDL               | BDL               | BDL           |
| 2     | Turbidity                           | NTU   | 1                                                         | 5                                                          | BDL               | BDL       | BDL          | BDL               | BDL         | BDL               | BDL               | BDL           |
| 3     | pH                                  | --    | 6.5-8.5                                                   | NR                                                         | 7.21              | 7.56      | 7.89         | 7.61              | 7.54        | 7.68              | 7.43              | 7.71          |
| 4     | Conductivity                        | µS/cm | -                                                         | -                                                          | 851               | 980       | 1060         | 1080              | 1170        | 960               | 1230              | 1125          |
| 5     | Total Dissolve Solids               | mg/l  | 500                                                       | 2000                                                       | 539               | 542       | 554          | 565               | 587         | 610               | 686               | 645           |
| 6     | Total Suspended Solids              |       | -                                                         | -                                                          | BDL               | BDL       | BDL          | BDL               | BDL         | BDL               | BDL               | BDL           |
| 7     | Alkalinity as CaCO <sub>3</sub>     | mg/l  | 200                                                       | 600                                                        | 167               | 190       | 172          | 175               | 182         | 189               | 240               | 200           |
| 8     | Total Hardness as CaCO <sub>3</sub> | mg/l  | 200                                                       | 600                                                        | 205               | 282       | 249          | 215               | 223         | 232               | 288               | 245           |
| 9     | Sodium as Na                        | mg/l  | -                                                         | -                                                          | 79.9              | 72.8      | 74.5         | 83.8              | 87.1        | 103.4             | 112.7             | 95.7          |
| 10    | Potassium as K                      | mg/l  | -                                                         | -                                                          | 20.0              | 18.2      | 18.6         | 21.0              | 21.8        | 25.8              | 28.2              | 23.9          |
| 11    | Calcium as Ca                       | mg/l  | 75                                                        | 200                                                        | 41.7              | 43.3      | 91.4         | 60.9              | 73.7        | 40.1              | 43.3              | 89.8          |
| 12    | Magnesium as Mg                     | mg/l  | 30                                                        | 100                                                        | 24.3              | 41.8      | 4.9          | 15.6              | 9.7         | 32.1              | 43.8              | 4.9           |
| 13    | Chloride as Cl                      | mg/l  | 250                                                       | 1000                                                       | 0                 | 0         | 0            | 0                 | 0           | 0                 | 0                 | 0             |

# EIA/EMP Report

13.74.0 Ha of Veeranam Black Granite Quarry at SF No. 74(P), 126/1A, 127, 144/1,  
Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, TamilNadu,  
Proposed by M/s. Tamil Nadu Minerals Limited (TAMIN)

| S. No | Parameters                 | Unit | Drinking water Standard (IS 10500: 2012) Acceptable Limit | Drinking water Standard (IS 10500: 2012) Permissible Limit | Near Project Site | Sattannur | Kil Karippur | Near Taradappattu | Tandra mpattu | Mottur Olagappadi | Near Mallikapuram | Sorappananda I |
|-------|----------------------------|------|-----------------------------------------------------------|------------------------------------------------------------|-------------------|-----------|--------------|-------------------|---------------|-------------------|-------------------|----------------|
|       |                            |      |                                                           |                                                            | GW1               | GW2       | GW3          | GW4               | GW5           | GW6               | GW7               | GW8            |
| 14    | Sulphate SO <sub>4</sub>   | mg/l | 200                                                       | 400                                                        | 167               | 190       | 172          | 175               | 182           | 189               | 240               | 200            |
| 15    | Nitrate as NO <sub>3</sub> | mg/l | 45                                                        | NR                                                         | 151               | 173       | 177          | 158               | 164           | 195               | 213               | 181            |
| 16    | Phosphate PO <sub>4</sub>  | mg/l | -                                                         | -                                                          | BDL               | BDL       | BDL          | BDL               | BDL           | BDL               | BDL               | BDL            |
| 17    | Fluorides as F             | mg/l | 1                                                         | 1.5                                                        | 0.33              | 0.28      | 0.31         | 0.27              | 0.21          | 0.24              | 0.19              | 0.36           |
| 18    | Cyanide                    | mg/l | 0.05                                                      | NR                                                         | BDL               | BDL       | BDL          | BDL               | BDL           | BDL               | BDL               | BDL            |
| 19    | Arsenic as As              | mg/l | 0.01                                                      | 0.05                                                       | BDL               | BDL       | BDL          | BDL               | BDL           | BDL               | BDL               | BDL            |
| 20    | Boron as B                 | mg/l | 0.5                                                       | 1.0                                                        | BDL               | BDL       | BDL          | BDL               | BDL           | BDL               | BDL               | BDL            |
| 21    | Cadmium as Cd              | mg/l | 0.003                                                     | NR                                                         | BDL               | BDL       | BDL          | BDL               | BDL           | BDL               | BDL               | BDL            |
| 22    | Chromium as Cr             | mg/l | 0.05                                                      | NR                                                         | BDL               | BDL       | BDL          | BDL               | BDL           | BDL               | BDL               | BDL            |
| 23    | Copper                     | mg/l | 0.05                                                      | 1.5                                                        | BDL               | BDL       | BDL          | BDL               | BDL           | BDL               | BDL               | BDL            |
| 24    | Iron                       | mg/l | 0.3                                                       | NR                                                         | 0.06              | 0.09      | 0.15         | 0.09              | 0.1           | 0.11              | 0.1               | 0.21           |
| 25    | Lead                       | mg/l | 0.01                                                      | NR                                                         | BDL               | BDL       | BDL          | BDL               | BDL           | BDL               | BDL               | BDL            |
| 26    | Manganese as Mn            | mg/l | 0.1                                                       | 0.3                                                        | BDL               | BDL       | BDL          | BDL               | BDL           | BDL               | BDL               | BDL            |
| 27    | Mercury                    | mg/l | 0.001                                                     | NR                                                         | BDL               | BDL       | BDL          | BDL               | BDL           | BDL               | BDL               | BDL            |
| 28    | Nickel as Ni               | mg/l | 0.02                                                      | NR                                                         | BDL               | BDL       | BDL          | BDL               | BDL           | BDL               | BDL               | BDL            |
| 29    | Selenium as Se             | mg/l | 0.01                                                      | NR                                                         | BDL               | BDL       | BDL          | BDL               | BDL           | BDL               | BDL               | BDL            |

| S. No | Parameters | Unit | Drinking water Standard (IS 10500: 2012) Acceptable Limit | Drinking water Standard (IS 10500: 2012) Permissible Limit | Near Project Site | Sattannur | Kil Karippur | Near Taradappattu | Tandra mpattu | Mottur Olagappadi | Near Mallikapuram | Sorappananda I |
|-------|------------|------|-----------------------------------------------------------|------------------------------------------------------------|-------------------|-----------|--------------|-------------------|---------------|-------------------|-------------------|----------------|
|       |            |      |                                                           |                                                            | GW1               | GW2       | GW3          | GW4               | GW5           | GW6               | GW7               | GW8            |
| 30    | Zinc as Zn | mg/l | 5                                                         |                                                            | BDL               | BDL       | BDL          | BDL               | BDL           | BDL               | BDL               | BDL            |

**Note:** BDL- Below Detectable Limit; NR-No Relaxation

**Interpretation of Groundwater Quality Monitoring Results:**

The physico-chemical characteristics of groundwater samples were analyzed and compared with IS 10500:2012 drinking water standards. Based on the test results, the groundwater quality in the studied locations meets the permissible limits, making it safe for drinking purposes.

| Parameter                                 | Observed Range   | IS 10500:2012 Limits                              | Interpretation                                                  |
|-------------------------------------------|------------------|---------------------------------------------------|-----------------------------------------------------------------|
| pH                                        | 7.21 – 7.89      | 6.5 – 8.5                                         | Within Limits – Indicates neutral to slightly alkaline water.   |
| Total Dissolved Solids (TDS)              | 539 – 686 mg/l   | 500 mg/l (Acceptable),<br>2000 mg/l (Permissible) | Within Limits – Slightly high but safe for consumption.         |
| Chloride (Cl <sup>-</sup> )               | 151 – 213 mg/l   | 250 mg/l (Acceptable),<br>1000 mg/l (Permissible) | Well Within Limits – No immediate concerns.                     |
| Sulphate (SO <sub>4</sub> <sup>2-</sup> ) | 37.7 – 53.2 mg/l | 200 mg/l (Acceptable),<br>400 mg/l (Permissible)  | Within Limits – No indication of sulfate-related contamination. |

- pH levels are within the permissible range, indicating good water quality.
- TDS levels are slightly elevated but within the permissible limits, suggesting moderate mineral content, which is not harmful.
- Chloride and sulfate concentrations are within acceptable limits, confirming no significant contamination from industrial or agricultural sources.
- The groundwater is suitable for drinking, as per IS 10500:2012 standards.

These interpretations relate to the sample tested for location only. To prevent ground water contamination and improving the quality and Quantity, rainwater harvesting, and groundwater recharging may be helpful.

**3.9 Soil quality**

Eight locations in and around the proposed project were selected for soil sampling. At each location, soil samples were collected from three different depths viz. 30 cm, 60 cm and 90 cm below the surface. Soil analysis was carried out as per IS: 2720 methods. The methodology adopted for each parameter is described in. Soil quality monitoring locations & results are given in **Table 3-17** & **Table 3-18**. A map showing the soil monitoring locations is given in **Figure 3-17**.

**Table 3-16 Test methods used for the analysis of Soil**

| S. No | Parameter Measured             | Test Method                        |
|-------|--------------------------------|------------------------------------|
| 1     | pH @ 25°C                      | IS 2720 (Part 26): 1987            |
| 2     | Electrical Conductivity        | IS 14767: 2000                     |
| 3     | Nitrogen as N                  | IS 14684: 1999 / FAO 2007 RA       |
| 4     | Phosphorus                     | IS 14684: 1999 RA                  |
| 5     | Potassium                      | FAO-UN 2007 RA                     |
| 6     | Organic Carbon/ Organic Matter | IS 2720 (Part 22): 1972            |
| 7     | Cation Exchange Capacity       | In House SOP by Calculation Method |

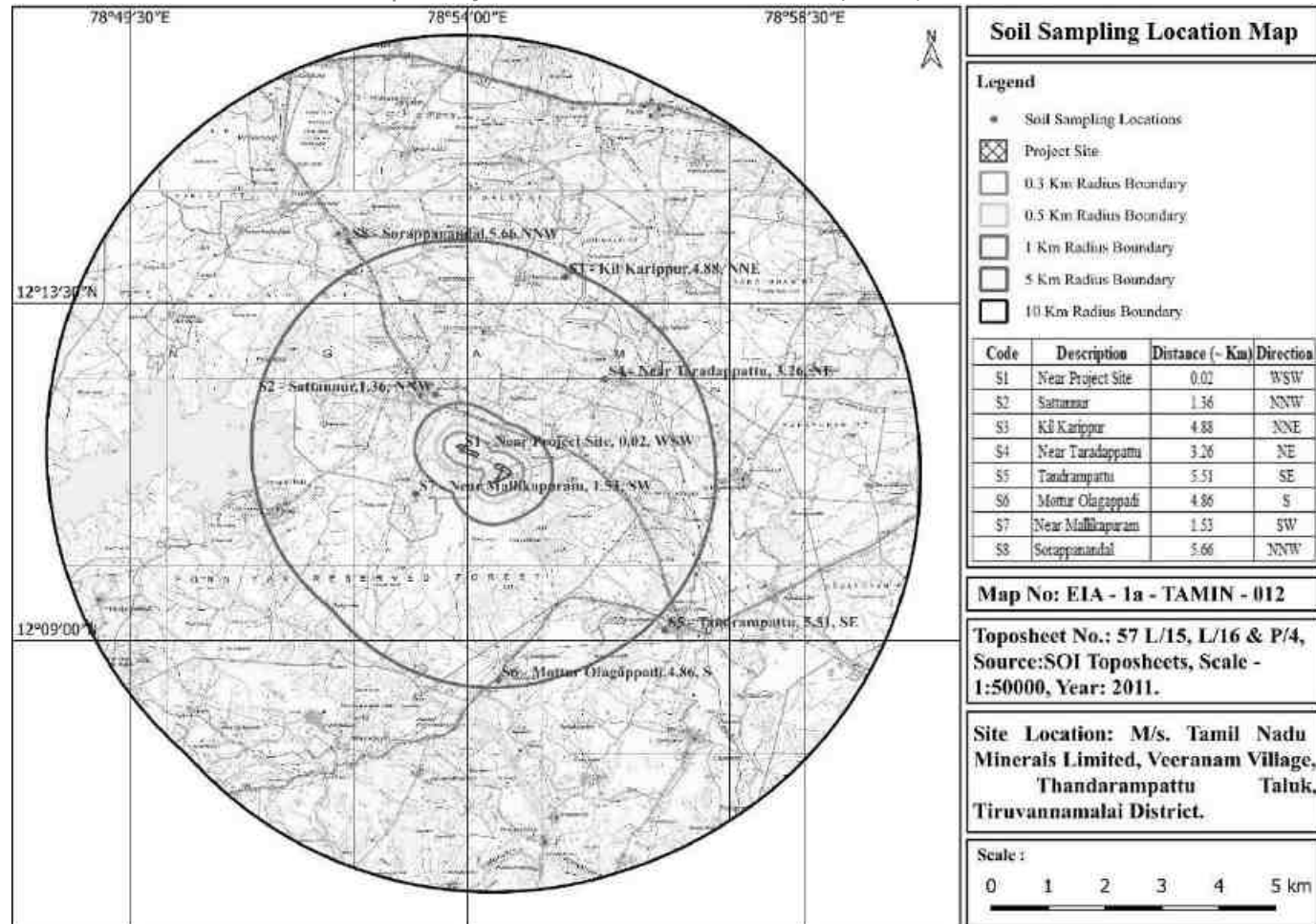


Figure 3-17 Soil monitoring locations

**Table 3-17 Soil & Sediment Quality Monitoring Locations**

| Location Code | Location          | Distance (Km) w.r.t project site | Direction w.r.t project site | Longitude | Latitude |
|---------------|-------------------|----------------------------------|------------------------------|-----------|----------|
| S1            | Near Project Site | 0.02                             | WSW                          | 78.89901  | 12.1924  |
| S2            | Sattannur         | 1.36                             | NNW                          | 78.8931   | 12.20468 |
| S3            | Kil Karippur      | 4.88                             | NNE                          | 78.92187  | 12.23088 |
| S4            | Near Taradappattu | 3.26                             | NE                           | 78.93064  | 12.20851 |
| S5            | Tandrapattu       | 5.51                             | SE                           | 78.94425  | 12.15266 |
| S6            | Mottur Olagappadi | 4.86                             | S                            | 78.90709  | 12.14104 |
| S7            | Near Mallikapuram | 1.53                             | SW                           | 78.88862  | 12.1827  |
| S8            | Sorappanandal     | 5.66                             | NNW                          | 78.87387  | 12.23883 |

**Table 3-18 Soil & Sediment Quality Monitoring Results**

| S. No | Parameters               | Units      | Near Project Site | Sattannur | Kil Karippur | Near Taradappattu | Tandram pattu | Mottur Olagappadi | Near Mallikapuram | Sorappanandal |
|-------|--------------------------|------------|-------------------|-----------|--------------|-------------------|---------------|-------------------|-------------------|---------------|
|       |                          |            | S1                | S2        | S3           | S4                | S5            | S6                | S7                | S8            |
| 1     | Sand                     | %          | 54.0              | 61.0      | 60.0         | 53.0              | 48.0          | 53.0              | 57.0              | 40.0          |
| 2     | Silt                     | %          | 24.0              | 26.0      | 24.0         | 15.0              | 13.0          | 30.0              | 25.0              | 41.0          |
| 3     | Clay                     | %          | 22.0              | 13.0      | 16.0         | 32.0              | 39.0          | 17.0              | 18.0              | 19.0          |
| 4     | pH                       | -          | 7.46              | 7.11      | 7.2          | 7.68              | 7.76          | 7.45              | 7.34              | 7.81          |
| 5     | Electrical conductivity  | µmhos/cm   | 278               | 243       | 298          | 212               | 253           | 265               | 214               | 197           |
| 6     | Nitrogen as N            | Kg/ha      | 178               | 220       | 212          | 187               | 199           | 167               | 208               | 201           |
| 7     | Phosphorus               | Kg/ha      | 64                | 58        | 61           | 66                | 51            | 53                | 57                | 62            |
| 8     | Potassium                | Kg/ha      | 184               | 245       | 289          | 322               | 352           | 360               | 343               | 346           |
| 9     | Cation Exchange Capacity | meq/100 gm | 4.6               | 11.6      | 1.2          | 8.2               | 9.7           | 0.7               | 1.1               | 2.6           |
| 10    | Organic Carbon           | %          | 0.782             | 0.625     | 0.617        | 0.755             | 0.674         | 0.689             | 0.687             | 0.721         |
| 11    | Organic matter           | %          | 1.421             | 1.132     | 1.064        | 1.302             | 1.234         | 1.188             | 1.278             | 1.243         |

### Interpretation of Soil Quality Monitoring Results:

- The **soil quality analysis** was conducted at eight locations and compared with **ICAR (Indian Council of Agricultural Research) standards** to determine the fertility and suitability of the soil for agriculture and environmental health.

| Parameter                    | Observed Range          | ICAR Standard Classification           | Interpretation                                                                               |
|------------------------------|-------------------------|----------------------------------------|----------------------------------------------------------------------------------------------|
| pH                           | 7.11 – 7.81             | Neutral to Slightly Alkaline           | Soils are suitable for agriculture but may require adjustments for specific crops.           |
| Electrical Conductivity (EC) | 197 – 298 $\mu$ mhos/cm | Average                                | Indicates low to moderate salinity, suitable for crop growth.                                |
| Nitrogen (N)                 | 167 – 220 kg/ha         | Better                                 | Some locations have low nitrogen content, requiring fertilization for improved fertility.    |
| Phosphorus (P)               | 51 – 66 kg/ha           | on an average sufficient to Sufficient | Low phosphorus levels indicate a need for phosphorus fertilizers to support plant growth.    |
| Potassium (K)                | 184 – 360 kg/ha         | Medium to Better                       | Deficient potassium levels, requiring soil amendments for optimal agricultural productivity. |
| Organic Carbon (%)           | 0.617 – 0.782           | On an average sufficient               | Indicates low organic matter, suggesting the need for organic fertilizers or compost.        |

- Soil pH is suitable for agriculture, though slightly alkaline in some areas.
- Low nitrogen, phosphorus, and potassium levels indicate poor fertility, requiring soil enrichment through fertilization.
- Organic matter content is low, indicating the need for composting or organic farming practices.
- Moderate conductivity suggests that soil is not saline and can support plant growth.

### 3.10 Biological Environment

#### 3.10.1 Introduction

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 ecosystems play an important role in identifying sensitive issues for undertaking appropriate action to mitigate the impact, if any. The biological study was undertaken 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 conditions with the help of available data, to predict changes in the biological environment because of present activities and to suggest measures for maintaining its health. Secondary source information was conducted to study the flora & fauna in the 10km 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. A survey of the wild plants as well as cultivated crop plants was conducted, and all the available information was recorded.

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

- Assessment of the 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.

#### Methodology

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

#### 3.10.2 Flora Assessment

Plants species were identified based on their specific diagnostics characters of family, genus and species using available floral and other related literature. Besides the identification of plant species, information was collected on the vernacular names and uses of plants made by local inhabitants.

#### 3.10.3 Fauna Assessment

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 identifying available fauna 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.

#### Floristic composition within the study area

For secondary information based on a total species found in the study area. The detailed list of plant species found in each quadrat provided in **Table 3-19**. Sathanur reservoir was created in 1957 on the River Ponniar at Sathanur Village in Tiruvannamalai Sambuvarayar district (12° 12'N). It covers 2010 Ha at the FRL of 222.2 m. The reservoir has a capacity of 228.91 million m<sup>3</sup> at full level and a mean depth of 11.4 m. Shore and volume development indices are favourable for productivity. The reservoir supports agricultural practices and Ponniyar Reserved Forest covers the region.

Table 3-19 List of flora reported/observed in the study area

| S. No.       | Scientific Name                 | Common Name         | Vernacular Name | Occurrence | IUCN Status |
|--------------|---------------------------------|---------------------|-----------------|------------|-------------|
| <b>Trees</b> |                                 |                     |                 |            |             |
| 1            | <i>Albizia saman</i>            | Rain tree           | Amaivagai       | Native     | LC          |
| 2            | <i>Areca catechu</i>            | Betel palm          | Ataikay         | Native     | LC          |
| 3            | <i>Artocarpus heterophyllus</i> | Jackfruit tree      | Pala Maram      | Native     | LC          |
| 4            | <i>Azadirachta indica</i>       | Neem                | Veppai          | Native     | LC          |
| 5            | <i>Bauhinia purpurea</i>        | Orchid tree         | Nilattiruvatti  | Native     | LC          |
| 6            | <i>Borassus flabellifer</i>     | Palm tree           | Panaimaram      | Native     | LC          |
| 7            | <i>Callistemon speciosus</i>    | Bottle brush        | Palasu          | Invasive   | LC          |
| 8            | <i>Carica papaya</i>            | Papaya tree         | Pappali         | Native     | LC          |
| 9            | <i>Caryota urens</i>            | Fishtail palm       | Kontalpanai     | Native     | LC          |
| 10           | <i>Cassia auriculata</i>        | Matura tea tree     | Avaram          | Native     | LC          |
| 11           | <i>Citrus limon</i>             | Lemon               | elumichai       | Native     | LC          |
| 12           | <i>Cocos nucifera</i>           | Coconut tree        | Tennai          | Native     | LC          |
| 13           | <i>Cordia dichotoma</i>         | Fragrant manjack    | Naruvili        | Invasive   | LC          |
| 14           | <i>Cordia sebestena</i>         | Geiger tree         | Achinaruvili    | Invasive   | LC          |
| 15           | <i>Cupressus macrocarpa</i>     | Monterey cypress    | -               | Invasive   | LC          |
| 16           | <i>Delonix regia</i>            | Flame of forest     | Mayil kondrai   | Native     | LC          |
| 17           | <i>Dracaena marginata</i>       | Dragon tree         | -               | Native     | LC          |
| 18           | <i>Eucalyptus globulus</i>      | Southern blue gum   | Karpuramar am   | Native     | LC          |
| 19           | <i>Ficus benghalensis</i>       | Indian Banyan       | Alamaram        | Native     | LC          |
| 20           | <i>Ficus benjamina</i>          | Indian fig          | Nintamarav akai | Native     | LC          |
| 21           | <i>Ficus elastica</i>           | Rubber fig          | -               | Native     | LC          |
| 22           | <i>Ficus racemosa</i>           | Cluster fig         | Athi            | Native     | LC          |
| 23           | <i>Lagerstroemia indica</i>     | Common crape myrtle | Pavalakkurin ji | Native     | LC          |
| 24           | <i>Leucaena leucocephala</i>    | Whitelead tree      | Periya-takarai  | Native     | LC          |
| 25           | <i>Madhuca longifolia</i>       | Butter tree         | Iluppai         | Native     | LC          |
| 26           | <i>Mangifera indica</i>         | Mango               | Maamaram        | Native     | LC          |
| 27           | <i>Manilkara zapota</i>         | Sapota              | chimaiyiluppai  | Native     | LC          |
| 28           | <i>Melia azedarach</i>          | Indian lilac        | Kattu vembhu    | Native     | LC          |
| 29           | <i>Millingtonia hortensis</i>   | Tree jasmine        | Maramalli       | Native     | LC          |

|               |                                      |                           |                     |          |    |
|---------------|--------------------------------------|---------------------------|---------------------|----------|----|
| 30            | <i>Mimusops elengi</i>               | Medlar tree               | Magizhamb<br>oo     | Native   | LC |
| 31            | <i>Morinda pubescens</i>             | Indian Mulberry           | Mannanunai          | Native   | LC |
| 32            | <i>Moringa oleifera</i>              | Drumstick tree            | Murungai            | Native   | LC |
| 33            | <i>Muntingia calabura</i>            | Singapore cherry          | Ten pazham          | Native   | LC |
| 34            | <i>Peltophorum<br/>pterocarpum</i>   | Copper pod                | Perungkonra<br>i    | Native   | LC |
| 35            | <i>Phoenix sylvestris</i>            | Sugar date palm           | icham               | Native   | LC |
| 36            | <i>Pithecellobium dulce</i>          | Manila tamarind           | Kodukkappu<br>li    | Native   | LC |
| 37            | <i>Polyalthia longifolia</i>         | False Asoka               | Vansulam            | Native   | LC |
| 38            | <i>Pongamia pinnata</i>              | Indian beech              | Nattamalam          | Native   | LC |
| 39            | <i>Ptychosperma elegans</i>          | Solitaire palm            | -                   | Native   | LC |
| 40            | <i>Ravenala<br/>madagascariensis</i> | Traveller's palm          | Visiri vazhai       | Native   | LC |
| 41            | <i>Roystonea regia</i>               | Cuban royal palm          | -                   | Native   | LC |
| 42            | <i>Saraca asoca</i>                  | Ashoka tree               | Ashogamara<br>m     | Native   | LC |
| 43            | <i>Sterculia foetida</i>             | Java olive tree           | Kutiraippitu<br>kku | Native   | LC |
| 44            | <i>Stereospermum<br/>tetragonum</i>  | Yellow snake tree         | Punkali             | Native   | LC |
| 45            | <i>Syzygium cumini</i>               | Java plum                 | Nagai               | Native   | LC |
| 46            | <i>Terminalia cattappa</i>           | Badam tree                | Nattuvadum<br>ai    | Native   | LC |
| 47            | <i>Thespesia populnea</i>            | Portia tree               | Poovarasu           | Native   | LC |
| <b>Shrubs</b> |                                      |                           |                     |          |    |
| 48            | <i>Allamanda cathartica</i>          | Golden trumpet            | Allamanda           | Invasive | LC |
| 49            | <i>Alpinia galangal</i>              | Galangal                  | Perarathai          | Native   | LC |
| 50            | <i>Bougainvillea<br/>spectabilis</i> | Great bougainvillea       | Kaakitha<br>poo     | Native   | LC |
| 51            | <i>Caesalpinia<br/>pulcherrima</i>   | Peacock flower            | Mayilkonrai         | Native   | LC |
| 52            | <i>Calotropis gigantea</i>           | Calotrope                 | Erukku              | Native   | LC |
| 53            | <i>Cestrum diurnum</i>               | Day jasmine               | -                   | Native   | LC |
| 54            | <i>Cestrum nocturnum</i>             | Night blooming<br>jasmine | Pavazhamall<br>i    | Native   | LC |
| 55            | <i>Datura metel</i>                  | Devil's trumpet           | Karu<br>oomathai    | Native   | LC |
| 56            | <i>Duranta erecta</i>                | Golden dew drop           | Aagayapoo           | Native   | LC |
| 57            | <i>Eclipta prostrata</i>             | False daisy               | Karisilangan<br>ni  | Native   | LC |

|              |                                     |                            |                   |          |    |
|--------------|-------------------------------------|----------------------------|-------------------|----------|----|
| 58           | <i>Euonymus japonicus</i>           | Japanese spindle           | -                 | Invasive | LC |
| 59           | <i>Euphorbia tithymaloides</i>      | Redbird flower             | Kannadikalli      | Invasive | LC |
| 60           | <i>Ficus elastica</i>               | Rubber fig                 | Seemai aalai      | Native   | LC |
| 61           | <i>Hamelia patens</i>               | Fire bush                  | Theepudhar        | Native   | LC |
| 62           | <i>Hibiscus Rosa sinensis</i>       | Indian Hibiscus            | Cembarutti        | Native   | LC |
| 63           | <i>Ixora coccinea</i>               | Ixora                      | Vedchi            | Native   | LC |
| 64           | <i>Jasminum arborescens</i>         | Navamallika                | Kattumalliga<br>i | Native   | LC |
| 65           | <i>Jasminum auriculatum</i>         | Juhi                       | Uccimalligai      | Native   | LC |
| 66           | <i>Jasminum officinale</i>          | Common jasmine             | Jathi malli       | Native   | LC |
| 67           | <i>Jasminum polyanthum</i>          | Pink Jasmine               | Thalavam          | Native   | LC |
| 68           | <i>Jasminum sambac</i>              | Arabian jasmine            | Gundu malli       | Native   | LC |
| 69           | <i>Nerium oleander</i>              | Nerium                     | Arali             | Native   | LC |
| 70           | <i>Piper longum</i>                 | Indian long pepper         | Tippili           | Native   | LC |
| 71           | <i>Plectranthus amboinicus</i>      | Indian borage              | Karpuravalli      | Native   | LC |
| 72           | <i>Plumeria obtusa</i>              | Singapore graveyard flower | Ponnalari         | Native   | LC |
| 73           | <i>Plumeria rubra</i>               | Temple tree                | Sampangi          | Native   | LC |
| 74           | <i>Pseuderanthemum carruthersii</i> | Carruther's false face     | -                 | Native   | LC |
| 75           | <i>Punica granatum</i>              | Pomegranate                | madulai           | Native   | LC |
| 76           | <i>Symphoricarpos orbiculatus</i>   | Coral berry                | -                 | Native   | LC |
| 77           | <i>Tecoma capensis</i>              | Cape honey suckle          | Velai             | Invasive | LC |
| 78           | <i>Tecoma stans</i>                 | Trumpet bush               | Sonnapatti        | Invasive | LC |
| 79           | <i>Valeriana officinalis</i>        | Garden heliotrope          | Catamaci          | Invasive | LC |
| 80           | <i>Volkameria inermis</i>           | The glory bower            | Sangam            | Invasive | LC |
| <b>Herbs</b> |                                     |                            |                   |          |    |
| 81           | <i>Acalypha indica</i>              | Indian Acalypha            | Kolippuntu        | Native   | LC |
| 82           | <i>Acalypha wilkesiana</i>          | Copper leaf                | Kuppaimeni        | Native   | LC |
| 83           | <i>Achyranthes aspera</i>           | Chaff flower               | Nayuruvi          | Native   | LC |
| 84           | <i>Allmania nodiflora</i>           | Node flower                | Kumattikkira<br>i | Native   | LC |
| 85           | <i>Aloe vera</i>                    | Indian aloe                | Katralai          | Native   | LC |
| 86           | <i>Alternanthera sessilis</i>       | Sessile joyweed            | Ponnankann<br>i   | Native   | LC |
| 87           | <i>Amaranthus viridis</i>           | Green amaranth             | Kuppaikeera<br>i  | Native   | LC |
| 88           | <i>Andrographis paniculata</i>      | Green chiretta             | Nilavempu         | Native   | LC |

