DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

For

Proposed Siruvalai Black Granite quarry over an extent of 20.28.0 ha

At
Survey No.: 170/1 (Part)
Siruvalai Village
Vikravandi Taluk
Villupuram District
Tamil Nadu State

By

M/s. Tamil Nadu Minerals Limited
No. 31, Kamarajar Salai
Chepauk
Chennai – 600 005

(Project termed under Schedule of 1(a) Mining of Minor Minerals 'B1' category as per EIA Notification 2006 and its Amendments & Project falls under Violation category as per S.O. 804 (E) dated 14th March 2017)

Proposal No: SIA/TN/MIN/435461/2023
ToR : SEIAA-TN/F.No.3888/SEAC/ToR-1533/2023 Dated: 09.08.2023
Baseline Period: March 2023- May 2023

EIA Consultant & Laboratory
M/s. HUBERT ENVIRO CARE SYSTEMS (P) LTD, CHENNAI
NABET Certificate No & Validity: NABET/EIA/24-27/RA 0335, valid up to 31.03.2027
NABL Certificate No: TC-12310 Dated: 25.09.2023 Valid Till 24.09.2025

July 2024

Name of the Client	:	M/s. Tamil Nadu Minerals Limited
Name of the Project	:	Proposed Siruvalai Black Granite Quarry over an Extent of 20.28.0 Ha
Name of the report	:	Draft EIA Report

Project No: H/01/2023/CON/011	**Document No:** RP003

Revision details: Reviewed before PH submission

R0	9.07.2024	1st Submission	P.V.R.Surendra	PVRSurendra	Mr.Vamsee Krishna		Dr.J.R. Moses	
Rev No.	**Date**	**Details**	**Name**	**Sign**	**Name**	**Sign**	**Name**	**Sign**
			Prepared by		**Checked by**		**Approved by**	

ACKNOWLEDGEMENT

The following personnel are gratefully acknowledged for their fullest support in collection, compilation of needful data regarding the project and kind cooperation in fulfilling the report on Environmental Impact Assessment (EIA) report for **Siruvalai Black Granite Quarry over an extent of 20.28.0 Ha** at Survey No.170/1 (Part), Siruvalai Village, Vikravandi Taluk, Villupuram District, and Tamil Nadu State.

M/s. Tamil Nadu Minerals Limited,

1) Dr. E Ganesan- Deputy Manager (ML)

M/s. Hubert Enviro Care Systems Private Limited,

1) Dr. J R Moses (CEO)
2) Dr. Raj Kumar Samuel (Director – Technical)
3) Mr. Vamsee Krishna Navooru (Head Consultant)

Declaration by the Project Proponent

I, Dr. E Ganesan, Deputy Manager (ML) of M/s Tamil Nadu Minerals Limited, declaration/ undertaking that owing the contents (information and data) of the EIA report preparation has been undertaken in the compliance with Terms of Reference (ToR) for the "**Siruvalai Black Granite Quarry over an extent of 20.28.0 Ha"** at Survey No.170/1 (Part), Siruvalai Village, Vikravandi Taluk, Villupuram District, and Tamil Nadu State and the information and content provided in the report are factually correct.

For Tamil Nadu Minerals Ltd,

Authorised Signatory
Dr.E.Ganesan,
Deputy Manager (ML)
TAMIN- Chennai.

Declaration by the Head of the Accredited Consultant Organization

I, Dr.J.R. Moses, hereby, confirm that the below mentioned experts prepared the EIA/EMP for Revised Schme of Mining for **Siruvalai Black Granite Quarry over an extent of 20.28.0 Ha** at Survey no.170/1 (Part), Siruvalai Village, Vikravandi Taluk, Villupuram District, and Tamil Nadu State. I also confirm that I shall be fully accountable for any misleading information mentioned in this statement.

Signature:

Date: 26.07.2024

Name: Dr.J.R.Moses

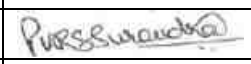
Designation: Chief Executive Officer

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

NABET Certificate No & Validity: NABET/EIA/24-27/RA 0335, valid up to 31.03.2027

Declaration of Experts contributing to the EIA

I, hereby, certify that I was involved in the EIA report for the **Proposed Siruvalai Black Granite Quarry over an extent of 20.28.0** Ha at Survey no.170/1 (Part), Siruvalai Village, Vikravandi Taluk, Villupuram District, and Tamil Nadu State. I was a part of the EIA team in the following capacity that developed the above EIA with the support of the following Functional Area Experts.

EIA Coordinator	
Name:	Mr. PVRS. Surendra
Signature:	
Date:	26.07.2024
Period of Involvement:	February 2023 to Till date

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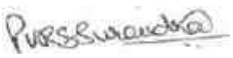
Functional Area Experts (FAEs)

S. No.	Functional Areas	Name of the Expert	Period of Involvement	Signature
1.	WP	Mr. Vamsee Krishna Navooru	**Period : February 2023 to Till date** **Task:** Selection of surface and ground water quality monitoring locations, and interpretation of analysis results. Identification and quantification of impacts and proposed suitable control measures and Environmental Management Plan.	
2.	SE	Mr. V. Dhivakar	**Period : February 2023 to Till date** **Task:** Site visit, Collection of secondary data, discussion with stake holders and Preparation of socio -economic status of the study area. Review of demographic characteristics, and supervision of baseline data collection. Collection and analysis of perception study carried out for the proposed project.	

S. No.	Functional Areas	Name of the Expert	Period of Involvement	Signature
3.	EB	Dr. Rajkumar Samuel	**Period: February 2023 to Till date** **Task:** Primary ecological survey and assessment of flora and fauna with respect to the core and buffer zone in study area and development of EMP. Collection of data from secondary sources and comparing with field data, compilation of Ecology and bio diversity data and their impact assessment on the study area.	
4.	LU	Mr. Venkateswarlu	**Period : March 2023 to May 2023** **Task :** Development of land use maps of study area using GIS / related tools, site visit for ground reality survey, finalization of land use maps and studying the ecologically sensitive details in the study area as per Topo map and Gazette notifications.	
5.	AP	Mr. PVRS Surendra	**Period: February 2023 to Till date** **Task:** Selection of air quality monitoring location, and interpretation of ambient air quality results. Estimation of fugitive emissions, identification and assessing of impacts due to air pollution and suggested suitable mitigation measures.	
6.	AQ	Dr. J R Moses	**Period: February 2023 to Till date** **Task:** Collection and developing of micro-meteorological data from secondary sources, preparing site specific wind rose pattern, prediction of dispersion of pollutants and incremental pollution levels with air quality modelling. Identification of impacts and proposed the suitable control measures, development of EMP.	
7.	NV	Mr. Vamsee Krishna Navooru	**Period: March 2023 to May 2023** **Task:** Identification of noise monitoring locations and measured the ambient noise levels & vibrations generated due to various activities. Identifying the probable impacts due to noise & vibrations and suggested noise pollution control measures along with environmental management plan.	

S. No.	Functional Areas	Name of the Expert	Period of Involvement	Signature
8.	GEO	B. Mallikarjuna Rao	**Period: March 2023 to May 2023 Task:** Studying the site topography, geology, geomorphological analysis, and existing available mineral resources. Studying of ground profile, assessing of environmental impacts due to proposed activity and proposed suitable mitigation measures	
9.	HG	Mr.PVRS Surendra	**Period: February 2023 to Till date Task**: Identification of ground water potential in the study area, analysis of surface hydrogeological data, its flow rate and direction. Preparation of report with respect to hydrogeological condition in and around the study area	
10.	SC	Dr. B.C. Nagaraja	**Period: March 2023 to May 2023 Task:** Identification of soil quality monitoring locations, assessing of soil nutrients/characteristics in the study area, assessing the impacts on soil and proposing the soil management practices during construction and operation phase of project.	
11.	SHW	Mr. Vamsee Krishna Navooru	**Period: February 2023 to Till date Task:** Quantification of Municipal solid waste and hazardous waste generation and suggesting management measures, methodologies for handling, treatment, disposal and storage of generated wastes.	
12.	RH	Dr. J R Moses	**Period: February 2023 to Till date Task:** Identification of hazardous materials, fire accidents within the facility and validation of existing risk assessment & Disaster management plan along with the preparation of risk assessment report for the proposed unit with consequence analysis and mitigation measures.	

S. No	Name	Role
1.	PVRS Surendra	TM for WP
2.	Abraham Abishek Moses	TM for AP & WP
3.	Pravina Rachel Moses	TM for EB & WP

4.	Dr Ramrajan S	TM for EB
5.	Chelladurai S	TM for SE
6.	Prabu M	TM for SHW
7.	Praveenkumaar R	TM for EC
8.	Monadevi M	TM for EC
9.	Mahadevi T	FAA for AP & AQ
10.	Uma Maheshwari P	TM for LU

LU - Land Use
AP - Air Pollution monitoring, prevention and control
AQ - Meteorology, air quality modeling and prediction
WP - Water pollution monitoring, prevention and control
EB - Ecology and biodiversity
NV - Noise& Vibration
SE - Socio-economics
HG - Hydrology, ground water and water conservation
GEO - Geology
RH - Risk assessment and hazards management
SHW - Solid and hazardous waste management
SC - Soil Conservation

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List of Annexure

Annexure No	Name of the Annexure
1	ToR
2	Precise area communication letter
3	Violation ToR obtained from SEIAA
4	Department of Geology and Mining Plan Approval Letter
5	Mining Plan
6	Sectional Plates of Mining plan
7	FMB Sketch
8	Copy of A Register
9	NoC Letter from AD Mines

List of Abbreviations

AAQ	Ambient Air Quality
AAQM	Ambient Air Quality Monitoring
AGL	Above Ground Level
ARL	Above Roof Level
AMSL	Above Mean Sea Level
BGL	Below Ground Level
CPCB	Central Pollution Control Board
CSR	Corporate Social Responsibility
DMP	Disaster Management Plan
EAC	Expert Appraisal Committee
EIA	Environmental Impact Assessment
EMC	Environmental Management Cell
EMP	Environmental Management Plan
ETP	Effluent Treatment Plant
GLC	Ground Level Concentration
GO	Government Order
ISO	International Organization for Standardization
kWh	Kilowatt Hour
MMR	Metalliferous Mines Regulations
MoEF &CC	Ministry of Environement Forest & Climate Change
NAAQ	National Ambient Air Quality
PCU	Passenger Car Unit
R & D	Research & Development
RA	Risk Assessment
ROM	Run of Mines
SOM	Scheme of Mining
SEIAA	State Environmental Impact Assessment Authority
SEAC	State Expert Appraisal Committee
TAMIN	Tamil Nadu Minerals Limited
TDS	Total Dissolved Solids
TNPCB	Tamil Nadu Pollution Control Board
ToR	Terms of Reference
kVA	kilo Volt Ampere

Executive Summary

1. INTRODUCTION

The proposed "Siruvalai Black Granite Quarry over an extent of 20.28.0Ha" is located at S.F.No.170/1 (Part), Siruvalai Village, Vikravandi Taluk, Villupuram District, Tamil Nadu State. The project falls under Schedule 1(a) Mining of Minor Minerals, B1 category as per EIA Notification 2006 and its amendments thereafter.

Government of Tamil Nadu granted quarry lease to TAMIN for quarrying black granite quarry over an extent 20.28.0Ha Government poramboke land in SF No.170/1of Siruvalai Village, Vikravandiupuram Taluk and District, for 20 years under Rule 8-C of Tamil Nadu Minor Mineral Concession Rules, 1959 vide reference G.O.Ms. No.285 Industries (MME1) Department, dated. 28.12.1995. The lease period was valid up to 24.07.2016.

Subsequently, TAMIN applied for renewal of lease on 14.05.2015 under Rule 8-C of Tamil Nadu Minor Mineral Concession Rules, 1959 vide TAMIN Letter Rc No.518/ML3/2015, dt.14.05.2015. As per the MoEF&CC Notification dated 14.09.2006, the lease was considered as ongoing project as the lease was granted before 14.09.2006 i. Hence, no EC is required.

Meanwhile, Hon'ble National Green Tribunal (NGT) Principle Bench, New Delhi passed an order that the existing mining lease holder would also have to comply with the requirement of obtaining Environmental Clearance from the competent authorities in accordance with law vide NGT judgement dated 13.01.2015.

In accordance with the above judgment, TAMIN applied for EC along with processing fee for an amount of Rs.1 lakh (Rupees One lakh only) by means of demand draft bearing No.195662 dated 04.09.2015 drawn at Indian Bank, Triplicane branch, Chennai in favour of the Member Secretary, SEIAA, Tamil Nadu. In meanwhile SEIAA returned the said proposal as the SEIAA/SEAC was not re-constituted in Tamil Nadu State.

Hence, TAMIN applied to MoEF & CC for obtaining the Environmental Clearance vide Proposal No: IA/TN/MIN28993/2015 as per the NGT Principal Bench Judgment on 13.01.2015. Meanwhile, SEIAA was re-constituted vide Notification S.O No. 219 dated 12.08.2015. TAMIN applied the same proposal to SEIAA vide SEIAA-TN/F.No.3888/2015 dated 09.09.2016.

While the EC proposal of the subject area was under process, at SEIAA level, it was informed by MoEF&CC that the projects without obtaining prior environmental clearance from the authority concerned shall be considered a case of violation as per MoEF&CC Notification S.O. 804(E) dated 14.03.2017

Based on the application, SEIAA has referred the application to AD (Mines) for further clarification vide Letter No.SEIAA-TN/3888/2016. However, Mining lease was expired on 24.07.2016. Further, SEIAA informed that TAMIN has to submit the certain details within 30 days from the date of receipt of

this letter under both violation or non-violation categories and the reply is not received within the stipulated time it would be construed that you are not interested vide SEIAA –TN/F.3888/2016/NGT, dt.28.10.2020

Accordingly, TAMIN replied that as the lease renewal application of TAMIN is under active consideration at Government, we request the Member Secretary, SEIAA that EC application of TAMIN may please be kept alive and further we request not to forfeit the processing fee of Rs.1 lakh (Rupees one lakh) only vide TAMIN's Letter Rc No. 3447/ML3/2015, dt. 30.11.2020

Meanwhile, as stated by the District Collector, TAMIN has operated the quarry during 15.01.2016 to 10.01.2017 without obtaining prior Environmental Clearance and obtained transport permit of 374.016 M^3 of black granite. So the Collector issued demand notice for remittance of 100% cost of minerals to get NOC from Department of Geology and Mining for getting environmental clearance. Hence, TAMIN remitted Rs.78,66,679/- towards penalty at 100% cost of the mineral and obtained NoC from DGM vide Letter Rc No.18/MM4/2020 dated 03.07.2020.

Government of Tamil Nadu, Industries, Investment Promotion & Commerce (MME.1) Department, issued the precise area communication has been granted vide Letter No.3492325/MME.1/2022-1,dated:13.01.2023. Precise area communication letter is enclosed as **Annexure –2**. As directed in the precise area communication letter, Mining plan was submitted by TAMIN and the same approved by Department of Geology and Mining vide Rc.No.5480/MM4/2022, dated, 19.05.2023 for geological reserves of 3,65,797m^3 and mineable reserves of 33,155m^3 and the same is enclosed as **Annexure - 3**.

TAMIN applied the proposal under violation category for obtaining Terms of Reference vide SIA/TN/MIN/435461/2023, dated 30.06.2023 in accordance with MoEF&CC Office Memorandum F. No. 22-10/2019-IA.III. Accordingly, the proposal was appraised during 395th SEAC meeting held on 27.07.2023 and 645th SEIAA meeting held on 09.08.2023 and Violation ToR was issued Lr No. SEIAA-TN/F.No.3888/SEAC/ToR-1533/2023 dated: 09.08.2023.

As per issued ToR under violation category, the Draft EIA report will be submitted to Tamil Nadu Pollution Contorl Board for Public Hearing. Public Hearing minutes along with compliance will be incorporated in the final EIA report and will be submitted for the appraisal of the proposed project in Tamil Nadu SEAC /SEIAA for seeking EC.

Table- 1 Salient Features of the Project Site

Survey No.	S.F.No.170/1(Part)
Village	Siruvalai Village
Taluk and District	Vikravandi Taluk, Villupuram District
State	Tamil Nadu
Toposheet No.	D44T8,12&C44B5,9
Latitude	12°01'36.8679" N to 12°02' 02.7900" N
Longitude	79°25'53.4838" E to 79°26'21.9508" E
Extent Area	20.28.0 Ha
Land Classification	Government Poramboke Land
Lease Period	20 years
Geological Reserves (ROM)	3,65,797m^3
Mineable Reserves (ROM)	33,155m^3
Production Capacity (ROM)	33,000m^3(Recovery @10%-3,300m^3)
Depth of Mining	24m BGL
Method of Mining	Open cast semi mechanized method
Nearest NH/SH Roads	SH-135(Villupuram-Tiruvannamalai) at ~2.39km, S NH-38 (Vellore-Thoothukudi) at ~2.39km, S
Nearest Railway station	Mundiyampakkam at ~8.61km, ESE
Nearest Airport	Puducherry Airport at ~40.19km, E
Nearest Town	Villupuram at ~9.50km, SSE
Water Requirement	1.5KLD
Power Requirement	60kVA
Fuel Requirement	200 liters/day
Depth of Water Table	8.3m

2. PROJECT DESCRIPTION

2.1 Method of Mining

The quarrying operation is being carried out by open cast semi-mechanized method with development of HEMM for development and production activities under Regulation106.

Conceptual Quarry Plan

The Geological reserve of black granite was computed based on the geological plan & sections. The estimated geological reserve was 3,65,797m^3. Mineable Reserves have been computed as 33,155 m^3.

The proposed production capacity is (ROM) 33,000m^3. The annual peak production will be 2,000m^3 at 10% recovery. The total production at 10% recovery is 3,300m^3 and granite waste will be 29,700m^3.

Table 2 Proposed Production Plan

S. No	Year	ROM (m^3)	Recovery@10% (m^3)	Granite Waste @ 90 % (m^3)
1	1st Year	4,000	400	3,600
2	2nd Year	20,000	2,000	18,000
3	3rd Year	3,000	300	2,700
4	4th Year	3,000	300	2,700
5	5th Year	3,000	300	2,700
Total		**33,000**	**3,300**	**29,700**

Table-3 Proposed Generation of Waste

Year	ROM (m^3)	Saleable Mineral (m^3)	Over Burden (m^3)	Side Burden (m^3)	Granite Rejects (m^3)
First	4,000	400	--	306	3,600
Second	20,000	2,000	--	4,572	18,000
Third	3,000	300	--	--	2,700
Fourth	3,000	300	--	--	2,700
Fifth	3,000	300	--	--	2,700
Total	**33,000**	**3,300**	**--**	**4,878**	**29,700**

2.2 Waste Management

Total waste produced during this mining period will be around 29,700m^3. An area of 1.45.0Ha will be used for waste dump. The total waste material will be dump in the centre and North west portion of the mining lease area. The dump will be maintained not exceeding 5m height and the slope angle will be at 45°.

2.3 Greenbelt Details

The total area for the proposed green belt is 0.06.50Ha during 5 years of the proposed quarrying activity and it is proposed to plant 300 no's of trees within the 7.5m safety buffer zone mine lease area.

Table-4 Proposed Greenbelt Details

Year	No of trees proposed to be planted	Area to be covered in m^2	Name of the species to be plant	Survival rate expected in %	No of trees expected to be grown
2023-28	300	650	Neem, pungam, vengai	80	240

2.3 Man power Requirement

Manpower details are given in below table.

Table 5 Manpower Details

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

2.4 List of Equipments

The list of Equipment is given in below table.

Table 6 List of Machineries

S. No	Machinery	Capacity	Numbers
1	Excavator	300 LC	1
2	Compressor	400 cfm	2
3	Dumpers	25 Tonnes	2
4	Diamond wire saw	30 m^3/day	1
5	Jack Hammers (32mm dia.)	1.2 to 6m	6
6	Diesel Generator	125 kVA	1
7	Tractor Mounted Air Compressor		1

2.5 Land Use Pattern

Land Use Pattern of the Mining Lease area is given in below **Table-7.**

Table-7 Land Use Pattern of the Mining Lease area

S.No	Description	Present area (Ha)	Proposed Mining Plan Period in Ha	Area at the end of the quarry (Ha)
1.	Area under quarrying	3.77.0	0.15.5	3.92.5
2.	Waste Dump	1.22.0	1.45.0	2.59.0
3.	Infrastructure	0.02.5	--	0.02.5
4.	Mine approach Road	0.32.0	--	0.32.0
5.	Village Road	0.40.0	--	0.40.0
6.	Afforestation	0.20.0	0.06.5	0.26.5
7.	Unutilized	14.34.5	12.67.5	12.75.5
Total		**20.28.0**	**14.34.5**	**20.28.0**

3.IMPACTS AND MITIGATION MEASURES

Impacts due to Mining Activity

Various environmental impacts which have been identified due to the mining operations are discussed in the following sections.

3.1 Soil Environment

3.1.1 Impacts

Potential impacts on land environment are envisaged due to hazardous and non-hazardous wastes generated in the project site like municipal waste from domestic use and waste oil from DG set and the other machineries.

3.1.2 Mitigation Measures

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

3.2 Land Environment

3.2.1 Impacts

The impact on land will be due to the following:

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

3.2.2 Mitigation Measures

- Dust suppression using water tankers.
- Greenbelt around infrastructure within the mine lease area and along the periphery of the mine lease area by using native plants.

3.3 Air Environment

3.3.1 Impacts on Air Environment

The major sources of air pollution due to mining operations are DG sets, Machineries and Vehicular transportation. The activities causing air pollution due to the mining operations will be excavation, drilling, blasting and transportation. The sources of air emission are given below in **Table 8**

Table-8 Sources of air pollution

S. No	Source of emission	Pollutant

1.	Excavation of Granite	PM
2.	DG Set	PM,NO_X,SO_X
3.	Transportation of Granite	PM,NO_X

3.3.2 Mitigation measures

The mitigation measures for the impacts due to the proposed mining activity in air environment is given below.

Table-9 Dust control measures in quarry

S. No	Operation or source	Control options
1	Drilling	➢ Liquid injection (water) ➢ Drills should be provided with dust extractors(dry or wet system). ➢ Providing PPE for workers.
2	Blasting	➢ Use of control blasting technique ➢ Water spray before blasting ➢ Water spray on blasted material prior to transportation
3	Loading	➢ Water spray
4	Hauling (emissions from roads)	➢ Water spray, treatment with surface agents, soil stabilization, Traffic control.
5	Transportation of mined material	➢ Covering of the trucks to avoid spillage ➢ Compacted haul road ➢ Speed control on vehicles ➢ Development of a green belt of suitable width on both sides of road.

3.4 Air Quality Modelling:

Total maximum GLCs from emissions as given below:

Table -10 Total maximum GLCs from emissions

Pollutant	Max. Base Line Conc. ($\mu g/m^3$)	Estimated Incremental Conc. ($\mu g/m^3$)	Total Conc. ($\mu g/m^3$)	NAAQ standard
PM	53.82	0.20	54.02	100
SO_2	9.29	0.03	9.32	80
NO_X	18.59	0.10	18.69	80

The maximum ground level concentration observed due to mining activities for PM, SO_2 and NO_x are 54.02$\mu g/m^3$, 9.32$\mu g/m^3$, and 18.69$\mu g/m^3$ respectively.

3.5 Impacts due to Transportation

The granite will be transported through existing road by tippers and approximate number of trips required is 2 times per week. The vehicular movement for the proposed project is given in **Table-11.**

Table-11 Traffic Volume after Implementation of the Project

For the Road	Volume of Traffic	Volume (V)	Road Capacity (C)	V/C Ratio	LOS Category*	Traffic Classification
Existing	4003	4589	15000	0.31	"A"	Free Flow
After implementation	4007	5943	15000	0.31	"A"	Free Flow

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

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

3.5.1 Mitigation Measures

- Regular water sprinkling on haul and access roads.
- Greenbelt development along the haul roads, dumps and along the boundaries of the lease area.
- Covering of the trucks to avoid spillage.

3.6 Wastewater Generation

There is no process effluent generation. The domestic sewage of 0.4 KLD will be disposed through septic tank followed by soak pit.

3.6.1 Mitigation Measures

3.6.1.1 Surface Water Pollution Control Measures

- Construction of garland drains of suitable size around mine area and dumps to prevent rain water entering into active mine areas.
- The dumping will be provided with slopes to prevent erosion. The dumps will be covered with grasses, shrubs, mulching, etc, to prevent erosion, till final backfilling of dumps into mined pit areas.

3.6.1.2 Ground Water Pollution Control Measures

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

3.6.1.3 Rain Water Harvesting

The rainwater will be diverted by garland drains to the mining pit within the mine lease. The stored water will be used for agriculture activities.

3.6.1.4 Mitigation Measures

- Construct barriers at suitable intervals along the path of the drains.
- Provide necessary overflow arrangement to maintain the natural drainage system.

3.7 Impact of Noise / Vibrations & Mitigation Measures

3.7.1 Impact of Noise

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

- Transportation vehicles
- Loading & unloading of minerals
- Drilling
- Controlled Blasting

3.7.2 Mitigation Measures

Following mitigation measures should be taken to control noise pollution:

- Wherever the noise levels exceed 85 dB (A), workers should be provided with earmuffs, ear plugs etc.
- All vehicles and machinery will be properly lubricated and maintained regularly.
- Speed of the Vehicles entering and leaving the quarrying lease will be limited to 25 kmph.
- Unnecessary use of horns by the drivers of the vehicles shall be avoided.
- Controlled blasting with proper spacing, burden and stemming will be maintained
- The blasting will be carried out during favourable atmospheric condition and less human activity timings.

3.7.3 Impact of Vibration

The vibration during the moment of machinery will be minimal for a short span that will be well within the prescribed limits.

3.7.4 Mitigation Measures

- Proper quantity of explosive, suitable stemming materials and appropriate delay system are to be adopted for safe blasting.
- Using $CaOH_2$- rock Breaking Powder for splitting of rocks instead of conventional blasting
- Safe blasting zones are kept around the periphery of the quarry.
- Proposed peripheral green belt will be developed in 7.5m safety zone around the quarry.

3.8 Impact on Human Settlement

- There are no monuments or places of worships in mine area. Ground vibration and noise pollution is maintained minimal and confined to the mine area. The quality of water both surface and ground water is good and all parameters of drinking water are as per IS standards. Water quality analysis will be carried out at periodical intervals during post monitoring.
- PM, NO_x and SO_2 have been observed to be below the prescribed limit. Noise levels have also been found to be below the permissible limits at all the locations

3.8.1 Mitigation Measures

- As preventive measures, greenbelt development around the mine lease area will be further strengthening for control of air emission to environment. The noise generated in the lease area will get attenuated due to plantation all around the lease area.
- All the employees will be periodically medically examined.

3.9 Biological Environment

3.9.1 Mining activities and their impact on biodiversity

Mining activity and their impacts on biodiversity is given below.

Table -12 Impacts on Biodiversity

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

3.9.2 Mitigation Measures

To reduce the adverse effects on flora/fauna status that are found in project area due to deposition of dust generating from mining operations, water sprinkling / water spraying systems and development of greenbelt will be ensured in all dust prone areas to arrest dust generation. Also The proponent has proposed a sum of Rs. 5,35,000/-for the "Schedule – I species" conservation plan under the following heads for the Schedule -1 Species including Shikra (*Accipiter badius*) and Peafowl (*Pavo Cristatus).*

3.10 Impacts on Occupational Health due to project operations

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

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

3.10.1 Mitigation Measures for Occupational Health

The mitigation measures of occupational health and safety is given below.

Table-13 Mitigation for occupational health and safety

S. No	Activity	Mitigation measures
1	Excavation	➢ Planned excavation, avoid haphazard mining
2	Drilling and blasting	➢ In addition, the operators and other workers should be provided with masks, helmets, gloves and earplugs. ➢ Wet drilling method will be adopted.
3	Safety zone	➢ Provisions for a buffer zone between the local habitation and the mine lease in the form of a green belt of suitable width. ➢ Restricted entry, use of sirens and cordoning of the lasting area are some of the good practices to avoid accidents.
4	Overburden stabilization	➢ Accidents are known to happen due to overburden collapse. ➢ Therefore, slope stabilization and dump stability are critical issues for safety and environment. Proper measures will be taken care.
5	Worker's health surveillance	➢ Health survey programmes for workers and local community. ➢ Regular training and awareness of employees to be conducted to meet health and safety objectives.

3.10.2 Mitigate Measures for Safety Aspects

- To reduce pollution emanation from quarry operations, carry out splitting of sheet rock by diamond wire saw which largely reduces the dust and noise generation.
- Water sprinkling on haul roads and dumping yards, etc.
- Greenbelt development wherever possible to arrest dust and reduce noise propagation.

- All staff and workers will be provided with PPE.
- 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.

4. PROECT COST & ESTIMATED TIM E OF COMPLETION

4.1 Project Cost

The estimated project cost is given below

Table-14 Project cost

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

4.2. Proposed schedule for approval and implementation

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

Table-15 Project schedule

Particulars	Time Schedule
Submission of Draft EIA/EMP to TNPCB for Public Hearing	July 2024
Conduction of Public Hearing and submitting final EIA/EMP	September 2024
Presentation before SEAC and Obtaining EC	November 2024

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

4.3 **CER Activity**:

TAMIN is proposing for following list of activities for the Siruvaliai Government Higher Secondary School for Rs.4.0 Lakhs. Based on O.M F.No. 22-65/2017-IA.III 2.0% of the Project Cost need to be spent for CER activities i.e., Rs. 2.0 Lakhs need to be spent for the CER activity. However TAMIN proposing for Rs. 4.0Lakhs which is 4.0% of Project cost.

5. MINING CLOSURE PLAN

5.1 Progressive Mine Closure Plan

As a petro genetic character the depth persistence of the Black Granite body in the mine lease area is beyond the workable limits. Based on the statutory provisions of mine safety rules and regulations the workable depth is proposed for 24m BGL. However in course of time there is a possibility of up gradation of technology for safe mining beyond 24m. Hence it is proposed not to backfill the ultimate pit. The Pit boundaries shall be safely fenced with 7.5m buffer safety zone and rain water or seepage water stored in the pit will be used for agriculture purpose. Green belt development will be maintained in the 7.5m buffer safety zone. Garland drain will be constructed around the quarry area to prevent surface run off rain water entering to the pit. When the reserves will be completely exhausted, the mine closure plan will be prepared and submitted to the competent authority to obtain approval and the same will be implemented.

6. REHANILITATION AND RESETTLEMENT

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

7. SITE ANALYSIS

Environmental sensitive such as water bodies, reserved forest, wildlife sanctuary, national park, human settlements and other ecological features are given below.

7.1 Environmentally/Ecologically Sensitive areas

The environmental sensitive areas covering an aerial distance of 15 km from the project boundary is given in below table.

Table – 16 Lists of Water Bodies

S.No	Water bodies	Distance (~km)	Direction
1.	Stream	Within the Site	
2.	Pond near Kunnatturtangal	0.39	N
3.	Pond near Dharmapuri	0.40	E
4.	Siruvalai Lake	0.73	W
5.	Adanur Lake	1.12	SE
6.	Viramur Lake	1.54	W
7.	Vengandur Lake	2.40	S
8.	Anniyur Lake	4.85	NW
9.	Pambai Ar	6.10	SW
10.	Puttimedu Lake	6.56	SE

11.	Pappanappattu Eri	6.77	E
12.	Pambai Vaykkal	9.45	SW
13.	Panamalai Eri	9.45	NW
14.	Varaha Nadi	9.78	E
15.	Ponnaiyar River	13.2	SSW
16.	Nandan Kava	13.22	NW
17.	Panambattu Lake	13.28	SSE
18.	Pillaiyarkovil Odai	13.98	W
19.	Vidur Dam	14.90	ENE

Table – 17 Lists of Monuments

S.No	Monuments	Distance(~km)	Direction
1.	Rock cut Pallava Temple	8.41km	NNE
2.	Talagiriswara Temple and a Cave containing an image of Durga and Pallava inscriptions together with adjacent-land	9.76km	NW
3.	Sri Brahmapuniswara Temple	10.51km	NNE
4.	Sri Pataleswara Temple	10.57km	NNE
5.	Melvalai Blood Art Stone	10.75km	W
6.	Sri Azhagiya Narasimma Perumal Temple	11.75km	NNE

Table – 18 Lists of Reserved Forests

S.No	Reserved Forests	Distance(~km)	Direction
1	Odaiyanattam RF	9.96	WNW
2	Melkondai RF	11.21	E
3	Tandavasamudram RF	11.36	NW
4	Gengavaram RF	11.95	WNW
5	Karai RF	14.02	N

Table – 19 Lists of Nearby Habitations

S.No	Reserved Forests	Distance(~km)	Direction	Population
1.	Kunnatturtangal	0.16	NE	225
2.	Dharmapuri	0.21	E	750
3.	Siruvalai	0.33	W	2,414
4.	Arumpuri	1.01	S	492
5.	Kundalappuliyur	1.15	NE	1,850

8 BASELINE STUDY

8.1 Study Period:

The baseline environmental surveys were carried out during March 2023 – May 2023 within the study area.

8.2 Ambient Air Quality

The ambient air quality has been monitored at 8 locations for 13 parameters as per NAAQS, 2009 within the study area.

Table – 20 Summary of Ambient Air Quality Monitoring

S.No	Parameters (µg/m³)	Minimum of Average	Maximum of Average	NAAQ Standards
1.	PM_{10} (µg/m³)	28.27	53.82	100
2.	$PM_{2.5}$ (µg/m³)	16.80	32.29	60
3.	SO_2 (µg/m³)	5.44	9.29	80
4.	NO_2 (µg/m³)	10.87	18.59	80

8.3 Noise Environment

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

Table – 21 Summary of Noise Monitoring

S.No	Noise level in dB(A) Leq		CPCB Standards	Environmental Setting
1.	Minimum	Maximum		
2.	57.7		75 dB(A) Day	Industrial
3.	49.3		70 dB(A) Night	
4.	51.9	53.8	55 dB(A) Day	Residential
5.	41.4	43.8	45 dB(A) Night	

8.4 Water Quality

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

8.4.1 Surface water quality

Table – 22 Summary of Surface Water Quality Monitoring

S.No	Parameters	Minimum	Maximum	IS 2296:1992 Standards
1.	pH	7.23	8.21	6.5 – 8.5
2.	TDS (mg/l)	269	449	500
3.	COD (mg/l)	16	24	-
4.	BOD (mg/l)	2	4	2
5.	Total Hardness	156	237	-

8.4.2 Ground Water Quality

Table – 23 Summary of Ground Water Quality Monitoring

S.NO	Parameters	Minimum	Maximum	IS 10500: 2012 Standards	
				Acceptable Limit	Permissible Limit
1.	pH	6.94	7.78	6.5 – 8.5	NR
2.	Total Dissolved Solids (mg/l)	491	692	500	2000
3.	Total Hardness (mg/l)	232	479	200	600

8.5 Soil Quality

Soil sampling was carried out at eight locations in the study area. The summary of the soil quality is given below

Table – 24 Summary of Soil Quality Monitoring

S.No	Parameters (µg/m³)	Minimum	Maximum
1.	pH	6.84	7.74
2.	Electrical conductivity (µmho/cm)	249	378
3.	Nitrogen (mg/kg)	5.2	12.5
4.	Phosphorus (mg/kg)	55.9	75.4

9. WASTE HANDLING

9.1 Solid Waste Management

The municipal solid waste generation and disposal details are given in **Table-25**.

Table-25 Municipal Solid Waste generation & Disposal

S. No	Type	Quantity Kg/day	Disposal method
1	Organic	8.1	Municipal bin
2	Inorganic	5.4	TNPCB authorized recyclers
Total		**13.5**	

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

9.2 Hazardous waste Management

The hazardous waste details and mode of disposals are given in **Table-26**

Table-26 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

10 POST PROJECT MONITORING

10.1 Post Project Environmental Monitoring

The Project proponent set up regular monitoring stations to assess the quality of the environment.

Table-27 Post Project Environmental Monitoring Program

S. No	Area of Monitoring	Number of Sampling Stations	Frequency of Sampling	Parameters to be Analyzed
1.	Meteorology	One	Hourly and Daily basis.	Wind speed and direction, Temperature, Relative Humidity, Atmospheric pressure, Rainfall.
2.	Ambient Air Quality	2 Stations (In downwind)	Twice a week:24 hourly period	PM_{10}, $PM_{2.5}$, SO_2, and NO_2
3.	Noise	2 (two within core area and two in buffer area)	Once every season	Ambient Equivalent continuous Sound Pressure Levels (Leq) at day and Night time.
4	Exhaust from DG set	Stack of DG set	Quarterly	PM_{10}, $PM_{2.5}$, SO_2, and NO_2
5	Vehicular Emissions	Parking area	Periodic monitoring of vehicles	Air emission and noise, PCU
6	Soil	Two Locations within the Project Site	Yearly Once	Physico chemical properties, Nutrients, Heavy metals
7	Terrestrial Ecology	Within 10km around the project	Once in three years	Symptoms of injuries on plants
8	Surface/ Ground water quality	Two Locations(within core area)	Yearly Once	As per ISO 10500 2012 & IS 2296 -1992 Standard parameters

11. DAMAGE ASSESSMENT REPORT

The TAMIN has operated this Siruvalai Black Granite quarry (over an area of 28.20.5 Ha) without prior Environment clearance from the period of 15.01.2016-10.01.2017 within the existing quarry depth of 10m in North East Pit and 4m in North West Pit excavated quantity of 347.016 m^3,as per the letter given by Director of Department of Geology and Mining, vide Rc.No. 18/MM4/2020 dated: 03.07.2020 and remitted Rs.78,66,679/- towards penalty at 100% cost of the mineral.. Hence The Damage Assessment for the violation period has been calculated for the period from 15.01.2016-10.01.2017 for 320days as per MOEF&CC SOP O.M F.No. 19-125/2019-IA.III Dated 5th March 2020. Based on the above said notification guidelines the Damage Assessment has been calculated on six following aspects.

1. Air Environment
2. Water Environment

3. Green Belt
4. Noise and Vibration Environment
5. Solid Waste Management
6. Land Environment

Also the economic benefits based on the turnover of the quarried quantity and the arrived Damage Cost. The penalty provision has been calculated based on the O.M F.No. 22-21/2020-IA.III Dated 07.07.2021. A maximum of 3.0% of the net profit as computed will be added to the total damage cost and will be used for community resource augmentation. The proponent did not sell any quarried granite blocks. Hence the turnover is zero. The Damage Assessment cost, Penalty need to be paid to TNPCB for the violation were summarized in below **Table -28.**

Table -28 Summary of Damage Assessment

S. No	Damage Assessment Cost in Lakhs (Rs)	Remediation Plan, Natural Resource & Community Resource Augmentation Plan Cost in Lakhs (Rs)	Penalty for violation cost in Lakhs (Rs)
1.	15,98,305	15,98,305	99,970

12. CONCLUSION

The "Proposed Siruvalai Black Granite Quarry over an extent of 20.28.0Ha**"** will be beneficial for the development of the nearby villages. Due to this proposed quarry, 30 no's of employment potential will be deployed which increase the social benefits of nearby villages. Environmental aspects like dust emission, noise, siltation due to surface run-off, etc. will have to be controlled within the permissible limit to avoid impacts on the surrounding environment. Necessary pollution control equipment like water sprinkling, plantation, personal protective equipment, etc., will form regular practice in the project. Additional pollution control measures and environmental conservation measures will be adopted to control/minimize impacts on the environment and socio-economic environment of the area. Measures like development of greenbelt along with haul road and periphery of the lease boundary will be created. The CER measures proposed to be adopted by the proponent will improve the social and economic status of the nearby villages.

1 INTRODUCTION OF THE PROJECT

1.1 Purpose of the Report

The proposed Siruvalai Black Granite Quarry over an Extent of 20.28.0Ha at S.F.No.170/1 (Part), Siruvalai Village, Vikravandi Taluk, Villupuram District, Tamil Nadu State. The land use classification of the project site is Government Poramboke land.

The project falls under B1 Category, Schedule 1(a) Mining of Minerals as per MoEF&CC notification and its amendment vide S. O. 804(E) dated 14th March 2017 for the ROM of 33000 m^3 and the production quantity at 10% recovery is 3,300m^3. TAMIN commenced the mining operation without prior environmental clearance from 15.01.2016 to 10.01.2017 under MoEF notification dated 14.09.2006. Hence, this is a violation project.

The ToR application was submitted under violation (Category B1, Schedule 1(a)) at TN-SEIAA vide proposal No.SIA/TN/MIN/435461/2023 & File No.SEIAA-TN/F.No.3888/2023 and ToR was obtained under Violation category vide Lr No. SEIAA-TN/F.No.3888/SEAC/ToR-1533/2023 dated: 09.08.2023. As per issued ToR the Draft EIA report has been prepared and submitted to Tamil Nadu Pollutiion Contorl Board for Public Hearing. Public Hearing Minutes along with compliance will be incorporated in final EIA and will be submitted for the appraisal of the proposed project in Tamil Nadu SEAC /SEIAA for seeking Environmental Clearance.

1.2 Project Background

1.3 Identification of Project & Project Proponent

Government of Tamil Nadu granted quarry lease to TAMIN for quarrying black granite quarry over an extent 20.28.0Ha Government poramboke land in SF No.170/1of Siruvalai Village, Villupuram Talukm and District, for 20 years under Rule 8-C of Tamil Nadu Minor Mineral Concession Rules, 1959 vide reference G.O.Ms. No.285 Industries (MME1) Department, dated. 28.12.1995. The lease period was valid up to 24.07.2016.

Subsequently, TAMIN applied for renewal of lease on 14.05.2015 under Rule 8-C of teh Tamil Nadu Minor Mineral Concession Rules, 1959 vide TAMIN Letter Rc No.518/ML3/2015, dt.14.05.2015. As per the MoEF&CC Notification dated 14.09.2006, the lease was considered as ongoing project as the lease was granted before 14.09.2006 i.e.22.03.1999. Hence, EC is not required.

Meanwhile, Hon'ble National Green Tribunal (NGT) Principle Bench, New Delhi passed an order that the existing mining lease holder would also have to comply with the requirement of obtaining Environmental Clearance from the competent authorities in accordance with law vide NGT judgement dated 13.01.2015.

In accordance with the above judgment, TAMIN applied for EC along with processing fee processing fee for an amount of Rs.1 lakh (Rupees One lakh only) by means of demand draft bearing No.195662 dated 04.09.2015 drawn at Indian Bank, Triplicane branch, Chennai in favour of the Member Secretary, SEIAA, Tamil Nadu vide TAMIN Letter Rc No.3447/ML3/2015, dt.08.09.2015. In turn SEIAA returned the said proposal as the SEIAA/SEAC was not re-constituted in Tamil Nadu State.

Hence, TAMIN applied to MoEF & CC for obtaining the Environmental Clearance vide Proposal No: IA/TN/MIN28993/2015 as per the NGT Principal Bench Judgment on 13.01.2015, Meanwhile, SEIAA was re-constituted vide Notification S.O No. 219 dated 12.08.2015. TAMIN applied the same proposal to SEIAA vide SEIAA TN F.No.3888/2015 dated 09.09.2016.

While the EC proposal of the subject area was under process, at SEAA level, it was informed by MoEF&CC that the projects without obtaining prior environmental clearance from the authority concerned shall be considered a case of violation as per MoEF&CC Notification S.O. 804(E) dated 14.03.2017. In accordance with above Notification, TAMIN applied for EC under violation category to MoEF&CC.

Based on the application, SEIAA has referred the application to AD (Mines) for further clarification vide Letter No.SEIAA-TN/3888/2016. However, Mining lease was expired on 24.07.2016. Further, SEIAA informed that TAMIN has to submit the certain details within 30 days from the date of receipt of this letter under both violation or non-violation categories and the reply is not received within the stipulated time it would be construed that you are not interested vide SEIAA –TN/F.3888/2016/NGT, dt.28.10.2020

Accordingly, TAMIN replied that as the lease renewal application of TAMIN is under active consideration at Government, we request the Member Secretary, SEIAA that EC application of TAMIN may please be kept alive and further we request not to forfeit the processing fee of Rs.1 lakh (Rupees one lakh) only vide TAMIN's Letter Rc No. 3447/ML3/2015, dt. 30.11.2020

Meanwhile, as stated by the District Collector, TAMIN has operated the quarry during 15.01.2016 to 10.01.2017 without obtaining prior Environmental Clearance and obtained transport permit of 374.016 M^3 black granite. So the Collector issued demand notice for remittance of 100% cost of minerals to get NOC from Department of Geology and Mining for getting environmental clearance. Hence, TAMIN remitted Rs.78,66,679/- towards penalty at 100% cost of the mineral and obtained NoC from DGM vide Letter Rc No. 18/MM4/2020 dated 03.07.2020.

Government of Tamil Nadu, Industries, Investment Promotion & Commerce (MME.1) Department, issued the precise area communication has been granted vide Letter No.3492325/MME.1/2022-1,dated:13.01.2023. Precise area communication letter is enclosed as **Annexure –2.** As directed in the precise area communication letter, Mining plan was submitted by TAMIN and the same approved by Department of Geology and Mining vide Rc.No.5480/MM4/2022, dated, 19.05.2023 for geological

reserves of 3,65,797m^3 and mineable reserves of 33,155m^3 and the same is enclosed as **Annexure - 3**.

TAMIN applied the proposal under violation category for obtaining Terms of Reference vide SIA/TN/MIN/435461/2023, dated 30.06.2023 in accordance with MoEF&CC Office Memorandum F. No. 22-10/2019-IA.III. Accordingly, the proposal was appraised during 395th SEAC meeting held on 27.07.2023 and 645th SEIAA meeting held on 09.08.2023 and Violation ToR was issued Lr No. SEIAA-TN/F.No.3888/SEAC/ToR-1533/2023 dated: 09.08.2023. As per issued ToR the Draft EIA report will be submitted to Tamil Nadu Pollution Contorl Board for Public Hearing. Public Hearing minutes along with compliance will be incorporated in the final EIA report and will be submitted for the appraisal of the proposed project in Tamil Nadu SEAC /SEIAA for seeking EC.

1.3.1 Identifirtcation of Project

The proposed Black Granite Mine is over an Extent of 20.28.0 ha located in S.F.No.170/1 (Part), located at Siruvalai Village, Vikravandi Taluk, Villupuram District, lies in the latitude from 12° 1'40.5904"N to 12° 02'02.5112"N and longitude from 79°25'53.4838"E to 79°26'21.9508"E . The area is marked in the survey of India Topo sheet No.D44T8,12&C44B5,9. The Black granite quarrying operation is proposed to carry out by opencast semi mechanized method by formation of benches. Benches are proposed with a height of 6m & width bench not less than the height. The area applied for quarry lease is exhibits hilly terrain; the altitude of the area is above ~64 m AMSL.

1.3.2 Project Proponent

Tamil Nadu Minerals Ltd also called TAMIN (An Undertaking of Government of Tamil Nadu) has been established in the year 1978 and it entered the international granite market in the year 1979 and has secured a steady market for dimensional blocks of black and other color materials in countries like Japan, Germany, Italy, Australia, UK, Switzerland, Holland, USA etc. TAMIN 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), Kashmir white (Leptynite), Paradiso (Migmatite gneiss), Green onyx (Syenite - porphyry) Red wave (Pink Feldspathic gneiss) Colombo Juparana (Pegmatitic granite gneiss of migmatitic origin), Raw silk (Yellow feldspathic Lepthnite) and a number of other colored granite varieties apart from other industrial minerals viz. quartz and feldspar, graphite, lime stone, silica sand, vermiculite, etc.

1.4 Brief Description of Nature of the Project

The project falls under B1 Category since the area of the proposed project is more than 5Ha, Schedule 1(a) Mining of Minerals as per MoEF&CC notification.

1.5 Land Acquisition Status

The proposed project site area of 20.28.0Ha is a Government Poramboke Land. It is a fesh lease, the proponent has applied for lease on 14.02.2022 and obtained Precise Area Communication Letter No. TAMIN vide Government Industries, Investment Promotion & Commerce (MME.1) Department,Letter No.3492325/MME.1/2022-1,dated:13.01.2023.

1.6 Size and Location of the Project

The total lease area for this proposed quarry is 20.28.0Ha and is located at S.F.No.170/1 (Part), Siruvalai Village, Vikravandi Taluk, Villupuram District, Tamil Nadu State. It is lies in the latitude range from 12°01'36.8679" N to 12°02' 02.7900" N and longitude from 79°25'53.4838" E to 79°26'21.9508" E. Land is classified as Government Poramboke land.

The Geological reserve of black granite was computed based on the geological plan & sections. The estimated geological reserve was 3,65,797m^3. Mineable Reserves have been computed as 33,155 m^3. The proposed production capacity ROM is 33,000m^3. The annual peak production will be 2,000m^3 at 10% recovery. The total production at 10% recovery is 3,300m^3 and granite waste will be 29,700m^3 with the proposed depth of 24m below ground level.

The area is marked in the survey of India Topo sheet No.D44T8,12&C44B5,9. Site Elevation is ~64m AMSL. The site co-ordinates are given in below table.

Table 1-1 Coordinates of the Project Site

S. No	Latitude (N)	Longitude (E)	S.No	Latitude (N)	Longitude (E)
BP1	12° 02'02.2915"	79°26'00.3132"	BP66	12° 01'53.3492"	79°25'57.6509"
BP2	12° 02'01.2205"	79°26'02.9691"	BP67	12° 01'56.1412"	79°25'58.4106"
BP3	12° 02'02.7900"	79°26'03.8962"	BP68	12° 01'57.6359"	79°25'56.4511"
BP4	12° 02'02.5112"	79°26'04.4101"	BP69	12° 01'58.9782"	79°25'56.9863"
BP5	12° 02'00.5536"	79°26'05.8790"	BP70	12° 01'59.1394"	79°25'58.9680"
BP6	12° 02'00.7778"	79°26'06.1288"	BP71	12° 01'57.1607"	79°26'01.4561"
BP7	12° 01'59.7466"	79°26'07.7563"	BP72	12° 01'57.2705"	79°26'02.6960"
BP8	12° 01'58.9649"	79°26'07.7110"	BP73	12° 01'59.1639"	79°26'03.5473"
BP9	12° 01'59.0286"	79°26'06.8450"	BP74	12° 01'59.2426"	79°26'04.4782"
BP10	12° 01'57.6281"	79°26'06.0483"	BP75	12° 01'57.9598"	79°26'05.2570"
BP11	12° 01'57.0287"	79°26'09.2522"	BP76	12° 01'54.9881"	79°26'04.1126"
BP12	12° 01'56.3755"		BP77	12° 01'54.6042"	79°26'02.5118"

		79°26'13.0121"			
BP13	12° 01'56.6716"	79°26'13.2722"	BP78	12° 01'53.1784"	79°26'01.6668"
BP14	12° 01'55.5865"	79°26'15.6251"	BP79	12° 01'53.3907"	79°26'00.4629"
BP15	12° 01'55.5958"	79°26'17.3021"	BP80	12° 01'47.6693"	79°25'56.2456"
BP16	12° 01'54.9256"	79°26'17.5097"	BP81	12° 01'47.7234"	79°25'56.7835"
BP17	12° 01'51.6466"	79°26'16.3425"	BP82	12° 01'48.9055"	79°25'57.5078"
BP18	12° 01'51.3414"	79°26'16.2352"	BP83	12° 01'48.8726"	79°25'58.0021"
BP19	12° 01'50.7175"	79°26'15.2244"	BP84	12° 01'52.2824"	79°25'59.8508"
BP20	12° 01'49.5878"	79°26'14.7560"	BP85	12° 01'52.1218"	79°26'01.0641"
BP21	12° 01'49.7257"	79°26'14.1625"	BP86	12° 01'52.9971"	79°26'02.2192"
BP22	12° 01'47.4926"	79°26'13.4927"	BP87	12° 01'53.4116"	79°26'02.3304"
BP23	12° 01'46.9623"	79°26'14.5685"	BP88	12° 01'53.4370"	79°26'02.5856"
BP24	12° 01'46.7083"	79°26'16.1986"	BP89	12° 01'54.6168"	79°26'03.9981"
BP25	12° 01'47.6363"	79°26'16.8744"	BP90	12° 01'54.1869"	79°26'04.7403"
BP26	12° 01'47.8425"	79°26'16.6621"	BP91	12° 01'57.0550"	79°26'05.6104"
BP27	12° 01'48.1762"	79°26'16.9885"	BP92	12° 01'56.7951"	79°26'06.3188"
BP28	12° 01'47.5041"	79°26'17.9098"	BP93	12° 01'56.1059"	79°26'09.2169"
BP29	12° 01'45.5884"	79°26'17.2303"	BP94	12° 01'54.7832"	79°26'08.2970"
BP30	12° 01'44.4325"	79°26'15.7148"	BP95	12° 01'54.1953"	79°26'09.7483"
BP31	12° 01'42.0609"	79°26'15.3226"	BP96	12° 01'53.2838"	79°26'09.8075"
BP32	12° 01'40.5648"	79°26'15.4094"	BP97	12° 01'53.4941"	79°26'08.0759"
BP33	12° 01'40.4988"	79°26'15.7068"	BP98	12° 01'53.4442"	79°26'03.8551"
BP34	12° 01'39.5428"	79°26'17.5551"	BP99	12° 01'50.2450"	79°26'03.2111"
BP35	12° 01'38.8206"	79°26'19.7559"	BP100	12° 01'50.6149"	79°26'01.4715"
BP36	12° 01'37.0823"	79°26'21.9508"	BP101	12° 01'49.8138"	79°26'01.0597"
BP37	12° 01'36.8679"	79°26'21.6752"	BP102	12° 01'47.6631"	79°26'00.5878"
BP38	12° 01'38.3550"	9°26'19.9940"	BP103	12° 01'47.3400"	79°26'02.9599"
BP39	12° 01'38.3794"	9°26'19.6834"	BP104	12° 01'45.9725"	79°26'02.5726"
BP40	12° 01'38.8366"	9°26'19.1921"	BP105	12° 01'46.6622"	79°26'00.6299"
BP41	12° 01'39.1825"	9°26'17.9621"	BP106	12° 01'46.8419"	79°25'55.7214"

BP42	12° 01'39.1246"	9°26'17.6023"	BP107	12° 01'47.7756"	79°26'08.4576"
BP43	12° 01'39.8618"	9°26'15.9915"	BP108	12° 01'49.8092"	79°26'08.2604"
BP44	12° 01'39.3072"	9°26'15.4207"	BP109	12° 01'50.1577"	79°26'09.8655"
BP45	12° 01'38.5798"	9°26'15.3499"	BP110	12° 01'49.9860"	79°26'10.5871"
BP46	12° 01'38.0429"	9°26'12.0675"	BP111	12° 01'51.6592"	79°26'10.8317"
BP47	12° 01'38.4128"	79°26'10.2161"	BP112	12° 01'51.7631"	79°26'10.4225"
BP48	12° 01'38.1669"	79°26'8.9345"	BP113	12° 01'53.8115"	79°26'10.5777"
BP49	12° 01'37.0492"	79°26'5.5783"	BP114	12° 01'52.6007"	79°26'14.7392"
BP50	12° 01'44.3881"	79°25'59.2261"	BP115	12° 01'50.9013"	79°26'14.7017"
BP51	12° 01'45.7772"	79°25'58.6991"	BP116	12° 01'49.7402"	79°26'14.1791"
BP52	12° 01'45.6354"	79°25'57.1348"	BP117	12° 01'50.0260"	79°26'12.7098"
BP53	12° 01'46.0677"	79°25'55.1948"	BP118	12° 01'48.1260"	79°26'12.0536"
BP54	12° 01'45.8622"	79°25'54.0672"	BP119	12° 01'47.7376"	79°26'10.5733"
BP55	12° 01'45.2069"	79°25'53.6647"	BP120	12° 01'44.4075"	79°26'06.8865"
BP56	12° 01'45.3469"	79°25'53.5163"	BP121	12° 01'44.0660"	79°26'11.9789"
BP57	12° 01'46.4099"	79°25'53.4838"	BP122	12° 01'42.1960"	79°26'11.0534"
BP58	12° 01'47.4496"	79°25'54.6014"	BP123	12° 01'41.2032"	79°26'10.0888"
BP59	12° 01'48.4275"	79°25'55.0745"	BP124	12° 01'40.5904"	79°26'09.0941"
BP60	12° 01'48.2178"	79°25'56.6844"	BP125	12° 01'40.9223"	79°26'06.3522"
BP61	12° 01'49.5998"	79°25'57.1022"	BP126	12° 01'44.2067"	79°26'12.6545"
BP62	12° 01'50.1248"	79°25'56.7802"	BP127	12° 01'43.1866"	79°26'15.2288"
BP63	12° 01'51.9513"	79°25'57.6849"	BP128	12° 01'41.3947"	79°26'15.0125"
BP64	12° 01'51.6605"	79°25'58.5506"	BP129	12° 01'42.4975"	79°26'12.1871"
BP65	12° 01'52.7453"	79°25'59.0248"			

1.7 Importance of the project to the country and the region

The granite dimensional stone material by virtue of its pleasing colour and texture and its best ability to take polishing and appealing look in polished product has attracted the consumers in the building construction and interior decoration industries. The domestic market capabilities have also been explored in recent periods. Bulk quantity of the blocks is produced and exported as raw blocks and

some quantity is being processed at TAMIN's Granite polishing units and exported as value added finished products.

The earning source in the targeted area is limited, most of the people in and around the area depend upon the seasonal agriculture and much of the people migrate to nearby towns where good industries and factories are growing up. Around 30 people directly employed including mining operations. Local villagers residing in the nearby villages shall be employed as semi-skilled workers.

1.8 EIA Study

As a part of compliance to the regulatory requirement i.e., to obtain Environmental Clearance from SEIAA-TN, TAMIN has appointed Environmental Consultant accredited by National Accreditation Board for Education and Training (NABET)-Quality Council of India (QCI), New Delhi. The work of undertaking field studies and preparation of EIA/EMP report under B1 category was assigned to M/s Hubert Enviro Care Systems (P) Ltd. (HECS) Chennai by the project proponent. HECS is accredited by NABET, vide possession of Certificate No.NABET/EIA/24-27/RA 0335, valid up to 31.03.2027.

1.8.1 EIA Cost

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

1.9 Scope of the Study

The scope of the work mentioned includes an assessment study of Granite mining 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 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.

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

Chapter 1: Introduction

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

Chapter 2: Project Description

This Chapter includes project description and infrastructure facilities delineating all the quarry operations and environmental aspect of the granite quarry operation phase activities.

Chapter 3: Description of the Environment

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

Chapter 4: Anticipated Environmental Impacts & Mitigation Measures

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

Chapter 5: Analysis of Alternatives (Technology and Sites)

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

Chapter 6: Environmental Monitoring Program

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

Chapter 7: Additional Studies

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

Chapter 8: Project Benefits

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

Chapter 9: Environmental Cost Benefit analysis

Not recommended during scoping

Chapter 10: Environmental Management Plan

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

Chapter 11: Summary and Conclusion

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

Chapter 12: Disclosure of the Consultant

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

Chapter 13: Damage Assessment Report

The Damage Assesment in all aspects of environment including Soil, Air, Water, Noise, Solid Waste Management estimated and penalty provisions enumerated.

1.10 Objectives of the Study

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

1.11 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.