|     |                                 |                        |                     |          |    |
|-----|---------------------------------|------------------------|---------------------|----------|----|
| 89  | <i>Apluda mutica</i>            | Mauritian grass        | Moongil pillu       | Native   | LC |
| 90  | <i>Aristida setacea</i>         | Broom grass            | Thudappam pillu     | Native   | LC |
| 91  | <i>Bambusa bamboo</i>           | Bamboo                 | Moongil             | Native   | LC |
| 92  | <i>Basella alba</i>             | Indian spinach         | Vasalakkirai        | Native   | LC |
| 93  | <i>Calliandra tergemina</i>     | Powder puff            | -                   | Native   | LC |
| 94  | <i>Canna indica</i>             | Indian shot            | Kattuvalai          | Native   | LC |
| 95  | <i>Catharanthus pusillus</i>    | Tiny periwinkle        | Chetthai            | Native   | LC |
| 96  | <i>Catharanthus roseus</i>      | Pink periwinkle        | Nithyakalya ni      | Native   | LC |
| 97  | <i>Centella asiatica</i>        | Indian pennywort       | Matanti             | Native   | LC |
| 98  | <i>Chloris barbata</i>          | Swollen finger grass   | Cevvarakum pul      | Native   | LC |
| 99  | <i>Cleome viscosa</i>           | Tick weed              | Naikaduku           | Native   | LC |
| 100 | <i>Cyanodon dactylon</i>        | Bermuda grass          | Arugam pillu        | Native   | LC |
| 101 | <i>Cyperus rotundus</i>         | Nut grass              | Korai pillu         | Native   | LC |
| 102 | <i>Dactyloctenium aegyptium</i> | Egyptian grass         | Kavarapillu         | Native   | LC |
| 103 | <i>Euphorbia heterophylla</i>   | Japanese poinsettia    | Paal perukki        | Invasive | LC |
| 104 | <i>Gardenia jasminoides</i>     | Cape Jasmine           | Parijatham          | Native   | LC |
| 105 | <i>Hemigraphis colorata</i>     | Red Ivy                | Vadaikutti          | Native   | LC |
| 106 | <i>Heteropogon contortus</i>    | Spear grass            | Oosi pillu          | Native   | LC |
| 107 | <i>Hymenocallis littoralis</i>  | Beach spider lily      | -                   | Native   | LC |
| 108 | <i>Kalanchoe pinnata</i>        | Air plant              | Runakkali           | Native   | LC |
| 109 | <i>Leucas aspera</i>            | Common leucas          | Thumbai             | Native   | LC |
| 110 | <i>Mimosa pudica</i>            | Touch me not plant     | Thottaccuru ngi     | Native   | LC |
| 111 | <i>Mollugo nudicaulis</i>       | Naked stem carpet weed | Parpadagam          | Native   | LC |
| 112 | <i>Musa paradisiaca</i>         | Banana                 | Vaazhai             | Native   | LC |
| 113 | <i>Ocimum gratissimum</i>       | Clove basil            | Vanatulasi          | Native   | LC |
| 114 | <i>Ocimum tenuiflorum</i>       | Tulsi                  | Karuntulasi         | Native   | LC |
| 115 | <i>Phyllanthus amarus</i>       | Gale of the wind       | Kilhkainelli        | Native   | LC |
| 116 | <i>Phyllanthus virgatus</i>     | Seed under leaf        | Patar nelli         | Native   | LC |
| 117 | <i>Portulaca grandiflora</i>    | Moss rose              | Pattu rose          | Native   | LC |
| 118 | <i>Solanum nigrum</i>           | Black nightshade       | Manathakka li       | Native   | LC |
| 119 | <i>Solanum trilobatum</i>       | Pea Eggplant           | Thuthuvalai         | Native   | LC |
| 120 | <i>Sphagneticola trilobata</i>  | Chinese wedelia        | Manjalkarila mkanni | Native   | LC |
| 121 | <i>Stylosanthes hamata</i>      | Caribbean stylo        | -                   | Native   | LC |

|                          |                                  |                       |                  |          |    |
|--------------------------|----------------------------------|-----------------------|------------------|----------|----|
| 122                      | <i>Tephrosia purpurea</i>        | Wild indico           | kavali           | Native   | LC |
| 123                      | <i>Tradescantia spathacea</i>    | Boat lily             | -                | Native   | LC |
| 124                      | <i>Trichodesma indicum</i>       | Indian borage         | Kavizhthum bai   | Native   | LC |
| <b>Climbers/Creepers</b> |                                  |                       |                  |          |    |
| 125                      | <i>Asparagus racemosus</i>       | Satamuli              | Shatavari        | Native   | LC |
| 126                      | <i>Cardiospermum halicacabum</i> | Balloon plant         | Mudakithan       | Native   | LC |
| 127                      | <i>Cayratia pedata</i>           | Birdfoot Grape vine   | Panni kodi       | Native   | LC |
| 128                      | <i>Cissus quadrangularis</i>     | Veld grape            | Pirandai         | Native   | LC |
| 129                      | <i>Cissus vitiginea</i>          | South indian treebine | Mutainari        | Native   | LC |
| 130                      | <i>Coccinia grandis</i>          | Ivy gourd             | Kovai            | Native   | LC |
| 131                      | <i>Cucumis melo</i>              | Muskmelon             | Thumattikai      | Native   | LC |
| 132                      | <i>Dioscorea tomentosa</i>       | Five leaf yam         | Noora kizhangu   | Native   | LC |
| 133                      | <i>Evolvulus alsinoides</i>      | Dwarf morning glory   | -                | Native   | LC |
| 134                      | <i>Hemidesmus indicus</i>        | Indian sarsaparilla   | Nannari          | Native   | LC |
| 135                      | <i>Passiflora foetida</i>        | Bush passion fruit    | Siruppunaik kali | Invasive | LC |
| 136                      | <i>Tylophora indica</i>          | Indian Ipecac         | Avaci            | Native   | LC |

(Note:LC-Least Concern as per IUCN)

#### Source:

- ▶ Gamble, J.S. and C.E.C. Fischer. 1915-1935. Flora of Presidency of Madras, Adlard and Son, London. pp. 1-3.
- ▶ 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.
- ▶ Treepedia Tamil Nadu: <https://www.tntreepedia.com/tree-location/>

#### 3.10.4 Fauna Diversity

This area hosts common animals. Indian Dogs, Jungle and Domestic cat, Rhesus macaque, Domestic Cows, Buffaloes, Bullocks, and Goat etc. are found amongst mammals. Indian cobra, bande Kraits and other common snakes, and lizards like garden lizards are commonly found amongst reptiles. Fauna diversity was 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).

**3.10.4.1 Bird's species**

A total of 57 species belonging different families have been identified from Agricultural and nearby forest area. A comparative chart of the total number of bird species belonging to different families along with their feeding preference and abundance are provided in **Table 3-20**.

**Table 3-20 List of Birds in the study area**

| S. No | Scientific name                  | Common name             | IUCN status | Nativity | WPA 1972 |
|-------|----------------------------------|-------------------------|-------------|----------|----------|
| 1     | <i>Acridotheres tristis</i>      | Common myna             | LC          | Native   | -        |
| 2     | <i>Aerodramus unicolor</i>       | Indian Swiftlet         | LC          | Native   | -        |
| 3     | <i>Alcedo atthis</i>             | Common Kingfisher       | LC          | Native   | -        |
| 4     | <i>Amaurornis phoenicurus</i>    | white-breasted waterhen | LC          | Native   | -        |
| 5     | <i>Anastomus oscitans</i>        | Asian openbill stork    | LC          | Native   | -        |
| 6     | <i>Ardeola grayii</i>            | Pond Heron              | LC          | Native   | -        |
| 7     | <i>Athene brama</i>              | Spotted owl             | LC          | Native   | -        |
| 8     | <i>Bubo bengalensis</i>          | Indian eagle-owl        | LC          | Native   | -        |
| 9     | <i>Bubulcus ibis</i>             | Cattle Egret            | LC          | Native   | -        |
| 10    | <i>Caprimulgus indicus</i>       | Jungle Nightjar         | LC          | Native   | -        |
| 11    | <i>Centropus sinensis</i>        | Greater coucal          | LC          | Native   | -        |
| 12    | <i>Ceryle rudis</i>              | Pied kingfisher         | LC          | Native   | -        |
| 13    | <i>Charadrius hiaticula</i>      | Common ringed plover    | LC          | Native   | -        |
| 14    | <i>Chrysomma sinense</i>         | Yellow-Eyed Babbler     | LC          | Native   | -        |
| 15    | <i>Cinnyris asiaticus</i>        | Purple sunbird          | LC          | Native   | -        |
| 16    | <i>Clamator coromandus</i>       | Red-Winged              | LC          | Native   | -        |
| 17    | <i>Clamator jacobinus</i>        | Pied Cuckoo             | LC          | Native   | -        |
| 18    | <i>Columba livia</i>             | Blue rock pigeon        | LC          | Native   | Sch - IV |
| 19    | <i>Copsychus saularis</i>        | Magpie-robin            | LC          | Native   | -        |
| 20    | <i>Corvus splendens</i>          | Hose crow               | LC          | Native   | -        |
| 21    | <i>Cuculus canorus</i>           | Common cuckoo           | LC          | Native   | -        |
| 22    | <i>Cuculus micropterus</i>       | Indian Cuckoo           | LC          | Native   | -        |
| 23    | <i>Dendrocitta vagabunda</i>     | rufous treepie          | LC          | Native   | -        |
| 24    | <i>Dicrurus macrocercus</i>      | Black drongo            | LC          | Native   | -        |
| 25    | <i>Ducula aenea</i>              | Green Imperial Pigeon   | NT          | Native   | -        |
| 26    | <i>Egretta garzetta</i>          | Little Egret            | LC          | Native   | -        |
| 27    | <i>Eudynamys scolopaceus</i>     | Koel                    | LC          | Native   | -        |
| 28    | <i>Falco tinnunculus</i>         | Common Kestrel          | LC          | Native   | -        |
| 29    | <i>Francolinus pondicerianus</i> | Grey francolin          | LC          | Native   | -        |
| 30    | <i>Fulica arta</i>               | Common coot             | LC          | Native   | -        |
| 31    | <i>Gallicrex cinerea</i>         | Watercock               | LC          | Native   | -        |
| 32    | <i>Glareola pratincola</i>       | Collared Pratincole     | LC          | Native   | -        |
| 33    | <i>Haliastur indus</i>           | Brahminy kite           | LC          | Native   | -        |

|    |                                  |                           |    |        |   |
|----|----------------------------------|---------------------------|----|--------|---|
| 34 | <i>Leptocoma zeylonica</i>       | Sunbird                   | LC | Native | - |
| 35 | <i>Lonchura Malacca</i>          | Black headed munia        | LC | Native | - |
| 36 | <i>Lonchura punctulata</i>       | Scaly breasted munia      | LC | Native | - |
| 37 | <i>Lonchura striata</i>          | White rumped munia        | LC | Native | - |
| 38 | <i>Megalaima haemacephala</i>    | Copper smith barbet       | LC | Native | - |
| 39 | <i>Megalaima zeylanica</i>       | Brown headed barbet       | LC | Native | - |
| 40 | <i>Merops orientalis</i>         | Green bee eater           | LC | Native | - |
| 41 | <i>Merops philippinus</i>        | Blue-tailed bee-eater     | LC | Native | - |
| 42 | <i>Microcarbo niger</i>          | Little Cormorant          | NA | Native | - |
| 43 | <i>Milvus migrans</i>            | Black kite                | LC | Native | - |
| 44 | <i>Orthotomus sutorius</i>       | Common tailorbird         | LC | Native | - |
| 45 | <i>Phaethon lepturus</i>         | White-Tailed Tropicbird   | LC | Native | - |
| 46 | <i>Phalacrocorax carbo</i>       | Great Cormorant           | NA | Native | - |
| 47 | <i>Phalacrocorax fuscicollis</i> | Indian Cormorant          | LC | Native | - |
| 48 | <i>Phalacrocorax niger</i>       | Little cormorant          | LC | Native | - |
| 49 | <i>Podiceps nigricollis</i>      | Eared grebe               | LC | Native | - |
| 50 | <i>Porphyrio poliocephalus</i>   | Grey-Headed Swampphen     | LC | Native | - |
| 51 | <i>Psittacula krameri</i>        | Rose ringed parakeet      | LC | Native | - |
| 52 | <i>Rallina eurizonoides</i>      | Slaty-Legged Crane        | NA | Native | - |
| 53 | <i>Sturnia pagodarum</i>         | Brahminy starling         | LC | Native | - |
| 54 | <i>Tachybaptus ruficollis</i>    | Dabchick                  | LC | Native | - |
| 55 | <i>Turdoides affinis</i>         | Yellow-billed Babbler     | LC | Native | - |
| 56 | <i>Turnix tanki</i>              | Yellow-Legged Buttonquail | LC | Native | - |
| 57 | <i>Vanellus indicus</i>          | Red wattled lapwing       | LC | Native | - |

(Note: LC- Least Concern, NA-Not Assessed, as per IUCN- International Union for Conservation of Nature, WPA-1972.

### 3.10.4.2 Mammals

The presence of mammals in the project influence area is documented based on secondary information. Mammals recorded from the secondary Survey in the Study area and their Conservation Status are provided in **Table 3-21**.

**Table 3-21 List of Mammals recorded from the secondary Survey in the Study area and their Conservation Status**

| S. No | Species name                  | Family    | Common name   | IUCN Conservation Status | Schedule WPA1972 |
|-------|-------------------------------|-----------|---------------|--------------------------|------------------|
| 1     | <i>Canis aureus</i>           | Canidae   | Naree         | LC                       | -                |
| 2     | <i>Felis chaus</i>            | Felidae   | Kaattu poonai | LC                       | -                |
| 3     | <i>Funambulus pennanti</i>    | Sciuridae | Anil          | LC                       | -                |
| 4     | <i>Bandicota benghalensis</i> | Muridae   | Varappu Eli   | LC                       | -                |

|   |                             |                 |                   |    |   |
|---|-----------------------------|-----------------|-------------------|----|---|
| 5 | <i>Cynopterus sphinx</i>    | Pteropodidae    | Nari mooku Vavval | LC | - |
| 6 | <i>Macaca radiata</i>       | Cercopithecidae | kurangu           | LC | - |
| 7 | <i>Herpetes edwardsi</i>    | Herpestidae     | Keeri Pillai      | LC | - |
| 8 | <i>Sus scrofa cristatus</i> | Suidae          | Kattu Pandri      | LC | - |
| 9 | <i>Axis axis</i>            | Cervidae        | Pulli Maan        | LC | - |

LC- Least Concern as per IUCN- International Union for Conservation of Nature.

### 3.10.4.3 Reptiles & Amphibians

Reptiles and amphibian species were prepared with secondary information sourced from publications. List of Reptiles & Amphibians recorded from the Primary Survey in the Study area and their Conservation Status is given in the **Table 3-22**.

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

| S. No.            | Scientific name             | Common name             | IUCN Status | WPA 1972         |
|-------------------|-----------------------------|-------------------------|-------------|------------------|
| <b>Reptiles</b>   |                             |                         |             |                  |
| 1                 | <i>Hemidactylus sp.</i>     | House lizard            | LC          | -                |
| 2                 | <i>Eutropis macularia</i>   | Common skink            | LC          | -                |
| 3                 | <i>Ophisops leschenault</i> | Snake-eyed lizard       | LC          | -                |
| 4                 | <i>Calotes versicolor</i>   | Garden lizard           | LC          | -                |
| 5                 | <i>Naja naja</i>            | Nalla Pambu             | LC          | Sch II (Part II) |
| 6                 | <i>Ptyas mucosa</i>         | Saarai Pambu            | LC          | -                |
| 7                 | <i>Ophiophagus hannah</i>   | King Cobra              | VU          | Sch II (Part II) |
| 8                 | <i>Varanus bengalensis</i>  | Common Indian Monitor   | LC          | -                |
| <b>Amphibians</b> |                             |                         |             |                  |
| 1                 | <i>Rana tigrina</i>         | Common yellow frog      | LC          | -                |
| 2                 | <i>Rana hexadactyla</i>     | Indian Green frog       | LC          | -                |
| 4                 | <i>Oziotelphusa ravi</i>    | Field Crab              | LC          | -                |
| 5                 | <i>Nerodia sipedon</i>      | Thanni Pambu            | LC          | -                |
| 6                 | <i>Lissemys punctata</i>    | Indian Flapshell Turtle | LC          | -                |

Note: LC- Least Concern as per IUCN- International Union for Conservation of Nature.

### 3.10.4.4 Butterfly Species

Butterflies 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. They participate in most of the ecological processes that sustain ecosystems. **A total of 35 species** belonging to five families of butterflies were recorded. List of Occurrence of butterfly species in buffer zone is given in the **Table 3-23**.

**Table 3-23 List of Occurrence of butterfly species in buffer zone (Secondary Source)**

| S. No | Scientific Name                   | Family         | Common Name              |
|-------|-----------------------------------|----------------|--------------------------|
| 1     | <i>Ariadne merione</i>            | Nymphalidae    | Common Caster            |
| 2     | <i>Atrophaneura aristolochiae</i> | Papilionidae   | Common Rose              |
| 3     | <i>Acraea terpsicore</i>          | Nymphalidae    | Tawny coster             |
| 4     | <i>Anthene lycaenina</i>          | Polyommatainae | Pointed Ciliate Blue     |
| 5     | <i>Athyma perius</i>              | Nymphalidae    | Common Sergeant          |
| 6     | <i>Belenois aurota</i>            | Pieridae       | Pioneer                  |
| 7     | <i>Eurema andersonii</i>          | Pieridae       | One-spotgrass yellow     |
| 8     | <i>Cepora nerissa dapha</i>       | Pieridae       | Common gull              |
| 9     | <i>Catopsilia pomona</i>          | Pieridae       | Common Emigrant          |
| 10    | <i>Catopsilia pyranthe</i>        | Pieridae       | Mottled Emigrant         |
| 11    | <i>Cupitha purreea</i>            | Hesperiidae    | Wax Dart                 |
| 12    | <i>Colotis etrida</i>             | Pieridae       | Small Orange Tip         |
| 13    | <i>Curetis spp</i>                | Curetinae      | Indian Sunbeam           |
| 14    | <i>Danaus chrysippus</i>          | Nymphalidae    | Plain Tiger              |
| 15    | <i>Danaus genutia</i>             | Nymphalidae    | Striped Tiger            |
| 16    | <i>Deudorix epijarbas</i>         | Theclinae      | Cornelian                |
| 17    | <i>Eurema hecabe</i>              | Pieridae       | Common Grass Yellow      |
| 18    | <i>Graphium teredon</i>           | Papilionidae   | Southern Bluebottle      |
| 19    | <i>Graphium doson</i>             | Papilionidae   | Narrow-banded Bluebottle |
| 20    | <i>Hypolimnias bolina</i>         | Nymphalidae    | Great Egg Fly            |
| 21    | <i>Hypolimnias misippus</i>       | Nymphalidae    | Danaid Egg Fly           |
| 22    | <i>Junonia almana</i>             | Nymphalidae    | Peacock Pansy            |
| 23    | <i>Junonia hierta</i>             | Nymphalidae    | Yellow Pansy             |
| 24    | <i>Junonia lemonias</i>           | Nymphalidae    | Lemon Pansy              |
| 25    | <i>Junonia orithya</i>            | Nymphalidae    | Blue Pansy               |
| 26    | <i>Leptosia nina</i>              | Pieridae       | Psyche                   |
| 27    | <i>Mycalesis perseus</i>          | Nymphalidae    | Common Bush Brown        |
| 28    | <i>Neptis hylas</i>               | Nymphalidae    | Common Sailer            |
| 29    | <i>Neptis nata hampsoni</i>       | Nymphalidae    | Sullied Sailer           |
| 30    | <i>Phalanta phalantha</i>         | Nymphalidae    | Common Leopard           |
| 31    | <i>Pachliopta aristolochiae</i>   | Papilionidae   | Common Rose              |
| 32    | <i>Pachliopta pandiyana</i>       | Papilionidae   | Malabar Rose             |
| 33    | <i>Sarangesa purendra Moore</i>   | Pyrginae       | Spotted Small Flat       |
| 34    | <i>Troides minos</i>              | Papilionidae   | Southern Birdwing        |
| 35    | <i>Ypthima asterope</i>           | Nymphalidae    | Common Three-ring        |

**Data source: Secondary from the references below:**

- List of Birds: Ali, S. (2002). The Book of Indian Birds (13th Revised Edition). Oxford University Press, New Delhi, 326pp.

- ▶ List of Butterflies: Kehimkar I. The Book of Indian Butterflies. Bombay Natural History Society, 2008, 497.
- ▶ Evans WH. Identification of Indian butterflies. The Bombay Natural History Society, Bombay, 1927, 32.
- ▶ 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>.
- ▶ 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](http://www.zsi.gov.in) (Last update: May 2018).
- ▶ S. S. Mishra, Laishram Kosygin, P. T. Rajan and K. C. Gopi, Zoological Survey of India in Venkataraman, K., Chattopadhyay, A. and Subramanian, K.A. (editors). 2013. Endemic Animals of India(vertebrates): 1–235+26 Plates. (Published by the director, Zoological Survey of India, Kolkata).
- ▶ Indian Reptiles, Amphibians and Insects in CITES Appendices. Maheshwar Hegde, S. Bhupathy\*, K. R. Sasidharan, T. P. Raghunath and N. Krishnakumar Institute of Forest Genetics and Tree Breeding, R.S. Puram, Coimbatore-2

### 3.10.4.5 Fish Diversity presence

The study area transverse agricultural land, open shrub land, rivers etc. that support the presence of fish diversity. Fish in the area and their presence were reported with the help of secondary sources and from the literature available. Occurrence of fish in buffer zone is provided in the **Table 3-24**.

**Table 3-24 List of Occurrence of fish in buffer zone**

| S. No | Scientific name                   | Family        | Common name       | Occurrence | IUCN status |
|-------|-----------------------------------|---------------|-------------------|------------|-------------|
| 1     | <i>Oreochromis niloticus</i>      | Cichlidae     | Jilappi           | Native     | LC          |
| 2     | <i>Labeo boga</i>                 | Cyprinidae    | Kendai            | Native     | LC          |
| 3     | <i>Tamarix macrochir</i>          | Cichlidae     | Greenhead tilapia | Native     | LC          |
| 4     | <i>Channa marulius</i>            | Channidae     | Giant snakehead   | Native     | LC          |
| 5     | <i>Oreochromis mossambicus</i>    | Cichlidae     | Tilapia           | Native     | LC          |
| 6     | Chanos Chanos                     | Cichlidae     | Madavai           | Native     | LC          |
| 7     | <i>Cirrhina mrigala</i>           | Cyprinidae    | Kendai            | Native     | LC          |
| 8     | <i>Catla catla</i>                | Cyprinidae    | katla             | Native     | LC          |
| 9     | <i>Labeo rohita</i>               | Cyprinidae    | Roghu             | Native     | LC          |
| 10    | <i>Hypselobarbus periyarensis</i> | Cyprinidae    | Periyar Barb      | Native     | LC          |
| 11    | <i>Hypselobarbus pulchellus</i>   | Cyprinidae    | Jerdon's carp     | Endemic    | CR          |
| 12    | <i>Karalla dussumieri</i>         | Leiognathidae | Vari Kare         | Native     | LC          |
| 13    | <i>Arius maculatus</i>            | Ariidae       | keluthi           | Native     | LC          |

|    |                         |                |                |        |    |
|----|-------------------------|----------------|----------------|--------|----|
| 14 | Barbodes carnaticus     | Cyprinidae     | Cauvery kendai | Native | LC |
| 15 | Chanda nama             | Ambassidae     | Kakkachee      | Native | LC |
| 16 | Channa marulius         | Channidae      | Iru viral      | Native | LC |
| 17 | Channa striata          | Channidae      | Viral wrahl    | Native | LC |
| 18 | Cirrhinus cirrhosus     | Cyprinidae     | Ven Kendai     | Native | LC |
| 19 | Ctenopharyngodon idella | Xenocyprididae | Pullu kendai   | Native | LC |

LC- Least Concern, CR- Critical as per IUCN- International Union for Conservation of Nature.

**Source:**

- Tamil Nadu Reservoirs: <https://www.fao.org/3/v5930e/V5930E03.htm>
- S. S. Mishra, Laishram Kosygin, P. T. Rajan and K. C. Gopi, Zoological Survey of India in Venkataraman, K., Chattopadhyay, A. and Subramanian, K.A. (editors). 2013. Endemic Animals of India(vertebrates): 1–235+26 Plates. (Published by the director, Zoological Survey of India, Kolkata)
- Talwar, P.K. and A.G. Jhingran 1991 Inland fishes of India and adjacent countries. vol 1. A.A. Balkema, Rotterdam. 541 p.

**Interpretation of Summary on Biological Survey:**

This is a comprehensive biodiversity assessment covered flora, fauna, avifauna, mammals, reptiles, amphibians, butterflies, and fish diversity in the study area and the Cauvery North Wildlife Sanctuary.

**1. Flora Diversity**

- Study Area: 136 plant species (87% native, 13% invasive).
- Cauvery North Wildlife Sanctuary: 24 species (1 invasive - *Opuntia delleni*).
  - Dominance of native species indicates a healthy ecosystem.
  - Invasive plants (e.g., *Callistemon speciosus*, *Cordia dichotoma*) may threaten native biodiversity.
  - Presence of medicinal plants (*Neem*, *Tulsi*, *Amla*) shows economic and ecological value.
  - IUCN Status: All species are *Least Concern (LC)*.

**2. Avifauna (Birds) Diversity**

- 59 species recorded in the study area.
  - Birds represent diverse feeding groups (insectivores, frugivores, raptors).
  - Presence of water birds suggests good wetland health.
  - Conservation Concerns:
    - *Green Imperial Pigeon* is *Near Threatened (NT)* (IUCN).
    - *Indian Peafowl* is under Schedule I of WPA, 1972 (high protection).

**3. Mammalian Fauna**

- 7 mammal species recorded in the study area.
  - Includes carnivores (Jackal, Jungle Cat), rodents, primates (Bonnet Macaque), and bats.

- No immediate conservation threats (*IUCN: LC*), but human-wildlife interactions should be monitored.
- Ecological Role:
  - Carnivores control pest populations.
  - Bats aid pollination and seed dispersal.

#### 4. Mammals in Cauvery Wildlife Sanctuary

- 21 species recorded with a mix of large mammals, herbivores, and carnivores.
- Conservation Concerns:
  - Endangered (EN): Asian Elephant, Lion-tailed Macaque, Dhole, Tree Shrew.
  - Vulnerable (VU): Leopard, Sloth Bear, Indian Bison, Nilgiri Langur, Sambar Deer.
  - Schedule I (WPA, 1972): 14 species, requiring strict legal protection.

#### 5. Reptile & Amphibian Diversity

- 6 reptiles and 4 amphibians recorded.
  - Mostly common species (*IUCN: LC*).
  - Indian Cobra (*Naja naja*) is under Schedule II (WPA, 1972) – protected species.

#### 6. Butterfly Diversity

- 35 species recorded, dominated by Nymphalidae family (14 species).
  - Indicates a healthy plant-pollinator network.
  - Presence of diverse butterfly families suggests good floral diversity.

#### 7. Fish Diversity

- 19 species recorded, mostly from Cyprinidae family (9 species).
  - Presence of native fish species suggests a stable aquatic ecosystem.
  - Critically Endangered (CR) species: *Hypselobarbus pulchellus* (Jerdon's Carp) – requires urgent conservation.

### 3.11 Socio Economic Profile

#### 3.11.1 Demographic details

In 2011, Tiruvannamalai had population of 2,464,875 of which male and female were 1,235,889 and 1,228,986 respectively. In 2001 census, Tiruvannamalai had a population of 2,186,125 of which males were 1,095,859 and remaining 1,090,266 were females.

**Source:** <https://www.census2011.co.in/census/district/26-tiruvannamalai.html>

#### 3.11.2 Population Density

The initial provisional data released by census India 2011, shows that density of Tiruvannamalai district for 2011 is 398 people per sq. km. In 2001, Tiruvannamalai district density was at 353 people per sq. km. Tiruvannamalai district administers 6,188 square kilometers of areas.

**Source:** <https://www.census2011.co.in/census/district/26-tiruvannamalai.html>

#### 3.11.3 Sex Ratio

With regards to Sex Ratio in Tiruvannamalai, it stood at 994 per 1000 male compared to 2001 census figure of 995. The average national sex ratio in India is 940 as per latest reports of Census 2011 Directorate. In 2011 census, child sex ratio is 930 girls per 1000 boys compared to figure of 948 girls per 1000 boys of 2001 census data.

**Source:** <https://www.census2011.co.in/census/district/26-tiruvannamalai.html>

### 3.11.4 Scheduled Castes and Scheduled Tribes

The Scheduled Castes (SCs) population in Tiruvannamalai district was 21.4 per cent in 2001 census which has now increased to 22.9 per cent in 2011 census. The rural-urban composition of SCs was 25.1 per cent and 14.4 per cent respectively in 2011 census. The Scheduled Tribes population in the district was 3.3 per cent in 2001 census and returned with a marginal increase to 3.7 per cent in 2011 census.

**Source :** [DH 2011 3305 PART A DCHB TIRUVANNAMALAI.pdf](#)

### 3.11.5 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 characteristics helps in identification, prediction, and evaluation of impacts on socio-economic and parameters of human interest due to proposed project developments. Socio economic Indicators of Tiruvannamalai District is given in **Table 3-25**.

**Table 3-25 Social Indicators of Tiruvannamalai District**

| S. No | Social Indicators                          | Tiruvannamalai District |
|-------|--------------------------------------------|-------------------------|
| 1     | Decadal variation %                        | 12.75                   |
| 2     | Urban population %                         | 20.08                   |
| 3     | Population density (Persons per square Km) | 398                     |
| 4     | Scheduled caste population %               | 22.94                   |
| 5     | Scheduled tribe population %               | 3.69                    |
| 6     | Literacy rate %                            | 74.21                   |

**Source :** [DH 2011 3305 PART A DCHB TIRUVANNAMALAI](#)

### 3.11.6 Education & Literacy

The average literacy rate of Tiruvannamalai in 2011 was 74.21 compared to 74.21 of 2001. If things are looked out at gender wise, male and female literacy were 83.11 and 65.32 respectively. For the 2001 census, the same figures stood at 79.17 and 55.63 in Tiruvannamalai District. Total literate in Tiruvannamalai District was 1,626,813 of which male and female were 909,803 and 717,010 respectively. In 2001, Tiruvannamalai District had 1,297,151 in its district. Education Infrastructures in the Tiruvannamalai District is proposed in the educational infrastructure in the Krishnagiri district from Secondary source is given in **Table 3-26**.

**Source :** <https://www.census2011.co.in/census/district/26-tiruvannamalai.html>

**Table 3-26 Education Infrastructures in the Tiruvannamalai District**

| Type of school          | Total schools |         | Rural Schools |         |
|-------------------------|---------------|---------|---------------|---------|
|                         | Government    | Private | Government    | Private |
| Primary                 | 1439          | 660     | 1307          | 401     |
| Primary + Upper Primary | 460           | 84      | 410           | 44      |

|                                                        |     |     |     |    |
|--------------------------------------------------------|-----|-----|-----|----|
| Primary + Upper Primary + Secondary + Higher Secondary | 13  | 122 | 5   | 52 |
| Upper Primary only                                     | 5   | 0   | 5   | 0  |
| Upper Primary + Secondary + Higher Secondary           | 133 | 28  | 123 | 20 |
| Primary + Upper Primary + Secondary                    | 5   | 50  | 3   | 43 |
| Upper Primary + Secondary                              | 202 | 18  | 197 | 14 |

**Source:** District Information System on Education (DISE report card 2016-17)

### 3.11.7 Social Economic Profile of the study area

**Table 3-27** provides the details on population profile within the study area. **Table 3-28** show the socio-economic indicator within the study area.

**Table 3-27 Population profile within study area**

| Name               | Household    | Population    | Male          | Female        | Children below 6 | Scheduled Caste | Scheduled Tribe |
|--------------------|--------------|---------------|---------------|---------------|------------------|-----------------|-----------------|
| <b>0-5 km</b>      |              |               |               |               |                  |                 |                 |
| Thandrampet        | 41852        | 179553        | 90128         | 89425         | 22506            | 41937           | 17077           |
| Melkaripur         | 628          | 2479          | 1267          | 1212          | 275              | 887             | 0               |
| Kolundampattu      | 794          | 3177          | 1574          | 1603          | 367              | 1237            | 158             |
| Sathanur           | 2133         | 8749          | 4422          | 4327          | 985              | 2036            | 446             |
| Kanakkandal        | 371          | 1529          | 792           | 737           | 219              | 129             | 226             |
| Keelvanakkambadi   | 1040         | 4518          | 2287          | 2231          | 509              | 1649            | 694             |
| Melamanjanoor      | 1079         | 4732          | 2383          | 2349          | 605              | 861             | 54              |
| <b>Total</b>       | <b>47897</b> | <b>204737</b> | <b>102853</b> | <b>101884</b> | <b>25466</b>     | <b>48736</b>    | <b>18655</b>    |
| <b>5-10 km</b>     |              |               |               |               |                  |                 |                 |
| Uchimalaikuppam    | 486          | 2134          | 1072          | 1062          | 284              | 956             | 0               |
| Pachal             | 297          | 1269          | 617           | 652           | 163              | 865             | 0               |
| Periakolapadi      | 583          | 2355          | 1204          | 1151          | 286              | 513             | 0               |
| Nedungavadi        | 223          | 908           | 447           | 461           | 109              | 266             | 0               |
| Sevanthangal       | 196          | 822           | 426           | 396           | 104              | 112             | 0               |
| Edathanur          | 714          | 2819          | 1398          | 1421          | 339              | 788             | 0               |
| Thenmudiyanur      | 1252         | 5484          | 2786          | 2698          | 606              | 1197            | 48              |
| Kalasthambadi      | 578          | 2340          | 1200          | 1140          | 261              | 552             | 10              |
| Sorappanandal      | 74           | 351           | 178           | 173           | 58               | 154             | 0               |
| <b>Total</b>       | <b>4403</b>  | <b>18482</b>  | <b>9328</b>   | <b>9154</b>   | <b>2210</b>      | <b>5403</b>     | <b>58</b>       |
| <b>Grand Total</b> | <b>52300</b> | <b>223219</b> | <b>112181</b> | <b>111038</b> | <b>27676</b>     | <b>54139</b>    | <b>18713</b>    |

(Source: Primary data correlated with secondary source i.e Census 2011)

**Table 3-28 Summary of Socioeconomic indicators within the study area**

| S. No | Particulars                                | Study Area | Unit |
|-------|--------------------------------------------|------------|------|
| 1     | Number of villages in the Study Area       | 16         | Nos. |
| 2     | Number of Towns/Municipality in study area | 0          | Nos. |
| 3     | Total Households                           | 52300      | Nos. |
| 4     | Total Population                           | 223219     | Nos. |
| 5     | Children Population (<6 Years Old)         | 27676      | Nos. |
| 6     | SC Population                              | 54139      | Nos. |
| 7     | ST Population                              | 18713      | Nos. |
| 8     | Total Working Population                   | 119992     | Nos. |
| 9     | Main Workers                               | 89353      | Nos. |
| 10    | Marginal Workers                           | 30639      | Nos. |
| 11    | Literates                                  | 131237     | Nos. |

(Source: Primary data correlated with secondary source i.e Census 2011)

### 3.11.8 Employment and livelihood

**Table 3-29** shows the classification of workers within the study area based on primary data, which has been further correlated with secondary data. Details of Literacy population in the study area based on primary data, which has been further correlated with secondary data is given in

Table 3-30.

**Table 3-29 Classification of workers within study area**

| Name             | Total<br>Workers | Main<br>Workers | Marginal<br>Workers | Agriculture Workers |       |             |       | Main      |        | Marginal  |        |
|------------------|------------------|-----------------|---------------------|---------------------|-------|-------------|-------|-----------|--------|-----------|--------|
|                  |                  |                 |                     | Main                |       | Marginal    |       |           |        |           |        |
|                  |                  |                 |                     | Cultivators         | Agri. | Cultivators | Agri. | Household | Others | Household | Others |
| 0-5 km           |                  |                 |                     |                     |       |             |       |           |        |           |        |
| Thandrapet       | 96021            | 70106           | 25915               | 23796               | 31111 | 1782        | 19697 | 995       | 14204  | 655       | 3781   |
| Melkaripur       | 1465             | 1350            | 115                 | 662                 | 458   | 10          | 73    | 21        | 209    | 0         | 32     |
| Kolundampattu    | 1906             | 1675            | 231                 | 394                 | 938   | 23          | 184   | 8         | 335    | 9         | 15     |
| Sathanur         | 4313             | 3505            | 808                 | 982                 | 1313  | 37          | 414   | 44        | 1166   | 101       | 256    |
| Kanakkandal      | 986              | 935             | 51                  | 172                 | 675   | 9           | 39    | 6         | 82     | 0         | 3      |
| Keelvanakkambadi | 2695             | 1944            | 751                 | 450                 | 1047  | 11          | 668   | 2         | 445    | 2         | 70     |
| Melamanjanoor    | 2597             | 2289            | 308                 | 666                 | 1329  | 61          | 140   | 6         | 288    | 7         | 100    |
| Total            | 109983           | 81804           | 28179               | 27122               | 36871 | 1933        | 21215 | 1082      | 16729  | 774       | 4257   |
| 5-10 km          |                  |                 |                     |                     |       |             |       |           |        |           |        |
| Uchimalaikuppam  | 1022             | 967             | 55                  | 429                 | 490   | 6           | 24    | 9         | 39     | 0         | 25     |
| Pachal           | 569              | 267             | 302                 | 108                 | 44    | 9           | 183   | 8         | 107    | 0         | 110    |
| Periakolapadi    | 1324             | 1048            | 276                 | 555                 | 350   | 54          | 34    | 9         | 134    | 10        | 178    |
| Nedungavadi      | 517              | 185             | 332                 | 53                  | 60    | 11          | 294   | 1         | 71     | 4         | 23     |
| Sevanthangal     | 504              | 469             | 35                  | 333                 | 96    | 14          | 14    | 16        | 24     | 5         | 2      |
| Edathanur        | 1465             | 1335            | 130                 | 425                 | 645   | 4           | 95    | 12        | 253    | 7         | 24     |
| Thenmudiyanur    | 3059             | 2038            | 1021                | 876                 | 790   | 304         | 657   | 25        | 347    | 9         | 51     |
| Kalasthambadi    | 1416             | 1206            | 210                 | 399                 | 735   | 7           | 97    | 5         | 67     | 4         | 102    |
| Sorappanandal    | 133              | 34              | 99                  | 6                   | 0     | 13          | 36    | 11        | 17     | 32        | 18     |
| Total            | 10009            | 7549            | 2460                | 3184                | 3210  | 422         | 1434  | 96        | 1059   | 71        | 533    |
| Grand Total      | 119992           | 89353           | 30639               | 30306               | 40081 | 2355        | 22649 | 1178      | 17788  | 845       | 4790   |

(Source: Primary data correlated with secondary source i.e Census 2011)

Table 3-30 Details of Literacy population in the study area

| Name               | Literates Population | Male Literates | Female Literates | Literates %  |
|--------------------|----------------------|----------------|------------------|--------------|
| <b>0-5 km</b>      |                      |                |                  |              |
| Thandrapet         | 104948               | 59256          | 45692            | 44.52        |
| Melkaripur         | 1498                 | 902            | 596              | 0.64         |
| Kolundampattu      | 1851                 | 1085           | 766              | 0.79         |
| Sathanur           | 5492                 | 3147           | 2345             | 2.33         |
| Kanakkandal        | 1011                 | 587            | 424              | 0.43         |
| Keelvanakkambadi   | 2791                 | 1583           | 1208             | 1.18         |
| Melamanjanoor      | 2454                 | 1363           | 1091             | 1.04         |
| <b>Total</b>       | <b>120045</b>        | <b>67923</b>   | <b>52122</b>     | <b>50.92</b> |
| <b>5-10 km</b>     |                      |                |                  |              |
| Uchimalaikuppam    | 1386                 | 781            | 605              | 0.59         |
| Pachal             | 706                  | 395            | 311              | 0.30         |
| Periakolapadi      | 1326                 | 779            | 547              | 0.56         |
| Nedungavadi        | 579                  | 337            | 242              | 0.25         |
| Sevanthangal       | 526                  | 299            | 227              | 0.22         |
| Edathanur          | 1741                 | 980            | 761              | 0.74         |
| Thenmudiyannur     | 3412                 | 1954           | 1458             | 1.45         |
| Kalasthambadi      | 1314                 | 784            | 530              | 0.56         |
| Sorappanandal      | 202                  | 114            | 88               | 0.09         |
| <b>Total</b>       | <b>11192</b>         | <b>6423</b>    | <b>4769</b>      | <b>4.75</b>  |
| <b>Grand Total</b> | <b>131237</b>        | <b>74346</b>   | <b>56891</b>     | <b>55.67</b> |

(Source: Primary data correlated with secondary source i.e Census 2011)

Table 3-31 Summary of Socio-Economic Survey

| S. No        | Impact Zone | Number of villages | Total Population | Male%       | Female %     | SC population% | ST population% | Total Workers% | Main Workers% | Marginal Workers% | Literacy%    | Non-Worker s% |
|--------------|-------------|--------------------|------------------|-------------|--------------|----------------|----------------|----------------|---------------|-------------------|--------------|---------------|
| 1            | 0-5km       | 16                 | 204737           | 50.24       | 49.76        | 12.44          | 23.80          | 9.11           | 53.72         | 8.5               | 58.63        | 46.28         |
| 2            | 5-10km      | 0                  | 18482            | 50.47       | 49.53        | 11.96          | 29.23          | 0.31           | 54.16         | 7.5               | 60.56        | 45.84         |
| <b>Total</b> |             | <b>16</b>          | <b>223219</b>    | <b>51.1</b> | <b>50.26</b> | <b>49.74</b>   | <b>12.40</b>   | <b>24.25</b>   | <b>8.38</b>   | <b>53.76</b>      | <b>58.79</b> | <b>46.24</b>  |

**Interpretation of Population Profile Results****1. Literacy Rate:**

- The overall literacy rate in the study region is 58.79%, with slight variations between the 0-5 km zone (58.63%) and the 5-10 km zone (60.56%).
- The literacy rate is moderate, indicating the need for further educational initiatives.

**2. Employment and Workforce:**

- Non-workers constitute more than 30% of the population in both impact zones (46.28% in 0-5 km, 45.84% in 5-10 km).
- Main workers account for 40.03% of the total population, while marginal workers make up 13.7%, highlighting seasonal or temporary employment patterns.
- The high non-working population (46.2%) suggests a need for employment-generating industries to improve economic conditions.

**3. Gender Distribution:**

- The male-to-female ratio is relatively balanced, with males (50.26%) and females (49.74%) in the total study area.

**4. Social Composition:**

- The Scheduled Caste (SC) population accounts for 24.25%, while the Scheduled Tribe (ST) population is 8.38%.
- The presence of SC/ST communities indicates the need for inclusive developmental programs to enhance social and economic opportunities.

## 4 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

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

The opencast mining operations involve development of benches, approach roads, haul roads, Drilling, 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 affected by mining activities are:

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

**The objective of this chapter is to:**

- ▶ Identify project activities that could beneficially or adversely impact the environment.
- ▶ Predict and assess the environmental aspects and impacts of such activities.
- ▶ Examine each environmental impact relationship in detail and identify its degree of significance.
- ▶ Identify possible mitigation measures for these project activities and select the most appropriate mitigation measure, based on the reduction in significance achieved and practicality in implementation.

This methodology is used in this chapter for preparing impacts and their listing evaluation. Mitigation measures are formulated based on the significance of the impact as discussed in Methodology; environmental impacts have been identified based on an assessment of environmental aspects associated with the project. The symbol 'a-Ve' indicates an adverse (negative) impact, and 'b+Ve' indicates a beneficial (positive) impact. Identified environmental impacts have been listed in **Table 4-1**.

Table 4-1 Impact Identification from proposed project

| S. No | Project activities/Aspects                          | Potential Environmental attributes |                  |                          |                    |                   |          |                             |                     |                                                | Summary of Indication                                                                                                                                                                                                                                                                    |
|-------|-----------------------------------------------------|------------------------------------|------------------|--------------------------|--------------------|-------------------|----------|-----------------------------|---------------------|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|       |                                                     | Land use/ Landcover (LU/LC)        | Air Quality (AQ) | Noise and Vibration (NV) | Surface Water (SW) | Ground Water (GW) | Soil (S) | Ecology & Biodiversity (EB) | Socio-Economic (SE) | Occupational Health, Community Health & Safety |                                                                                                                                                                                                                                                                                          |
| 1     | Site selection-Land Acquisition                     | a-Ve                               | -                | -                        | -                  | -                 | -        | -                           | b<br>+Ve            | -                                              | LU/LC (-): Potential change in land cover<br>SE (+): Economic development and Employment to local                                                                                                                                                                                        |
| 2     | Preparation of site-Clearance of vegetation at site | a-Ve                               | -                | -                        | -                  | -                 | a-Ve     | a-Ve                        | -                   | -                                              | LC (-): Change in land cover from vegetation cover to barren (since land use change will be long term /permanent being development operations)<br>EB (-): Possible loss of vegetation cover<br>SE (+): short time employment                                                             |
| 3     | Excavation                                          | a-Ve                               | a-Ve             | a-Ve                     | a-Ve               | a-Ve              | a-Ve     | a-Ve                        | b<br>+Ve            |                                                | LU (-) Creation of pit and some areas will be converted to the reservoir.<br>AQ (-) Dust emission due to mining activities, use of rock breakers, vehicular movement, and use of dewatering pump<br>NV (-) Due to mining activities, use of compressor and use of machineries for mining |

|   |                                         |             |             |             |   |             |             |              |              |   |                                                                                                                                                                                                         |
|---|-----------------------------------------|-------------|-------------|-------------|---|-------------|-------------|--------------|--------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   |                                         |             |             |             |   |             |             |              |              |   | SW, GW (-) use of water for dust suppression, domestic purpose and Greenbelt development<br>EB (-) dust emission, Removal of vegetation and generation of noise<br>SE (+) generation of employment      |
| 4 | Stacking of Mineral Reject and Handling | -           | <i>a-Ve</i> | <i>a-Ve</i> | - | -           | -           | <i>a-Ve</i>  | -            | - | AQ (-) generation of dust<br>NV (-) generation of noise<br>EB (-) generation of noise and dust emission                                                                                                 |
| 5 | Transportation of mining material       | -           | <i>a-Ve</i> | <i>a-Ve</i> | - | -           | -           | <i>a-Ve</i>  | <i>b +Ve</i> | - | AQ (-) generation of dust<br>NV (-) generation of noise<br>EB (-) generation of noise<br>SE (+) Employment Generation                                                                                   |
| 6 | Land Reclamation                        | <i>a-Ve</i> | <i>a-Ve</i> | -           | - | <i>a-Ve</i> | <i>a-Ve</i> | <i>b +Ve</i> | <i>b +Ve</i> | - | LU (-) some areas will be converted to water reservoir.<br>AQ (-): Dust emission due to leveling.<br>EB (+): Some areas will be converted to water reservoirs.<br>SE (+): generation of water reservoir |

## 4.1 Land Environment

The proposed site is located at S.F.No. 74(P), 126/1A, 127, 144/1 of Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District, Tamil Nadu State. The lease area for mining of color granite is 13.74.0 Ha. The quarry land is classified as Government Poramboke land. The quarry lease was applied, quarry lease vide G.O Ms. No. 28 Industries (MME1) department dated 24.05.2004 for a period of 20 years under Rule 8-C of the Tamil Nadu Minor Mineral Concession Rules, 1959. Previous Lease & EC Process As the lease deed was executed with the District Collector on 15.06.2004, the lease period is valid up to 14.06.2024.

### 4.1.1 Anticipated Impacts

- Removal of site vegetation will change Land cover.
- The topsoil and bushes observed on the hillside over the dyke will be completely removed. As a result, excavation of the hill ridge will take place, which may interrupt the aesthetic view of the locality.
- The proposed quarrying operations will alter the hillock slope and the natural drainage pattern.
- Generation of hazardous and non-hazardous waste is expected.
- The exposed topsoil will be vulnerable to wind and water erosion.
- Infrastructural facilities such as office buildings, rest shelters, a first-aid center, and other service facilities will be created.

**Table 4-2 Land Use Pattern of the lease area**

| S. No        | Description           | Area to be Required<br>Mining Plan Period<br>(Ha) |
|--------------|-----------------------|---------------------------------------------------|
| 1            | Mining                | 1.53.0                                            |
| 2            | Approach Road         | 0.10.5                                            |
| 3            | Waste Dump            | 2.20.0                                            |
| 4            | Office Infrastructure | 0.02.0                                            |
| 5            | Afforestation         | 0.50.0                                            |
| 6            | Unutilized Area       | 5.45.5                                            |
| 7            | Old pit               | 0.75.0                                            |
| 8            | Old Dump              | 2.91.0                                            |
| 9            | Village Road          | 0.27.0                                            |
| <b>Total</b> |                       | <b>13.74.0</b>                                    |

**Table 4-3 Impact and Mitigation Measures on Land Environment**

| S. No. | Project Activity/Aspect                  | Potential Environmental Impact on LU/LC | Summary of Impact                                                                           | Mitigation Measures                                                                                                                                             |
|--------|------------------------------------------|-----------------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Land Acquisition                         | Negative (-ve)                          | Change in existing land use from unused/hill terrain to mining zone.                        | Utilize barren or non-agricultural land.                                                                                                                        |
| 2      | Site Clearing/Vegetation Removal         | Negative (-ve)                          | Conversion of vegetated/hill slope land to bare area; localized loss of vegetation.         | Minimize vegetation clearance; implement greenbelt development using native species around the lease boundary and infrastructure.                               |
| 3      | Excavation                               | Negative (-ve)                          | Alteration of natural landform; formation of pits and benches in granite terrain.           | Phased excavation with designated ultimate pit limits. Use benches and systematic quarry design to stabilize slopes.                                            |
| 4      | Land Reclamation/Post-Mining Land Use    | Negative (-ve)                          | Quarry pit remains as a permanent topographical change; some areas become water reservoirs. | Post-mining land use planning to include fencing of pit area and conversion to water storage. No backfilling is required due to hard rock nature.               |
| 5      | Overburden Dumping                       | Negative (-ve)                          | Erosion risk, land degradation, and potential dump instability.                             | OB dumps will be properly leveled and stabilized with a max height <10 m, 26° slope, toe wall, and garland drains. Native grass and shrub plantation on slopes. |
| 6      | Surface Infrastructure Development       | Neutral to Slight Negative              | Minor changes to LU/LC due to site office, roads, and loading zones.                        | Use minimal land area for infrastructure. Include landscaping and vegetative cover around buildings and along haul roads.                                       |
| 7      | Soil Stripping & Topsoil Stockpiling     | Neutral                                 | Temporary change in land cover; risk of erosion or compaction of topsoil.                   | Topsoil will be stored with bunds and reused for greenbelt and reclamation. Avoid long-term exposure of stockpiles.                                             |
| 8      | Water Flow Alteration During Monsoon     | Negative (-ve)                          | Risk of erosion, siltation, and localized flooding from stormwater runoff.                  | Construct garland drains, silt traps, and proper stormwater management structures around quarry and OB dumps. Maintain existing drainage pattern.               |
| 9      | Abandonment and Site Safety Post-Closure | Negative (-ve)                          | Safety risk due to open pits; visual                                                        | Quarry pits will be fenced after lease period. Signage and access restrictions to                                                                               |

|    |                                     |                |                                                                                 |                                                                                                                                                                                        |
|----|-------------------------------------|----------------|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |                                     |                | impact if not managed.                                                          | prevent accidental entry. Pits may serve as water storage or recharge structures.                                                                                                      |
| 10 | Greenbelt Development (Progressive) | Positive (+ve) | Improvement in visual aesthetics, dust control, and ecological value over time. | Year-wise plantation of native trees and shrubs along the lease boundary, haul roads, OB dumps, and around infrastructure. Maintenance and monitoring for survival rate to be ensured. |

## 4.2 Air Environment

Base line data reveals that ambient air quality in the study area for the Parameters PM<sub>10</sub>, PM<sub>2.5</sub> & NO<sub>2</sub>, are well within the permissible Limits as prescribed by the National Ambient Air Quality Standards (NAAQS) for Industrial Area, Residential, Rural & Other areas.

The major air pollution sources from the mining operations are mining activities such as blasting, drilling, loading & unloading, Excavating and transportation etc. The particulate emissions & gaseous 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. The sources of air emission are detailed below in **Table 4-4**.

**Table 4-4 Sources of air pollution at quarry**

| S. No | Source of emission                   | Pollutant                           |
|-------|--------------------------------------|-------------------------------------|
| 1.    | Excavation / Mining activity         | PM                                  |
| 2.    | Operation of diesel driven equipment | Gaseous emission/Fugitive emissions |
| 3.    | Transportation                       | PM, NOx, CO                         |

**4.2.1 Anticipated Impacts**

- ▶ Emissions and Particulate matter from mining activities are primarily generated during operations such as blasting, drilling, excavation, loading, unloading, and transportation.
- ▶ Machinery such as compressors and jackhammers used for drilling also contribute to air pollution.
- ▶ The resulting air pollution may lead to respiratory issues in nearby populations.
- ▶ In addition, air pollutants can negatively impact surrounding ecosystems, vegetation, livestock habitats, and nearby water sources.

**Table 4-5 Sources of Air Pollution, Impacts and Mitigation Measures**

| S. No. | Source of Emission                      | Primary Pollutants                 | Anticipated Impacts                                                                                                                                   | Mitigation Measures                                                                                                                                                             |
|--------|-----------------------------------------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Excavation / Mining Activity            | Particulate Matter (PM)            | Dust emissions affecting air quality and visibility; potential respiratory health impacts to workers and nearby residents.                            | Water sprinkling at excavation sites; phased excavation; covering exposed surfaces; dust suppression using water tankers.                                                       |
| 2      | Drilling with compressors & jackhammers | PM, Noise, Minor Gaseous Emissions | Fine dust generation and local air quality degradation; occupational exposure for operators.                                                          | Use of <b>dust aprons, wet drilling</b> methods; regular maintenance of drilling equipment; PPE (masks, goggles) for workers.                                                   |
| 3      | Blasting Activities                     | PM, NOx, CO, SOx                   | Short-term high concentration of dust and gases; potential irritation, visibility reduction, and risk to nearby flora/fauna.                          | Use of <b>controlled blasting techniques</b> (e.g., NONEL detonators); proper stemming; use of adequate boosters/primers for complete detonation to minimize fumes.             |
| 4      | Loading & Unloading of Granite Blocks   | PM                                 | Dust generation at handling points; risk of fugitive dust emissions near stockpiles and transfer points.                                              | Minimize drop heights; regular water spraying at loading points; shielding of transfer points; paved loading zones.                                                             |
| 5      | Transportation of Mined Material        | PM, NOx, CO                        | Dust raised from haul roads and emissions from diesel trucks; dispersion of pollutants along the route impacting roadside vegetation and habitations. | <b>Water sprinkling on haul roads</b> ; regular maintenance of vehicles; use of covered trucks; limiting vehicle speed; scheduling movement to avoid peak human activity hours. |

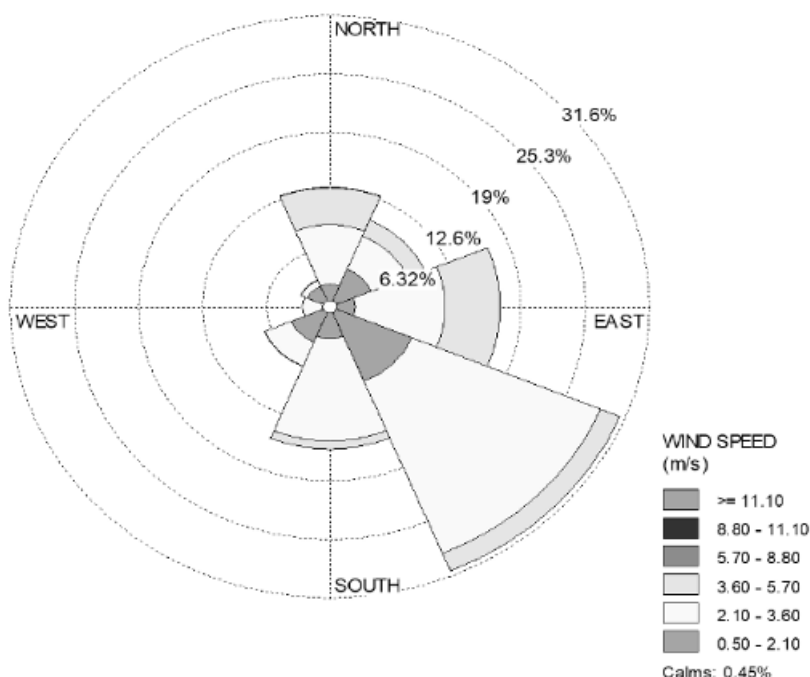
|   |                                            |                 |                                                                                                      |                                                                                                                                                                                                        |
|---|--------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6 | Operation of Diesel Machinery & Generators | NOx, CO, HC, PM | Emissions from fossil fuel combustion; minor contribution to ambient air pollution load.             | Regular engine maintenance; use of low-sulfur diesel; shifting to fuel-efficient or electric equipment where feasible.                                                                                 |
| 7 | Wind Erosion from Topsoil/Overburden Dumps | PM              | Airborne dust during dry and windy conditions; potential contribution to ambient particulate levels. | Compaction and covering of topsoil stockpiles; use of <b>native grass cover</b> ; bund construction; periodic water spraying.                                                                          |
| 8 | Lack of Vegetation Cover (Initial Phase)   | --              | Less absorption of pollutants; enhanced dispersion of dust and heat.                                 | <b>Greenbelt development</b> over 0.80.00 ha using native species (~1,200 saplings); planting along approach roads, lease boundaries, and around infrastructure using <b>topsoil for nourishment</b> . |

**Table 4-6 Fugitive dust & Particulate matter control in the proposed project**

| S. No | Activities                                                                     | Fugitive Dust control Mitigation measure                                                                                                                                                                                          | Dust control Mitigation measure/Control options                                                                    |
|-------|--------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| 1     | Drilling                                                                       | • Drills should be provided with dust extractors (wet system)                                                                                                                                                                     | • Liquid injection (water or water plus a wetting agent)<br>• Capturing and venting emissions to a control device. |
| 2     | Blasting                                                                       | • Water sprinkling before blasting.<br>• Water sprinkling on blasted material prior to transportation.<br>• Use of control blasting technique.                                                                                    |                                                                                                                    |
| 3     | Excavation of site, Movement of JCBs, other machinery, workers / laborers etc. | • Water sprinkling will be carried out as and when required.                                                                                                                                                                      |                                                                                                                    |
| 4     | Transportation of mined material                                               | • Covering of the trucks/dumpers to avoid spillage.<br>• Compacted haul road Speed control on vehicles<br>• Development of a green belt of suitable width on both sides of road, which acts as wind break and traps fugitive dust |                                                                                                                    |
| 5     | Loading                                                                        | • Water sprinkling                                                                                                                                                                                                                |                                                                                                                    |
| 6     | Hauling (emissions from roads)                                                 | • Water spray, treatment with surface agents, soil stabilization, paving, traffic control.                                                                                                                                        |                                                                                                                    |

**4.2.2 Meteorological Data**

Site-specific meteorological data for the period **FEB (1.2.2025) to April (31.04.2025)** was considered for the study. The data used for AERMET processing included daily observations of wind speed, wind direction, temperature, relative humidity, air pressure, precipitation, and solar radiation. AERMET reformats this meteorological data to make it suitable for use as input in the AERMOD dispersion model. A wind rose for the study period was also generated and is presented in **Figure 4-1**.



**Figure 4-1 Wind rose of meteorology is considered for for Dispersion Modeling FEB (1.2.2025) to April (31.04.2025)**

#### 4.2.2.1 AERMET Process

For the 3 phase AERMET processing of meteorological data, specifications of the land use in the area are required to determine the terrain roughness for modelling. The land use was characterized 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 modelling.

#### 4.2.2.2 AERMOD Process

AERMOD Software Version 22112 (11.0.1) was used for air dispersion modelling. AERMOD MPI is Lakes Environmental parallel version of the AERMOD model. AERMOD MPI Version 22112 is the parallel version for the US EPA AERMOD model dated 22112 released by the US EPA on June 27, 2022, and is applicable to a wide range of buoyant or neutrally buoyant emissions up to a range of 50 km. In addition to more straightforward 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 behaviour 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 the elevated stable layer and then allows it to re-enter the boundary layer when and if appropriate. For sources both the CBL and the SBL AERMOD treats the enhancement of lateral dispersion resulting from plume meander. The emissions from proposed stacks are estimated and these stack emissions are used for the air dispersion modeling as shown in **Table 4-7**.

Maximum concentration value for PM<sub>10</sub>, PM<sub>2.5</sub>, & NO<sub>x</sub> obtained through modelling is shown in **Figure 4-2**, and **Figure 4-4** respectively and the first ten highest values of Ground Level Concentration (GLC) for proposed stacks is given in **Table 4-12**, **Table 4-13** & **Table 4-14** respectively.

#### 4.2.2.3 Emission Calculations

Each mining activity acts as a source of air emissions, and the estimation of these emissions depends on several factors, including meteorological conditions, topography, and the characteristics of the material being handled. It is essential to calculate the quantity of emissions released into the atmosphere from each activity or source at the site. The following emission formulas are used to estimate the emission rates for various sources.