1.12 Applicable Regulatory Framework

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

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

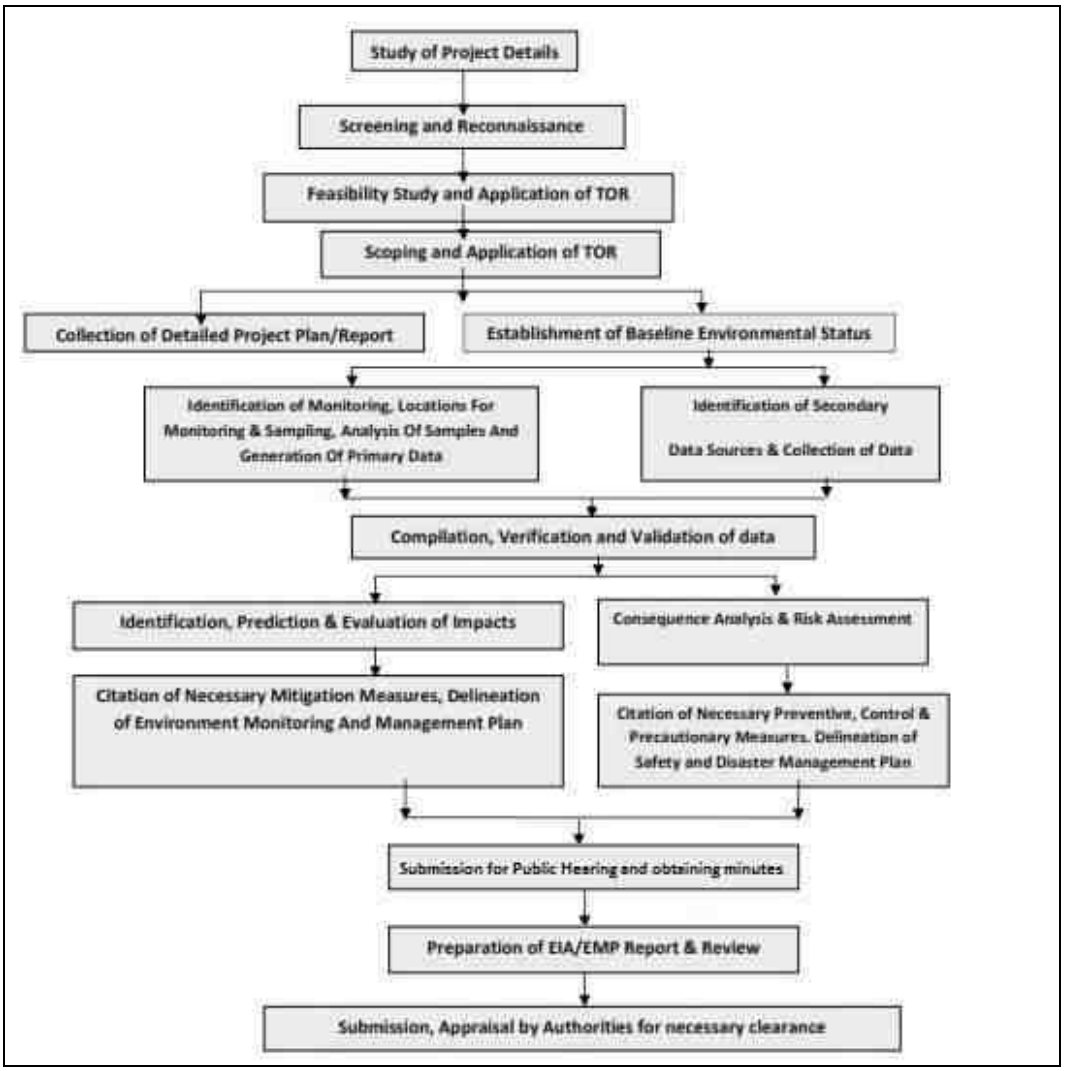


Figure 1-1 Feasibility & Environmental Assessment Process

1.13 Legal Complicability

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

- The Water (Prevention and Control of Pollution) Act, 1974 as amended
- The Water (Prevention and Control of Pollution) Cess Act, 1977, as amended
- The Air (Prevention and Control of Pollution) Act, 1981 as amended (Air Act).
- The Noise Pollution and Regulation Act: 2000
- The Environment (Protection) Act, 1986 (EPA)
- The Wildlife (Protection) Act, 1972 as amended
- The Forest (Conservation) Act, 1980 as amended
- The Public Liability Insurance Act, 1991
- The Mines and Minerals (Regulation and Development) Act, 1957 as amended
- Circulars issued by the Director-General Mines Safety (DGMS).
- Contract Labor Regulation and Abolition Act 1970
- The Motor Vehicles Act – 1989
- PESO – Explosives and handling of Hazardous Material: 1934 as Ammended in 2024

1.14 Terms of Reference Compliance

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

Additional ToR specified by the SEAC to deal with the violation aspects of the mining projects

Additional TOR Specified by the SEAC to deal with violation aspects of the mining projects		
Section A		
As per the MoEF & CC Notification S.O.1030 (E) dated 08.03.2018		
S. No	**ToR details**	**Compliance**
1.	1. The PP shall furnish a comprehensive report based on the scientific studies carried out to assess the hydrogeological condition of the proposed quarry site and implication due to the quarrying activities, by involving any one of the reputed Research and Academic Institutions - (i) CSIR-Central Institute of Mining & Fuel Research (CIMFR), Dhanbad, (ii) National Institute of Rock Mechanics (NIRM), Bangalore, (iii) Division of Geotechnical Engineering-IIT-Madras, (iv) Dept of Mining Engg. National Institute of Technology (NITK), Surathkal, (v) University of Madras - Centre for Environmental Sciences, Guindy Cmapus and (vi) Anna University Chennai-Dept of Geology, CEG Campus.	Hydrogeological Study report is being prepeared and the same will be submitted along with the final EIA report.
2.	The PP shall provide the detailed information on implications due to the existence of Poultry farms and	Poultry farm is situated within 1 km radial distance of the proposed mine lease area. Only source during mine operation would be drilling, blasting and movement

	structures located within a radial distance of 1 km	of quarrying machinery. Drillers would be exposed to about 75-80 dB(A). • Drilling operation will be done by wet drilling method. Hence the dust emission will be minimalized. • Controlled Blasting will be adopted and also Rock Breaking Powder will be used instead of Conventional Blasting. • Diamond wire saw cutting will be used for splitting of blocks. Hence the impact on the nearby poultry farms and other structures with in 1km radius will be minimum.
3.	The PP shall provide the implications due to this unsymmetrical nature of this project, highly fragmented & non-contiguous in nature, on the existing two villages & Patta land located nearby and prepare a conceptual plan on systematic & scientific way of quarrying along with the required mitigation measures through adopting a 'Quarry Management System' for this project by involving any one of these reputed Research and Academic Institutions – (i)CSIR-Central Institute of Mining & Fuel Research (CIMFR), Dhanbad, (ii) National Institute of Rock Mechanics (NIRM), Bangalore, (iii) Division of Geotechnical Engineering-IIT-Madras,) Dept of Mining Engg. National Institute of Technology (NITK), Surathkal, (v) University of Madras - Centre for Environmental Sciences, Guindy Cmapus and	The implication report for the unsymmetrical nature of this project through adopting a Quarry Management System will be prepared by the reputed Research/Academic Institutions and the same will be submitted along with final EIA report.
4.	The PP shall prepare a plan for installing garland drainage around the periphery of the lease of proposed quarry.	The garland drain will be developed around the periphery of the proposed lease boundary before execution of the quarry.

<table>
<tr><th>S. No</th><th>ToR details</th><th>Compliance</th></tr>
<tr><td>1.</td><td>In the case of existing/operating mines, a letter obtained from the concerned AD (Mines) shall be submitted and it shall include the following:

(1) Original pit dimension

(ii) Quantity achieved Vs EC Approved Quantity

(iii) Balance Quantity as per Mineable Reserve calculated.

(iv) Mined out Depth as on date Vs EC Permitted depth

(v) Details of illegal/illicit mining

(vi) Violation in the quarry during the past working.

(vii) Quantity of material mined out outside the mine lease area

(viii) Condition of Safety zone/benches
(ix) Revised/Modified Mining Plan showing the benches of not exceeding 6 m height and ultimate depth of not exceeding 50m</td><td>• The District Collector of Villupuram has stated that TAMIN has operated the above said quarry in the violation period from 15.01.2016 to 10.01.2017 and has obtained transport permit for 374.016m^3. Hence TAMIN is liable for remittance of 100% cost of the mineral. Therefore as per the demand notice issued by the District Collector, TAMIN has remitted the cost of mineral of Rs.78,66,679/- and obtained NoC from DGM vide Letter Rc No. 18/MM4/2020 enclosed as Annexure-9.

• There is no quarry operation done outside the lease area.

• As directed in the precise area communication letter vide Letter No.3492325/MME.1/2022-1,dated:13.01.2023, Mining plan was submitted by TAMIN with benches of not exceeding 6m height and ultimate depth of 24m and the same approved by Department of Geology and Mining vide Rc.No.5480/MM4/2022, dated, 19.05.2023 is enclosed as Annexure -3.</td></tr>
<tr><td>2.</td><td>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.</td><td>The details of nearby Habitations are given below:

<table>
<tr><th>S. No</th><th>Name of the Village</th><th>Distance in km</th><th>Direction</th><th>Population (census 2011)</th></tr>
<tr><td>1</td><td>Kunnatturtangal</td><td>0.16</td><td>NE</td><td>225</td></tr>
<tr><td>2</td><td>Dharmapuri</td><td>0.21</td><td>E</td><td>750</td></tr>
<tr><td>3</td><td>Siruvalai</td><td>0.33</td><td>W</td><td>2414</td></tr>
<tr><td>4</td><td>Arumpuri</td><td>1.01</td><td>S</td><td>492</td></tr>
<tr><td>5.</td><td>Kundalappuliyur</td><td>1.15</td><td>NE</td><td>1850</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>S. No</th><th>ToR details</th><th>Compliance</th></tr>
<tr><td></td><td></td><td>The VAO certificate indicating the location of habitations within 300m radius from the periphery of the site will be submitted along with final EIA.</td></tr>
<tr><td>3.</td><td>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.</td><td>The manmade structures located within theradius of 50m, 200m 300m, 500m were given below.
<table>
<tr><th>S.No</th><th>Description</th><th>Count</th></tr>
<tr><td colspan="3">0-50m</td></tr>
<tr><td>1</td><td>Poutary Farms</td><td>3</td></tr>
<tr><td>2</td><td>House</td><td>1</td></tr>
<tr><td colspan="3">50-100m</td></tr>
<tr><td>1</td><td>Poutary Farms</td><td>3</td></tr>
<tr><td>2</td><td>Structure</td><td>2</td></tr>
<tr><td>3</td><td>House</td><td>1</td></tr>
<tr><td colspan="3">100-200m</td></tr>
<tr><td>1</td><td>Poutary Farms</td><td>1</td></tr>
<tr><td>2</td><td>House</td><td>8</td></tr>
<tr><td>3</td><td>Temple</td><td>1</td></tr>
<tr><td>4</td><td>Structure</td><td>1</td></tr>
<tr><td>5</td><td>School</td><td>1</td></tr>
<tr><td colspan="3">200-300m</td></tr>
<tr><td>1</td><td>House</td><td>62</td></tr>
<tr><td>2</td><td>Temple</td><td>1</td></tr>
<tr><td>3</td><td>Structure</td><td>2</td></tr>
<tr><td colspan="3">300-400m</td></tr>
<tr><td>1</td><td>House</td><td>137</td></tr>
<tr><td>2</td><td>Water Tank</td><td>1</td></tr>
<tr><td>3</td><td></td><td></td></tr>
<tr><td colspan="3">400-500m</td></tr>
<tr><td>1</td><td>House</td><td>76</td></tr>
</table></td></tr>
</table>

S. No	ToR details	Compliance
		2 | Temple | 1
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.	The detailed hydrogeological study report will be submitted along with final EIA report.
5.	The Proponent shall carry out Bio diversity study through reputed Institution and the same shall be included in EIA Report.	Bio diversity study was conducted and details of biodiversity study and the list of flora and fauna species were discussed in **Chapter 3. Section 3.24**
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.	The DFO letter upto radius of 25km from the proposed project site will be submitted along with final EIA report.
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 & 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.	Benches have been formed as per mining plan in accordance with Reg. 106 of MMR, 1961 in this old quarry. Furher this dolerite rock is very hard rock formation. Hence, as of now there is no need to coduct the slope stability study. However the Slope stability report will be submitted along with final EIA report.
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.	Becnhes have been formed as per mining plan in accordance with Reg. 106 of MMR, 1961 in this old quarry. Furher this dolerite rock is very hard rock formation. Hence, as of now there is no need to coduct the slope stability study. However the slope stability report will be submitted along with final EIA report

<table>
<tr><th>S. No</th><th>ToR details</th><th>Compliance</th></tr>
<tr><td>9.</td><td>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/1 Class mines manager appointed by the proponent.</td><td>The blasting affidavit will be submitted along with final EIA report.</td></tr>
<tr><td>10</td><td>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.</td><td>The conceptual design of Blasting Operation will be submitted along with final EIA report.</td></tr>
<tr><td>11.</td><td>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.</td><td>The Photographic and videographic evidences of Quarries operated will be submitted along with final EIA report.</td></tr>
<tr><td>12.</td><td>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,</td><td>TAMIN obtained way permit and transported 374.01 6M^3 from 15.01.2016 to 10.01.2017. Hence, TAMIN remitted Rs.78,66,679/- towards penalty and obtained NoC from DGM vide Letter Rc No. 18/MM4/2020.</td></tr>
<tr><td>13</td><td>What was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines?</td><td>TAMIN has obtained way permit and transported 374.01 6m^3 from 15.01.2016 to 10.01.2017</td></tr>
<tr><td>14</td><td>Quantity of minerals mined out.
Highest production achieved in any one year

• Detail of approved depth of mining.

• Actual depth of the mining achieved earlier.

• Name of the person already mined in that leases area.

• If EC and CTO already obtained, the copy of the same shall be submitted.</td><td>• TAMIN obtained way permit and transported 374.01 6M^3 from 15.01.2016 up to lease period 24.07.2016. Hence, TAMIN remitted Rs.78,66,679/- towards penalty and obtained NoC from DGM vide Letter Rc No. 18/MM4/2020.

• Actual Depth of Achieved Mining:

<table>
<tr><th>S.No</th><th>Pit</th><th>Average Depth (m)</th></tr>
<tr><td>1</td><td>North West</td><td>4.00</td></tr>
<tr><td>2</td><td>North East</td><td>10.00</td></tr>
</table>
</td></tr>
</table>

S. No	ToR details	Compliance
	• Whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches.	• The Mining Lease area is a Government Poramboke land. The Previous Lesse is also M/s. TAMIN • EC and CTO was not obtained hence the proponent has applied the proposed project under violation category. • Yes the mining was carried out as per the approved mining plan.
15	All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/Topo sheet, topographic sheet, geomorphology, lithology and geology of the mining lease area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	All corner coordinates are given in **Chapter 1, Section 1.6, and Table 1-2.** Topo Map given in **Figure 2-5.** Geology and Geomorphology of the study area is provided in **Chapter 3 Section 3.15, 3.11 and Figure 3.10.**
16	The PP shall carry out Drone video survey covering the cluster, green belt, fencing, etc.,	Th entire mine lease area along with green belt will be video graphed through Drone will be submitted in the Final EC presentation.
17	The proponent shall furnish photographs of adequate fencing, green belt along the periphery including replantation of existing trees & safety distance between the adjacent quarries & water bodies nearby provided as per the approved mining plan.	Photographs of adequate fencing and green belt will be attached with Final EIA.

<table>
<tr><th>S. No</th><th>ToR details</th><th>Compliance</th></tr>
<tr><td>18</td><td>The Project Proponent shall provide the details of mineral reserves and mineable reserves, planned production capacity, proposed working methodology with justifications, the anticipated impacts of the mining operations on the surrounding environment, and the remedial measures for the same.</td><td>
Geological Reserves
<table>
<tr><th>S.No</th><th>Updated Geological Reserves ($m^{3)}$</th><th>Updated Mineable Reserves (m^3)</th><th>Mineable Reserves Saleable @10% Recovery (m^3)</th></tr>
<tr><td>1.</td><td>3,65,797</td><td>33,155</td><td>3,316</td></tr>
</table>
Yearwise production details
<table>
<tr><th>S. No</th><th>Year</th><th>ROM (m^3)</th><th>Production @ 10% Recovery(m^3)</th><th>Granite waste @ 90%(m3)</th></tr>
<tr><td>1</td><td>1st Year</td><td>4000</td><td>400</td><td>3600</td></tr>
<tr><td>2</td><td>2nd Year</td><td>20000</td><td>2000</td><td>18000</td></tr>
<tr><td>3</td><td>3rd Year</td><td>3000</td><td>300</td><td>2700</td></tr>
<tr><td>4</td><td>4th Year</td><td>3000</td><td>300</td><td>2700</td></tr>
<tr><td>5</td><td>5th Year</td><td>3000</td><td>300</td><td>2700</td></tr>
<tr><td colspan="2">Total</td><td>33000</td><td>3300</td><td>29700</td></tr>
</table>
Method of mining is given in Chapter 2, Section 2.7.2. &2.7.3
Mitigation of measures are given in Chapter 2,Section 2.15
</td></tr>
<tr><td>19</td><td>The Project Proponent shall provide the Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of 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.</td><td>The organization chart hierarchy is dicussed inn Chapter 10 and given in Figure 10-1</td></tr>
</table>

S. No	ToR details	Compliance
20	The Project Proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of groundwater pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds, etc. within 1 km (radius) along with the collected water level data for both monsoon and non-monsoon seasons from the PWD/TWAD so as to assess the impacts on the wells due to mining activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided.	The hydrogeological study is being onducted and the same will be submitted along with final EIA report.
21	The proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality & flora/fauna including traffic/vehicular movement study.	The baseline data for the environmental and ecological parameters with regard to surface water / groundwater quality, air quality, soil quality & flora / fauna including traffic / vehicular movement study are discussed in **Chapter 3**.
22	The Proponent shall carry out the Cumulative impact study due to mining operations carried out in the quarry specifically with reference to the specific environment in terms of soil health, biodiversity, air pollution, water pollution, climate change and flood control & health impacts. Accordingly, the Environment Management plan should be prepared keeping the concerned quanty and the surrounding habitations in the mind.	Detailed impact study has been carried out and the Impacts and mitigation measures in terms of soil health, biodiversity, air pollution, water pollution were given in Chapter 4.
23	Rain water harvesting management with recharging details along with water balance (both monsoon & non-monsoon) be submitted.	There is no separate Rain water harvesting system proposed by the project propoenent. However the rain water is being diverted to the center quarried pit which will act as settling pond and for rain water harvesting. The details of rain water harvesting for the proposed project is dicussed in **chapter 4, section 4.5.4**
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	Land use pattern of the study area is discussed in Chapter 3 and Section 3.9 Figure 3-6, Table3-2. Land use Pattern of the mine lease area is given in **Chapter 2, Section 2.6, Table 2-3**

S. No	ToR details	Compliance
	should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.	
25.	Details of the land for storage of Overburden/Waste Dumps (or) Rejects outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any. should be provided.	As per the details of land use pattern given in Sectional plate No-2 of mining plan, the existing waste dump area is 1.22.0 Ha. Area proposed for the waste dump area is 1.45.0Ha in the North east and North west corner of the ML area.
26.	Proximity to Areas declared as 'Critically Polluted (or) the Project areas which attracts the court restrictions for mining operations, should also be indicated and where so required. clearance certifications from the prescribed Authorities, such as the TNPCB (or) Dept. of Geology and Mining should be secured and furnished to the effect that the proposed mining activities could be considered.	There is no critically polluted area within the study area of the project site.
27	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	As a part of water conservation measures the rainwater will be diverted to the center pit of the mine and the stored water will be used for agricultural purpose and ground water recharge. Details of rainwater harvesting measures are discussed in **Chapter 4, Section 4.5.4**
28	Impact on local transport infrastructure due to the Project should be indicated.	Impact on local transport infrastructure due to the Project dicussed in **Chapter 4 in Section 4.4**
29	A tree survey study shall be carried out (nos., name of the species, age, diameter etc.,) both within the mining lease applied area & 300m buffer zone and its management during mining activity.	The list of floral species available in the study area and the details of tree species were discussed in **Chapter 3, Section 3.24.4, Table 3-18**
30	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific.	**Mine Closure Plan:** As a petro genetic character the depth persistence of the Black Granite body in the mine lease area is beyond the workable limits. Based on the statutory provisions of mine safety rules and regulations the workable depth is proposed for 24m BGL. However in course of time there is a possibility of up gradation of technology for safe mining beyond 24m. Hence it is proposed not to backfill the ultimate pit. The Pit boundaries shall be safely fenced with

S. No	ToR details	Compliance
		7.5m buffer safety zone and rain water or seepage water stored in the pit will be used for agriculture purpose. Green belt development will be maintained in the 7.5m buffer safety zone. Garland drain will be constructed around the quarry area to prevent surface run off rain water entering to the pit. When the reserves will be completely exhausted, the mine closure plan will be prepared and submitted to the competent authority to obtain approval and the same will be implemented. The detailed Mine closure plan is attached along with Mining Plan as **Annexure 4.** Mine closure plan is given in **Chapter 2,Section 2.17.1**
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.	EIA Co-ordinator educated the local students on the importance of preserving local flora and fauna during the site visit.
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.	The proponent will develop greenbelt around the periphery of the Mine Lease area of around 300 species including neem, pungam, vengai, vilvam
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	As per committee recommendations, taller / one year old saplings raised in eco-friendly bags, will be planted as per the advice of local forest authorities / botanist / horticulturist with regard to sites specific choices The proposed quarry is fresh lease within the existing quarry. The total area for proposed green belt is 0.06.5 Ha out of 20.28.0 Ha during 5 years of the proposed quarrying activity and it is proposed to plant 300 nos of trees per

S. No	ToR details	Compliance
	and in between blocks in an organized manner	year and Rs.1,50,000/- will spend for proposed greenbelt development and maintenance. The details are given in Chapter 4 Section 4.11.
34	A Disaster management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period.	A detailed Disaster management plan is discussed in **Chapter 7, Section 7.3**
35	A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period.	A detailed Risk assessment and management plan is discussed in **Chapter 7, Section 7.2**
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.	Occupational Health impacts & mitigation measures are provided in **Chapter 10, Section 10.4**
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 proponent M/s. TAMIN proposes proper mititgation measures and Environmental management Plan during the operation of the quarry. Total capital cost of Rs. **51,50,100**/- and reccuring cost of Rs. **27,27,530**allocated for environmental protection activities.
38	The Socio-economic studies should be carried out within a 5km buffer zone from the mining activity. Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	The socio-economic study was carried out within a 10 km buffer zone from the mining activity. The detailed measures of socio-economic significance is discussed in **Chapter 3, Section 3.25**
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.	There is no litigation against the project.

S. No	ToR details	Compliance
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 proposed project • The quarrying activities in this area will benefit to the local people directly 30persons and indirectly 20 persons. • The direct beneficiaries will be those who get employed in the mines as skilled and unskilled workers. • Improvement in Per Capita Income. • The socio - Economic conditions of the village and distance will enhance due to the project, hence the project should be allowed after considering all the parameters. • It can thus be concluded that the project is environmentally compatible, financially viable and would be in the interest of construction industry thereby indirectly benefiting the masses.
41	If any quarrying operations were carried out in the proposed quarrying site for which now the EC is sought, the Project Proponent shall furnish the detailed compliance to EC with the site photographs which shall duly be certified by MoEF&CC, Regional Office, Chennai (or) the concerned DEE/TNPCB.	The project proponent operated the quarry without prior environmental clearance. Hence the project falls under violation, so the certified compliance report is not applicable.
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 detailed EMP is discussed in **Chapter 10**.
43	Concealing any factual information or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this Terms of Conditions besides attracting penal provisions in the Environment (Protection) Act, 1986.	All the information provided by the project proponent is factual and no false information has been submitted.
Remarks by SEIAA		
1.	The Authority noticed that the project proponent has proposed to work in too many blocks. Instead, the PP shall rework the site to work in one component block in phases.	As recommended by the SEIAA, after obtaining EC and CTO the project proponent will operate the mine in a phased manner in the proposed blocks.

S. No	ToR details	Compliance
2.	The project proponent shall prepare mine closure plan considering quantity of Topsoil & Weathered rock. If any.	Mine Closure Plan is provided in **Chapter 2, Section 2.17.1**
3.	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.	The DFO letter stating the proximity distance of Reserve Forests, Protected Areas, Sanctuaries, Tiger reserve will be provided with final EIA report.
Annexure 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 managaemnet Committee will be formed with inclusive of all proponent in the cluster.
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.,	For the effective implementation of EMP, the members of the cluster management committee will coordinate among themselves.
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.	The list of Members involving in the Cluster Management Committee will be intimated to to the AD Mines before excecution of Mining Lease and the same will updated every year to the AD mines
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.	The Detailed Operational Plan will be submitted including the blasting frequency with respect to the nearby quarry after obtaining EC.
5.	The committee shall deliberate on risk management plan 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.	The committee will deliberate the Risk Management Plan during natural calamities by considering the cluster evacuation Plan.
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 to practice sustainable mining will be drafted after the Cluster Management Committee formation.

S. No	ToR details	Compliance
	the environmental policy devised shall be given in detail.	
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.	The action plan on restoration strategy will be provided after the Cluster Management Committee formation.
8.	The committee shall furnish the Emergency Management plan within the cluster.	The Emergency Management Plan within the cluster will be furnished after the formation of Cluster Maganement Committee.
9.	The committee shall deliberate on the health of the workers/staff involved in the mining as well as the health of the public.	The detailed health deliberation of the workers are Discussed in Chapter 10 in Section 10.12
10	The committee shall furnish an action plan to achieve sustainable development goals with reference to water, sanitation & safety,	The action plan to achieve sustainable development goals with reference to water, sanitation and safety will be submitted after committee formation
11	The committee shall furnish the fire safety and evacuation plan in the case of fire accidents.	The fire safety evacuation plan wil be provided after committee formation
Impact Study of MIninng:		
12	Detailed study shall be carried out in regard to impact of mining around the proposed mine lease area covering the entire mine lease period as per precise area communication order issued from reputed research institutions on the following a) Soil health & soil biological, physical land chemical features. b) Climate change leading to Droughts, Floods etc. c) Pollution leading to release of Greenhouse gases (GHG), rise in Temperature, & Livelihood of the local people. d) Possibilities of water contamination and impact on aquatic ecosystem health. e) Agriculture, Forestry & Traditional practices.	• Impact and mitigation measures of soil given in **Chapter 4, Section 4.1.1** • Impact on Climate Change discussed in **Chapter 4, Section 4.3** • Pollution leading to release of Greenhouse Gases and Carbon emission is discussed in **Chapter 4, Section 4.2** • Impact on Livelihood on Local People is discussed in **Chapter 4, Section, 4.9** • Impact on biological Environment is discussed in **Chapter 4, Section**

S. No	ToR details	Compliance
	f) Hydrothermal/Geothermal effect due to destruction in the Environment. g) Bio-geochemical processes and its foot prints including environmental stress. h) Sediment geochemistry in the surface streams.	**4.10**
	Agriculture & Agro-Biodiversity	
13	Impact on surrounding agricultural fields around the proposed mining Area.	There will be no impact on the nearby agicultural land since the TAMIN Mining Operations are being done with dust extractor the remaining dust will also be suppressed with water sprinkler provision.
14	Impact on soil flora & vegetation around the project site.	Impact and mitigation measures of soil given in **Section 4.1,** Impact and mitigation measures on flora and vegetation is given in **Section 4.10.**
15	Details of type of vegetations including no. of trees & shrubs within the proposed mining area and. If so, transplantation of such vegetations all along the boundary of the proposed mining area shall committed mentioned in EMP.	As per the plate no.5 of the sectional plates of mining plan, the proposed area does not contain any trees to transplant. However the Project proponent is committed to plant 300 trees in the periphery of the proposed lease area.
16	The Environmental Impact Assessment should study the biodiversity, the natural ecosystem, the soil micro flora, fauna and soil seed banks and suggest measures to maintain the natural ecosystem.	The details of Flora and fauna are discussed in **Chapter 3, Section 3.24** Indian Peafowl, Shikra – Schedule 1 species is found in the study area. The conservation plan is also proposed. The details of conservation plan is discussed in **Chapter 3, Section 3.24**
17	Action should specifically suggest for sustainable management of the area and restoration of ecosystem for flow of goods and services.	A detailed action plan on sustainable management of the area and restoration of ecosystem for flow of goods and services are discussed in **Chapter 4, Section 4.9**
18	The project proponent shall study and furnish the impact of project on plantations in adjoining patta lands, Horticulture, Agriculture and livestock.	The impact of project on plantations in adjoing patta lands, Horticulture, Agriculture and livestock are discussed in **Chapter 4.**

<table>
<tr><th>S. No</th><th>ToR details</th><th>Compliance</th></tr>
<tr><td colspan="3">Forests</td></tr>
<tr><td>19</td><td>The project proponent shall detailed study on impact of mining on Reserve forests free ranging wildlife.</td><td>The proposed mining lease area of 20.28.0Ha does not cover any forest land. The nearest Reserved forest is Odaiyanattam RF located at 9.96km away from the proposed mining lease area. Hence there will be no impact on the nearby reserved forest.

List of Reserved Forests with in 15km Radius:
<table>
<tr><th>S.No</th><th>Places</th><th>Distance (≈km)</th><th>Direction</th></tr>
<tr><td>1</td><td>Odaiyanattam RF</td><td>9.96</td><td>WNW</td></tr>
<tr><td>2</td><td>M□lkondai RF</td><td>11.21</td><td>E</td></tr>
<tr><td>3</td><td>Tandavasamudram RF</td><td>□1.36</td><td>NW</td></tr>
<tr><td>4</td><td>Gengavaram RF</td><td>11□95</td><td>WNW</td></tr>
<tr><td>5</td><td>Karai RF</td><td>14.02</td><td>N</td></tr>
</table>

The impact on Biological including flora and fauma were discussed in Chapter 4 Section 4.10</td></tr>
<tr><td>20</td><td>The Environmental Impact Assessment should study impact on forest, vegetation, endemic, vulnerable and endangered indigenous flora and fauna.</td><td>Detailed biodiversity study is discussed in Chapter 3, Section 3.11. The impact on flora and fauna is discussed in Chapter 4, section 4.10</td></tr>
<tr><td>21</td><td>The Environmental Impact Assessment should study impact on standing trees and the existing trees should be numbered and action suggested for protection.</td><td>The impacts and mitigation measures of Biological environment is discussed in Chapter 4, Section 4.10

Action suggested for protection:
An area of 0.06.5 Ha is proposed for the green belt development of green belt. The proponenet has developed green belt of around 300 plants of the species including Neem, Pungam, Vengai as recommended by SEIAA/SEAC in ToR. The proponenet has committed to spend of Rs. 1,50 000/- for green belt development and maintainanace.
Plants are chosen to provide aesthetic, ecological and economical value. Trees will help to arrest propagation of noise and help to lessen dust pollution due to dust arresting action. The plantation will be developed</td></tr>
</table>

S. No	ToR details	Compliance
		around 7.5m safety zone of the quarry.
22	The Environmental Impact Assessment should study impact on protected areas, Reserve Forests, National Parks, Corridors and Wildlife pathways, near project site.	As there is no RF within the 1km buffer area, the mining activity will not impact the Reserved forests. There are no National parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors; Tiger/ Elephant Reserves is located within 10km of the mine lease area. The list of reserve forest within 15km radius is discussed in **Chapter 3**, Section **Section 3.4 & Table 3-1.**
WaterEnvironment		
23	Hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells, and surface water bodies such as rivers, 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.	Hydrogeological Study report is being prepared and the same will be submitted along with final EIA report.
24	Erosion Control measures.	Green belt development is one of the important erosion control measure which is discussed in **Chapter 4 in Section 4.10**
25	Detailed study shall be carried out in regard to impact of mining around the proposed mine lease area on the nearby Villages, Water-bodies/ Rivers, & any ecological fragile areas.	The detailed impacts on the study area due to the proposed mining activity were discussed in **Chapter 4.**
26	The project proponent shall study impact on fish habitats and the food WEB/ food chain in the water body and reservoir.	A detailed study on impacts and its mitigation measures of biological environment is discussed in **Chapter 4, Section 4.9**

S. No	ToR details	Compliance
27	The project proponent shall study and furnish the details on potential fragmentation impact on natural environment, by the activities.	The potential fragmentation impact of natural environment, by the activities is discussed in **Chapter 4.**
28	The project proponent shall study and furnish the impact on aquatic plants and animals in water bodies and possible scars on the landscape, damages to nearby caves, heritage site, and archaeological sites possible land form changes visual and aesthetic impacts.	The detailed impact on on aquatic plants and animals in water bodies and possible scars on the landscape, damages to nearby caves, heritage site, and archaeological sites are discussed in **Chapter 4**.
29	The Terms of Reference should specifically study impact on soil health, soil erosion, the soil physical, chemical components and microbial components.	The detailed base line study has been conducted and the study Soil quality monitoring locations & results are discussed in **Chapter 3, Section 3.10**.
30	The Environmental Impact Assessment should study on wetlands, water bodies, rivers streams, lakes and farmer sites.	The detailed impact on nearby waterbodies, rivers and streams were discussed in **Chapter 4 Section 4.3**
Energy:		
31	The measures taken to control Noise, Air, Water, Dust Control and steps adopted to efficiently utilize the energy shall be furnished,	Environmental Impacts and Mitigation Measures are provided in **Chapter 4**.
Climate Change		
32	The Environmental Impact Assessment shall study in detail the carbon emission and also suggest the measures to mitigate carbon emission including development of carbon sinks and temperature reduction including control of other emission and climate mitigation activities.	Operating a granite quarry can have several impacts on increasing carbon emissions and contributing to temperature rise, primarily through direct and indirect mechanisms. The proposed Granite Quarry has the potential to generate various GHG emissions, including carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), fluorinated gases, water vapour, and ozone. These emissions can arise from different phases of quarrying operations, such as excavation, transportation, energy consumption, and land-use changes. A detailed study has been conducted to analyse and mitigating these emissions for minimizing environmental impact and promoting sustainable quarrying practices the same has been discussed in Chapter Section The mitigation measure of Air Environment is discussed in **Chapter 4, Section 4.2**

S. No	ToR details	Compliance
33	The Environmental Impact Assessment should study impact on climate change, temperature rise, pollution and above soil & below soil carbon stock.	The operation of the proposed quarry can have various impacts on climate change, temperature rise, pollution, and carbon stocks, both above and below the soil. A detailed study has been conducted the results are discussed in **Chapter 4, Section 4.3**
Mine Closure Plan		
34	Detailed Mine Closure Plan covering the entire mine lease period as per precise area communication order issued.	Mine Closure Plan is provided in **Chapter 2, Section 2.17.1**
EMP		
35	Detailed Environment Management Plan along with adaptation, mitigation & remedial strategies covering the entire mine lease period as per precise area communication order issued.	The Environment Management Plan with budget allocation as capital cost and recurring cost is discussed in **Chapter 10**
36	The Environmental Impact Assessment should hold detailed study on EMP with budget for Green belt development and mine closure plan including disaster management plan.	The proponent has committed to spend Rs. 1,50,000 for Greenbelt development.
Risk Assessment		
37	To furnish risk assessment and management plan including anticipated vulnerabilities during operational and post operational phases of Mining.	Risk Identification & Management are provided in **Chapter 7, Section 7.2**
Disaster Management Plan		
38	To furnish disaster management plan and disaster mitigation measures in regard to all aspects to avoid/reduce vulnerability to hazards & to cope with disaster/untoward accidents in & around the proposed mine lease area due to the proposed method of mining activity & its related activities covering the entire mine lease period as per precise area communication order	Disaster Management Plan is provided in **Chapter 7, Section 7.3.**

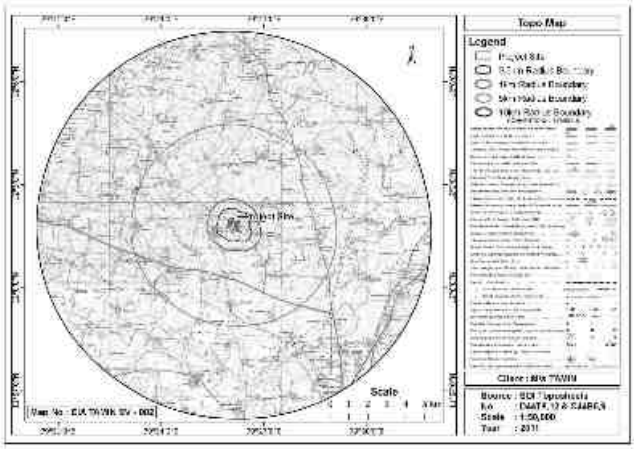
S. No	ToR details	Compliance
	issued.	
Others		
39	The project proponent shall furnish VAO certificate with reference to 300m radius regard to approved habitations, schools, Archaeological sites, Structures, railway lines, roads, water bodies such as streams, odai, vaari, canal, channel, river, lake pond, tank etc.	The VAO certificate will be submitted along with final EIA report.
40	As per the MoEF& CC office memorandum F.No.22-65/2017-IA.III dated: 30.09.2020 and 20.10.2020 the proponent shall address the concerns raised during the public consultation and all the activities proposed shall be part of the Environment Management Plan.	The draft EIA of the proposed quarry will be submitted for Public Hearing. After obtaining the minutes from TNPCB portal the concerned raised in the PH meeting will be incorporated in the final EIA along with the compliance. The budget on EMP will be allocated as per raised concern if applicable.
41	The project proponent shall study and furnish the possible pollution due to plastic and microplastic on the environment. The ecological risks and impacts of plastic & microplastics on aquatic environment and fresh water systems due to activities, contemplated during mining may be investigated and reported.	No plastics are involved in the proposed project

STANDARD TERMS OF REFERENCE

<table>
<tr><th>S. No</th><th>ToR Point</th><th>Compliance</th></tr>
<tr><td>1.</td><td>Year wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed there had been any increase in production after the EIA Notification 1994 came into force, w.r.t the highest production achieved prior to 1994.</td><td>

This Granite (Minor Mineral) Mining Projects. EC is applicable as per notification S.O.1533(E) dated 14.09.2006.
Year-wise production details is given in Annexure –4 plate of Mining Plan
The quarry is in operation without EC from 15.01.2016 to 10.01.2017. Hence the ToR for this project was obtained under violation category vide Lr No. SEIAA-TN/F.No.3888/SEAC/ToR-1533/2023 dated: 09.08.2023.
for the production capacity 3,300cbm

The proposed yearwise production is given below
<table>
<tr><th>S. No</th><th>Year</th><th>ROM (m^3)</th><th>Production @ 10% Recovery(m^3)</th><th>Granite waste @ 90%(m3)</th></tr>
<tr><td>1</td><td>1st Year</td><td>4000</td><td>400</td><td>3600</td></tr>
<tr><td>2</td><td>2ndYear</td><td>20000</td><td>2000</td><td>18000</td></tr>
<tr><td>3</td><td>3rdYear</td><td>3000</td><td>300</td><td>2700</td></tr>
<tr><td>4</td><td>4th Year</td><td>3000</td><td>300</td><td>2700</td></tr>
<tr><td>5</td><td>5th Year</td><td>3000</td><td>300</td><td>2700</td></tr>
<tr><td colspan="2">Total</td><td>33000</td><td>3300</td><td>29700</td></tr>
</table>
</td></tr>
<tr><td>2.</td><td>A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.</td><td>TAMIN is rightful lessee in accordance with the above Government of Tamil Nadu has granted precise area communication letter from IIPC (MME.1) Department vide letter No. 3492325/MME.1/2022-1,dated:13.01.2023 is enclosed as Annexure–2..</td></tr>
<tr><td>3.</td><td>All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mines lease area, production levels, waste generation and its management, mining technology and should be in the name of the lessee.</td><td>Yes. All documents including approved mine plan, EIA and Executive summary is compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. in the name of TAMIN (lessee).</td></tr>
<tr><td>4.</td><td>All corners co-ordinates of the mine lease area, superimposed on a High Resolution Imagery/ toposheets, topographic sheets, geomorphology and geology of the area should be</td><td>1. All corner co-ordinates of Mining Lease area given in Chapter 1, Section 1.6. Table 1.2
2. All corner co-ordinates of the mine lease area, superimposed in a High Resolution Imagery/ topo</td></tr>
</table>

	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).	sheet, topographic sheet, geomorphology and geology of the area has been provided in **Chapter 3.** 3. Such a Imagery of the proposed area and land use and other ecological features of the study area (core and buffer zone) has been clearly shown in **Chapter 3.**
5.	Information should be provided in Survey of India Toposheets 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.	Topo map prepared in 1:50000 scale and given as **Figure 2-5** in **Chapter 2.**  Geomorphology of land forms of the area is given in **Figure 3-10** Existing Minerals and Mining History of the area is given in **Chapter 3, Section 3.8.5** Important water bodies, streams and rivers and soil characteristics have been explained in **Chapter 3**
6.	Details about the land proposed for mining activities should be given with information as to whether mining confirms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.	The proposed quarry is Government Poramboke land and TAMIN has already obtained lease for 20 years vide G.O MS No.285 Industries (MME1) Department Dated 28.12.1995. The lease period was valid up to 24.07.2016. The Government of Tamil Nadu has proposed to grant lease to TAMIN for 20 years vide Government of Tamil Nadu, IIPC (MME.1) Department, Lr. No. 3492325/MME.1/2022-1,dated:13.01.2023. i.e., Precise area communication letter is enclosed as **Annexure-2.**
7.	It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA report with description of the prescribed operating process/procedures to bring into focus any	TAMIN has a well laid down Environment Policy approved by its Board of Directors. Environmental Policy of TAMIN is given in **Chapter 10 Section 10.3** The hierarchical systems or administrative order of the Company to deal with the environmental issues and for ensuring compliances with the EC conditions has been given in **Chapter 10, Figure 10-1**.

<table>
<tr><td></td><td>infringement/deviation/violation of the environment or forest norms/condition? 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-compliance/ 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.</td><td></td></tr>
<tr><td>8.</td><td>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.</td><td>It is open cast semi mechanized mining and no underground mining will be done. So no subsidence study is required.

A detail regarding Slope of the pit, drilling and blasting is mentioned inChapter 2 Section 2.10

Safeguard measures are provided in Chapter-7, Section 7.2</td></tr>
<tr><td>9.</td><td>The study area will comprise of 10km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc. should be for the life of the mine/lease period.</td><td>The study area of 10km zone around the mines lease from lease periphery and furnished in Chapter 3.
The production capacity, mineable capacity, waste generation and other such details have been calculated for the lease period of five years as per the approved mining plan and also discussed in EIA in the Chapter 2 in Table 2-7</td></tr>
<tr><td>10.</td><td>Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass, preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.</td><td>Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features are given below.
Land use pattern of the Study Area:
Land use/land coverof Study Areais given in Chapter 3 and Section 3.5.4.1, Table 3-3, Figure 3-7 & Figure 3-8.
Land use details of the quarry area:
<table>
<tr><th>S.No</th><th>Description</th><th>Present area (Ha)</th><th>Proposed Mining Plan Period in Ha</th><th>Area at the end of the quarry (Ha)</th></tr>
<tr><td>1.</td><td>Area under quarrying</td><td>3.77.0</td><td>0.15.5</td><td>3.92.5</td></tr>
<tr><td>2.</td><td>Waste Dump</td><td>1.22.0</td><td>1.45.0</td><td>2.59.0</td></tr>
</table></td></tr>
</table>

		3.	Infrastructure	0.02.5	--	0.02.5
		4.	Mine approach Road	0.32.0	--	0.32.0
		5.	Village Road	0.40.0	--	0.40.0
		6.	Afforestation	0.20.0	0.06.5	0.26.5
		7.	Unutilized	14.34.5	12.67.5	12.75.5
		Total		**20.28.0**	**14.34.5**	**20.28.0**

11.	Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given.	The rejected granite waste will be dumped in the centre and North west portion in the proposed waste dump area of 1.45.0Ha of 20.28.0Ha of the mine lease area. The details of proposed granite waste is given below.

Year	**ROM (m^3)**	**Saleable Mineral (m^3)**	**Over Burden (m^3)**	**Side Burden (m^3)**	**Granite Rejects (m^3)**
First	4,000	400	--	306	3,600
Second	20,000	2,000	--	4,572	18,000
Third	3,000	300	--	--	2,700
Fourth	3,000	300	--	--	2,700
Fifth	3,000	300	--	--	2,700
Total	**33,000**	**3,300**	**--**	**4,878**	**29,700**

12.	A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry of 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	The proposed quarry lease area is a Government poramboke land and the same has been mentioned in Precise area communication letter issued by GoTN vide Lr.No. 3492325/MME.1/2022-1,dated:13.01.2023, is enclosed as **Annexure–2**. No Forest land is involved in the proposed project area. The DFO letter will be provided along with final EIA report.

	desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.	
13.	Status of forestry clearance for the broken up area and virgin forest land involved in the project including deposition of Net Present Value (NPV) & Compensatory Afforestation (CA) should be indicated. A copy of the forest clearance should also be furnished.	As the lease area is Government poramboke land and there is no forest land involved in the lease applied area the question of net present value (NPV) and compensatory afforestation (CA) and copy of the forestry clearance does not arise.
14.	Implementation status of recognition of forest right under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Acts, 2006 should be indicated.	The area is not covered under Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006. Hence, it is not applicable.
15.	The vegetation in the RF/PF areas in the study area, with necessary details, should be given.	The details of vegetation in the RF/ PF areas in the study area are given in **Chapter 3, Section 3.4, Table 3-1 and Figure 3-3.**
16.	A study shall be got done to ascertain the impact of the mining project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigate measures required, should be worked out with cost implications and submitted.	There are no protected wildlife areas within the 15km radius of the project. Impact study was carried out as per ToR and detailed mitigation measures are furnished in **Chapter 4**
17.	Location of National Parks, Sanctuaries, Biosphere Reserves, wildlife Corridors, Ramsar site Tiger/Elephant Reserves (existing as well as proposed), if any, within 10km of the mines 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	Detailed of flora & fauna Ecology and Biodiversity along with methodology, of the Study area has been carried out and details are added in**Chapter 3, Section 3.24** Peafowl, Shikra -schedule I species identified in the study area. The conservation plan for the species is discussed in **Chapter 3, Table 3-21**

	National Board of Wildlife and copy furnished.	
18.	A detailed biological study area [core zone and buffer (10km radius of the periphery of the mines lease)] shall be carried out. Details of the 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.	Detailed of flora & fauna Ecology and Biodiversity along with methodology, of the Study area has been carried out and details are added in**Chapter 3, Section 3.24** Peafowl, Shikra - schedule I species identified in the study area. The conservation plan for the species is discussed in **Chapter 3, Table 3-21**
19.	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.	The project site is not falling near to any sensitive area or Critically polluted area.
20.	Similarly, for coastal projects, a CRZ map duly authenticated by one of the authorized agencies demarcating LTL, HTL, CRZ area, location of the mines lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: the mining projects falling under CRZ would also	CRZ is not applicable

	need to obtain approval of the concerned Coastal Zone Management Authority).	
21.	R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SC's/ST's 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 their action programmes prepared and submitted accordingly, integrating the sectoral programmes of the line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.	There is no Rehabilitation and Resettlement is involved. Land classified as a Government poramboke land. Precise Area communication Letter was Obtained for the proposed mine area- Ref: Letter No. 3492325/MME.1/2022-1, Dated 13.01.2023
22.	One season (non monsoon) i.e. March-May (summer season), October-December (post monsoon season), December-February (Winter season) primary baseline data on ambient air quality as per CPCB notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so complied 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.	The primary baseline data monitored covered three (3) months i.e., from **March 2023 – May 2023**, and secondary data was collected from Government and Semi-Government organizations. The primary baseline data results and discussions are furnished in **Chapter 3**. **Ambient Air Quality**: The details of Ambient Air Quality Monitoring Locations, Results and Maps are provided in **Chapter 3, Section 3.20, Table 3.7- Table 3.8, Figure 3.17 & Figure 3.18.** **Noise:** The details of Noise Monitoring Locations, Results and Maps are provided in **Chapter 3, Section 3.21, Table 3.9, and Figure 3.19.** **Water:** The details of Surface Water Monitoring Locations, Results and Maps are provided in **Chapter 3, Section 3.22.1, Table 3.11 &Table 3.12, Figure 3.20.**

<table>
<tr><td></td><td>There should be at least one monitoring station within 500m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM_{10}, particularly for free silica, should be given.</td><td>The details of Ground Water Monitoring Locations, Results and Maps are provided in Chapter 3, Section 3.22.5, Table 3.14 to Table 3.15, Figure 3.22.

Soil:
The details of soil Monitoring Locations, Results and Maps are provided in Chapter 3, Section 3.23, Table 3.16 & Table 3.17, and Figure 3.23.

Detailed of flora & fauna Ecology and Biodiversity along with methodology, of the Study area has been carried out and details are added inChapter 3, Section 3.24.

Peafowl, Shikra -schedule I species identified in the study area. The conservation plan for the species is discussed in Chapter 3, Table 3-21</td></tr>
<tr><td>23.</td><td>Air quality modeling should be carried out for prediction of impacts of the project on the air quality of the area. It should also take into account the impact of the movement of vehicles for transportation of minerals. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on allocation 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 be also indicated on the map.</td><td>
<table>
<tr><th>Pollutant</th><th>Max. Base Line Conc. ($\mu g/m^3$)</th><th>Estimated Incremental Conc. ($\mu g/m^3$)</th><th>Total Conc. ($\mu g/m^3$)</th><th>NAAQ standard</th></tr>
<tr><td>PM</td><td>53.82</td><td>0.20</td><td>54.02</td><td>100</td></tr>
<tr><td>SO_2</td><td>9.29</td><td>0.03</td><td>9.32</td><td>80</td></tr>
<tr><td>NO_X</td><td>18.59</td><td>0.10</td><td>18.69</td><td>80</td></tr>
</table>
Air quality modeling carried out for prediction of impacts of the project on the air quality of the area. The details are given in Chapter 4 and Section 4.1.3.

Predominent wind direction South.

Map showing the Ambient Air Quality monitoring locations are given in Chapter 3, Secion 3.20 Figure 3.17.

Wind rose diagram considered for dispersion modeling is shown in Chapter 4, Section 4.1.3 Figure 4.1.

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

The details are provided in Chapter 4, Section 4.4 Table 4.15 & Table 4.16.</td></tr>
<tr><td>24.</td><td>The water requirement for the project, its availability and sources should be furnished.</td><td>
<table>
<tr><th>S. No</th><th>Description</th><th>Water Requirement(KLD)</th></tr>
</table>
</td></tr>
</table>

	A detailed water balance should be provided. Fresh water requirement for the project should be indicated.	<table><tr><td>1.</td><td>Drinking water</td><td>0.5</td></tr><tr><td>2.</td><td>Wire Saw Cutting</td><td>0.3</td></tr><tr><td>3.</td><td>Dust suppression</td><td>0.3</td></tr><tr><td>4.</td><td>Green belt</td><td>0.4</td></tr><tr><td colspan="2">Total</td><td>1.5</td></tr></table> Source of Water: Private Tankers The water requirement for the project is 1.5 KLD and breakup is addressed in **Chapter 2** and **Section 2.11.2 & Table 2-9.**
25.	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the project should be provided.	No ground water withdrawn to met the water requirement. The total water requirement is sourced from Private tank suppliers.
26.	Description of water conservation measures proposed to be adopted in the project should be given. Details of rainwater harvesting proposed in the project, if any, should be provided.	**Surface Water Pollution Control Measures** ➢ Construction of garland drains of suitable size around mine area and dumps to prevent rain water descent into active mine areas. ➢ During monsoon season, the rain water is being collected by natural slope of area to water fed tank of the mine and it will be utilized for dust suppression and greenbelt development. ➢ The mine water will be regularly tested for presence of any undesirable elements and appropriate measures will be taken in case any element is found exceeding the limits prescribed by CPCB. **Ground Water Pollution Control Measures** ➢ The domestic sewage from the canteen and toilets will be routed to septic tanks. ➢ Regular monitoring of water levels and quality in the existing open wells and bore well in the vicinity will be carried out. **Rain Water Harvesting** ➢ The rainwater is being diverted towards the middle of the mine to prevent water entering the mine working. The rainwater flows will also contain fines both from surface and waste dumps during seasonal flows. As such, it is being proposed to have structures in such a way to act as settling pond and also for rainwater harvesting. Water conservation measures are proposed in **Chapter 4** and **Section 4.5.4**
27.	Impact of the project on the water quality, both surface and ground water, should be assessed and necessary safeguard measures, if any required, should be provided.	The mining activity proposed in depth of 24m from the elevated ground level as per mining Plan. Water table is found at a depth of 8.3m below ground level Hence there is a possibility to intersect the ground water table while crossing mining operation at a depth of 24m.

		TAMIN will get necessary permission from authority concerned at the time of operation Water requirement is met through private water supply. There is no withdrawl of ground water.
28.	Based on actual monitored data, it may clearly be shown whether working will intersect ground water. Necessary data and documentation in this regard may be provided. In case the working will intersect ground water table, a detailed Hydro Geological Study should be undertaken and report furnished. The report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of groundwater should also be obtained and copy furnished.	The mining activity proposed in depth of 24m from the elevated ground level as per mining Plan. Water table is found at a depth of 8.3m below ground level. Hence there is a possibility to intersect the ground water table while crossing mining operation at a depth of 24m. TAMIN will get necessary permission from authority concerned at the time of operation Water requirement is met through private water supply. There is no withdrawl of ground water.
29.	Details of any stream, seasonal or otherwise, passing through the lease area and modification/diversion proposed, if any, and the impacts of the same on the hydrology should be brought out.	A stream is running inside the project site. However there will not be any impact due to the proposed project since the safety distance of 50m will be maintained as mentioned in Presice Area Communication letter Vide Letter No. 3492325/MME.1/2022-1, Dated 13.01.2023
30.	Information on site elevation, working depth, groundwater table etc. should be provided both in AMSL and bgl. A scientific diagram may also be provided for the same.	Site Elevation- Height of the Proposed Project Site is 64mbgl. Water table is found at a depth of 8.3m below ground level. Hence there is a possibility to intersect the ground water table while crossing mining operation at a depth of 24m. TAMIN will get necessary permission from authority concerned at the time of operation
31.	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the project. Phase-wise plan of plantation	Green Belt Development plan is proposed for 0.06.5Ha. Details given in **Chapter 4**, **Section 4.11** & Green belt photos are given in **Figure 2-8.**

	already done should be given. The plant species selected for greenbelt should have greater ecological value and should be of good utility value to local population with emphasis on local and native species and the species which are tolerant to pollution.	
32.	Impact on local transport infrastructure due to the project should be indicated. Projected increase in truck traffic as a result of the project in the present road network (including those outside the project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as state government) should be covered. Project proponent shall conduct impact of Transportation study as per Indian Road Congress Guidelines.	The Granite dimensional blocks are transported to consumer directly as per buyer's requirement. The granite is being transported through existing road by tippers and approximate number of trips required is 2 times per week. This minimum trip does not create impact on existing transportation. Impacts and mitigation measures on transportation is given in **Chapter 4, Section 4.3.**
33.	Details of the onsite shelter and facilities to be provided to the mines workers should be included in the EIA Report.	Sanitation facilities will be provided to mines workers at the proposed infra structure area in the land use plan of 0.02.5 Ha
34.	Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.	There will be no reclamation and restoration. It is proposed not to fill back the ultimate pit, in as much as good quantity of reserve is available below the workable depth.

35.	Occupational Health impacts of the project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	Occupational Health impacts &preventive measures detail given in **Chapter 4** and **Section 4.13** The EMP details are given as separately as **Chapter 10** along with EMP Cost details.
36.	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	The proponent M/s. TAMIN proposes proper mititgation measures and Environmental management Plan during the operation of the quarry. Total capital cost of Rs. **51,50,100/-** and reccuring cost of Rs. **27,27,530** allocated for environmental protection activities.
37.	Measures of socio economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	Impacts and measures are addressed in **Chapter 4** and **Section 4.13.**
38.	Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.	The EMP details are given as a separately as **Chapter 10** along with EMP Cost details.
39.	Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.	EIA report has been prepared as per the obtained violation ToR vide Lr. No. SEIAA-TN/F.No3888/SEACToR-1533/2023 dated 09.08.2023. Draft EIA report will be submitted for Public Hearing (PH). After PH the minutes will be incorporated in the EIA report along with action plan or commitment by the proponent. Final EIA will be submitted to TNSEAC for further appraisal of the project and obtaining Environment Clearance.

<table>
<tr><td>40.</td><td>Details of litigation pending against the project, if any, with direction/order passed by any Court of Law against the project should be given.</td><td>There is no litigation pending against the project.
But, TAMIN has started the quarry activites without prior EC, the project falls under Violation category.</td></tr>
<tr><td>41.</td><td>The cost of the project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.</td><td>The project Cost is 99,97,000/-
The Capital and recurring Cost of EMP is given below:
<table>
<tr><th>S. No</th><th>Environment Aspects for Budget Allocation</th><th>Capital Cost</th><th>Recurring Cost</th></tr>
<tr><td>1.</td><td>Air Environment</td><td>2,77,800</td><td>11,57,500</td></tr>
<tr><td>2.</td><td>Noise</td><td>50000</td><td>6,15,030</td></tr>
<tr><td>3.</td><td>Water Environement</td><td>2,02,800</td><td>5,000</td></tr>
<tr><td>4.</td><td>Waste Management</td><td>1,10,000</td><td>5,000</td></tr>
<tr><td>5.</td><td>Implementation of EC, Mining Plan & DGMS Condition</td><td>43,59,500</td><td>9,27,000</td></tr>
<tr><td>6.</td><td>Greenbelt</td><td>1,50,000</td><td>18,000</td></tr>
<tr><td></td><td>Total</td><td>51,50,100</td><td>27,27,530</td></tr>
</table></td></tr>
<tr><td>42.</td><td>A Disaster management Plan shall be prepared and included in the EIA/EMP report.</td><td>Disaster Management Plan is given in Chapter 7 and Section 7.3</td></tr>
<tr><td>43.</td><td>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.</td><td>The project benefits are:
➢ The quarrying activities in this belt will benefit to the local people both directly 30 persons.
➢ The direct beneficiaries will be those who get employed in the mines as skilled and unskilled workers.
➢ Improvement in Per Capita Income.
➢ The socio - Economic conditions of the village and distance will enhance due to the project, hence the project should be allowed after considering all the parameters.
➢ It can thus be concluded that the project is environmentally compatible, financially viable and would be in the interest of construction industry thereby indirectly benefiting the masses.
Project benefits are given in Chapter 8.</td></tr>
</table>

2 PROJECT DESCRIPTION

2.1 Description of Project

The quarry site is located at S.F.No.170/1 (Part), Siruvalai Village, Vikravandi Taluk, Villupuram District, Tamil Nadu State. The proposed lease area for mining of Black granite is 20.28.0Ha. The land use classification of the project site is government Poramboke land. The quarry lease was applied vide Letter No. 3492325/MME.1/2022-1, dated 13.01.2023 for 20 years. The project falls under B1 Category, Schedule 1(a) Mining of Minerals as per MoEF&CC notification and its amendment vide S. O. 804(E) dated 14th March 2017. TAMIN commenced the mining operation of the subject area without prior environmental clearance from 15.01.2016 to 10.01.2017 under MoEF&CC notification dated 14.09.2006. Hence, this is a violation project.

2.2 Type of project including interlinked and interdependent projects

The project falls under B1 Category, Schedule 1(a) Mining of Minerals as per MoEF&CC notification. The proposed type of mining is surface mining. The method proposed for mining is opencast semi mechanised method.

2.3 Need for the project:

The Black granite dimensional stone material by virtue of its pleasing color and texture such as 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 produced are exported as raw blocks and some quantity is being processed at TAMIN's Granite processing units and exported as value added finished products.

The earning source in the targeted area is limited, most of the people in and around the area depend upon the seasonal agriculture and much of the people migrate to nearby towns where good industries and factories are growing up. Through this project will give employment opportunities to 30 direct and 20 indirect employees.

2.4 Quarry Location

The Black granite mine is over an extent of 20.28.0 Ha located in S.F.No.170/1 (Part), located at Siruvalai Village, Vikravandi Taluk, Villupuram District, lies in the latitude of 12°01’37.0492” N to 12°02’02.7900” N and longitude of 79°25’53.4838” E to 79°26’21.9508” E. The area is marked in the survey of India Topo sheet No.D44T8,12 & C44B5,9. Site Elevation is above ~64m AMSL. The boundary Coordinates of the site given in **Table 2.1.** The project location

map is given in **Figure 2.1.** 300 m Radius Google Imagery of the lease area boundary is given in **Figure 2.2.** 500m Radius Google Imagery of the project site is given in **Figure 2.3**. 10km radius village map of the project site is shown in **Figure 2.4**. Topo map of the study area is given in **Figure 2.5.** Environmental sensitive areas covering within 15 km from project boundary is given in **Figure 2.6**.