#### 4.2.2.4 Mining Operational data

**Table 4-7 Overview of the Source Parameters**

| S. No | Description                         | Symbol | Quantity             |
|-------|-------------------------------------|--------|----------------------|
| 1.    | Moisture Content (%)                | M      | 0.45                 |
| 2.    | Silt Content (%)                    | s      | 3                    |
| 3.    | Production / Day (m <sup>3</sup> )  |        | 14.5                 |
| 4.    | Production / Day (Ton)              |        | 39.0                 |
| 5.    | No. of vehicles with categorization |        | 1 no. HW<br>2 no. 4W |
| 6.    | Working Hours per day (hrs)         |        | 8                    |

## 4.2.2.5 Emission Factors

Table 4-8 Emission Factor

| Activity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Uncontrolled Emissions Factor                                                                           | Reference                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                               |             |                  |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------|------------------|-------|-----------|--------------|-----|----------------------|------------------|-----------------------------|---|-----------------------------------------------------------------------------------|------------|---------------|----|--------------------------------------------------------------------------------------------------------|------------|-------------------------------|----------------|----------------------------------------------------------------------------------|-----------|---------------------|----|----------------------------|--------------------------------------|--------------|----|------------------------------------------------------------------|-------------------------|------------------|----|---------------------------------------------------------------------------------------------------------|--------------------------|-------------------------------|
| Topsoil excavation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Activities:<br><br>1. Bulldozing<br>2. Loading<br>3. Unloading<br>4. Transportation                     | <i>Jose I. Huertas &amp; Dumar A. Camacho &amp; Maria E. Huertas, Standardized emissions inventory methodology for open-pit mining areas, Environ Sci Pollut Res,2012.</i>                                                                                                                                                                                                                                                                                           |                               |             |                  |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                         | <table><tr><th>Operation</th><th>Activity</th><th colspan="2">Equation ID</th></tr><tr><th></th><th></th><th>TSP</th><th>PM<sub>10</sub></th></tr><tr><td rowspan="5">Topsoil handling</td><td>Top soil removal by scraper</td><td>1</td><td>0</td></tr><tr><td>Bulldozing</td><td>2</td><td>20</td></tr><tr><td>Loading</td><td>3</td><td>21</td></tr><tr><td>Transportation</td><td>4</td><td>22</td></tr><tr><td>Unloading</td><td>5</td><td>21</td></tr></table> | Operation                     | Activity    | Equation ID      |       |           |              | TSP | PM <sub>10</sub>     | Topsoil handling | Top soil removal by scraper | 1 | 0                                                                                 | Bulldozing | 2             | 20 | Loading                                                                                                | 3          | 21                            | Transportation | 4                                                                                | 22        | Unloading           | 5  | 21                         |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                         | Operation                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Activity                      | Equation ID |                  |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                               | TSP         | PM <sub>10</sub> |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                         | Topsoil handling                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Top soil removal by scraper   | 1           | 0                |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
| Bulldozing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 20                            |             |                  |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
| Loading                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 3                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 21                            |             |                  |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
| Transportation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 4                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 22                            |             |                  |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
| Unloading                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 5                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 21                            |             |                  |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
| <table><tr><th>Equation ID</th><th>Equation</th><th>Units</th><th>Reference</th></tr><tr><td>1</td><td>0.029</td><td>kg TSP/hr</td><td>USEPA (2005)</td></tr><tr><td>2</td><td><math>35.6 \frac{kg}{hr}</math></td><td>kg TSP/hr</td><td>USEPA (2005)</td></tr><tr><td>3</td><td><math>0.0012 \frac{kg}{hr} \left( \frac{25.2}{147.25} \right)^{1.4} \cdot 0.018 \cdot</math></td><td>kg TSP/hr</td><td>USEPA (2005a)</td></tr><tr><td>4</td><td><math>1.38 \left( \frac{hr}{mi} \right)^{0.7} \left( \frac{mi}{hr} \right)^{0.45} (1 - \eta_a)(1 - \eta_b)</math></td><td>kg TSP/VKT</td><td>USEPA (2005a), Cowherd (1988)</td></tr><tr><td>5</td><td><math>0.0012 \frac{kg}{hr} \left( \frac{25.2}{147.25} \right)^{1.4} \cdot 0.02 \cdot</math></td><td>kg TSP/hr</td><td>USEPA (2005a, 2008)</td></tr><tr><td>20</td><td><math>0.75(8.44) \frac{kg}{hr}</math></td><td>kg PM<sub>10</sub>/hr (bulldozing)</td><td>USEPA (2008)</td></tr><tr><td>21</td><td><math>0.00056 \frac{kg}{hr} \left( \frac{25.2}{147.25} \right)^{1.4}</math></td><td>kg PM<sub>10</sub>/hr</td><td>USEPA (2005a, b)</td></tr><tr><td>22</td><td><math>0.423 \left( \frac{hr}{mi} \right)^{0.7} \left( \frac{mi}{hr} \right)^{0.45} (1 - \eta_a)(1 - \eta_b)</math></td><td>kg PM<sub>10</sub>/VKT</td><td>USEPA (2005a), Cowherd (1988)</td></tr></table> | Equation ID                                                                                             | Equation                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Units                         | Reference   | 1                | 0.029 | kg TSP/hr | USEPA (2005) | 2   | $35.6 \frac{kg}{hr}$ | kg TSP/hr        | USEPA (2005)                | 3 | $0.0012 \frac{kg}{hr} \left( \frac{25.2}{147.25} \right)^{1.4} \cdot 0.018 \cdot$ | kg TSP/hr  | USEPA (2005a) | 4  | $1.38 \left( \frac{hr}{mi} \right)^{0.7} \left( \frac{mi}{hr} \right)^{0.45} (1 - \eta_a)(1 - \eta_b)$ | kg TSP/VKT | USEPA (2005a), Cowherd (1988) | 5              | $0.0012 \frac{kg}{hr} \left( \frac{25.2}{147.25} \right)^{1.4} \cdot 0.02 \cdot$ | kg TSP/hr | USEPA (2005a, 2008) | 20 | $0.75(8.44) \frac{kg}{hr}$ | kg PM <sub>10</sub> /hr (bulldozing) | USEPA (2008) | 21 | $0.00056 \frac{kg}{hr} \left( \frac{25.2}{147.25} \right)^{1.4}$ | kg PM <sub>10</sub> /hr | USEPA (2005a, b) | 22 | $0.423 \left( \frac{hr}{mi} \right)^{0.7} \left( \frac{mi}{hr} \right)^{0.45} (1 - \eta_a)(1 - \eta_b)$ | kg PM <sub>10</sub> /VKT | USEPA (2005a), Cowherd (1988) |
| Equation ID                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Equation                                                                                                | Units                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Reference                     |             |                  |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.029                                                                                                   | kg TSP/hr                                                                                                                                                                                                                                                                                                                                                                                                                                                            | USEPA (2005)                  |             |                  |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | $35.6 \frac{kg}{hr}$                                                                                    | kg TSP/hr                                                                                                                                                                                                                                                                                                                                                                                                                                                            | USEPA (2005)                  |             |                  |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | $0.0012 \frac{kg}{hr} \left( \frac{25.2}{147.25} \right)^{1.4} \cdot 0.018 \cdot$                       | kg TSP/hr                                                                                                                                                                                                                                                                                                                                                                                                                                                            | USEPA (2005a)                 |             |                  |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | $1.38 \left( \frac{hr}{mi} \right)^{0.7} \left( \frac{mi}{hr} \right)^{0.45} (1 - \eta_a)(1 - \eta_b)$  | kg TSP/VKT                                                                                                                                                                                                                                                                                                                                                                                                                                                           | USEPA (2005a), Cowherd (1988) |             |                  |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | $0.0012 \frac{kg}{hr} \left( \frac{25.2}{147.25} \right)^{1.4} \cdot 0.02 \cdot$                        | kg TSP/hr                                                                                                                                                                                                                                                                                                                                                                                                                                                            | USEPA (2005a, 2008)           |             |                  |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
| 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | $0.75(8.44) \frac{kg}{hr}$                                                                              | kg PM <sub>10</sub> /hr (bulldozing)                                                                                                                                                                                                                                                                                                                                                                                                                                 | USEPA (2008)                  |             |                  |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
| 21                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | $0.00056 \frac{kg}{hr} \left( \frac{25.2}{147.25} \right)^{1.4}$                                        | kg PM <sub>10</sub> /hr                                                                                                                                                                                                                                                                                                                                                                                                                                              | USEPA (2005a, b)              |             |                  |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
| 22                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | $0.423 \left( \frac{hr}{mi} \right)^{0.7} \left( \frac{mi}{hr} \right)^{0.45} (1 - \eta_a)(1 - \eta_b)$ | kg PM <sub>10</sub> /VKT                                                                                                                                                                                                                                                                                                                                                                                                                                             | USEPA (2005a), Cowherd (1988) |             |                  |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
| Wet Drilling for rough stone, Gravel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 8.00E-05 lbs PM10 /ton                                                                                  | <i>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.</i>                                                                                                              |                               |             |                  |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
| Loading                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1.00E-04 lbs PM10 /ton                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                               |             |                  |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
| Unloading                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1.60E-05 lbs PM10 /ton                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                               |             |                  |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |
| Haulage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6.2 lbs PM10 / Mile Tipper                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                               |             |                  |       |           |              |     |                      |                  |                             |   |                                                                                   |            |               |    |                                                                                                        |            |                               |                |                                                                                  |           |                     |    |                            |                                      |              |    |                                                                  |                         |                  |    |                                                                                                         |                          |                               |

## 4.2.2.6 Consider activities in Mining activities

Table 4-9 Emissions from Mining Activities

| S. No       | Activities         | Emission rate (g/s) |         |     |     |
|-------------|--------------------|---------------------|---------|-----|-----|
|             |                    | PM10                | PM2.5   | SO2 | NOx |
| 1           | Topsoil excavation | 0.08025             | 0.04815 | -   | -   |
| 2           | Wet drilling       | 0.00170             | 0.00102 | -   | -   |
| 3           | Hauling            | 0.98300             | 0.59000 | -   | -   |
| 4           | Conveyor loading   | 0.00213             | 0.00128 | -   | -   |
| 5           | Unloading          | 0.00034             | 0.00020 | -   | -   |
| Total (g/s) |                    | 1.06742             | 0.64065 | -   | -   |

**Table 4-10 Vehicular Emissions**

| S. No | Activities                        | PM10 Emission rate (g/s) | PM2.5 Emission rate (g/s) | NOX Emission rate (g/s) |
|-------|-----------------------------------|--------------------------|---------------------------|-------------------------|
| 1     | 4Wheels (Tippers & tankers)-1 Nos | 0.000174                 | 0.000104                  | 0.00174                 |
| 2     | HW (Excavator)-2Nos               | 0.000833                 | 0.000500                  | 0.09720                 |

**Table 4-11 Emission considered for GLC**

| S. No | Activities                       | PM <sub>10</sub> Emission rate (g/s) | PM <sub>2.5</sub> Emission rate (g/s) | NO <sub>x</sub> Emission rate (g/s) |
|-------|----------------------------------|--------------------------------------|---------------------------------------|-------------------------------------|
| 1     | <b>Area Source</b>               |                                      |                                       |                                     |
|       | Topsoil excavation               | 0.08025                              | 0.04815                               | -                                   |
|       | Wet drilling                     | 0.00170                              | 0.00102                               | -                                   |
|       | Conveyor loading                 | 0.00213                              | 0.00128                               | -                                   |
|       | Unloading                        | 0.00034                              | 0.00020                               | -                                   |
|       | <b>Sub Total (g/s)</b>           | <b>0.08442</b>                       | <b>0.05065</b>                        | -                                   |
| 2     | <b>Line Source</b>               |                                      |                                       |                                     |
|       | Haulage                          | 0.983000                             | 0.590000                              | -                                   |
|       | 4Wheels (Tippers & tankers)-1Nos | 0.000174                             | 0.000104                              | 0.00174                             |
|       | HW (Excavator)-2Nos              | 0.000833                             | 0.000500                              | 0.09720                             |
|       | DG -125KVA                       | 0.001527                             | 0.000763                              | 0.02175                             |
|       | <b>Sub Total (g/s)</b>           | <b>1.06994</b>                       | <b>0.642017</b>                       | <b>0.12069</b>                      |

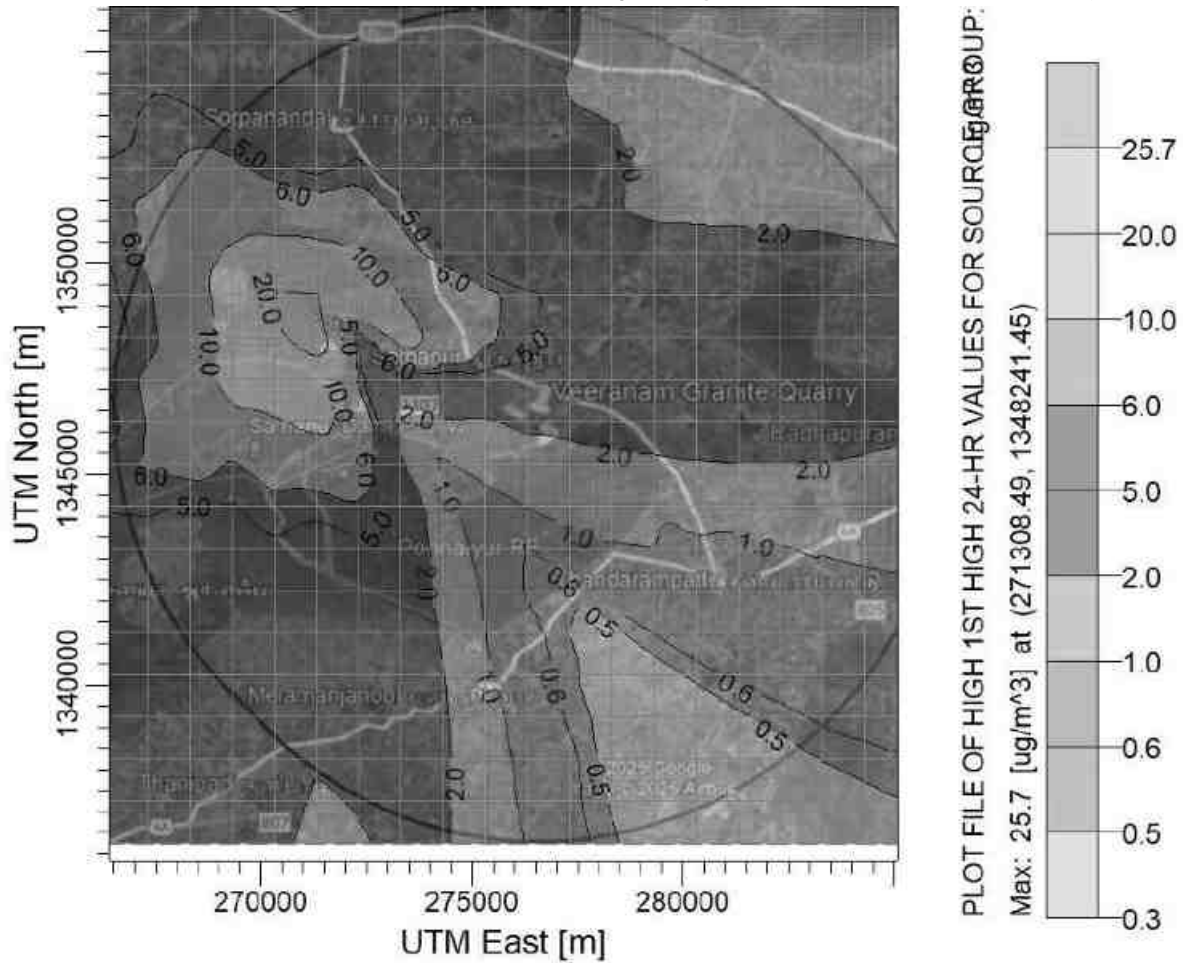


Figure 4-2 Predicted 24-Hrs GLC of PM<sub>10</sub> within 10 km Radius of the Study Area

Table 4-12 Predicted Highest and Habitation receptors Concentrations PM<sub>10</sub>

| S. No | UTM Coordinates |         | Conc. (µg/m <sup>3</sup> ) | Name of the habitation | Distance (km) | Direction |
|-------|-----------------|---------|----------------------------|------------------------|---------------|-----------|
|       | E               | N       |                            |                        |               |           |
| 1     | 271308.5        | 1348241 | 25.68522                   | Project Site           | -             | -         |
| 2     | 270308.5        | 1349241 | 20.6045                    | Chegapatti             | 0.43          | SE        |
| 3     | 271308.5        | 1349241 | 20.29869                   | No habitation          | 0.76          | SW        |
| 4     | 270308.5        | 1348241 | 18.31775                   | No habitation          | 1.95          | NW        |
| 5     | 272308.5        | 1349241 | 16.64502                   | No habitation          | 0.89          | NE        |
| 6     | 270308.5        | 1347241 | 15.89579                   | No habitation          | 1.36          | SW        |
| 7     | 271308.5        | 1347241 | 14.91486                   | No habitation          | 1.76          | SW        |
| 8     | 273308.5        | 1348241 | 12.30748                   | Chegapatti             | 1.5           | SE        |
| 9     | 269308.5        | 1349241 | 12.28254                   | No habitation          | 2.21          | S         |
| 10    | 270308.5        | 1350241 | 11.69084                   | No habitation          | 3.22          | S         |

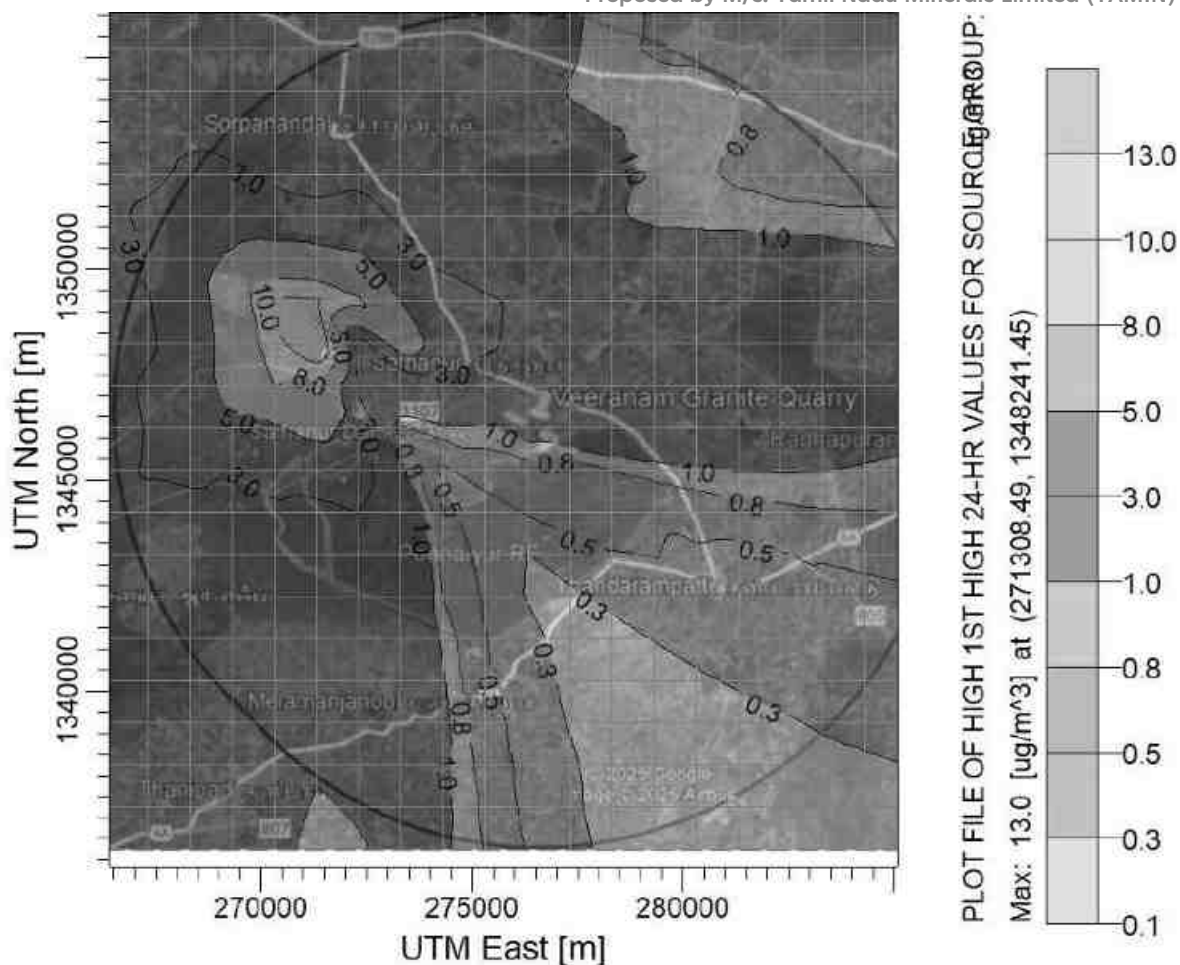


Figure 4-3 Predicted 24-Hrs GLC of PM<sub>2.5</sub> within 10 km Radius of the Study Area

Table 4-13 Predicted Highest and Habitation receptors Concentrations PM<sub>2.5</sub>

| S. No | UTM Coordinates |         | Conc. (µg/m <sup>3</sup> ) | Name of the habitation | Distance (km) | Direction |
|-------|-----------------|---------|----------------------------|------------------------|---------------|-----------|
|       | E               | N       |                            |                        |               |           |
| 1     | 271308.5        | 1348241 | 12.98145                   | Project Site           | -             | -         |
| 2     | 270308.5        | 1349241 | 10.41362                   | Chegapatti             | 0.43          | SE        |
| 3     | 271308.5        | 1349241 | 10.25906                   | No habitation          | 0.76          | SW        |
| 4     | 270308.5        | 1348241 | 9.25789                    | No habitation          | 1.95          | NW        |
| 5     | 272308.5        | 1349241 | 8.41248                    | No habitation          | 0.89          | NE        |
| 6     | 270308.5        | 1347241 | 8.03381                    | No habitation          | 1.36          | SW        |
| 7     | 271308.5        | 1347241 | 7.53805                    | No habitation          | 1.76          | SW        |
| 8     | 273308.5        | 1348241 | 6.22026                    | Chegapatti             | 1.5           | SE        |
| 9     | 269308.5        | 1349241 | 6.20766                    | No habitation          | 2.21          | S         |
| 10    | 270308.5        | 1350241 | 5.90861                    | No habitation          | 3.22          | S         |

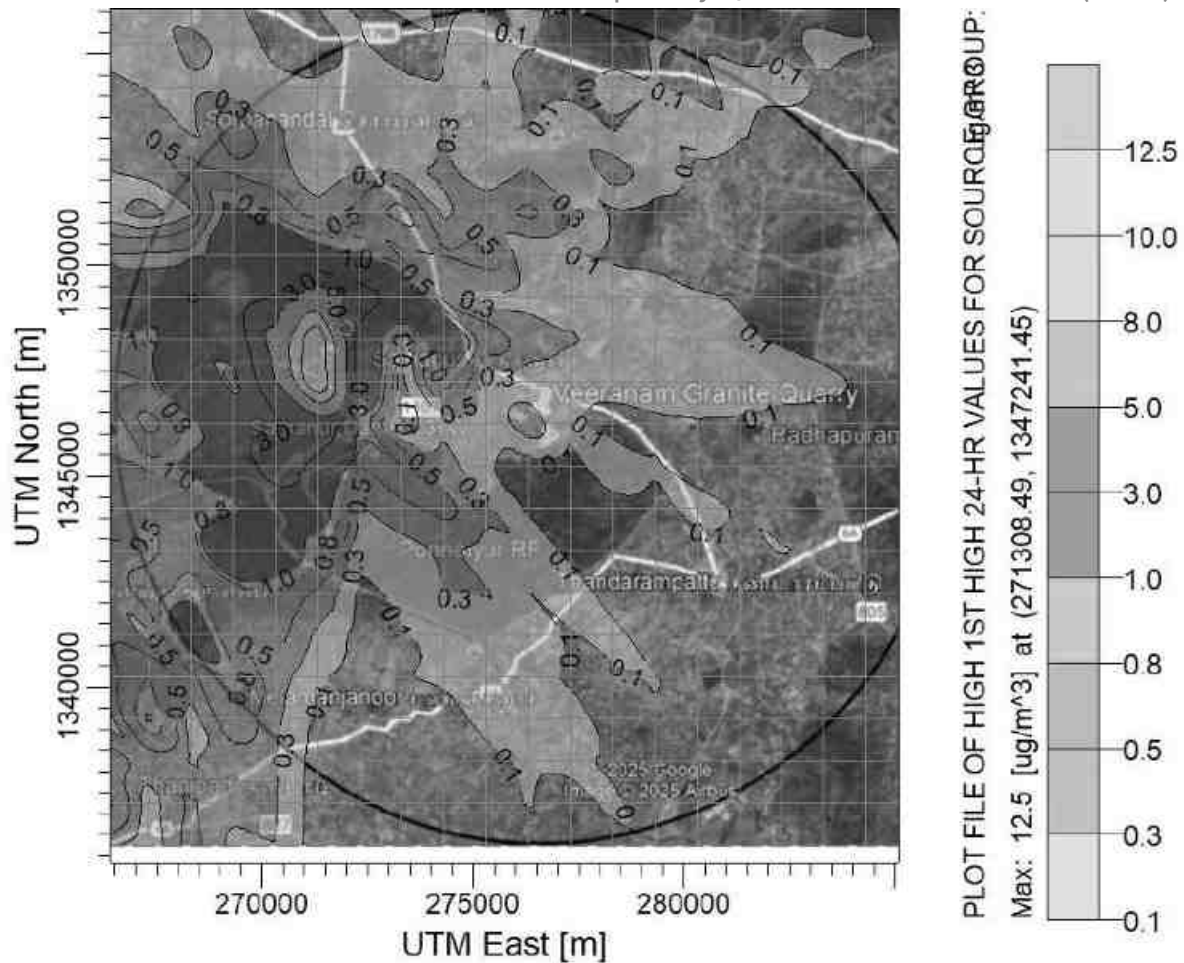


Figure 4-4 Predicted 24-Hrs GLC of NO<sub>x</sub> within 10 km Radius of the Study Area

Table 4-14 Predicted Highest and Habitation receptors Concentrations NO<sub>x</sub>

| S. No | UTM Coordinates |         | Conc. (µg/m³) | Name of the habitation | Distance (km) | Direction |
|-------|-----------------|---------|---------------|------------------------|---------------|-----------|
|       | E               | N       |               |                        |               |           |
| 1     | 271308.5        | 1347241 | 12.49386      | Project Site           | -             | -         |
| 2     | 271308.5        | 1348241 | 11.97407      | Chegapatti             | 0.43          | SE        |
| 3     | 271308.5        | 1349241 | 6.93464       | No habitation          | 0.76          | SW        |
| 4     | 270308.5        | 1348241 | 5.91482       | No habitation          | 1.95          | NW        |
| 5     | 270308.5        | 1347241 | 4.99078       | No habitation          | 0.89          | NE        |
| 6     | 271308.5        | 1346241 | 4.64508       | No habitation          | 1.36          | SW        |
| 7     | 270308.5        | 1345241 | 4.6312        | No habitation          | 1.76          | SW        |
| 8     | 272308.5        | 1349241 | 4.22371       | Chegapatti             | 1.5           | SE        |
| 9     | 268308.5        | 1349241 | 3.17538       | No habitation          | 2.21          | S         |
| 10    | 270308.5        | 1349241 | 3.06145       | No habitation          | 3.22          | S         |

**4.2.2.7 Conclusion**

It was observed that the maximum ground level concentration observed due to mining activities and traffic movement without control measures for PM<sub>10</sub>, PM<sub>2.5</sub> and NO<sub>x</sub> are 25.7 µg/m<sup>3</sup>, 13.0 µg/m<sup>3</sup> and 12.5 µg/m<sup>3</sup> respectively. The highest concentration levels identified at the project site only. So, it can be concluded that even during operation of quarry the impact envisaged is moderate. The total increase in concentrations above baseline status to estimate the percentage increase is summarized in **Table 4-15**.

**Table 4-15 Total Maximum GLCs due to Mining Activities without Control measures**

| Pollutant         | Max. Baseline Conc. (µg/m <sup>3</sup> ) | Estimated Incremental Conc. (µg/m <sup>3</sup> ) | Total Conc. (µg/m <sup>3</sup> ) | NAAQ standard | % Increase |
|-------------------|------------------------------------------|--------------------------------------------------|----------------------------------|---------------|------------|
| PM <sub>10</sub>  | 57.2                                     | 25.7                                             | 82.9                             | 100           | 44.9       |
| PM <sub>2.5</sub> | 27.8                                     | 13.0                                             | 40.8                             | 60            | 46.7       |
| NO <sub>x</sub>   | 24.0                                     | 12.5                                             | 36.5                             | 80            | 52.0       |

**4.2.3 Impacts due to Transportation**

Granite will be transported directly to consumers based on market demand and buyer requirements. Transportation will be carried out using tippers via the existing approach roads.

The average annual production is estimated at 19533 m<sup>3</sup> (approximately 6898 metric tons) of granite. Based on an operating schedule of 240 working days per year, the average saleable production will be around 10.4 m<sup>3</sup> per day (or 23 metric tons per day). Assuming an average truck carrying capacity of 10 tons, this translates to approximately 2–3 truck trips per day, depending on market conditions. This minimal level of traffic is not expected to have a significant impact on the existing transportation infrastructure.

**4.2.3.1 Mitigation Measures**

The increment in the dust emissions will be mainly due to Excavation & 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.
- ▶ Wet drilling will be followed.
- ▶ 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.

**4.2.4 Impacts due to Carbon Emissions:**

The proposed quarrying operations have the potential to generate various greenhouse gas (GHG) emissions, including carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), fluorinated gases, water vapor, and ozone. These emissions may result from multiple phases of

quarrying activities such as excavation, material transportation, energy consumption, and land-use changes.

Mitigation strategies have also been identified to minimize the environmental impact and to support sustainable quarrying practices. Impacts Due to Carbon Emissions and Mitigation Measures is provided in **Table 4-16**.

#### 4.2.4.1 Above-Ground Carbon Stock

Deforestation and soil disturbance associated with quarrying activities result in the reduction of above-ground carbon stocks. This occurs due to the release of stored carbon from vegetation into the atmosphere during land clearing and biomass removal.

#### 4.2.4.2 Below-Ground Carbon Stock:

Soil erosion and physical disturbance from quarrying activities lead to the loss of soil organic carbon. This not only contributes to greenhouse gas emissions but also compromises soil fertility and overall ecosystem health.

**Table 4-16 Impacts Due to Carbon Emissions and Mitigation Measures**

| S. No | Activity                                                                  | Impacts or Consequences                                                                                                                                                                                  | Mitigation Measures                                                                                                                                                       |
|-------|---------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1     | Operation of Heavy Machinery and Equipment – Direct Emissions             | Continuous operation of machinery releases CO <sub>2</sub> directly into the atmosphere, contributing to increased carbon emissions.                                                                     | Implementing energy-efficient technologies and practices, such as using low-emission equipment or transitioning to cleaner fuels, to reduce direct emissions.             |
| 2     | Energy-intensive processes, such as drilling, cutting, and transportation | Combustion of fossil fuels releases CO <sub>2</sub> and other GHGs, contributing to indirect emissions from quarry operations.                                                                           | Transitioning to renewable energy sources, such as solar, to reduce indirect emissions associated with energy consumption.                                                |
| 3     | Land-Use Changes and Deforestation                                        | Deforestation releases stored carbon in trees and soil into the atmosphere, increasing carbon emissions. Loss of vegetative cover reduces the area's ability to sequester carbon through photosynthesis. | Plantation in and around the quarry area to help offset carbon emissions and restore ecosystem functions.                                                                 |
| 4     | Soil Disturbance, Excavation, and Carbon Loss                             | Soil disturbance disrupts the natural carbon cycle, accelerating organic matter decomposition and releasing CO <sub>2</sub> . Soil erosion further reduces the soil's ability to retain carbon.          | Implementing sustainable land management practices, such as minimizing soil disturbance and using erosion control measures, to help preserve soil and reduce carbon loss. |
| 5     | All Operations – Impacts on Microclimate and Temperature                  | Quarry operations alter local microclimates, leading to temperature increases due to vegetation removal and exposure of bare rock surfaces. Heat generated by machinery                                  | Plantation in and around the quarry area to mitigate temperature rise and restore ecosystem balance.                                                                      |

|  |                                          |  |
|--|------------------------------------------|--|
|  | further contributes to temperature rise. |  |
|--|------------------------------------------|--|

#### 4.2.5 Impact on climate change, temperature rise, pollution

The proposed quarry is expected to impact climate change, temperature rise, pollution, and carbon stocks, both above and below the soil. The detailed Climate change and temperature and its impacts, and mitigation measures are provided in **Table 4-17**. Impact of Mining due to GHG Emissions & Local Livelihood with Mitigation Measures is provided in **Table 4-18**.