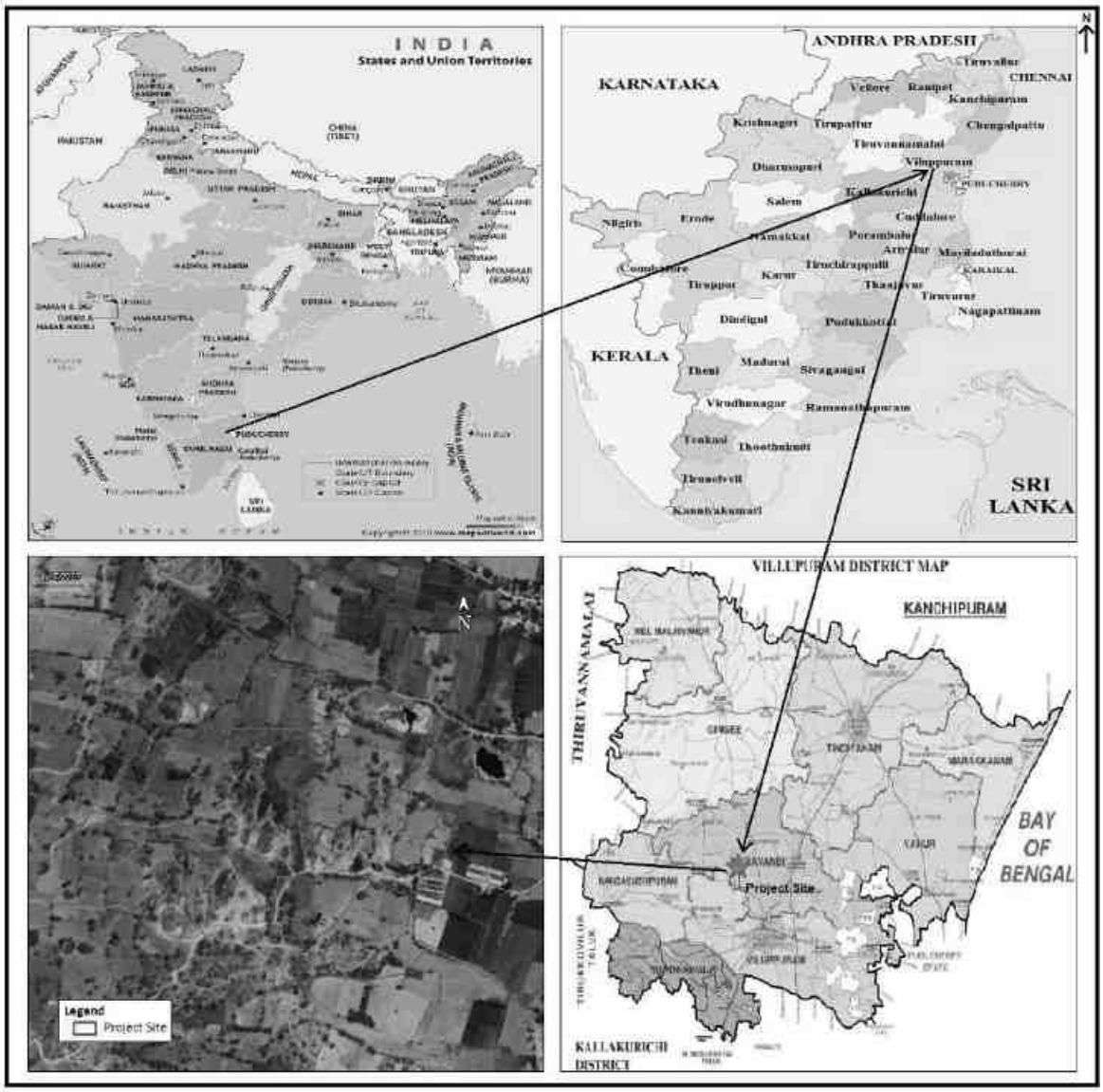


Figure 2-1 Project Location Map

Figure 2-2 300 m Google Imagery of the lease area boundary

Figure 2-3 500m Radius Google Imagery of the project site

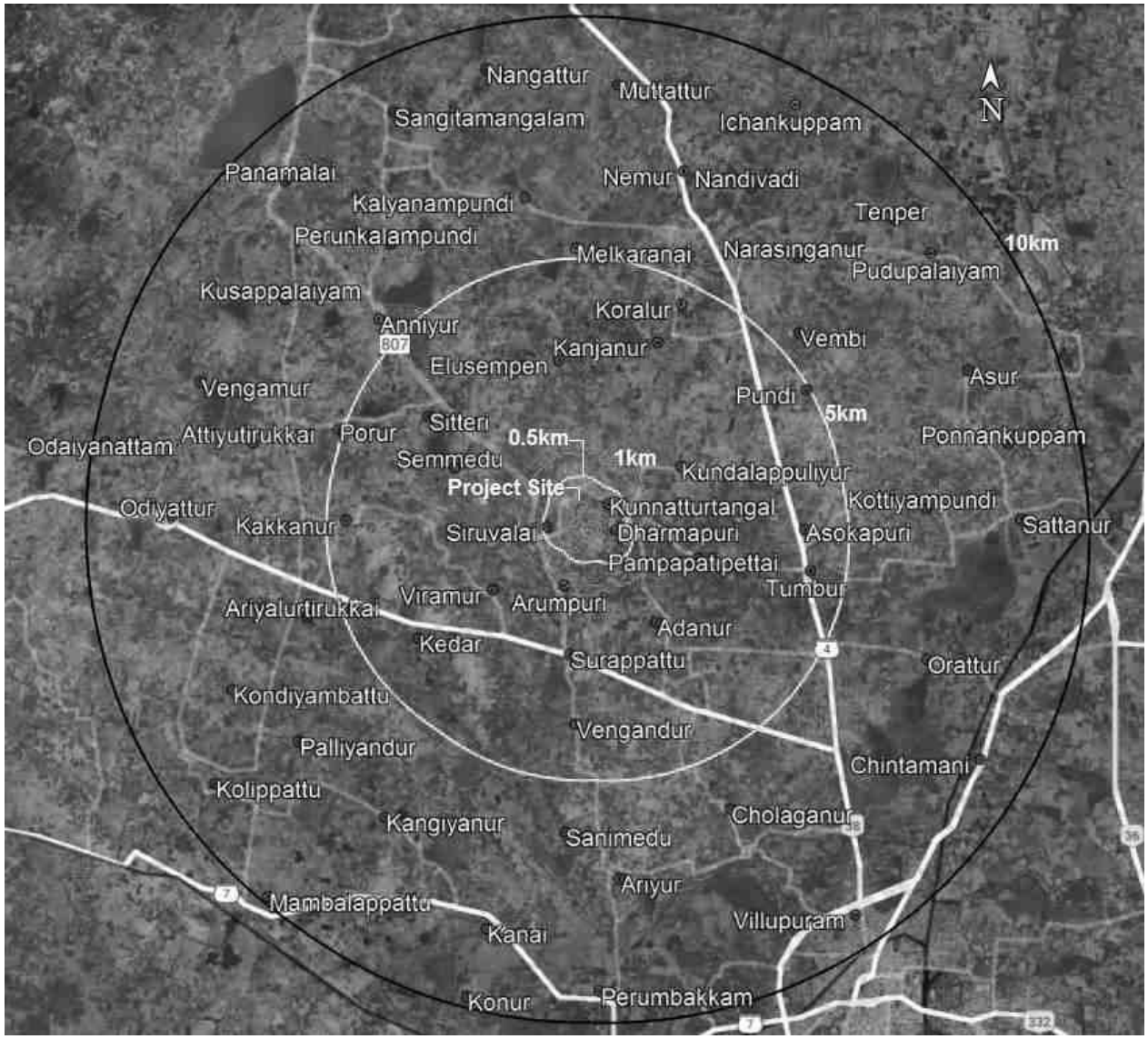


Figure 2-4 10km radius Google Imagery of the project site

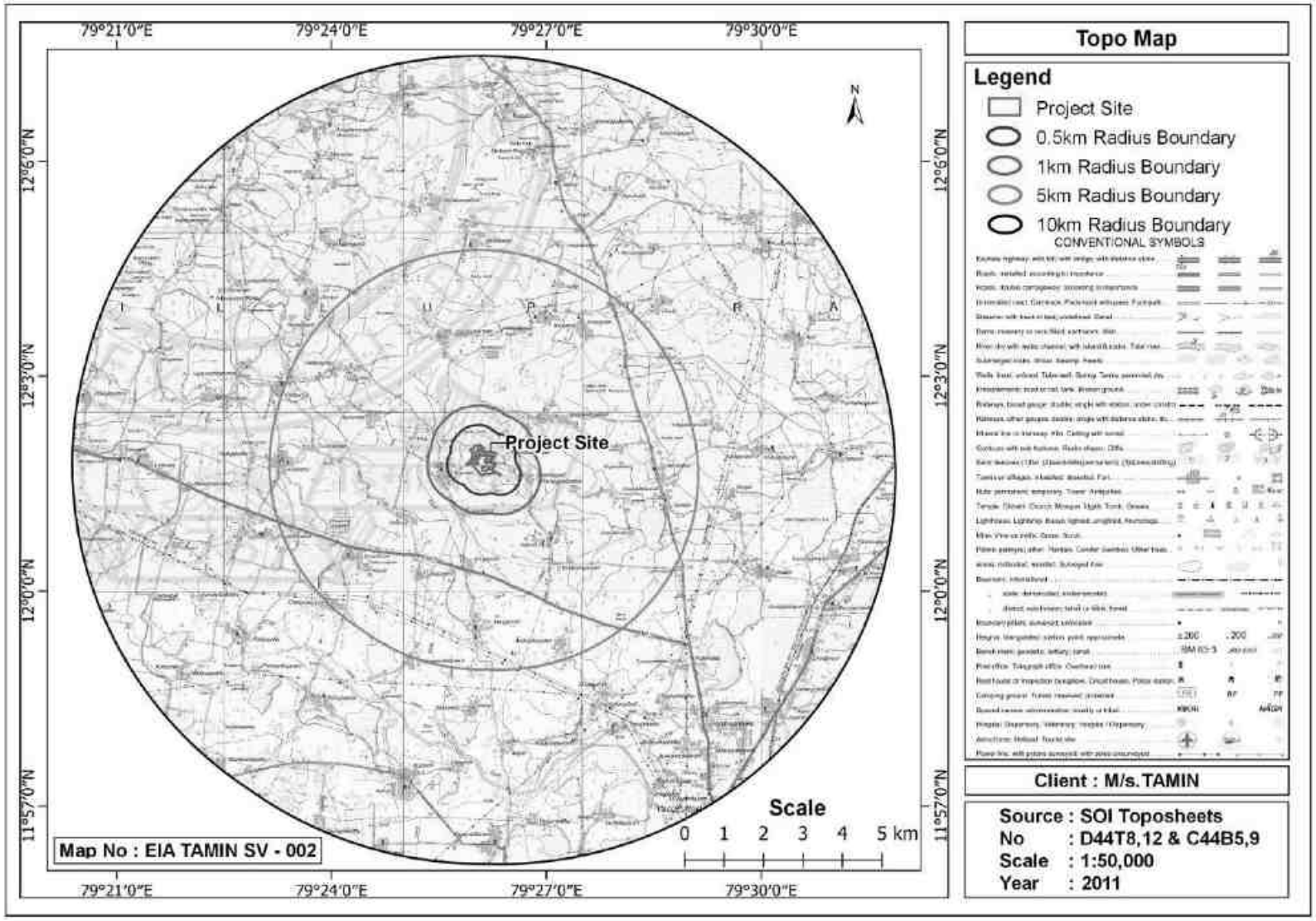


Figure 2-5 Topo map of the study area

2.4.1 Project Summary & Salient Features

Project Summary & Salient Features within 15km radius of the project boundary is shown in **Table 2-1.**

Table 2-1 Project Summary & Salient Features within 15km radius of the lease area boundary

S.No	Particulars	Details
1.	Latitude	12°01'37.0492" N to 12°02'02.7900" N
2.	Longitude	79°25'53.4838" E to 79°26'21.9508" E
3.	Site Elevation above MSL	~64 m AMSL
4.	Topography	Undulating Topography with plain agricultural land
5.	Land use of the site	Government Poramboke land
6.	Extent of lease area	20.28.0 Ha
7.	Quarry Lease (G. O.3(D)No.75)	20 Years,Letter No.3492325/MME.1/2022-1, dated:13.01.2023
8.	Mining Plan Approval Letter	RcNo. 5480/MM4/2022, Dated 19.05.2023
9.	Water Requirement	1.5 KLD
10.	Power requirement through DG Set	60 KVA (DG Set 1*120 kVA)
11.	Fuel requirements (Lts/Day)	200
12.	Manpower	Direct-30
13.	Municipal Solid waste Generation (Kg /day	13.5
14.	Waste Oil generation (Lts/Y)	3.0
15.	Project Cost in Lakh	Rs. 99.97/-
16.	Nearest highway	➢ SH-135 (Villupuram-Tiruvannamalai) ~2.39km (S) ➢ NH-38(Vellore - Thoothukudi) ~ 2.39 km (S)
17.	Nearest railway station	Mundiyampakkam Railway Station ≃8.61 km (ESE)
18.	Nearest airport	➢ Puducherry Airport ≃40.19km (E) ➢ Cuddalore Airport ≃50.56km (SSE)
19.	Nearest town / city	**Nearest City:** Villupuram ≃9.50 Km (SSE)
20.	Seismicity	Seismic zone-II
21.	Defense Installations	Nil within 15 km radius
22.	State Boundary	Nil

2.4.2 Nearest Human Settlement

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

Table 2-2 Nearest Human Settlement

S. No	Name of the Village	Distance in km	Direction	Population (census 2011)
1	Kunnatturtangal	0.16	NE	225
2	Dharmapuri	0.21	E	750
3	Siruvalai	0.33	W	2414
4	Arumpuri	1.01	S	492
5.	Kundalappuliyur	1.15	NE	1850

2.5 Details of alternate sites considered

There is no alternative sites examined, The entire Black Granite Bulk quantity of the blocks are produced and exported as raw blocks and is being processed at TAMIN's Granite processing units and exported as value added finished products.

2.6 Size or magnitude of operation

The Black granite mine is over an extent of 20.28.0 ha located in S.F.No.170/1 (Part), located at Siruvalai Village, Vikravandi Taluk, Villupuram District, lies in the latitude of 12°01'37.0823" N to 12°02'02.7900" N and longitude of 79°25'53.7838" E to 79°26'21.9508" E. The area is marked in the survey of India Topo sheet No.D44T8,12&C44B5,9.

The Black granite quarrying operation is proposed to carry out by opencast semi mechanized method by formation of benches. Benches are proposed with a height of 6m & width bench not less than the height. Proposed production of mine is 33,000m^3 with a depth of Mining of 24m from BGL for the period of 20 years. The area applied for quarry lease is exhibits flat terrain; the altitude of the area is ~64 AMSL.The Land Use Break up summarized as **Table 2-3.**

Table 2-3 Land use Pattern of the quarry area

S.No	Description	Present area (Ha)	Area to used during the proposed mining plan period in Ha	Area at the end of the quarry (Ha)
1.	Area under quarrying	3.77.0	0.15.5	3.92.5
2.	Village Road	0.40.0	--	0.40.0
3.	Mine approach Road	0.32.0	--	0.32.0
4.	Infrastructure	0.02.5	--	0.02.5
5.	Waste Dump	1.22.0	1.45.0	2.59.0
6.	Afforesation	0.20.0	0.06.5	0.26.5
7.	Un utilized area	14.34.5	12.67.5	12.75.5
	Total	**20.28.0**	**14.34.5**	**20.28.0**

2.7 Proposed Schedule for Approval and Implementation

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

Particulars	Time Schedule
Submission of Draft EIA/EMP	June2024
Conducting Public Hearing and submitting final EIA/EMP	July 2024
Presentation before SEAC and Obtaining EC	October 2024

2.7.1 Black Granite Reserves

The available mineable reserve calculated by deducting 7.5m safety distance and bench loss. The updated geological reserve of Black granite estimated based on the geological cross-sections was 3, 65,797m3 as on 01.02.2023. By applying the 10% recovery, the updated geological effective reserve as 3, 65,797 m^3. The updated minerable reserves for Black granite have been arrived as 33,155m^3 as on 01.02.2023 after consideration of mineral locked-up in benches and safety barrier. By applying 10% recovery, the updated mineable effective reserves as 3,316 m^3.

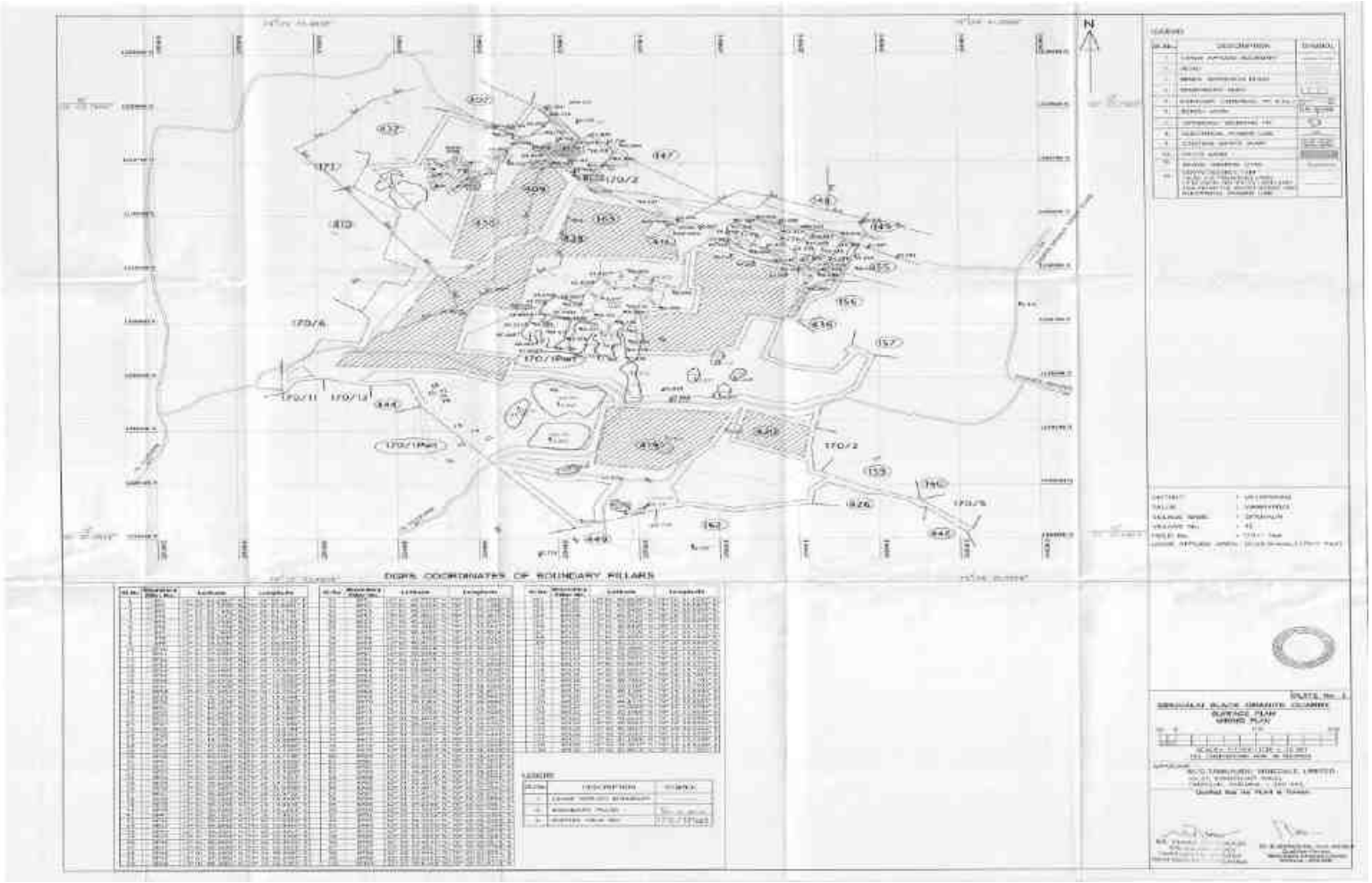


Figure 2-6 Surface Plan of the Granite Quarry

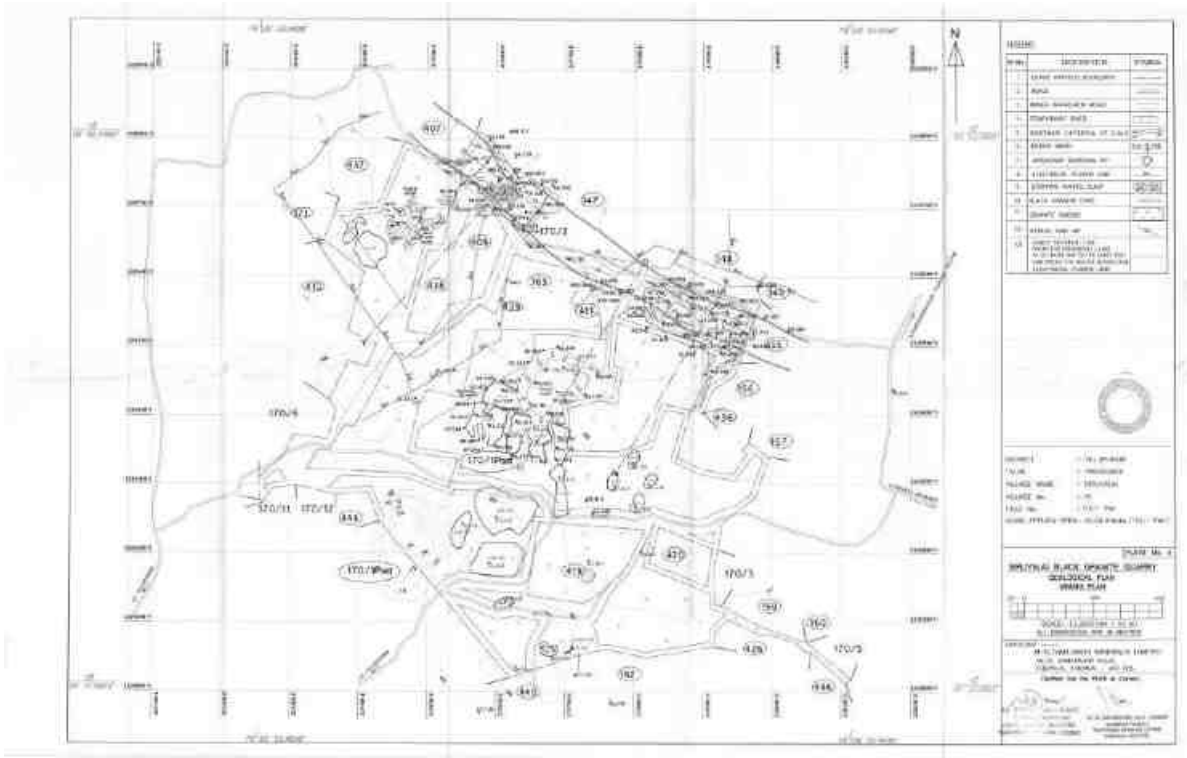


Figure 2-7 Geological Plan

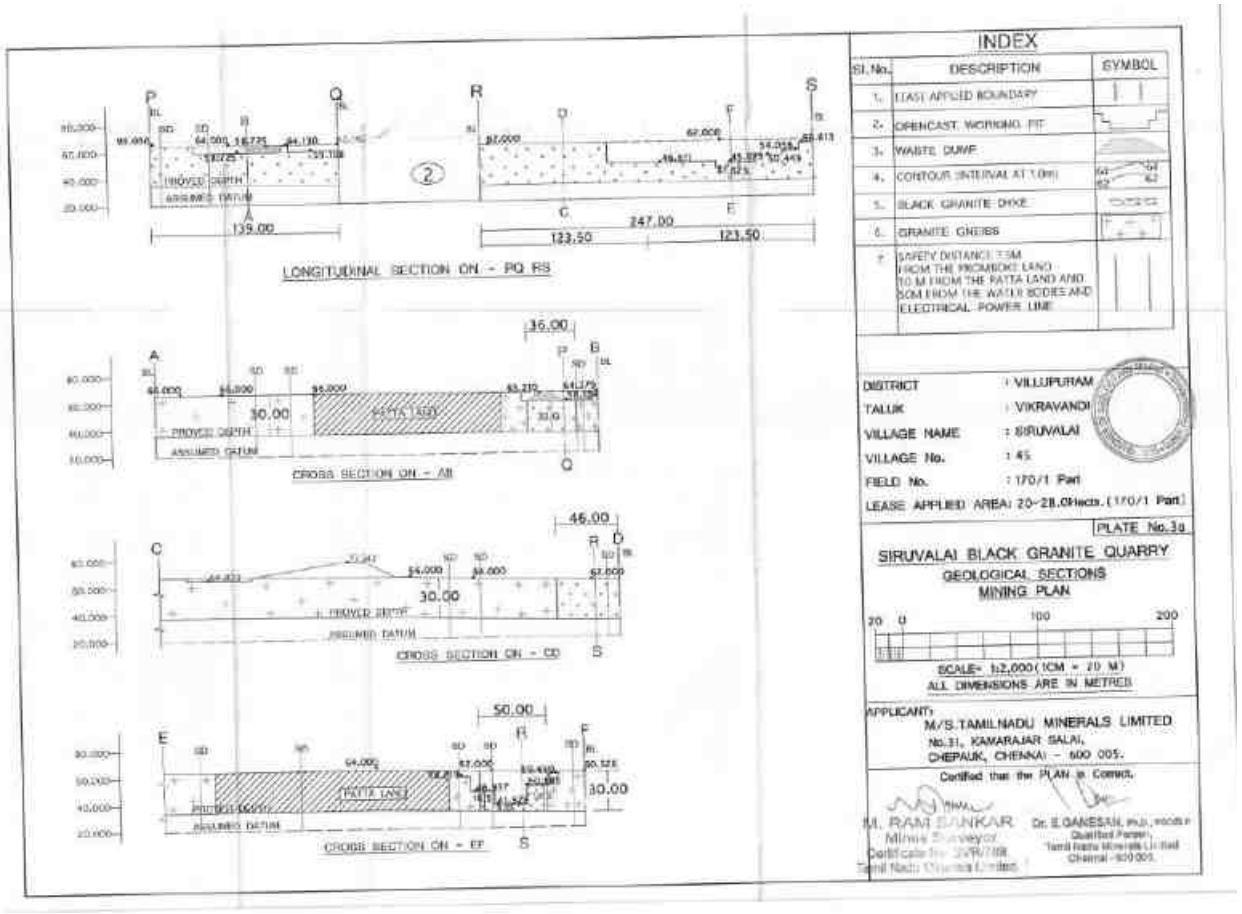


Figure 2-8 Geological Sections

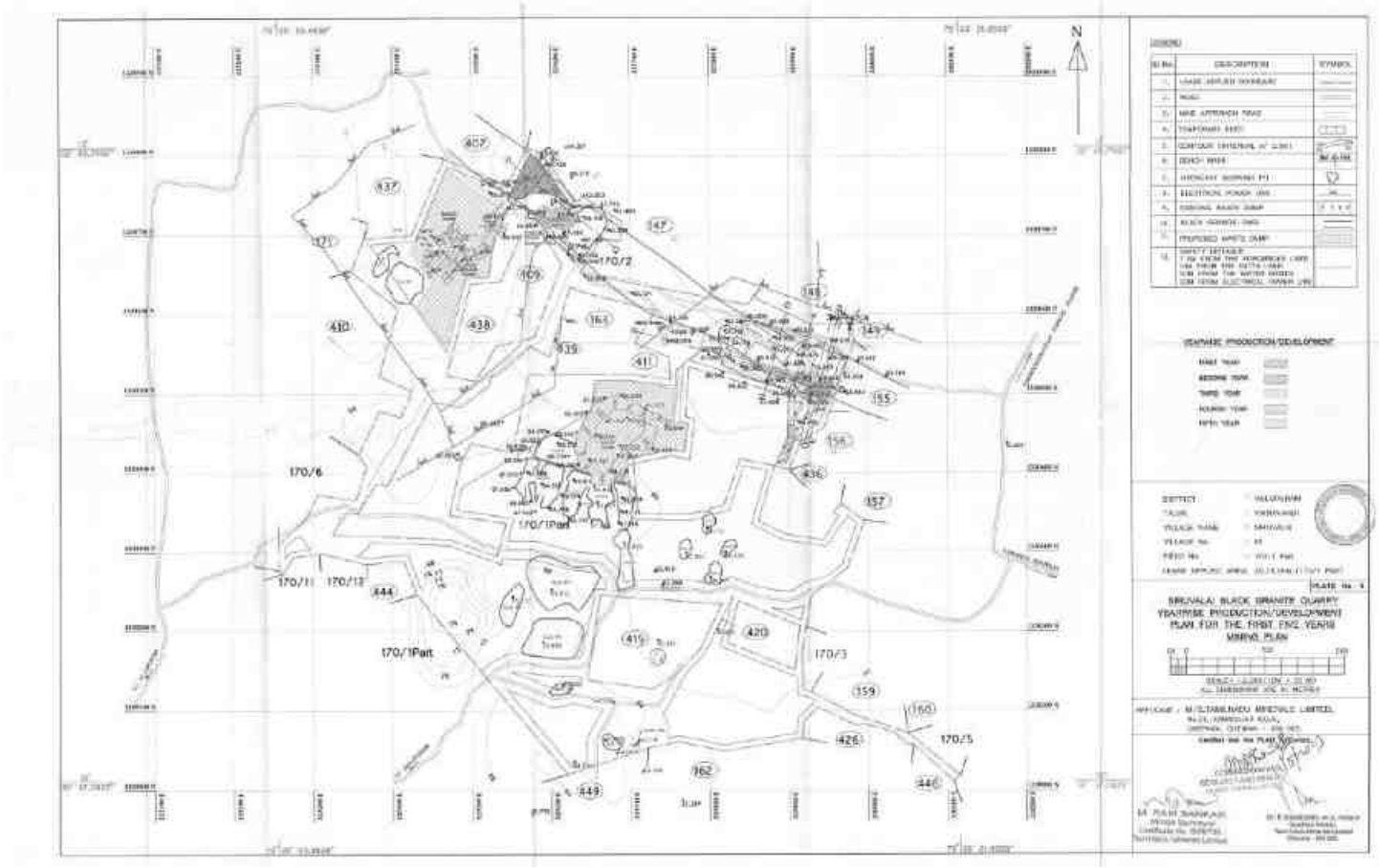


Figure 2-9 Year wise production/Development plan

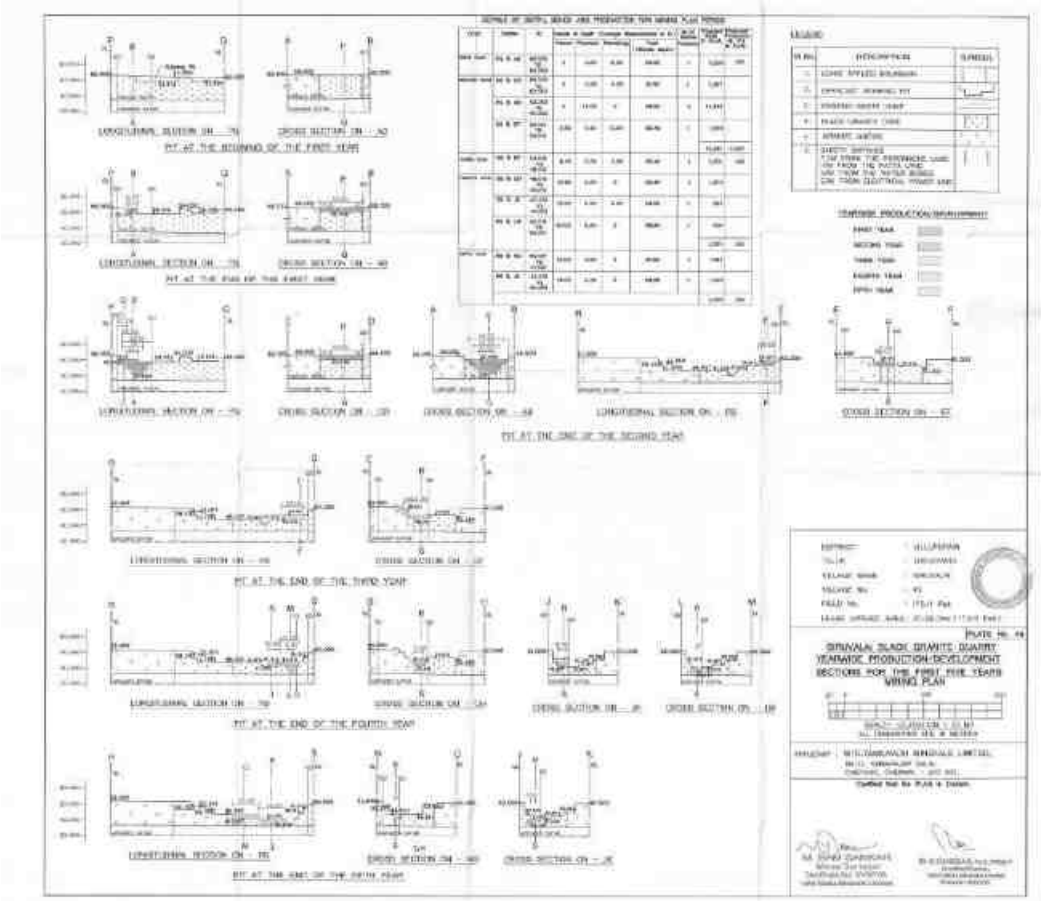


Figure 2-10 Year wise production/Development section

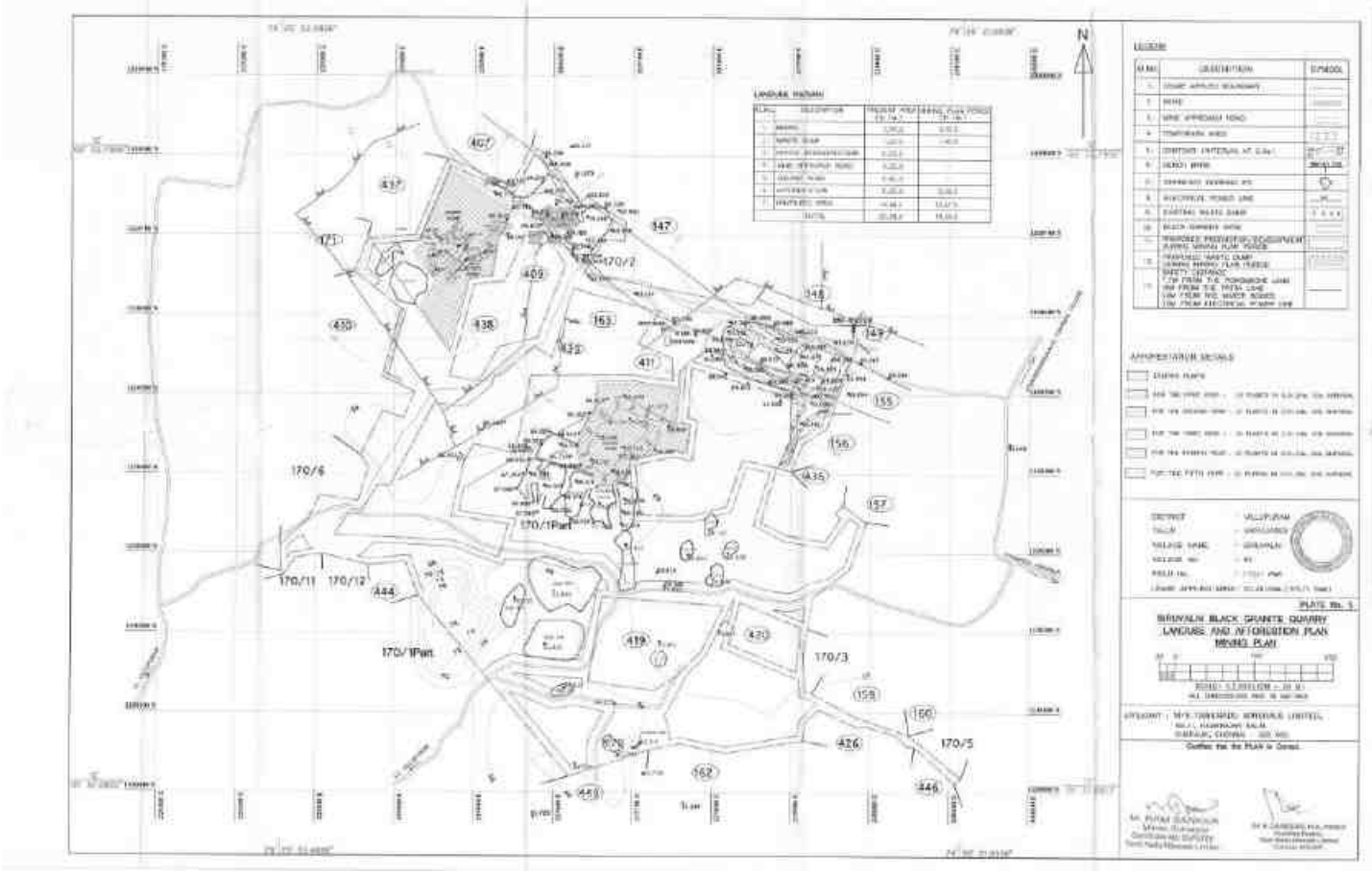


Figure 2-11 Land Use and Afforesation plan

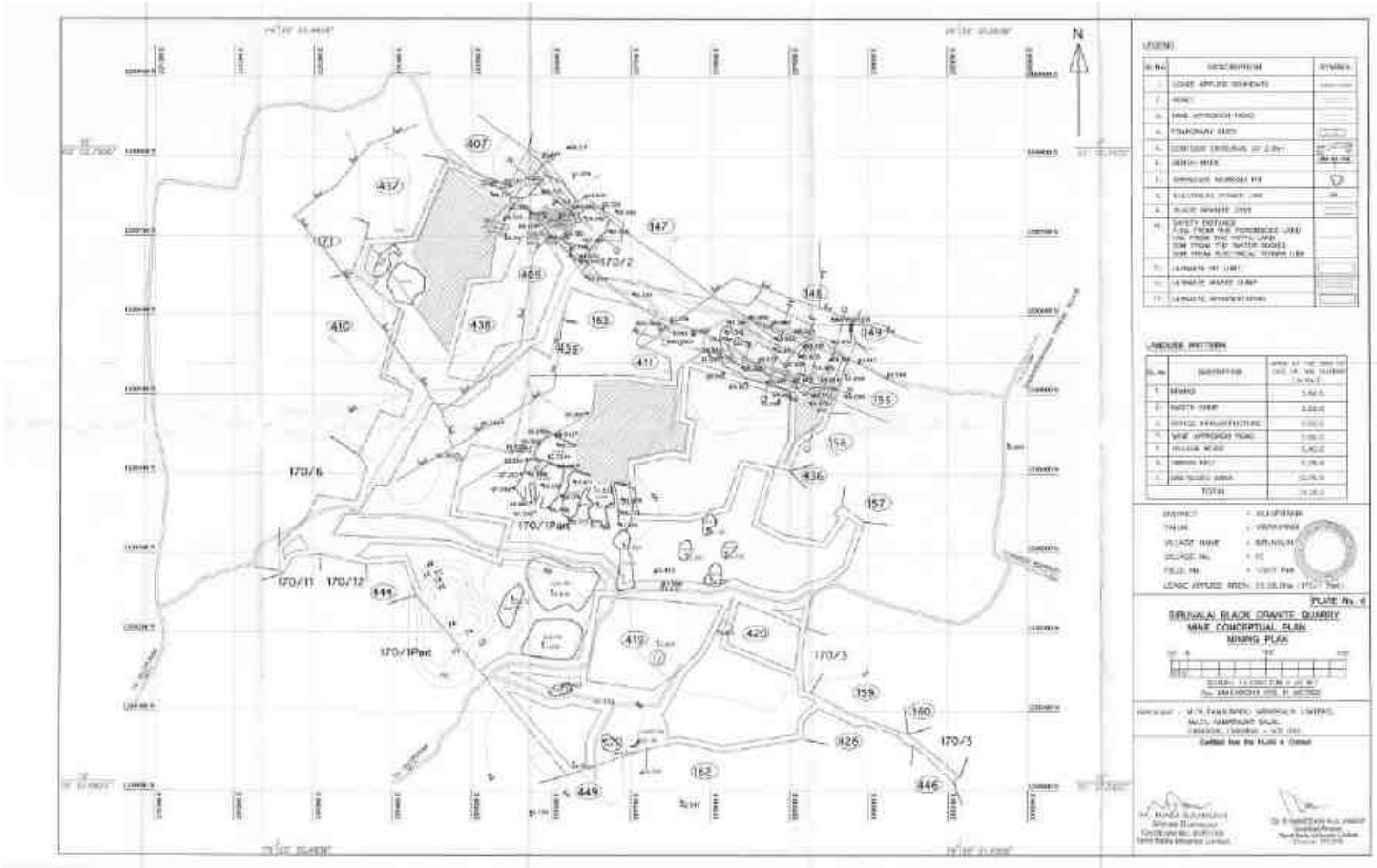


Figure 2-12 Conceptual Plan of the quarry

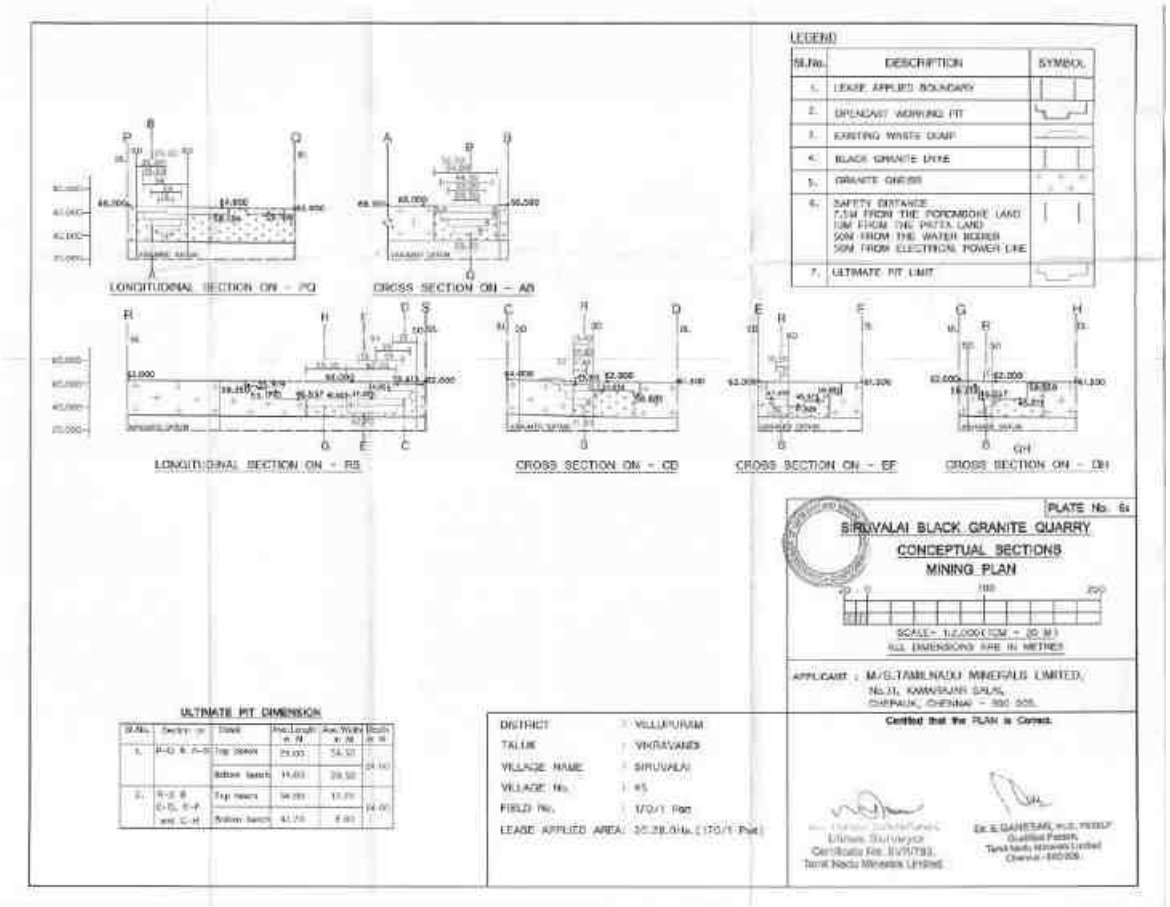


Figure 2-13 Conceptual Section of the quarry

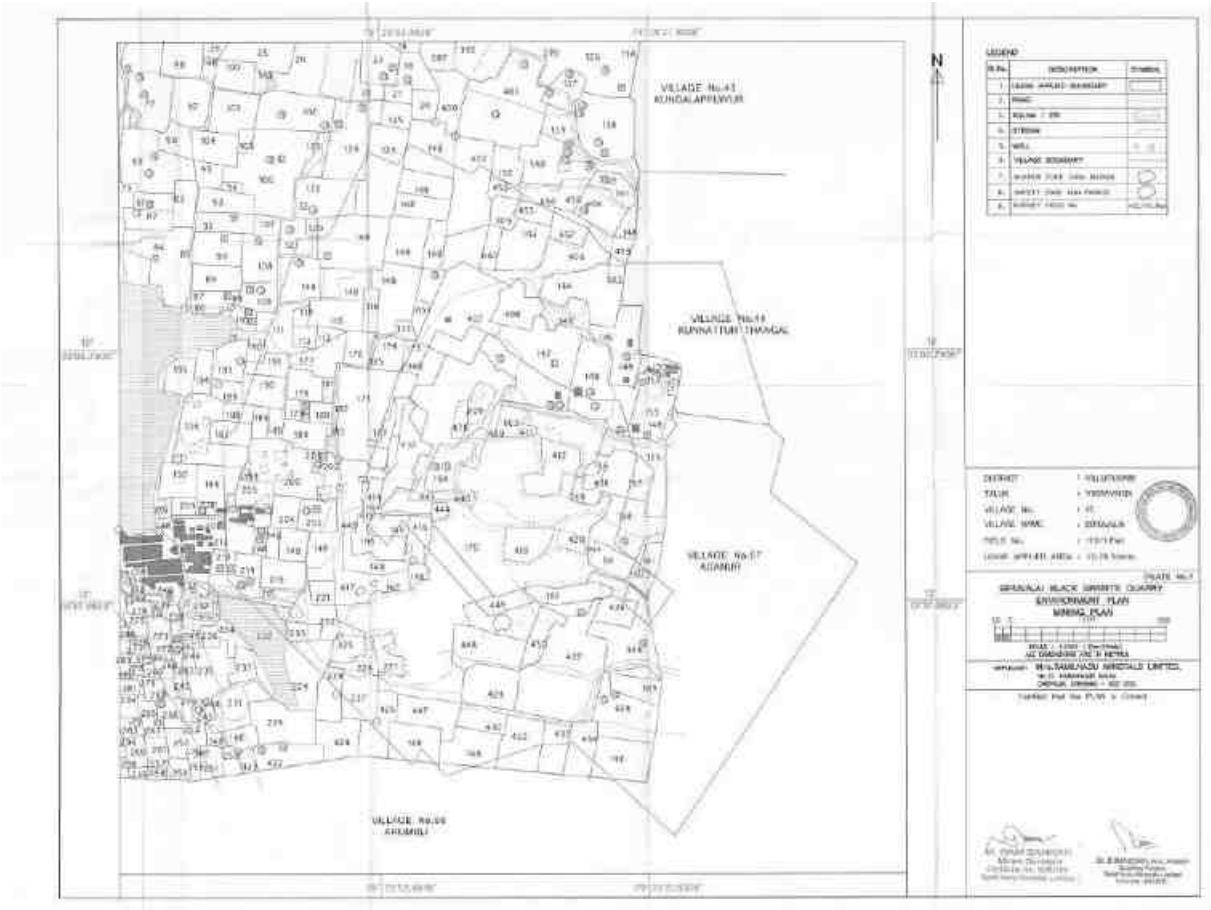


Figure 2-14 Environmental Plan of the quarry

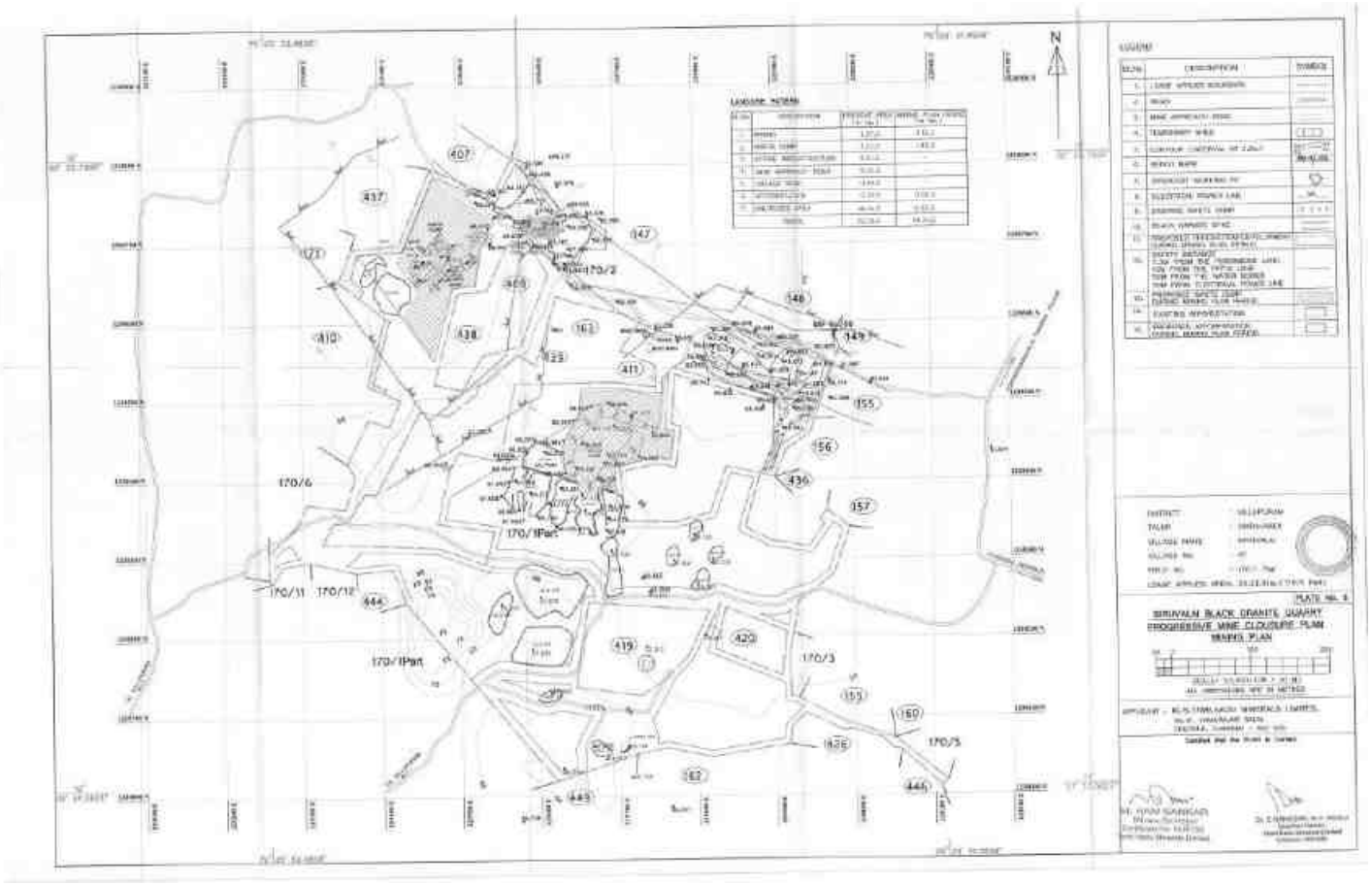


Figure 2-15 Mine Closure Plan of the quarry

Table 2-4 Updated reserves as on 01.02.2023

S.No	Updated Geological Reserves ($m^{3)}$	Updated Mineable Reserves (m^3)	Mineable Saleable Reserves @10% Recovery (m^3)
1.	3,65,797	33,155	3,316

2.8 Summary of the Magnitude of Operation

The Mining plan was approved by the Commissioner of Geology & mining, Chennai vide letter No.5480/MM4/2022, dated 19.05.2023 for 20.28.0Ha.

Year wise production details for 5 years is summarized in **Table 2-6.**

Table 2-5 Yearwise Development/Production for the Five Years

S. No	Year	ROM (m^3)	Production @ 10% Recovery(m^3)	Granite waste @ 90%(m3)
1	1st Year	4000	400	3600
2	2nd Year	20000	2000	18000
3	3rd Year	3000	300	2700
4	4th Year	3000	300	2700
5	5th Year	3000	300	2700
Total		**33000**	**3300**	**29700**

2.9 Project Cost

Project cost of the project is shown in **Table 2-6.**

Table 2-6 Project cost of the project

S. No	Description of the Cost	Cost in Lakhs
I. Fixed Asset Cost		
1	Land Cost	Nil because of Govt. Land
	Labours Shed	50,000/-
	Sanitary facilities	50,000/-
	Fencing Cost	1,25,000/-
	Sub Total	**2,25,000/-**
II. Operational cost		
	Jack Hammers (6 nos)	1,98,000/-
	Compressor (2 nos)	19,82,000/-
	Diamond wire saw (1 no)	4,87,000/-
	Diesel General 120KVA	4,00,000/-
	Excavator (1 no). hire	6,00,000/-
	Tippers (2 nos)	58,00,000/-
	Drinking water facility for the labours	50,000/-
	Safety kits	50,000/-
	Sub Total	**95,67,000/-**
III	**EMP Cost**	
	Afforestation	30,000/-
	Water Sprinkling	50,000/-
	Water Quality Test	25,000/-
	Air Quality Test	25,000/-
	Noise/Vibration Test	25,000/-
	CSR activities	50,000/-
	Sub Total	2,05,000/-
	Grand Total	**99,97,000/- ≃Rs. 1 Crore**

2.10 Technology&Process Description

2.10.1 Technology

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

The major purpose of mine development is to provide auxiliary and support facilities for physically opening a surface or underground, or mine and bringing it to full production is to be planned. The facilities will not contribute directly to the production operation. It is a period of intensive and diversified activity on the project site with environmental impacts, which are

usually different in nature from operational impacts, which are crucial for successful environmental management. Schematic Diagram of Mining Process is given in **Figure 2-18.**

2.10.2 Method of mining-Open Cast Working

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

- Recovery of the granite mineral is to be as undamaged rectangular dimensional blocks. In the attempt to the benches and sides with the above statutory parameters haphazard blasting may be involved.
- In which case the commercial granite body may get spoiled due generation of blasting cracks.In the exercise of forming the benches with 60° slope within the granite deposit, the portion confined within the 60° as we as its complimentary part in the extricated block will become as mineral waste while shaping into rectangular blocks.
- The granite industry needs blocks as huge as few cubic meters volume withmeasurements upto 3m x 2m x 2m.
- Production of such huge blocks with a moving bench of 6m height is not possible. Production of such huge blocks in turn increases the recovery and reduces the mineral waste during dressing.
- Blocks of smaller size of certain varieties of granite are not marketable now-a-days. Formation of too many benches with more height and the width equal to the heightmay lease to mineral lock up.

Hence in order to avoid granite waste and to facilitate economical and convenient mining operations, it is proposed to obtain relaxation to the provisions of Regulation 106 (2) (a) up to a bench parameter of 6m height and 3m width with vertical faces. Such a provision for relaxation of the Regulation has been provided within the regulation 106 (2) (a). Further, it is to be noteworthy that opencast granite mining operations with the above proposed bench parameters may not be detrimental to Mines Safety, since the entire terrain is made up of hard rock, compact sheet and possess high stability on slope even at higher vertical angles. It is proposed not to backfill the pit in as much as good quantities of reserves are underlying the pits. The stock yard for the granite blocks produced and the dressing yard where the manual dressing and shaping of the blocks are carried out are located near the working pit in

order to minimize the lead from the pit to the dressing yard and stock yard. A mine office, store room, first-aid room and workers rest shelter have been provided.

2.10.3 Process Description

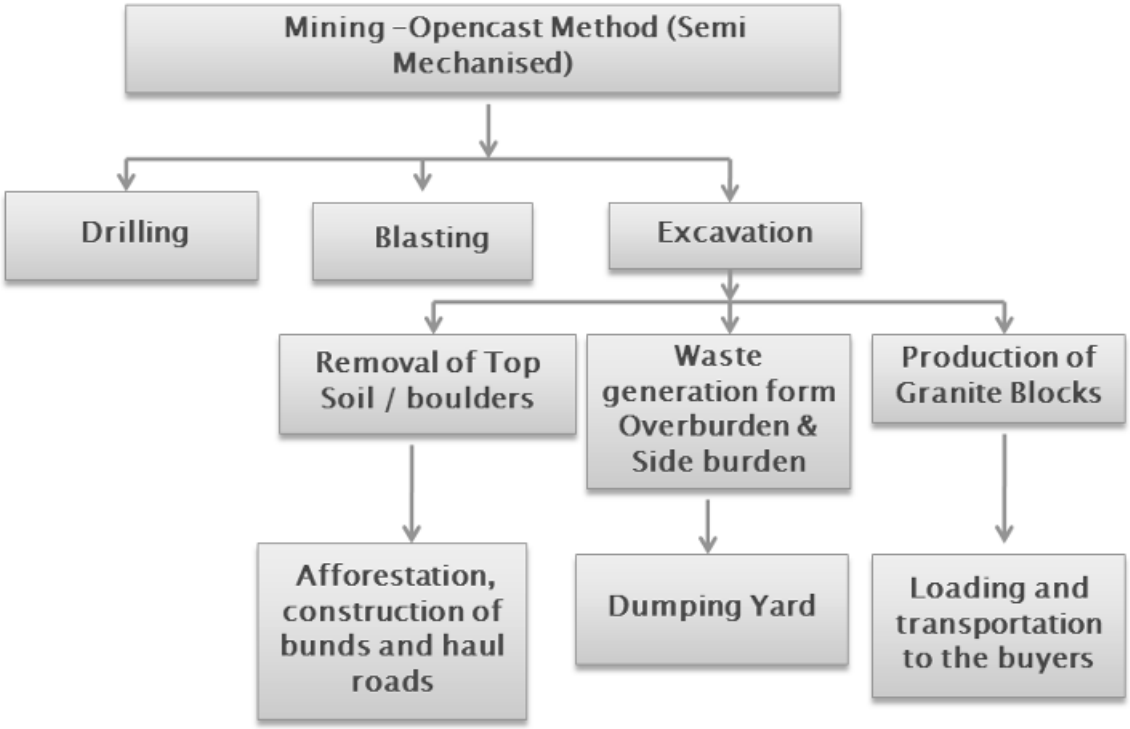


Figure 2-16 Schematic diagram of the mining process

2.10.4 Mining

Open cast, semi-mechanized mining with 6m vertical bench with a bench width of 6m has been proposed. Under the regulation 106 (2) (a) of the Metalliferous Mines Regulation 1961 in all open cast working in hard ore body, the benches and sides should be properly benched and sloped. The eight of any benches shall not exceed 10m and the width thereof shall not be less than the height has to be maintained.

The benches shall be sloped at an angle of more than 60° from the horizontal. 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.
All the above process continued together aiming at the liberation of huge volume of the granite body from the parent sheet rock is called ‘primary cutting’.

1. The secondary splitting in to required size involves long hole drilling up to the bottom of the separated block and mild blasting along the required plans.
2. Now-a-days the secondary splitting is carried out by way of splitting and overturning cushion operational procedure. The procedure is by utilizing the

compressed air available at the quarry at 7 to 8 bar pressure, initially (widening) splitting up to 15 to 18cms. Next by using super imposed cushion widening up to80cms and overturning of the blocks.

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

The defect free rectangular shaped dimensional stones as acceptable to consumers are produced by the method described as above which is constantly supervised by experienced mining geologist. The waste material generated during mining activity include the rock fragments of different angularity formed during the works, during the removal of naturally defective and uneconomical portions of the deposits and the working waste formed during dressing of the extricated blocks. Such waste material is proposed to the dumped along northern side the lease boundary / barren area where the commercial granite occurrences are not seen / the area covered with poor quality granite deposit identified to be uneconomical due to sheared and contacted nature or the presence of closely space natural joints, etc.

2.10.5 Blasting

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

The portion to be extricated from the parent rock body is freed in all planes by adopting different methods as described in chapter 4.0. Only mild explosives such as gun powder, detonating cord, ordinary detonators etc will be used for the production of granite blocks. The blast holes of 32mm diameter are drilled upto the bottom of the horizontal plane all along the required planes without deviations sub grade drilling is avoided, since it may damage the underlying granite deposit.

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

cms from the drill hole on blasting. Sub grade drilling may affecttheunderlying granite deposit.

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

Now-a-days the splitting within the sheet rock is affected by diamond wire sawing, which largely reduces the use of explosives in granite mining. Many adverse effects of blasting are avoided and hence Diamond wire cutting will substantially increase the recovery. Hence it is proposed to deploy one wire saw machine in this quarry during its operation. Since the dimensional stones, which are needed without any cracks, high explosives are not used. The secondary splitting into required involves long hole drilling upto the bottom of the separated block along the required planes for which mostly rock breaking powder is used for splitting. It is chemically called as "Calcium Hydroxide Ca $(OH)^{2}$".

Soundless cracking Agent is a non explosive- demolition agent that has the ability to safely demolish the rocks and reinforced concrete, cement without producing noise, vibrations, debris launches or environmental pollution. To carry out demolition CRACMAX need to be mixed with water and poured in the drilled holes. Now a day only wire sawmachine is being utilized for primary cutting to liberate the required sizes of blocks from the parent rock. The secondary spitting is carried out by the way of splitting and overturning cushtion operational procedure.

2.10.6 Loading & Transportation

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

2.10.7 Exploration

A number of valuable data for economical mining of the granite stone in this area have already been known from the actual mining practice during the past 33 years in this field.

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

The details of estimation of geological reserves and mineable reserves with reference to the geological plan and sections in Plate No: -3 and conceptual plan and sections in Plate No: -6 which have been furnished as **Annexure 5.**

2.10.8 Storage of Explosives

The applicant will engage an authorized explosive agency to carry out the small amount of blasting. As such no storage of explosives is envisaged for this proposal. The blasting will be supervised by DGMS authorized foreman/ mines manager.

2.10.9 Mine drainage

The mine area is an elevated ground with gentle slope on both sides of the linear dyke. Hence there is natural drainage system facilitating easy and comfortable drainage of rain waters. However, as a precaution, catch drains has been formed all around the working pit and it has been led to the natural drainage, so that the rain water will not enter the working areas. The water table will be at a depth of 8.3m BGL, A diesel engine with 5 H.P capacity is kept at the mine site to meet any eventuality of bailing out the rain water to the natural drainage outside to carry out the mine working uninterrupted.

2.11 Requirements

2.11.1 Land Requirement and Land Use Planning

Quarry Land use pattern details are shown in **Table 2-7 and** Land use pattern in provided in**Table 2-8.**

Table 2-7 Quarry Land details

District	Taluk	Village	S.F. No.	Area in Ha	Occupancy /ownership
Villupuram, Tamilnadu	Vikravandi	Siruvalai	170/1 (Part)	20.28.0	Government Poramboke land

Table 2-8 Land Use Pattern of the quarry area

S.No	Description	Present area (Ha)	Area to be used during the proposed Mining Plan period in Ha	Area at the end of the quarry (Ha)
1.	Area under quarrying	3.77.0	0.15.5	3.92.5
2.	Waste Dump	1.22.0	1.45.0	2.59.0
3.	Infrastructure	0.02.5	--	0.02.5
4.	Mine approach Road	0.32.0	--	0.32.0
5.	Village Road	0.40.0	--	0.40.0
6.	Afforesation	0.20.0	0.06.5	0.26.5
7.	Unutilized	14.34.5	12.67.5	12.75.5
	Total	**20.28.0**	**14.34.5**	**20.28.0**

2.11.2 Water Requirement

The total water requirement is ~1.5 KLD. The total water requirement will be met from water tanker suppliers. Domestic wastewater will be treated in Septic Tank followed by soak pit. Septic Tank will be cleaned periodically. The water requirement break up is given in**Table 2-9.**

Table 2-9 Water requirement breakup

S. No	Description	Water Requirement (KLD)
1	Drinking water& Domestic purpose	0.5
2	Wire saw cutting purpose	0.3
3	Dust suppression	0.3
4	Green belt	0.4
	Total	**1.5**

2.11.3 Power Requirement

- DG Set with a capacity of 125 kVA will be used to meet the power requirement of 60 kVA.
- Diesel (HSD) will be used for quarrying machineries around 200 liters of HSD will be used per day.
- Diesel will be brought from nearby diesel pumps.

2.11.4 Fuel Requirement

The Power requirement is 60 kVA met through one DG Set with a capacity of 125kVA.Diesel (HSD) is being used for quarrying machineries around 200 liters/day of HSD is being used. Diesel will be brought from nearby diesel pumps. Fuel requirement is shown in**Table 2-10.**

Table 2-10 Fuel requirement

S. No	Details	Existing
1	Power requirement (kVA)	60
2	DG Set capacity (kVA)	1*125
3	Diesel (Liters/day)	200

Source: *Project proponent*

2.11.5 List of Equipments

The list of Equipment is given in **Table 2-11.**

Table 2-11 List of Machineries

S. No	Machinery	Capacity	Numbers
1	Excavator	300 LC	1
2	Compressor	400 cfm	2
3	Dumpers	25 Tonnes	2
4	Diamond wire saw	30 m^3/day	1
5	Jack Hammers (32mm dia.)	1.2 to 6m	6
6	Diesel Generator	125 kVA	1
7	Tractor Mounted Air Compressor		1

2.11.6 Man power Requirement

Manpower details are given in **Table 2-12.**

Table 2-12 Manpower Details

S.No	Description	No of persons
A	**Technical/Mining Personnel**	
1	Geologist/Agent (M.sc Qualified)	1
2	Mine Manager (Holder of Manager Certificate of Competency under MMR, 1961	1
3	Mining Mate cum Blaster	1
4	Machinery operator	6
5	Diesel Mechanic	1
B	**Workers**	

1	Skilled	1
2	Semi- Skilled	9
3	Un-skilled	10
	Total	**30**

2.12 Infrastructure facilities

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

2.13 Resource optimization/recycling and reuse envisaged in the project

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

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

This quarry project does not require huge water and No electricity requirement is proposed for the project (60kVA DG set only for backup purpose). The operations will be carryout in day time only.

2.15 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 generation, Noise generation, Solid waste generation etc.