**Table 4-17 Climate Change and Temperature Rise – Impacts and Mitigation Measures**

| Sl. No | Activity                                                    | Impacts / Consequences                                                                                                                                                                                                                                                | Mitigation Measures                                                                                                                                                                                                 |
|--------|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Direct Emissions due to Heavy Machinery and other Equipment | Quarrying activities involving heavy machinery, diesel vehicles, and energy-intensive processes release greenhouse gases (GHGs) like carbon dioxide (CO <sub>2</sub> ) and methane (CH <sub>4</sub> ), contributing to climate change and increased carbon emissions. | Implement energy-efficient technologies and transition to renewable energy sources such as solar power to reduce dependency on fossil fuels. Additionally, use low-emission equipment to minimize direct emissions. |
| 2      | Vegetation removals/removal of Trees                        | Clearing of vegetation for quarrying reduces carbon sequestration capacity, leading to the release of stored carbon into the atmosphere and contributing to climate change.                                                                                           | Develop a greenbelt to restore vegetation and sequester carbon. Implement afforestation programs and rehabilitate degraded areas to offset deforestation impacts.                                                   |
| 3      | Change of Land Cover and Soil Composition                   | Changes in land cover and soil disturbance disrupt local microclimates, affecting temperature, humidity, and precipitation patterns in the surrounding areas.                                                                                                         | Apply soil conservation techniques such as erosion control, reclamation, and stabilization to maintain soil carbon and ecosystem integrity. Reduce land disturbances to preserve the natural microclimate balance.  |

**Table 4-18 Impact of Mining due to GHG Emissions & Local Livelihood with Mitigation Measures**

| Impact Area     | Potential Effect                                                                       | Consequences of Local Livelihood                                                                   | Mitigation Measures                                                                                           | Monitoring Strategies                                                                                              |
|-----------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Air Pollution   | Increased CO <sub>2</sub> , NO <sub>x</sub> , SO <sub>2</sub> , PM10 & PM2.5 emissions | Respiratory diseases (asthma, bronchitis).<br>Reduced agricultural productivity.                   | Use low-emission machinery & renewable energy sources.<br>Implement dust suppression & greenbelt development. | Monitor air quality (PM10, CO <sub>2</sub> , NO <sub>x</sub> ) near mining zones.                                  |
| Water Pollution | Acid mine drainage, leaching of heavy metals                                           | Contaminated drinking water affecting human and livestock health.<br>Loss of aquatic biodiversity. | Install water treatment plants & lined tailing storage.<br>Regular treatment of mine water before discharge.  | Regularly Monitoring of groundwater & surface water quality.<br>Monitor pH & heavy metal levels in nearby streams. |

|                  |                                                             |                                                                                                          |                                                                                                                 |                                                                                                        |
|------------------|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Soil Degradation | Land clearing, loss of soil fertility                       | Reduced crop yield impacting farmers' income.<br><br>Increased dependency on external food sources.      | Implement top-soil conservation & land reclamation.                                                             | Track vegetation regrowth using satellite imagery.<br><br>Conduct periodic soil quality testing.       |
| Climate Change   | Temperature rise due to CO <sub>2</sub> and land-use change | Erratic rainfall patterns affecting crops.<br><br>Higher cooling costs and stress-related health issues. | Reduce deforestation & implement plantation<br>Introduce energy-efficient mining operations.                    | Regular Monitoring                                                                                     |
| Livelihood Shift | Displacement and job loss in traditional sectors            | Loss of income sources for farming.<br><br>Increased migration for alternative jobs.                     | - Promote alternative employment (eco-tourism, skill training).<br>Provide compensation & resettlement support. | Conduct livelihood impact assessments yearly.<br>Implement CER/ CSR programs for affected communities. |

### 4.3 Water Environment

There are no surface sources viz. rivers/ lake within the proposed quarry lease area. There will not be any ground water withdrawal, as the total water requirement will be met through authorized vendors or local panchayat. the economically workable average depth of 30 m from the top of the hill works (above ground level). Hence, there will not be any groundwater level intersect. Therefore, ground water regime will be undisturbed. The list water bodies available within the 15km radius from the project site is provided in **Table 4-19**. The Detailed Hydrological Report is Final EIA Persensation the enclosed. Water balance Chart is provided in **Figure 4-5**.

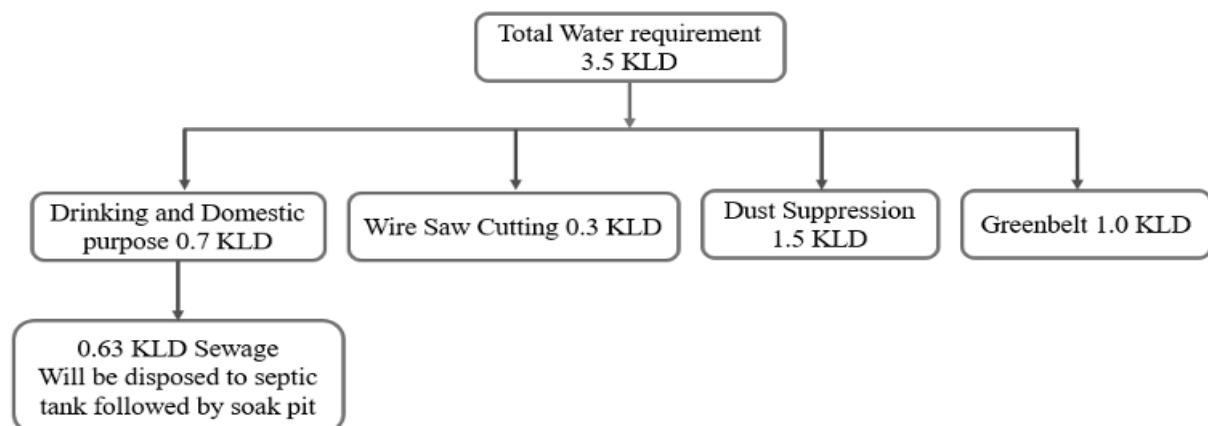


Figure 4-5 Water balance Chart

The existing water environment quality has been studied, and the study results are discussed in **Chapter 3**, which show that generally the water quality in the area is well within statutory standards.

**Table 4-19 List of waterbodies within the 15km radius of the project site**

| Description               | Dist. (~Km)          | Dir. |
|---------------------------|----------------------|------|
| Veernam Lake              | Adjacent to the site |      |
| Sathanur Lake             | 1.08                 | N    |
| Mallikapuram Lake         | 1.39                 | WNW  |
| Naykkanur Lake            | 1.41                 | NE   |
| Sattannur Lake            | 1.85                 | NNW  |
| Taradapattu Lake          | 2.34                 | NE   |
| Govindapuram Lake         | 3.2                  | N    |
| Alal Ar                   | 3.72                 | ENE  |
| Sathanur Dam              | 3.73                 | W    |
| Taradapattu Lake          | 3.82                 | NE   |
| Thandarampattu Canal      | 3.91                 | ENE  |
| Kil Vanakkambadi Lake     | 4.31                 | E    |
| Melkarippur Lake          | 4.48                 | NNE  |
| Tandarampattu Lake        | 4.85                 | SE   |
| Kilvanakkambadi Canal     | 5.14                 | E    |
| Kolundampattu Canal       | 5.57                 | NNE  |
| Ponnaiyar River           | 5.58                 | SSW  |
| Sattanur Main Canal       | 5.77                 | S    |
| Sorappanandal Lake        | 5.8                  | NW   |
| Keelamanjanoor Canal      | 5.98                 | SSW  |
| Lake near Kilvanakkambadi | 6.16                 | ESE  |
| Lake near Melpennathur    | 6.41                 | NNW  |
| Nedungavadi Lake          | 6.9                  | NE   |
| Mudiyanur Lake            | 6.92                 | SE   |
| Lake near Pudurnattam     | 7.58                 | SW   |
| Tiruvadattanur Lake       | 7.65                 | S    |
| Pamban Ar                 | 8.51                 | SSW  |
| Erraiyur Malai RF         | 8.86                 | NNE  |
| Perumbakkam Lake          | 8.98                 | E    |
| Eraiur Lake               | 9.5                  | N    |
| Melserumbakkam Lake       | 9.7                  | E    |
| Varatta Ar                | 9.98                 | SSW  |
| Asuvangasuranai Lake      | 9.98                 | ENE  |
| Cheyyar R                 | 10.32                | NNW  |
| Pinjur Canal              | 12.46                | NW   |
| Melmudiyanur Canal        | 12.58                | N    |
| Munnurmangalam Canal      | 12.74                | NNW  |
| Samudram Tank             | 13.14                | E    |
| Muraiya Ar                | 13.25                | NW   |
| Valaiyar Odai             | 13.5                 | W    |
| Ramakkal Odai             | 13.53                | WSW  |

#### 4.3.1 Anticipated Impacts

There are no surface sources and ground water regime will not be altered during mining. The mine surface runoff along with the chemicals, lubricants and granite particle sediments may enter the canal which will affect the water quality. Impact Identification and Mitigation Measures is provided in **Table 4-20**. The major sources of water pollution due to this quarry operation will be as below:

- ▶ Domestic sewage from mine.
- ▶ Deterioration in surface/groundwater quality of receiving body.
- ▶ Changes to hydraulic regime.

**Table 4-20 Impact Identification and Mitigation Measures on Water Environment**

| Sl. No | Source of Water Pollution             | Potential Impact                                                                                                                                         | Mitigation Measures                                                                                                                                                                    |
|--------|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Domestic Sewage from Mine             | Untreated sewage from mining activities can contaminate nearby water bodies and soil, leading to waterborne diseases and environmental degradation.      | Implement a proper sewage treatment system such as a septic tank or bio-toilets to manage domestic wastewater efficiently.                                                             |
| 2      | Surface Runoff Carrying Pollutants    | Runoff from mining activities may contain chemicals, lubricants, and granite particle sediments, which can enter nearby canals and affect water quality. | Construct settling ponds to trap sediments, use oil-water separators for hydrocarbons, and implement proper drainage channels to prevent contamination of surface water.               |
| 3      | Impact on Surface/Groundwater Quality | Seepage of mining-related pollutants into groundwater or surface water bodies may alter water quality and make it unfit for consumption.                 | Regular monitoring of water quality, adoption of controlled chemical usage, and ensuring proper storage of lubricants and fuels to prevent spills.                                     |
| 4      | Changes to Hydraulic Regime           | Excessive water extraction and quarrying activities may alter the natural flow of groundwater, affecting nearby wells and water resources.               | Use stored rainwater from quarry pits for dust suppression and mining operations instead of relying on groundwater sources. Implement water recharge pits to maintain the water table. |

#### 4.3.2 Mitigation Measures

##### 4.3.2.1 Surface Water Pollution Control Measures

- ▶ No process effluent is generated. Domestic sewage of 0.63 KLD is treated through a septic tank followed by a soak pit.
- ▶ Construct garland drains of suitable size around the mine area and dumps to prevent rainwater from entering active quarry zones.
- ▶ During the monsoon season, rainwater is naturally collected in a water-fed tank and utilized for dust suppression and greenbelt development.
- ▶ Dump tops will have inner slopes to control water flow and prevent erosion from washouts.
- ▶ Active dump areas will be covered with grass, shrubs, and mulching to prevent erosion until Draft backfilling is completed.

- ▶ Retaining walls will be provided at dump tops and unstable benches to prevent material wash-off and landslides, reducing siltation of water channels.
- ▶ Rainwater channels/drainage will have baffles and settling pits to arrest suspended solids before the water flows out of the mine area.
- ▶ Mine water will be regularly tested for contaminants, and corrective measures will be implemented if any element exceeds CPCB-prescribed limits.
- ▶ Worked-out slopes will be stabilized by planting appropriate shrubs and grasses to reduce erosion risks.

#### **4.3.2.2 Ground Water Pollution Control Measures**

- ▶ Domestic sewage from toilets will be directed to septic tanks to prevent groundwater contamination.
- ▶ Regular monitoring of water levels and quality in nearby open wells and bore wells will be conducted to detect any potential impacts.

#### **4.3.2.3 Rainwater Harvesting**

- ▶ Rainwater is diverted to the middle of the quarry to prevent excessive water from ingredients into the working areas.
- ▶ Seasonal water flows carrying fine particles from the surface and waste dumps are controlled using settling structures.
- ▶ Barriers will be installed at appropriate intervals along drainage paths.
- ▶ Water will be diverted to a de-silting cum rainwater harvesting pond within the mine area.
- ▶ An overflow system will be incorporated to ensure the natural drainage system remains unaffected.

**Table 4-21 Hydrothermal/Geothermal Effect Due to Mining Activities**

| Impact Area                                                | Potential Environmental Impact                    | Mitigation Measures                                              | Monitoring Strategies                                                     |
|------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------------|
| <b>Hydrothermal/<br/>Geothermal<br/>Effect</b>             | Disruption of subsurface temperature flow         | Conduct geothermal impact assessments before mining.             | Regular monitoring of subsurface temperature using thermal sensors.       |
|                                                            | Localized groundwater temperature changes         | Maintain buffer zones around geothermal hotspots.                | Install groundwater monitoring wells and measure temperature fluctuations |
|                                                            | Alteration of underground water flow              | Implementation of water recharge structures to maintain balance. | Periodical hydrogeological studies                                        |
| <b>Bio-<br/>Geochemical<br/>Processes &amp;<br/>Stress</b> | Heavy metal leaching into soil and water          | Implement tailing pond systems for controlled discharge.         | Regular testing of soil and water for heavy metals                        |
|                                                            | Altered carbon, nitrogen, and sulfur cycles       | Implementing afforestation programs.                             | Periodic soil fertility test                                              |
|                                                            | Loss of vegetation impacting carbon sequestration | Plantation of native plants during and post-mining activities.   | Verification of satellite imagery for vegetation cover changes.           |
|                                                            | Increased air and soil pollution                  | Implementation of dust suppression measures                      | Regular air quality monitoring.                                           |
| <b>Sediment<br/>Geochemistry in<br/>Surface Streams</b>    | Increased erosion and runoff                      | Construct sediment control ponds and check dams.                 | Conduct sediment load analysis in nearby streams if available             |
|                                                            | Disruption of aquatic ecosystems                  | Establish buffer zones and maintain minimum water flow levels.   | Conduct regular biological surveys for aquatic biodiversity health.       |

#### 4.4 Noise Environment

The primary sources of noise pollution during mining operations include:

- Drilling
- Blasting
- Loading operations (which are intermittent)
- Vehicular movement (which occurs sporadically throughout working hours)

These activities contribute to increased background noise levels, particularly within the active mining zone. While noise levels tend to diminish over distance, they may still pose concerns for workers and nearby communities.

**Table 4-22 Permissible Exposure in Cases of Continuous Noise (OSHA, Govt. of India)**

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

**4.4.1 Potential Impacts of Increased Noise Levels:****Occupational Health Effects**

- Prolonged exposure to high noise levels may lead to hearing impairment, fatigue, and stress among workers.
- Communication difficulties may arise, increasing the risk of workplace accidents.

**Disruption to Surrounding Environment**

- Elevated noise levels may cause disturbances to local wildlife, potentially altering their habitat and behavioral patterns.
- Increased noise may also affect livelihoods and quality of life in nearby residential or agricultural areas.

**Community Disturbance**

- Blasting and heavy machinery operations may generate vibration and noise that could cause discomfort to nearby communities.
- Schools, healthcare facilities, and households near the mine lease area may experience noise-related disruptions.

Since noise levels attenuate over distance, the impact is expected to reduce significantly beyond the mine lease boundary. However, effective mitigation measures must be implemented to minimize its effects on workers and nearby settlements. Impact and Mitigation Measures for Noise Pollution is provided in **Table 4-24**.

**Table 4-23 Aspect – Impact identification on Noise Levels**

| S. No. | Project Activity                        | Identify Aspects                                                                                                                                                                                                            | Impacts                                                                                  |
|--------|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| 1      | Clearance of vegetation at site         | Noise due to vehicular movement                                                                                                                                                                                             | One time temporary                                                                       |
| 2      | Drilling, Blasting and Excavation       | <ul style="list-style-type: none"> <li>▪ Due to mining activities compressor and use of machinery for mining.</li> <li>▪ Noise induced Hearing Loss (NIHL) to</li> <li>▪ workers exposed to higher noise levels.</li> </ul> | Moderate & Temporary Impact and it will be restricted to the mining activities duration  |
| 3      | Stacking of mineral reject and handling | Generation of noise                                                                                                                                                                                                         | Moderate & temporary impact and it will be restricted to the mining activities duration  |
| 4      | Transportation of mining material       | <ul style="list-style-type: none"> <li>▪ Generation of noise due to mining activities</li> <li>▪ Temporary Threshold Shift /</li> </ul>                                                                                     | Moderate & Temporary impact and it will be restricted to the mining activities duration. |

|  |  |                                                                                                                                                                                                                                                                                                                                                               |  |
|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |  | <p>Permanent Threshold Shift to workers exposed to higher noise levels.</p> <ul style="list-style-type: none"> <li>▪ Disturbance in communication.</li> <li>▪ Annoyance/irritation to the residents in nearby villages.</li> <li>▪ Disturbance to the fauna residing in the area.</li> <li>▪ Sleep disturbance to the residents in nearby villages</li> </ul> |  |
|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

**Table 4-24 Impact and Mitigation Measures for Noise Pollution**

| S. No. | Source of Noise                | Potential Impacts                                                                                                                                                            | Mitigation Measures                                                                                                                                       |
|--------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Drilling                       | <ul style="list-style-type: none"> <li>- High noise levels affecting workers</li> <li>- Noise-induced hearing loss</li> <li>- Stress and fatigue</li> </ul>                  | <ul style="list-style-type: none"> <li>- Use of sharp drill bits to reduce noise</li> <li>- Provide earmuffs/earplugs to workers</li> </ul>               |
| 2      | Blasting                       | <ul style="list-style-type: none"> <li>- Sudden high-intensity noise</li> <li>- Vibration affecting nearby areas</li> <li>- Disturbance to local communities</li> </ul>      | <ul style="list-style-type: none"> <li>- Develop a green belt to reduce noise propagation</li> <li>- Conduct controlled blasting</li> </ul>               |
| 3      | Excavation & Material Handling | <ul style="list-style-type: none"> <li>- Continuous noise from heavy machinery</li> <li>- Increased ambient noise in the mining zone</li> </ul>                              | <ul style="list-style-type: none"> <li>- Maintain equipment regularly to reduce noise</li> <li>- Periodic monitoring as per CPCB</li> </ul>               |
| 4      | Transportation of Materials    | <ul style="list-style-type: none"> <li>- Noise from vehicles</li> <li>- Temporary and permanent hearing damage</li> <li>- Disturbance to residents &amp; wildlife</li> </ul> | <ul style="list-style-type: none"> <li>- Restrict vehicle speed to 25 kmph</li> <li>- Avoid unnecessary honking</li> </ul>                                |
| 5      | Machinery Operation            | <ul style="list-style-type: none"> <li>- Prolonged noise exposure causing worker fatigue and communication issues</li> </ul>                                                 | <ul style="list-style-type: none"> <li>- Proper maintenance and lubrication of machinery</li> <li>- Install silencers on equipment</li> </ul>             |
| 6      | Community Disturbance          | <ul style="list-style-type: none"> <li>- Noise from mining affecting nearby schools, hospitals, and residential areas</li> </ul>                                             | <ul style="list-style-type: none"> <li>- Develop a green belt buffer zone</li> <li>- Schedule high-noise activities during non-sensitive hours</li> </ul> |
| 7      | Worker Health & Safety         | <ul style="list-style-type: none"> <li>- Hearing impairment</li> <li>- Increased accident risk due to communication difficulties</li> </ul>                                  | <ul style="list-style-type: none"> <li>- Provide PPE (earmuffs, earplugs)</li> <li>- Rotate workers in high-noise areas</li> </ul>                        |

## 4.5 Impact of Vibration

The main sources of vibration in the proposed mine are as follows:

- Drilling
- Blasting
- Loading and Unloading
- Transportation

- Ramp developments

Impact and Mitigation Measures for Vibration is provided in **Table 4-25**.

**Table 4-25 Impact and Mitigation Measures for Vibration**

| S. No. | Aspect                          | Potential Impact                                                                                      | Mitigation Measures                                                                                                                  |
|--------|---------------------------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Drilling                        | Ground vibrations due to drilling operations.                                                         | Use controlled drilling techniques to minimize vibrations.<br>Maintain safe distances from sensitive structures.                     |
| 2      | Blasting                        | High-intensity ground vibration and air overpressure due to explosives.                               | Use appropriate stemming and delay systems.<br>Avoid overcharging of blast holes.<br>Maintain safe blasting zones around the quarry. |
| 3      | Loading & Unloading of Minerals | Short-term, localized vibrations.                                                                     | Implement proper handling techniques.<br>Use low impact loading equipment where feasible.                                            |
| 4      | Transportation Vehicles         | Continuous low-frequency vibrations affecting surrounding areas.                                      | Maintain speed limits within the quarry.<br>Ensure proper vehicle maintenance to minimize vibration levels.                          |
| 5      | Proximity to Infrastructure     | Structural damage to facilities within the mine lease area.                                           | Maintain safe distances from infrastructure.<br>Use vibration-dampening measures like greenbelt development along sensitive areas.   |
| 6      | Ground Subsidence               | Risk of soil destabilization over time.                                                               | Conduct geotechnical surveys before excavation.<br>Implement controlled blasting and excavation methods.                             |
| 7      | Human Health Effects            | Fatigue, muscle strain, joint pain, sleep disturbances, and cardiovascular problems due to vibration. | Provide workers with proper PPE (earplugs, anti-vibration gloves).<br>Implement job rotation schedules to reduce prolonged exposure. |

## 4.6 Biological Environment

### Summary of Existing Biological Environment

- Flora: 136 species (87% native). Includes ecologically important and medicinal plants. No endangered species, but 16 invasive species are present.
- Avifauna: 57 bird species, including Indian Peafowl (Schedule I, WPA) and Green Imperial Pigeon (Near Threatened, IUCN).
- Mammals: 7 species observed. All are of Least Concern (IUCN).
- Cauvery Wildlife Sanctuary: Hosts 21 major species, including Endangered and Vulnerable ones like Asian Elephant, Sloth Bear, and Dhole.
- Reptiles & Amphibians: 10 species recorded. Only Indian Cobra is protected (Schedule II, WPA).
- Butterflies: 35 species. Dominance of nectar-feeding Nymphalidae indicates floral richness.
- Fish: 19 species, mostly native. Jerdon's Carp (Critically Endangered & Endemic) needs urgent conservation.

Most of these species fall under the 'Least Concern' category in study areas other than Cauvery Wildlife sanctuary biological data, but certain species require conservation measures based on ecological roles, conservation status, and local threats and the conservation plan is prepared based on the biological baseline data collected from the study area of the proposed project site. The objective is to ensure the safeguarding of ecologically significant and sensitive species observed in the project impact zone. All species recorded exclusively from the Cauvery North Wildlife Sanctuary (flora) and Cauvery Wildlife Sanctuary (fauna) are not to be included in conservation plans and is provided in **Table 4-26**.

**Table 4-26 Identified Species for Conservation plan**

| S. No. | Species Name                             | Ecological Importance / Status                  | Conservation Measures                                                           |
|--------|------------------------------------------|-------------------------------------------------|---------------------------------------------------------------------------------|
| 1      | Ducula aenea (Green Imperial Pigeon)     | Near Threatened (IUCN)                          | Protect fruiting trees, avoid habitat disturbance, conduct periodic monitoring. |
| 2      | Pavo cristatus (Indian Peafowl)          | Schedule I (WPA), Ecologically significant bird | Ensure nesting and foraging ground protection, avoid hunting, raise awareness.  |
| 3      | Hypselobarbus pulchellus (Jerdon's Carp) | Critically Endangered (IUCN), Endemic fish      | Prevent water pollution, restrict overfishing, habitat restoration in streams.  |
| 4      | Azadirachta indica (Neem)                | Medicinal, native tree species                  | Promote plantation in buffer areas, protect existing trees.                     |
| 5      | Ocimum tenuiflorum (Tulsi)               | Medicinal herb                                  | Encourage cultivation in greenbelt areas and awareness programs.                |
| 6      | Cynopterus sphinx (Fruit Bat)            | Pollinator and seed disperser                   | Preserve fruit trees, reduce night-time disturbances.                           |

A dedicated team should periodically monitor the status of the identified species and habitats. Adaptive management strategies should be implemented to ensure the success of the conservation efforts. This conservation plan aims to support biodiversity and ecological balance

in the project area. Continued commitment and stakeholder involvement are critical to safeguarding the flora and fauna identified.

The Impacts on Biological Environment due to mining activities are provided in **Table 4-27**.

**Table 4-27 Impacts and Mitigation Measures on Biological Environment and Biodiversity**

| S. No. | Activity / Aspect                              | Examples of Aspects / Causes                   | Potential Biodiversity Impacts                                                                       | Mitigation Measures                                                                                                            |
|--------|------------------------------------------------|------------------------------------------------|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| 1      | Land Extraction / Clearing                     | Land clearing                                  | Loss of habitat, introduction of plant diseases, siltation of water bodies                           | Limit land clearing to required areas only; afforestation with native species; implement soil erosion control measures         |
| 2      | Blasting, Digging, Hauling                     | Dust, noise, vibration, water pollution        | Disruption of water courses; impact on aquatic ecosystems due to altered hydrology and water quality | Controlled blasting; water sprinkling for dust suppression; noise mitigation; sedimentation ponds to manage runoff             |
| 3      | Waste Dumping / Handling                       | Land disturbance, soil & water contamination   | Loss of habitat, contamination of soil and water, increased sedimentation                            | Designated waste disposal areas with liners; retaining walls and runoff barriers; regular monitoring of soil and water quality |
| 4      | Air Emissions from Operations                  | Air pollution (dust and gaseous emissions)     | Dust deposition on leaves, reduced photosynthesis, habitat degradation                               | Greenbelt development; regular maintenance of machinery; use of dust suppression systems (sprinklers, water tankers)           |
| 5      | Waste Disposal (hazardous/non-hazardous)       | Oil spills, contaminated runoff                | Encouragement of pests, spread of disease, groundwater contamination                                 | Secure storage of chemicals/oils; spill containment systems; proper treatment of waste; pest control measures.                 |
| 6      | Infrastructure Development (e.g., Power Lines) | Land clearing                                  | Fragmentation of habitats, displacement of species                                                   | Avoid ecologically sensitive zones, replanting native flora post-construction                                                  |
| 7      | Accommodation & Worker Facilities              | Land clearing, sewage, domestic waste          | Habitat loss, pollution from sewage, spread of diseases                                              | Installation of STP/soak pits for sewage; waste segregation and disposal; plantation around facilities                         |
| 8      | Access Roads Construction                      | Clearing vegetation, altering natural drainage | Habitat fragmentation; waterlogging upslope, reduced drainage downslope                              | Route roads along existing clearings; design proper cross-drainage structures; restore vegetation along roadsides              |
| 9      | Population Growth / Human Activity             | Land pressure, hunting, increased resource use | Pressure on flora/fauna; introduction of                                                             | Community awareness programs; habitat restoration initiatives;                                                                 |

|    |                               |                                            |                                                                                 |                                                                                                     |
|----|-------------------------------|--------------------------------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
|    |                               |                                            | invasive species; loss of native biodiversity                                   | avoid illegal poaching and grazing                                                                  |
| 10 | Water Use / Abstraction       | Groundwater extraction, mine dewatering    | Alteration in aquatic habitat; species displacement due to reduced water levels | Controlled water extraction; water harvesting structures; recharge pits; monitoring of water levels |
| 11 | Noise from Operations         | Drilling, blasting, transport noise        | Disturbance to fauna; migration of birds and ani fugitive emissions mals        | Noise barriers; limit noisy operations to daytime; maintenance of silencers and mufflers            |
| 12 | Dust Deposition on Vegetation | Movement of vehicles and mining operations | Reduced photosynthesis; leaf damage; stunted growth                             | Regular water spraying on haul roads; roadside plantations using dust-tolerant native species       |

#### 4.6.1 Green Belt Development

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

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

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 greenbelt development during first 5 years of mining plan, at the end of life of quarry; TAMIN proposed to plant 800 No's of trees around the lease area and Rs. 30,000/- per year will spend for proposed greenbelt development and maintenance.

**Table 4-28 Proposed Greenbelt development Plan**

| Local Name of the Tree        | Scientific Name of the Tree | Survival | No. of Species |
|-------------------------------|-----------------------------|----------|----------------|
| Vaagai                        | Albizia Lebbeck             | 80 %     | 800            |
| Manjadi                       | Adenaanthera Pavonina       |          |                |
| Aatru Poovarasu               | Hibiscus Tiliaceous         |          |                |
| Panai                         | Borassus Flabellifer        |          |                |
| Yetti                         | Strychnos Nuxvomica         |          |                |
| Purangai Naari, Pudanga Naari | Premna Tomentosa            |          |                |
| Magizha Maram                 | Mimusops Elengi             |          |                |
| Puthranjivi                   | Puthranjiva Roxburghii      |          |                |
| Pisin Pattai                  | Litsea Glutinosa            |          |                |
| Sandhana Vembu                | Toona Ciliate               |          |                |
| Eachai                        | Phoenix Sylvestre           |          |                |

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. 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 Social Environment

### 4.7.1 Anticipated Impacts

The proposed project site is free from any habitations or settlements within the core zone. Therefore, no resettlement or rehabilitation concerns are anticipated. During the operational phase, adherence to the prescribed Environmental Management Plan (EMP) will ensure that environmental parameters such as air, water, noise, and ecological quality remain within permissible limits.

#### Socio-economic Benefits:

- Positive socio-economic impacts are expected in the buffer zone through employment and ancillary business opportunities.
- Indirect employment generation in support sectors such as transport, mechanical services, loading/unloading, and food supply.
- Upliftment in the standard of living through economic inflow to local communities.

**Environmental Commitments:**

- The buffer zone will be preserved and monitored regularly to ensure compliance with environmental norms.

The quarry will be operated using sustainable practices to minimize environmental damage. Impacts with Mitigation and Monitoring Measures on Socio-Economic Environment is summarized in **Table 4-29**. Corporate Environmental Responsibility (CER) Plan is provided in **Table 4-30**.