2.16 Solid Waste Management

The municipal Solid waste generation and management details are given in**Table 2-13.**

Table 2-13 Municipal Solid Waste generation & Management

S. No	Type	Quantity Kg/day	Disposal method
1	Organic	8.1	Municipal bin including food waste
2	Inorganic	5.4	TNPCB authorized recyclers
	Total	**13.5**	

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

2.17 Hazardous waste Management

The type of hazardous waste and the quantity generated are detailed in **Table 2-14.**

Table 2-14 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 TNPCB Authorized Agencies for Reprocessing/Recycling

2.17.1 Mine Closure Plan

Land degradation is one of the major adverse impacts of opencast mining in the form of excavated voids and also in the form of waste dumps. As per the petro genetic character, the depth persistence of the black granite body in the area is beyond the workable limits. However, it is very difficult to operate granite dimensional stone mine economically below a depth of 24m by observing the statutory of mine safety rules and regulations. Hence in the proposed mining plan, only 24m depth has been envisaged as 'Workable depth' for safe and economic mining.

However, it is proposed not to back fill the ultimate pit, in as much as quantity of reserves is available below the workable depth of 24m and there is possibility of technology up-gradation in granite mining for greater depths. The site boundaries shall be sagely fenced and used as a reservoir after mining activities are over. There is no proposal for back filling, reclamation and rehabilitation. The quarried pits after the end of the life of lease will be fenced to prevent inherent entry of public and cattle. There is no proposal for back filling, reclamation and re habitation.

The quarry pit will be fenced to prevent inherent entry of public. The green belt development will be maintained. Drilling will be carrying out by wet drilling to control the dust into the air. Blasting will be carrying out on limited scale. Mist spray on haul road will be proposed to prevent the dust propagation into the air. The plantation will be carried out on the safety barriers to prevent Noise, besides wet drilling will be practiced to prevent dust. All the machineries will be maintained in good conditions as per RTO and TNPCB Norms to prevent Noise, Smoke and vibration. Machineries will be periodically maintained by experienced mechanic to minimize noise, smoke and ground vibration.

- A detailed final closure plan to create productive and sustainable land use of the mined area after cessation of mining operations.
- The plan must be accepted by mine owners, regulating agencies, and local communities
- Year-wise progressive reclamation plans
- A plan to protect the health and safety of the surrounding habitat
- A plan to eliminate/contain all possible sources of pollution post-mining
- A plan to conserve valuable attributes and aesthetics of the surrounding area

- A plan to minimize and overcome adverse socio-economic impacts on the people dependent on the mine after cessation of mining operations

2.17.2 Progressive Mine Closure Plan

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

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

3 DESCRIPTION OF ENVIRONMENT

3.1 Preamble

This chapter depicts the establishment of baseline for valued environmental components, as identified in and around the project area is located at survey no: 170/1 (Part), located at Siruvalai Village, Vikravandi Taluk, Villupuram District, Tamil Nadu State.. The primary baseline data monitored covered three (3) months i.e., from **March 2023 – May 2023**, and secondary data was collected from Government and Semi-Government organizations. The primary baseline data has been generated by M/s. Hubert Enviro Care Systems (P) Ltd, Chennai, and a MoEF & CC approved Environmental Testing Laboratory for the following Terrestrial environmental components.

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

3.2 Study Area

A 10 km radial distance from the proposed project site boundary has been identified as the General study area for assessing the baseline environmental status. The core study area is the project area and its immediate surroundings to the tune of 1.0 km radius from the boundary. Further the Project Impact/Influence Area (PIA) is 10 km from the boundary of the project site which covers parts of in Siruvalai Village, Vikravandi Taluk, Villupuram District, and Tamil Nadu State.

3.3 Description of the Study Area

TAMIN proposes Siruvalai Black Granite quarry lease over an extent of 20.28.0Ha at S.F. Nos:170/1 (Part), located at Siruvalai Village, Vikravandi Taluk, Villupuram District, Tamil

Nadu State. Mundiyampakkam Railway Station is located approximately at a distance of 8.61 km towards ESE and Villupuram to Mundiyampakkam Railway Line is located approximately at a distance of 8.62 km towards ESE from the project boundary.NH-38 Vellore to Thoothukudi Highway is located towards S at a distance of ~2.39 km and SH-135 (Viluppuram-Tiruvannamalai) is located towards South at a distance of 2.39 km from the project boundary. An overall idea of the study area with reference to the physical conditions are presented for better understanding in the following sections before proceeding into the section on the prevailing environmental conditions of the study area. The map showing the satellite image of the study area is given in **Figure 3-1** and Topo Map of the study area is given in **Figure 3-2.**

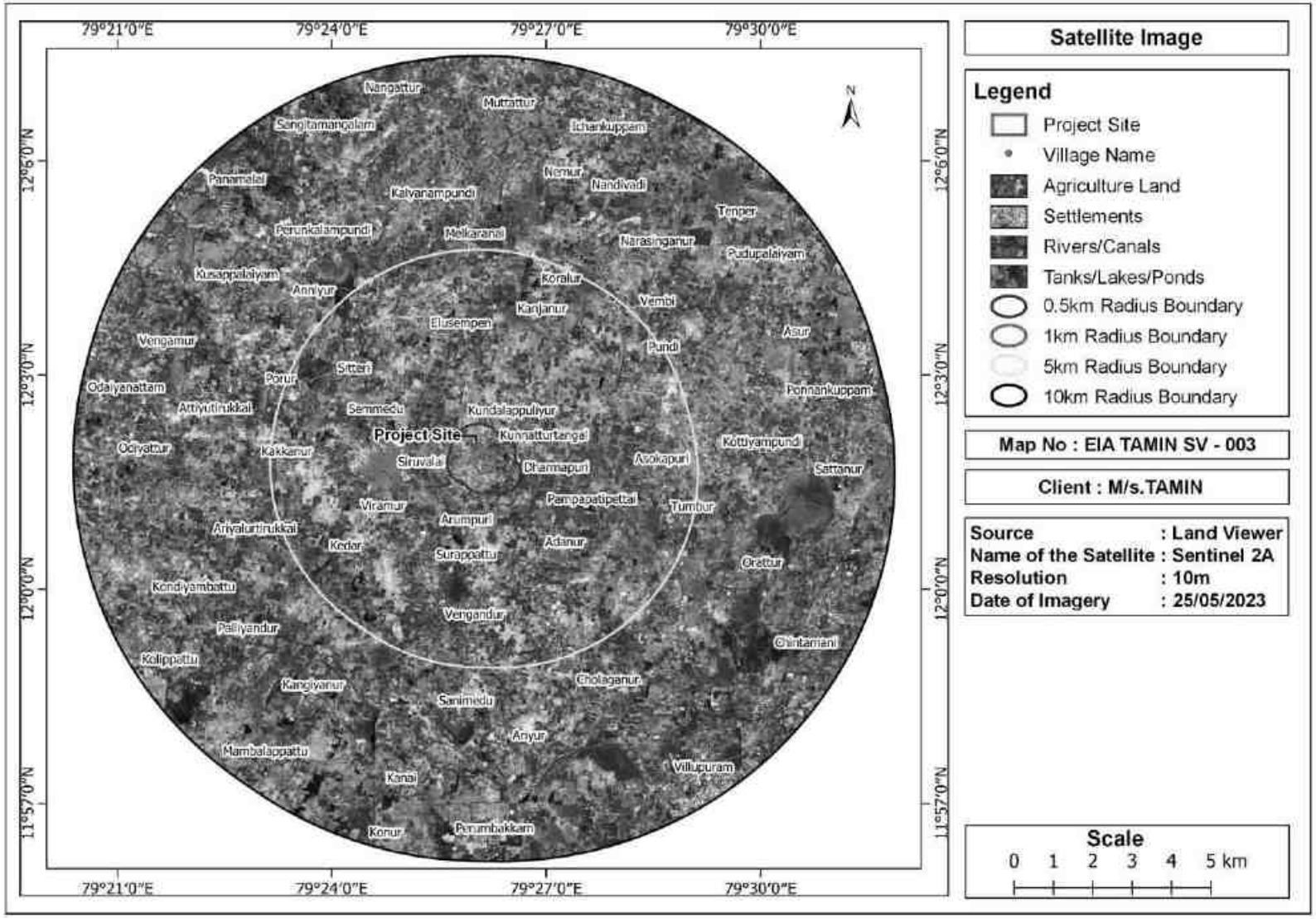


Figure 3-1 Map showing the Satellite Image of the study area of Project

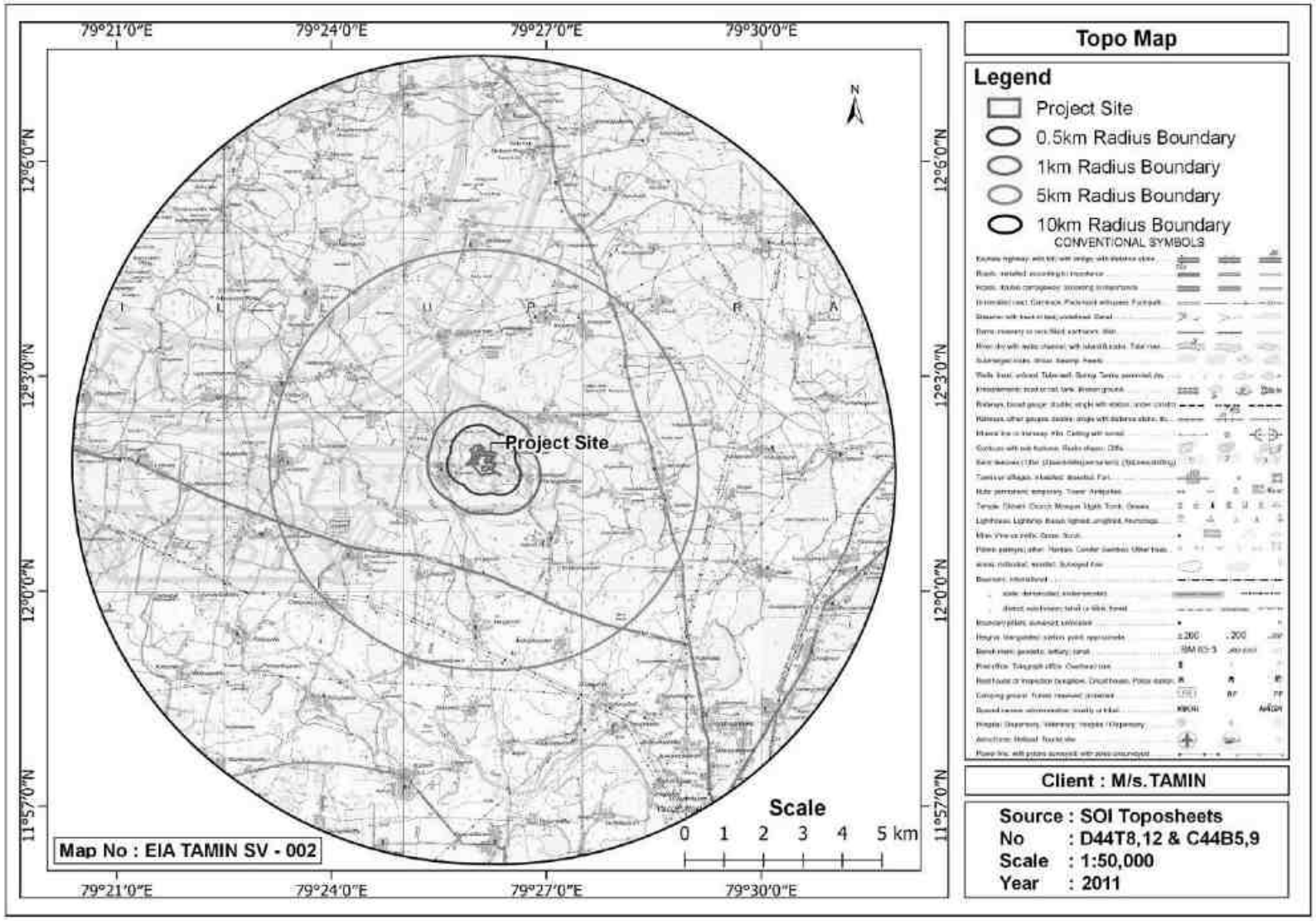


Figure 3-2 Topo Map of Study area

3.4 Environmentally/Ecologically Sensitive areas

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

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

<table>
<tr><th>S. No.</th><th>Areas</th><th>Distance & Direction from project boundary</th></tr>
<tr><td>1.</td><td>Monuments</td><td>
<table>
<tr><th>S. No</th><th>Places</th><th>Distance (≈km)</th><th>Directi□n</th></tr>
<tr><td>1.</td><td>Rock cut Pallava Temple</td><td>8.41</td><td>NNE</td></tr>
<tr><td>2.</td><td>Talagiriswara Temple and a Cave□ containing a□ image of Durga and Pallava inscription□ together with adjacent-land</td><td>9.76</td><td>NW</td></tr>
<tr><td>3.</td><td>Sri Brahmapuniswara Temple</td><td>10.51</td><td>NNE</td></tr>
<tr><td>4.</td><td>Sri Pataleswara Temple</td><td>10.57</td><td>NNE</td></tr>
<tr><td>5</td><td>Melvalai Blood Art Stone</td><td>10.75</td><td>W</td></tr>
<tr><td>6</td><td>Sri Azhagiya Narasimma Perumal Temple</td><td>11.75</td><td>NNE</td></tr>
</table>
</td></tr>
<tr><td>2.</td><td>Wetlands, Watercourses or other water bodies, coastal zone</td><td>
<table>
<tr><th>S. No</th><th>Places</th><th>Distance (≈km)</th><th>Direction</th></tr>
<tr><td>1</td><td>Stream</td><td colspan="2">Within the Site</td></tr>
<tr><td>2</td><td>Pond near Kunnatturtangal</td><td>0.3□</td><td>N</td></tr>
<tr><td>3</td><td>Pond near Dharmapuri</td><td>0.40</td><td>E</td></tr>
<tr><td>4</td><td>Siruvalai Lake</td><td>0.73</td><td>W</td></tr>
<tr><td>5</td><td>Adanur Lake</td><td>1.12</td><td>SE</td></tr>
<tr><td>6</td><td>Viramur Lake</td><td>1.54</td><td>W</td></tr>
<tr><td>7</td><td>Vengandur Lake</td><td>2.4</td><td>S</td></tr>
<tr><td>8</td><td>Anniyur Lake</td><td>4.85</td><td>NW</td></tr>
<tr><td>9</td><td>Pambai Ar</td><td>6.10</td><td>□W</td></tr>
<tr><td>10</td><td>Puttimedu Lake</td><td>6.56</td><td>SE</td></tr>
<tr><td>11</td><td>Pappanappattu Eri</td><td>6.77</td><td>E</td></tr>
<tr><td>12</td><td>Pambai Vaykkal</td><td>9.45</td><td>SW</td></tr>
<tr><td>13</td><td>Panamalai Eri</td><td>9.45</td><td>NW</td></tr>
<tr><td>14</td><td>Varaha Nadi</td><td>9.78</td><td>E</td></tr>
<tr><td>15</td><td>Ponnaiyar River</td><td>13.2</td><td>SSW</td></tr>
<tr><td>16</td><td>Nandan Kava</td><td>13.22</td><td>NW</td></tr>
<tr><td>17</td><td>Panambattu Lake</td><td>13.28</td><td>SSE</td></tr>
<tr><td>18</td><td>Pillaiyarkovil Odai</td><td>13.98</td><td>W</td></tr>
<tr><td>19</td><td>Vidur Dam</td><td>14.90</td><td>ENE</td></tr>
</table>
</td></tr>
<tr><td>3.</td><td>Reserved Forests</td><td>
<table>
<tr><th>S.No</th><th>Places</th><th>Distance (≈km)</th><th>Direction</th></tr>
<tr><td>1</td><td>Odaiyanattam RF</td><td>9.96</td><td>WNW</td></tr>
<tr><td>2</td><td>Melkondai RF</td><td>11.21</td><td>E</td></tr>
<tr><td>3</td><td>Tandavasamudram RF</td><td>11.36</td><td>NW</td></tr>
<tr><td>4</td><td>Gengavaram RF</td><td>11.95</td><td>WNW</td></tr>
<tr><td>5</td><td>Karai RF</td><td>14.02</td><td>N</td></tr>
</table>
</td></tr>
<tr><td>4.</td><td>Routes or facilities</td><td>
<table>
<tr><th>S.No</th><th>Nearest Highway</th><th>Distance</th><th>□irection</th></tr>
</table>
</td></tr>
</table>

	used by the public for access to recreation or other tourist, pilgrim areas	

		(≈km)	
1.	SH-135(Villupuram-Tiruvannamalai)	2.39	S
2.	NH-38 (Vellore - Thoothukudi)	2.39	S

5.	State, National boundaries	➢ Nil

6.	Densely populated or built-up area (Nearest Town, City, District)	

S. No	Places	Distance (≈km)	D□rection	Population
1.	Kunnatturtangal	0.16	NE	225
2.	Dharmapuri	0.21	E	750
3.	Siruvalai	0.33	W	2414
4.	Arumpuri	1.01	S	492
5.	Kundalappuliyur	1.15	NE	1850
Nearest Town and City				
1.	Nearest Town - Villupuram	9.50km	SSE	

7.	Nearest Railway station, Airport & port	

Nearest Railway Station, Airport & Port			
No	**Places**	**Distance (≈km)**	**Direction**
1.	Nearest Railway Station - Mundiyampakkam	8.61	ESE
2.	Puducherry Airport	40.19	E
3.	Cuddalore Port	50.56	SE

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

S. No	Places	Distance (≈km)	Direction
SCHOOLS			
1.	Siruvalai Govt Hr Sec School	0.76	SW
2.	Kedar Govt High □chool	3.29	SW
3.	Thumbur Govt High School	4.06	E
4.	Kanjanur Govt Hr Sec Sc□□ol	4.21	NNE
5.	Melkaranai Go□t Hr Sec School	5.12	N
6.	Sanimedu Govt Hr Sec School	5.63	□
7.	Attiyur Thirukkai Govt Hr Sec School	6.54	WNW
8.	Mambalapattu Govt High School	10.33	SW
9.	Viluppuram Govt Girls High School	11.11	SSE
10.	Vikravandi Govt High School	11.54	E
COLLEGES			
1.	KG College of Pharmacy & RI	4.49	E
2.	Swami Vivekananda Arts and Science College	4.88	ESE
3.	Villupuram Govt Medical College and Hospital	8.91	ESE
4.	Viluppuram Arignar Anna Govt Arts College	11.85	SE
5.	A.R. Engineering College	11.97	ESE
6.	Villupuram Govt Law College	11.99	SSE
7.	Surya Group of Institutions	12.11	ENE

		GOVERNMENT BUILDINGS			
		1.	Kunnathur Thangal VAO office	1.28	NE
		2.	Anniyur Fire Station	5.75	NW
		3.	Viluppuram District Jail	8.64	S
		4.	Viluppuram District Police Office	11.23	SSE
		5.	Viluppuram District Collector Office	11.24	SSE
		6.	Viluppuram Combined Court	11.38	SSE
		HOSPITALS			
		1.	Kedar Govt PHC	3.16	SW
		2.	Vembi Govt PHC	4.33	NE
		3.	Anniyur Govt PHC	6.31	NW
		4.	St.Mary's Health Centre	7.50	W
		5.	Villupuram Govt Hospital	10.62	SSE
		6.	Villupuram Railway Hospital	11.94	SE
		7.	Vikravandi Govt Hospital	11.98	E
		8.	Periathatchur Govt PHC	13.42	NE
		RELIGIOUS PLACES			
		1.	Ezhu Kannimar Temple	0.16	W
		2.	Mariamman Temple	0.30	NE
		3.	St. Therese Of Child Jesus Church	5.42	NNE
		4.	Sri Ramanadheswarar Temple	5.61	NW
		5.	Sri Abirameshwarar Temple	7.11	SSE
		6.	Masjid Abdulhai	8.66	ESE
		7.	Panamalai Thalagireeshwarar Shiva Temple	9.76	NW
		8.	Sri Brahmmapureeswarar Temple	10.51	NNE
		9.	White Masjid	11.41	E
		10.	Vanathu Chinnappar Church	12.05	SW
		INDUSTRIES			
		1.	Gopi krishna wearhousing	3.57	E
		2.	Rajshree Sugars & Chemicals Ltd	8.72	ESE
		3.	Lakshmi Industries	10.38	E
		4.	Sri Srinivasa Mordern Rice Mill	10.43	E
		5.	Anandha Rice Mill	10.71	E
		6.	Vikravandi wharehouse	10.85	E
		7.	BBB Brand Modern Rice Mill Pvt Ltd	11.11	E
		8.	Nagammai Cotton Mill Pvt Ltd	11.74	E
		9.	Asian Beverage Pvt Ltd	12.40	ENE
		10.	Food Cotporation Of India Warehouse	12.74	ENE
		11.	Ninestaar Modern Rice Mill	12.97	ENE
		12.	Swashpet Industries	13.97	SSE

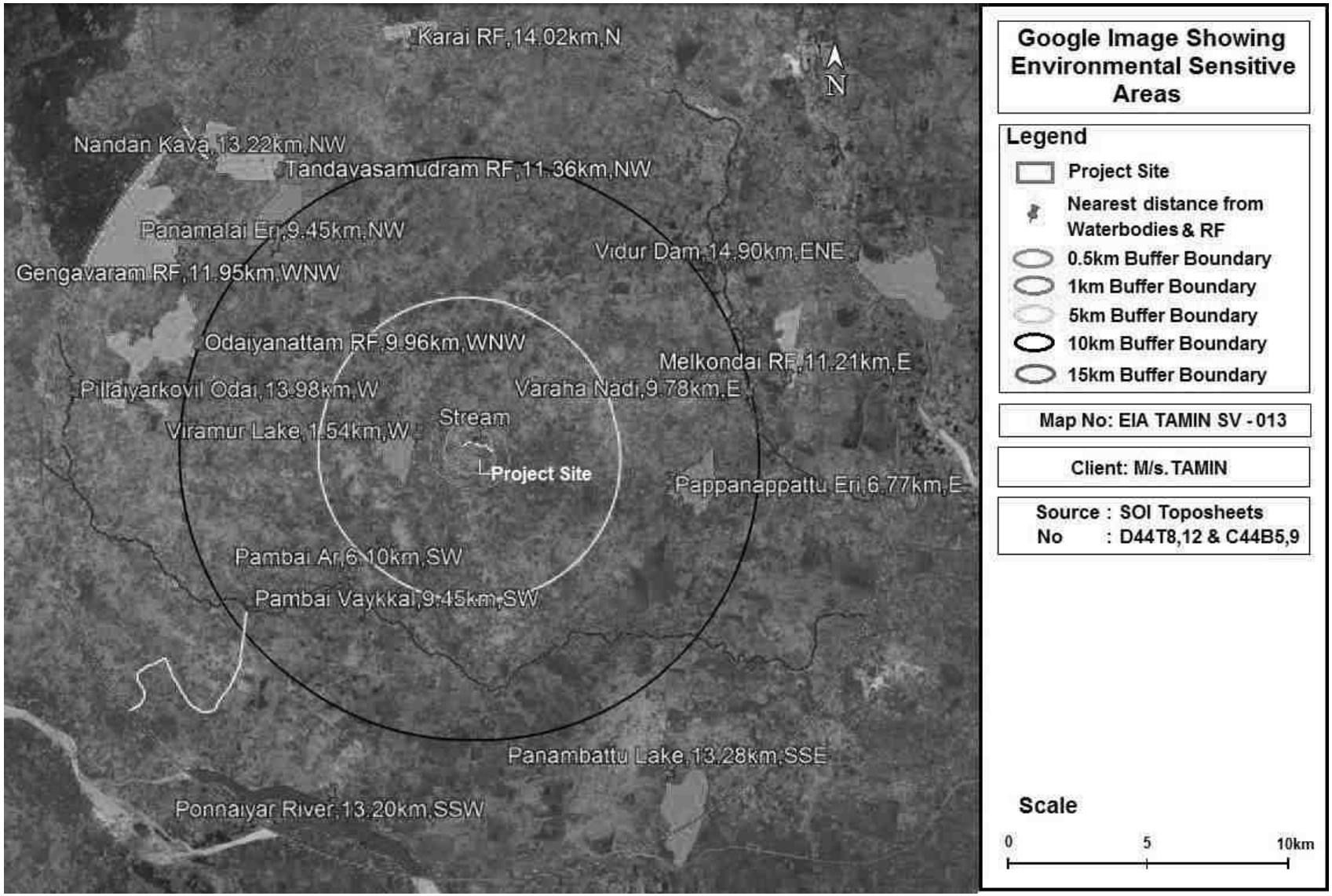


Figure 3-3 Environmental sensitive areas covering within 15 km from project boundary

3.5 Physical Conditions

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

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

3.6 PIA District Profile

Viluppuram district is located between 11^0 and 35^0 Northern Latitude and 78^0 38' and 80^0 Eastern Longitude. It is bordered on the north by Kancheepuram district and Tiruvannamalai district, on the south by Cuddalore district and east by Union Territory of Puducherry. According to district authorities, the total geographical area of the district is 7194 sq kms.

Source:*https://censusindia.gov.in/nada/index.php/catalog/1105/download/3434/DH_2011_3306_PART_B_DCHB_VILUPPURAM.pdf*

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

3.7 Climatic Conditions

The climate of Viluppuram district is fairly dry and on the whole healthy. The temperature is moderate. The maximum and minimum temperature in the district is 36^0C and 21^0C respectively. The rainfall is more in the coastal area compared to interior areas. An average, about 93.82% of the rainfall is received during North East and South West monsoons. Normally the district does not get heavy rainfall with the exception of Marakkanam and Vanur blocks. The rainfall is moderate in Kandamangalam and Koliyanur blocks, it is scanty in Kallakkurichi and Sankarapuram blocks.

Source:*https://censusindia.gov.in/nada/index.php/catalog/1105/download/3434/DH_2011_3306_PART_B_DCHB_VILUPPURAM.pdf*

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

3.8 Natural Resources of Villupuram District

3.8.1 Flora & Fauna

The coastal regions – containing the casuarinas plantations, sand dunes, the mangroves and scrub jungle. This includes the whole of Pitchavaram, Pitchavaram extension and Killai Reserved Forests. The lateritic region - containing the extensive cashew plant at ion and dry evergreen forest covering Kangiruppum Bit I and II, Velangulam, Ammeri, Narimanam, Semakottai and Extension, Kallamedu and Kuttady Reserved Forests.

The inland plains region - containing the eucalyptus and miscellaneous fuel plantations and the thorny scrub jungles at Alwarmalai, Varanjaram, Porasakurichi, Magarur, Katt umailur, Nangur, Krishnapuram, Thottapadi, Kottalamalai, Melpalangur, Mallapuram and Poosapadi Reserved Forests.

Source:*https://censusindia.gov.in/nada/index.php/catalog/1105/download/3434/DH_2011_3306_PART_B_DCHB_VILUPPURAM.pdf*

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

3.8.2 Forest Resources

Gingee and Kalrayan hills are the two major hills in the district. Forest areas in the district constitutes about 14% of the total area of the district which spread in t he areas bordering Salem, Dharmapuri and Tiruvannamalai districts with divisions of reserve forest, interface forest and social forest.Teak, rose and sandal trees are found in the hills. In Kalrayan hills and Gingee areas some medicinal plants are grown. In the social forest areas, trees raised are mainly for firewood and paper making. Babul, Eucalyptus and Casuarina are found to be grown in the district. The main activities of forest department are protection and preservation of the existing natural forests and wild animals such as Spotted Deer, Antelope, Sloth Bear etc., and also development of the degraded forests.

Source:*https://censusindia.gov.in/nada/index.php/catalog/1105/download/3434/DH_2011_3306_PART_B_DCHB_VILUPPURAM.pdf*

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

3.8.3 Irrigation

Intensive and extensive cultivation of land depends mainly on the availability of water. The rivers in Viluppuram district are not perennial. So, the major sources of irrigation are tube wells and open dug wells. Lower anaicut, Tirukkoyilur anaicut, Ellis Chuoltry anaicut and reservoir are the important irrigation projects in the district.

Source:*https://censusindia.gov.in/nada/index.php/catalog/1105/download/3434/DH_2011_3306_PART_B_DCHB_VILUPPURAM.pdf*

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

3.8.4 Agricultural Resources

Agriculture is the mainstay of the people in the district. Except Gingee and Kalrayan hills, the entire district is characterized by plains. Major portion of the plains is utilized for agricultural purpose. The major crops in the district are paddy, groundnut, cotton, sugarcane, tapioca and cumbu. Paddy is the important food crop cultivated over an extent of 148454 hectares in the district during 2009-10. Among pulses, black grams and red grams are the most important varieties grown over an extent of 17276 and 519 hectares respectively. During 2009-10, nearly 19763 hectares were used for the production of pulses in the district.

Source:*https://censusindia.gov.in/nada/index.php/catalog/1105/download/3434/DH_2011_3306_PART_B_DCHB_VILUPPURAM.pdf*

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

3.8.5 Mineral Resources

The major portion of Viluppuram district is covered by mineral deposits like silica sand, lime stone, black granite and blue metal. Silica sand is found in Agaram reserve forest in Tindivanam taluk. Fine clay deposits are found in large numbers in Tindivanam taluk. Inferior grade sedimentary limestone deposit is found in Vanur taluk. Gingee, Kallakkurichi, Tindivanam, Tirukkoyilur, Ulundurpettai, Vanur and Viluppuram taluks has rich sources of export quantity of black granite. Multicoloured granites are found in Gingee, Kallakkurichi and Viluppuram taluks. The mineral map of Tamilnadu is shown in the **Figure 3-4**.

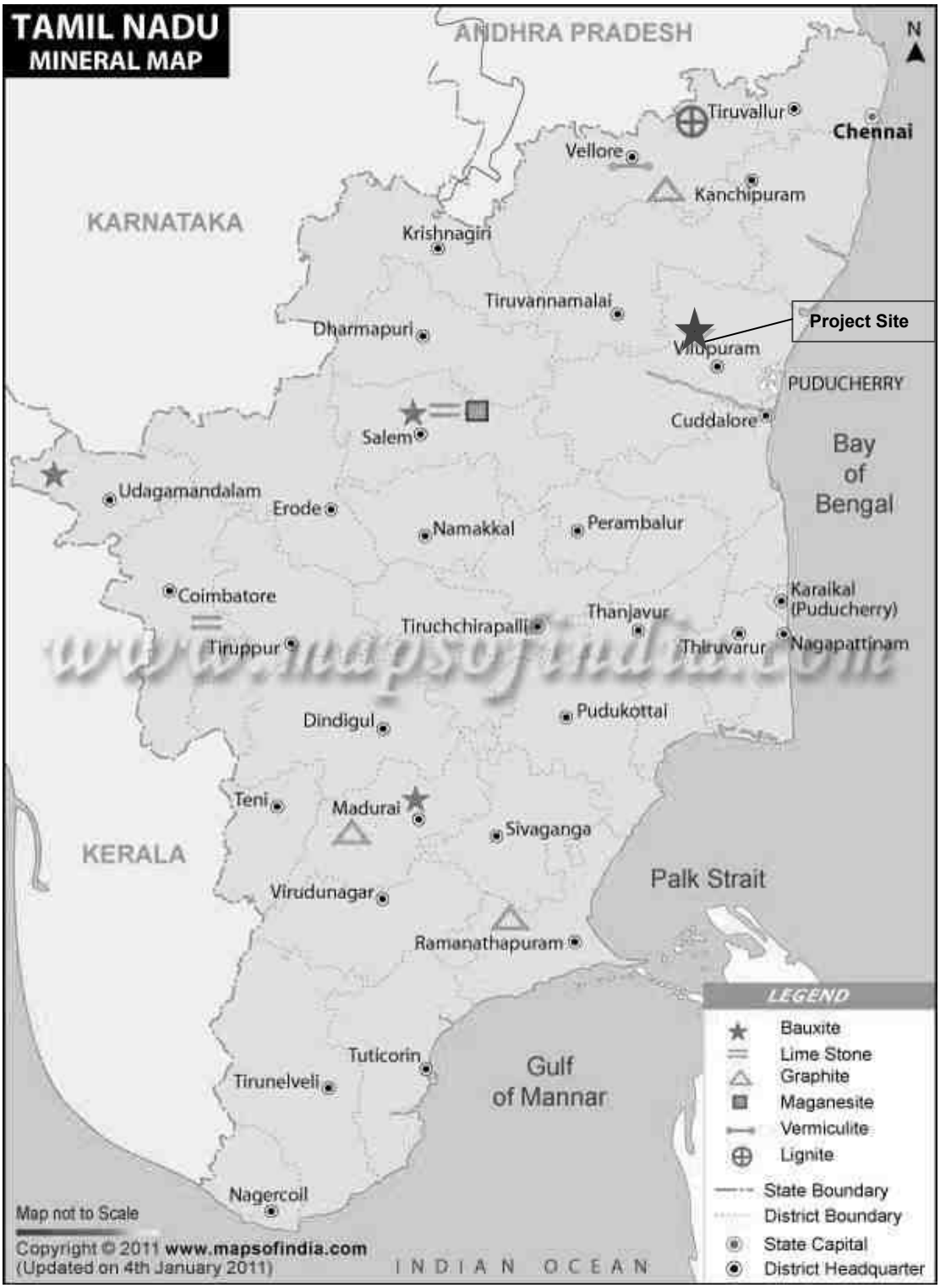


Figure 3-4 Mineral Map of Tamil Nadu

3.9 Land use land cover for the study area

Total Project Study Area is **344.30** Sq.Km. Land Use /Land Cover pattern of the Study Area and Land Use /Land Cover map of the Study Area is given in **Figure 3.6** and **Figure 3.8** respectively. The land use/ land cover pattern of the study area is given in **Table 3-7.**

Table 3-2 Land use/ Land Cover pattern of the Study Area

S. No	Description	Area (sq.km)	Area (Acres)	Area (Hectares)	Area (%)
1.	Crop land	198.35	49013.28	19835	57.61
2.	Fallow	81.34	20099.52	8134	23.62
3.	Mining	30.92	7640.49	3092	8.98
4.	Plantation	20.43	5048.36	2043	5.93
5.	River / Stream / Canals	5.59	1381.32	559	1.62
6.	Rural	2.56	632.59	256	0.74
7.	Salt affected land	2.20	543.63	220	0.64
8.	Scrub land	1.55	383.01	155	0.45
9.	Urban	1.34	331.12	134	0.39
10.	Waterbodies	0.02	4.94	2	0.01
	Total	**344.30**	**85078.25**	**34430**	**100.00**

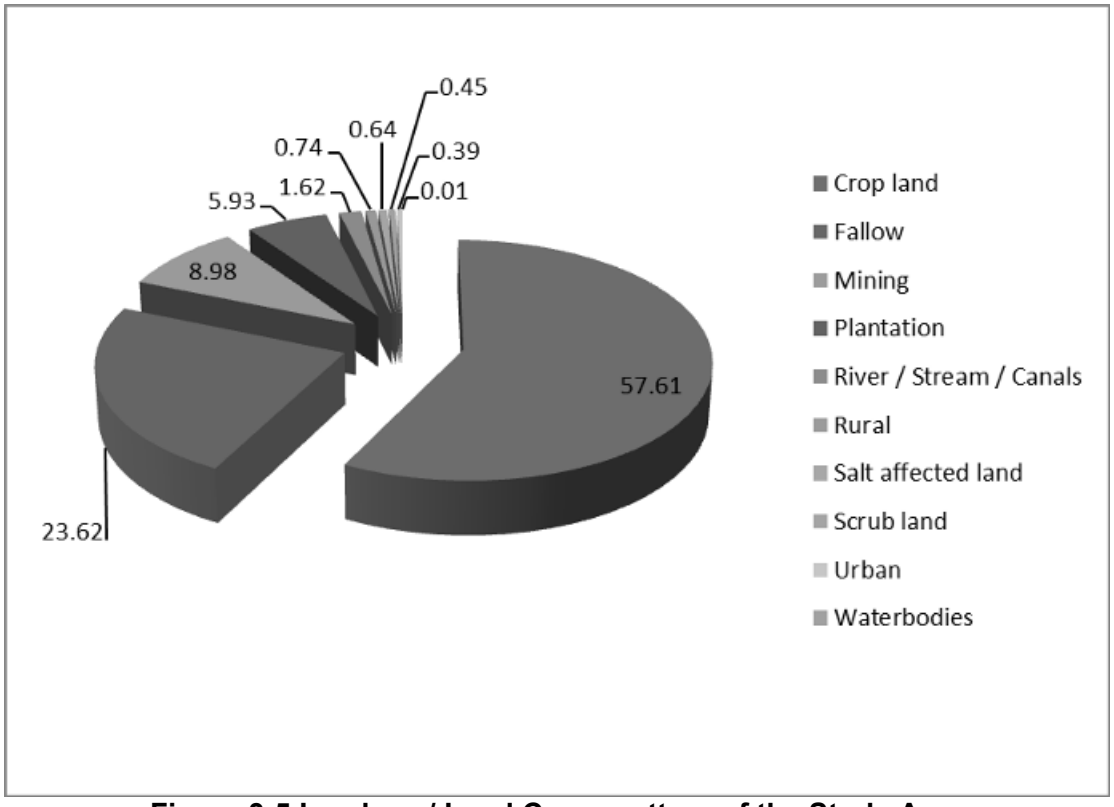


Figure 3-5 Land use/ Land Cover pattern of the Study Area

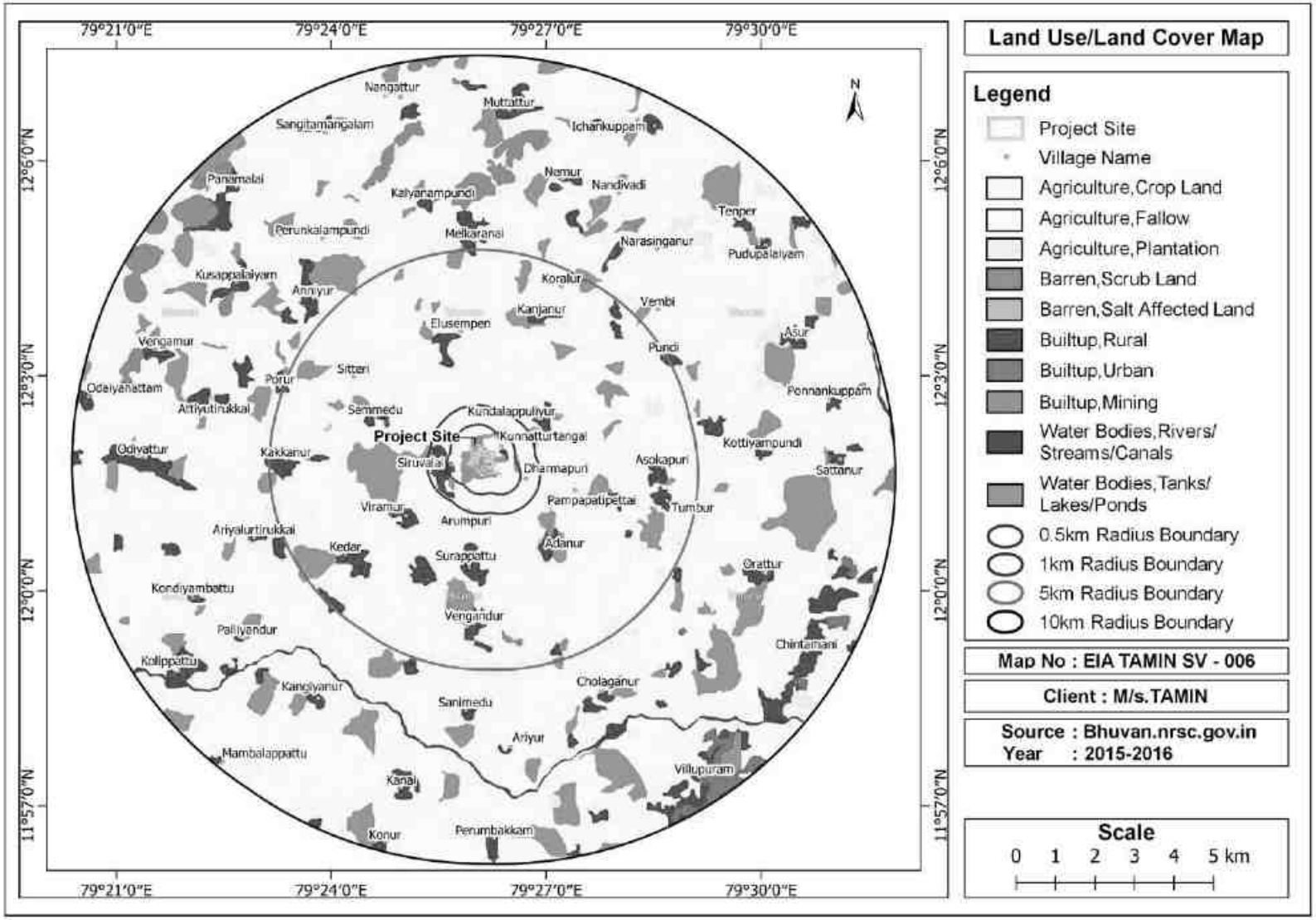


Figure 3-6 Land use/ land cover map of the Study Area

3.10 Topography

The greater part of the district is covered by the metamorphic rocks belonging to Gneissic formations. The district has also three types of sedimentary rocks belonging to different geological periods. The Kalrayan hills on the north represent a continuous range of hills covered with some thorny forests and vegetation. The most beautiful hill of the district is Gingee hills. The residual and denudational hills are common in Thirukoilur, Kallakurichi and Gingee taluks. Structural hills are noticed on the western part of the district. The shallow pediments and buried pediments are quite common in the central part of the district.The Physical map of Tamilnadu is given as **Figure 3-9**. Topo map of study area is given as **Figure 3-2** and contour map of the study area is given as **Figure 3-10.**

Source: *https://spc.tn.gov.in/DHDR/Vlupuram_dt.pdf*

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

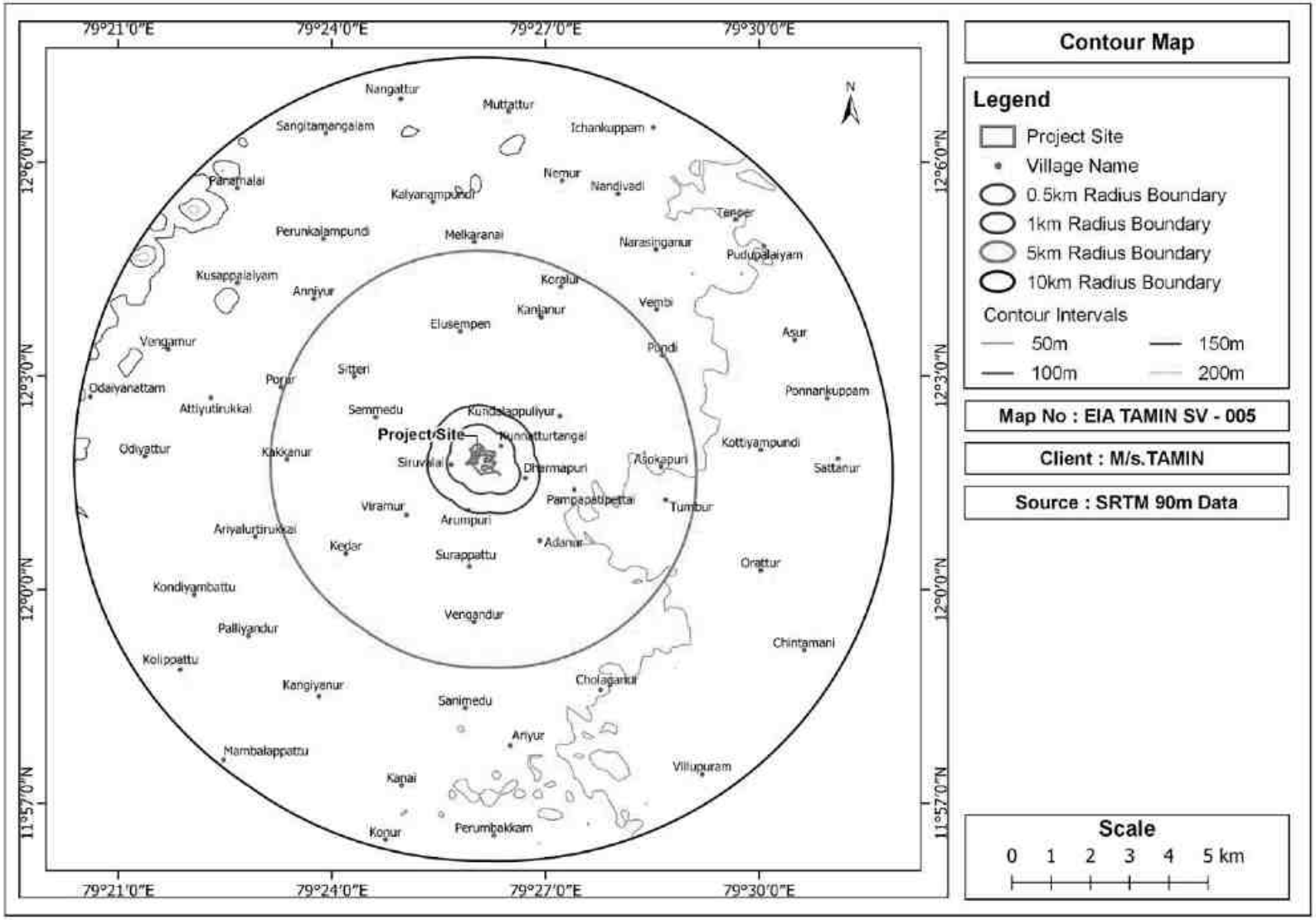


Figure 3-7 Contour map of Study Area

3.11 Geomorphology of PIA District

The residual hills and denudational hills are common in Tirukoilur, Kallakurichi and Gingee taluks. Structural hills are noticed in the western part of the district. The shallow pediments and buried pediments are common in the central part of the district. Coastal areas are having older and younger flood plains and also beach landforms at places. The ground slope is gentle towards coast. The valley fill near Villupuram is thick, which forms main ground water discharge zone. Lineaments are restricted to parts of Kallakurichi and Sankarapuram areas and productive fractures are noticed in select pockets. The crystalline sedimentary contact fault is having sympathetic fractures in hard rocks but mostly they are dry fractures. The Geomorphology Map of the Viluppuram District is shown as **Figure 3-12.**

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

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

3.12 Geomorphology of the Study Area

Geomorphology of the study area consists of Denudational origin - pediment – pedi plain Complex-84.06%, Denudational Origin-Low Dissected Hills and Valleys-0.85%, Fluvial Origin-Bajada – 6.33%, Water Bodies-8.77%. The total Geographical area of the study area is **344.30 sq.km**. The Geomorphology of the study area is given in **Table 3-4.** Geomorphology pattern of the study area is given in **Figure 3.12.** Geomorphology map of study area is given in **Figure 3.13.**

Table 3-3 Geomorphology of the study area

S. No.	Geomorphology	Area in sq.km	Area in Acre	Area in Hectare	Total Area %
1.	Denudational Origin-Pediment-PediPlain Complex	289.40	71513.18	28940	84.06
2.	Denudational Origin-Low Dissected Hills and Valleys	2.91	719.47	291	0.85
3.	Fluvial Origin-Bajada	21.78	5382.44	2178	6.33
4.	Water Bodies	30.20	7463.16	3020	8.77
	Total	**344.30**	**85078.25**	**34430**	**100**

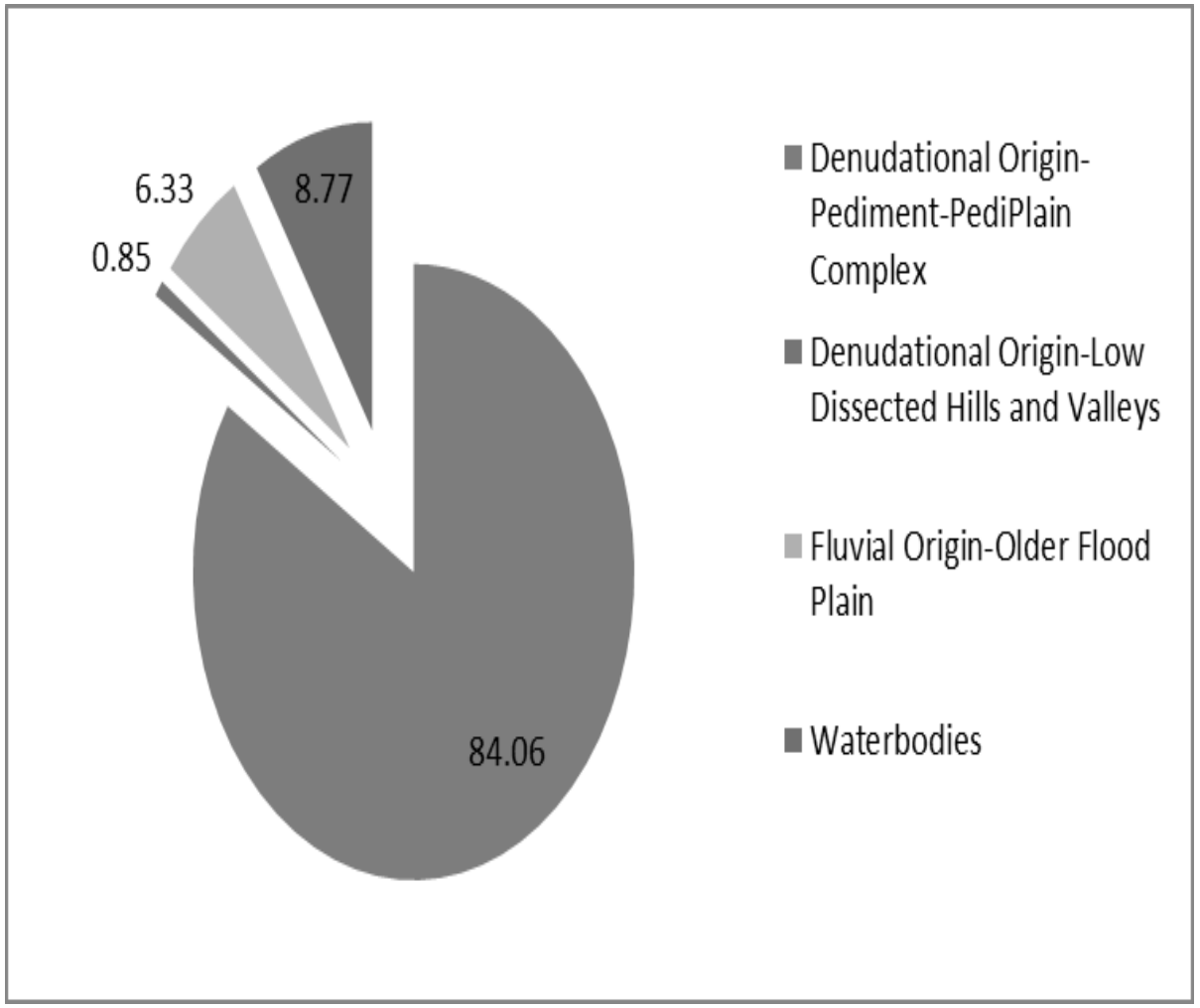


Figure 3-9 Geomorphology Pattern of the Study Area

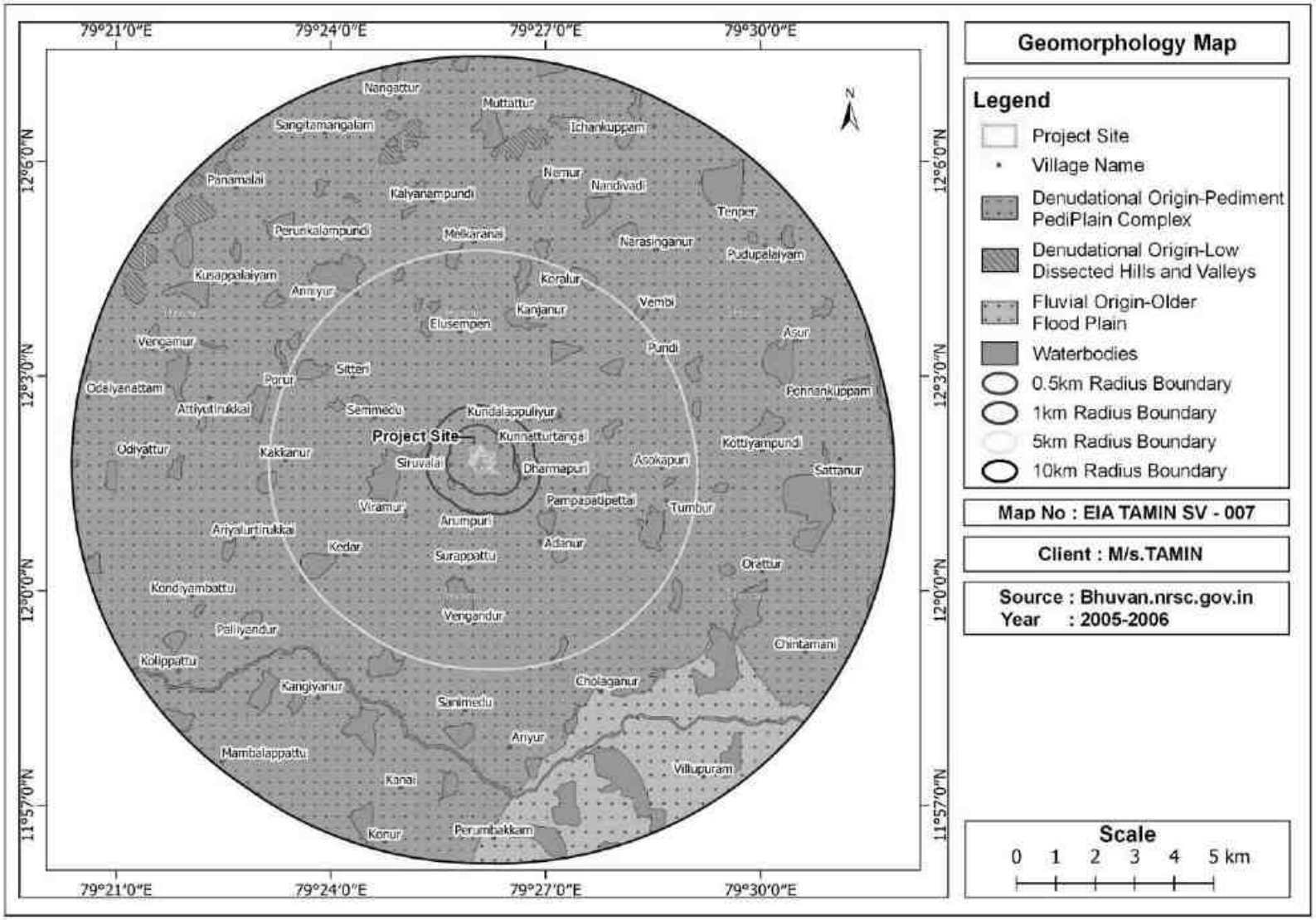


Figure 3-10 Geomorphology Map of Study Area

3.13 Hydrogeology of PIA District

Villupuram district is underlain by crystalline metamorphic complex in the western part of the district and sedimentary tract in eastern side (Plate-II). The thickness of sediments exceeds 600m near southern part of the district. Groundwater occurs under phreatic and semi–confined conditions in consolidated formations, which comprises weathered and fractured granites, gneisses and charnockites whereas in unconsolidated sedimentary rocks the groundwater occurs in phreatic, semi-confined conditions in Vanur sandstone, Kadapperi kuppam formation and Turuvai limestone. The district is having rocky outcrops in major part of Kallakurichi, Sankarapuram and Tirukoilur taluks. The weathering is highly erratic and the depth of abstraction structures is controlled by the intensity of weathering and fracturing. The depth of wells varies from 6.64 to 17m bgl and water levels in observation wells tapping shallow aquifers varied from 0.74 to 9.7 m bgl during pre monsoon (May 2006) and it varies from 0.7 to 4.45 mbgl during post monsoon (January 2007). During pre monsoon, the depth to water levels in the range of >2 to 5 m bgl in major part of the district, in the range of >5 -10 m bgl in western and southeastern parts of the district and range of 0-2 m bgl were recorded in two isolated pockets (Plate –III). During post monsoon the depth to water levels range of >2 to 5 m bgl exists in major part of the district, range of 0 - 2 m bgl prevails in central and northeastern parts of the district and range of >5 - 10 m bgl were recorded in two isolated pockets in the southwester and north western parts of the district (Plate –IV). The depth to piezometric surface ranged from 2.8 to 11.25 m bgl during Pre monsoon and 0.5 to 6.35 m bgl during post monsoon. The ground water is being developed my means of dug wells, bore wells and tube wells. The diameter of the well is in the range of 7 to 10 m and depth of dug wells range from 15 to 18 m bgl depending on the weathered thickness and joints. The dug wells yield up to 1lps in summer months and few wells remains dry. The yield is adequate for irrigation for one or two crops in monsoon period. The yield of bore wells in favorable locations vary from <1 to 6lps. The valley fills, intersection of lineaments, particularly, in the western part along the foot hills of Kalrayan hills are reported to have potential pockets suitable for dug wells and bore wells. The area of contact between crystalline and sedimentary formations has variable yield prospects. The cretaceous formations are very compact and yield prospects are low. The dug wells of 6 m diameter and 10 m bgl depth in sandy tracts give about 3.5lps. The yield of tube wells in the sedimentary formation ranges from 2.4 to 37lps.The hydrogeology map of Viluppuram District is given in Figure 3-11

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

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

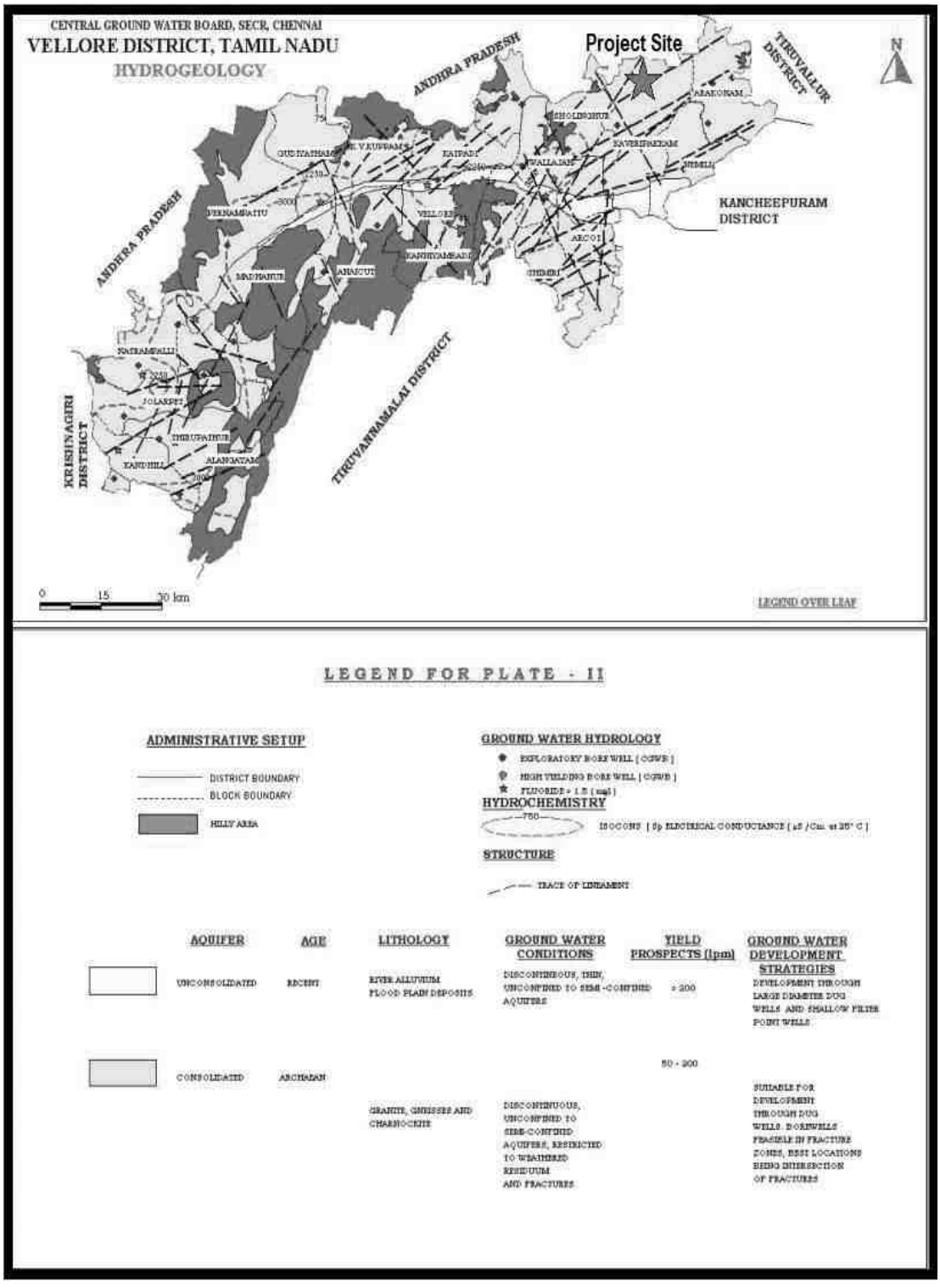


Figure 3-12 Hydrogeology map of the PIA district

3.14 Drainage Pattern in PIA District

Ponnaiyar, Malattar and Gadilam are the major rivers draining the district. Ponnaiyar River flows from northwest to east in the district. Manimukta nadi originates in Kalrayan hills and drains the southern part of the district. Pambaiyar and Varaganadhi originate in the uplands of the district and join Bay of Bengal. Varaganadhi is also known as Gingee River and drains the parts of Gingee and Vanur taluks of this district. Malattar and Gadilam rivers also originate in the uplands within the district and flow eastwards to Cuddalore district. All the rivers are ephemeral in nature and carry only floodwater during monsoon period. The drainage pattern is mostly parallel to sub parallel and drainage density is very low. There are small reservoirs across rivers namely Gomukhi, Vedur and Mahanathur.The drainage map of the Study Area is given as **Figure 3-14**.