**Table 4-29 Impacts with Mitigation and Monitoring Measures on Socio-Economic Environment**

| Impact Area                  | Potential Effects                                                                      | Consequences on Local Livelihood / Community            | Mitigation Measures                                                               | Monitoring Strategies                                                               |
|------------------------------|----------------------------------------------------------------------------------------|---------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Air Pollution                | Increased CO <sub>2</sub> , NO <sub>x</sub> , SO <sub>2</sub> , PM10 & PM2.5 emissions | Respiratory diseases; reduced agricultural productivity | Use low-emission machinery; dust suppression; greenbelt development               | Air quality monitoring (PM10, CO <sub>2</sub> , NO <sub>x</sub> ) near mining zones |
| Water Pollution              | Acid mine drainage, heavy metal leaching                                               | Contaminated drinking water; aquatic biodiversity loss  | Water treatment plants; lined tailing storage; pre-discharge mine water treatment | Ground and surface water quality monitoring; pH, metals                             |
| Soil Degradation             | Land clearing, loss of fertility                                                       | Reduced crop yield; dependence on external food sources | Topsoil conservation; land reclamation                                            | Satellite vegetation tracking; soil quality testing                                 |
| Climate Change               | CO <sub>2</sub> emissions, land-use change                                             | Erratic rainfall; higher cooling costs; health issues   | Reduce deforestation; energy-efficient mining operations                          | Monitoring of climate-related indicators                                            |
| Health & Safety              | Dust, noise, and traffic-related issues                                                | Respiratory and hearing problems; accident risks        | PPEs, dust control, traffic safety                                                | Health audits; accident tracking                                                    |
| Traditional Occupation Shift | Loss of farming and grazing jobs                                                       | Livelihood loss; forced occupational shift              | Skill development; green jobs; eco-tourism promotion                              | Employment audits; training participation records                                   |
| Resource Competition         | Increased use of water and local utilities                                             | Local scarcity; price inflation                         | Sustainable resource use; recycling                                               | Resource consumption tracking                                                       |
| Cultural Disruption          | Influx of migrant labor                                                                | Cultural dilution; social conflicts                     | Local hiring preference; community programs                                       | Social cohesion surveys; stakeholder consultations                                  |
| Livelihood Displacement      | Shift away from agriculture and small-scale trade                                      | Income instability; out-migration                       | Compensation; alternate livelihood; CSR-based support                             | Livelihood impact assessments; CSR program reviews                                  |

#### 4.7.2 Corporate Environmental Responsibility

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

**Table 4-30 Corporate Environmental Responsibility (CER) Plan**

| S. No        | CER Activities for Veeranam Village Government Hr. Sec. School                             | Amount (Lakhs) |
|--------------|--------------------------------------------------------------------------------------------|----------------|
| 1.           | Road maintenance along with Plantation<br>(Approach Road connectivity to Veeranam village) | 0.50           |
| 2.           | Govt Girls High School- Toilet facilities                                                  | 0.50           |
| 3.           | Govt Girls High School- Providing Library Books in connection with Environmental           | 0.50           |
| 4            | Govt Girls High School-Drinking Water facility (Portable RO System with Cooling facility)  | 0.50           |
| <b>Total</b> |                                                                                            | <b>2.00</b>    |

#### 4.7.3 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.
- ▶ Greenbelt works in the project.
- ▶ Casual labour is needed for various activities.

The proposed project may create opportunities for indirect employment in the field of vehicle hiring, labours, trading of construction materials, carpenters etc.,

#### 4.8 Impacts on Occupational Health due to project operations

Mining operations may cause potential occupational health risks to workers due to prolonged exposure to dust, noise, and vibration associated with quarry activities. These health concerns can have both short-term and long-term implications on the well-being of the workforce. Occupational Health Impacts and Mitigation Measures are provided in **Table 4-31**.

**Table 4-31 Occupational Health Impacts, Mitigation Measures**

| S. No | Impact Area                 | Anticipated Impacts                                                | Mitigation Measures                                                                             |
|-------|-----------------------------|--------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| 1     | Dust Exposure               | Dust-related pneumonia, tuberculosis                               | Water sprinkling on haul roads, wet drilling systems, greenbelt development                     |
| 2     | Physical Strain             | Rheumatic arthritis due to heavy labor                             | Ergonomic work practices, regular breaks, training in safe handling methods                     |
| 3     | Vibration from Equipment    | Segmental vibration syndrome from long-term use of vibrating tools | Use of anti-vibration tools, scheduled breaks, health monitoring for vibration-related symptoms |
| 4     | Noise Pollution             | Noise-induced hearing loss                                         | Use of earplugs/muffs, acoustic enclosures for equipment, regular noise level monitoring        |
| 5     | Fire and Emergency Risks    | Injuries and fatalities from fire/explosions                       | Emergency Response Plan (ERP), installation of fire extinguishers, mock drills, and training    |
| 6     | Hazardous Material Handling | Exposure-related health issues                                     | PPEs suited for materials handled, training in safe chemical handling procedures                |
| 7     | Medical Emergencies         | Lack of immediate care can worsen injuries                         | On-site first aid facilities, tie-ups with local hospitals, trained medical personnel           |
| 8     | Worker Health Monitoring    | Chronic illnesses going undetected                                 | Periodic health check-ups, occupational health surveillance, medical records maintenance        |
| 9     | Community Health Linkages   | Potential spread of occupational diseases to nearby communities    | Extension of emergency medical support to communities, awareness programs                       |
| 10    | Blasting Operations         | Increased risk of injuries due to flying debris and air shock      | Restricted entry, sirens, cordoning of the blast zone, proper training and SOPs                 |

#### 4.8.1 Physical Hazards

- ▶ Traumatic injury remains a significant problem and ranges from the trivial to the fatal. Common causes of fatal injury include rock fall, mobile equipment accidents, falls from height, entrapment, and electrocution.
- ▶ Noise is almost ubiquitous in mining. It is generated by drilling, blasting, materials handling and transportation. Controlling noise has proven difficult in mining and noise-induced hearing loss remains common.
- ▶ Whole body vibration is commonly experienced whilst operating mobile equipment, such as load, haul, dump units, trucks, scrapers, and diggers.
- ▶ Poorly maintained roads and vehicles contribute to the problem. Hand arm vibration syndrome is also encountered with the use of vibrating tools such as air leg rock drills.

#### 4.8.2 Biological Hazards

- ▶ The risk of tropical diseases such as malaria and dengue fever are substantial at some remote mining locations. Leptospirosis and ancylostomiasis were common in mines, but eradication of rats and improved sanitation has controlled these hazards effectively.

#### 4.8.3 Ergonomic Hazards

- ▶ Although mining has become increasingly mechanized, there is still a substantial amount of manual handling. Cumulative trauma disorders continue to constitute the largest category of occupational disease in mining and often result in prolonged disability. Broken ground is often encountered and can cause ankle and knee injuries.

#### 4.8.4 Psychological Hazards

- ▶ Drug and alcohol abuse has been a difficult issue to deal with in mining. Debate continues about how to measure psychophysical impairment. Nevertheless, mining operations commonly require the measurement of urinary drug metabolites and breath or alcohol on pre-employment and following accidents. Remote locations are common in mining with mine employees separated from their families and communities during work periods.
- ▶ Expatriate placements are also common in mining and the associated psychosocial hazards have been reviewed recently. Unfortunately, fatal, and severe traumatic injuries continue to occur in mining and often have a profound impact on morale. Post-traumatic stress disorders sometimes develop in witnesses, colleagues, and managers. Registered managers often feel personally responsible for such injuries, even in the absence of negligence, and face the ordeal of government inquiries and legal proceedings.

#### 4.8.5 Mitigation Measures

- ▶ To reduce pollution emanation from quarry operations by carrying out splitting of sheet rock by diamond wire saw which largely reduces the dust and noise generation.
- ▶ Adoption of dust suppression measures like spraying water, use of drill with dust collection system or wet drills etc.
- ▶ 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.
- ▶ 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.
- ▶ Plantation
- ▶ Avoid blasting during unfavorable wind & atmospheric conditions.
- ▶ An emergency response plan that includes installation of emergency response equipment to combat events such as fire.

- ▶ On-site first aid facilities will be provided, and employees will be extended to the local community in emergencies.
- ▶ Health Check programs periodically (1 Year Once).

#### 4.9 Study on Plastic & Microplastic Pollution in Mining Activities

Plastic and microplastic pollution from mining operations can significantly affect terrestrial and aquatic ecosystems. These pollutants originate from routine mining activities such as the use of packaging materials, PPE, drilling fluids, and waste disposal. If unmanaged, they can lead to bioaccumulation in aquatic species, soil contamination, and human exposure risks. Sources of Plastic & Microplastic Pollution- Impacts and Mitigation Measures are provided in **Table 4-32**.

**Table 4-32 Sources of Plastic & Microplastic Pollution- Impacts and Mitigation Measures**

| Source                              | Anticipated Impacts                                                             | Mitigation Measures                                                   |
|-------------------------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| Plastic packaging & waste           | Land litter, blockage of drainage systems, ingestion by animals                 | Implement plastic waste management plans & recycling programs         |
| Personal protective equipment (PPE) | Improper disposal may lead to environmental accumulation of synthetic materials | Use biodegradable alternatives; educate workers on disposal practices |
| Explosives & drilling residues      | Contamination of soil and water by plastic-based chemicals                      | Promote use of eco-friendly blasting and drilling materials           |
| Conveyor belts & pipes              | Release of plastic microparticles through wear and tear                         | Regular equipment maintenance and material upgrades                   |
| Wastewater discharge                | Dispersal of microplastics in aquatic ecosystems, bioaccumulation in fish       | Strict wastewater treatment before discharge                          |

#### 4.10 Traffic Density

The average annual production is estimated at 19533 m<sup>3</sup> (approximately 6858 metric tons) of granite. Based on an operating schedule of 240 working days per year, the average saleable production will be around 10.4 m<sup>3</sup> per day (or 23 metric tons per day). Assuming an average truck carrying capacity of 10 tons, this translates to approximately 2–3 truck trips per day, depending on market conditions. This minimal level of traffic is not expected to have a significant impact on the existing transportation infrastructure. The detailed impacts and mitigation Measures are provided in **Table 4-33**.

**Table 4-33 Impacts of Traffic and Transportation, Mitigation Measures**

| Impact Area                 | Anticipated Impacts                                                           | Mitigation Measures                                                               |
|-----------------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Increased Truck Movement    | Slight increase in traffic load on approach roads and nearby highways.        | Schedule transport during non-peak hours. Use covered trucks to prevent spillage. |
| Road Safety at Junctions    | Possibility of congestion or minor accidents at junction points.              | Deploy trained flaggers at junctions. Install traffic signage and road markings.  |
| Vehicular Emissions         | Emissions from trucks can marginally contribute to air pollution.             | Ensure PUC compliance of all vehicles. Encourage regular maintenance of trucks.   |
| Dust Generation             | Dust emission due to movement on unpaved roads or loading operations.         | Water sprinkling on haul roads. Paving of frequently used internal roads.         |
| Noise from Vehicle Movement | Noise disturbance to nearby areas due to truck engine operations and honking. | Use of well-maintained vehicles with silencers. Avoid use of air horns.           |

## 5 ANALYSIS OF ALTERNATIVES

### 5.1 Introduction

The proposed Black Granite Quarry is over extent of 13.74.0 Ha located at S.F. No.74(P), 126/1A, 127, 144/1 of Veeranam Village, Thandarampattu Taluk, Thiruvannamalai District.

### 5.2 Alternate Technology

Semi mechanized opencast method will be used for mining. No alternative technology will be envisaged for this proposed project. The alternative Technology analysis details are provided in Table 5-1.

**Table 5-1 Alternative Technology Analysis**

| S. No | Mining Activity        | Available Technologies                  | Potential Impact                                  | Preferred Technology to be followed |
|-------|------------------------|-----------------------------------------|---------------------------------------------------|-------------------------------------|
| 1     | Rock breaking /Cutting | Burner Cutting                          | High noise levels                                 | -                                   |
|       |                        | Wire Saw Cutting                        | No significant environmental impact               | Wire Saw Cutting                    |
| 2     | Drilling               | Jackhammer Manual Drilling              | Emission of dust and noise generation             | -                                   |
|       |                        | Wet Drilling                            | Minimal dust emissions                            | Wet Drilling                        |
|       |                        | Tamrac Machine Drilling                 | Insignificant dust and noise levels               | -                                   |
|       |                        | Wagon Drill                             | Produces dust and noise                           | -                                   |
|       |                        | LD Bore                                 | Dust emission                                     | -                                   |
|       |                        | PRD Drilling                            | Low dust emissions                                | -                                   |
| 3     | Blasting               | Conventional Blasting                   | Generates noise                                   | -                                   |
|       |                        | Muffle Blasting                         | Reduced noise impact                              | -                                   |
|       |                        | Expansive Mortar / Rock Breaking Powder | Negligible noise impact                           | -                                   |
|       |                        | Controlled Blasting                     | Reduces ground vibrations and noise               | Controlled Blasting                 |
|       |                        | Hydraulic Splitting                     | No noise or vibration, water-pressure based       | Hydraulic Splitting                 |
|       |                        | Chemical Blasting                       | Non-explosive, slow rock breakage, minimal impact | Chemical Blasting                   |
|       |                        | Shock Tube Blasting                     | Controlled explosion, reduced fly rock            | -                                   |
|       |                        | Silent Blasting (Gas-Expansion Systems) | Fractures rock with gas expansion, no noise       | -                                   |

### 5.3 Site Justification and Connectivity

Since the project is site-specific due to the natural availability of granite deposits in this location, alternative sites were not considered. The proposed area is classified as Government Poramboke Land, and a lease has been secured for granite mining using the Open Cast Semi-Mechanized Method.

Open cast, semi-mechanized mining with 6m vertical bench with a bench width is 6m with vertical slope. Under 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.

A detailed site inspection was conducted by the project proponent and the approved Geologist to assess the occurrence of granite deposits, geological features, and feasibility for safe, economical, and environmentally sustainable mining. Comprehensive granite mapping was carried out, followed by a section-wise estimation of reserves. Road connectivity is shown in Figure 5-1.

**Table 5-2 Site Connectivity and Features**

| Feature                         | Details                                                                                                             |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Latitude &amp; Longitude</b> | 12.11'13.12"N to 12.11'28.05"N<br>78.54'35.10"E to 78.54'08.07"E                                                    |
| <b>Site Elevation (AMSL)</b>    | 225 - 251 AMSL                                                                                                      |
| <b>Topography</b>               | Hilly terrain                                                                                                       |
| <b>Lease Area - Topo Sheet</b>  | 57L/15, L/16, P4                                                                                                    |
| <b>Land Classification</b>      | Government Poramboke Land                                                                                           |
| <b>Nearest Highway</b>          | NH 179B: Section of Chennai–Salem Expressway, 8.83, NNE<br>NH 179B: Section of Chennai–Salem Expressway, 8.83, NNE. |
| <b>Nearest Railway Station</b>  | Thiruvannamalai Railway Station, 19.14, ENE                                                                         |
| <b>Nearest Airport</b>          | Salem Airport, 100.85, WSW<br>International Airport: Chennai International Airport, 160.40, ENE.                    |
| <b>Nearest Town/City</b>        | Town: Thandarampattu, 3.94, ESE<br>City/ District HQ: Tiruvannamalai, 14.75, ENE.                                   |



**Figure 5-1 Road Connectivity for quarry area**

## 6 ENVIRONMENTAL MONITORING PROGRAMME

### 6.1 General

Environmental monitoring refers to the systematic observation and measurement of environmental indicators over time. This process helps track ecological changes and evaluate the effectiveness of the project's environmental safeguards. To ensure proper implementation of the Environmental Management Plan (EMP), all operational activities will be periodically reviewed. Monitoring will cover critical parameters like air and water quality, noise levels, and other relevant indicators to ensure they remain within acceptable limits set by regulatory bodies. The mitigation measures outlined in Chapter 4 will be implemented to minimize environmental impacts. The monitoring plan is aligned with the guidelines of the Ministry of Environment, Forest and Climate Change (MoEF&CC), the Central Pollution Control Board (CPCB), and the State Pollution Control Board (SPCB). It includes scheduled evaluations using approved methodologies to maintain compliance and promote sustainable operations throughout the project duration. The project proponent will take overall responsibility for monitoring and ensuring environmental compliance throughout the lifecycle of the project. The primary responsibilities include:

- ▶ Overseeing the implementation of environmental management and pollution control measures as proposed.
- ▶ Ensuring the afforestation and plantation activities are carried out as planned, including survival rate monitoring and maintenance.
- ▶ Maintaining comprehensive records of environmental monitoring activities for submission to statutory authorities and for audit purposes.
- ▶ Periodically reviewing the performance of pollution control systems and initiating corrective actions wherever deficiencies are identified.
- ▶ Conducting routine safety audits and awareness programs to enhance safety consciousness among workers and staff.
- ▶ Monitoring of slope stability of benches and overburden (OB) dumps, maintenance of garland drains, check dams, and timely de-silting.
- ▶ Assessing the potential environmental impact of ongoing project activities to identify areas of concern.
- ▶ Liaising with concerned State and Central Government departments to ensure regulatory compliance and communication.
- ▶ Taking immediate remedial measures in case of any unexpected environmental issue attributable to project operations.
- ▶ Conducting safety training sessions and regular emergency drills for workers to build preparedness.
- ▶ Ensuring that all firefighting and emergency equipment is always maintained in a ready-to-use state.

For each environmental component, the monitoring plan will define the specific parameters, monitoring locations, frequency, duration, applicable standards, and assign responsibility for 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. the proponent

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

Post-project monitoring is an equally important aspect in the Environmental Management Plan. To verify the outcome on the implemented mitigation measures and to alter the proposed mitigation, Post project monitoring becomes inevitable. An environment monitoring plan is given in **Table 6-1**.

**Table 6-1 Post Environmental Monitoring Plan**

| S. No | Parameters                                                          | Measurement Methodology                                   | Frequency       | Location                                | Data Analysis                                                              | Reporting Schedule                                                                                                                                                  | Monitoring Cost Projected |
|-------|---------------------------------------------------------------------|-----------------------------------------------------------|-----------------|-----------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| 1     | Ambient Air Monitoring (PM10, PM2.5) as per CPCB consent conditions | IS 5182 & CPCB Guidelines Vol. 1 (Gravimetric Method)     | Monthly         | 2 stations (downwind)                   | Comparison with specified limits and previous baseline data (if available) | Compliance report of EC to MoEF&CC on a six-monthly basis and consent compliance to CPCB as required. Reports to be shared with top management and process manager. | 12,000                    |
| 2     | Exhaust Gases from Vehicles and Machinery                           | PUC Certificate compliance                                | As per validity | At site                                 | Ensure compliance with vehicular emission norms                            | Same as above                                                                                                                                                       | 2,000                     |
| 3     | Water Consumption Records                                           | SOP for maintaining water usage record (dust suppression) | Daily           | Site & approach road                    | Comparison of actual consumption against EC commitment                     | Compliance report of EC to MoEF&CC (6-monthly) and CPCB as per requirement. Reports to be shared with top management and process manager.                           | 1,000                     |
| 4     | Ground Water Quality Monitoring                                     | IS 3025                                                   | Twice a year    | Nearest habitation                      | Comparison with prescribed limits                                          | Compliance report of EC to MoEF&CC and consent to CPCB as per requirement                                                                                           | 6,000                     |
| 5     | Noise Monitoring                                                    | EPA / CPCB Guidelines                                     | Monthly         | 2 locations (site & nearest habitation) | Comparison with specified CPCB noise standards                             | Same as above. Reports to top management and process manager.                                                                                                       | 5,000                     |
| 6     | Greenbelt Development                                               | Survival rate of plants                                   | Regular         | At site                                 | Replantation of dead saplings and monitoring water usage                   | Same as above                                                                                                                                                       | 4,000                     |
| 7     | Soil Quality Monitoring                                             | IS: 2720 & standard lab methods                           | Once a year     | 2 locations (site & nearest)            | Comparison with prescribed limits                                          | Same as above                                                                                                                                                       | 4,000                     |

|              |                                       |                                                        |                                       |                                                     |                                                                    |                                                                                                             |               |
|--------------|---------------------------------------|--------------------------------------------------------|---------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|---------------|
|              |                                       |                                                        |                                       | cultivation<br>land)                                |                                                                    |                                                                                                             |               |
| 8            | Terrestrial Ecology                   | As per DFO<br>conditions/NOC                           | Once a year                           | 10 km radius of<br>project site                     | Comparison with<br>baseline biological<br>data                     | Compliance report to<br>MoEF&CC (six-monthly) or<br>as per Forest<br>Department/stakeholder<br>requirements | 6,000         |
| 9            | Emergency<br>Response<br>Preparedness | Mock drill in<br>presence of<br>observer               | Once a year                           | Various<br>locations<br>within mining<br>lease area | Mock drill report to<br>identify deficiencies<br>and improvements  | Report submitted to<br>management after each<br>drill                                                       | 5,000         |
| 10           | Occupational Health<br>Programs       | As per Mine<br>Regulations, 1961<br>and DGMS circulars | Entry-level<br>and once in<br>3 years | At site                                             | Audiometry, pre-<br>placement, and<br>periodic medical<br>checkups | Compliance with DGMS<br>and Mine Regulation<br>requirements                                                 | 5,000         |
| <b>Total</b> |                                       |                                                        |                                       |                                                     |                                                                    |                                                                                                             | <b>50,000</b> |

### 6.3 Monitoring Procedures/ Methodology

The monitoring schedule is designed to regularly assess pollution levels such as air quality, water quality, and noise to ensure they meet the standards set by the Environmental Protection Act, as well as the guidelines of the Central and State Pollution Control Boards. The methods and frequency of monitoring follow the procedures recommended by the Ministry of Environment, Forest and Climate Change (MoEF&CC), CPCB, and SPCB.

### 6.4 Emergency Procedures for Reporting and documentation

All necessary records and reports will be prepared in full compliance with applicable legal and regulatory frameworks. It is essential to strictly follow the guidelines prescribed by competent authorities to ensure transparency and accountability. Periodic and systematic documentation will be maintained to support clear tracking of performance over time, including historical trends and future projections.

The project authorities will maintain dedicated records for water usage, wastewater discharge, solid waste generation, air quality, and emissions. These records will be updated routinely to support effective environmental oversight and prompt corrective action, if needed.

Once reports are compiled, they will be submitted without delay to the relevant statutory bodies for evaluation. The management will ensure that all documentation is consistent with the applicable norms, and that no deviation from the approved procedures occurs.

Regular audits and evaluations will be conducted on these records. Any inconsistencies or gaps observed in environmental controls, operational practices, or implemented technologies will be addressed immediately. Suitable corrective measures will be undertaken to rectify issues and ensure continued compliance.

### 6.5 Occupational Health and Safety

Periodic occupational health check-ups will be conducted for staff and permanent workers, at least once every three years, to facilitate early detection of health issues and enable timely medical intervention. Audiometric testing will be carried out regularly for employees working in high-noise zones. Safety protocols and performance will be reviewed from time to time by the designated safety officer.

Occupational health and safety play a vital role in enhancing productivity and maintaining a healthy employer-employee relationship. In mining operations, dust and noise are the primary occupational health concerns. Safety measures during blasting, equipment maintenance, and the handling of explosives will strictly adhere to the Mines Act, 1952, Mines Rules, 1955, The Metalliferous Mines Regulations, 1961, and relevant DGMS Circulars.

To minimize risks arising from exposure to dust, heat, noise, and vibration, several safeguards have been included in the Environmental Management Plan (EMP), including:

- Use of wet drilling techniques or dust collection systems
- Provision of rest shelters equipped with essential amenities such as drinking water, fans, and sanitation facilities
- Distribution of personal protective equipment (PPE) to all workers
- Job rotation strategies for workers exposed to high-noise areas
- Availability of fully equipped first-aid facilities on site

## 7 ADDITIONAL STUDIES

### 7.1 Introduction

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

- ▶ Public consultation
- ▶ Risk Identification and Management/Occupational Health and safety studies have been conducted, and a safety plan was prepared.
- ▶ Disaster Management Plan
- ▶ Mine closure plan as per GCDR 1999

#### 7.1.1 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 13.74.0 Ha. However, the proposed project falls under 'B1' Violation category, Public Hearing is Mandatory. So, the EIA report has been prepared as per the obtained ToR vide Identification No. TO25B0108TN5444492N, dated 13/05/2025. The Baseline studies are carried out during the period of **Feb (1.2.2025 to April 31.4.2025)**. Draft EIA report will be submitted for Public Hearing (PH). After PH, the minutes obtained will be incorporated in the EIA report along with an action plan by the proponent towards issues raised during Public Hearing. Final EIA will be submitted to TNSEAC for further appraisal of the project and obtaining Environment Clearance.

## 7.1.2 Risk Identification & Management

### 7.1.2.1 Introduction

Mining and related activities pose various potential hazards to both workers and the public. It is essential that mine workers operate in a safe and healthy environment without compromising their efficiency. The safety measures required to ensure the well-being of employees, and the security of mining operations, are outlined in the Mines Act, 1952.

Risk assessment in mining involves identifying potential hazards, evaluating possible failure scenarios, and determining the extent of potential damage. The risk assessment study includes the following key aspects:

- ▶ Identification of potential hazard areas.
- ▶ Identification of representative failure cases.
- ▶ Evaluating the extent of damage and impact zones arising from hazardous incidents.
- ▶ Assessing the suitability of the site concerning hazard prevention and disaster mitigation.
- ▶ Providing recommendations to minimize the likelihood of severe accidents.
- ▶ Developing a Disaster Management Plan (DMP), including On-site and Off-site Emergency Plans.
- ▶ Formulating an Occupational Health and Safety Plan.

All mining operations will be conducted under the supervision of a qualified mine manager holding a First-Class Manager's Certificate of Competency. To ensure workers remain vigilant, they will participate in regular refresher training programs. However, certain hazards may arise during routine operations, including:

- ▶ Accidents involving explosives.
- ▶ Mishaps due to heavy mining equipment.

To mitigate these risks, the following safety measures will be strictly implemented:

- ▶ Full compliance with the Mines Act, 1952, Metalliferous Mines Regulations, 1961 (MMR 1961), and Mines Rules, 1955.
- ▶ Restricted access to unauthorized personnel.
- ▶ Provision of firefighting equipment and first-aid facilities in the mine's office and work areas.
- ▶ Distribution and mandatory use of safety gear (helmets, boots, goggles, gloves, etc.) with regular inspections.
- ▶ Mandatory training and periodic refresher courses for all employees working in hazardous areas.
- ▶ Conducting mining operations as per approved plans, with regular plan updates.
- ▶ Routine cleaning of working faces to ensure safe operations.
- ▶ Regular maintenance and inspection of all mining equipment following manufacturer guidelines.
- ▶ Implementation of dust suppression measures along haul roads.
- ▶ Promoting safety awareness through training programs, posters, and safety competitions.
- ▶ Establish a trained emergency response team to handle any mining-related incidents.

### 7.1.2.2 Emergency Preparedness

The proposed quarry site does not present risks of major land-related disasters. In case of natural calamities such as floods or cyclones, the project proponent will coordinate with local Revenue and Disaster Management authorities.

- ▶ The site does not fall within an earthquake-prone zone.
- ▶ There is no risk of flooding as the quarry is located away from rivers and water bodies.
- ▶ The geological formation of the area consists of stable rock masses with gentle slopes, minimizing the risk of landslides.
- ▶ If any unforeseen hazards arise, appropriate safety measures will be implemented following statutory requirements.

A First Aid Room equipped with emergency medical supplies has been set up to address minor workplace injuries. Additionally, adequate transportation facilities are available to transfer injured or unwell workers to the nearest healthcare facility if needed.

### 7.1.2.3 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
- ▶ Handling of materials (Product and Wastes/overburdens)
- ▶ Heavy Machinery

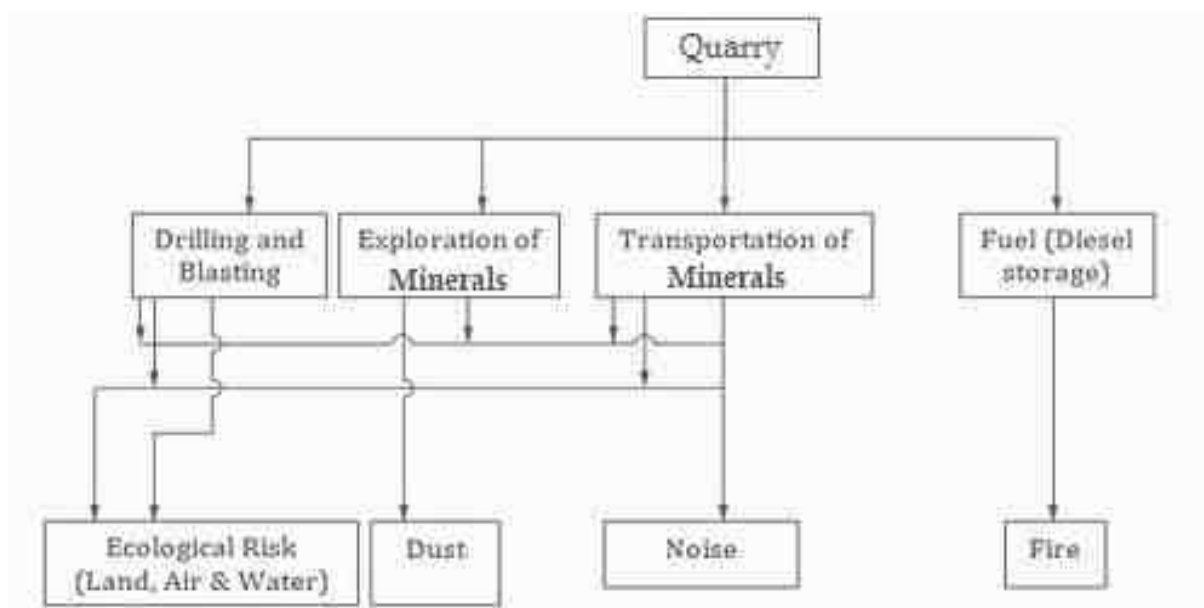


Figure 7-1 Identification of hazards in opencast mine

### 7.1.2.4 Drilling -Mitigation measures during Drilling

Drilling specifications:

- Drill hole diameter :32 mm up to 1.2–1.5 m long Depth and inclination of drill hole is Generally drilled vertically in Alignment. Interval between holes is 3m.
- Explosive type: Detonator Fuse

Drilling is a main operation in mining and is associated with the generation of particulate matter and elevated noise levels in the surrounding area. For the excavation of hard rock strata, drilling and controlled blasting will be employed. Drilling will be carried out using jackhammers to a depth of approximately 1.2 to 1.5 meters, with a hole diameter of 30mm.

#### **Precautionary Measures to Prevent Accidents during Drilling:**

- To control dust emissions during drilling, effective measures such as the use of dust extractors and wet drilling systems are recommended.
- Utilizing high-quality drill bits also helps in minimizing dust generation.
- Additionally, noise produced during drilling can be reduced by employing dust extraction systems and acoustically enclosed compressors, which aid in controlling both particulate matter and noise levels at the source.
- Preferably schedule drilling during daylight hours and limit operations during high-wind conditions to reduce the dispersion of dust.
- Regular maintenance of drilling equipment ensures efficient operation and reduces emissions of noise and dust due to worn-out parts.

#### **7.1.2.5 Blasting/Primary Cutting**

Blasting activities involve the systematic separation of the horizontal (bottom) and vertical (side) planes using serial blasting techniques. This is typically executed with 32 mm diameter blast holes charged with detonating agents, carried out simultaneously along both planes. The objective is to efficiently dislodge substantial volumes of granite from the parent rock mass while minimizing environmental disturbance—a process known as Primary Cutting.

Blasting poses several safety and environmental risks, including the ejection of rock fragments beyond the intended safety perimeter. This is often due to overcharging or specific geological anomalies of the site. Flying debris is particularly prevalent during initial and Draft blasts. Additionally, ground vibrations can destabilize adjacent areas, and dust and noise pollution are persistent by-products of the process.

#### **Precautionary Measures to Prevent Accidents during Blasting/ Primary Cutting:**

- Controlled blasting techniques will be employed to regulate the direction and intensity of blasts, thereby reducing the risk of fly-rock and ground vibrations.
- Accurate charge calculations will be conducted to avoid overcharging and to ensure the effectiveness and safety of the blasts.
- Acoustic barriers and dust suppression systems will be installed to mitigate noise and airborne particulate matter generated during blasting.
- Personal protective equipment (PPE) will be mandatorily provided and used by all personnel involved in blasting operations, while access to the blasting zone will be restricted to authorized staff only.
- Strict adherence to mining safety regulations and standard operating procedures (SOPs) will be ensured throughout all blasting activities.
- A competent person will be appointed to supervise all blasting operations, in accordance with the Metalliferous Mines Regulations, 1961.

- A danger zone with a radius of 300 meters from the blast site will be clearly marked, and access will be controlled with security guards stationed at all entry points.
- Prior to each blast, all personnel and machinery will be evacuated from the designated danger zone and moved to safe locations.
- Audible warning signals (sirens or whistles) will be used to alert workers, visitors, and neighboring residents before the initiation of any blast.
- To prevent damage to nearby structures, only controlled blasting will be conducted using pre-approved techniques and safety practices.

#### 7.1.2.6 Secondary Splitting

The Secondary Splitting process is employed to achieve the desired dimensions of stone blocks following the initial primary cutting. This method involves long-hole drilling along pre-determined planes extending to the base of the previously detached granite mass. For the actual splitting, rock-breaking agents such as expansive mortar, chemically identified as Calcium Hydroxide  $[Ca(OH)_2]$ , are used. These compounds exert pressure upon curing, enabling controlled fracturing of the rock without the use of high-impact explosives.

Subsequent to the splitting process, defective or fractured segments of the stone are removed. The remaining stone is manually dressed into consistent, rectangular blocks using traditional tools like feathers, wedges, and chisels. This step is performed by skilled artisans, ensuring precision in shaping and optimal material recovery.

To maintain the quality and safety of operations, the entire process is conducted under the supervision of qualified personnel, including a Mining Geologist and a Mining Engineer. Their oversight ensures the delivery of defect-free dimensional stones that comply with industry standards and customer requirements.

#### Precautionary Measures to Prevent Accidents during Secondary Splitting:

- Use of non-explosive expanding agents to minimize noise, vibration, and flying debris.
- Manual dressing instead of mechanical cutting to reduce dust and avoid over-breakage.
- Supervised operations by trained personnel to maintain safety standards and minimize material loss.
- Proper training for workers in handling expansion compounds and manual tools safely.
- Use of personal protective equipment (PPE) such as gloves, goggles, and dust masks during manual dressing.
- Regular monitoring of work practices to ensure compliance with safety and environmental guidelines.

#### 7.1.2.7 Risks during Heavy Machinery Handling

Handling and operation of heavy machinery such as dumpers, dozers, and other earthmoving equipment pose significant safety risks in mining operations. A majority of accidents involving such machinery are often the result of mechanical failures (e.g., brake, hydraulic, or steering system malfunctions) or human errors like poor visibility, operator fatigue, lack of proper training, or negligence.

**Precautionary Measures to Prevent Accidents due to Trucks & Dumpers and other machinery handling**

- Routine inspection and preventive maintenance of all heavy machinery.
- Operation only by certified and experienced personnel.
- Regular refresher training for all equipment operators.
- Installation of reverse alarms, proximity sensors, and rear-view cameras.
- Clearly marked speed limits within the project area, especially near curves and slopes.
- Parking only on level ground with parking brakes applied; use of wheel chocks where required.
- Proper shift schedules and rest breaks to avoid operator fatigue.
- Mandatory use of personal protective equipment (PPE) like helmets, reflective vests, and safety boots.
- All machinery to be equipped with fire extinguishers and first-aid kits.
- Operators trained in emergency shutdown and first-response procedures.
- All transportation activities to be supervised and controlled by site management.
- Weekly mechanical checks of vehicles by an authorized competent person.
- Road signs to be placed at all turning and hazardous points.
- Reversing areas to be kept man-free, especially near embankments and tipping points.
- Use of statutory fencing, training, and safety awareness to reduce accidents.
- Oversized rocks to be handled in the pit using secondary blasting.
- Loads with large rocks must not be placed near bench edges to avoid hazards.
- Dumper movement governed by a pre-established Code of Traffic Rules implemented at the site.

**7.1.2.8 Overburden and Dump Handling**

Overburden and waste materials generated during mining primarily consist of rock fragments and naturally defective or uneconomic portions of the granite deposit. Additional waste is created during the manual dressing and sizing of the extracted blocks.

Total waste to be generated during the ten years of Mining Plan period will be 1,75,802m<sup>3</sup>. The area for disposal of waste rock has been identified over the existing waste dump in north and southwest side of the lease area. The dumps will be maintained not exceeding 5m height and the angle of slope of dumps will be at 45° from horizontal. Granite rubble and waste fragments generated during production and development will be reused for forming approach roads and dumping yards. Adequate space has been identified within the lease area for dumping such waste, specifically on barren land currently covered with soil.

The handling and disposal of overburden can result in several environmental and operational impacts. These include alteration of the natural land surface and topography due to the accumulation of waste, potential dust emissions during handling and transport, and adverse visual impacts on the surrounding landscape. There is also a risk of erosion and sedimentation, particularly during monsoon seasons, and occupational hazards associated with the manual and mechanical handling of waste.

**Precautionary Measures to Prevent Accidents due to Overburden handling and Dumps Management**

- Use predefined and geologically stable areas (south side of lease) for waste disposal.
- The waste dumps will be terraced, compacted, and stabilized to prevent erosion and slope failure.
- Regular sprinkling of water on haul roads and during waste handling to minimize dust.
- Progressive plantation of native species along the periphery of the dumps to improve aesthetics and reduce wind-blown dust.
- Effective sorting and reuse of usable stone fragments wherever possible.
- Provision of garland drains and silt traps to control runoff and sedimentation during rains.
- Ensuring the use of personal protective equipment (PPE) and safe waste handling practices for workers.
- In flat areas where the dumping operations have come to an end, the slope angle should be flattened by about 15° lower than the angle of repose which varies from the site to site but not less than 25°.
- Planting vegetation as early as possible over the overburden dump slopes.
- Provide drainage channels along the overburden dump toe for additional protection, in such a way that 15m should be maintained left between the overburden dump and the bench.
- If a mine is abandoned, the bench and overburden dump should be separated from each other by digging a trench of 6 to 10m width.
- Maintaining a safe distance (minimum 15 meters) between the dump toe and active mining benches.
- Terracing of overburden dumps and slope flattening where dumping ends, with angles reduced by at least 15° from the natural angle of repose (typically not less than 25°).
- Early-stage vegetative stabilization of dump slopes to prevent erosion.
- Construction of drainage channels along the dump toe to manage stormwater and prevent washouts.
- In case of mine abandonment, separation of the dump and quarry benches by excavating a trench 6–10 meters wide to act as a buffer zone and reduce mass movement risks.
- Regular monitoring of dump stability, especially during the monsoon season, to identify and correct any early signs of failure.

**7.1.2.9 Storage of Explosive**

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

**7.1.2.10 Fuel Storage**

Most of the HEMM will operate on diesel. However, no major storage is envisaged at the mine Lase area. A diesel tanker will be provided for the crawler mounted machines operating in the mine.

### 7.1.2.11 Water Logging

Water logging in them in site have been avoided by adopting following measures.

- ▶ Correct marking of position of water bodies with their highest flood level and keeping the mine protected by suitable bunds.
- ▶ Water from the surface water bodies shall not enter the mines.
- ▶ Draining of mine water by suitable capacity pumps.

**Table 7-1 Impacts and Mitigation Measures for Storage of Explosives, Fuel Storage and Water logging**

| Activity              | Potential Impacts                                                  | Mitigation Measures                                                                                                                                                                                                                     |
|-----------------------|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Storage of Explosives | Risk of fire, explosion, and safety hazard during handling and use | -No explosive storage proposed on-site<br>-Blasting to be carried out by licensed contractors only                                                                                                                                      |
| Fuel Storage          | Risk of spillage, fire hazard, soil contamination                  | -No permanent fuel storage within lease area<br>-Mobile diesel tankers used for refueling machinery                                                                                                                                     |
| Water Logging         | Flooding of mine pit, equipment damage, unsafe working conditions  | - Proper identification of nearby water bodies and flood levels<br>-Construction of bunds for protection<br>- Mine water to be pumped out using suitable capacity dewatering pumps<br>-Surface runoff prevented from entering mine area |

### 7.1.2.12 Safety Measures at the Proposed Open Cast mining Project

- ▶ The benches are properly sloped at an angle of 60 degrees to avoid any spillage of benches.
- ▶ The opencast mine is designed to operate using a shovel-dumper system, which necessitates proper benching to ensure slope stability and to facilitate the safe movement of dumpers and other heavy machinery. The Draft quarry slope, at its deepest point, will not exceed 45° from the horizontal. (This angle is measured between the line connecting the toe of the bottommost bench and the crest of the topmost bench, relative to the horizontal plane).
- ▶ Garland drains will be constructed around the periphery of the quarry to manage stormwater and prevent water accumulation within the working area.
- ▶ A minimum safety buffer of 100 meters will be maintained between the quarry's surface edge and any nearby public buildings, roads, or infrastructure. If the quarry edge comes within 200 meters of any road or public building, special permission from the Directorate General of Mines Safety (DGMS) will be obtained to carry out controlled blasting operations, ensuring no harm to public life or property.
- ▶ All mining activities will strictly adhere to the guidelines and conditions set by DGMS and will be carried out under the supervision of competent personnel appointed in accordance with the Metalliferous Mines Regulation Act, 1961.

### 7.1.3 Disaster Management Plan

The disaster management plan is aimed at ensuring safety of human life, protection of the environment, safeguarding of infrastructure, and restoration of operations, in that specific order. For its effective implementation, the plan must be widely circulated among all personnel and reinforced through regular training, rehearsals, and mock drills.

The primary objective of the plan is to utilize all available resources both within the mining operation and from external agencies to achieve the following goals:

- ▶ Rescue and provide medical treatment to casualties.
- ▶ Safeguard all personnel present in the mining area.
- ▶ Minimize damage to property and the surrounding environment.
- ▶ Contain the incident immediately and bring it under control as swiftly as possible.
- ▶ Identify and document any fatalities.
- ▶ Provide accurate and timely information to the news media and authorities.
- ▶ Ensure the safe rehabilitation of the affected area.
- ▶ Preserve all relevant records, evidence, and equipment for inquiry into the cause and circumstances of the incident.
- ▶ Optimize response efficiency to enable rescue, rehabilitation, medical support, and a return to normalcy.

#### Emergency Organization (EO)

It is recommended to set up 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 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. To handle disaster/emergency situations, the following personnel shall deal with the disaster/Emergency.

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

##### 7.1.3.1 Emergency Services

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

- ▶ Fire Protection System
- ▶ Off Site Emergency Plan

### 7.1.3.2 Fire Protection System

The fire protection system for the project will consist of portable hand-held fire extinguishers of suitable types and capacities, strategically placed for extinguishing small fires in critical areas such as mine operational zones, diesel storage areas, and explosive storage points (if any).

### 7.1.3.3 Off-Site Emergency Plan

An off-site emergency plan, outlining the steps to address potential emergencies that could impact the areas surrounding the project site, must be prepared in consultation with local authorities such as the Panchayat officials, Revenue Department, and the Assistant Commissioner (Excise). As per the Drafted plan, in the event of any off-site emergency, immediate and coordinated actions must be initiated in consultation with the District Collector and other relevant revenue officials to effectively manage the situation and minimize risk to the public and environment.

### 7.1.4 Progressive Quarry/Mine Closure Plan

Land degradation is one of the major adverse impacts of opencast mining in the form of excavated voids and in the form of waste dumps. As per the Petro genetic character, the depth persistence of the weathered rock, Road metals and boulders body in the area is beyond the workable limits. The proposed mining plan, only 30m 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 technological up-gradation in mining for greater depths.

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

#### 7.1.4.1 Progressive Mine Closure Plan

In the proposed Black Granite Quarry operations, a bench height of 6 meters will be maintained during the first five years, with a total depth reaching 30 meters over the entire life of the quarry. As this depth is above the local groundwater table, groundwater will not be disturbed in any manner.

Afforestation activities will be undertaken and maintained along the safety barrier zone until the vegetation reaches a stable and self-sustaining stage. The sludge from sanitary facilities (toilets) will be periodically removed and utilized as organic manure to support afforestation efforts.

There is no proposal to backfill the ultimate pit, as high-quality granite reserves exist below the current workable depth of 30 meters. Future technological advancements may allow for safe and economically viable mining at greater depths.

Upon cessation of mining activities, the pit boundaries will be properly fenced to prevent unauthorized access. Once the quarry pit accumulates rainwater or underground seepage, it may be repurposed for agricultural or water harvesting purposes, ensuring long-term beneficial land use.

#### 7.1.4.2 Water Quality Management

The groundwater quality in the region has been observed to be within a neutral pH range, indicating good quality. Most of the analytical results for both groundwater and surface water samples reveal that the parameter concentrations are well within permissible limits as per applicable standards.

To ensure continued protection of water resources, garland drains will be constructed along the periphery of the mining pit and at the toes of the side dumps. These drains will be strategically aligned to channel all surface runoff away from the mining zone, thereby preventing waterlogging and contamination.

The surface drainage will be directed to settling tanks for sediment removal. Additionally, any catchment water collected in the mining pit will be directed to a main sump, which will serve as a source of water for dust suppression, green belt development, and plantation activities, promoting sustainable water use within the quarry lease area.

#### 7.1.4.3 Mine Seepage Water

Negligible seepage of water into the mining pit is anticipated. This seepage will be collected in a well-guarded sump or pond, allowing adequate time for settling of suspended solids. The treated water will be reused for dust suppression on working faces, haul roads, and dump surfaces, thereby promoting water conservation within the quarry.

The lease-applied area is a hillock with an elevation of approximately 18 meters. The region experiences an average annual rainfall of about 985 mm, received during both the Southwest and Northeast monsoons. Although the area receives moderate rainfall, the groundwater table lies at a depth of around 15 meters.

During the rainy seasons, both surface runoff and groundwater seepage are directed to a common sump located at a lower point in the mine. The collected water is then dewatered and discharged to nearby agricultural fields using 10 HP oil engine pumps, ensuring beneficial reuse of water and avoiding any stagnation within the mining area.

#### 7.1.4.4 Air Quality Management

Ambient air quality was monitored twice a week over a 12-week period during the pre-monsoon season (Season 01). The parameters monitored included PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, and NO<sub>x</sub>, and all sampling activities were conducted as per Central Pollution Control Board (CPCB) monitoring guidelines at designated locations.

To mitigate air pollution in the proposed mining area, the following measures have been considered:

- ▶ Water sprinkling will be carried out regularly at active working faces, haul roads, and dump surfaces to suppress dust.
- ▶ Regular cleaning and removal of spilled colour granite from haul roads and weighbridge areas to prevent dust resuspension.
- ▶ Routine maintenance of mining equipment to ensure efficient operation and minimal emissions.
- ▶ Development of a green belt around the overburden dumps to reduce fugitive dust emissions and promote a clean and healthy environment.

#### 7.1.4.5 Solid waste Management

As stated earlier, mining will be carried out using the opencast semi-mechanized method involving conventional equipment such as hydraulic excavators/shovels and dumpers, along with ancillary equipment like compressors, wire cutting machines, generators, etc.

- ▶ Total waste generation during the ten-year Mining Plan period is estimated at 175802 m<sup>3</sup>.
- ▶ The waste will be dumped on the western side of Survey No. 126/1A within the lease boundary.
- ▶ Waste dumps will be maintained at a maximum height of 5 meters, with the dump slope angle not exceeding 45° from the horizontal.
- ▶ Granite rubble and waste fragments generated during production and development will be reused for forming approach roads and dumping yards.
- ▶ Adequate space has been identified within the lease area for dumping such waste, specifically on barren land currently covered with soil.

#### 7.1.4.6 Mine Drainage

The lease applied area is a hillock rising to a height of 18 meters. The region receives an average annual rainfall of approximately 985 mm, during both the Southwest and Northeast monsoon seasons. Despite this, the rainfall is considered scanty, and the groundwater table lies at around 15 meters depth.

During the rainy seasons:

- ▶ Surface runoff and minor groundwater seepage are collected in a designated sump within the quarry area.
- ▶ The collected water is dewatered using 10 HP oil engines and redirected to nearby agricultural fields.
- ▶ This arrangement helps in preventing waterlogging in the mining area and utilizes the water beneficially for irrigation purposes.

#### 7.1.4.7 Disposal of Waste

A total of 175802 m<sup>3</sup> of waste material is expected to be generated during the ten-year Mining Plan period. This waste will be systematically dumped on the western side of Survey Field No. 126/1A within the lease-applied area.

The following measures will be adopted for safe disposal:

- ▶ Dump height will be maintained at a maximum of 5 meters.
- ▶ The angle of repose (slope) of the dump will not exceed 45° from the horizontal to ensure slope stability.
- ▶ Dumps will be located on non-mineralized, barren land within the lease area, avoiding any environmental or operational conflicts.

#### 7.1.4.8 Topsoil Management

Topsoil will be carefully removed and stacked at designated locations within the earmarked dump site, with appropriate preventive and protective measures in place to avoid erosion and nutrient loss.

The following measures will be followed:

- ▶ Topsoil will be used for plantation activities along the haul roads, lease boundary, and for the reclamation of external dumps and backfilled areas (if any).
- ▶ Topsoil stockpiles will be maintained at low heights to minimize compaction and will be vegetated with grass to preserve fertility.
- ▶ In addition to permanent topsoil stacks, temporary stacks will be placed near excavation and reclamation areas to facilitate concurrent utilization, avoiding the need to transport topsoil to the main stack near the overburden dump.

#### **7.1.4.9 Disposal of Mining Machinery**

Mining operations are proposed to be carried out using company-owned machinery, which includes excavators, mining tippers, compressors, wire saw machines, jackhammers, and other essential mining equipment. All equipment complies with RTO regulations and Central Pollution Control Board (CPCB) norms.

The company also operates a centralized workshop at Salem to handle major repairs and rectification of its equipment.

Machinery that reaches the end of its operational life is written off and disposed of in accordance with the guidelines prescribed by the Government and the TAMIN Board. Surplus equipment that remains in working condition will be reallocated to other ongoing projects of the company.

#### **7.1.4.10 Other Infrastructure**

Semi-permanent structures will be established within the lease area to support mining operations. These will include mine offices, a storeroom, and a first-aid room, ensuring smooth administrative functioning and prompt response to any minor health incidents.

#### **7.1.4.11 Safety & Security**

Quarrying operations are proposed in elevated areas, thereby minimizing the risk of pit-related hazards. To ensure the safety of both humans and animals, barbed wire fencing will be installed around the quarry boundaries to prevent unauthorized entry and avoid untoward incidents in the quarry area.

#### **7.1.4.12 Social Impact Assessment R & R Action plan**

No Rehabilitation and Resettlement (R&R) is required for the proposed project, as there is no displacement of people or structures involved.

## 8 PROJECT BENEFITS

### 8.1 Benefits in Physical Infrastructure

- ▶ Developmental activities will be undertaken in nearby areas, aligned with the needs and priorities of the local communities.

### 8.2 Benefits in the Social Infrastructure

- ▶ Improvement in per capita income of the local population.
- ▶ Enhancement of the overall socio-economic conditions of nearby villages due to the proposed project.
- ▶ The project is environmentally compatible, financially viable, and will support the construction industry indirectly benefiting the wider community.
- ▶ Community development initiatives under Corporate Social Responsibility (CSR) and Corporate Environmental Responsibility (CER) will benefit nearby villages.
- ▶ As per O.M. F.No. 22-65/2017-IA.III dated 01.05.2018, 2.0% of the project cost is to be allocated for Corporate Environment Responsibility (CER) activities. Accordingly, an amount of Rs. 2.0 Lakhs will be spent towards the development of Veeranam Village Government Girls Higher Secondary School. Corporate Environmental Responsibility (CER) Plan details are provided in **Table 4-30**.
- ▶ The State Government will also benefit directly from the proposed mine, through increased revenue from royalties, CESS, DMF, GST etc.
- ▶ Improvement in communication, transport, education, community development and medical facilities and overall change in employment and income opportunity.

### 8.3 Employment potential- Skilled, Semi-Skilled and Unskilled

- ▶ The quarrying activity will generate employment opportunities, contributing to the economic development of the local population.
- ▶ Approximately 35 people will be directly employed in the quarry operations as skilled and unskilled workers.
- ▶ Around 20 individuals will benefit indirectly through allied services and support activities.
- ▶ The direct beneficiaries will include local people employed in mining operations in roles such as equipment operators, laborers, and maintenance staff.
- ▶ Provision for implementing fish culture (optional) will help in developing additional skills among local communities, especially for those in need.

## 9 ENVIRONMENTAL MANAGEMENT PLAN

### 9.1 Introduction

After the approval of the Environmental Impact Assessment (EIA) Management Plan, the following administrative framework will be established to ensure effective implementation of mitigation measures and monitoring of their effectiveness:

#### 9.1.1 Environmental Management Cell (EMC)

A dedicated Environmental Management Cell will be formed, comprising qualified personnel responsible for coordinating all environmental protection and management activities.

#### 9.1.2 Roles and Responsibilities

Clear roles and responsibilities will be assigned to designated staff for implementation of specific mitigation measures, compliance with legal requirements, and regular environmental monitoring.

#### 9.1.3 Standard Operating Procedures (SOPs)

SOPs will be developed for all major activities such as dust suppression, waste disposal, afforestation, noise and vibration control, and water quality management to ensure consistency and effectiveness.

#### 9.1.4 Monitoring Program

A comprehensive environmental monitoring schedule will be followed to track air, water, noise, and soil parameters, and assess the effectiveness of mitigation measures as provided in Chapter 6 of the EIA Report.

#### 9.1.5 Periodic Review and Reporting

Environmental performance will be reviewed periodically through internal audits and reports will be submitted to regulatory authorities as per stipulated timelines.

#### 9.1.6 Training and Capacity Building

Regular training sessions and awareness programs will be conducted for all levels of staff to ensure their involvement in environmental protection and sustainability.

#### 9.1.7 Grievance Redressal Mechanism

A structured system will be in place for recording and addressing public or worker grievances related to environmental aspects of the project.

#### 9.1.8 Third-party Audits and Review

Independent audits and reviews will be carried out periodically to ensure transparency, assess compliance, and recommend improvements where required.

### 9.2 Environmental Management Cell (EMC)

The Environment Monitoring Cell will ensure effective implementation of the environment management plan and ensure compliance of environmental statutory guidelines through Mine Management Level of the proposed quarry. The following responsibilities are provided to the team of EMC.

**Table 9-1 TAMIN Quarry Project: Designation and Responsibilities (for 13.74.0 Ha Black Granite Quarry)**

| S. No. | Designation                                          | Responsibility / Remarks                                                                                        |
|--------|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| 1      | General Manager (Quarries)                           | Zonal oversight; reporting to TAMIN HQ; overall monitoring of all quarry units under the division.              |
| 2      | Project Officer / Agent                              | Statutory head of the specific quarry lease as per MMR 1961; responsible for overall management and compliance. |
| 3      | Mines Manager (First Class / Second Class)           | Day-to-day quarry operations, safety, manpower, and reporting to Project Officer.                               |
| 4      | Geologist                                            | Supervision of granite quality, mapping, and geological documentation for mining and export purposes.           |
| 5      | Mining Engineer                                      | Production planning, drilling/blasting supervision, and haulage operations.                                     |
| 6      | Environmental Officer / EMC In-Charge/Duputy Manager | Implementation of EMP, baseline data monitoring, compliance with EC/CTO, liaison with TNPCB & SEIAA.            |
| 7      | Surveyor (Licensed)                                  | Lease boundary demarcation, surface plan preparation, and volume calculation as per mining plan.                |
| 8      | Mechanical Engineer                                  | Maintenance of machinery like excavators, compressors, cranes, DG sets, etc.                                    |
| 9      | Electrical Supervisor                                | Quarry lighting, DG sets, electrical panels, and ensuring statutory compliance under CEA rules.                 |
| 10     | Safety Officer (Certified)                           | Ensuring safety in blasting, slope stability, PPE usage; compliance under Metalliferous Mines Regulation.       |
| 11     | CSR & Admin Officer                                  | Monitoring CSR initiatives (like fencing, green belt), admin and public hearing coordination.                   |
| 12     | Blaster / Shot Firer (Licensed)                      | Handling and usage of explosives in granite blocks extraction, with DGMS license.                               |
| 13     | Medical / First Aid Officer                          | Onsite health care, medical records, and emergency preparedness.                                                |
| 14     | Accountant / Stores Officer                          | Handling quarry expenses, machinery logs, spare procurement, and statutory payment documentation.               |
| 15     | Data Entry / EMC Support Staff                       | Compilation of air, water, and noise monitoring data, health records, and compliance file maintenance.          |
| 16     | Green Belt Supervisor / Plantation Caretaker         | Supervising survival rate of saplings, watering and maintenance of green belt.                                  |

**9.2.1 Environmental 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 stretches beyond statutory obligations and we are committed to managing and continually improving 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 the objective of having no injuries and accidents in the workplace and providing a safe workplace for our employees,

contractors and others who perform their duties. We shall provide adequate Health care to our employees and create processes to reduce the adverse effect of the operations on the health of the employees.

- ▶ We provide safety appliances and continuous training in safety to our employees and contract workmen to ensure safe production and achieve the target of zero accidents. We are committed to supporting actions aimed at increasing employees' safety outside work hours.
- ▶ We continuously evaluate and improve our conduct and carry out regular audits, 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.

**The TAMIN has formulated well-planned and integrated Environmental policies as shown below:**

- ▶ M/s. Tamil Nadu Minerals Ltd is committed to welfare and development needs of the society around it.
- ▶ All rules and conditions prescribed in the Indian Mines Act, Metalliferous Mines Regulation etc., will be adopted to ensure risks-free and safe mining operations. All personal protective devices supplied to workers and staff should be used while they work in the mines and any violation in this respect will be dealt with, inflicting 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 hierarchical communicative channels from the lowest level to superior levels in a quick time bound duration.
- ▶ 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 and 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 Error! Reference source not found.

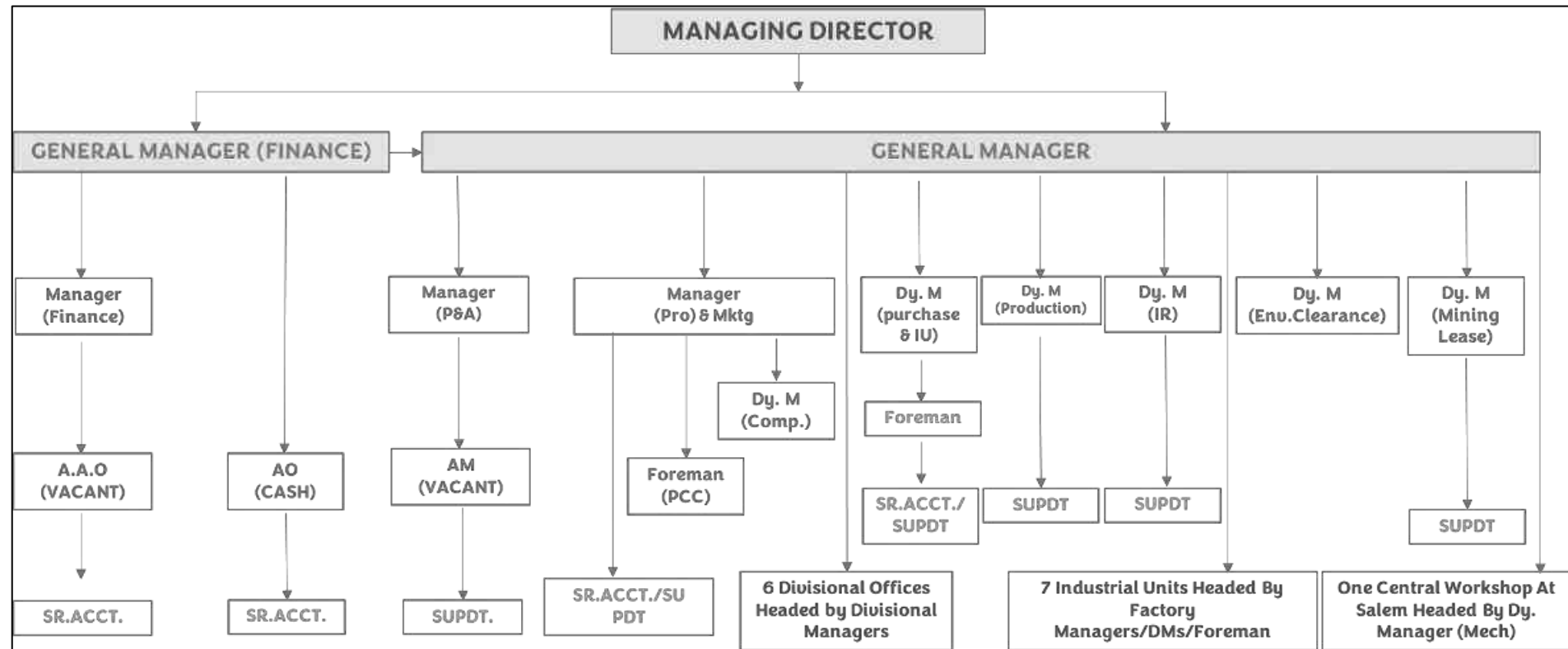


Figure 9-1 Hierarchical System of the TAMIN

### 9.3 Land Environment

The landscape will be slightly changed due to open cast quarry. There will be no land subsidence as the area is made up of hard rock. The aesthetic environment will not be affected, as the quarry is 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. The control measures and responsibility of EMC are provided below:

**Table 9-2 Responsibilities under EMC Land Environment Management**

| Control                                                                                                                                           | Responsibility             |
|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| Designing vehicle wash-down system so that all washed water is captured and passed                                                                | Mines Manager              |
| Re-fuelling will be carried out in a safe location, away from vehicle movement pathways                                                           | Mine Foreman & Mining Mate |
| No external dumping i.e., outside the project area                                                                                                | Mine Foreman               |
| Greenbelt on dumps and its maintenance                                                                                                            | Environment Officer        |
| Garland drains with catch pits to be provided all around the project area to prevent                                                              | Environment Officer        |
| The periphery of Project area will be planted with thick plantation to arrest the fugitive dust, which will also act as acoustic barrier          | Mines Manager              |
| Thick plantation using native flora species will be carried out on the backfilled area                                                            | Mines Manager              |
| There will be formation of a small surface water body in the mined-out area, which can be used for watering the greenbelt at the conceptual stage | Environment Officer        |

## 9.4 Air Quality Management

The Project Proponent proposes Open Cast Semi-mechanized mining operations involving both machinery and labor. Air pollution, particularly dust, will be generated during activities such as site preparation, drilling, blasting, mining, hauling, handling, and transportation of materials. Additionally, emissions from diesel vehicles and machinery will release pollutants such as SO<sub>2</sub> and NO<sub>x</sub>. The objective of the Environmental Management Plan (EMP) is to minimize air emissions and reduce their impact on ambient air quality in and around the mining site through well-implemented mitigation measures.

### 9.4.1 Emission Source Identification

The primary emission sources include:

- Activities related to pits and quarries include overburden operations, drilling, hauling, loading, and stockpiling.
- Emissions of PM and road dust due to HEMM & Mining Tippers.
- Emissions from generators, vehicles, and machinery.