***Source**:https://censusindia.gov.in/nada/index.php/catalog/1105/download/3434/DH_2011_3306_PART_B_DCHB_VILUPPURAM.pdf*

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

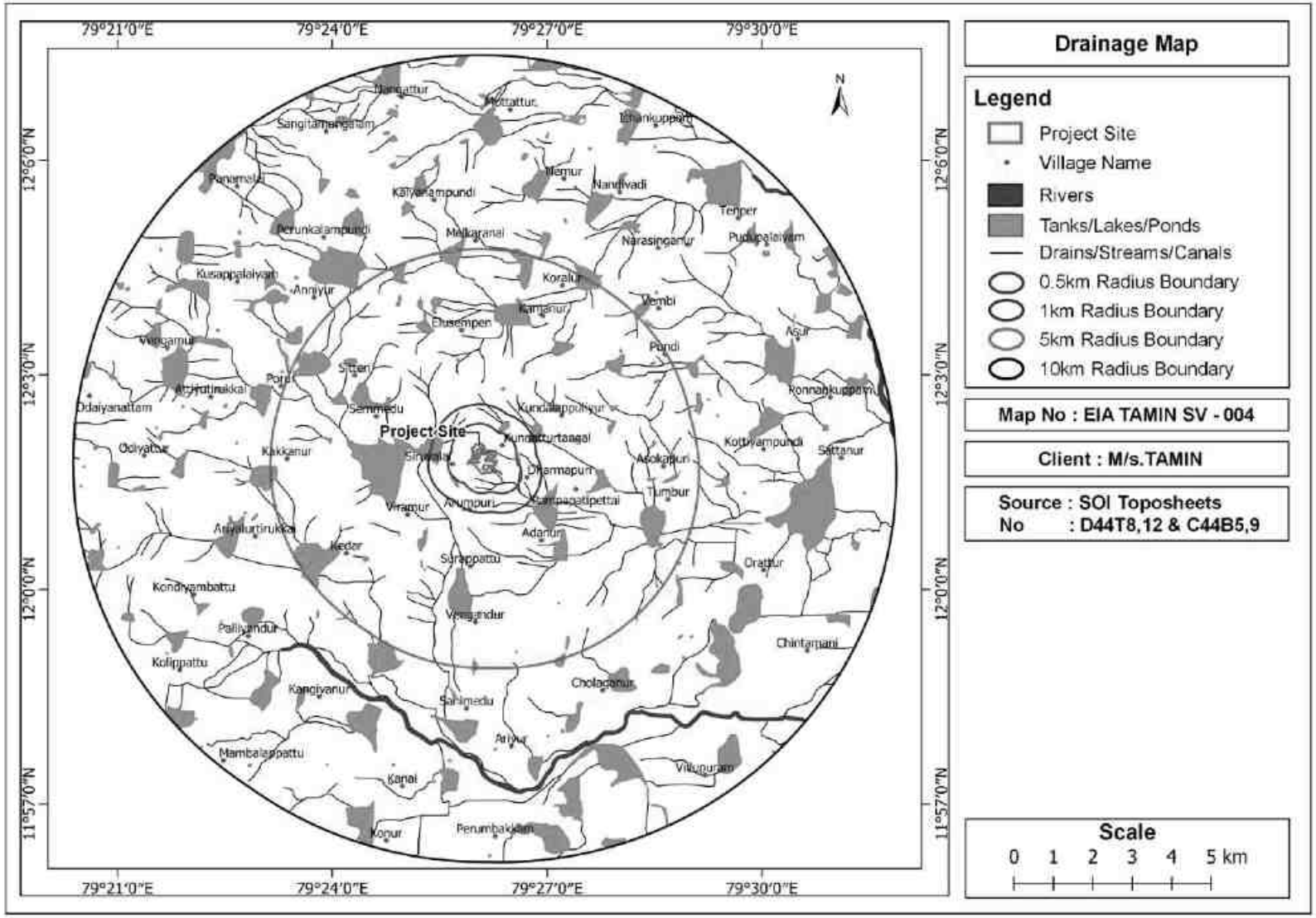
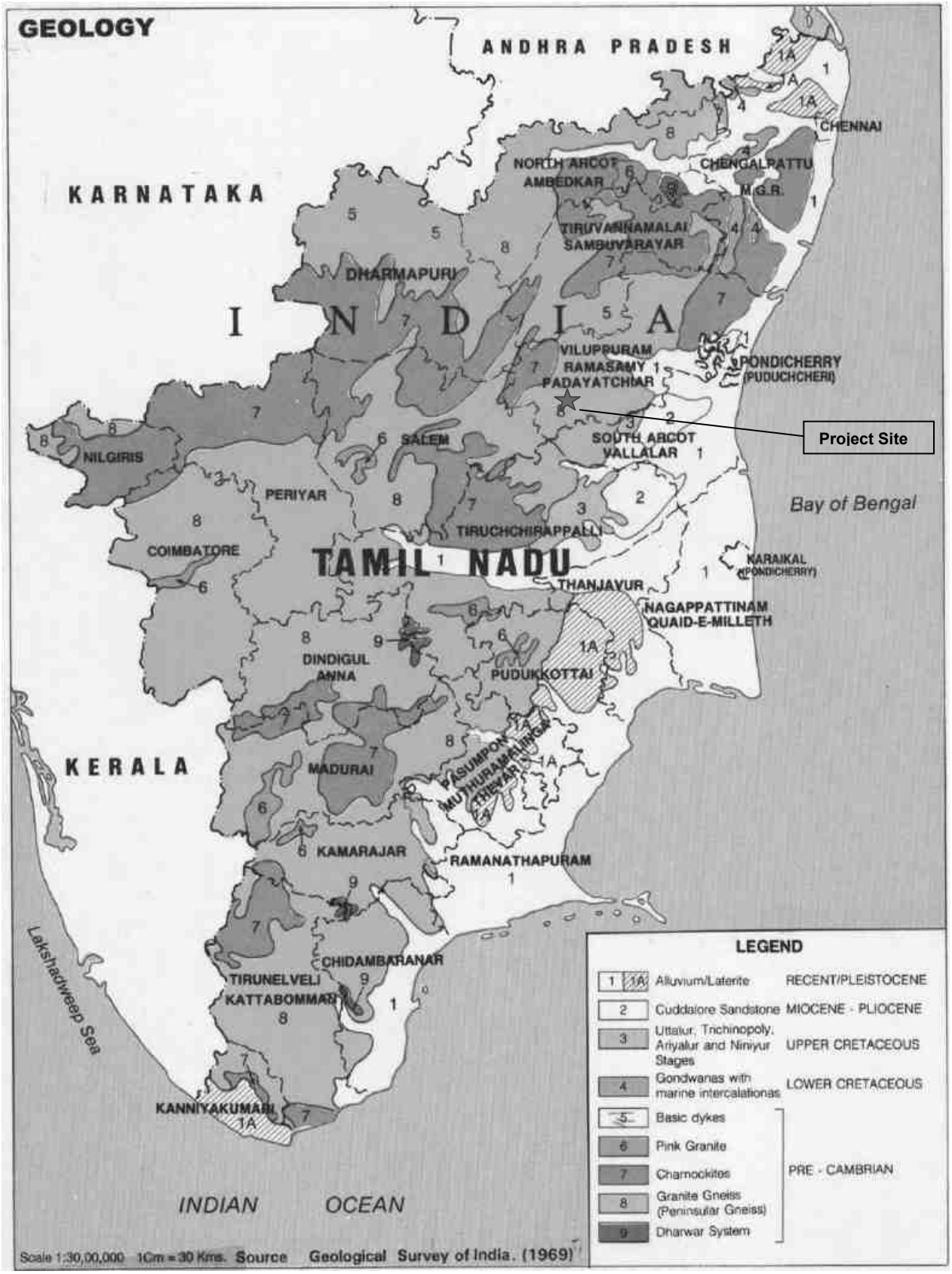


Figure 3-13 Drainage map of the study area

3.15 Geology

The hills are found in the western part of the district and they are Kalrayan and Ginjee hills falling under Kallakurichi and Ginjee taluks respectively. Plain terrain occurs in the middle part of this district, while the coastal plains lie in the eastern part of the district in and around Marakanam and Vanur taluks.The Geological map of Tamilnadu is given as **Figure 3-15.**

Source: *http://cgwb.gov.in/District_Profile/TamilNadu/VILUPPURAM.pdf*
*(**Ref:** Government of India, Ministry of Water Resources, Central Ground Water Board, South Eastern Coastal Region Chennai, "District Ground Water Brochure Viluppuram District")*

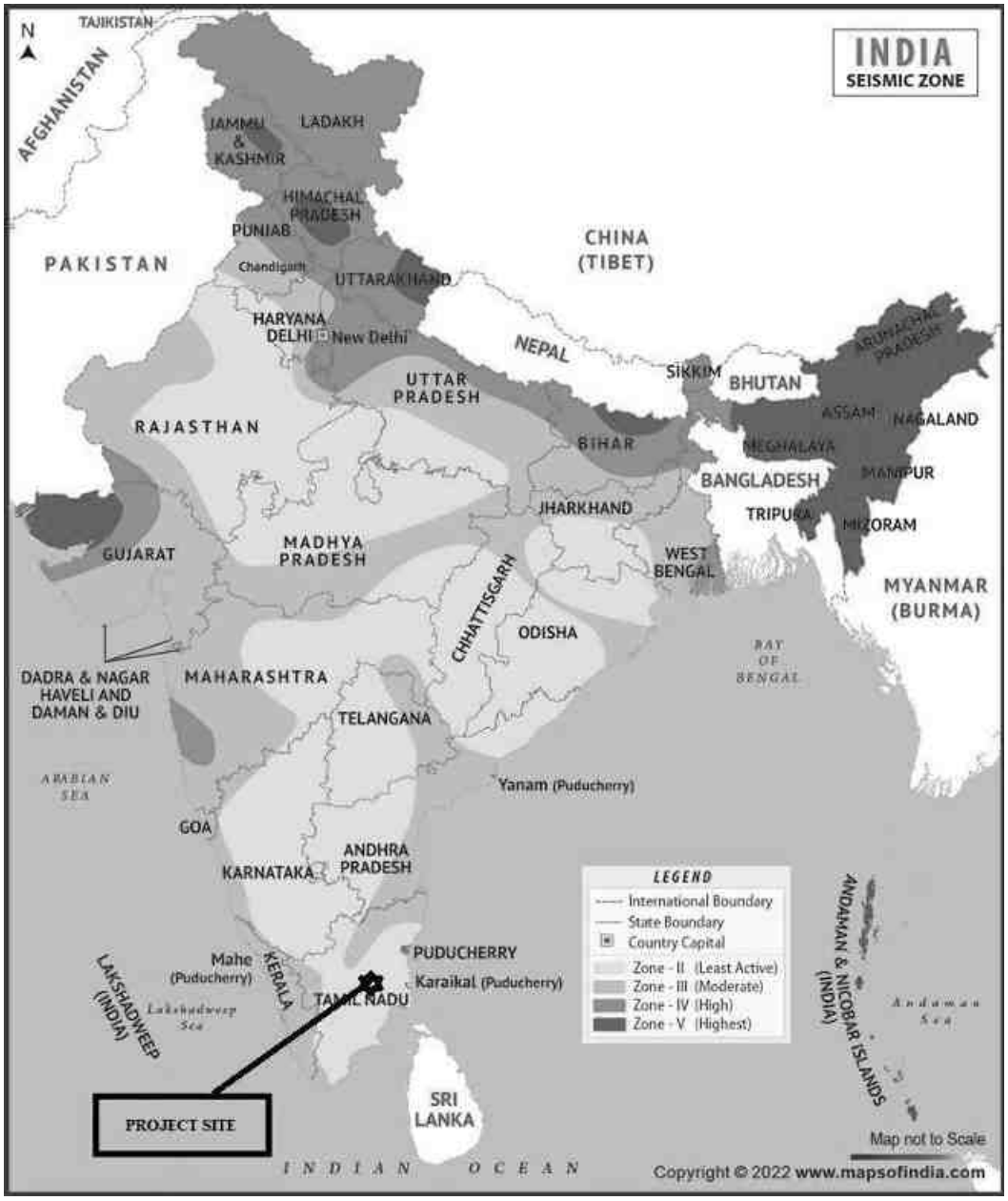


Source: Geological Survey of India

Figure 3-14 Geology Map of Tamilnadu

3.16 Seismicity

As per Earthquake hazard map of Tamil Nadu, The project location/study area falls in Zone II, which is categorized as a Low Damage Risk Zone. The seismicity map of India is shown in **Figure 3.16.**



(Source: Maps of India)

Figure 3-15 Seismicity Map of India

3.17 Soils in PIA District

The soils in the district are mainly red soil, sandy loam and black cotton soil. Alluvial soils are found in eastern side bordering coastal areas. Black soils are confined to low ground in select pockets in Vanur taluk.

Source:*https://censusindia.gov.in/nada/index.php/catalog/1105/download/3434/DH_2011_3306_PART_B_DCHB_VILUPPURAM.pdf*

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

3.18 Natural Hazards in PIA District

As any other coastal environment, coast of Villupuram district also gets affected with regular erosion and accretion. Sea level rise and elevation in sea surface temperature are also seen here as the consequences of global climate change. It has been ascertained from the available information that only 8 taluks and 22 blocks were affected by flood in the years 1992-94 and affected by cyclone in the years 1993-94. Banana cultivation faces the cyclone havoc most frequently.

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

3.19 Air Environment

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

3.19.1 Meteorological Conditions

The regional air quality is influenced by the meteorology of that region. The principal weather parameters that influence the concentration of the air pollutants in the surroundings are wind speed, wind direction and temperature. The meteorological data is useful for proper interpretation of the baseline data. It is used as input for air quality dispersion models for predicting the post project environmental scenario i.e. ground level concentrations due to mining activities, Quarry machineries, DG set & vehicles etc.

3.19.2 Meteorological Data Collection

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

3.19.3 General Meteorological Scenario based on IMD Data

The nearest India Meteorological Department (IMD) station located to project site is Cuddalore. The Climatological data of Cuddalore (11° 46' N and 79° 46' E), published by the IMD, based on daily observations at 08:30 and 17:30 hour IST for a 30 year period (1991-2020), is presented in the following sections on the meteorological conditions of the region. The monthly variations of the relevant meteorological parameters are reproduced in **Table 3.5**.

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

Month	Temp (°C)		Rainfall (mm)		Relative Humidity (%)		Vapour Pressure hPa		Mean Wind Speed (kmph)	Predominant Wind Directions (From)*	
	Daily Max.	Daily Min.	Total	No. of days	08:30	17:30	08:30	17:30		08:30	17:30
Jan	29.7	20.8	26.2	1.3	86	71	24.8	24.9	5.5	NW	NE
Feb	31.0	21.5	13.6	0.8	84	70	26.0	26.3	5.0	NW	E
Mar	32.7	23.3	15.1	0.4	81	71	29.2	29.2	5.3	NW	SE
Apr	34.5	25.9	19.8	1.0	75	73	32.3	33.0	5.9	SW	SE
May	36.9	26.9	49.8	2.1	70	73	31.4	34.6	6.9	SW	SE
Jun	37.0	26.5	53.9	2.9	68	66	29.4	31.6	7.4	SW	SE
Jul	35.9	25.8	62.6	4.0	71	64	28.7	30.5	6.5	SW	SE
Aug	35.1	25.4	118.2	5.7	75	68	29.1	31.2	6.2	SW	SE
Sep	34.2	25.2	112.7	5.8	77	74	29.7	32.0	5.6	SW	SE
Oct	32.2	24.5	272.3	9.9	84	78	30.5	31.1	4.3	SW	SE
Nov	30.0	23.1	389.5	12.2	88	80	29.0	29.1	4.8	N	NE
Dec	29.1	21.7	236.1	6.4	87	76	26.2	26.3	5.8	N	NE
Max.	**37.0**	**26.9**	**389.5**	**12.2**	**88**	**80**	**32.3**	**34.6**	**7.4**	**Annual Predominant wind direction is South East**	
Min.	**29.1**	**20.8**	**13.6**	**0.4**	**68**	**64**	**24.8**	**24.9**	**4.3**		
Avg. /Total.	**33.2**	**24.2**	**1369.6**	**52.4**	**79**	**72**	**28.9**	**30**	**5.8**		

As per the above IMD Climatological **Table 3.5,** the observations drawn are the following.

- Highest Daily maximum temperature is 41°C and the Lowest daily minimum temperature is 23°C were recorded in the months of June and January respectively
- Maximum and minimum relative humidity of 94.31% and 29.45% were recorded in the months of November, and July respectively.
- Maximum and minimum rainfall of 389.5 mm and 13.6 mm was recorded in the months of November and February respectively.
- Maximum and minimum Mean wind speed is 7.72 Km/hr and 1.03 Km/hr was recorded in the months of June and October respectively. Annual Predominant wind direction is South East.

3.19.4 Meteorological data during Study Period

The meteorological data of study period was used for interpretation of baseline status and to simulate the meteorological conditions for prediction of impacts in modeling studies. Meteorology Data for the Study Period (March 2023 to May 2023) is presented in **Table 3.6.**

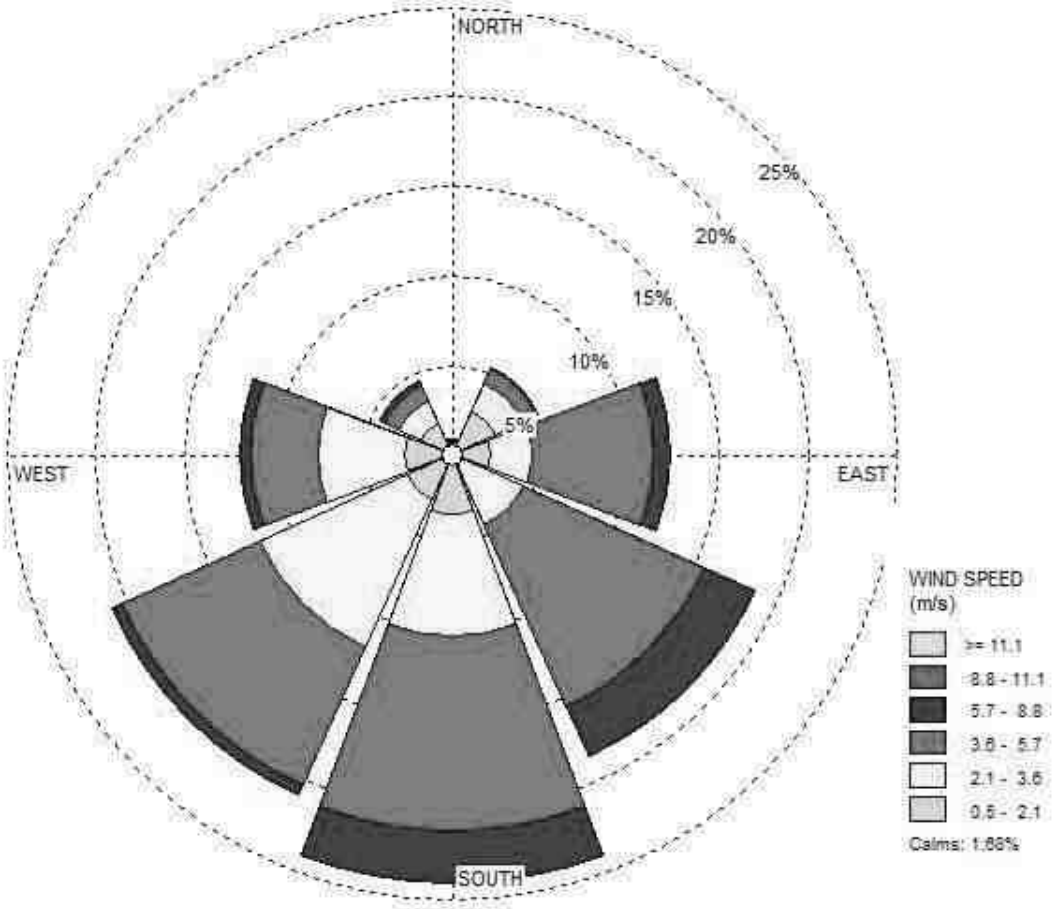


Figure 3-16 Wind rose diagram considered for Dispersion Modelling (March 2023 to May 2023)

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

S.No	Parameter	Observation
1.	Temperature	Max Temperature: 41°C Min Temperature:23°C Avg Temperature: 30.59°C
2.	Average Relative Humidity	74.71%
3.	Average Wind Speed	3.43m/s
4.	Predominant Wind Direction	South

3.19.5 Atmospheric Inversion

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

- Average atmospheric temperature: 23°C
- Average Relative humidity: 74.71 %
- Average Wind speed: 3.43 m/s

The daily inversion level calculated based on the average temperature and average wind speed at the project site and the maximum inversion height is derived by the graph plotted based on the average temperature and average wind speed. The daily inversion level at the project site varies from 50 to 3664m during 6 AM to 4 PM, the maximum recorded at 4 PM, May 2023. This is shown in the following **Figure 3.20**

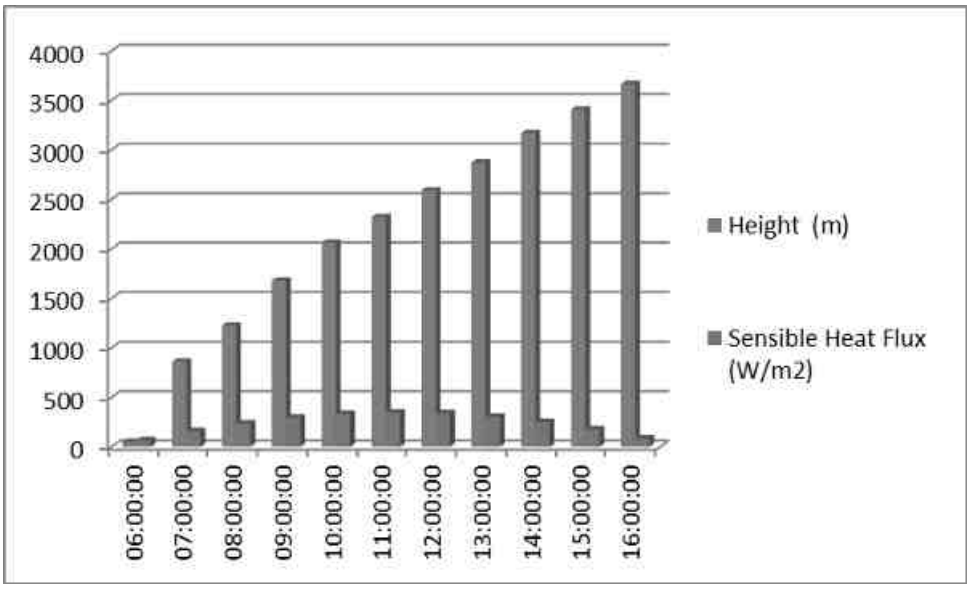


Figure 3-17 Atmospheric inversion level at the project site

3.20 Ambient Air Quality

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

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

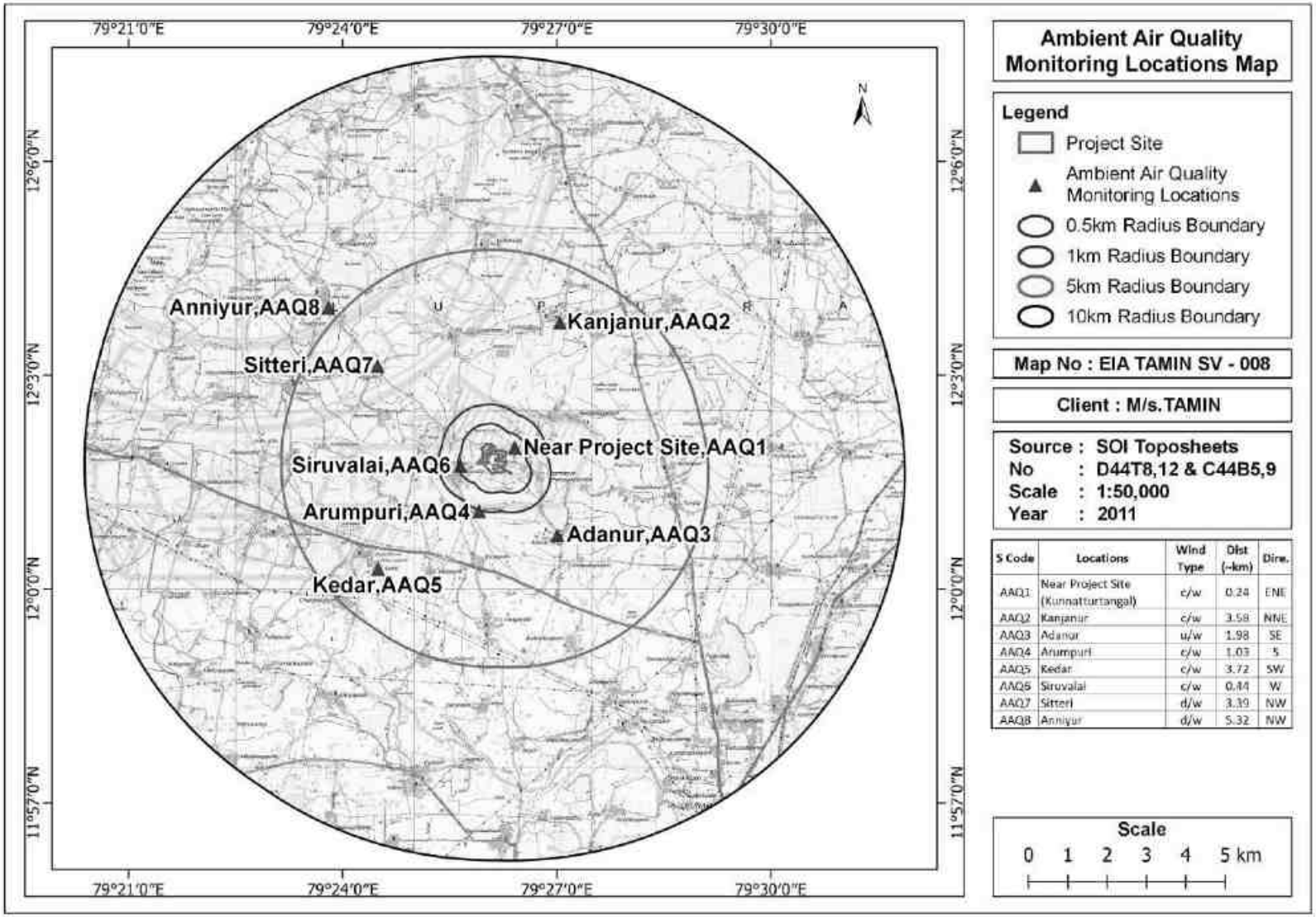
3.20.1 Ambient Air Quality Monitoring Stations

To evaluate the baseline air quality of the study area, Eight (08) monitoring locations have been identified as per annual wind predominance of Cuddalore from IMD data (1991-2020). The wind predominance during study period (**March 2023 to May 2023**) is from **South East.**

Map showing the AAQ monitoring locations is given in **Figure 3.21** and the details of the locations are given in **Table 3.7.**

Table 3-6 Details of Ambient Air Quality Monitoring Locations

Station Code	Location	Type of Wind	Distance (~km) from Project boundary	Azimuth Directions
AAQ1	Project Site	c/w	0.24	E
AAQ2	Kanjanur	c/w	3.58	NNE
AAQ3	Adanur	u/w	1.98	SE
AAQ4	Arumpuri	c/w	1.03	S
AAQ5	Kedar	c/w	3.72	SW
AAQ6	Siruvalai	c/w	0.44	W
AAQ7	Sitteri	d/w	3.39	NW
AAQ8	Anniyur	d/w	5.32	NW



S Code	Locations	Wind Type	Dist (~km)	Dire.
AAQ1	Near Project Site (Kunnatturtangal)	c/w	0.24	ENE
AAQ2	Kanjanur	c/w	3.58	NNE
AAQ3	Adanur	u/w	1.98	SE
AAQ4	Arumpuri	c/w	1.03	S
AAQ5	Kedar	c/w	3.72	SW
AAQ6	Siruvalai	c/w	0.44	W
AAQ7	Sitteri	d/w	3.39	NW
AAQ8	Anniyur	d/w	5.32	NW

Figure 3-18 Map showing the Ambient Air Quality monitoring locations

3.20.2 Ambient Air Quality Monitoring Techniques and Frequency

Ambient air quality was monitored twice in a week for One (01) season (shall cover 12 weeks), i.e. during (**March 2023 – May 2023**). PM10, PM2.5, SO2, NOx, CO, Pb, O3, NH3, C6H6, C20H12, As, Ni, Free Silica were monitored. Sampling was carried out as per Central Pollution Control Board (CPCB) monitoring guidelines at each location. Analytical methods used for analysis of parameters are given in **Table 3.8.**

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

S.No	Parameters	Analytical method	NAAQ standards: 2009		Sampling Time
1.	Sulphur Dioxide (SO_2), µg/m^3	IS:5182(Part-2):2001 (Reaff:2006)	50 (Annual)	80(24 Hours)	24 Hours
2.	Nitrogen Dioxide (NO_2), µg/m^3	IS: 5182 (Part - 6): 2006	40 (Annual)	80 (24 Hours)	24 Hours
3.	Particulate Matter ($PM_{2.5}$), µg/m^3	IS: 5182 (Part - 23): 2006	40 (Annual)	60 (24 hours)	24 Hours
4.	Particulate Matter (PM_{10}), µg/m^3	IS:5182 (Part– 23): 2006	60 (Annual)	100 (24 hours)	24 Hours
5.	CO mg/m^3	IS:5182(Part–10):1999 (Reaff:2006)	2 (8 hours)	4 (1hour)	8 Hours
6.	Pbµg/m^3	IS:5182(Part–22):2004 (Reaff:2006)	0.5(Annual)	1(24 hours)	24 Hours
7.	O_3, µg/m^3	IS: 5182 (Part – 9): 1974	100(8hours)	180 (1hour)	8 Hours
8.	NH_3, µg/m^3	APHA (air) 2nd edition (Indophenol-blue method)	100(Annual)	400(24 hours)	8 Hours
9.	Benzene, µg/m^3	IS:5182(Part–11):1999 (RA:2009)	5 (Annual)	5 (Annual)	24 Hours
10.	Benzo (a) pyrene, ng/m^3	IS:5182(Part–12):2004 (RA:2009)	1 (Annual)	1 (Annual)	24 Hours
11.	Arsenic, ng/ m^3	APHA (air) 2nd edition	6 (Annual)	6 (Annual)	24 Hours
12.	Nickel ng/ m^3	In house method (AAS method) based on CPCB guidelines volume 1	20(Annual)	20(Annual)	24 Hours
13.	Free Silica	NIOSH Manual-Method 7601	--	--	8 hours

3.20.3 Results and Discussions

The variations of the pollutants Particulate matter <10 micron size (PM_{10}),Particulate matter <2.5 micron size ($PM_{2.5}$), Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2),Carbon Monoxide

(CO), Lead (Pb),Ozone (O_3),Benzene (C_6H_6), Benzo (a) pyrene ($C_{20}H_{12}$), Arsenic (As), Nickel (Ni),Ammonia (NH_3), Free Silica are compared with National Ambient Air Quality Standards (NAAQS), MoEF&CC Notification, November 2009. Ambient Air Quality Monitoring Data (**March 2023 to May 2023)** for the study area is given in **Table 3.9** and trends of measured ambient concentration in the study area were graphically represented in **Figure 3-22.**

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

Parameters	Conc.	NAAQ Standards	Locations							
			Near Project Site	Kanjanur	Adanur	Arumpuri	Kedar	Siruvalai	Sitteri	Anniyur
			AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
PM10 Conc. (µg/m³)	Min.	100 (24 Hours)	37.77	33.50	36.63	32.14	37.37	33.31	35.14	28.27
	Max		53.82	47.74	52.21	45.80	53.26	47.47	50.08	40.29
	Avg.		**45.29**	**40.18**	**43.93**	**38.54**	**44.82**	**39.95**	**42.14**	**33.90**
	98th 'tile		53.51	47.47	51.90	45.54	52.96	47.19	49.78	40.06
PM2.5 Conc. (µg/m3)	Min.	60 (24 Hours)	16.80	20.01	21.69	19.17	22.42	19.98	21.08	16.80
	Max		23.94	28.51	30.91	27.32	31.96	28.48	30.05	23.94
	Avg.		**20.14**	**24.00**	**26.01**	**22.99**	**26.89**	**23.97**	**25.28**	**20.14**
	98th 'tile		23.80	28.35	30.73	27.16	31.77	28.32	29.87	23.80
SO2 Conc. (µg/m3)	Min.	80 (24 Hours)	6.52	6.11	6.27	5.69	6.45	5.83	6.40	5.44
	Max		9.29	8.71	8.94	8.10	9.19	8.31	9.13	7.75
	Avg.		**7.83**	**7.33**	**7.52**	**6.82**	**7.74**	**6.99**	**7.69**	**6.52**
	98th 'tile		9.24	8.66	8.89	8.06	9.13	8.26	9.07	7.70
NO2 Conc.(µg/ m3)	Min.	80 (24 Hours)	13.04	12.22	12.54	11.37	12.89	11.66	12.81	10.87
	Max		18.59	17.42	17.87	16.21	18.37	16.61	18.25	15.49
	Avg.		**15.65**	**14.66**	**15.04**	**13.64**	**15.46**	**13.98**	**15.36**	**13.04**
	98th 'tile		18.48	17.32	17.77	16.11	18.27	16.52	18.15	15.40
Pb (µg/m3)	Avg.	1 (24 hour)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)
CO (mg/m3)	Avg.	4 (1hour)	**0.38**	**0.33**	**0.37**	**0.32**	**0.36**	**0.33**	**0.35**	**0.28**
O3 (µg/m3)	Avg.	180 (1hour)	10.67	10.21	10.58	10.41	10.53	10.18	10.61	10.02

Parameters	Conc.	NAAQ Standards	Locations							
			Near Project Site	Kanjanur	Adanur	Arumpuri	Kedar	Siruvalai	Sitteri	Anniyur
			AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
NH3 (µg/m3)	**Avg.**	**400 (24 hours)**	7.14	6.90	7.84	7.16	6.57	7.34	6.21	6.49
Benzene (µg/m3)	**Avg.**	**5 (Annual)**	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)
Benzo (a) pyrene, (ng/m3)	**Avg.**	**1 (Annual)**	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)
Arsenic (ng/ m3)	**Avg.**	**6 (Annual)**	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)
Nickel (ng/m3)	**Avg.**	**20 (Annual)**	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)
Free Silica (µg/m3)	**Avg**	**-**	BLQ(LOQ 0.04)	BLQ (LOQ 0.04)	BLQ (LOQ 0.04)	BLQ (LOQ 0.04)	BLQ (LOQ 0.04)	BLQ (LOQ 0.04)	BLQ (LOQ 0.04)	BLQ (LOQ 0.04)

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

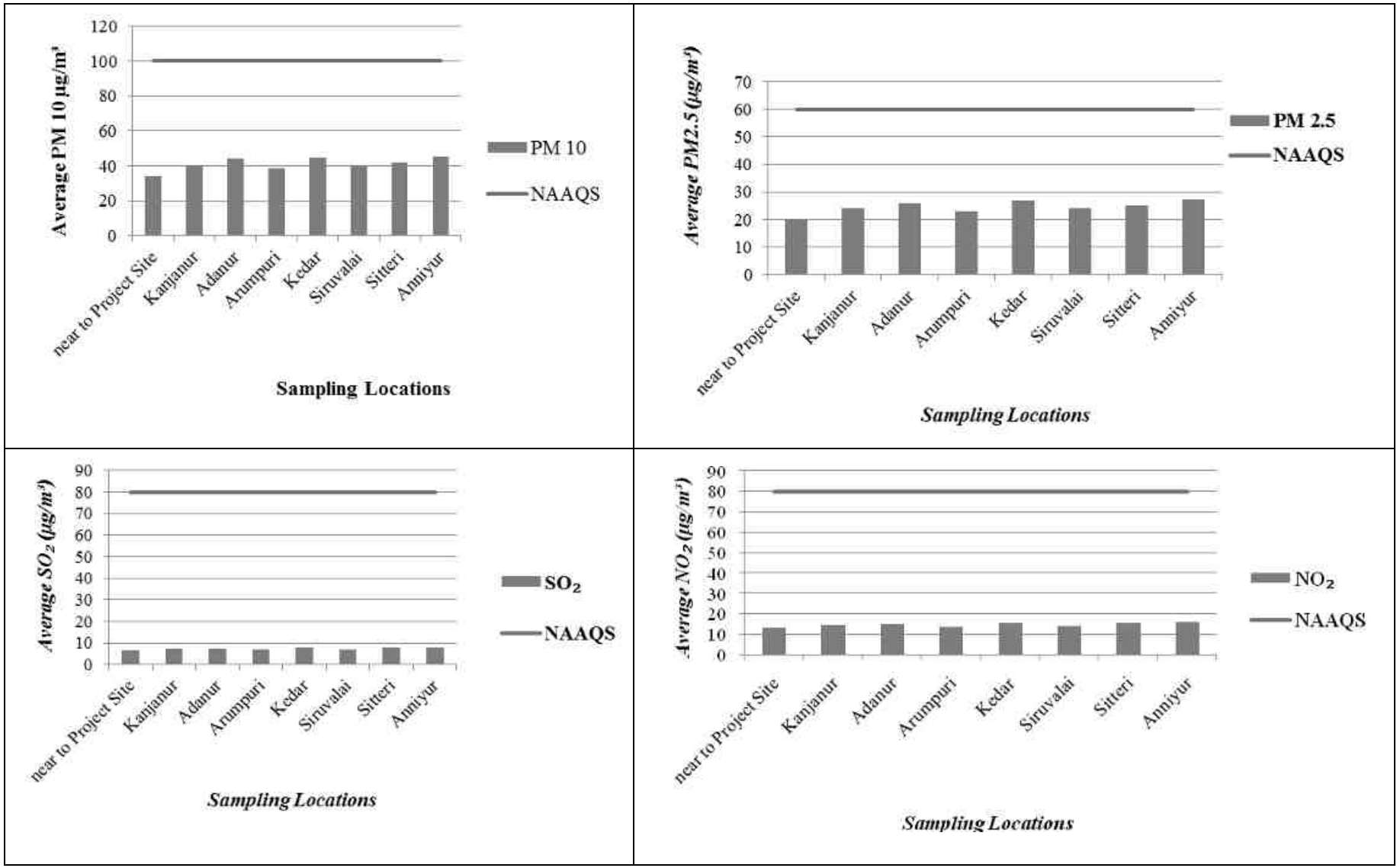


Figure 3-19 Trends of Measured Ambient Concentrations in the Study Area

3.20.4 Observations

The ambient air quality has been monitored at 8 locations for 13 parameters as per CPCB guidelines within the study area. The average baseline levels of PM_{10} is 28.27 to 53.82 µg/m³, $PM_{2.5}$ is 16.80 to 32.29 µg/m³, SO_2 is 5.44 to 9.29 µg/m³, NO_2 is 10.87 to 18.59 µg/m³ all the parameters are well within the National Ambient Air Quality Standards for Industrial, Commercial and Residential areas at all monitoring locations during the study period.

3.21 Noise Environment

The prevailing ambient noise level at a particular location is nothing but the resultant (total) of all kinds of noise sources existing at various distances around that location. The ambient noise level at a location varies continuously depending on the type of surrounding activities. Ambient noise levels have been established by monitoring noise levels at Eight (08) locations in and around 10 km distance from project area during the study period using precision noise level meter. The noise monitoring locations in the study area were selected after giving due consideration to the various land use categories. The land use categories include commercial, residential, rural and sensitive areas. Noise levels were recorded on an hourly basis for one complete day at each location using pre- calibrated noise levels. Sampling images and map noise showing the noise monitoring locations are given in **Figure 3.23.**

3.21.1 Results and Discussions:

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

Ld: Average noise levels between 6:00 hours to 22.00 hours.

Ln: Average noise levels between 22:00 hours to 6.00 hours.

The comparison of day equivalent noise levels (Ld) and night equivalent noise levels (Ln) with the respective CPCB stipulated noise standards for various land use categories are shown in the **Table 3.11.**

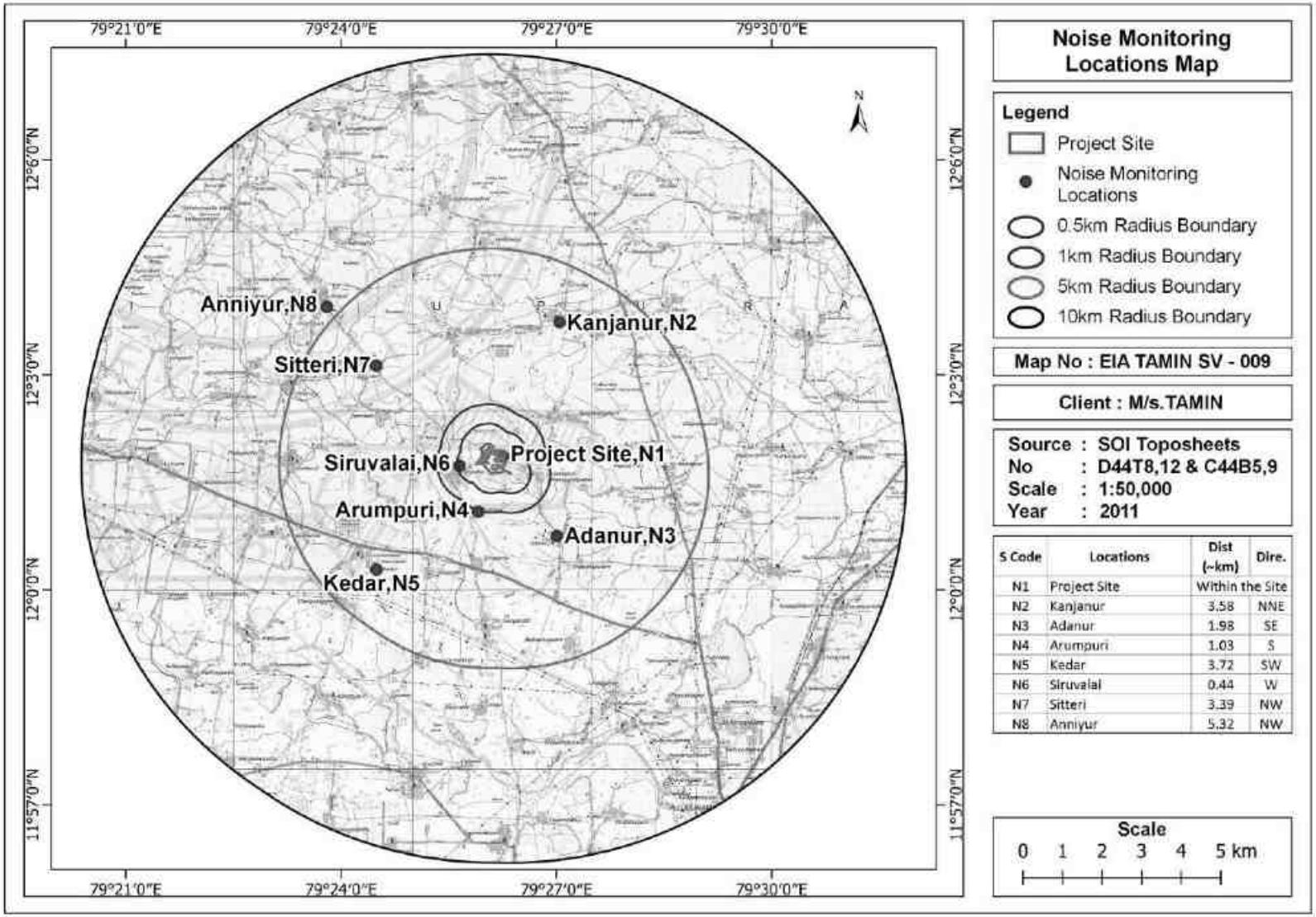
Table 3-9 Day and Night Equivalent Noise Levels

Location Code	Location	Distance (~km) from Project boundary	Azimuth Direction	Noise level in dB(A) Leq		CPCB Standard		Environmental Setting
				Day	Night	Lday (Ld)	LNight (Ln)	
N1	Project Site	0.24	E	57.7	49.3	75	70	Industrial
N2	Kanjanur	3.58	NNE	53.8	41.4	55	45	Residential
N3	Adanur	1.98	SE	52.4	42.8	55	45	Residential
N4	Arumpuri	1.03	S	51.9	43.7	55	45	Residential
N5	Kedar	3.72	SW	52.9	42.3	55	45	Residential
N6	Siruvalai	0.44	W	53.5	43.4	55	45	Residential
N7	Sitteri	3.39	NW	53.4	43.8	55	45	Residential
N8	Anniyur	5.32	NW	52.3	41.6	55	45	Residential

Observations

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

- In industrial area, day time noise level was about 57.7 dB(A) and 49.3 dB(A) during night time, which is within prescribed limit by MoEF&CC (75 dB(A) Day time & 70 dB(A) Night time).
- In residential area day time noise levels varied from 51.9 dB(A) to 53.8 dB(A) and night time noise levels varied from 41.4 dB(A) to 43.8 dB(A) across the sampling stations. The field observations during the study period indicates that the ambient noise levels are within the prescribed limit noise by CPCB (55 dB(A) Day time & 45 dB(A) Night time).



S Code	Locations	Dist (~km)	Dire.
N1	Project Site	Within the Site	
N2	Kanjanur	3.58	NNE
N3	Adanur	1.98	SE
N4	Arumpuri	1.03	S
N5	Kedar	3.72	SW
N6	Siruvalai	0.44	W
N7	Sitteri	3.39	NW
N8	Anniyur	5.32	NW

Figure 3-20 Map showing the noise monitoring location

3.22 Water Environment

3.22.1 Surface Water Resources

The Ponnaiyar, the Malattar and the Gadilam are the major rivers draining the district. The Ponnaiyar River flows from northwest to east in the district. The Manimukta nadi originates in Kalrayan hills and drains the southern part of the district. The Pambaiyar and the Varaganadhi originate in the uplands of the district and join Bay of Bengal. The Varaganadhi is also known as the Gingee River and drains the parts of Gingee and Vanur taluks of this district. The Malattar and Gadilam rivers also originate in the uplands within the district and flow eastwards to Cuddalore district. All the rivers are ephemeral in nature and carry only floodwater during monsoon period. The drainage pattern is mostly parallel to sub parallel and drainage density is very low. There are small reservoirs across rivers namely Gomukha, Vedur and Mahanathur.

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

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

3.22.2 Surface Water Quality Assessment

Water quality monitoring and assessment can be used to determine ambient water quality, the extent and causes of a water quality problem, or to measure the effectiveness of best management practices being implemented in water system. Monitoring helps to determine the trends in the quality of the aquatic environment and the impact due to the release of contaminants, other anthropogenic activities, and/or by waste treatment operations (impact monitoring).To establish the baseline status of water environment, the representative sampling locations for surface water within a radial distance of 10Km from project site have been selected as per CPCB guidelines of Water Quality Monitoring through an adequate survey of the project area. Test methods used for the analysis of water quality parameters is given in**Table 3.11**.Water sampling and map of sampling location are given in **Table 3.12** and **Figure 3.24.**

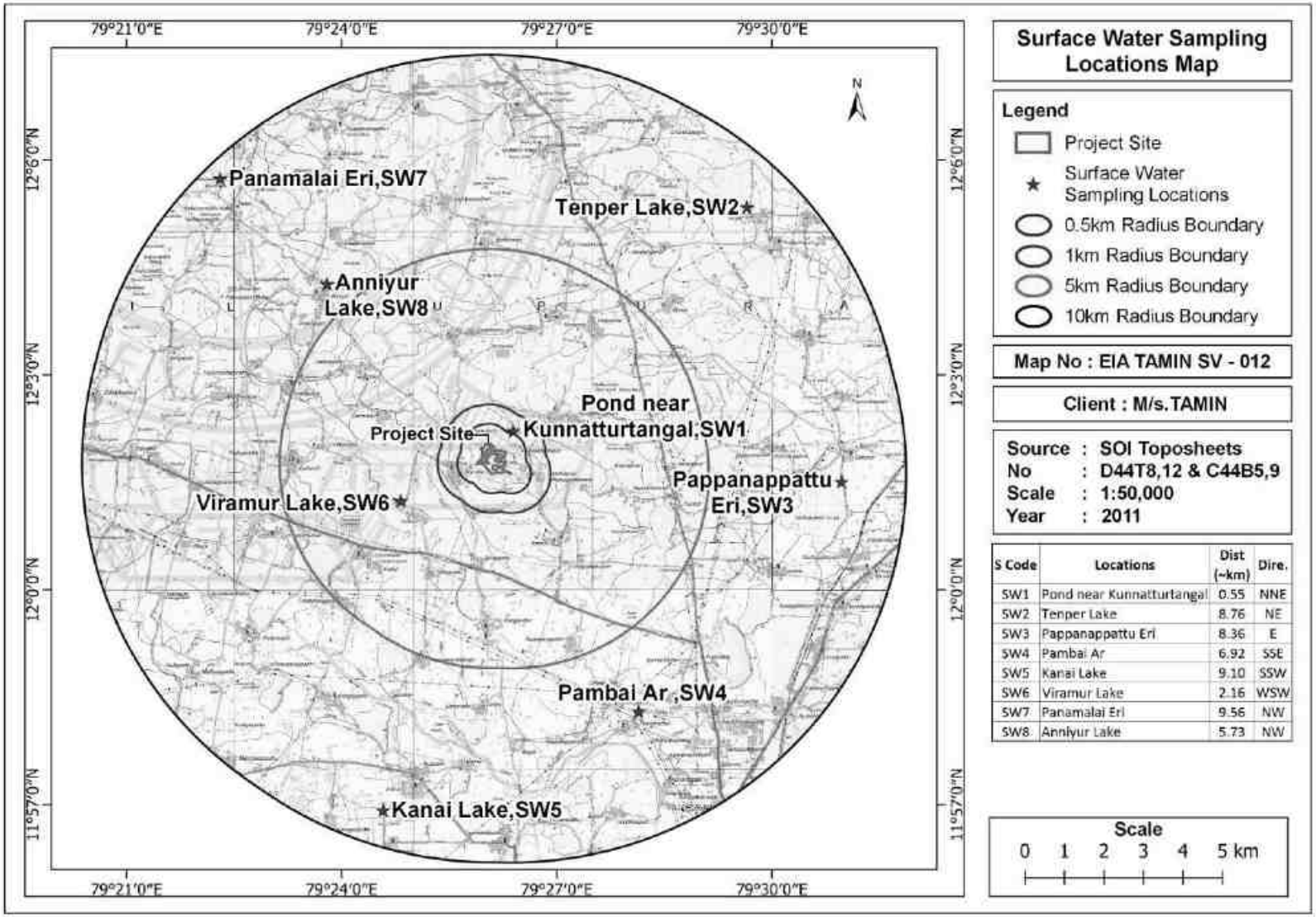
Table 3-10 Test methods used for the analysis of water quality parameters

Sl. No	Parameter Measured	Test Method
1	Turbidity	IS 3025(Part - 10):1984
2	pH	IS:3025 (Part - 11):2022
3	Electrical Conductivity	IS:3025 (Part - 14): 2013
4	Total Dissolve Solids	IS: 3025:1(Part - 16) 1984
5	Total Suspended Solids	IS 3025 (Part - 17) 1984

Sl. No	Parameter Measured	Test Method
6	Total Alkalinity as CaCO3	IS:3025,1 (Part - 23) 1986
7	Total Hardness as CaCo3	IS:3025 (Part - 21) 2009
8	Sodium as Na	IS:3025,5(Part - 45) 1993
9	Potassium as K	IS:3025,5(Part - 45) 1993
10	Calcium as Ca	IS 3025 (Part - 40):1991
11	Magnesium as Mg	IS 3025 (Part - 46) 1994
12	Chloride as cl	4500Cl---BAPHA 23rd Edn:2017
13	Sulphate as SO4	IS 3025(Part - 24) Sec 1:2022
14	Nitrate as NO3	IS 3025 (Part34):Sec3:2021
15	Phosphate as PO4	IS 3025 (Pt 45) 1993 (R 2006)
16	Fluorides as F	IS 3025 (Part - 60):2008
17	Cyanide as Cd	IS 3025 (Part-27):Sec 1:2021
18	Arsenic as As	USEPA Method 200.8:1994
19	Cadmium as Cd	IS 3025 (Part - 41)1991
20	Chromium, Total	IS:3025 (Part - 52) 2003
21	Lead as Pb	IS:3025 (Part - 47) 1994
22	Manganese as Mn	IS 3025:(Part - 59):2006
23	Mercury as Hg	IS 3025 (Part48):1994 RA 1999
24	Nickel as Ni	IS 3025:(Part-54):2003
25	Selenium as Se	IS 3025 Part (56)2003
26	Zinc as Zn	IS:3025 (Part - 49) 1994
27	Dissolved Oxygen (DO)	IS:3025 (Part - 38)1989
28	BOD, 3 days @ 27°C as O_2	5210B APHA22nd Edn 2012
29	Chemical Oxygen Demand as O_2	IS:3025 (Part-58)-2006

Table 3-11 Details of Surface water sampling locations

Location Code	Locations	Distance from Project Boundary(~km)	Direction from project boundary
SW1	Pond near Kunnatturtangal	0.55	NNE
SW2	Tenper Lake	8.76	NE
SW3	Pappanappattu Eri	8.36	E
SW4	Pambai Ar	6.92	SSE
SW5	Kanai Lake	9.10	SSW
SW6	Virmur Lake	2.16	WSW
SW7	Panamalai Eri	9.56	NW
SW8	Anniyur Lake	5.73	NW



S Code	Locations	Dist (~km)	Dire.
SW1	Pond near Kunnatturtangal	0.55	NNE
SW2	Tenper Lake	8.76	NE
SW3	Pappanappattu Eri	8.36	E
SW4	Pambai Ar	6.92	SSE
SW5	Kanai Lake	9.10	SSW
SW6	Viramur Lake	2.16	WSW
SW7	Panamalai Eri	9.56	NW
SW8	Anniyur Lake	5.73	NW

Figure 3-21 Map showing the surface water monitoring locations

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

S. No	Parameter	Unit	Tenper Lake	Pappanapattu Eri	Pambai Ar d/s	Kanai Lake	Pambai Ar u/s	Veramur Lake	Panamalai Eri	Anniyur Lake
			SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
1.	pH (at 25°C)	--	7.84	7.48	7.7	8.21	7.42	7.76	7.23	7.86
2.	Turbidity	NTU	7	5	8	7	6	6	5	8
3.	Electrical Conductivity	µS/cm	750	715	746	826	706	682	589	484
4.	Total Dissolved Solids	mg/l	408	399	412	449	383	369	315	269
5.	Total Suspended Solids	mg/l	16	12	18	15	14	13	12	17
6.	Total Alkalinity as $CaCO_3$	mg/l	96	179	172	118	110	128	83	103
7.	Total Hardness as $CaCO_3$	mg/l	178	237	187	217	183	200	156	169
8.	Sodium as Na	mg/l	63	47	65	61	54	45	40	31
9.	Potassium as K	mg/l	4	3	5	4	4	3	3	2
10.	Calcium as Ca	mg/l	41.38	55.09	43.47	51.75	41.85	44.12	36.26	39.29
11.	Magnesium as Mg	mg/l	18.17	24.19	19.09	21.45	18.98	21.74	15.92	17.25
12.	Chloride as Cl	mg/l	121.18	97.64	94.48	126.30	113.38	94.73	84.37	65.18
13.	Sulphate as SO_4	mg/l	72.3	35.8	53.9	84.4	55.6	61.0	56.4	30.3
14.	Nitrate as NO_3	mg/l	1.83	1.18	0.89	1.42	0.92	0.84	0.77	0.65
15.	Phosphate as PO_4	mg/l	2.37	1.15	0.61	0.17	0.34	1.52	1.18	3.19
16.	Fluorides as F	mg/l	0.57	0.36	0.67	0.56	0.44	0.67	0.68	0.39
17.	Cyanide	mg/l	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
18.	Arsenic	mg/l	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)
19.	Cadmium as Cd	mg/l	BLQ(LOQ	BLQ(LOQ	BLQ(LO	BLQ(LOQ	BLQ(LOQ	BLQ(LOQ	BLQ(LOQ	BLQ(LOQ

S. No	Parameter	Unit	Tenper Lake	Pappanapattu Eri	Pambai Ar d/s	Kanai Lake	Pambai Ar u/s	Veramur Lake	Panamalai Eri	Anniyur Lake
			SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
			0.001)	0.001)	Q 0.001)	0.001)	0.001)	0.001)	0.001)	0.001)
20.	**Chromium, Total**	**mg/l**	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
21.	**Lead as Pb**	**mg/l**	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
22.	**Manganese as Mn**	**mg/l**	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)
23.	**Mercury**	**mg/l**	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)
24.	**Nickel as Ni**	**mg/l**	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
25.	**Selenium as Se**	**mg/l**	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
26.	**Zinc**	**mg/l**	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
27.	**Dissolved Oxygen**	**mg/l**	6.2	6.1	5.8	6.2	6.0	5.9	5.8	6.1
28.	**Chemical Oxygen Demand as O_2**	**mg/l**	16	20	24	16	20	24	24	20
29.	**BOD, 3 days @ 27°C as O_2**	**mg/l**	2	3	4	3	3	4	4	3

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

3.22.3 Results and Discussions

Water sampling results are compared with Surface water standards IS 2296:1992.

- Water sampling results are compared with Surface water standards IS 2296:1992.
- pH in the collected surface water samples varies between 7.23 to 8.21 which is within the limit of IS 2296:1992.
- The Total Dissolved Solids (TDS) value of collected surface water sample ranges from 269 mg/l to 449 mg/l.
- The Total hardness value of the collected surface water sample ranges between 156 mg/l to 237 mg/l
- BOD value of surface water varies from 2 mg/l to 4 mg/l.
- COD value of surface water varies from 16 to 24 mg/l.

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

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

S.No	Parameters	Unit	A	B	C	D	E
1	Turbidity	NTU	---	---	---	---	---
2	pH	--	8.5	8.5	8.5	8.5	8.5
3	Conductivity	µS/cm	---	---	---	1000	2250
4	Total Dissolved Solids	mg/l	500	---	1500	---	2100
5	Alkalinity as $CaCO_3$	mg/l	---	---	---	---	---
6	Total Hardness as $CaCo_3$	mg/l	300	---	---	---	---
7	Calcium as Ca	mg/l	80.10	---	---	---	---
8	Magnesium as Mg.	mg/l	24.28	---	---	---	---
9	Sodium Na	mg/l	---	---	---	---	---
10	Potassium	mg/l	---	---	---	---	---
11	Chloride as Cl	mg/l	250	---	600	---	600
12	Sulphate as SO4	mg/l	400	---	400	---	1000
13	Phosphate	mg/l	---	---	---	---	---
14	Nitrate as NO_3	mg/l	20	---	50	---	---
15	Fluorides as F	mg/l	1.5	1.5	1.5	---	---
16	Cyanide	mg/l	0.05	0.05	0.05	---	---
17	Arsenic	mg/l	0.05	0.2	0.2	---	---
18	Cadmium	mg/l	0.01	---	0.01	---	---
19	Chromium, Total	mg/l	0.05	0.05	0.05	---	---
20	Copper	mg/l	1.5	---	1.5	---	---
21	Iron	mg/l	0.3	---	50	---	---
22	Lead	mg/l	0.1	---	0.1	---	---

S.No	Parameters	Unit	A	B	C	D	E
23	Zinc	mg/l	15	---	15	---	---
24	Manganese	mg/l	0.5	---	---	---	---
25	Selenium	mg/l	0.01	---	0.05	---	---
26	Mercury	mg/l	0.001	---	---	---	---
27	Dissolved Oxygen	mg/l	6	5	4	4	---
28	COD	mg/l	---	---	---	---	---
29	BOD	mg/l	2	3	3	---	---

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

Class B –Water for outdoor bathing.

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

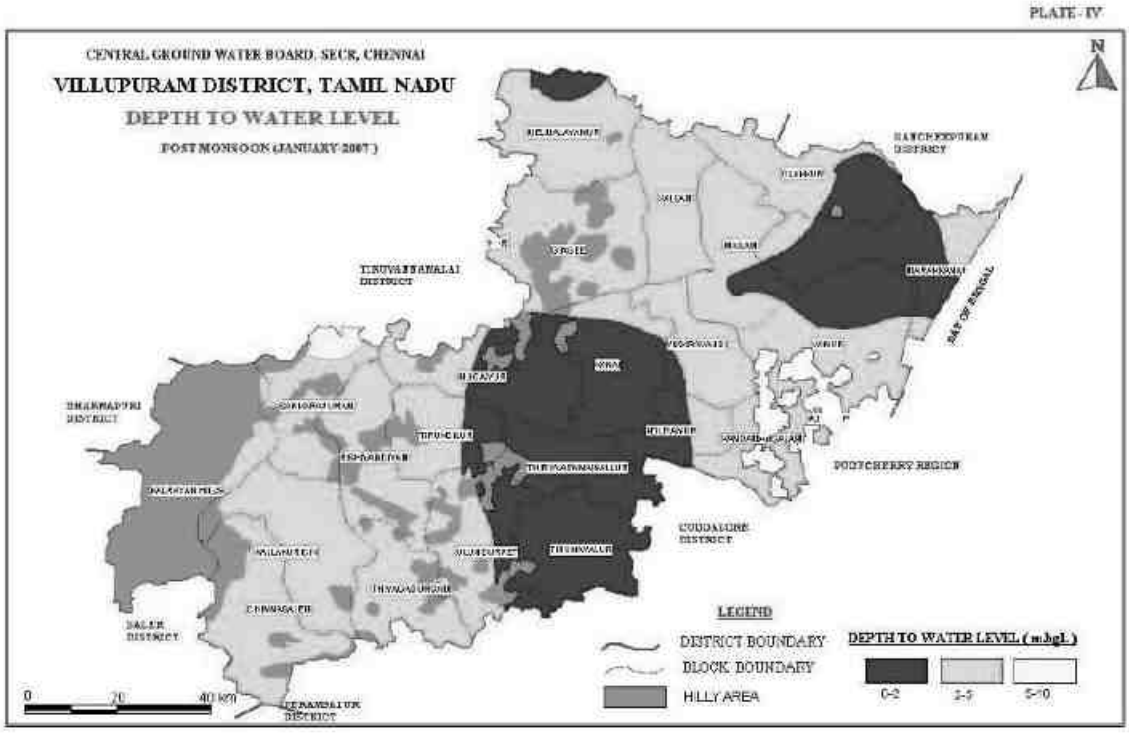
Class D – Water for fish culture and wild life propagation.

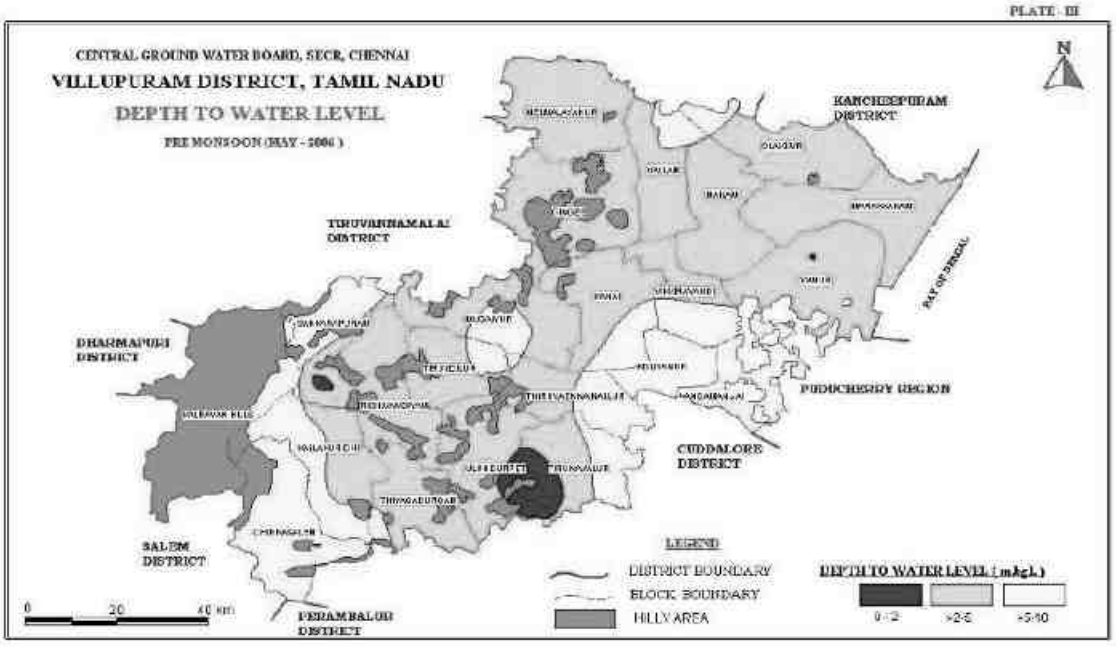
Class E – Water for irrigation, industrial cooling and controlled waste disposal

3.22.4 Groundwater resources

Ground water development is very high in the district. There are number of dug wells and dug cum bore wells in the hard rock areas while tube wells are common in the sedimentary areas. The average draft of dug wells in hard rock areas is of the order of 1.2 ha.m./year. The extraction of ground water by shallow tube wells in the eastern part of the district is of the order of 2.5 ha.m./year. The average command area for dug well and bore well in the district is 2 ha and 3 ha respectively. The hard rock areas in select pockets with valley fills and lineaments are having appreciable ground water potential. At many pockets, the command areas are the main potential ground water zones, The yield prospects are good in select pockets of Villupuram, Sankarapuram and Kallakurichi areas where as it is very poor in Tirukoilur, Ulundurpet, Gingee and Tindivanam taluks. The massive granites in Gingee and Tindivanam taluks do not favour even bore wells. The augmentation of well yield by horizontal and extension bores is successful in part of Kallakurichi and Tirukoilur areas. The crystalline sedimentary contact zones have thick limestone capping followed by productive granular zones, which are tapped, by number of cavity wells of 40 to 60 m bgl depth giving 7 to 10 lps discharge. The tube wells can yield about 70 to 200 m3/hr and can sustain pumping for 10 hrs a day. The Depth to water level during Pre Monsoon & Post Monsoon for Viluppuram District, Tamil Nadu, is given in **Figure 3-25**.

Source: *http://cgwb.gov.in/District_Profile/TamilNadu/VILUPPURAM.pdf(**Ref:** Government of India, Ministry of Water Resources, Central Ground Water Board, South Eastern Coastal Region Chennai, "District Ground Water Brochure Viluppuram District")*





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

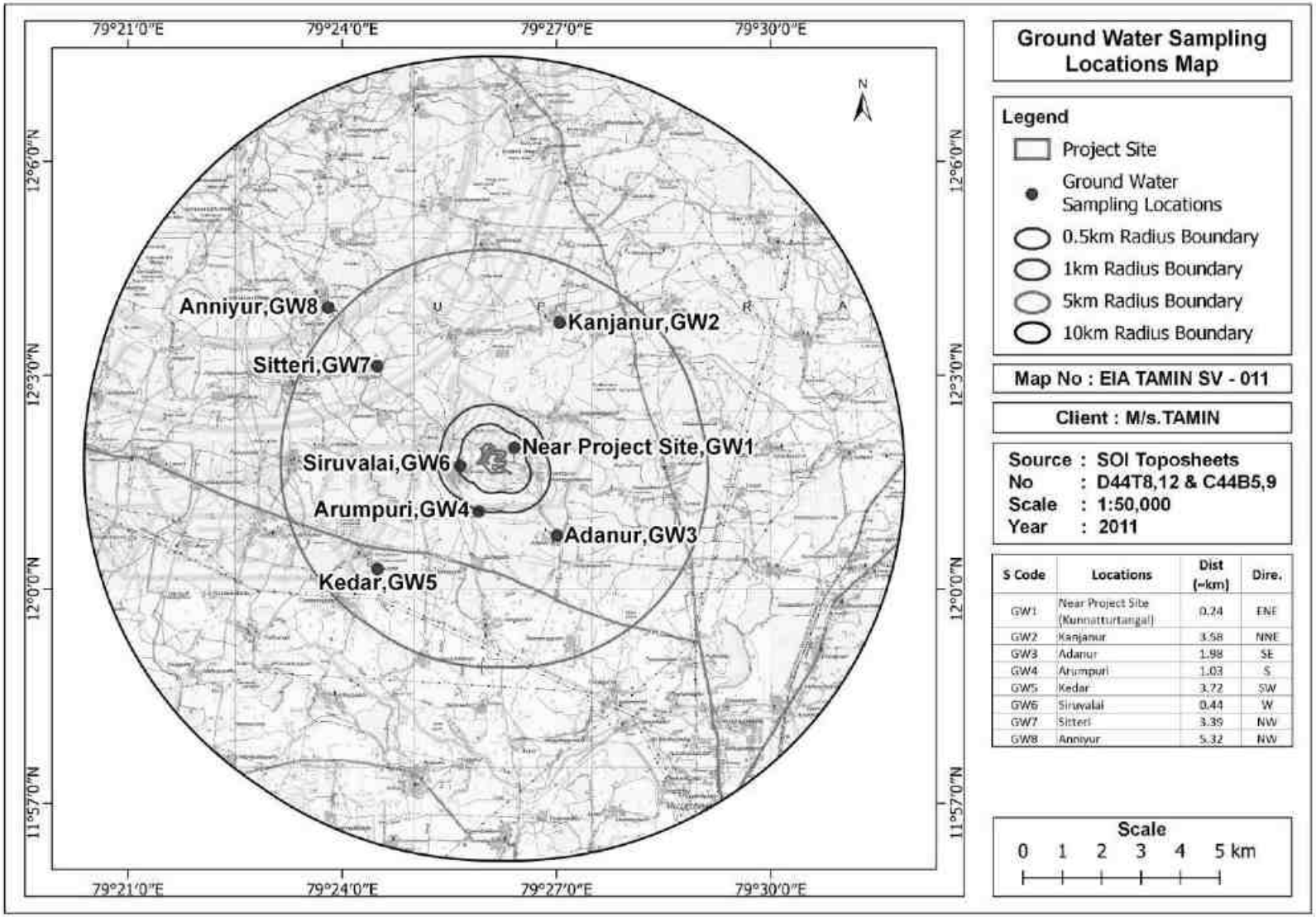
Figure 3-22 Depth to water level during Pre-Monsoon & Post Monsoon in Villupuram District

3.22.5 Groundwater Quality

Groundwater is the principal source for domestic and drinking purposes in almost all villages near the study area. The quality of the groundwater received is influenced by pollution of soil and air, industrial and domestic waste disposal, application of fertilizers and pesticides in agriculture, etc. Total Eight (08) ground water monitoring locations were identified for assessment in different villages around the project site based on the usage of sub surface water by the settlements/ villages in the study area. The groundwater results are compared with the acceptable and permissible limit of water quality standards as per IS: 10500 (2012) for drinking water. Groundwater quality monitoring locations and results are given in **Table 3.15** and **Table 3.16** and Map showing the groundwater monitoring locations is given in **Figure 3.26.**

Table 3-14 Details of Groundwater Quality Monitoring Locations

Station Code	Location	Distance (km) from Project boundary	Azimuth Directions
GW1	Project Site	Within site	
GW2	Kanjanur	3.58	NNE
GW3	Adanur	1.98	SE
GW4	Arumpuri	1.03	S
GW5	Kedar	3.72	SW
GW6	Siruvalai	0.44	W
GW7	Sitteri	3.39	NW
GW8	Anniyur	5.32	NW



S Code	Locations	Dist (~km)	Dire.
GW1	Near Project Site (Kunnatturtangal)	0.24	ENE
GW2	Kanjanur	3.58	NNE
GW3	Adanur	1.98	SE
GW4	Arumpuri	1.03	S
GW5	Kedar	3.72	SW
GW6	Siruvalai	0.44	W
GW7	Sitteri	3.39	NW
GW8	Anniyur	5.32	NW

Figure 3-23 Map showing the groundwater monitoring locations

Table 3-15 Physico chemical analysis of Ground water samples from study area

S. No	Parameters	Unit	Drinking water Standard (IS 10500: 2012) Acceptable Limit	Drinking water Standard (IS 10500: 2012) Permissible Limit	Project Site	Kanjanur	Adanur	Arumpuri	Kedar	Siruvalai	Sitteri	Anniyur
					GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
1.	Colour	Hazen	5	15	BLQ (LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)
2.	Turbidity	NTU	1	5	BLQ (LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
3.	pH	--	6.5-8.5	NR	7.34	7.78	7.53	7.21	7.37	6.94	7.47	7.39
4.	Conductivity	µS/cm	-	-	1150	1082	1252	957	1126	1269	918	1232
5.	Total Dissolved Solids	mg/l	500	2000	625	605	692	520	611	686	491	684
6.	Total Suspended Solids	mg/l	-	-	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)
7.	Alkalinity as $CaCO_3$	mg/l	200	600	106	169	152	121	131	134	91	153
8.	Total Hardness as $CaCO_3$	mg/l	200	600	343	289	347	272	232	479	244	404
9.	Sodium as Na	mg/l	-	-	88	97	117	83	119	57	77	93
10.	Potassium as K	mg/l	-	-	6	7	8	6	8	4	5	7
11.	Calcium as Ca	mg/l	75	200	81.38	67.18	80.67	64.20	53.93	111.35	57.41	93.92
12.	Magnesium as Mg	mg/l	30	100	34.05	29.50	35.41	27.21	23.68	48.89	24.60	41.23
13.	Chloride as Cl	mg/l	250	1000	203.41	192.54	243.39	173.57	248.24	219.46	160.23	227.73
14.	Sulphate SO_4	mg/l	200	400	114.6	76.4	82.3	58.3	44.2	138.5	78.9	103.9
15.	Nitrate as NO_3	mg/l	45	NR	5.78	5.61	6.17	7.32	6.73	5.13	4.78	5.23
16.	Fluorides as F		1	1.5	BLQ(LOQ 0.02)	BLQ(LOQ 0.02)	BLQ(LOQ 0.02)	BLQ(LOQ 0.02)	BLQ(LOQ 0.02)	BLQ(LOQ 0.02)	BLQ(LOQ 0.02)	BLQ(LOQ 0.02)
17.	Cyanide	mg/l	0.05	NR	BLQ(LO	BLQ(LO	BLQ(L	BLQ(LO	BLQ(L	BLQ(LO	BLQ(LO	BLQ(L

S. No	Parameters	Unit	Drinking water Standard (IS 10500: 2012) Acceptable Limit	Drinking water Standard (IS 10500: 2012) Permissible Limit	Project Site	Kanjanur	Adanur	Arumpuri	Kedar	Siruvalai	Sitteri	Anniyur
					GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
					Q 0.01)	Q 0.01)	OQ 0.01)	Q 0.01)	OQ 0.01)	Q 0.01)	Q 0.01)	OQ 0.01)
18.	Arsenic as As	mg/l	0.01	0.05	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
19.	Boron as B	mg/l	0.5	1.0	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
20.	Cadmium as Cd	mg/l	0.003	NR	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)
21.	Chromium as Cr	mg/l	0.05	NR	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)
22.	Copper as Cu	mg/l	0.05	1.5	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)
23.	Iron as Fe	mg/l	0.3	NR	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
24.	Lead as Pb	mg/l	0.01	NR	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
25.	Manganese as Mn	mg/l	0.1	0.3	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)
26.	Mercury	mg/l	0.001	NR	BLQ(LOQ	BLQ(LOQ	BLQ(LOQ	BLQ(LOQ	BLQ(LOQ	BLQ(LOQ	BLQ(LOQ	BLQ(LOQ

S. No	Parameters	Unit	Drinking water Standard (IS 10500: 2012) Acceptable Limit	Drinking water Standard (IS 10500: 2012) Permissible Limit	Project Site	Kanjanur	Adanur	Arumpuri	Kedar	Siruvalai	Sitteri	Anniyur
					GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
					0.0005)	0.0005)	0.0005)	0.0005)	0.0005)	0.0005)	0.0005)	0.0005)
27.	Nickel as Ni	mg/l	0.02	NR	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
28.	Selenium as Se	mg/l	0.01	NR	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)

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

3.22.6 Results and Discussions

A summary of analytical results are presented below:

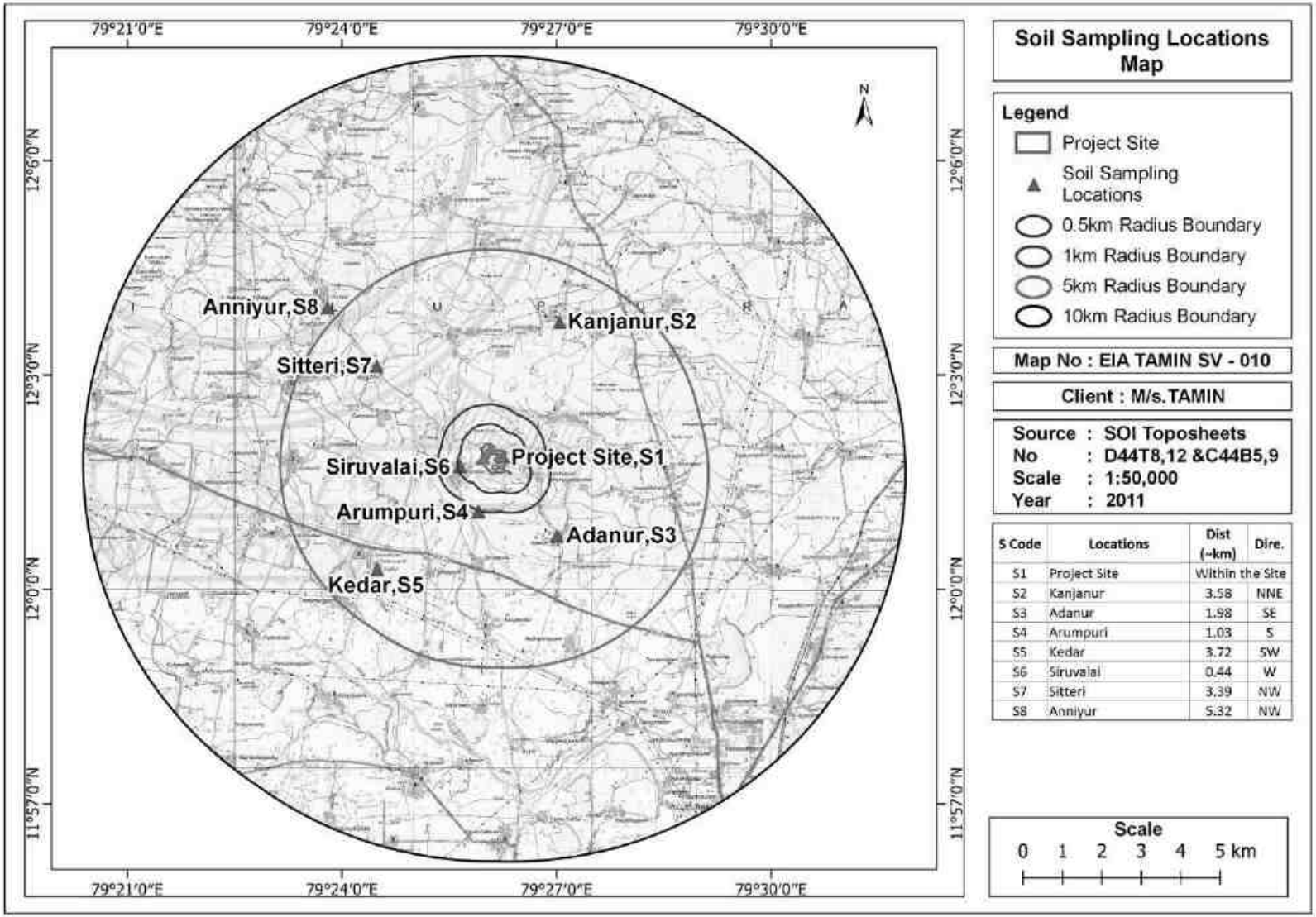
- The pH of the collected ground water sample ranges from 6.94 to 7.78.
- The concentrations of Chloride in the collected ground water sample ranges from 160.23 to 248.24 mg/l.
- Total Dissolved Solids (TDS) value of the collected ground water sample varies from 491 mg/l to 692 mg/l.
- Total hardness of the collected ground water sample ranges from 232 mg/l to 479 mg/l.
- The concentrations of Sulphate in the collected ground water sample ranges from 44.2 to 138.5 mg/l.

3.23 Soil as a resource and its Quality

Soil quality monitoring locations & results are given in **Table 3-17 and Table 3-18.** Map showing the soil monitoring locations are given in **Figure 3-27**.

Table 3-16 Soil & Sediment Quality Monitoring Locations

Location Code	Location	Distance (km) from Project boundary	Azimuth Directions
S1	Project Site	Within site	
S2	Kanjanur	3.58	NNE
S3	Adanur	1.98	SE
S4	Arumpuri	1.03	S
S5	Kedar	3.72	SW
S6	Siruvalai	0.44	W
S7	Sitteri	3.39	NW
S8	Anniyur	5.32	NW



S Code	Locations	Dist (~km)	Dire.
S1	Project Site	Within the Site	
S2	Kanjanur	3.58	NNE
S3	Adanur	1.98	SE
S4	Arumpuri	1.03	S
S5	Kedar	3.72	SW
S6	Siruvalai	0.44	W
S7	Sitteri	3.39	NW
S8	Anniyur	5.32	NW

Figure 3-24 Map showing the soil monitoring location

Table 3-17 Soil Quality Monitoring Results

S. No	Parameters	Units	Project Site	Kanjanur	Adanur	Arumpuri	Kedar	Siruvalai	Sitteri	Anniyur
			S1	S2	S3	S4	S5	S6	S7	S8
1.	Soil Texture	-	Clay loam	Clay Loam	Sandy Loam	Sandy Loam	Sandy loam	Clay loam	Sandy clay loam	Sandy clay loam
2.	Sand	%	28.4	35.6	51.2	52.8	55.2	39.4	48.6	54.3
3.	Clay	%	29.7	25.9	29.4	24.9	28.3	19.4	32.6	33.4
4.	Silt	%	41.9	38.5	19.4	22.3	16.5	41.2	18.8	12.3
5.	pH	-	7.74	7.58	7.27	7.38	7.13	6.84	6.93	7.63
6.	Electrical conductivity	µS/cm	249	369	346	378	268	257	277	316
7.	Cation Exchange Capacity	meq/100 gm	124.2	118.7	108.2	111.9	98.4	103.4	128.4	120.4
8.	Nitrogen as N	mg/kg	104.4	96.7	85.9	97.6	101.4	91.8	112.5	110.8
9.	Phosphorus as P	mg/kg	13.4	12.5	15.8	13.4	15.9	17.6	19.9	18.4
10.	Potassium as K	mg/kg	63.4	62.5	59.8	75.4	55.9	74.6	57.9	56.4
11.	Cadmium	mg/kg	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
12.	Porosity	-	0.72	0.70	0.43	0.42	0.43	0.72	0.42	0.41
13.	Water Holding capacity	(inches of water per foot of soil)	18.3	18.7	18.1	17.8.	18.9	19.2	17.9	18.7

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

3.23.1 Results and Discussions

Summary of analytical results

- The pH of the soil samples ranged from 6.84 to 7.74.
- Conductivity of the soil samples ranged from 249 to 378 µS/cm.
- Nitrogen content ranged from 91.8 mg/kg to 112.5mg/kg.
- Phosphorous ranged from 12.5 mg/kg to 19.9 mg/kg.
- Potassium ranged from 55.9 mg/kg to 75.4 mg/kg.

3.24 Biological Environment

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

During survey, following aspects were considered for ecological studies:

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

3.24.1 Methodology

Terrestrial investigations for flora and fauna records were collected by random field survey and a checklist was prepared. During field survey, discussions with the local people were carried-out to collect information related to local biodiversity in and around the area.

3.24.2 Floral Study

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

3.24.3 Faunal Study

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

3.24.4 Floristic composition within the study area

For secondary information based on a total 112 species under 41 family found in the study area. The detailed list of plant species found in each quadrat provided in **Table 3.19.**

Table 3-18 Cumulative List of Floral Species

S.No	Botanical Name	Family	Common Name	Habit	IUCN
1.	*Abrusprecatorius*	Fabaceae	Kundumani	Shrub	NA
2.	*Abutilon indicum*	Malvaceae	Perun thuthi	Shrub	NA
3.	*Acacia nilotica*	Mimosaceae	Karuvelam	Tree	LC
4.	*Acacia planifrons*	Mimosaceae	Kodaivelam	Tree	NA
5.	*Acalypha indica*	Euphorbiaceae	Kuppaimeni	Herb	NA
6.	*Acanthospermumhispidum*	Compositae	--	Herb	NA
7.	*Achyranthes aspera*	Amaranthaceae	Nayurivi	Herb	NA
8.	*Aegle marmelos*	Rutaceae	Vilvam	Tree	NA
9.	*Aervalanata*	Amaranthaceae	Peelai, Sirupeelai	Shrub	NA
10.	*Aerva persica*	Amaranthaceae	Perumpeelai	Shrub	NA
11.	*Aeschynomene americana*	Fabaceae	--	Herb	NA
12.	*Aeschynomene aspera*	Fabaceae	Thakkai	Shrub	NA
13.	*Ageratum conyzoides*	Compositae	Poompillu	Herb	NA
14.	*Alloteropsiscimicina*	Poaceae	--	Grass	NA
15.	*Alternanthera sessilis*	Amaranthaceae	Ponnanganni	Herb	NA
16.	*Anisomeles indica*	Labiatae	--	Herb	NA
17.	*Annona squamosa*	Annonaceae	Seetha	Tree	NA
18.	*Arachis hypogaea*	Fabaceae	Verkadalai	Herb	NA
19.	*Argemone mexicana*	Papaveraceae	BramanThandu	Herb	NA

S.No	Botanical Name	Family	Common Name	Habit	IUCN
20.	*Aristida adscensionis*	Poaceae	--	Grass	NA
21.	*Aristida hystrix*	Poaceae	--	Grass	NA
22.	*Aristolochiabracteolata*	Aristolochiaceae	Aduthinnappalai	Herb	NA
23.	*Barleria acuminata*	Acanthaceae	--	Shrub	NA
24.	*Barlerialongiflora*	Acanthaceae	--	Shrub	NA
25.	*Barlerianoctiflora*	Acanthaceae	--	Shrub	NA
26.	*Boerhaviadiffusa*	Nyctaginaceae	Mookarattai	Herb	NA
27.	*Boerhaviaerecta*	Nyctaginaceae	Seemaimookarattai	Herb	NA
28.	*Carica papaya*	Caricaceae	Pappali	Tree	NA
29.	*Carissa carandas*	Apocynaceae	Kalaa, Perun kala	Shrub	NA
30.	*Cassia fistula*	Caesalpiniaceae	Kondrai	Tree	NA
31.	*Celosia argentea*	Amaranthaceae	Pannaikeerai	Herb	NA
32.	*Cissus quadrangularis*	Vitaceae	Pirandai	Shrub	NA
33.	*Citrullus colocynthis*	Cucurbitaceae	Peikkumatti	Herb	NA
34.	*Citrus aurantifolia*	Rutaceae	Elumichai	Tree	NA
35.	*Cleome viscosa*	Capparidaceae	Nai kadugu	Herb	NA
36.	*Coccinia grandis*	Cucurbitaceae	Kovai	Climber	NA
37.	*Croton bonplandianum*	Euphorbiaceae	Rail poondu	Herb	NA
38.	*Cucumis sativus*	Cucurbitaceae	Vellarikkaai	Climber	NA
39.	*Cyperus bulbosus*	Cyperaceae	–	Sedge	NA
40.	*Ecliptaprostrata*	Compositae	Karisaalai	Herb	NA
41.	*Eleocharis acutangula*	Cyperaceae		Sedge	NA
42.	*Eragrostistenella*	Poaceae		Grass	NA
43.	*Euphorbia antiquorum*	Euphorbiaceae	Sadura-kalli	Tree	NA
44.	*Euphorbia hirta*	Euphorbiaceae	Ammanpacharisi	Herb	NA
45.	*Euphorbia indica*	Euphorbiaceae	Ammanpacharisi	Herb	NA
46.	*Evolvulusalsinoides*	Convolvulaceae	Vishnukarandi	Herb	NA
47.	*Ficus benghalensis*	Moraceae	Aala maram	Tree	NA
48.	*Ficus religiosa*	Moraceae	Arasu	Tree	NA
49.	*Fimbristylis ovata*	Cyperaceae		Sedge	NA
50.	*Glinuslotoides*	Molluginaceae	Siruseruppadai	Herb	NA
51.	*Gynandropsisgynandra*	Capparidaceae	Nalvaelai, Vaelai	Herb	NA
52.	*Hedyotis aspera*	Rubiaceae		Herb	NA
53.	*Heliotropium indicum*	Boraginaceae	Thaelkodukku	Herb	NA
54.	*Hibiscus surattensis*	Malvaceae		Undershrub	NA
55.	*Hybanthusenneaspermus*	Violaceae	Orilaithamarai	Herb	NA
56.	*Hygrophilaschulli*	Acanthaceae	Neermulli	Herb	NA
57.	*Hyptissuaveolens*	Labiatae		Shrub	NA
58.	*Indigofera aspalathoides*	Fabaceae	Sivanaarvaembu	Herb	NA
59.	*Indigofera linnaei*	Fabaceae		Herb	NA
60.	*Indigofera tinctoria*	Fabaceae	Avuri, Neeli	Herb	NA
61.	*Ipomoea pes-caprae*	Convolvulaceae	Attukkal, Kudhirai Kulambu	Creeper	NA
62.	*Jasminum sambac*	Oleaceae	Malli, Peru malli, Pichigai	Climbing Shrub	NA

S.No	Botanical Name	Family	Common Name	Habit	IUCN
63.	*Jatropha curcas*	Euphorbiaceae	Kaatu-amanakku	Shrub	NA
64.	*Jatropha gossypifolia*	Euphorbiaceae	Kaatu-amanakku	Shrub	NA
65.	*Justicia adhatoda*	Acanthaceae	Adathodai	Shrub	NA
66.	*Justicia simplex*	Acanthaceae		Herb	NA
67.	*Kylinga bulbosa*	Cyperaceae		Sedge	NA
68.	*Lagenaria siceraria*	Cucurbitaceae	Surakkaai	Climber	NA
69.	*Lantana camara*	Verbenaceae	Unnichedi	Shrub	NA
70.	*Leucaena leucocephala*	Mimosaceae	Soundil	Tree	NA
71.	*Leucas aspera*	Labiatae	Thumbai	Herb	NA
72.	*Ludwigia perennis*	Onagraceae		Herb	NA
73.	*Martynia annua*	Martyniaceae	ThaelKodukku	Herb	NA
74.	*Melia azedarach*	Meliaceae	Malaivaembu	Tree	NA
75.	*Merremia hederacea*	Convolvulaceae		Herb	NA
76.	*Nyctanthes arbor-tristis*	Nyctanthaceae	Parijaatham	Tree	NA
77.	*Ocimumamericanum*	Labiatae	Ganjaankorai	Herb	NA
78.	*Pavonia odorata*	Malvaceae	Peramutti	Herb	NA
79.	*Pedalium murex*	Pedaliaceae	Perunerunji	Herb	NA
80.	*Phyllanthus acidus*	Euphorbiaceae	Aranelli	Tree	NA
81.	*Phyllanthus amarus*	Euphorbiaceae	Kizha-nelli	Herb	NA
82.	*Phyllanthus emblica*	Euphorbiaceae	Nelli, Muzhunelli	Tree	NA
83.	*Phyllanthus reticulatus*	Euphorbiaceae	Inkipazham	Shrub	NA
84.	*Pithecellobium dulce*	Mimosaceae	Kodukkaaipuli	Tree	NA
85.	*Plumbago zeylanica*	Plumbaginaceae	Chitthiragam	Herb	NA
86.	*Polygala javana*	Polygalaceae		Shrub	NA
87.	*Pongamia pinnata*	Fabaceae	Punga maram	Tree	NA
88.	*Portulaca oleracea*	Portulacaceae	Kari keerai	Herb	NA
89.	*Prosopis juliflora*	Mimosaceae	Velikkaathaan	Tree	NA
90.	*Psidium guajava*	Myrtaceae	Koyya	Tree	NA
91.	*Punica granatum*	Punicaceae	Madhulai	Shrub	NA
92.	*Rhynchosiaviscosa*	Fabaceae		Climber	NA
93.	*Ricinus communis*	Euphorbiaceae	Amanakku	Shrub	NA
94.	*Riveahypocrateriformis*	Convolvulaceae	Boodhikeerai	Climber	NA
95.	*Ruellia tuberosa*	Acanthaceae		Herb	NA
96.	*Sansevieria roxburghiana*	Dracaenaceae	Marun, Mottamamji	Herb	NA
97.	*Senna auriculata*	Caesalpiniaceae	Avaram	Shrub	NA
98.	*Senna occidentalis*	Caesalpiniaceae	Peiyavarai	Tree	NA
99.	*Sesamum indicum*	Pedaliaceae	Ellu	Herb	NA
100.	*Sida acuta*	Malvaceae	Malaithangi	Herb	NA
101.	*Sida cordata*	Malvaceae	Pazhampaasi	Herb	NA
102.	*Sida cordifolia*	Malvaceae	Nilatutthi	Herb	NA
103.	*Solanum americanum*	Solanaceae	Manatakkali	Herb	NA
104.	*Solanum melongena*	Solanaceae	Kathiri	Herb	NA
105.	*Solanum torvum*	Solanaceae	Chundai	Shrub	NA
106.	*Solanum trilobatum*	Solanaceae	Thoodhuvalai	Climber	NA
107.	*Solanum virginianum*	Solanaceae	Kandankathiri	Herb	NA

S.No	Botanical Name	Family	Common Name	Habit	IUCN
108.	*Spermacocehispida*	Rubiaceae	Nathaichoori	Herb	NA
109.	*Spermacoceocymoides*	Rubiaceae		Herb	NA
110.	*Tamarindus indica*	Caesalpiniaceae	Puliyamaram	Tree	NA
111.	*Tectona grandis*	Verbenaceae	Thekku	Tree	NA
112.	*Tephrosia purpurea*	Fabaceae	Kozhinji	Undershrub	NA

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

3.24.5 Terrestrial Fauna

The core area is not a habitat for any Rare or endangered or threatened (RET) wildlife. Common rodents, reptiles and birds were seen. There was nothing unusualor special about the wild fauna of the core area. A list of fauna reported from secondary thestudy area is given in **Table 3-20**.

3.24.6 List of Fauna

Table 3-19 Cumulative List of Floral Species

S.No.	Scientific Name	Common Name	WPA & IUCN Status
(a)Mammals			
1	*Canis aureus*	Jackal	II
2	*Felis chaus*	Jungle Cat	II/LC
3	*Funambulus palmarum*	Palm Squirrel	IV/LC
4	*Herpestesedwardsii*	Indian Grey Mongoose	II/LC
5	*Lepus nigricollis*	Indian Hare	IV/LC
6	*Mus booduga*	Indian Field mouse	V/LC
(b)Birds			
1	*Acridotheres tristis*	Common Myna	LC
2	*Alcedoatthis*	Common Kingfisher	LC
3	*Amaurornisphoenicurus*	White Breasted Waterhen	LC
4	*Anas acuta*	Common Teal	LC
5	*Ardeolagrayii*	Paddy Bird	LC
6	*Ardea purpurea*	Eastern Purple Heron	LC
7	*Astur badius*	Shikra	LC
8	*Aythraferina*	Common Pochard	LC
9	*Bubulcus ibis*	Cattle Egret	LC
10	*Burhinus indicus*	Satone Curlew	LC
11	*Centropus sinensis*	Southermcoucal	LC
12	*Cinnyris asiaticus*	Purple Sunbird	LC

13	*Centropus sinensis*	Crow Pheasant	LC
14	*Coracias benghalensis*	Southern Indian Roller	LC
15	*Corvus spelndens*	Ceylon house Crow	LC
16	*Dicrurusmacrocercus*	Black Drongo	LC
17	*Egrettagarzetta*	Little Egret	LC
18	*Eudynamysscolopacea*	Koel	LC
19	*Gallus gallus*	Red Jungle Fowl	LC
20	*Halcyon smyrnensis*	White Throated Kingfisher	LC
21	*Haliastur Indus*	Brahmy Kite	LC
22	*Lanius meridionalis*	Southerm Grey Shrike	VU
23	*Motacillamaderaspatensis*	White browed Wagtail	IV/LC
24	*Anas crecca*	Common Teal	LC
25	*Nycticoraxnycticorax*	Night Heron	LC
26	*Orthotomussutorius*	Tailor Bird	LC
27	*Passer domesticus*	Indian House Sparrow	LC
28	*Pavocristatus*	Indian Peafowl	I
29	*Perdicula asiatica*	Jungle Bush Quail	LC
30	*Phalacrocorax niger*	Little Cormorant	LC
31	*Psittaculacyanocephala*	Parakeet	LC
32	*Psittaculakrameri*	Rose Ringed Parakeet	LC
33	*Pycnonotuscafer*	Red Vanted Bulbul	LC
34	*Saxicoloidesfulicata*	Indian Robin	LC
35	*Strentopelia chinensis*	Spotted Dove	IV/ LC
36	*Streptopeliadecaocto*	Indian Ring Dove	LC
37	*Poster roseus*	Rosy Starling	LC
38	*Turdoidescaudatus*	Common Babbler	LC
39	*Vanellus indicus*	Red Wattled Lapwing	LC
(c)Amphibians			
1	*Bufo bufo*	Common Toad	LC
2	*Duttaphrynusmelanostictus*	Common Indian Toad	IV
3	*Euphlyctiscyanophlyctis*	Indian Skipper Frog	LC
4	*Euphlyctishexadactylus*	Indian Pond Frog	LC
5	*Fejervaryalimnocharis*	Rice Field Frog	LC
6	*Polypedates maculatus*	Common Tree Frog	LC
7	*Rana tiger*	Common Frog	IV
8	*Sphaerothecabreviceps*	Indian Burrowing Frog	LC
(d)Reptiles			
1	*Calotes versicolor*	Garden Lizard	LC
2	*Calotes sp.*	Garden Calotes	-
3	*Eutropiscarinata*	Common Brahminy Skink	-
4	*Eutropiscarinata*	Keeled Grass Skink	LC
5	*Hemidactylus macalatus*	Spotted House Gecko	LC
6	*Mabuyacarinata*	Indian Mabuya	-
7	*Naga naja*	Indian Cobra	-

8	*Natrixnatrix*	Grass Snake	LC
9	*Pieris canidae*	Indian Cabbage White	-
10	*Ptyas mucosa*	Indian Rat Snake	II
11	*Typhlinabrahmina*	Blind Snake	-
(e) Butterflies			
1	*Danaus chrysippus*	Plain Tiger	NA
2	*Danaus genutia*	Striped Tiger	NA
3	*Ariadne merione*	Common Caster	NA
4	*Neptishylas*	Common Sailor	NA
5	*Phalantaphalantha*	Common Leopard	NA
6	*Melanitisleda*	Common Evening Brown	NA
7	*Ypthimaasterope*	Common Three Ring	NA
8	*Euthalanais*	Baronet	NA
9	*Argynnishyperbius*	Indian Fritillary	NA
10	*Bybliailithya*	Joker	NA
11	*Colotisdanae*	Crimson Tip	NA
12	*Colotisetrida*	Small Orange Tip	NA
13	*Euremahecabe*	Common Grass Yellow	NA
14	*Ceporanerissa*	Common Gull	NA
15	*Leptosianina*	Psyche	NA
16	*Castaliusrosimon*	Common Pierrot	NA
17	*Arhopalacentaurus*	Large Obakblue	NA
18	*Euchrysopscnejus*	Gram Blue	NA
19	*Jamides celeno*	Common Cerulin	NA
20	*Freyeriatrochylus*	Grass Jewel	NA
21	*Papiliodemoleus*	Lime Butterflies	NA
22	*Atrophaneuraaristolochiae*	Common Rose	NA
23	*Borbocinnara*	Rice Swift	NA

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

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

3.4.1.1 *Conservation Plan*

The Conservation Plan would focus on conservation of habitats of Schedule-I species identified during the study. We identified 2 IUCN red list species viz..two faunal species in

the study area i.e. 10 km buffer area. The shikra is very similar in appearance to other sparrow hawk

Table 3-20 Occurrence of Schedule-1 species in buffer zone

S.No	Common Name	Species Name	IUCN	WPA 1972
Birds				
1	Shikra	*Accipiter badius*	LC	Schedule I
2	Peafowl	*Pavo Cristatus*	LC	Schedule I
Butterfly				
1	Common Pierrot	*Castalius rosimon*	LC	Schedule I

3.103.6 Management Plan

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

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

Further suggestion/ recommendation

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

Table 3-21. Conservation plan for Schedule – I species for five years

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

**All above activity will be carried out with the consultation of Ecologist
Plant Species will be suggested by the Ecologist and plant saplings will be distributed in project villages as per the above mentioned schedule (year wise).

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

Table 3-22 Conservation Activity Schedule – I species

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

3.25 Socio Economic profile of Project Influenced Area

Viluppuram district was earlier a part of Cuddalore district. It was then bifurcated from Cuddalore and became a separate district on 30 September 1993. Viluppuram district ranked 6th in terms of the highest population among the districts. The district had 15% urban population to its total population.The district has recorded the highest Scheduled Caste population (31.54%) to the total population in the district.The district has recorded the 3rd highest Scheduled Tribe population (0.23%) to the total population of the district. In terms of population density, Viluppuram district has recorded 481 persons per square kilometer. The sex ratio of the district was 987, lower than the State sex ratio of 996. The district has recorded the literacy of 71.9%, lower than the State literacy of 80.1%.

Source:
https://censusindia.gov.in/nada/index.php/catalog/43788/download/47492/DH_33_2001_VIL.pdf
(**Ref**:Directorate of Census Operations-Tamil Nadu, "District Census Handbook-2011,Viluppuram District",DH_2011_3306_PART_A_DCHB_VILUPPURAM)

3.26 Socio Economic Aspects

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

- Demographic structure

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

The following **Table 3.22** provides the certain important social indicators of Villupuram District.

Table 3-22 Social Indicators of the PIA district

S.No	Social Indicators	Villupuram District
2.	Decadal growth rate %	16.84
3.	Urban population %	15.01
4.	Sex ratio	987
5.	0-6 age group %	11.68
6.	Population density (Persons per square Km)	481
7.	Scheduled caste population %	31.54
8.	Scheduled tribe population %	0.23
9.	Literacy rate %	71.88
10.	Work Participation rate %	41.57
11.	Main Workers %	72.37
12.	Marginal Workers %	27.63
13.	Cultivators %	10.04
14.	Agricultural labourers %	51.35
15.	Workers in household industries %	1.72
16.	Other workers %	36.89

Source:https://censusindia.gov.in/nada/index.php/catalog/43788/download/47492/DH_33_2001_VIL.pdf

(**Ref**:Directorate of Census Operations-Tamil Nadu, "District Census Handbook-2011,Viluppuram District",DH_2011_3306_PART_A_DCHB_VILUPPURAM)

3.26.1 Population and Household Size

The total population of Viluppuram district was 3458873; rural with 2939785 and urban with 519088

Source:

https://censusindia.gov.in/nada/index.php/catalog/43788/download/47492/DH_33_2001_VIL.pdf

(**Ref**:Directorate of Census Operations-Tamil Nadu, "District Census Handbook-2011,Viluppuram District",DH_2011_3306_PART_A_DCHB_VILUPPURAM)

3.26.2 Sex Ratio

As per 2011 Census the sex ratio was 987 for every 1,000 males, lower when compared to the State Sex Ratio of 996 in Viluppuram district. The sex ratio of 0-6 age group was 941 for district.

Source:

https://censusindia.gov.in/nada/index.php/catalog/43788/download/47492/DH_33_2001_VIL.pdf

(**Ref**:Directorate of Census Operations-Tamil Nadu, "District Census Handbook-2011,Viluppuram District",DH_2011_3306_PART_A_DCHB_VILUPPURAM)

3.26.3 Scheduled Castes and Scheduled Tribes

Viluppuram has a population of 509767 persons belonging to Scheduled Castes which represents 31.54% of the total population of the district.

Source:

https://censusindia.gov.in/nada/index.php/catalog/43788/download/47492/DH_33_2001_VIL.pdf

(**Ref**:Directorate of Census Operations-Tamil Nadu, "District Census Handbook-2011,Viluppuram District",DH_2011_3306_PART_A_DCHB_VILUPPURAM)

3.26.4 Education & Literacy

The study of the education and literacy profile in the region is relevant in order to have an understanding whether the proposed project can utilize skilled human resources available within the area. According to 2011 census data, the literacy rate in the Villupuram district is 71.88 %.The literacy rate has been the major determinant of the rise or fall of the other indicators. The accessibility of Primary and Upper Primary education has increased the literacy rate as well as reducing the dropout rate **Table 3-23**. Show the details of education infrastructures in Viluppuram District.

Table 3-23 Education Infrastructures in the Villupuram District

Type of school	Total schools	
	Government	Private
Primary	1583	259
Primary + Upper Primary	481	28
P + UP+ Secondary + Higher Secondary	4	51
UP only	18	10
UP + Secondary + Higher Secondary	201	15
P + UP + Secondary	5	55
UP + Secondary	208	12

Source:*http://udise.in/Downloads/Publications/Publications-2016-17/DRC_Raw_Data%202016-17.xlsx*

3.26.5 Health Facilities

Primary Health Centres (PHCs) and Health Sub-centres (HSCs) are providing the preventive, curative and rehabilitative health care services to the rural people. The district has good number of public health systems accessible and affordable apart from the private health facilities. The Health Facilities given in below table**.**

Table 3-24 Medical Facilities available in Villupuram District

Name of the District	Type of Facility	Facilities	
		Total Facility	Active Facilities
Villuppuram District	SC	345	345
	PHC	52	52
	CHC	13	13
	SDH	7	7
	DH	0	0
	Total	**417**	**417**

*(**Note:** SC – Sub Center; PHC – Primary Health Center; CHC – Community Health Center; SDH – Sub District Hospital; DH – District Hospital)*
*(**Source:** National Health Mission/rhs20-21)*

3.26.6 Economic Activity & Livelihood Pattern

In Viluppuram district, as per the Census 2011, there were a total of 671994 workers, comprising 67482 cultivators, 345057 agricultural labourers, 11555 household Industry workers and 247900 other workers.
https://censusindia.gov.in/nada/index.php/catalog/43788/download/47492/DH_33_2001_VIL.pdf

(**Ref**:Directorate of Census Operations-Tamil Nadu, "District Census Handbook-2011,Viluppuram District",DH_2011_3306_PART_A_DCHB_VILUPPURAM)

3.26.7 Social Economic Profile of the study area

Introduction: The socio-economic study of the project area is to determine how a proposed project will affect or change the lives of current or future residents of the geographical area.

Methodology: To conduct door-to-door surveys and interact with people in the project area, transect walk study in the project area. The interference is arrived at by extrapolation of secondary data with the current situation(primary data)

A transect walk is a mapping exercise that uses a systematic walk along a defined path within a community with local people. It is a participatory research method that explores environmental and social resources, conditions, and systems by listening, asking, observing and producing a transect diagram alongside community members.

Ref:Keller S. Transect Walk . Sustainable Sanitation and Water Management)

The villages and towns covering 10 km radius from the boundary of the project site is taken for the study. **Table 3-25** shows the population profile within the study area.

Table3.25 Population profile within the study area

Sl. No	Name	Households	Total Population	Male	Female	Children below 6	Scheduled Caste	Scheduled Tribe
Villuppuram District								
Villuppuram Taluk								
1.	Velleripattu	197	818	420	398	85	0	0
2.	Sitheri	197	887	446	441	111	190	94
3.	Elusembon	595	2535	1274	1261	268	351	175
4.	Koralur	177	720	357	363	95	392	200
5.	Vengayakuppam	69	295	155	140	33	0	0
6.	Narasinganur	239	1009	504	505	117	200	107
7.	Vembi	473	1977	1013	964	222	983	498
8.	Kanjanur	539	2195	1082	1113	220	1315	661
9.	Veliyandal	140	560	267	293	81	250	120
10.	Pundi	368	1728	889	839	266	849	435
11.	Olagalampundi	434	1871	951	920	241	395	210
12.	Kundalappuliyur	412	1850	930	920	227	947	471
13.	KunnathurThangal (I)	54	225	118	107	31	0	0
14.	Siruvalai	556	2414	1231	1183	311	679	348
15.	Semmedu	265	1170	592	578	138	541	280
16.	Kakkanur	697	3124	1574	1550	332	402	200
17.	Viramur	605	2842	1401	1441	331	942	457
18.	Arumbuli	121	492	246	246	54	152	69
19.	Adanur	954	4075	2056	2019	420	469	236
20.	Kasbakaranai	506	2133	1090	1043	263	946	483
21.	Thumbur	777	3408	1794	1614	343	1056	576
22.	Kottiyampundi	379	1635	835	800	211	40	17
23.	Kedar	1390	5862	3008	2854	673	1125	570
24.	AgaramChittamur	431	1922	977	945	224	774	391
25.	Vengandur	744	3153	1620	1533	388	475	255

Sl. No	Name	Households	Total Population	Male	Female	Children below 6	Scheduled Caste	Scheduled Tribe
26.	Asarakuppam	298	1228	617	611	126	133	59
27.	Pungunam	120	492	243	249	61	0	0
28.	Surappattu	194	838	445	393	92	259	0
29.	Valappattu	343	1380	714	666	165	265	1
30.	Panamalai	1370	5694	2880	2814	691	1065	95
31.	Sangitamanagalam	841	3624	1815	1809	416	1101	97
32.	Nangathur	798	3186	1591	1595	345	235	0
33.	Nagar	344	1393	707	686	190	474	8
34.	S. Kolapakkam	216	928	442	486	85	60	9
35.	Muttatur	822	3525	1799	1726	405	612	1
36.	Salavanur	50	241	126	115	29	90	0
37.	Vellayaimbattu	726	3049	1534	1515	343	988	10
38.	Vengamur	337	1315	669	646	139	285	152
39.	Hanumanthapuram	448	1999	1006	993	254	0	15
40.	Thirukkunam	388	1726	926	800	187	691	0
41.	Anniyur	1096	4780	2412	2368	571	963	0
42.	Perunkalapundi	206	951	494	457	120	542	92
43.	Kannandal	199	904	466	438	105	294	2
44.	Kaliyanampundi	722	2828	1425	1403	336	703	119
45.	Arasalapuram	157	727	364	363	95	140	0
46.	Mandagapattu (E)	486	1965	982	983	231	3	0
47.	Echchanguppam	369	1515	751	764	165	26	0
48.	Tenpair	993	4352	2170	2182	499	1591	56
49.	Nandivadi	393	1825	909	916	220	4	32
50.	Nemur	473	2123	1077	1046	255	811	0
51.	Melkaranai	888	3953	2014	1939	511	656	40
52.	Porur	301	1351	666	685	145	75	71
53.	AttiyurThirukkai	996	4580	2316	2264	573	1059	0
54.	Narasinganur	239	1009	504	505	117	200	0

Sl. No	Name	Households	Total Population	Male	Female	Children below 6	Scheduled Caste	Scheduled Tribe
55.	Asur	1472	6159	3048	3111	796	951	48
56.	Ariyalur (Thirukkai)	1128	5290	2693	2597	572	1016	0
57.	Kottiyampundi	379	1635	835	800	211	40	0
58.	Sattanur	801	3255	1651	1604	414	1850	49
59.	Pappanapattu	694	2769	1409	1360	304	970	37
60.	Orathur	890	3937	1951	1986	451	1737	56
61.	Palliyandur	471	2272	1145	1127	278	1077	0
62.	Kolippattu	513	2159	1085	1074	284	781	0
63.	Malligappattu	255	1047	519	528	129	0	0
64.	Kangiyanur	692	2947	1500	1447	348	1047	27
65.	Cholaganur	445	1962	986	976	264	991	13
66.	Tennamadevi	670	2842	1446	1396	378	1104	19
67.	AyyurAgaram	1479	5893	2969	2924	604	763	4
68.	Mundiyambakkam	963	4044	1995	2049	420	1006	0
69.	Ayyankovilpattu	1115	4716	2399	2317	504	335	0
70.	Thiruvamattur	1108	4837	2421	2416	567	1352	0
71.	Cholampundi	336	1484	729	755	171	667	0
72.	Ariyur	556	2370	1207	1163	263	786	0
73.	Kuppam	396	1966	1001	965	270	1027	181
74.	Mambalapattu	1121	4876	2488	2388	557	1798	6
75.	Karingalippattu	373	1777	869	908	222	1047	19
76.	Kanai	810	3440	1734	1706	454	562	11
77.	Vailamur	177	834	397	437	91	355	11
78.	Idappalaiyam	206	811	397	414	95	2	0
79.	Alathur	232	938	459	479	74	0	0
80.	Virattikuppam	559	2431	1218	1213	263	603	8
81.	Villupuram	905	3920	1965	1955	522	1152	28
82.	Nannadu	370	1639	843	796	176	737	0
83.	Vedambattu	160	772	386	386	70	598	0

Sl. No	Name	Households	Total Population	Male	Female	Children below 6	Scheduled Caste	Scheduled Tribe
84.	Perumbakkam	547	2184	1091	1093	219	9	0
85.	Kuchchippalaiyam (Vada)	470	2010	1009	1001	218	347	0
86.	Kakuppam (I)	1101	4788	2267	2521	592	248	29
Villuppuram District-Thirukkoyilur Taluk								
87.	Melvalai	475	2165	1097	1068	302	578	21
88.	Kilvalai	192	809	397	412	106	0	0
89.	Othiyathur	955	4301	2196	2105	493	218	41
90.	Kasbakaranai	722	3636	1852	1784	441	2514	123
91.	Perichanur	286	1257	636	621	177	0	27
92.	Sitheripattu	330	1753	895	858	243	1003	0
93.	Sennakunam	1325	5993	3071	2922	702	1886	0
Villuppuram District-Gingee Taluk								
94.	Pulivandi	364	1501	728	773	214	474	0
95.	MatturTirukkai	285	1431	727	704	153	145	1
96.	**Total**	**52460**	**227231**	**114605**	**112626**	**26768**	**58574**	**8471**

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

A walk-through survey was conducted by visiting rural place within the 10 km radius. While doing so, many interactions with various people like farmers, women, labours, teachers, health workers, etc. were conducted.

3.26.8 Employment and Livelihood

Majority of population in the study area comes under other working categories. As agriculture cannot be a main sustenance for most of farmers, they have dual professions. Farming is mostly seasonal, they involve in other livelihood activities like business, non-agriculture labour, agriculture labour and other service sectors. Fragmentation of landholding leads to adopt to have additional occupation.Summaries of employment and livelihood within the study are given in**Table 3-26.**

Table3.26 Summaries of Employment and Livelihood within the study area

Sl. No	Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers					
					Main	Marginal	Main	Marginal	Main	Marginal	Main	Marginal
1)	Velleripattu	478	476	2	123	0	298	0	4	0	51	2
2)	Sitheri	427	426	1	139	0	136	1	2	0	149	0
3)	Elusembon	1392	1065	327	406	38	532	157	6	90	121	42
4)	Koralur	409	80	329	8	12	27	281	0	10	45	26
5)	Vengayakuppam	176	45	131	7	8	22	98	3	12	13	13
6)	Narasinganur	516	108	408	6	60	3	332	7	4	92	12
7)	Vembi	897	865	32	47	0	725	26	2	0	91	6
8)	Kanjanur	1184	679	505	56	16	509	226	6	3	108	260
9)	Veliyandal	245	235	10	15	0	186	0	0	0	34	10
10)	Pundi	952	165	787	89	7	5	775	0	0	71	5

Sl. No	Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers					
					Main	Marginal	Main	Marginal	Main	Marginal	Main	Marginal
11)	Olagalampundi	1031	758	273	471	24	200	194	8	0	79	55
12)	Kundalappuliyur	1006	387	619	106	41	196	525	12	3	73	50
13)	KunnathurThangal (I)	133	123	10	52	0	36	9	0	0	35	1
14)	Siruvalai	1302	1171	131	306	0	584	128	7	0	274	3
15)	Semmedu	538	428	110	91	0	188	95	1	5	148	10
16)	Kakkanur	1545	406	1139	79	179	165	779	9	52	153	129
17)	Viramur	1339	1232	107	395	16	432	56	27	3	378	32
18)	Arumbuli	205	185	20	44	1	126	19	0	0	15	0
19)	Adanur	2288	1268	1020	348	10	691	998	22	3	207	9
20)	Kasbakaranai	1183	376	807	77	5	153	750	13	7	133	45
21)	Thumbur	1505	1155	350	452	43	447	190	26	32	230	85
22)	Kottiyampundi	1045	1029	16	174	0	776	3	36	0	43	13
23)	Kedar	2694	1463	1231	637	39	354	952	64	36	408	204
24)	AgaramChittamur	1107	590	517	279	44	223	430	15	11	73	32
25)	Vengandur	1836	1375	461	445	56	541	312	8	2	381	91
26)	Asarakuppam	744	494	250	92	8	262	203	3	4	137	35
27)	Pungunam	203	157	46	117	0	0	33	0	0	40	13
28)	Surappattu	315	135	180	89	3	3	131	11	13	32	33
29)	Valappattu	633	240	393	63	27	49	287	1	3	127	76
30)	Panamalai	2419	1509	910	253	27	643	616	88	82	525	185
31)	Sangitamanagalam	2000	555	1445	108	17	30	1345	20	7	397	76
32)	Nangathur	1539	1201	338	212	37	588	148	45	44	356	109
33)	Nagar	758	732	26	164	0	418	18	35	5	115	3

Sl. No	Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers					
					Main	Marginal	Main	Marginal	Main	Marginal	Main	Marginal
34)	S. Kolapakkam	471	186	285	31	49	88	234	0	0	67	2
35)	Muttatur	1640	382	1258	75	234	27	866	6	5	274	153
36)	Salavanur	83	21	62	0	0	0	59	0	1	21	2
37)	Vellayaimbattu	1054	536	518	117	72	203	311	4	4	212	131
38)	Vengamur	758	404	354	9	47	362	237	4	19	29	51
39)	Hanumanthapuram	1213	824	389	302	1	369	372	12	1	141	15
40)	Thirukkunam	899	626	273	261	19	97	209	55	2	213	43
41)	Anniyur	2313	1786	527	838	22	476	493	40	3	432	9
42)	Perunkalapundi	494	494	0	174	0	200	0	0	0	120	0
43)	Kannandal	418	242	176	130	1	49	164	3	0	60	11
44)	Kaliyanampundi	1595	1546	49	222	0	1093	10	43	2	188	37
45)	Arasalapuram	484	411	73	16	2	148	13	4	1	243	57
46)	Mandagapattu (E)	1057	929	128	309	9	529	73	6	18	85	28
47)	Echchanguppam	795	672	123	189	60	444	44	14	9	25	10
48)	Tenpair	2193	814	1379	81	16	141	1168	184	92	408	103
49)	Nandivadi	1069	929	140	415	2	352	10	16	0	146	128
50)	Nemur	1211	598	613	63	16	170	447	20	4	345	146
51)	Melkaranai	2057	2009	48	385	5	1359	30	19	1	246	12
52)	Porur	719	709	10	150	1	413	1	7	1	139	7
53)	AttiyurThirukkai	2206	760	1446	313	50	246	1269	27	17	174	110
54)	Narasinganur	516	108	408	6	60	3	332	7	4	92	12
55)	Asur	3187	3077	110	459	14	2256	79	13	2	349	15
56)	Ariyalur (Thirukkai)	3015	1871	1144	623	33	864	966	32	16	352	129

Sl. No	Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers					
					Main	Marginal	Main	Marginal	Main	Marginal	Main	Marginal
57)	Kottiyampundi	1045	1029	16	174	0	776	3	36	0	43	13
58)	Sattanur	1829	1775	54	242	2	1343	40	23	1	167	11
59)	Pappanapattu	1298	702	596	69	29	402	390	8	8	223	169
60)	Orathur	1909	1113	796	210	25	353	522	31	23	519	226
61)	Palliyandur	1183	424	759	63	84	178	561	5	2	178	112
62)	Kolippattu	996	103	893	2	118	2	769	16	0	83	6
63)	Malligappattu	528	398	130	91	0	271	129	1	0	35	1
64)	Kangiyanur	1361	225	1136	52	262	100	702	2	20	71	152
65)	Cholaganur	1212	1094	118	277	28	624	67	3	1	190	22
66)	Tennamadevi	1268	816	452	123	37	432	327	7	3	254	85
67)	AyyurAgaram	2842	2276	566	387	41	1047	372	19	7	823	146
68)	Mundiyambakkam	1556	900	656	49	23	169	159	85	48	597	426
69)	Ayyankovilpattu	1903	1274	629	133	19	426	404	43	13	672	193
70)	Thiruvamattur	2267	1226	1041	259	24	288	719	23	4	656	294
71)	Cholampundi	757	575	182	79	1	274	160	0	2	222	19
72)	Ariyur	1343	486	857	162	86	221	710	5	9	98	52
73)	Kuppam	1024	893	131	233	5	394	36	27	3	239	87
74)	Mambalapattu	2397	1446	951	494	78	498	780	129	30	325	63
75)	Karingalippattu	1176	111	1065	17	99	23	810	1	12	70	144
76)	Kanai	1474	1132	342	72	5	344	123	30	11	686	203
77)	Vailamur	476	289	187	25	0	189	152	13	2	62	33
78)	Idappalaiyam	283	277	6	2	0	216	5	2	0	57	1
79)	Alathur	525	521	4	46	0	369	3	1	0	105	1

Sl. No	Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers					
					Main	Marginal	Main	Marginal	Main	Marginal	Main	Marginal
80)	Virattikuppam	956	835	121	160	6	177	29	15	12	483	74
81)	Villupuram	1468	1061	407	59	13	82	178	32	21	888	195
82)	Nannadu	653	551	102	145	10	131	82	6	0	269	10
83)	Vedambattu	432	432	0	9	0	407	0	0	0	16	0
84)	Perumbakkam	1223	932	291	110	23	638	120	14	1	170	147
85)	Kuchchippalaiyam (Vada)	1068	966	102	358	1	351	35	1	1	256	65
86)	Kakuppam (I)	1894	1547	347	47	67	185	70	106	43	1209	167
Villuppuram District-Thirukkoyilur Taluk												
87)	Melvalai	777	474	303	6	1	353	230	4	4	111	68
88)	Kilvalai	265	263	2	130	0	104	1	2	0	27	1
89)	Othiyathur	1958	1450	508	37	17	956	401	44	30	413	60
90)	Kasbakaranai	1602	749	853	246	21	262	729	6	14	235	89
91)	Perichanur	569	187	382	52	3	27	366	5	0	103	13
92)	Sitheripattu	825	798	27	46	1	590	18	0	0	162	8
93)	Sennakunam	3130	1550	1580	326	280	745	1083	70	95	409	122
Villuppuram District-Gingee Taluk												
94)	Pulivandi	891	370	521	32	185	310	315	3	1	25	20
95)	MatturTirukkai	719	205	514	28	85	63	323	7	13	107	93
	Total	**112573**	**72502**	**40071**	**16170**	**3110**	**33757**	**29427**	**1822**	**1067**	**20753**	**6467**

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

3.26.9 Educational Infrastructure within study area

The district has good primary and secondary education infrastructure in urban and rural areas. The people around the study area have well connected to educational infrastructures.The following **Table 3-27** shows the literates population and the percentage within the study area.