### 9.4.2 Measures for Dust Suppression

- Water sprinkling on mine haulage roads and waste dumps using tankers at regular intervals.
- Drilling blast holes (32 mm dia) under wet conditions to prevent dust emissions.
- Water sprinkling at Tipper unloading points.
- Provision of respirators and dust masks to workers, especially drillers and loaders.
- Use of PUC-certified vehicles for transportation.
- Wet working faces before drilling and excavation.
- Periodic health checkups for workers.
- Plantation along approach roads and the periphery of the quarry lease area.
- Use of water tankers with spraying arrangements for dust suppression on haul roads.

### 9.4.3 Haulage Controls

- Regular maintenance of haul roads.
- Enforcement of speed limits for transport vehicles.
- Daily water spraying on roads using tankers.
- Periodic maintenance of transport trucks to reduce emissions.
- Avoidance of truck overloading.

### 9.4.4 Emission Controls for Material Handling

- Regularly wetting working faces before drilling and excavation.
- Provision of dust masks to drillers and loading workers.
- Periodic health checkups for workers.
- Plantation along approach roads and surrounding the quarry lease area.
- Use of water tankers with spraying arrangements for regular haul road sprinkling.

**Table 9-3 Responsibilities under EMC Air Environment Management**

| Measures                                               | Responsibility      |
|--------------------------------------------------------|---------------------|
| Water sprinkling on roads, dumps, and unloading points | Environment Officer |

|                                                      |                     |
|------------------------------------------------------|---------------------|
| Wet drilling and face preparation                    | Mines Manager       |
| Provision of dust masks and respirators              | Mine Foreman        |
| Health check-ups and safety measures for workers     | Environment Officer |
| PUC checks and maintenance of vehicles and equipment | Mining Mate         |
| Plantation and greenbelt development                 | Environment Officer |
| Monitoring speed limits and preventing overloading   | Mine Foreman        |

## 9.5 Noise Pollution Control and Ground Vibration and Fly Rock Control

In an operational mine major noise sources are the operation of mine machinery, equipment & playing vehicles. Noise generation may be for an instant, intermittent or continuous period, with low to high decibels.

**Table 9-4 General noise levels generated at mines**

| Equipment                         | NoiseLevel (dB(A)) |
|-----------------------------------|--------------------|
| RotaryDrills                      | 72-100             |
| Compressor(85M <sup>3</sup> /min) | 50-55              |
| Excavator                         | 75-90              |
| Diesel Tipper                     | 74-109             |
| Diesel Generator                  | 80-94              |

### Control Measures to be followed to control the level of Incremental Noise

- **Minimize Drilling Operations**  
Avoid unnecessary drilling and limit it to essential operational requirements only.
- **Use of PPEs (Earmuffs/Earplugs)**  
Provide earmuffs or earplugs to all workers operating in or near high-noise zones, particularly around drilling and generator areas.
- **Maintain Proper Haul Road Gradients**  
Designing and maintaining gentle gradients to reduce vehicle engine strain and associated noise.
- **Greenbelt Development**  
Dense plantations along the mining lease boundary to function as a natural sound barrier.
- **Use of Noise-Reducing Technology**  
Adoption of low-noise equipment such as Diamond Wire Saw machines and use of crack powder in place of conventional blasting, wherever feasible.
- **Restrict Noisy Activities to Daytime**  
Conduct drilling and blasting strictly during daytime hours and use sharp bits and optimized air pressure to reduce noise.
- **Acoustic Enclosures for Machinery**  
Enclose noise-emitting machines (e.g., compressors, diesel generators) in soundproof housings to limit ambient noise.

**Table 9-5 Responsibilities under EMC for Noise Level control in the project**

| Control Measure                                                | Responsible Person                          |
|----------------------------------------------------------------|---------------------------------------------|
| Limiting unnecessary drilling operations                       | Mines Manager                               |
| Issuance and monitoring of earmuff usage                       | Mine Foreman / Safety Officer               |
| Design and maintenance of haul road gradients                  | Mines Manager                               |
| Implementation and upkeep of greenbelt                         | Environment Officer                         |
| Deployment of low-noise technologies                           | Mining Engineer / Mines Manager             |
| Scheduling of blasting and ensuring optimal drilling practices | Mining Mate / Drilling Supervisor           |
| Installation and inspection of acoustic enclosures             | Environment Officer / Maintenance In-Charge |

**Table 9-6 Proposed Management Controls for Ground Vibration & Fly Rocks**

| Control                                                                                                                                                                                                                                         | Responsibility     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Controlled blasting using delay detonators will be carried out to maintain the PPV value (below 8 mm/s) well within the prescribed standards of DGMS.                                                                                           | Mines Manager      |
| Drilling and blasting during the initial stage will be carried out under the supervision of qualified persons.                                                                                                                                  | Mines Manager      |
| Proper stemming of holes should be carried out with statutory competent qualified blaster under the supervision of statutory mines manager to avoid any anomalies during blasting.                                                              | Mines Manager      |
| Prior to blasting within 500 meters of the lease boundary, establish a fly rock exclusion zone within adjacent properties and check with landholders that the area is not occupied by humans; blast clearance zones are applied for all blasts. | Mine Mate, Blaster |

## 9.6 Water Pollution Control Measures

Mining operations have minimal potential to impact surface water sources due to the absence of major streams or rivers in the vicinity. However, proactive control measures will be implemented to ensure that water quality in and around the lease area is preserved. The following measures are proposed to manage and mitigate water pollution risks.

### Surface Drainage Management

- Construct surface water ditches or channels to divert rainwater runoff toward agricultural lands, thus preventing water stagnation and erosion within the mine lease area.

Use of Mine Water Reuse mine water efficiently for:

- Mechanized cutting operations
- Wet drilling
- Dust suppression on haul roads and work areas
- Greenbelt development

### Dump Runoff Channelization

- Properly design and maintain drainage around overburden and waste dumps to prevent runoff from contaminating nearby areas.

**Domestic Wastewater Management**

- Install a septic tank followed by a soak pit to manage wastewater from sanitation facilities.
- Ensure regular maintenance and cleaning of the septic system to avoid overflow or leakage.

**Table 9-7 Responsibilities under EMC for Water Pollution and Management**

| Control Measure                                             | Responsible Person                            |
|-------------------------------------------------------------|-----------------------------------------------|
| Construction and maintenance of surface drains and channels | Mines Manager / Civil Supervisor              |
| Management and reuse of mine water for operational needs    | Mine Foreman / Water Management Officer       |
| Monitoring and guiding controlled runoff from dumps         | Environment Officer                           |
| Planning and execution of wet drilling and dust suppression | Mining Mate / Drilling Supervisor             |
| Maintenance of septic tank and soak pit system              | Housekeeping Supervisor / Environment Officer |
| Monitoring water quality in and around the site             | Environment Officer                           |

**9.7 Biological Environment**

Mining activities may lead to habitat disruption, soil erosion, and loss of flora and fauna if not managed properly. To minimize these impacts and promote ecological sustainability, the following mitigation measures are proposed under the Environmental Management Plan (EMP).

**► Wildlife Protection Measures**

- The project site is not located within any notified Wildlife Sanctuary, National Park, Tiger Reserve, or Elephant Corridor.
- A barbed wire fence will be erected around the mining area to prevent unintended wildlife entry and enhance safety.
- Mining activities will be conducted strictly between 6:00 AM to 6:00 PM to avoid disturbance to any nocturnal fauna.
- Controlled blasting techniques and restrictions on high-noise activities will be implemented to reduce vibrations and sound levels.
- Avoidance of forest roads for transportation of mining materials to protect forest integrity.

**► Greenbelt Development**

- A greenbelt with a minimum of 800 native saplings annually will be developed around the lease boundary.
- Plantation will serve as a buffer for wildlife movement and help in dust and noise attenuation.
- Lighting will be avoided during nighttime to prevent light pollution and disturbance to fauna.

► **Biodiversity Enhancement**

- As no major wildlife is reported within the lease area, focus will be on improving local biodiversity through afforestation and habitat restoration.

## 9.8 Afforestation along the Lease Area

Tree planting will be carried out along the boundary of the mining lease area and other disturbed zones. The plantation will be done using native species suited to local agro-climatic conditions.

► **Plantation Targets**

- As per the Mining Scheme, 800 trees will be planted.
- Considering an average survival rate of 50%, proper maintenance including watering, protection, and gap filling will be carried out.

► **Soil and Site Preparation**

- Available topsoil will be used to nourish plantations.
- Use of organic manure and mulching to enhance plant survival.

**Table 9-8 Responsibilities under EMC for conservation of Biological Environment and Afforestation**

| Control Measure                                       | Responsible Person                            |
|-------------------------------------------------------|-----------------------------------------------|
| Barbed wire fencing and protection of quarry boundary | Site Supervisor / Mines Manager               |
| Ensuring working hours compliance (6 AM to 6 PM)      | Mines Manager / Shift In-Charge               |
| Implementation of controlled blasting techniques      | Blasting Supervisor / Mining Engineer         |
| Avoiding forest road usage by mining vehicles         | Logistics/Transport In-Charge                 |
| Greenbelt and afforestation program planning          | Environment Officer / Plantation Consultant   |
| Procurement and planting of native species            | Horticulture Consultant / Environment Officer |
| Monitoring plant survival and replacing dead saplings | Plantation Supervisor                         |

## 9.9 Socio Economic Environment

Mining projects, while economically beneficial, can lead to socio-economic changes within nearby communities. The proposed plan aims to enhance the quality of life of residents in the surrounding villages through inclusive development initiatives, while minimizing any adverse effects.

### Proposed Control Measures and Initiatives

#### Social Development

- Employment opportunities for local residents in skilled and unskilled jobs related to mining and site maintenance.
- Support for skill development programs (e.g., masonry, tailoring, driving) to enhance long-term livelihoods.

#### Health & Hygiene

- Organize health camps and periodic medical check-ups for workers and nearby villagers.
- Provide Personal Protective Equipment (PPE) to all site workers.

- Implement and maintain safe drinking water facilities at the mine site and in nearby communities.
- Regular vector control and sanitation programs.

#### Infrastructure Development

- Assist in the repair or construction of rural roads, culverts, and community water storage.
- Upgradation of educational facilities like benches, books, or school maintenance in affected villages.
- Support for solar lighting, especially in public areas or community centers.
- Development of rainwater harvesting structures in collaboration with village panchayats.

#### Minimizing Disruptions

- Maintain regular communication with villagers to address grievances proactively.
- Ensure that transport routes avoid village centers to reduce traffic, dust, and noise.
- Restrict working hours to daytime operations only to maintain peace in surrounding habitations.

**Table 9-9 Responsibilities under EMC for Socio Economic Environment improvements**

| Initiative/Measure                                   | Responsible Person                              |
|------------------------------------------------------|-------------------------------------------------|
| Community liaison and grievance handling             | CSR/Community Relations Officer                 |
| Local employment and skill training coordination     | HR Manager / Site Manager                       |
| Health check-ups and sanitation drives               | Medical Officer / EMC Health & Safety In-Charge |
| Infrastructure support initiatives                   | CSR/Community Relations Officer                 |
| Monitoring transport-related disturbances            | Logistics Supervisor / Environment Officer      |
| PPE distribution and usage compliance                | Safety Officer                                  |
| Reporting and auditing of socio-economic initiatives | Deputy Manager/ EMC Coordinator / CSR Lead      |

### 9.10 Occupational Health & Safety Measures

The granite mining operations in the proposed semi-mechanized open cast setup are expected to have minimal health hazards, as granite stone does not contain toxic elements, and the mechanization level limits direct exposure. However, occupational health and safety (OHS) remains a critical component of environmental management and worker welfare.

#### Workplace Hazard Awareness

- Regular awareness programs on occupational risks and best practices.
- Display of safety instructions and emergency response charts at strategic locations.

#### Dust & Air Quality Control

- Conduct periodic air quality monitoring at work sites to ensure exposure levels remain within permissible limits.
- Use of wet drilling techniques and regular water sprinkling to suppress dust.

**Respiratory and PPE Provisions**

- Provide and enforce the use of adequate respiratory protection (masks, respirators).
- Ensure workers are equipped with helmets, ear plugs, gloves, and safety shoes based on job type.

**Medical Surveillance**

- Conduct pre-employment and periodic medical check-ups for all workers to track occupational health trends.
- Maintain individual medical records and ensure early detection of potential illnesses.

**Training & Capacity Building**

- Organize regular safety training sessions covering, proper use of Personal Protective Equipment (PPE)
- First aid and emergency response
- Safe handling of equipment and tools

**Emergency Preparedness**

- Equip the site with first-aid kits, fire extinguishers, and emergency contact info.
- Appoint a trained First Aid Officer at the site during all operational hours.

**Table 9-10 Responsibilities under EMC for Occupational Health and Safety**

| OHS Measure                                       | Responsible Person                              |
|---------------------------------------------------|-------------------------------------------------|
| Air quality monitoring and reporting              | Environment Officer / Health & Safety In-Charge |
| Distribution and enforcement of PPE usage         | Site Safety Officer                             |
| Periodic medical check-ups and record maintenance | Medical Officer / Site Health Supervisor        |
| Worker safety training sessions                   | EMC Coordinator / Safety Officer                |
| Emergency preparedness & first aid readiness      | First Aid Officer / Shift Supervisor            |
| Hazard awareness and signage implementation       | Environment Officer / Health & Safety In-Charge |

**9.10.1 Care and Maintenance during Temporary Discontinuance**

In the event of temporary discontinuance of quarry operations, the project will strictly adhere to the provisions of the Mines Act, 1952 and Rule 17 of the Granite Conservation and Development Rules, 1999 to ensure safe and secure maintenance of the site. The site will be properly secured and maintained in compliance with legal regulations during any period of inactivity.

**9.10.2 Safety and Security**

Once quarrying operations are complete, the excavated area will be properly fenced with controlled access, ensuring worker safety during the closure phase. A designated single entry/exit point will be created to regulate site access.

**9.10.3 Corporate Social Responsibility**

The project will allocate 2.5% of its annual profit towards CSR initiatives that directly benefit the neighborhood villages. These funds will be used for:

- Educational programs, such as scholarship funds for local students.
- Healthcare and sanitation improvement in the surrounding communities.

- Infrastructure development, such as road repairs and water supply systems.

#### 9.10.4 Corporate Environmental Responsibility

As per the MOEFCC Office Memorandum F-22-65/2017IA.III dated 1st May 2018, the project proponent has earmarked an investment of Rs. 1,99,940 (Say 2,00,000/-) (2% of total capital cost) for Corporate Environmental Responsibility (CER). and this budget is allocated for Veeranam Village Government High School.

**Table 9-11 Responsibilities under EMC for Socio economic benefit implementation**

| Socio-Economic Measure                                    | Responsible Person                     |
|-----------------------------------------------------------|----------------------------------------|
| Employment generation and skill development               | HR Manager / Community Liaison Officer |
| Compliance with Mines Act during temporary discontinuance | Mines Manager / Site Supervisor        |
| Safety and security during closure                        | Safety Officer / Site Manager          |
| CSR fund allocation and project implementation            | CSR Manager / EMC Coordinator          |
| Implementation of CER activities                          | Environment Officer / CSR Manager      |

#### 9.10.5 Budget for Environmental Protection

To ensure effective implementation of the Environmental Management Plan (EMP), a total budget has been allocated as follows:

- **Capital Cost:** Rs. 26,96,800/-
- **Recurring Cost:** Rs. 9,95,780/- per annum

This allocation covers expenses for pollution control measures, environmental monitoring, greenbelt development, occupational health and safety, waste management, and other environmental protection activities. Environmental Management costs are given in **Table 9-12**.

**Table 9-12 Environmental Management Plan Cost**

| Environmental Attribute | Mitigation Measure                                                                           | Provision for Implementation                                                                                                    | Capital | Recurring | Remarks                                                                                          |
|-------------------------|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|---------|-----------|--------------------------------------------------------------------------------------------------|
| Air Environment         | Compaction, gradation and drainage on both sides for Haulage Road                            | Rental Dozer & drainage construction on haul road @ Rs. 10,000/- per hectare; and yearly maintenance @ Rs. 10,000/- per hectare | 137400  | 137400    | Depends on area; both capital and recurring costs should be multiplied by the number of hectares |
|                         | Fixed Water Sprinkling Arrangements + Water sprinkling by own water tankers                  | Fixed Sprinkler Installation and New Water Tanker Cost for Capital; and Water Sprinkling (thrice a day) Cost for recurring      | 50000   | 25000     |                                                                                                  |
|                         | Air Quality will be regularly monitored as per norms within ML area & Ambient Area           | Yearly Compliance as per CPCB norms                                                                                             | 50000   | 5000      |                                                                                                  |
|                         | Muffle blasting – To control fly rocks during blasting                                       | Blasting face will be covered with sand bags / steel mesh / old tyres / used conveyor belts                                     | 0       | 0         |                                                                                                  |
|                         | Wet drilling procedure / latest eco-friendly drill machine with separate dust extractor unit | Dust extractor @ Rs. 25,000/- per unit deployed as capital & @ Rs. 2500 per unit recurring cost for maintenance                 | 150000  | 15000     | Depends on number of jack hammers deployed; capital and recurring costs are shown for 2 units    |
|                         | No overloading of trucks/tippers/tractors                                                    | Manual Monitoring through Security guard                                                                                        | 0       | 5000      |                                                                                                  |
|                         | Stone carrying trucks will be covered by tarpaulin                                           | Monitoring if trucks will be covered by tarpaulin                                                                               | 0       | 5000      |                                                                                                  |
|                         | Enforcing speed limits of 20 km/hr within ML area                                            | Installation of Speed Governors @ Rs. 5000/- per Tipper/Dumper deployed                                                         | 10000   | 10000     | Depends on number of tipper/dumpers deployed; capital costs are shown for 2 unit                 |
|                         | Regular monitoring of exhaust fumes as per RTO norms                                         | Monitoring of Exhaust Fumes by Manual Labour                                                                                    | 0       | 5000      |                                                                                                  |

|                          |                                                                                                                                          |                                                                      |       |        |  |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-------|--------|--|
|                          | Regular sweeping and maintenance of approach roads for at least about 200 m from ML Area                                                 | Provision for 2 labours @ Rs.10,000/labour (Contractual) per Hectare | 0     | 137400 |  |
|                          | Installing wheel wash system near gate of quarry                                                                                         | Installation + Maintenance + Supervision                             | 50000 | 20000  |  |
| <b>Noise Environment</b> | Source of noise will be during operation of transportation vehicles, HEMM for this proper maintenance will be done at regular intervals. | Provision made in Operating Cost                                     | 0     | 0      |  |
|                          | Oiling & greasing of Transport vehicles and HEMM at regular interval will be done                                                        | Provision made in Operating Cost                                     | 0     | 0      |  |
|                          | Adequate silencers will be provided in all the diesel engines of vehicles.                                                               | Provision made in Operating Cost                                     | 0     | 0      |  |
|                          | It will be ensured that all transportation vehicles carry a fitness certificate.                                                         | Provision made in Operating Cost                                     | 0     | 0      |  |
|                          | Safety tools and implements that are required will be kept adequately near blasting site at the time of charging.                        | Provision made in OHS part                                           | 0     | 0      |  |
|                          | Line Drilling all along the boundary to reduce the PPV from blasting activity and implementing controlled blasting.                      | Provision made in Operating Cost                                     | 0     | 0      |  |
|                          | Proper warning system before blasting will be adopted and clearance of the area before blasting will be ensured.                         | Blowing Whistle by Mining Mate / Blaster / Competent Person          | 0     | 0      |  |

|                                                               |                                                                                                    |                                                                                                                   |        |       |                                                                                               |
|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|--------|-------|-----------------------------------------------------------------------------------------------|
|                                                               | Provision for Portable blaster shed                                                                | Installation of Portable blasting shelter                                                                         | 50000  | 0     |                                                                                               |
|                                                               | Shot hole Blasting will be practiced to control Ground vibration and fly rocks                     | Rs. 30/- per 6 Tonnes of Blasted Material                                                                         | 0      | 0     |                                                                                               |
| <b>Water Environment</b>                                      | Water management                                                                                   | Provision for garland drain @ Rs. 10,000/- per Hectare with maintenance of Rs. 5,000/- per annum                  | 137400 | 68700 | Only capital costs depend on area; capital costs should be multiplied with number of hectares |
| <b>Waste Management</b>                                       | Waste management (Spent Oil, Grease etc.,)                                                         | Provision for domestic waste collection and disposal through authorized agency (Spent Oil, Grease etc.,)          | 25000  | 10000 |                                                                                               |
|                                                               |                                                                                                    | Installation of dust bins                                                                                         | 5000   | 1000  |                                                                                               |
|                                                               | Bio toilets will be made available outside mine lease on the land of owner itself                  | Provision made in Operating Cost                                                                                  | 0      | 0     |                                                                                               |
| <b>Implementation of EC, Mining Plan &amp; DGMS Condition</b> | Size 6' X 5' with blue background and white letters as mentioned in MoM Appendix II by the SEAC TN | Fixed Display Board at the Quarry Entrance as permanent structure mentioning Environmental Conditions             | 10000  | 3000  |                                                                                               |
|                                                               | Workers will be provided with Personal Protective Equipment's                                      | Provision of PPE @ Rs. 4000/- per employee with recurring based on wear and tear (say, @ Rs. 1000/- per employee) | 140000 | 35000 | Capital and recurring costs are shown for 35 employees; should be adjusted as per the actuals |
|                                                               | Health check up for workers will be provisioned                                                    | IME & PME Health check up @ Rs. 1000/- per employee                                                               | 35000  | 35000 | Recurring costs are shown for 35 employees; should be adjusted as per the actuals             |
|                                                               | First aid facility will be provided                                                                | Provision of 2 Kits per Hectare @ Rs. 2000/-                                                                      | 0      | 27480 | Depends on area; recurring costs should be multiplied with number of hectares                 |

|                               |                                                                                                                                                                                          |                                                                                                                                                                                                                         |        |        |                                                                                                  |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------|--------------------------------------------------------------------------------------------------|
|                               | Mine will have safety precaution signages, boards.                                                                                                                                       | Provision for signages and boards made                                                                                                                                                                                  | 10000  | 2000   |                                                                                                  |
|                               | Barbed Wire Fencing to quarry area will be provisioned.                                                                                                                                  | Per Hectare fencing Cost @ Rs. 2,00,000/- with Maintenance of Rs 10,000/- per annum                                                                                                                                     | 0      | 137400 | Depends on area; both capital and recurring costs should be multiplied by the number of hectares |
|                               | No parking will be provided on the transport routes. Separate provision on the south side of the hill will be made for vehicles /HEMMs. Flaggers will be deployed for traffic management | Parking area with shelter and flags @ Rs. 50,000/- per hectare project and Rs. 10,000/- as maintenance cost                                                                                                             | 687000 | 137400 | Depends on area; both capital and recurring costs should be multiplied by the number of hectares |
|                               | Installation of CCTV cameras in the mines and mine entrance                                                                                                                              | Camera 4 Nos, DVR, Monitor with internet facility                                                                                                                                                                       | 30000  | 5000   |                                                                                                  |
|                               | Implementation as per Mining Plan and ensure safe quarry working                                                                                                                         | Mines Manager (1st Class / 2nd Class / Mine Foreman) under regulation 34 / 34 (6) of MMR, 1961 and Mining Mate under regulation 116 of MMR,1961 @ 40,000/- for Manager & @ 25,000/- for Foreman / Mate                  | 0      | 40000  |                                                                                                  |
| <b>Green Belt Development</b> | Green belt development - 500 trees per one hectare (200 Inside Lease Area & 300 Outside Lease Area)                                                                                      | Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant (capital) for plantation inside the lease area and @ 30 per plant maintenance (recurring) | 340000 | 51000  |                                                                                                  |
|                               |                                                                                                                                                                                          | Avenue Plantation @ 300 per plant (capital) for plantation outside the                                                                                                                                                  | 780000 | 78000  |                                                                                                  |

|  |  |                                                          |           |          |  |
|--|--|----------------------------------------------------------|-----------|----------|--|
|  |  | lease area and @ 30 per plant<br>maintenance (recurring) |           |          |  |
|  |  |                                                          | 26,96,800 | 9,95,780 |  |

## 10 SUMMARY & CONCLUSION

### 10.1 Justification for the Project Implementation

An Environmental Impact Assessment (EIA) has been conducted to evaluate the proposed granite quarry project. This assessment was carried out in alignment with the Terms of Reference (ToR) and based on collected baseline environmental data for the region. The EIA identified potential environmental impacts and outlined appropriate mitigation strategies through a comprehensive Environmental Management Plan (EMP).

The impacts anticipated from the proposed quarrying activities are relatively minor and can be effectively managed through well-planned control measures. Given the project's limited environmental risks and its potential socio-economic benefits, the initiative is considered both feasible and advantageous for regional development.

The Environmental Management Plan for the project will address the following components:

- Soil Pollution and Control Measures
- Air Pollution Management
- Noise Control Measures
- Solid and Hazardous Waste Management
- Water Pollution Prevention and Management

To ensure systematic and effective implementation, an Environmental Management Cell (EMC) will be established.

### 10.2 Mitigation of Anticipated Adverse Impacts

The proposed granite quarry is expected to generate moderate environmental impacts, all of which can be effectively mitigated through a comprehensive Environmental Management Plan (EMP). Key concerns include emissions of particulate matter from operations like drilling, blasting, and transportation, as well as runoff-induced water pollution and habitat disturbances.

To address air quality impacts, measures such as wet drilling, controlled blasting, and routine water sprinkling on roads and work areas will be adopted. Dust and noise will be further controlled through greenbelt development within and around the lease area using native species. Surface runoff will be managed through the construction of garland drains, catch pits, and stormwater bunds, while rainwater harvesting structures will help in groundwater recharge. Noise levels are currently within the prescribed CPCB standards, and the use of noise-compliant equipment and PPE like earplugs and earmuffs will ensure occupational safety. In terms of biodiversity, the project site does not intersect with any ecologically sensitive zones, and protective steps such as afforestation and fencing will help reduce any localized disturbances. From a socio-economic standpoint, the project promises direct and indirect employment, improved local infrastructure, and community development through CSR and CER commitments.

To further enhance environmental safeguards, advanced methods like diamond wire saw cutting, NONEL blasting, and non-explosive rock-breaking agents will be employed to reduce vibrations, fly rock, and dust. With baseline environmental parameters well within permissible limits, the planned mitigation strategies aim to maintain environmental quality and ensure regulatory compliance throughout the quarry lifecycle.

Additionally, as discussed in Chapter 10, an Environmental Management Cell (EMC) will be constituted. This cell will be responsible for:

- Monitoring and implementing EMP measures
- Ensuring compliance with environmental regulations
- Overseeing environmental performance across air, water, and land components

With minimal anticipated impacts and robust mitigation in place, the project is expected to foster employment, improve local infrastructure, and enhance the socio-economic condition of nearby communities. Considering these benefits, the proposed project may be recommended for Environmental Clearance.

## 11 DISCLOSURE OF CONSULTANTS

### 11.1 Consultant Details

For obtaining Environmental Clearance from the State Environment Impact Assessment Authority (SEIAA), Tamil Nadu, the project proponent has engaged Environmental Consultants accredited by the National Accreditation Board for Education and Training (NABET) under the Quality Council of India (QCI), New Delhi. The responsibility for conducting baseline studies and preparing the EIA/EMP report under the B1 Violation category has been assigned to M/s. EHS360 Labs Pvt. Ltd., Chennai, which holds NABET accreditation for Schedule 1(a): Mining of Minerals, Category B projects, and vide Certificate No. NABET/EIA/22-25/SA 0233, valid up to 24.06.2025.

The Terms of Reference (ToR) for the project were granted under Identification No. TO25B0108TN5444492N, dated 13/05/2025 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.

### 11.2 Brief and Nature of Consultancy

M/s. EHS360 Labs Pvt. Ltd. (EHS) is a leading environmental consultancy firm in India, offering comprehensive solutions in the field of environmental management. The organization is accredited by the National Accreditation Board for Education and Training (NABET) for conducting Environmental Impact Assessment (EIA) studies and facilitating Environmental Clearances across multiple sectors, including Sectors 1, 7, 8, 21, 29, 38, and 39.

In addition to EIA consultancy, EHS provides a wide array of services, including environmental monitoring and analysis, environmental audits, risk assessment studies, turnkey environmental solutions, operation and maintenance (O&M) of environmental systems, and facilitation of statutory approvals from regulatory bodies such as the Ministry of Environment, Forest and Climate Change (MoEFCC) and State Pollution Control Boards (SPCBs).

The valid NABET accreditation certificate is appended at the end of this chapter for reference.

### 11.3 Team Member for EIA report

In addition to the approved experts for NABET, the following members are also involved in the EIA as Team Member/FAA to build their competencies for handling sector 1 projects and functional areas

#### 11.4 EIA Team Members

| Name of Internal Team Member | Activity / Area                         | Involvement – Actual Work Performed                                                                                                                  | Under Approved Expert |
|------------------------------|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Mr. Santhosh Kumar A         | Air Quality Modelling & prediction (AQ) | Assisted with FAE & Coordination for data collection, Secondary data analysis, and validating primary data. coordination with FAEs and team members. | Ms. Tushali Jagwani   |
| Mrs. Tatiparthi Rajani       | Air Quality Modelling & prediction (AQ) | Assisted with FAE & Coordination for data collection, Secondary data analysis, and validating primary data. coordination with FAEs and team members. | Ms. Tushali Jagwani   |

## 11.5 Copy of QCI NABET Accreditation



भारतीय गुणवत्ता परिषद्  
**QUALITY COUNCIL  
OF INDIA**  
Creating an Ecosystem for Quality



**National Accreditation Board for Education and Training**

**Certificate of Accreditation**

**EHS360 Labs Private Limited**

Old No.8/2, New No. 10/2, 50th Street, 7th Avenue, Ashok Nagar, Chennai -600083, Tamil Nadu

*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 opencast & underground                                                                                                                                                                                 | 1               | 1 (a) (i) | A    |
| 2.    | Mineral beneficiation                                                                                                                                                                                                               | 7               | 2 (b)     | B    |
| 3.    | Metallurgical industries (Ferrous & Non-ferrous)                                                                                                                                                                                    | 8               | 3 (a)     | B    |
| 4.    | Synthetic organic chemicals industry (dyes & dye intermediates; bulk drugs and intermediates excluding drug formulations; synthetic rubbers; basic organic chemicals, other synthetic organic chemicals and chemical intermediates) | 21              | 5 (f)     | B    |
| 5.    | Airports                                                                                                                                                                                                                            | 29              | 7(a)      | A    |
| 6.    | Building and construction projects                                                                                                                                                                                                  | 38              | 8 (a)     | B    |
| 7.    | 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 February 04, 2025, posted on QCI-NABET website.*

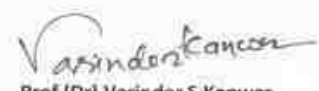
*The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no. QCI/NABET/ENV/ACC/25/3534 dated March 6, 2025. The accreditation needs to be renewed before the expiry date EHS360 Labs Private Limited, Chennai following due process of assessment.*

Valid up to  
**June 24, 2025**

Issue Date  
**March 06, 2025**



Certificate No.  
**NABET/EIA/22-25/SA 0233**



**Prof (Dr) Varinder S Kanwar**  
CEO - NABET

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

END OF THE REPORT