Table 3-27 Details of Education facilities within study area

S. No	Type of School	Numbers
1	Government Primary school	1583
2	Private Primary school	259
3	Government Primary + Upper Primary school	481
4	Private Primary + Upper Primary school	28
5	Government P + UP+ Secondary + Higher Secondary school	4
6	Private P + UP+ Secondary + Higher Secondary school	51
7	Government UP only	18
8	Private UP only	10
9	Government UP + Secondary + Higher Secondary school	201
10	Private UP + Secondary + Higher Secondary school	15
11	Government P + UP + Secondary school	5
12	Private P + UP + Secondary school	55
13	Government UP + Secondary school	208
14	Private UP + Secondary school	12

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

Table3.28 Literates population and the percentage within the study area

Sl. No	Name	Population	Literates Population	% Literates
Villuppuram District				
Villuppuram Taluk				
1.	Velleripattu	818	476	58.19
2.	Sitheri	887	650	73.28
3.	Elusembon	2535	1654	65.25
4.	Koralur	720	508	70.56
5.	Vengayakuppam	295	208	70.51
6.	Narasinganur	1009	798	79.09
7.	Vembi	1977	1199	60.65
8.	Kanjanur	2195	1373	62.55
9.	Veliyandal	560	305	54.46
10.	Pundi	1728	935	54.11
11.	Olagalampundi	1871	1039	55.53
12.	Kundalappuliyur	1850	1058	57.19
13.	KunnathurThangal (I)	225	107	47.56
14.	Siruvalai	2414	1491	61.76
15.	Semmedu	1170	752	64.27
16.	Kakkanur	3124	2053	65.72
17.	Viramur	2842	1962	69.04
18.	Arumbuli	492	332	67.48
19.	Adanur	4075	2651	65.06
20.	Kasbakaranai	2133	1331	62.40
21.	Thumbur	3408	2345	68.81
22.	Kottiyampundi	1635	906	55.41

Sl. No	Name	Population	Literates Population	% Literates
23.	Kedar	5862	3866	65.95
24.	AgaramChittamur	1922	1137	59.16
25.	Vengandur	3153	1867	59.21
26.	Asarakuppam	1228	923	75.16
27.	Pungunam	492	295	59.96
28.	Surappattu	838	631	75.30
29.	Valappattu	1380	875	63.41
30.	Panamalai	5694	4093	71.88
31.	Sangitamanagalam	3624	2654	73.23
32.	Nangathur	3186	2444	76.71
33.	Nagar	1393	934	67.05
34.	S. Kolapakkam	928	637	68.64
35.	Muttatur	3525	1972	55.94
36.	Salavanur	241	176	73.03
37.	Vellayaimbattu	3049	1729	56.71
38.	Vengamur	1315	793	60.30
39.	Hanumanthapuram	1999	1119	55.98
40.	Thirukkunam	1726	1045	60.54
41.	Anniyur	4780	2783	58.22
42.	Perunkalapundi	951	579	60.88
43.	Kannandal	904	682	75.44
44.	Kaliyanampundi	2828	1915	67.72
45.	Arasalapuram	727	468	64.37
46.	Mandagapattu (E)	1965	1214	61.78
47.	Echchanguppam	1515	759	50.10
48.	Tenpair	4352	2967	68.18
49.	Nandivadi	1825	1185	64.93

Sl. No	Name	Population	Literates Population	% Literates
50.	Nemur	2123	1477	69.57
51.	Melkaranai	3953	2283	57.75
52.	Porur	1351	1002	74.17
53.	AttiyurThirukkai	4580	2706	59.08
54.	Narasinganur	1009	798	79.09
55.	Asur	6159	3276	53.19
56.	Ariyalur (Thirukkai)	5290	3871	73.18
57.	Kottiyampundi	1635	906	55.41
58.	Sattanur	3255	2105	64.67
59.	Pappanapattu	2769	1816	65.58
60.	Orathur	3937	2670	67.82
61.	Palliyandur	2272	1393	61.31
62.	Kolippattu	2159	1364	63.18
63.	Malligappattu	1047	616	58.83
64.	Kangiyanur	2947	1842	62.50
65.	Cholaganur	1962	1232	62.79
66.	Tennamadevi	2842	1844	64.88
67.	AyyurAgaram	5893	4001	67.89
68.	Mundiyambakkam	4044	3102	76.71
69.	Ayyankovilpattu	4716	3157	66.94
70.	Thiruvamattur	4837	3300	68.22
71.	Cholampundi	1484	858	57.82
72.	Ariyur	2370	1534	64.73
73.	Kuppam	1966	1156	58.80
74.	Mambalapattu	4876	3099	63.56
75.	Karingalippattu	1777	1231	69.27
76.	Kanai	3440	2333	67.82

Sl. No	Name	Population	Literates Population	% Literates
77.	Vailamur	834	505	60.55
78.	Idappalaiyam	811	625	77.07
79.	Alathur	938	687	73.24
80.	Virattikuppam	2431	1693	69.64
81.	Villupuram	3920	2776	70.82
82.	Nannadu	1639	1145	69.86
83.	Vedambattu	772	425	55.05
84.	Perumbakkam	2184	1362	62.36
85.	Kuchchippalaiyam (Vada)	2010	1257	62.54
86.	Kakuppam (I)	4788	3496	73.02
Villuppuram District-Thirukkoyilur Taluk				
87.	Melvalai	2165	1256	58.01
88.	Kilvalai	809	515	63.66
89.	Othiyathur	4301	2985	69.40
90.	Kasbakaranai	3636	2261	62.18
91.	Perichanur	1257	894	71.12
92.	Sitheripattu	1753	956	54.54
93.	Sennakunam	5993	3528	58.87
Villuppuram District-Gingee Taluk				
94.	Pulivandi	1501	1051	70.02
95.	MatturTirukkai	1431	1028	71.84
	Total	**227231**	**147292**	**64.71**

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

3.26.10 Health facility within the study area

The majority of people visit nearby Hospitals/health services provided by the Government. The area has got good public health facilities at easily reachable distances. There were no major health issues reported in our survey. Even for any minor ailments they contact medical facilities immediately as it is very accessible to them. The local transport facilities and the communication facilities are the main reasons to get immediate medical attention. The incidents of institutional delivery are high due to awareness, education, economic development, proximity to health delivery system. The Infant mortality rate and the maternal mortality rate have significantly reduced. The health facilities within the study area are given in **Table 3-29.**

Table3.29 Health facility within the study area

S.No	Type	Numbers
1	Community health centre	1
2	Primary health centre	5
3	Primary health sub-centre	58
4	Maternity and Child Welfare Centre	7
5	TB hospital/Clinic	6
6	Hospital Allopathic	0
7	Hospital Alternative Medicine	0
8	Dispensary Health Centre	5
9	Veterinary hospital	14
10	Mobile health clinic	0
11	Family Welfare Centre	5
12	Non-Government Medical facilities Out Patient	0

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

3.26.11 Summary

The Socioeconomic profile of the study area shows that the majority of people in the study area work in non-agricultural sector, however in rural area majority of the people in the rural area depends on agricultural sector. They have good educational infrastructures and the people in the study area are well connected to the educational infrastructures. The average literacy rate of the study area is **64.71**%. The people in the study area are well connected to Government primary health centres and Primary health sub-centresshows the socio-economic indicators within the study area given in **Table 3-30**.

Table3.30 Summaries of Socio-economic indicators within the study area

S.No	Particulars	Study area	Unit
1	Number of villages in the Study Area	95	Nos.
2	Total Households	52460	Nos.
3	Total Population	227231	Nos.
4	Children Population (<6 Years Old)	26768	Nos.
5	SC Population	58574	Nos.
6	ST Population	8471	Nos.
7	Total Working Population	112573	Nos.
8	Main Workers	72502	Nos.
9	Marginal Workers	40071	Nos.
10	Cultivators	19280	Nos.
11	Agricultural labours	63184	Nos.
12	Household Industries	2889	Nos.
13	Other Workers	27220	Nos.
14	Literates	147292	Nos.

4 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.1 **Details of Investigated Environmental impacts due to project location, possible accidents, project design, regular operations, final decommissioning or rehabilitation of a completed project**

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

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

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

4.1 Environmental Impacts during Operation Phase

4.1.1 Land Environment

The mining operation is in operation since 1988 and extent of lease area is 20.28.0 Ha.is Land classifies as a Government poramboke land. The quarry lease was applied quarry lease vide Precise area communication has been granted for 20 years vide Government

Industries,Investment promotion & Commerce (MME.1) Department, Letter No.3492325/MME.1/2022-1, dated:13.01.2023. The land use pattern is given in **Table** 4-1**.**

4.1.1.1 Land Degradation

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

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

Table 4-1 Land Use Pattern of the quarry area

S. No	Description	Present area (Ha)	Area Required during mining plan period (Ha)	Area at the end of the quarry (Ha)
1.	Area under quarrying	3.77.0	0.15.5	3.92.5
2.	Waste Dump	1.22.0	1.45.0	2.59.0
3.	Infrastructure	0.02.5	--	0.02.5
4.	Mine approach Road	0.32.0	--	0.32.0
5.	Village Road	0.40.0	--	0.40.0
6.	Afforesation	0.20.0	0.06.5	0.26.5
7.	Unutilized	14.34.5	12.67.5	12.75.5
Total		**20.28.0**	**14.34.5**	**20.28.0**

Mitigation Measures

- Dust suppression on exposed areas using water tankers and automatic sprinkling systems
- Contour overburden dump to minimize erosion
- Plantation using native plant sapling.
- Compliance with mine decommissioning plan.
- Drainage control structures like garland drain to be made around OB dump area to avoid water flow during monsoon below the OB dump.
- Leveling, grading and drainage arrangement for top of OB dumps.
- Topsoil to be stored in small heaps (5m high) at appropriate moisture content with proper vegetation.
- Top soil shall be used in afforestation work, as early as possible.

- Top soil will be removed & stored on the inner boundary of the mining lease area. To improve its quality, soil stabilizers shall be mixed and leguminous plantation will be done over these stacks.
- After complete extraction of estimated reserves of black granite. The deeper working pits, after completion of Mining /Quarrying left as it is, which would serve as water ponds/ water reservoirs.
- The quarried pits after the end of the life of lease will be fenced to prevent inherent entry of public and cattle's.
- Management plan for topsoil utilization and conservation.
- Progressive year-wise green belt development inside and outside the lease area.

4.1.2 Air Environment

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

Table 4-2 - Sources of air pollution at quarry

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

Baseline data reveals that ambient air quality in the study area for the Parameters SPM, SO_2& NOx, are well within the permissible Limits as prescribed by the National Ambient Air Quality Standards (NAAQS) for Industrial Area, Residential, Rural & Other areas.

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

Mitigation measures

- Use of dust aprons on drilling equipment and adopting wet drilling methods.
- Usage of Wire saw machine to reduce blasting and drilling.
- Delay blasting under unfavorable wind and atmospheric conditions

The production of blast fumes containing noxious gases will be reduced by the following methods:

- Use of adequate booster/primer
- Proper stemming of the blast hole.
- Drills fitted with dust collection system to be deployed or using wet drilling method.
- Development of greenbelt.

Table 4-3 Fugitive dust control in mine

S. No	Activities	Best practices
1	Drilling	➢ Drills should be provided with dust extractors (dry or wet system)
2	Blasting	➢ Water spray before blasting ➢ Water spray on blasted material prior to transportation ➢ Use of controlled blasting technique
3	Transportationof mined material	➢ Covering of the trucks/dumpers to avoid spillage ➢ Compacted haul road ➢ Speed control on vehicles ➢ Development of a green belt of suitable width on both sidesof road, which acts as wind break and traps fugitive dust

Table 4-4 Dust control measures in quarry

S. No	Operation or source	Control options
1	Drilling	➢ Liquid injection (water or water plus a wetting agent) ➢ Capturing and venting emissions to a control device.
2	Blasting	➢ Water spray before blasting ➢ Water spray on blasted material prior to transportation ➢ Use of controlled blasting technique
3	Loading	➢ Water spray
4	Hauling (emissions from roads)	➢ Water spray, treatment with surface agents, soil stabilization, paving, traffic control.
5	Windblown dust from roads	➢ Oiling surface active agents, soil stabilization, paving, sweeping.

4.1.3 Meteorological Data

The site specific meteorological data for thre**e** months from March 2023 to May 2023 was obtained from secondary sources and processed in AERMET to plot wind rose diagram (Fig 4.3.1). Other data included for AERMET were daily wind speed, wind direction, temperature, relative humidity, air pressure, precipitation, and solar radiation recorded during the period. AERMET reformats meteorological data so that it can be used as input for AERMOD model.

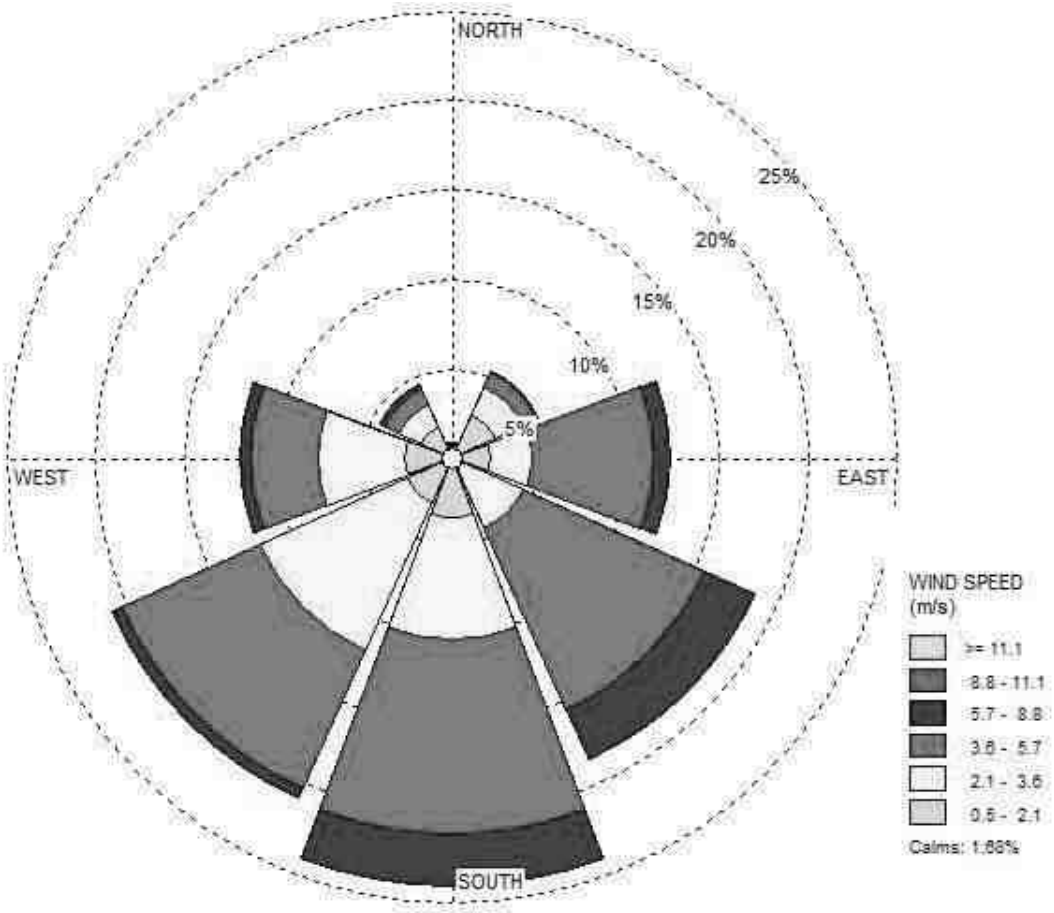


Figure 4-1 Wind rose diagram considered for Dispersion Modeling (March 2023 to May 2023)

4.1.4 AERMET Process

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

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

4.1.5 AERMOD Process

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

AERMOD is a steady-state plume model. In the stable boundary layer (SBL), it assumes the concentration distribution to be Gaussian in both the vertical and horizontal. In the convective boundary layer (CBL), the horizontal distribution is also assumed to be Gaussian, but the vertical distribution is described with a bi-Gaussian probability density function (pdf). This behavior of the concentration distributions in the CBL was demonstrated by Willis and Deardorff (1981) and Briggs (1993). Additionally, in the CBL, AERMOD treats "plume lofting," whereby a portion of plume mass, released from a buoyant source, rises to and remains near the top of the boundary layer before becoming mixed into the CBL. AERMOD also tracks any plume mass that penetrates into the elevated stable layer, and then allows it to re-enter the boundary layer when and if appropriate. For sources in both the CBL and the SBL, AERMOD treats the enhancement of lateral dispersion resulting from plume meander. The emissions mainly generated from the mining activities are Blasting, Drilling, Scrapping, Excavation, Loading, Unloading, and transportation etc. Machinery like compressors and jack hammers are used for Drilling are estimated and used as inputs for the air dispersion modelling as shown in **Table 4-5** to **Table 4-9.**

Maximum incremental value for SO_2, NOx and PM are shown in **Figures 4-2** to **4-6** and Top 10 highest Ground Level Concentration (GLC) obtained from modeling are given in **Table 4-10 & 4-14** respectively.

4.1.6 Emission Calculations

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

Source:

1. Emission Estimation Technique Manual for Mining and Processing of Non-Metallic Minerals by NPI, Nov 1999
2. Determination of the emission rate from various opencast mining operations, S. K. CHAULYA∗, M. K. CHAKRABORTY, et. Al. *Water, Air, and Soil Pollution 140: 21–55, 2002.*
3. Chaulya, S., 2006. Emission rate formulae for surface iron mining activities. *Environmental Modeling Assessment,* Issue 11, pp. 361-370.
4. *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.

Table 4-5 Overview of the Source Parameters

S. NO	Description	Symbol	Quantity
1	Moisture Content (%)	m	1.64
2	Silt Content (%)	s	6
3	Production / Day (Tonn/Day)		6.05

Table 4-6 Emission from Mining Equipments

Source	Fuel used	Stack Details					Emissions (g/s)		
		No of Stack	Height (m) AGL	Dia (m)	Temp (°C)	Exit Velocity (m/s)	PM	SO_2	NO_X
125 KVA DG	Diesel	1	3	0.3	180	10	1.55E-02	1.44E-02	2.18E-01

Table 4-7 Vehicular Sources Emission details

Source	Emission (g/s)	
	PM	NO_X
4 Wheeler (1 no.)	6.94E-05	6.94E-04
Heavy Duty Vehicles (2 no.)	1.11E-04	1.94E-02
Total	**1.81E-04**	**2.01E-02**

Table 4-8 Emission Considered for Mining Activity

Activities	PM_{10} Emission rate
Wet Drilling (g/s)	1.27E-07
Haulage (g/s)	5.74E-05
Waste Dumping (g/s)	2.46E-06
Open Pit ($g/s.m^2$)	8.24E-09

Table 4-9 Emission input for modeling

Activities	PM_{10}	SO_2	NO_x
Line Source (Haul Road) (g/s)	5.74E-05	-	-
Area Source (Open Pit) ($g/s.m^2$)	8.24E-09	-	-
Area Source (Waste Dumping) (g/s)	2.46E-06	-	-
Point Source (DG) (g/s)	1.55E-02	1.44E-02	2.18E-01
Point Source (Drilling) (g/s)	1.27E-07	-	-
Line Source (Vehicle) (g/s)	1.81E-04	-	2.01E-02

Note:

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

1. 60% of PM_{10} is considered as $PM_{2.5}$b. Emission calculation is done for total production.

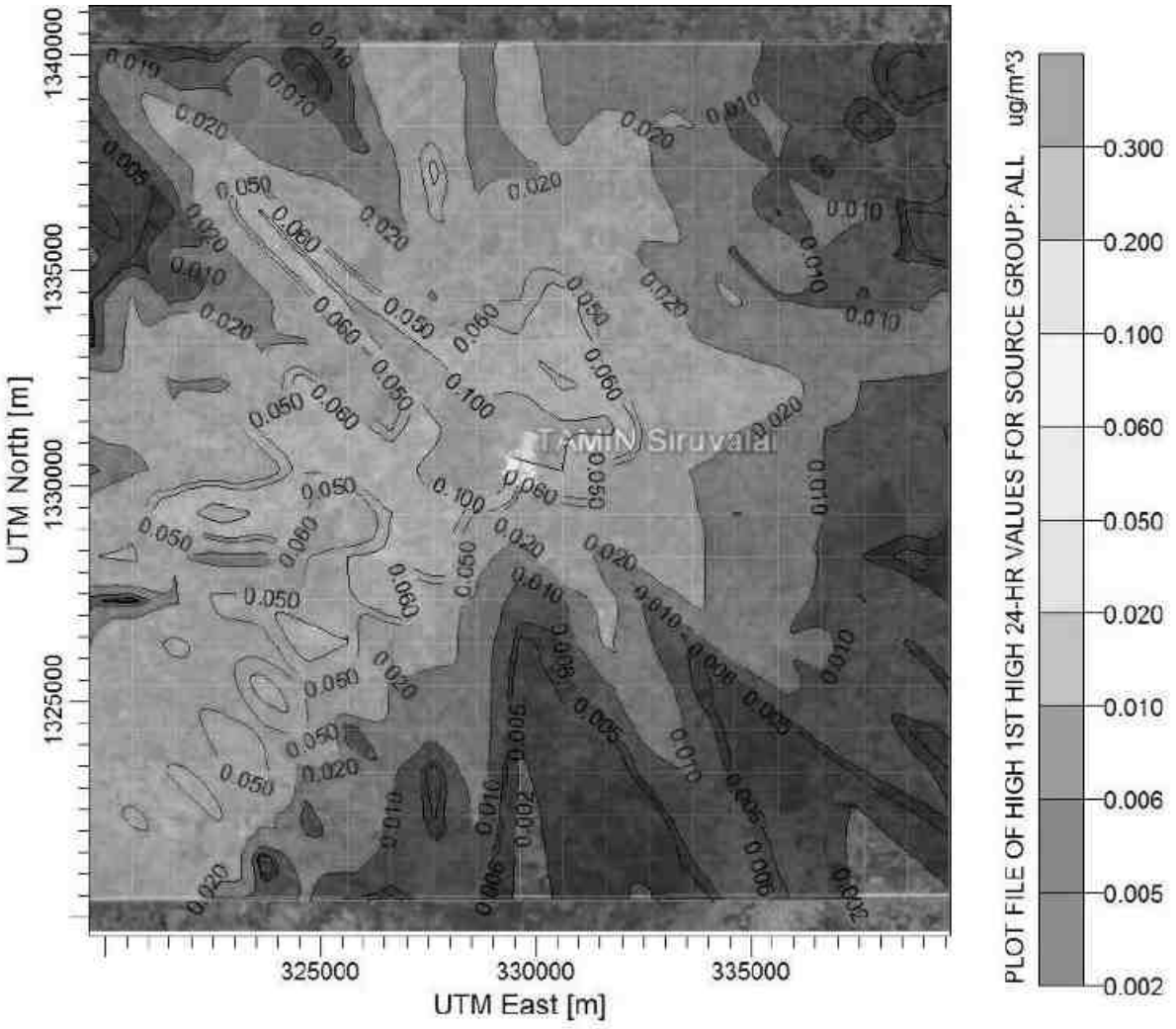


Figure 4-2 Predicted 24 hrs GLC's of PM within 10 km radius of the Study area

Table 4-10 Predicted Top 10 Highest Concentration of PM_{10}

S.NO	UTM coordinates (m)		Conc. ($\mu g/m^3$)	Distance from Centre of the project (km)	Direction from project Centre
	E	N			
1.	328624	1330355	0.20146	1.00	W
2.	329624	1331355	0.19749	1.00	N
3.	327624	1332355	0.18268	2.82	NW
4.	328624	1331355	0.17195	1.41	NW
5.	326624	1333355	0.14368	4.24	NW
6.	322624	1329355	0.12176	7.17	WSW
7.	327624	1330355	0.11733	2.00	W
8.	331624	1331355	0.11344	2.23	ENE
9.	325624	1334355	0.10791	5.65	NW

10.	330624	1331355	0.10662	1.41	NE

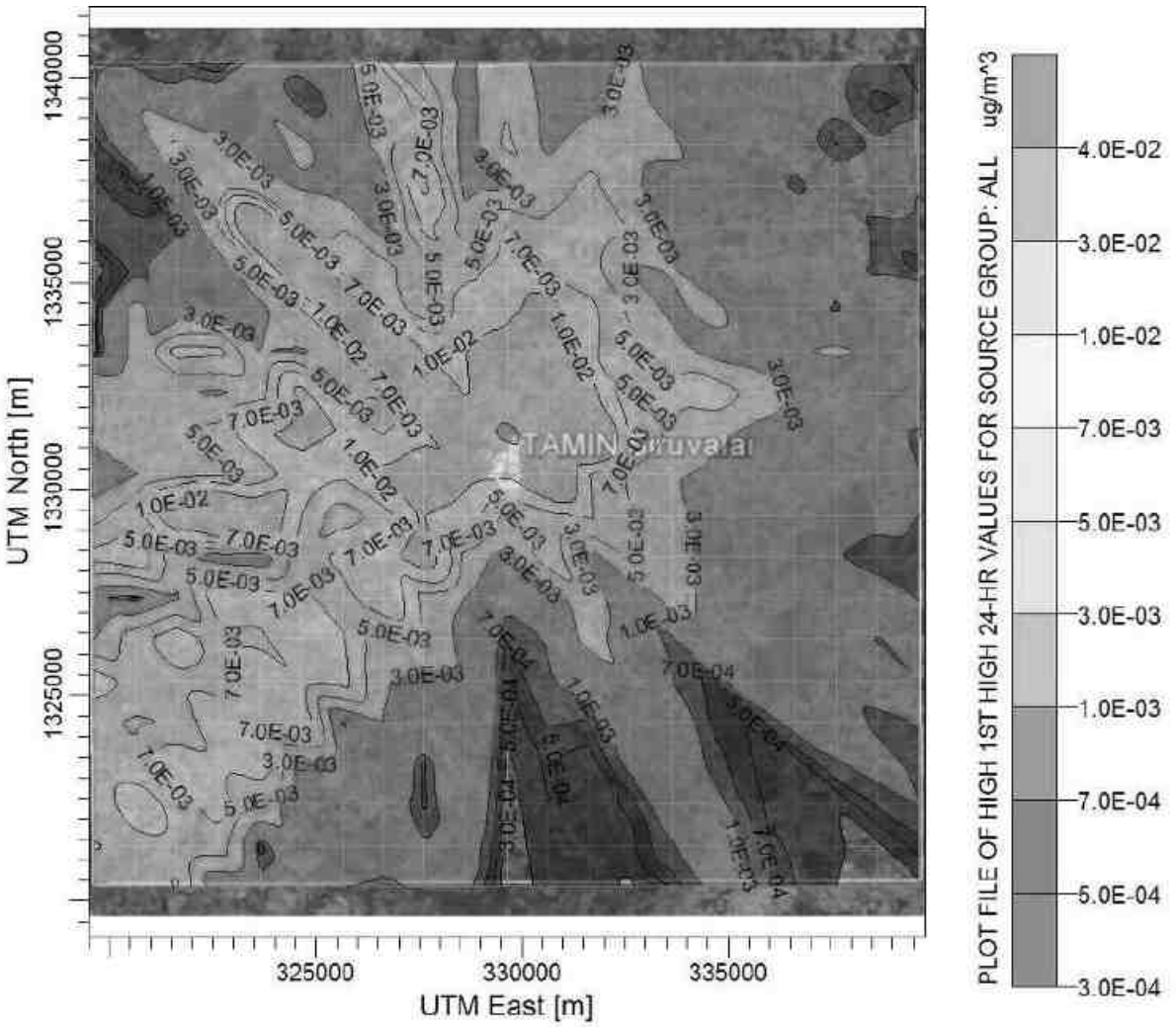


Figure 4-3 Predicted 24-Hrs' GLC's of SO_2 within 10 km Radius of the Study Area

Table 4-11 Predicted Top 10 Highest Concentration of SO_2

S.NO	UTM coordinates (m)		Conc. ($\mu g/m^3$)	Distance from Centre of the project (km)	Direction from project Centre
	E	N			
1.	329624	1331355	0.03528	1.00	N
2.	327624	1332355	0.02793	2.82	NW
3.	326624	1333355	0.02281	4.24	NW
4.	331624	1331355	0.01913	2.23	ENE
5.	322624	1329355	0.01911	7.17	WSW
6.	330624	1331355	0.0187	1.41	NE
7.	323624	1336355	0.01802	8.48	NE
8.	324624	1335355	0.01765	7.07	NW
9.	328624	1331355	0.01758	1.41	NW
10.	325624	1334355	0.01732	5.65	NW

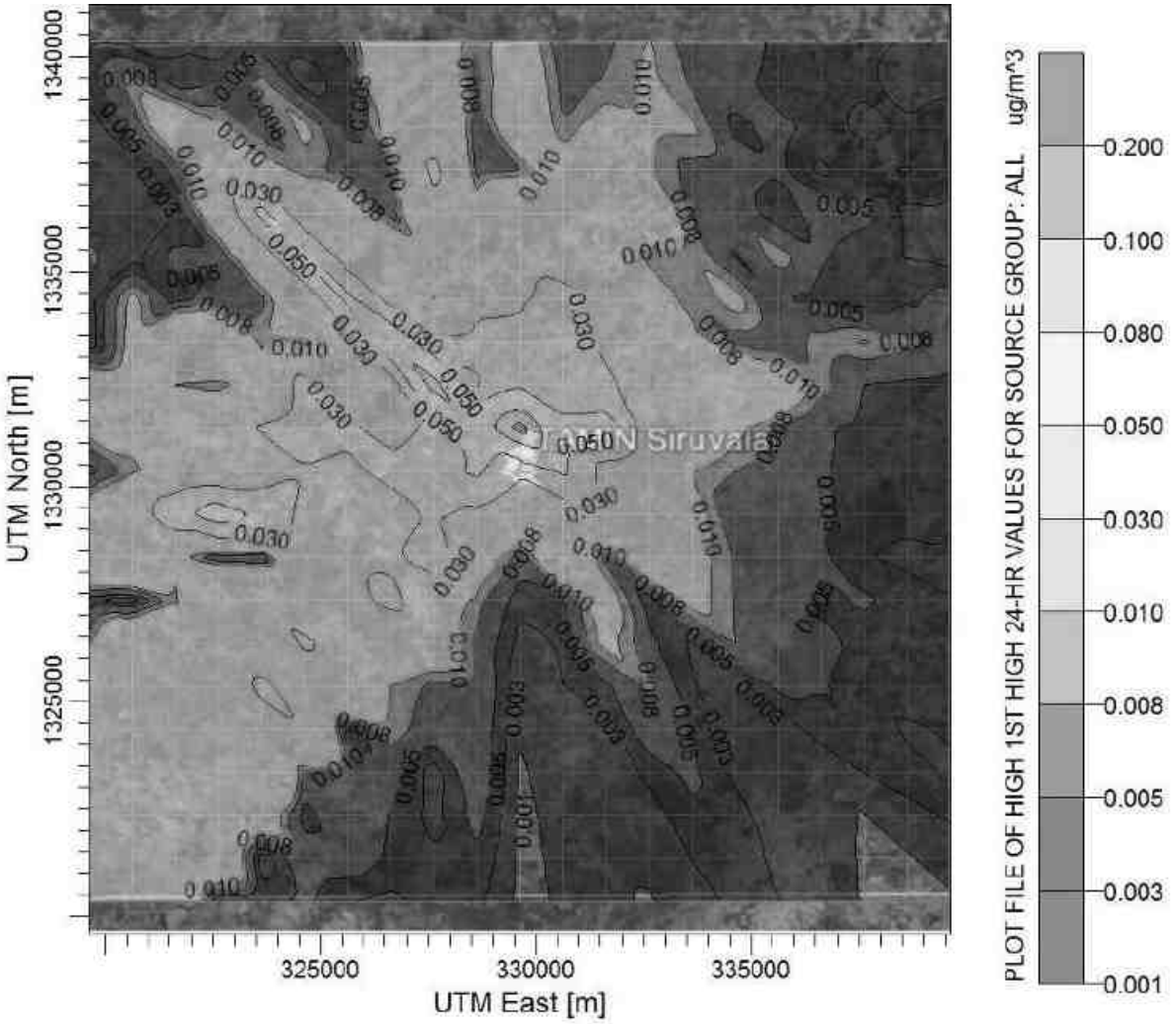


Figure 4-4 Predicted 24-Hrs' GLC's of NO_x within 10 km Radius of the Study Area

Table 4-12 Predicted Top 10 Highest Concentration of NO_x

S.NO	UTM coordinates (m)		Conc. ($\mu g/m^3$)	Distance from Centre of the project (km)	Direction from project Centre
	E	N			
1.	329624	1331355	0.10815	1.00	N
2.	327624	1332355	0.0906	2.82	NW
3.	326624	1333355	0.07297	4.24	NW
4.	328624	1331355	0.06779	1.41	NW
5.	322624	1329355	0.06142	7.17	WSW
6.	331624	1331355	0.05988	2.23	ENE
7.	330624	1331355	0.05772	1.41	NE
8.	323624	1336355	0.05591	8.48	NE
9.	324624	1335355	0.05523	7.07	NW
10.	325624	1334355	0.05516	5.65	NW

Conclusion:

The total increase in concentrations above baseline status to estimate the percentage increase is summarized in **Table 4-13.**

Table 4-13 Total Maximum GLCs from the Mining Emissions

Pollutant	Max. Base Line Conc. ($\mu g/m^3$)	Estimated Incremental Conc. ($\mu g/m^3$)	Total Conc. ($\mu g/m^3$)	NAAQ standard
PM	53.82	0.20	54.02	100
SO_2	9.29	0.03	9.32	80
NO_X	18.59	0.10	18.69	80

4.2 Impact due to Carbon Emisson

The proposed Quarry has the potential to generate various GHG emissions, including carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), fluorinated gases, water vapour, and ozone. These emissions can arise from different phases of quarrying operations, such as excavation, transportation, energy consumption, and land-use changes. A detailed study has been conducted to analyse and mitigating these emissions for minimizing environmental impact and promoting sustainable quarrying practices.

Operating a granite quarry can have several impacts on increasing carbon emissions and contributing to temperature rise, primarily through direct and indirect mechanisms. The key impacts are identified as:

S.No	Activity	Impacts /Consequences	Mitigation Measures
1	Operation of Heavy Machinery and Equipment – Direct Emissions	The continuous operation of such machinery results in the direct release of CO2 into the atmosphere,	Implementing energy- efficient technologies and practices, such as using low-emission equipment or transitioning to cleaner fuels, can help reduce direct emissions from machinery.
2	Energy-intensive processes, such as drilling, cutting, and	The combustion of fossil fuels releases CO_2 and other GHGs, contributing to indirect emissions associated with quarry	Transitioning to renewable energy sources, such as solar can reduce indirect emissions associated with energy consumption in quarry operations.

3	Land-Use Changes and Deforestation:	Deforestation results in the release of carbon stored in trees and soil into the atmosphere, thereby contributing to increased carbon emissions. Additionally, the loss of vegetative cover reduces the area's capacity to sequester carbon through	Implementing reforestation and afforestation programs in and around the quarry area can help offset carbon emissions and restore ecosystem functions.
4	Soil Disturbance, Excavation and Carbon Loss	Soil disturbance disrupts the natural carbon cycle by accelerating the decomposition of organic matter, releasing carbon dioxide into the atmosphere. Moreover, soil erosion reduces the soil's ability to retain carbon, further	Implementing sustainable land management practices, such as minimizing soil disturbance and erosion control measures, can help preserve soil carbon and reduce carbon loss.
5	All Operations-Impacts on Microclimate and Temperature	Quarry operations can alter local microclimates and contribute to temperature rise in the surrounding areas. Removal of vegetation and exposure of bare rock surfaces can increase surface temperatures through the absorption and retention of solar radiation. Additionally, the	Implementing revegetation and reforestation programs within the quarry area can help mitigate temperature rise and restore ecosystem balance.

Mitigation measures to address these impacts may include development of Carbon Sinks.

Carbon sinks are natural or artificial systems that absorb and store carbon dioxide (CO_2) from the atmosphere, helping to mitigate climate change by reducing the concentration of

greenhouse gases. There are several options for carbon sinks, each with varying degrees of effectiveness and feasibility. Some common carbon sink options include:

- Implementing revegetation and afforestation programs to restore vegetative cover and sequester carbon.
- Adopting sustainable land management practices to minimize soil disturbance and erosion, thereby preserving soil carbon.
- Incorporating carbon offset projects, such as reforestation initiatives or carbon capture and storage (CCS) technologies, to offset emissions generated by quarry operations.
- Install renewable energy sources such as solar, in lieu of operating DGs, for non-quarrying operations.
- Expand afforestation (planting trees on lands that historically lacked forests) and reforestation (restoring degraded forests) efforts to enhance carbon sequestration and biodiversity conservation.
- Healthy soils have the capacity to store significant amounts of carbon in the form of organic matter. Implementing sustainable land management practices such as no-till agriculture, cover cropping, and agroforestry can enhance soil carbon sequestration and improve soil health, wherever possible.

4.3 Impact on climate change, temperature rise, pollution

The operation of the proposed Siruvalai Black Granite Quarry covering an area of 20.28.0 hectares can have various impacts on climate change, temperature rise, pollution, and carbon stocks, both above and below the soil. A detailed study has been conducted the results are given below

Sl.No	Activity	Impacts /Consequences	Mitigation Measures
1	Operation of Heavy Machinery and Equipment – Direct Emissions	Quarryingactivities involving machinery, diesel vehicles, and energy consumption emit greenhouse gases (GHGs) such as carbon dioxide (CO_2) and methane (CH_4), contributing to climate change. Carbon emissions.	Adopt energy-efficient technologies and practices to reduce energy consumption and associated GHG emissions in quarry operations. Transition to renewable energy sources such as solar power to power quarry operations, minimizing reliance on

			fossil fuels. The other mitigation measures given in the previous point.
2	Deforestation:	Clearing vegetation for quarry operations releases stored carbon into the atmosphere, leading to reduced carbon sequestration capacity and contributing to climate change.	Implement reforestation and afforestation programs to restore vegetation cover and sequester carbon, offsetting emissions from deforestation and land-use changes. Restore degraded areas within and around the quarry site to enhance carbon sequestration and biodiversity conservation.
3	Alteration of land cover and soil composition	Alteration of land cover and soil composition can disrupt local microclimates, affecting temperature, humidity, and precipitation patterns in the surrounding area.	Implement soil conservation measures such as erosion control, reclamation and soil stabilization to preserve soil carbon and maintain ecosystem integrity. Minimize soil disturbance during quarry operations to reduce carbon loss from soils and prevent erosion.

Major Environmental Pollution

Air Pollution: Quarrying activities generate dust, particulate matter, and diesel exhaust emissions, leading to air pollution and respiratory health issues for nearby communities.

Water Pollution: Runoff from the quarry site can carry sediment, chemicals, and heavy metals into nearby water bodies, polluting surface water and harming aquatic ecosystems.

Noise Pollution: Drilling, Cutting and heavy machinery operations produce noise pollution, disrupting wildlife habitats and affecting the well-being of local residents.

Soil Contamination

Soil Erosion: Soil disturbance and erosion associated with quarrying activities can lead to soil degradation, loss of topsoil, and reduced soil fertility, impacting agricultural productivity and ecosystem functioning.

Chemical Spills: Accidental spills or leaks of hazardous materials used in quarry operations can contaminate soil, posing risks to soil health, plant growth, and groundwater quality.

Impacts on Above and Below Soil Carbon Stock:

Above Soil Carbon Stock: Deforestation and soil disturbance reduce aboveground carbon stocks by releasing stored carbon from vegetation into the atmosphere. **Below Soil Carbon Stock:** Soil erosion and disturbance associated with quarrying activities lead to the loss of soil organic carbon, compromising soil fertility and ecosystem health.

Mitigation Measures

- Implement reforestation and afforestation programs to restore vegetation cover and sequester carbon, offsetting emissions from deforestation and land-use changes.
- Adopt energy-efficient technologies and renewable energy sources like solar or wind power to reduce emissions from quarry operations and minimize environmental impact.
- Implement soil conservation measures such as erosion control, reclamation, and soil stabilization to preserve soil carbon and maintain ecosystem integrity.
- Install dust suppression systems, sedimentation ponds, and water treatment facilities to mitigate air and water pollution from quarrying activities.
- Implement habitat restoration and conservation measures to protect biodiversity and ecosystem services affected by quarry operations.
- Engage with local communities, stakeholders, and regulatory authorities to address concerns, promote transparency, and ensure sustainable quarrying practices.

By implementing these mitigation measures, it is possible to minimize the environmental impacts of the proposed Siruvalai Black Granite Quarry, reduce carbon emissions, preserve ecosystem health, and promote sustainable development in the region.

4.4 Impacts due to Transportation

The Granite dimensional blocks are transported to consumer directly as per buyer's requirement. The mine is in operation since 1998 and granite is being transported through existing road by trippers and approx. no. of trips required is 2 times per week. This minimum trip does not create impact on existing transportation.

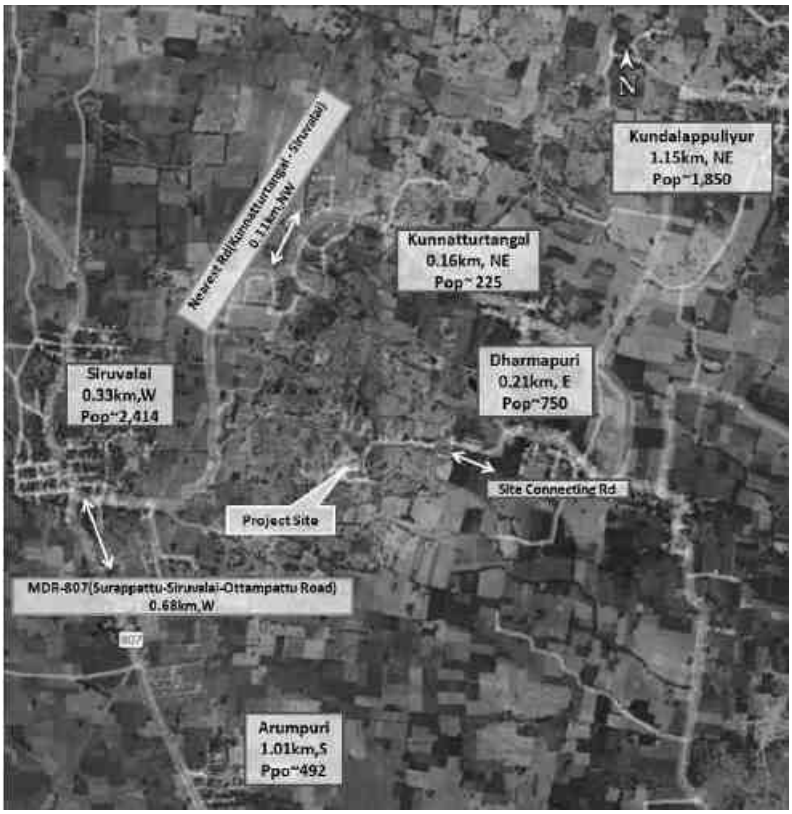


Figure 4-5 Site Connectivity Map

Table 4-14 Existing & proposed vehicular movement per day

S. No	Type of Vehicle	Existing vehicles	Existing PCU	Proposed vehicles	Proposed PCU	Total vehicles after project implementation	PCU Factors IRC (SP 41)	Total PCU after project implementation
1	2 wheelers	1968	1476	0	0	1968	0.75	1476
2	3 wheelers	147	176	0	0	147	2	294
3	4 wheelers/ cars	156	156	0	0	156	1	156
4	Trucks/ Bus/HCV	165	363	4	15	169	3.7	625
5	Agricultural tractor	86	344	0	0	86	5	430
6	Light emission vehicle-LCV	1481	2073	0	0	1481	2.0	2962
	Total	**4003**	**4589**	**4**	**15**	**4007**	**-**	**5943**

Table 4-15 Traffic Volume after Implementation of the Project

For the Road	Volume of Traffic	Volume (V)	Road Capacity (C)	V/C Ratio	LOS Category*	Traffic Classification
Existing	4003	4589	15000	0.31	"A"	Free Flow
After implementation	4007	5943	15000	0.31	"A"	Free Flow

*LOS (Level of Service) categories are A-Free Flow, B- Stable Traffic Flow, C- Restricted Flow, D- High Density Flow, E- Unstable flow, F- Forced or breakdown flow*LOS (Level of Service) categories are given below.

Table 4-16 Classification and Level of Services

S.No	Level of Service	V/C	Classification
1.	A	<0.35	Free flow traffic
2.	B	0.35-0.55	Stable traffic flow
3.	C	0.55-0.77	Restricted flow
4..	D	0.77-0.92	High Density flow
5.	E	0.92-1.0	Unstable flow
6.	F	>1.0	Forced Traffic flow

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

Mitigation Measures

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

- Regular water sprinkling on haul and access roads.
- Haul roads to be maintained by surface grading to minimize excessive road surface wearing.
- 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.

4.5 Water Environment

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

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

- Domestic effluent from the mine.
- Wastewater from Machineries cooling
- Mine discharge water pumped out from the mines
- Reduction in groundwater availability
- Due to poor aquifer condition the impact on water level will be confined to few hundred.
- Deterioration in surface / ground water quality of receiving body.
- Reduction in surface and groundwater availability for domestic and for irrigation purposes.
- Changes to hydraulic regime.

4.5.1 Wastewater Generation

There is no process effluent generation; the negligible quantity of domestic sewage of 0.4KLD is disposed through septic tank.

4.5.2 Mitigation Measures

Surface Water Pollution Control Measures

- Construction of garland drains of suitable size around mine area and dumps to prevent rain water descent into active mine areas.
- During monsoon season, the rain water is being collected by natural slope of area to water fed tank of the mine and it will be utilized for dust suppression and greenbelt development.
- The dump tops will be provided with inner slopes to control water flow to prevent erosion washouts. The dumps tops and slopes of in active areas will be covered with grasses, shrubs, mulching, etc, to prevent erosion,
- Retaining walls of adequate dimensions will be provided at the top of dumps and the unstable OB benches within the mine to prevent wash off from dumps and sliding of material from benches. This will help in preventing silting of water drains/channels
- The water channels/drains carrying the rain water from the mine will be provided with baffles and settling pits to arrest the suspended solids, if any, present in this water

- The worked out slopes will be stabilized by planting appropriate shrub/grass species on the slopes.
- The mine water will be regularly tested for presence of any undesirable elements and appropriate measures will be taken in case any element is found exceeding the limits prescribed by CPCB

4.5.3 Ground Water Pollution Control Measures

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

4.5.4 Rain Water Harvesting

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

4.6 Drainage pattern and Hydrogeology

- Catchment area inside the mine will be affected.

Mitigation measures

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

4.7 Impact of Noise / Vibrations & Mitigation Measures

Impact of Noise on Working Environment

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

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

Noise due to Drilling, Excavation and Transportation

The noise levels in the working environment will be maintained within the standards prescribed by Occupational Safety and Health Administration (OSHA). These standards

were established with the emphasis on reducing the hearing loss. The permissible limits, as laid down by OSHA, are presented in **Table 4-16.**

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

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

Noise Due to Blasting

The main sources of noise in quarrying activity are drilling & Excavators. The blasting activity being minimum, the noise generated will be minimal. The blasting effect will be contained within the quarry lease area. Blasting activities are involved in this Quarry as green belt will be developed around the mine which restricts the propagation of noise.
Following mitigation measures should be taken to control noise pollution:

- Plan Blasting in a way keeping the atmospheric conditions to reduce the fallout.
- Controlled blasting techniques to be utilised.
- Wherever the noise levels exceed 85 dB A, workers should be provided with earmuffs, ear plugs etc.
- All vehicles and machinery will be properly lubricated and maintained regularly.
- Speed of the Vehicles entering and leaving the quarrying lease will be limited to 25 kmph.
- Unnecessary use of horns by the drivers of the vehicles shall be avoided.

Noise Impact Analysis on Community

In Industrial area day time noise levels was about 57.7 dB (A) and 49.3 dB(A) during night time, which is within prescribed limit by MoEF & CC (75 dB (A) Day time & 70 dB(A) Night time).

In residential area day time noise levels varied from 51.9 dB (A) to 53.8 dB(A) and night time noise levels varied from 41.4 dB(A) to 43.8 dB(A) across the sampling stations. The field observations during the study period indicate that the ambient noise levels in Residential area are all well within the limits.

In summary, it can be stated that the impact on the present noise levels due to mining operations will be restricted to the work zone areas only. The impact on the ambient noise

levels will not be felt at the settlement areas due to masking effect with the existing noise levels. Hence, the noise levels impact due to the mining operations on community is insignificant.

Mitigate Measures

- Controlled blasting with proper spacing,burden and stemming will be maintained
- No secondary blasting
- Minimum quantity of detonating fuse will be consumed by using alternatively Excel non-electrical initiation system
- The blasting will be carried out during favourable atmospheric condition and less human activity timings
- The prime movers/diesel engines will be properly maintained
- Provision of sound insulated chambers for the workers deployed on machines (HEMM)
- Proper designing of plant & machinery by providing inbuilt mechanism like silencers, mufflers and enclosures for noise generating parts and shock absorbing pads at the foundation of vibrating equipment
- A thick tree belt will be provided in phased manner around the periphery of the mine to attenuate noise
- Trees will be planted on both sides of haul roads
- Personal Protective Equipment (PPE) like ear muffs/ear plugs will be providedto the operatorsof HEMM and persons working near HEMM and reducing the exposure time of workers to the higher noise levels.

4.8 Impact of Vibration

Blasting activities are involved in Granite Quarry operations. The vibration during the moment of machinery will be minimal for a short span that will be well within the prescribed limits. Proposed Peripheral green belt is being developed in 0.06.5 Ha. This will mitigate the Vibration.

Mitigate Measures

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

4.9 Impact on Human Settlement

The total lease area is 20.28.0 Ha which Governmentporamboke land. TAMIN obtained the quarry lease was applied quarry lease vide Government Industries Investment Promotion & Commerce (MME-1) dept Letter No.3492325/MME.1/2022-1,dated:13.01.2023 for 20 years. Hence R&R Plan is not required for this Quarry.There is no monuments or places of worships in mine area. Ground vibration and noise pollution is being maintained minimal and confined to the mine area. The quality of water both surface and ground water is good and all parameters of drinking water are as per IS standards. Water quality analysis will be carried out at periodical intervals during post project monitoring. The PM, NO_2 and SO_2 have been observed to be below the prescribed limit. Noise levels have also been found to be below the permissible limits at all the locations. Further, the noise generated in the lease area will get attenuated due to plantation and green belt all around the lease area. As preventive measures, greenbelt development around the mine lease area will be further strengthening for control of air emission to environment. All the employees when inducted will be medically examined. Further, they will also be medically examined at periodical interval.

4.10 Biological Environment

Mining activities and their impact on biodiversity

Table 4-18 Impacts on Biodiversity

S. No	Activity	Examples ofaspects	Examples of biodiversity impact
1.	Extraction	Land clearing	Loss of habitat, introduction of plant diseases,Siltation of water courses
2.	Blasting, Digging andhauling	Dust,noise,vibration,waterpollution	Disruption of water courses,impacts on aquatic ecosystems due to changes in hydrology and water quality
3.	Waste dumping	Clearing, water and soil pollution	Loss of habitat, soil and water contamination, sedimentation, acid mine drainage
4.	Tailing management	Land clearing, water pollution	Loss of habitat, toxicity, sedimentation, water quality and stream flow
5.	Air emissions	Air pollution	Loss of habitat or species
6.	Waste disposal	Oil and water pollution	Encouragement of pests, disease transfer, contamination of groundwater and soil
7.	Building power lines	Land clearing	Loss or fragmentation of habitat
8.	Provision of accommodation	Land clearing, soil and waterpollution, waste generation	Loss of habitat, sewage disposal and disease impacts
9.	Access roads	Land clearing	Habitat loss or fragmentation, water logging upslope and drainage shadows down slope

10.	Population growth	Land clearing or increasedhunting	Loss of habitat or species, stress on local and regional resources, pest introduction, clearing
11.	Water supply (potable or industrial)	Water abstraction or mine dewatering	Loss or changes in habitat or species composition

Existing Biological Scenario

- Odaiyanattam, Melkondai, Tandavasamudram, Gengavaram, Karai Reserve Forests are located within the 15km radius of the project. Other than these, there is no Wildlife sancturary is located within 10km from the mines. There will not be any adverse impact due to mining operations in this lease since only small production is involved from this lease and there will not be any major polluting source from the mining operations. Besides, all necessary mitigation measures will be implemented.
- There is no perennial water body near the site and there will be no discharge of effluent from the mine.
- In the Quarry area or its proximate areas there is no wetland and the natural flow of water not available.
- There is no rare or endangered species
- There are no wild animals in the area. In the post mining stage, proper fencing will be carried in the mined out area to prevent fall of animals in the mine pits.
- No such significantly important medicinal value species within both the ML areas and its nearby region.
- There are no any wetlands, fish breeding grounds, marine ecology nearby the quarry area, which will be affected due to this project.

Mitigate Measures

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

4.11 Flora and Fauna

Activities of Mine development and operations & transportation to end users will cause the following impacts on flora and fauna.

Impact

- Displacement of existingfauna.
- Lossofvegetation

Mitigation measures

- Renovation of ponds

- Construction of check dams and water holes; Engagement of fire watchers.
- Education and training etc.
- Logistic support in form of equipment, Vehicles etc as required by the implementing DFO will be extended.

The objectives of the green belt cover will cover the following

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

Table 4-19 Conservation Plan for Schedule I species for five years conservation Plan

S.No	Work or Activity	1 to 5 years	Location
1.	Plantation	100 trees per year plant of local plant species for five years in villages.	Villages covered in 10 km study area
2.	Water filling	5 number in water hole filing during summer.	Ponds covered in 10 km study area
3.	Awareness	In school of nea/rby villages for peacock conservation as Drawing Competition. (Peacock Picture) & Essay Writing on Peacock.	Villages covered in 5 km study area
***All above activity will be carried out with the consultation of Ecologist*			
Plant Species will be suggested by the Ecologist and plant saplings will be distributed in project villages as per the above mentioned schedule (year wise).			

4.12 Green Belt Development

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

Plants are chosen to provide aesthetic, ecological and economical value. Trees will help to arrest propagation of noise and help to lessen dust pollution due to dust arresting action. The existing plantation will be developed inside the mining lease is about 0.06.5 Ha out of 20.28.0Ha

The Proponent ia commtted to devlop Green belt around the Periphery of the ML by planting 300 number tree saplings including neem, pungam, vengai which were recommended by SEIAA and SEAC in ToR. The soil dumps, are planted to prevent erosion and for stabilization of the soil. Plants are chosen to provide aesthetic, ecological and economical value. Trees will help to arrest propagation of noise and help to lessen dust pollution due to dust arresting action.

4.13 Impacts on Occupational Health Due to Project Operations

Anticipated occupational illness sequel to mining activities involved in the project as follows

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

Mitigate Measures for Occupational Health

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

Table 4-20 Mitigation for occupational health and safety

S. No	Activity	Mitigation measures
1	Excavation	Planned excavation, avoid haphazard mining
2	Drilling and blasting	➢ Driller should be equipped with a closed cabin to reduce exposure to noise and dust. ➢ In addition, the operators and other workers should be provided with masks, helmets, gloves and earplugs.
3	Safety zone	➢ Provisions for a buffer zone between the local habitation and the mine lease in the form of a green belt of suitable width. ➢ Restricted entry, use of sirens and cordoning of the lasting area are some of the good practices to avoid accidents.
4	Overburden stabilization	➢ Accidents are known to happen due to overburden collapse. ➢ Therefore, slope stabilization and dump stability are critical issues for safety and environment.
5	Worker's health surveillance	➢ Health survey programmes for workers and local community. ➢ Regular training and awareness of employees to be conducted to meet health and safety objectives.

Mitigate Measures for Safety Aspects

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

4.14 Irreversible and Irretrievable commitments of environmental components

Irreversible and Irretrievable commitments of environmental components are not envisaged in the proposed project.

4.14.1 Assessment of Significance of Impacts

This chapter comprises the information regarding the identified beneficially or adversely environmental impacts due to possible aspects predicted because of location of the plant,

expected / predicted accidents scenario, conceptualization of project, preconstruction & construction activities and due to operation of machineries/equipment. Environmental aspect-impact relationship will be identified and quantified with its scale of magnitude and scale of importance, accordingly significance of impact will be determined along with mitigation measures.

The impact assessment essentially consists of three steps:

1. Impact Identification
2. Impact Predictions
3. Impact Analysis for determination of significance of impacts

Here, impact assessment has been done based on each action and its potential in creating impact is expressed in terms of its magnitude and importance. For quantitative representation, both magnitude & importance are represented by values as described below:

4.14.2 Scale of Importance:

Importance of an interaction is related to its significance, or an assessment of probable consequences of anticipated impact. It ranges from 1 to 10; with 10 representing a very important interaction and 1 of relatively low.

4.14.3 Scale of Magnitude:

Impact score or magnitude ranges from 0-5 with positive and negative values, depending upon the impact rising out of the project activity.

Table 4-21 Severity Criteria for Magnitude of Impacts

S. No	Category	Description of category	Impact	
			Adverse	Beneficial
1	No impact	-	0	0
2	No appreciable impact	Short term reversible	-1	1
3	Significant impact	Long term reversible	-2	2
4	Major impact	Irreversible but of lesser extent	-3	3
5	High impact	Irreversible but of medium extent	-4	4
6	Permanent impact	Severe irreversible impact	-5	5

Score of each of the component is to be multiplied by ‘’Importance factor” and totals core is to be obtained by summation of products. Score ranges of impact evaluation based on matrix score is given below

Table 4-22 Score ranges for Beneficial and Adverse Impacts

S. No	Total score	Outcome
1	+ve / -ve	Beneficial impact / adverse impact
2	0-300	No appreciable Beneficial impact / adverse impact

S. No	Total score	Outcome
3	300-600	Appreciable but reversible adverse impact-mitigation measures are needed
4	600-900	Significant adverse impacts: most of the impacts are reversible. Mitigation measures are crucial.
5	900-1200	Major adverse impacts; most of the impacts are reversible. Alternative site selection to be considered.
6	>1200	Permanent irreversible impact; alternatives to the project need to be explored

Table 4-23 Impact Matrix without EMP

S.No	Environmental components likely to be affected	Air quality			Noise & Vibration			Surface water			Ground water			Soil quality			Flora & fauna			Land use pattern			Socio economics			Impact score
		Magnitude	Importance	(M * I)	Magnitude	Importance	(M * I)	Magnitude	Importance	(M * I)	Magnitude	Importance	(M * I)	Magnitude	Importance	(M * I)	Magnitude	Importance	(M * I)	Magnitude	Importance	(M * I)	Magnitude	Importance	(M * I)	(Sum of M * I)
1	Site clearance and removal of vegetation	-	-	0	-	-	0	-	-	0	-	-	0	-3	5	-15	-1	4	-4	-4	6	-24	-	-	0	-43
2	Drilling and blasting operation	-5	8	-40	-5	8	-40	-	-	0	-	-	0	-4	-6	24	-1	4	-4	-2	7	-14	-	-	0	-74
3	Dust generation due to mining activity	-5	8	-40	-	-	0	-3	5	-15	-	-	0	-	-	0	-2	4	-8	-	-	0	-5	6	-30	-93
4	Loading & Unloading of granite	-4	7	-28	-3	6	-18	-	-	0	-	-	0	-2	4	-8	-1	3	-3	-	-	0	-2	4	-8	-65
5	Fall in pit, Accidents, fall of side walls etc.	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-4	6	-24	-2	4	-8	-3	5	-15	-47
6	Change in Topography and slopes	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-3	6	-18	-	-	0	-18
7	Granite Resource Depletion	-	-	0	-	-	0	-	-	0	-	-	0	-3	8	-24	-	-	0	-2	8	-16	-	-	0	-40
8	Stacking and handling of Mineral Rejects and Overburden	-2	5	-10	-	-	0	-	-	0	-	-	0	-3	6	-18	-	-	0	-2	7	-14	-	-	0	-42

9	Noise generation due to vehicular movement	-	-	0	-3	5	-15	-	-	0	-	-	0	-	-	0	-1	4	-4	-	-	0	-2	4	-8	-27
10	Usage of DG sets	-2	5	-10	-2	5	-10	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-20
11	Sewage Generation	-	-	0	-	-	0	-3	6	-18	-2	6	-12	-3	5	-15	-	-	0	-	-	0	-	-	0	-45
12	Consumption of water	-	-	0	-	-	0	-1	5	-5	-2	5	-10	-	-	0	-	-	0	-	-	0	-1	2	-2	-17
13	Employment opportunities	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	3	6	18	18
14	Greenbelt development	2	7	14	2	7	14	-	-	0	-	-	0	2	4	8	2	5	10	2	4	8	-	-	0	46
Total impact score		-16	40	-114	-11	31	-69	-7	16	-38	-4	11	-22	-16	26	-48	-8	30	-37	-13	42	-86	-10	27	-45	-459

Interpretation:

Based on assumption of importance and magnitude, the final impact score without EMP is -459 which concludes that the proposed project has, **"Appreciable but reversible adverse impact-mitigation measures are needed".**

Table 4-24 Impact Matrix with EMP

S.No	Environmental components likely to be affected	Air quality			Noise & Vibration			Surface water			Ground water			Soil quality			Flora & fauna			Land use pattern			Socio economics			Impact score	Mitigation Measures
		Magnitude	Importance	(M * I)	Magnitude	Importance	(M * I)	Magnitude	Importance	(M * I)	Magnitude	Importance	(M * I)	Magnitude	Importance	(M * I)	Magnitude	Importance	(M * I)	Magnitude	Importance	(M * I)	Magnitude	Importance	(M * I)	(Sum of M * I)	
1	Site clearance and removal of vegetation	-	-	0	-	-	0	-	-	0	-	-	0	-2	5	-10	-1	4	-4	-2	6	-12	-	-	0	-26	Development of green belt and plantation
2	Drilling and blasting operation	-3	8	-24	-3	8	-24	-	-	0	-	-	0	-2	-6	12	-1	4	-4	-2	7	-14	-	-	0	-54	1. Ensure to use PPEs and well-maintained vehicles 2. Regular Water Sprinkling 3. Safe blasting zones are kept around the periphery of the quarry
3	Dust generation due to mining activity	-2	8	-16	-	-	0	-1	5	-5	-	-	0	-	-	0	-1	4	-4	-	-	0	-1	3	-3	-23	Water Sprinkling to control dust emission

4	Loading & Unloading of granite	-3	7	-21	-2	6	-12	-	-	0	-	-	0	-	-	0	-1	3	-3	-	-	0	-2	4	-8	-44	1. Dust filter mask to be provided to all workers 2. Vehicles will be covered by Tarpaulin sheets 3. Speed limits of vehicles will be maintained
5	Fall in pit, Accidents, fall of side walls etc.	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-1	6	-6	-1	4	-4	-1	5	-5	-15	Proper fencing and PPE's will be provided.
6	Change in Topography and slopes	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-2	5	-10	-	-	0	-10	Mine closure plan will be implemented after completion of mining activity.
7	Granite Resource Depletion	-	-	0	-	-	0	-	-	0	-	-	0	-2	8	-16	-	-	0	-2	8	-16	-	-	0	-32	Deletion of granite has positive & negative impacts. Even though it plays a vital role in improvement of country's economic development.
8	Stacking and handling of Mineral Rejects and Overburden	-1	5	-5	-	-	0	-	-	0	-	-	0	-2	6	-12	-	-	0	-2	7	-14	-	-	0	-31	1. Garland drains will be provided to prevent the back flow of OB material into nearby water bodies. 2. Granite rejects will be dumped into southwest side

																										of the quarry
9	Noise generation due to vehicular movement	-	-	0	-1	5	-5	-	-	0	-	-	0	-	-	0	-1	4	-4	-	-	0	-1	4	-4	-13	1. All vehicles and machinery will be properly lubricated and maintained regularly. 2. Speed of the vehicles entering and leaving the quarrying lease will be limited to 25 kmph.
10	Usage of DG sets	-2	5	-10	-1	5	-5	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-15	The DG set are provided with stacks of adequate height so as to disperse the emanating flue gases containing suspended particulate matters, oxides of sulphur and nitrogen without affecting the ground level concentrations.
11	Sewage Generation	-	-	0	-	-	0	-1	6	-6	-1	6	-6	-	-	0	-	-	0	-	-	0	-	-	0	-12	Sewage will be disposed in soak pit Garland drains are provided

12	Consumption of water	-	-	0	-	-	0	-1	5	-5	-1	5	-5	-	-	0	-	-	0	-	-	0	-1	1	-1	-11	Water requirement will be met by private tankers Rain water management will be provided
13	Employment opportunities	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	3	6	18	18	Employment will be provided to local workers
14	Greenbelt development	2	7	14	2	7	14	-	-	0	-	-	0	-	-	0	2	5	10	-	-	0	-	-	0	38	1. The plantation will be developed around 7.5m safety zone of the quarry. 2. Plants are chosen to provide aesthetic, ecological and economical value.
Total impact score		-9	40	-62	-5	31	-32	-3	16	-16	-2	11	-11	-8	13	-26	-4	30	-15	-11	37	-70	-3	23	-3	**-235**	

Interpretation:

Based on the assumption of importance and magnitude, the final impact score with the implementation of mitigation measures is -235, which concludes that the proposed project has, "**No appreciable beneficial impact / adverse impact**".

5 ANALYSIS OF ALTERNATIVES

5.1 Introduction

The Proposed Siruvalai Black Granite Quarry is over an extent of 20.28.0 Ha located in S.F.No.170/1 of Siruvalai Village, Vikravandi Taluk, Villupuram District, Tamil Nadu. The type of mining to be done is Surface Mining and the method to be adopted is Opencast Semi Mechanised Mining.

5.2 Description of each alternatives with its adverse impacts

Alternative site is not considered, since it is fresh quarry.

5.3 Selection of Alternate Sites

No alternative site selection was carried out for this project since the project is site specific because of the availability of mineral in the location.

5.4 Site Connectivity

The Site connectivity details are given in **Table 5-1**.

Table 5-1 Site Connectivity Details

Nearest State Highway	SH-135(Villupuram-Tiruvannamalai) at ~2.39km, S
Nearest National Highway	NH-38 (Vellore-Thoothukudi) at ~2.39km, S
Nearest Railway Station	Mundiyampakkam at ~8.61km, ESE
Nearet Town	Villupuram Town, ~9.50 km, SSE

5.4.1 Technology Alternatives

No new technologies have been considered for this quarry. The open cast, semi-mechanized method with bench 6 m height and width not less than height has been proposed.

Table 5.1 Alternative Technology Analysed

S.No	Activity involved in mining Operation	Technology	Impact
1.	Cutting	Burner Cutting	Adverse level of Noise
		Wire saw Cutting	No adverse impact to environment
2.	Drilling	Manual Drilling using jack hammer	Dust emission and Noise
		Wet drilling	Negligible dust emission
		Tamrac – Machine Drilling	Negligible dust emission and Noise
		Wagon Drill	Dust emission and Noise
		LD Bore	Dust emission

		PRD Drilling	Negligible dust emission
3.	Blasting	Conventional Blasting	Noise
		Muffle Blasting	Mininmal Noise impact
		Rock Breaking Powder or Expansive Mortar for secondary breaking	Negligible impact on noise

6 ENVIRONMENTAL MONITORING PROGRAMME

6.1 General

The mitigation measures suggested in **Chapter 6** will be implemented so as to reduce the impact on the environment due to the operations of the project. The monitoring schedules are planned for systematic study of various pollution levels with respect to air and water qualities, noise levels, etc. to ensure that they conform to the standards laid down by Environmental Protection Act and various Central and State Pollution Control Board Limits. The various methodologies and frequency of studies of all environmental quality parameters also conform to norms laid down by MOEF, CPCB and SPCB in this respect.

The Project proponent of quarry will be overseeing/reviewing following activities:

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

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

6.2 Monitoring Schedules for Various Environmental Parameters

The proponent shall adopt the following monitoring schedule for environmental parameters. However, based on the need and priority it may be suitably modified / improved. However, since the proponents are different, monitoring, fulfilling of all the statutory obligations and maintaining records are to be carried out separately by the proponents.

6.3 Post Project Environmental Monitoring

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

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

Table 6-1 Post Project Environmental Monitoring Program

S. No	Area of Monitoring	Number of Sampling Stations	Frequency of Sampling	Parameters to be Analyzed
1.	Meteorology	At mine site before start of Air Quality Monitoring and IMD Secondary Data	Yearly once	Wind speed and direction, Temperature, Relative Humidity, Atmospheric pressure, Rainfall.
2.	Ambient Air Quality	2 Stations (In downwind)	Half yearly	PM_{10}, $PM_{2.5}$, SO_2, VOC and NO_2
3.	Noise	2 (two within plant premises and two outside plant premises)	Once every season	Ambient Equivalent continuous Sound Pressure Levels (Leq) at day and Night time.
4	Exhaust from DG set	Stack of DG set	Quarterly	PM_{10}, $PM_{2.5}$, SO_2 & CO
5	Vehicular Emissions	Parking area	Periodic monitoring of vehicles	Air emission and noise, PCU
6	Solid waste / Hazardous waste	Check conformance to HWM rules	Quantity and Quality monitoring	Physical state, Paint Filter Liquid test (PFLT), Loss On Drying (LOD), Loss On Ignition & Calorific Value.
7	Soil	Two Locations within the Project Site	Yearly Once	Physico chemical properties, Nutrients, Heavy metals
8	Terrestrial Ecology	Within 10km, around the project	Once in three years	Symptoms of injuries on plants
9	Surface/ Ground water quality	Two Locations Within Project Site	Yearly Once	As per ISO 10500 Standard parameters

Occupational Health and Safety

- Occupational health survey of staff and permanent workers will be undertaken at least once in 3 years to detect early incidence of diseases and for prompt remedial medical follow up in the matter. Audiometric test for the workers will be done at regular interval for workers of the noise prone area. Safety matters also will be reviewed periodically by safety in-charge.

- Occupational health and safety is very closely related to productivity and good employer-employee relationship. The main factors of occupational health in mines are fugitive dust and noise. Safety of employees during blasting operation and maintenance of mining equipment and handling of explosive materials is to be taken care of as per the Mine Regulations, 1961 and Circulars of DGMS. To avoid any adverse effects on the health of workers due to dust, heat, noise and vibration, sufficient measures have been proposedin the EMP. These include
    - Provision of wet drilling /or dust collectors
    - Provision of rest shelters for mine workers with amenities like drinking water, fans, toilets etc.
    - Provision of personnel protection devices for the workers
    - Rotation of workers exposed to high noise areas
    - Closed control room in crusher house with proper ventilation
    - First-aid facilities

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

6.4 Environmental Monitoring Programme

Table 6-2 Environmental Management Plan

S. No	Salient Items	Proposals as per proposed mining plan period
1	Top Soil storage preservation and utilization	The recovered interstitial soil from the mine will be used for Planting trees and growing vegetation.
2	Land Reclamation	Proposed not to backfill the mine-pit, and will be left as its condition
3	Waste Dump Management	Proposed to stack the waste in the inner boundary of the lease hold area all along the southern boundary of the field and may used to grow plants.
4	Afforestation Program with precautions for survival and protection of plantation.	Proposed to cover an afforestation 20 plants per year is proposed with the survival rate of 50%

5	Quality of mine water and any interference with surface waters pruces	The proposal for the Confinement of waste dumps arranged to prevent the interference of surface water sources and thus the quality of mine water is good.
6	Fly rock fragments And precautions	Proposed to follow up low explosives detonating cord can be used to avoid fly rock. Fly rock will be avoided by deploying diamond wire cutting method.

7 ADDITIONAL STUDIES

7.1 Introduction

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

1. Public consultation
2. Enumerate the aspects of Violation
3. Quantification of Damage Assessment
4. NaturalResources, Ecological Damage &Remediation Plan and Cost
5. Natural &Community Resource Augmentation Plan
6. Community ResourceAugmentation Plan breakup
7. Risk assessment /Disaster Management Plan
8. Mine closure plan
9. Occupational Health and safety studies have been conducted and a safety plan was prepared.

7.1.1 Public Consultation

The project is categorized 'B' category as per EIA Notification 2006; As per MoEF & CC Office Memorandum, dated 3rdJune 2009; EIA Notification, 2006 exempted from undertaking public hearing in existing projects.

However, the project falls under violation category, Public Hearing is Mandatory for violation projects. So, EIA report has been prepared as per the obtained violation The proposal was appraised under violation category during 395th SEAC meeting held on 27.07.2023 and 645th SEIAA meeting held on 09.08.2023 and recommended for violation ToR. ToR issued vide Lr. No. SEIAA-TN/F.No3888/SEACToR-1533/2023 dated 09.08.2023 for the preparation of EIA/EMP report with ecological damage assessment, remediation plan, natural resource augmentation plan and community resource augmentation plan. for Public Hearing (PH) to Villupuram PCB.

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

7.2 Risk Identification & Management

7.2.1 Introduction

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

- Identification of potential hazard areas
- Identification of representative failure cases
- Visualization of the resulting scenarios in terms of fire (thermal radiation) and explosion
- Assess the overall damage potential of the identified hazardous events and the
- impact zones from the accidental scenarios
- Assess the overall suitability of the site from hazard minimization and disaster mitigation point of view
- Furnish specific recommendations on the minimization of the worst accident Possibilities
- Preparation of broad DMP, On-site and Off-site Emergency Plan, which includes
- Occupational Health and Safety Plan.

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

- Accident due to explosives
- Accident due to heavy mining equipment; and
- In order to take care of above hazard/disasters, the following control measures will be adopted.
- All safety precautions and provisions of the Mine Act, 1952, the MMR 1961 and the Mines Rules, 1955 will be strictly followed during all mining operations
- Entry of unauthorized persons will be prohibited
- Fire fighting and first-aid provisions in the mines office complex and mining area;
- Provisions of all the safety appliances such as safety boot, helmets, goggles etc. will be made available to the employees and regular check for their use

- Training and refresher courses for all the employees working in hazardous premises; Under mines rules all employees of mines will have to undergo the training at a regular interval
- Working of mine, as per approved plans and regularly updating the mine plans;
- Cleaning of mine faces will be regularly done
- Handling of explosives, charging and blasting will be carried out by competent persons only.
- Provision of magazine at a safe place with fencing and necessary securityarrangement
- Regular maintenance and testing of all mining equipment as per manufacturer's guidelines.
- Suppression of dust on the haulage roads
- Adequate safety equipment will be provided at explosive magazine
- Increasing the awareness of safety and disaster through competitions, posters and other similar drives.
- For any type of above disaster, a rescue team will be formed by training the mining staff with specialized training.

7.2.2 Identification of Hazards in Open Cast Mining

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

- Drilling
- Blasting
- Overburden handling
- Heavy Machinery

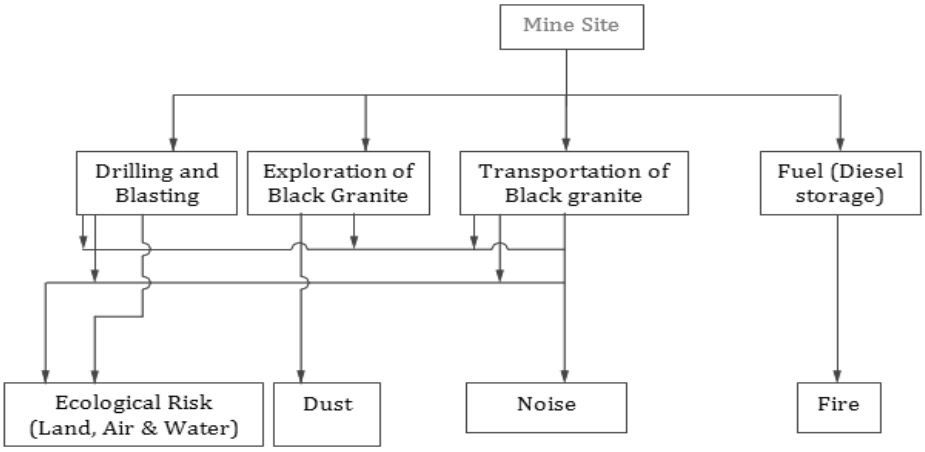


Figure 7-1 Identification of Hazards in Opencast Mine

7.2.3 Drilling

Drilling is an important activity in mining. This activity releases particulate matter into the air and noise in the vicinity of the operation. The particulate matter/dust can be arrested by employing dust extractor, wet or dry type. The usage of standard drill bits also reduces the dust formation. The noise is also arrested by the usage of dust extractors. The compressors which feed the compressor air to the drilling jack hammers can be covered in acoustic enclosures which reduce the dust and noise.

The hard strata will be excavated after drilling and blasting. Drilling will be done with jack hammers up to 1.2 to 1.5 m depth having a diameter of 30-32 mm.

7.2.4 Blasting

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

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

7.2.5 Precautionary Measures to Avoid Accidents Due to Blasting

- The provisions laid down in the MMR 1961 related to Blasting shall strictly be followed. However some of the main provisions are written here
- The blasting will be done under supervision of blaster/mine mate/mine foreman/mine manager
- Shots shall not be fired except during the hours of daylight.
- The holes charged onany particular day shall be fired on the same day.
- Adequate blasting shelters or other protection shall be provided at mines.
- The shot-firer shall give sufficient warning by effective signals over the entire area falling within a radius of danger zone.
- Multi-shot exploder shall be used. A shot-firer will fire maximum 120 Shots.

- During the approach and progress of electrical storm, adequate precautions shall be taken.

7.2.6 Overburden Handling

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

7.2.6.1 Heavy Machinery

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

Precautionary Measures to Prevent Accidents due to Trucks and Dumpers

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

7.2.6.2 Storage of Explosives

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

7.2.6.3 Safety Measures at the Mine site

- Adequate care has been taken in deciding the size of the bench for the working pit.

- The benches are properly sloped at an angle of 70 degree to avoid any spillage of benches.
- Adequate drainage system at the top of the pit and also on the benches shall be made to prevent erosion of the benches.
- The quarries will be protected by garland drains around the periphery for stormwater drainage.

7.3 Disaster Management Plan

The disaster management plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities. For effective implementation of the disaster management plan, it should be widely circulated and personnel training through rehearsals/drills. The objective of the disaster management plan is to make use of the combined resources of the mining operation and the outside services to achieve the following:

- Effect the rescue and medical treatment of casualties
- Safeguard other people
- Minimize damage to property and the environment
- Initially contain and ultimately bring the incident under control
- Identify any dead
- Provide for the needs of relatives
- Provide authoritative information to the news media
- Secure the safe rehabilitation of affected area
- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the emergency
- In effect, it is to optimize operational efficiency to rescue rehabilitation and render medical help and to restore normalcy.

7.3.1 Emergency Organization (EO)

It is recommended to setup an emergency organization. A senior executive (Mine Manager) who has control over the affairs of the mine would be heading the emergency organization. He would be designated as site controller. As per the general organization chart, in the mines, the Mines Foreman would be designated as the Incident Controller (IC). The incident controller would be reporting to the site controller.

Emergency coordinators would be appointed who would undertake the responsibilities like fire fighting, rescue, rehabilitation, transport and provide essential and support services.

7.3.2 Emergency Communication (EC)

Whoever notices an emergency situation such as fire, growth of fire etc. would inform his immediate superior and Emergency Control Centre (ECC). The person on duty in the emergency control centre would appraise the site controller. Site Controller verifies the situation from the incident controller of that area or the Shift In-charge and takes a decision about an impending on site emergency. This would be communicated to the entire incident controllers, emergency coordinators. Simultaneously, the emergency warning system would be activated on the instructions of the site controller.

7.3.3 Emergency Coordinator - Medical, Mutual Aid, Rehabilitation, Transport and Communication

- Organizes medical treatment to the injured and if necessary will shift the injured to nearby hospitalsMobilizes extra medical help from outside, if necessary
- Keeps a list of qualified first aiders of the factory and seek their assistance
- Maintains first aid and medical emergency requirements
- Makes sure that all safety equipment are made available to the emergency team.
- Assists Site Controller with necessary data and to coordinate the emergency activities
- Assists Site Controller in updating emergency plan, organizing mock drills
- verification of inventory of emergency facilities and furnishing report to SiteController maintains liaison with Civil Administration
- Ensure availability of canteen facilities and maintenance of rehabilitation centre
- Liaison with Site Controller/Incident ControllerEnsure transportation facility
- Ensures availability of necessary cash for rescue/rehabilitation and emergency expenditure. Controls rehabilitation of affected areas on discontinuation of emergencymakes available diesel/petrol for transport vehicles engaged in emergency operation.
- He would assist Site Controller and Incident Controller
- Maintains essential services like Diesel Generator, Water, Fire Water, power supply for lighting. Gives necessary instructions regarding emergency electrical supply, isolation ofcertain sections etc. to shift in-charge and electricians
- Ensures availability of adequate quantities of protective equipment and other emergency materials, spares etc.

In order to handle disaster/emergency situations, an organization chart entrusting responsibility to various project personnel exists with their specific roles during emergency.

The possible composition of the management team shall be:

- Mines foreman
- Mine mate
- Senior most operator(communication)
- Operator(Medical Coordination

7.3.4 Emergency Services

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

1. Fire Protection System
2. Off Site Emergency Plan

7.3.5 Fire Protection System

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

7.3.6 Off-Site Emergency Plan

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

7.3.7 Water Quality Management

Average ground water table in the region indicates availability at a depth 14m from ground level. The average water level fluctuations between pre-monsoon and monsoon season is around 1.5 m and the gradient of water table normally follows the surface slope and is from west to east directions.The ground water quality in the region indicates neutral range with pH values ranging from 6.6 to 8.3. Most of the analytical results for ground and surface water showed parameter concentrations well within the permissible limits.Garland drains will be provided all along the periphery of the mining pit and along the toes of the side burden dumps. These drains will be aligned in such a way that all the surface drainage water will be carried away from the mining zone to settling tanks.The mining pit's catchment water will be

coursed to the main sump and used for dust suppression and green belt development & plantation activities.

7.3.8 Mines Seepage Water

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

7.3.9 Air Quality Management

Ambient air quality was monitored twice in a week for One (01) season (shall cover 12 weeks), i.e. during Pre-Monsoon season (March 2023-May 2023). PM_{10}, $PM_{2.5}$, SO_2, NO_x, Pb, NH_3, C_6H_6, $C_{20}H_{12}$, As, Ni, were monitored. Sampling was carried out as per Central Pollution Control Board (CPCB) monitoring guidelines at each location.

The following precautions havebeenconsideredorabatementofairpollutionin theblack granite mine area:

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

7.3.10 Solid waste Management

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

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

7.3.11 Stabilization of Dump

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

7.3.12 Top Soil Management

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

7.3.13 Disposal of Mining Machinery

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

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

7.3.14 Other Infrastructure

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

7.3.15 Safety & Security

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

8 PROJECT BENEFITS

- The quarrying activities in this belt will benefit to the local people both directly 30and indirectly 20 persons.
- The direct beneficiaries will be those who get employed in the mines as skilled and unskilled workers.
- Improvement in Per Capita Income.
- The socio - Economic conditions of the village and distance will enhance due to the project, hence the project should be allowed after considering all the parameters.
- It can thus be concluded that the project is environmentally compatible, financially viable and would be in the interest of construction industry thereby indirectly benefiting the masses.
- **CER activity** :

  TAMIN is proposing for following list of activities for the Siruvaliai Government Higher Secondary School for Rs.4.0 Lakhs. Based on O.M F.No. 22-65/2017-IA.III 2.0% of the Project Cost need to be spent for CER activities i.e., Rs. 2.0 Lakhs need to be spent for the CER activity. However TAMIN proposing for Rs. 4.0Lakhs.

Table 8-1 Proposed CER activity

S.No	CER Activities for Siruvalai Government Hr. Secondary School	Amount in Lakhs
1.	Developing Drinking water facility within the school premises	1.0
2.	Toilet facilities for Government School	2.0
3.	Providing Library facility	0.5
4.	Greenbelt development within the school premises	0.5
	Total	**4.0**

9 ENVIRONMENTAL COST & BENEFIT ANALYSIS

(Not recommended during scoping)

10 ENVIRONMENTAL MANAGEMENT PLAN

10.1 Description of the administrative aspects of ensuring that mitigative measures are implemented and their effectiveness monitored, after approval of the EIA Management Plan

The Environmental Management Plan for Siruvalai Black Granite Quarry identifies the principles, procedures and methods that will be used to control and minimize the environmental imapocts for the proposed project.

10.2 EMP Structure and Organisation

10.3 Environment Policy of TAMIN

M/s. Tamil Nadu Minerals Ltd, believes that good safety, Health & Pollution control practices contribute to individual well-being and organization morale. Our commitment to Safety, Health and Environment stretch beyond statutory obligations and we are committed to manage and continually improve the overall safety, Health and Environmental performance.

We M/s Tamil Nadu Minerals Ltd are committed to ensure that:

- We develop safe working methods and practices, with as objective of no injuries and accidents at the work place and provide a safe work place for our employees, contractors and other who perform their duties. We shall provide adequate Health care to our employees, and create processes to reduce the adverse effect of the operations on the health of the employees.
- We provide safety appliances and continuous training in safety to our employees and contract workmen to ensure safe production and achieve the target of zero accidents. We are committed to supporting actions aimed at increase in employees' safety outside work hours.
- We protect the environment by control and prevention of pollution and promote green environment.
- We continuously evaluate and improve our conduct and carryout regular audit, analysis and studies to eliminate potential concerns and continuously improve upon our Safety, Health and Environmental standards.
- We communicate our Safety, Health and Environmental Policy to all our employees' contractors and to the public for better understanding and practice.
- Management has knowledge of relevant issues regarding Safety, Health and Environment and provides a foundation for setting objectives and targets.

Management shall fulfill its responsibility to inform, educate and motivate employees and others to understand and comply with this policy and applicable laws.

- M/s. Tamil Nadu Minerals Ltd shall use its resources in order to live up to this policy and thereby promote our business.

Besides, the company has formulated well-planned and integrated Environmental policies as shown below:

M/s Tamil Nadu Minerals Ltd is committed to welfare and development needs of the society around it.

- All rules and conditions prescribed in the Indian Mines Act, Metalliferrous Mines Regulation etc., will be adopted to ensure risks-free and safe mining operations. All personal protective devices supplied to workers and staff should be used while they work in the mines and any violation in this respect will be dealt with inflict of warnings first, followed subsequently by punitive punishments including fines and ultimately dismissal, if repeated continuously.
- Any infringement / violation of any rule or unsafe mining operations should be reported to Mines Manager / Mine Foremen /Mine Mate/ Blaster who will take immediate corrective measures for avoiding major disasters. The report will ultimately reach the Board of Directors through upwardly hierarchical communicative channels from the lowest level to superior levels in quick time bound duration.
- The Agent and the Mines Manager should exercise overall control over entire mining and connected operations and all infringements / violations on any count pertaining to unsafe operations, environmental degradation, etc., should be brought to the notice of the Board of Directors. Remedial measures for such violations and deviations should be taken by the Mines Manager to avoid any hazards or disasters in the mine and nearby areas. The persons responsible for such violations will be punished through appropriate disciplinarily penal actions.
- The EC conditions and stipulations will be strictly followed by all supervisory staff of the mine, and will co-ordinate in various issues like prescribed environmental monitoring schedules, vibration monitoring studies during blasting, green belt development, management of dumps etc.
- Penal actions will be taken by the company in cases of continuous negligence resulting in violations deviations in this respect.
- A time schedule of once in 15 days for review of all operational factors as mentioned above is in force, for proper and quick corrective actions. Hierarchical System of the TAMIN is shown in **Figure 10-1**

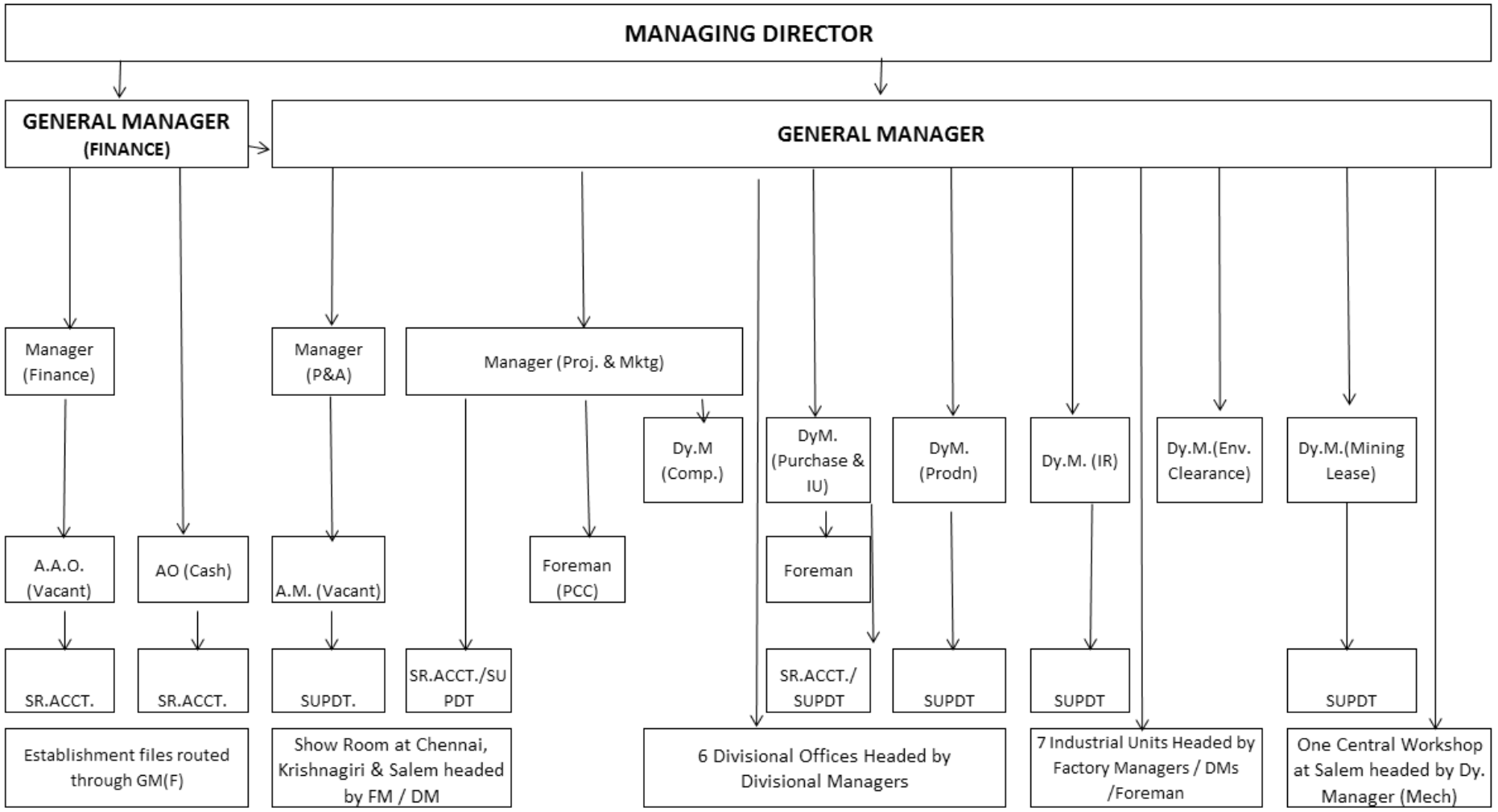


Figure 10-1 Hierarchical System of the TAMIN

10.3.1 Control Measures

10.3.2 Air Quality Management

Quarrying operations involves open cast semi mechanized method, but there is involvement of labours too. Dust would be generated during the course of over burden removing, drilling, mining, hauling, handling and transportation of the material. Dust is likely to be generated from emissions of diesel vehicles such as SO_2, NOx etc.

10.3.2.1.1 Emission Source Identification

The emission sources related to mining operation includes, overburden operations, drilling, conveying, washing, drying, hauling, loading and unloading stock piles.

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

10.3.2.1.2 Measures for dust suppression

Water will be sprinkled for suppression of air dust on mine haulage roads. Drilling of blast holes of 32 mm dia always under wet condition to prevent flying of dust and drillers will use respirators in accordance with mines regulations. In the unloading point of tippers, water will be sprinkled.

10.3.2.1.3 Emissions from Material Handling

PM emissions occur during the handling and transfer operations of material from one process to another within the facility.Open storage piles of raw material and products are generated at various points throughout the operational area.

The environmental control measures, which are being taken and proposed to control the fugitive dust released during the quarry production are given below:

- The working faces will be regularly wetted before carrying out the drilling and excavation.
- Dust masks will be provided to the workers especially for the drillers and for the workers working in the loading operations.
- Periodic health check up for the workers shall be done
- Plantation along approach roads and surrounding the quarry lease area.
- Water tankers with spraying arrangement will be used for regular water sprinkling on the haul roads to ensure effective dust suppression.

10.3.2.1.4 Haulage

- Haul road will be maintained regularly.

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

10.3.3 Noise Pollution Control

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

Equipment	Noise Level (dB (A))
Rotary Drills	72-100
Compressor (85m^3/min)	50-55
Rock buggy machine	110-115
Excavator	75-90
Diesel Tipper	74-109
Diesel Generator	80-94

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

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

10.3.4 Water Pollution Control Measures

Surface Water

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

Mine Drainage Water

During the five years sheet rock will be mined. During this period of the lease, quarrying will go to the depth of 24 meters below ground level including 12m thick overburden from the present level. Mine water will be used in mechanized cutting of the blocks and for wetting purpose.The runoff from the dumps will be channelized and care will be taken.

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

10.3.5 Land Environment

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

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

10.3.6 Top soil management

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

10.3.7 Solid Waste Management

The solid waste that is likely to be generated during the quarry activity will be stacked along the lease barrier according to their quality and size. Irregular large size rocks of different size will be

cut.The remaining waste material will be dumped at separate lease area acquired by applicant at outside the quarry lease area. This waste rock pieces will be used as road metal or building material. All the care will be taken to minimize the waste generation at the source.

- The overburden is dumped inside the mining area to stabilize slopes and reclaim low lying areas within the mine. Top Soil recovered will be used in the green belt areas on the Southern side of the lease area.
- Top Soil recovered will be used in the green belt areas on the boundary of the mine site.
- Top soil will be removed & Stored on the inner boundary of the mining lease area. To improve its quality, soil stabilizers shall be mixed and leguminous plantation will be done over these stacks.
- The solid waste that is likely to be generated during the quarry activity will be stacked along the lease barrier according to the mining plan.
- All the care will be taken to minimize the waste generation at the source.

10.3.7.1 Stabilization of Dumps

The dumps are mainly constituted of quarry waste with soil. It will be afforested properly to stabilize the dumps and preserve soil character. Further ends will be properly subjected to vegetation by growing some bushes and shrubs. Garland canal also will be dug around the dump.

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

10.3.7.2 Measures to be adopted for Solid Wastes Management

From the waste generated if any are separated and kept at the dump site. It is supplied to crushing plants and is used as road metal. The left out waste will be used for back filling the quarry which will be covered with soil added with soil conditioners and quarry will be reforested.

10.3.8 Biological Environment

As in any typical Ligneous rocks deposit, there is no tree growth on the area, but grass shrub and bushes grow sparsely. No wildlife is found in quarry Lease area. In order to minimize the impacts and to improve up on the existing eco system afforestation plan will be envisaged.

- As in any typical intrusive igneous rocks deposit, there is no tree growth on the area, but grass shrub and bushes grow sparsely.

- In order to minimize the impacts and to improve up on the existing eco system afforestation plan will be envisaged.
- No wildlife is found in quarry Lease area.

10.3.9 Granite Conservation and Development

The mining plan proposed has fully covered the aspects of granite conservation with a future plan to extend the proposed working of the mine to the full depth of the deposit. Extreme care is being taken to ensure proper supervision of quality control of the granite dimensional stone aimed at the recovery of the maximum saleable quantity / quality of granite dimensional stones suitable for full utilization of the consumers.

10.3.10 Afforestation Plan

The main aim of the plantation of the mined out areas is to stabilize the area to protect it from rain, wind erosion, improve the aesthetics and support the re-creation of bio-diversity. For this purpose mined out area will be reclaimed by backfilling and afforested at post mining stage.

- Afforestation will be taken up along the lease area.
- In the proposed mining plan period 30 plants per year is proposed to be planted for complying Afforestation program with the arrived survival rate of 50% in the south eastern portion of the lease area in the phased manner.
- Only Shrubs and bushes are seen in the quarry Lease area.

10.4 Occupational Health & Safety Measures

Granite stonedoes not contain any toxic elements. Further this being a mechanized mine, production is by mechanized means and waste material handling partly by mechanized way, there shall be marginal impact on air and noise qualities. Therefore, the possibilities of any health hazards are minimal.

- Awareness and planning are keys to prevention of occupational health hazards.
- Conducting air monitoring to measure worker exposures and to ensure that provided controls are adequate for protection of workers.
- Adequate respiratory protection will be provided to the workers.
- Periodic medical examinations for all workers.
- Provide workers with training that includes information about health effects, work practices, and use of protective equipments.

10.5 Socio-Economic Benefits

Granite Quarry project is not going to have any negative impact on the social or cultural life of the villagers in the near vicinity. The quarry activity will provide job opportunities, which will help them to develop economically.

Granite quarry will be done with the vision of leaving a positive impact on socio-economics of people living in the nearby villages. A first-aid centre to meet the basic medical needs of employees will be provided.

Employment potential

Around 30 people directly and 20 people indirectly employed including material suppliers, outside workshops, unit supported industries. Local villagers residing in the nearby villages shall be employed as semi-skilled workers.

Care and Maintenance during Temporary Discontinuance

All the provisions as per the Mines Act 1952 and Rule17 of GC & DR 1999 shall be strictly adhered during temporary discontinuation.

Safety and Security

At the end of quarry operations, the total area excavated will be fenced properly with single opening for workers engaged in closure plan work.

10.6 Budget for Environmental Protection

It is necessary to include the environmental cost as a part of the budgetary cost component. Total of Rs 2,05,000/- allocated for environmental protection activities. Environmental Management cost is given in

Table 10-1.

Table 10-1 Environmental Monitoring Cost

Parameters	Mitigation Measure	Capital cost (INR)	Recurring Cost
Air Environment	Compaction, gradation and drainage on both sides for Haulage Road	2,02,800	2,02,800
	Fixed Water Sprinkling Arrangements + Water sprinkling by own water tankers	0	50,000

	Air Quality will be regularly monitored as per norms within ML area & Ambient Area	-	40,000
	Muffle blasting – To control fly rocks during blasting	-	10,000
	Wet drilling procedure / latest eco-friendly drill machine with separate dust extractor unit	25,000	2500
	No overloading of trucks/tippers/tractors	-	5,000
	Stone carrying trucks will be covered by tarpaulin	-	10,000
	Enforcing speed limits of 20 km/hr within ML area	0	1,000
	Regular monitoring of exhaust fumes as per RTO norms	0	5,000
	Regular sweeping and maintenance of approach roads for at least about 200 m from ML Area	-	8,11,200
	Installing wheel wash system near gate of quarry	50,000	20,000
Noise Environment	Source of noise will be during operation of transportation vehicles, HEMM for this proper maintenance will be done at regular intervals.	0	4,80,000
	Oiling & greasing of Transport vehicles and HEMM at regular interval will be done	0	10,000
	Adequate silencers will be provided in all the diesel engines of vehicles.	0	10,000
	It will be ensured that all transportation vehicles carry a fitness certificate.	0	0
	Safety tools and implements that are required will be kept adequately near blasting site at the time of charging.	0	10,000
	Line Drilling all along the boundary to reduce the PPV from blasting activity and implementing controlled blasting.	0	50,000

	Proper warning system before blasting will be adopted and clearance of the area before blasting will be ensured.	0	50,000
	Provision for Portable blaster shed	50,000	5,000
	NONEL Blasting will be practiced to control Ground vibration and fly rocks	0	30
Water Environment	Water management	2,02,800	5,000
Waste Management	Waste management (Spent Oil, Grease etc.,)	50,000	5,000
	Bio toilets will be made available outside mine lease on the land of owner itself	60,000	0
Implementation of EC, Mining Plan & DGMS Condition	Size 6' X 5' with blue background and white letters as mentioned in MoM Appendix II by the SEAC TN	2,500	1,000
	Workers will be provided with Personal Protective Equipment's	1,20,000	30,000
	Health check up for workers will be provisioned	0	30,000
	First aid facility will be provided	16,000	0
	Mine will have safety precaution signages, boards.	5,000	1,000
	Barbed Wire Fencing to quarry area will be provisioned.	40,56,000	10,000
	Construction of Green mesh along with wire fencing around the lease area	1,00,000	20,000
	No parking will be provided on the transport routes. Separate provision on the bottom of the hill will be made for vehicles /HEMMs. Flaggers will be deployed for traffic management	50,000	50,000
	Installation of CCTV cameras in the mines and mine entrance	10,000	5,000

	Implementation as per Mining Plan and ensure safe quarry working	0	7,80,000
Green Belt Development	Green belt development - 300 trees per one hectare	60,000	9,000
		90,000	9,000
Total		**51,50,100**	**27,27,530**

S.No	Environment Aspects for Budget Allocation	Capital Cost	Recurring Cost
1.	Air Environment	2,77,800	11,57,500
2.	Noise	50000	6,15,030
3.	Water Environement	2,02,800	5,000
4.	Waste Management	1,10,000	5,000
5.	Implementation of EC, Mining Plan & DGMS Condition	43,59,500	9,27,000
6.	Greenbelt	1,50,000	18,000
	Total	**51,50,100**	**27,27,530**

10.7 Corporate Environmental Responsibility

TAMIN will allocate INR 2 Lakhs i.e (2% of project cost) towards for CER activities will be implemented as per MoEF&CC O.M dated 1st May 2018 (F.No. 22-65/2017-IA.III).

11 SUMMARY & CONCLUSION

11.1 Background

The extent area of the quarry "Proposed Siruvalai Black Granite Quarry" is 20.28.0 Ha at S.F.No.170/1 (Part) at Siruvalai Village, Vikravandi Taluk, Villupuram District, Tamil Nadu State. The project falls under B1 Category, Schedule 1(a) Mining of Minerals as per EIA Notification dated 14th September 2006 and its subsequent amendments. The ToR application was submitted under violation (Category B1, Schedule 1(a)) at TN-SEIAA vide proposal No.SIA/TN/MIN/435461/2023 & File No.SEIAA-TN/F.No.3888/2023. and ToR was obtained under Violation category vide Lr No. SEIAA-TN/F.No.3888/SEAC/ToR-1533/2023 dated: 09.08.2023. As per issued ToR the Draft EIA report and the darft EIA report has been prepared and will be submitted to Tamil Nadu Pollutiion Contorl Board for Public Hearing after obtaining the Public Hearing Minutes the final EIA will be submitted for the appraisal of the proposed project in Tamil Nadu SEAC /SEIAA.

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

11.2 Baseline Study

11.2.1 Ambient Air Quality

The ambient air quality has been monitored at 8 locations for 13 parameters as per CPCB guidelines within the study area. The average baseline levels of PM10 is 28.27 to 53.82 µg/m³, PM2.5 is 16.80 to 32.29 µg/m³, SO2 is 5.44 to 9.29 µg/m³, NO2 is 10.87 to 18.59 µg/m³ all the parameters are well within the National Ambient Air Quality Standards for Industrial, Commercial and Residential areas at all monitoring locations during the study period.

11.2.2 Noise Environment

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

- In Industrial area (Project site), day time noise level was about 57.7 dB (A) and 49.3 dB(A) during night time, which is within prescribed limit by CPCB for Industrial area (75 dB(A) Day time & 70 dB(A)Night time).
- In Residential area day time noise levels varied from 51.9 dB (A) to 53.8 dB (A) and night time noise levels varied from41.4dB(A) to 43.8dB(A) across the sampling

stations. The field observations during the study period indicate that the ambient noise levels in Residential area are within the limit prescribed by CPCB for Residential area (55 dB (A) Day time & 45 dB(A) Night time).

11.2.3 Water Environment

The prevailing status of water quality at 08 locations for surface water and 8 locations for ground water have been assessed during March 2023 to May 2023.The standard methods prescribed in IS were followed for sample collection, preservation and analysis in the laboratory for various physiochemical parameters.

11.2.4 Surface water quality

Water sampling results are compared with Surface water standards IS 2296:1992.

- pH in the collected surface water samples varies between 7.23 to 8.21.
- The Total Dissolved Solids range from 269 mg/l to 449 mg/l.
- The Total hardness ranges between 156 mg/l – 237 mg/l.
- BOD values varying from 2 to 4 mg/l. COD varies from 16 to 24 mg/l.
- The concentration of heavy metals like As, Cd, Cr, Pb, Mn, Hg, Ni and Se are within the limits of IS 2296:1992.

11.2.5 Ground Water Quality

A summary of analytical results are presented below:

- The average pH ranges from 6.94-7.78.
- In the present findings the TDS value varied from 491 mg/l to 692 mg/l for the ground water and for all samples it exceeds the acceptable limits but within permissible limits of IS 10500: 2012.The acceptable and permissible limit of TDS for drinking water is 500 mg/l and 2000 mg/l.
- The Total hardness ranges between 232mg/l – 479 mg/l for ground water and for all samples it exceeds the acceptable limit but is within permissible limits of IS 10500: 2012..
- The concentrations of Chloride in the collected ground water sample ranges from 160.23 to 248.24 mg/l.
- The concentrations of Sulphate in the collected ground water sample ranges from 44.2 to 138.5 mg/l.

11.2.6 Land Environment

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

Summary of analytical results

- The pH of the soil samples ranged from 6.84 to 7.74.
- Conductivity of the soil samples ranged from 249 to 378 µS/cm.
- Nitrogen content ranged from 91.8 mg/kg to 112.5mg/kg.
- Phosphorous ranged from 12.5 mg/kg to 19.9 mg/kg.
- Potassium ranged from 55.9 mg/kg to 75.4 mg/kg.

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12 DISCLOSURE OF CONSULTANTS

In order to assess the potential environmental impacts dueto the proposed project at Survey. 170/1(Part), Siruvalai Village, Vikravandi Taluk, Villupuram District, Tamil Nadu State to undertake EIA study.The nature of consultancy service rendered covers terrestrial environmental assessment.

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

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

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

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

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

12.2 Strengths of HECS

Number of Employees

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

12.3 QCI-NABET - EIA Accreditation

Consultancy	Hubert Enviro Care Systems Pvt. Ltd., Chennai
NABET Certificate No	NABET/EIA/24-27/RA 0335, valid up to 31.03.2027
MoEF Reg. Lab	F.No. Q-15018/13/2016-CPW

भारतीय गुणवत्ता परिषद्
QUALITY COUNCIL OF INDIA
Creating an Ecosystem for Quality

NABET

National Accreditation Board for Education and Training

Certificate of Accreditation

Hubert Enviro Care Systems, Chennai

A-21, III Phase, Thiru Vi Ka Industrial Estate– 600032

*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 mining	1	1 (a) (i)	A
2.	Offshore and onshore oil and gas exploration, development & production	2	1 (b)	A
3.	River Valley projects	3	1 (c)	A
4.	Thermal power plants	4	1 (d)	A
5.	Mineral beneficiation	7	2 (b)	A
6.	Metallurgical industries (ferrous & non-ferrous)	8	3 (a)	A
7.	Cement plants	9	3 (b)	A
8.	Petroleum refining industry	10	4 (a)	A
9.	Pesticides industry and pesticide specific intermediates (excluding formulations)	17	5 (b)	A
10.	Petro-chemical complexes	18	5 (c)	A
11.	Petrochemical based processing	20	5 (e)	A
12.	Synthetic organic chemicals industry	21	5 (f)	A
13.	Industrial estates/ parks/ complexes/areas, export processing Zones (EPZs), Special Economic Zones (SEZs), Biotech Parks, Leather Complexes	31	7 (c)	A
14.	Bio-medical waste treatment facilities	32A	7(d a)	B
15.	Ports, harbours, break waters and dredging	33	7 (e)	A
16.	Highways,	34	7 (f)	B
17.	Common Effluent Treatment Plants (CETPs)	36	7 (h)	B
18.	Common Municipal Solid Waste Management Facility (CMSWMF)	37	7 (i)	B
19.	Building and construction projects	38	8 (a)	B
20.	Townships and Area development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in RAAC minutes dated May 31, 2024, 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/ACO/24/3292 dated June 25, 2024. The accreditation needs to be renewed before the expiry date by Hubert Enviro Care Systems, Chennai following due process of assessment.

Issue Date
June 25, 2024

Valid up to
March 31, 2027

Mr. Ajay Kumar Jha
(Sr. Director, NABET)

Certificate No.
NABET/EIA/24-27/RA 0335

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.

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

13 DAMAGE ASSESSMENT REPORT

13.1 Enumerate the aspects of Violation

The Damage Assessment has been calculated for the proposed Siruvalai Black Granite Quarry over an extent of 20.28.0Ha for the period of operation of the quarry operated from 15.1.2016 to 10.1.2017 of violation period as per O.M F.No. 18-125/2019-IA.III Dated 5th March 2020. Based on the guidelines the Damage Assessment has been calculated on six following aspects.

1. Air Environment
2. Water Environment
3. Green Belt
4. Noise and Vibration ENvironment
5. Solid Waste Management
6. Land Environment

Also the economic benefits based on the turn over of the quarried quantity and the arrived Damage Cost. The penalty provision has been calculated based on the O.M F.No. 22-21/2020-IA.III Dated 07.07.2021.

13.2 Quantification of Damage cost

13.3 Air Environment

As per European Environment Agency Damage (in Indian currency @ Rs 80 per euro) per tonne emission estimates for PM10 in 2020 (2005 prices) for PM10, PM2.5, NO2 and SO2 are Rs. 17.02 lakhs, Rs. 26.21 lakhs, Rs. 4.79 lakhs and Rs. 8.25 lakhs respectively. These values are as per the assessment of EEA are updated upto 2020.

- For Indian conditions, damage cost / tonne can be reduced to 20% of the annual rate considered for UK/Europe since the cost of living / medical expenses are approximately 1/5th of the European cost on an average, accepting the fact that the density of population is much higher than European countries. In case of severely polluted areas/ cities, these damages cost can be considered @ 50% of the EEA Rates viz:
- Damage (@ 20% EEA Rate) cost Per Kg/day for PM10, PM2.5, NOx and SO2, at the 20% of EEA rates are as: PM10 – Rs. 340.00 per kg / day; PM2.5 – Rs 524.00 per kg / day; NOx – Rs. 96.00 per kg / day & SO2 – Rs. 165.00 per kg / day

Table 13-1 Damage (@ 20% EEA Rate) cost Per Kg/day

S.No	Parameters	For Emission Per Year (Rs. In lakhs)	Per day (Rs/Kg)	Per Kg/day (Rs.)
1.	PM_{10}	3.4	933.00/2.74	340
2.	$PM_{2.5}$	5.24	1436.00/2.74	524
3.	NO_X	0.96	263.00/2.74	96
4.	SO_2	1.96	452.00/2.74	165

13.3.1 Damage Assessment Calculation:

No of working days per year during violation period from 15.1.2016 to10.1.2017 is 320 days. The quantity of Black Granite Excavated during the violation period is given in the below Table 13-2

Table 13-2 Quantity Excavated

S.No	Type of Mineral	Excavated Quantity (CUM)	Depth (m)	
1.	Black Granite	347.016	Pit1 (North west)	4
			Pit 2 (North East)	10

13.3.2 Input Parameters for Damage Assessment Calculation for Air Environment

Vehicle:

Tipper – 5

4Wheeler – 1

DG:

DG Capacity – 250 kW

Table 13-3 Emission Factor Source

S.No	Activity	Reference
1.	Wet Drilling	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.
2.	Loading	
3.	Unloading	

4.	Haulage	
5.	Vehicle	ARAI- Automotive Research Association of India
6.	DG	AP-42: Compilation of Air Emissions Factors

13.3.3 Mining Activity Emission

Table 13-4 Mining Activity Emission

Mining Activity	Emission (Ton)			
	PM10	**PM2.5**	**SO2**	**Nox**
Line Source (Haul Road)	9.40E-04	5.64E-04	-	-
Area Source (Open Pit)	9.41E-01	5.65E-01	-	-
Area Source (Waste Dumping)	4.48E-05	2.69E-05	-	-
Point Source (DG)	2.85E-01	1.71E-01	2.65E-01	4.01E+00
Point Source (Drilling)	1.15E-06	6.92E-07	-	-
Point Source (vehicle)	8.00E-03	4.80E-03	-	-
Total(Ton)	**1.24E+00**	**7.41E-01**	**2.65E-01**	**4.01E+00**

13.3.4 Emission calculation References

- The drilling emission is calculated with the equation of Chakraborty, et al. (2002),
- The emission factors for the haul roads the equation from the literature Chaulya, (2006).
- Haul Roads &Waste dump emission calculated based on the literature Chakraborty, et al., (2002).
- Open pitEmission calculation as per the open pit estimation is another tool than the area source in AERMOD. (Neshuku, 2012).

Table 13.2 Quantification of Emissions due to quarry activities (violation period)

S. No	Emission details	Emissions quantity Tonne /Year	Total Emission quantity in kg
1	PM10	1.235	1235.38
2	PM2.5	0.741	741.23
3	SO_2	0.265	264.53
4	NOx	4.011	4010.67

Source for project activities: *Project proponent*

Table 13-5 Operation (from DG &Transportations Activities

S. No	Pollutant	Total generation from production carried(Kg)	Cost of damage Rate (Rs/Kg)	Total damage Amount (Rs)
1	PM10	1235.38	340	4,20,029.2
2	PM2.5	741.23	524	3,88,404.52
3	SO_2	264.53	165	4,3647.45
4	NOx	4010.67	96	3,85,024.32
Total				12,37,105.49

13.4 Water Environment

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

13.4.1 Water pollution

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

13.4.2 Environmental Compensation Ground Water (EC$_{GW}$)

The guidelines have proposed following formula for calculation of Environmental Compensation Ground Water (EC$_{GW}$):

EC$_{GW}$ = Water Consumption per Day x No. of Days x Environmental Compensation Rate for illegal extraction of ground water (EC$_{GW}$) Where water Consumption is in m_3/day and ECR$_{GW}$ in Rs. /M^3

As per CGWB, safe, semi-critical, critical and over-exploited areas are categorized from the ground water resources point of view (CGWB, 2017). List of safe, semi-critical, critical and over-exploited areas are available on the website of CGWB.

Sector wise damage assessment with respect to Ground water utilization without NOC shall be calculated as per the formula suggested by the guidelines

13.4.2.1 Industry and Mining sector

Total Quantity assessed by GEC 2015 and neither fully or nor partially governed / managed by the industry / mining sectors, the damage cost will be as following

Table 13-6 Industry and Mining Sector Ground Water Consumption Damage Cost

Level Category	Water consumption M^3 day			
	<200	200 to <1000	1000 to <5000	>5000
	Damage cost in Rs/M_3			
Safe	15	21	30	40
Semi-Critical /	30	45	60	75
Critical	45	60	85	115
Over Exploited	60	90	120	150

13.4.3 Environmental Compensation Surface Water (EC_{SW})

Total Quantity assessed by GEC 2015 and neither fully or nor partially governed / managed by the industry / mining sectors, the damage cost will be as following:

Table 13-7 Compensatory Cost of Surface Water

Level Category	Water consumption M^3 day			
	<200	200 to <1000	1000 to <5000	>5000
	Damage cost in Rs/M_3			
Safe	10	15	20	25
Semi-Critical / Critical	20	30	40	50
Over Exploited	40	60	80	100

Working:

- Source of water: Private Tankers (Ground Water)
- Water Requirement per day: 1.5 KLD (1.5 m^3)
- No of Days: 320
- Level Category of Project Location: Over Exploited(Source: CGWB)

Table 13-8 Water Consumption Calculation

Year	Water Consumption for production KL/A	Damage cost per KL	Cost (Rs)
15.1.2016-10.01.2017	480	60	28,800
Total			28,800

Note:1. *The water consumption is taken for total violation period of 1 year from 15.01.2016-10.01.2017*

13.4.4 Sewage Generation Calculation:

Input Parameters:

Sewage Generation: 0.4 KLD No of working days: 320

Table 13-9 Analysis of damage cost from Effluent & Sewage Generation

Year	Sewage (Quantity in KL/A)	Damage cost per KL(Rs.)	Total (Rs)
15.01.2016-10.01.2017	*128*	50	6400
	Total in Rs		6,400

13.5 Green Belt

13.5.1 Building & Infra Sector

- 3 Times the requirement as per norms to be planted in the neighborhood @ Rs.1100/Per Tree
- For every tree cut - 5 trees to be planted in the project/Boundary in other areas @ 1100/Per
- Tree In NCR for every tree cut - 10 trees to be planted in the project/Neighborhood @ 1100/Per Tree.

13.5.2 Mining & Other Industries

- Above 3 points also applicable to mining & other Industries and apart from that below points to be considered

- Green belt is to be provided all along the ML boundary for a minimum width of 7.5M and also in the safety zone @ 7.5M width besides provision of GB along the water courses at 50M boundary on either side. Plantation on Minimum active dumps and other non-operational areas.

- EAC will assess the non or partial provision of theses and compensation will be estimated for the gap quantity @1500 nos/Ha. In Case of Industry as min of 33% of the plot area is to be covered under GB and plantation. The environmental damage will be assessed accordingly @1500 plants/Ha for the deficiency.

Working:

Table 13-10 Tree Cutting Propobable Damage Cost

S.N	Probable Damage	Quantity	Cost of the damage	Total cost of damage Amount (Rs)
1.	Tree cutting	Nil	1,100 Rs per tree	-

The quarry Lease area is fully rocky terrain. The quarry is in operation since, 1998. As per proponent information there is no removal of trees. No tree cut has been done. Hence no damage cost is considered

13.6 Noise And Vibration Environment

- Noise Monitoring and impact must be assessed by proper modeling Damage Assessment: Based on the impact exceeding the threshold values on neighborhood and core zone, the project will be assessed
- Provision of PPE's to employees: Provision of PPE: Rs. 1000 / head x No. of employees
- Provision of Noise barrier, while the habitations are in close proximity: Perimeter x height = Sq.Mtrs x Rs. 400 / sq. Mtrs as damage cost / relative remediation by either providing barriers / Green belt to be affected.In case of non-provision of either partial/ full GB as required, the damage will be assessed as following:

GB = Three tier at Rs.1100/ per tree in case of NCR, Metropolitan cities and for others @ Rs.500 per tree

Working:

Table 13-11 Tree Shortfall

S.N	Probable Damage	Quantity	Cost of the damage	Total cost of damage Amount (Rs)
1.	Trees requirement for greenbelt development	As per CPCB 1500 trees/ha for greenbelt development Approximately 400 trees required.	Rs 500 per tree	2,00,000

13.7 Solid Waste Management

13.7.1 Infra/ Industry Sector

As per SWM Rules 2016, non-compliance/ partial compliance will be applicable for operating projects only. As per the industry average: cost of collection/ processing per house is Rs.12.00 per day for 4 persons and waste: 1.5-2.0 kg i.e Rs. 6.0 per kg per day for a colony of not less than 30000 to 100000 population. In construction stage for the workers, the overhead will be minimum of 4times per kg since to deal with minimum numbers and also it has to be carted to a distant place of availability. Hence it is taken as Rs.25/-per Kg.

13.7.2 Working -Operation Phase

No of Manpower: 35

Table 13-12 Organic and inorganic Waste Generation

S.No	Type	Quantity(Kg/day)	Disposal Method
1	Organic	9.45	Municipal bin
2	In Organic	6.30	TNPCB authorized recyclers
Total		**15.75**	

Table 13-13 Dasmage Cost for the quantity of generated solid waste

Probable Damage	Quantity	Cost of the	Total cost of damage Amount (Rs)
Solid waste Generation	15.75Kg/day	Rs.25/-per Kg	1,26,000
	Number of days worked – days		
	15.75x320 = 5040 kg		

There is no any additional Manpower incurred since we have not exceeded the approved production quantity (<33350Kg/A) in all days of violation period. Only the number of products has been exceeded against the EC approved products. So, there was no additional Municipal Solid Waste generation during the violation period (*15.01.2016-10.01.2017*).

In case of Hazardous Waste generation, the quantity generations are within the Hazardous Waste Authorized quantity and all the waste have been properly disposed to the recyclers/TSDF

13.8 Land Environment

Guidelines as per F.No.19-125/2019-IA.III for Land Environment-In Minning and other Industries

Damage to agriculture and community lands will be calculated at the beneficial cost/ Market values of the extent of the land/ water bodies so impacted for remediation

Topsoil Mismanagement will be assesses @50/- per cum of Qty not utilized.

Cost of rectification for proper slope, plantation on non-active dumps, others surface water control measures shall be assessed by the committee based on the area estimated and damage/ remediation cost to be computed for non/ partial provision of Garland drains, toe drains, toe walls, check dams, settling tanks and plantation

13.8.1 Working on Damage Cost:

Table 13-14 Damage Cost on Top Soil Loss

Probable Damage	Quantity	Cost of the damage	Total cost of damage Amount (Rs)
Loss of Topsoil	-	50 Rs per m^3	Nil since the site is covered with hard rock surface

13.9 Consolidation of all aspects of Damage cost

The arrived cost of value of Damagme from the quarrying period of *15.01.2016-10.01.2017* is given in below **Table 13-15**

Table 13-15 Consolidated Value of Damage Cost of all environmental aspects

S. No	Type waste	Amount is Rupees
Construction Phase		
	Top Soil	-
1	Tree cutting	-
2	Air emission	-
3	Solid waste Generation	-
Total (A)		
Operation Phase		
1	Air Emissions	12,37,105.49
2	Water Environment	28,800
3	Land Environement	6,400
4	Solid Waste Management	12,6000
5	Noise and Vibration -Tree requirement for Greenbelt	2,00,000
Total (B)		**15,98,305.49**
Total (A) +(B)		**15,98,305.49**

13.10 Economic Benifits

Guidelines as per F.No.19-125/2019-IA.III for Economic Benefits -Mining – Minor Mineral Non Coal Mining Sector

A maximum of 3.0% of the net profit as computed will be added to the total damage cost and will be used for community resource augmentation

13.10.1 Total turnover of products manufacturing without EC during Violation period (*15.01.2016-10.01.2017*)

A maximum of 3.0% of the net profit as computed will be added to the total damage cost and will be used for community resource augmentation.

13.11 Penalty Provisions

For Process Expansion

ii. Where operation /production with expanded capacity have commenced

1% of the project cost (attributable to the expansion activity) incurred upto the date of filling of application along with EIA/EMP report PLUS 0.25% of the total turnover (attributable to the expansion activity/capacity) involved during the period of violation

Note: TAMIN has operated the quarry during 15.01.2016 to 10.01.2017 without obtaining prior Environmental Clearance and obtained transport permit of 374.016 m^3 black granite. So the Collector issued demand notice for remittance of 100% cost of minerals to get NOC from Department of Geology and Mining for getting environmental clearance. Hence, TAMIN remitted Rs.78,66,679/- towards penalty at 100% cost of the mineral and obtained NoC from DGM vide Letter Rc No. 18/MM4/2020 dated 03.07.2020. Hence the turnover is Nil.

Table 13-16 Penalty provisions for violation cases

S. No	Description	Cost in Rs	Penalty in Rs
1	Project cost (1%)	99,97,000 (Project Cost)	99,970
2	Total turnover of products Manufacturing without EC during Violation period (15.01.2016-10.01.2017) (0.25%)	Nil	Nil
Total		99,97,000	99,970

13.12 Remediation Plan, Natural Resource & Community Resource Augmentation Plan

S. No	Component Remediation	Remediation Proposed	Description	Location	Total Cost Management			
					Year I	Year II	Year III	Total cost
Remediation Plan								
1	Noise & Vibration	Avenue Plantation	Plantation of native plants at 90% survival rate with allocated cost budget including maintenance for 3 years.	Nearby villages	2,00,000	50,000	50,000	3,00,000

Total (Rupees) - A								
Natural Resource Augmentation Plan								
2	Water	Ground Water Management	Conservation of lakes	Lakes present in and around the project area and in the study area	1,50,000	75,000	75,000	3,00,000
Total (Rupees) - B								
Community Resource Augmentation Plan								
3	Socio Economic	Medical camps	Providing health camps & check-up	Nearby villages	1,00,000	1,00,000	1,00,000	3,00,000
4	Infrastructure Development	-	Providing Library facilities	Nearby Government schools	2,00,000	50,000	50,000	3,00,000
			Providing drinking water	Nearby villages	1,32,769	1,32,768	1,32,768	3,98,305
Total (Rupees) - C								
GRAND TOTAL (Rupees) – A+B+C								15,98,305.49 (~15,98,305)

13.13 Conclusion

The total damage cost = Rs.15,98,305

The Penalty Cost = Rs.99,970

Summary of Damage Assessment

S. No	Damage Assessment Cost (Rs)	Remediation Plan, Natural Resource & Community Resource Augmentation Plan Cost (Rs)	Penalty for violation cost (Rs)
1.	15,98,305	15,98,305	99,970

13.14 Summary of Damage Assessment

- As per MoEF&CC Notification S.O.804 (E) dated 14th March 2017, Damage assessment cost is **INR.** 15,98,305**/-**
- The total amount to be spent for Remediation Plan and Natural Resource and Community Resource Augmentation Plan is worked out for an amount of **INR.**15,98,305**/-**
- As per MoEF&CC F.No.22-21/2020-IA.III, Dated 07.07.2021 & O.M dated 28.01.2022, total amount of **Rs.** 99,970 will be the penalty under violation case.
- The project proponent will allocate **INR.** 15,98,305**/-** and submit a bank guarantee to Tamil Nadu Pollution Control Board (TNPCB) for remediation plan and Natural and Community Resource Augmentation Plan.
- The bank guarantee shall be deposited prior to the grant of environmental clearance and will be released after successful implementation of the remediation plan and Natural and Community Resource Augmentation Plan as per MoEF&CC Notification S.O.804(E) Dated 14th March 2017.