
DRAFT ENVIRONMENTAL IMPACT ASSESSMENT & ENVIRONMENTAL MANAGEMENT PLAN

FOR OBTAINING
Prior Environmental Clearance under EIA Notification – 2006
Schedule Sl. No. 1 (a) (i): Mining Project

NON-FOREST LAND/ **GOVERNMENT LAND** / FRESH MINE/ **MINOR MINERAL**/ 'B1' CATEGORY

MANGAMMALPURAM SAND QUARRY (For Resorting the Functional Efficiency of Coleroon River)

Project Proponent	Project Location
The Executive Engineer Water Resources Department Mining and Monitoring Division, Tiruchirappalli District, Tamil Nadu State - 620 020	Mangammalpuram Village, Lalgudi Taluk, Tiruchirapalli District S.F. No: 217 (Part)
PROJECT DETAIL	
Extent	- 20.00.0 Ha
Total Mineable Reserves	- 5,00,000m ³ of Sand
Depth	- 2.5m (1.5m ABL + 1m BBL)
Proposed lease period	- Two years

As per TOR vide

Lr No. SEIAA-TN/F.No.9283/SEAC/ToR-1220/2022 Dated: 22.08.2022

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Baseline Monitoring Season – December 2022 to February 2023

ENVIRONMENTAL LAB
EHS 360 LABS PRIVATE LIMITED

(Approved by ISO/IEC 17025:2017)

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MAY 2023

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CHAPTER – 1: INTRODUCTION

1.0 PREAMBLE

Environmental Impact Assessment (EIA) is the management tool to ensure the sustainable development and it is a process, used to identify the environmental, social and economic impacts of a project prior to decision-making. It is a decision-making tool, which guides the decision makers in taking appropriate decisions for any project. EIA systematically examines both beneficial and adverse consequences of the project and ensures that these impacts are taken into account during the project designing. It also reduces conflicts by promoting community participation, information, decision makers and helps in developing the base for environmentally sound project.

Whenever floods and consequent damages occurred it was resorted to increase the bund level to restore the carrying capacity of river. It was never thought of quarrying river due to the enormous cost, it requires and the problem of ways and means to dispose the desilted sand. Consequence of this Change in river regime and reduction in carrying capacity of the Coleroon river, the shoals in the rivers, divert the flow of water resulting in bund erosion and consequent breaches, which lead to loss of property and lives.

Solution to the above problem is to desilt the sand and shoals in Coleroon River by expending huge amount. Alternatively, the economical solution to this problem is to quarry the sand to remove the shoals. This option would not yield net revenue to the state Exchequer apart from making available the important construction material for infrastructure development at a reasonable price to the common people.

The project proponent, Executive Engineer, Water Resources Department, Mining and Monitoring division applied for Sand quarry lease over an extent of 20.00.0 Ha in Mangammalpuram Village, Lalgudi Taluk, Tiruchirapalli District, Tamil Nadu. The application was processed by the Department of Geology and Mining, Tiruchirapalli and passed precise area communication letter vide Rc.No 700/2021/Mines, dated 22.02.2022 to obtain Mining plan and Environmental Clearance from the SEIAA, Tamil Nadu. The mining plan was prepared and got approval from the Assistant Director, Department of Geology and Mining, Tiruchirapalli vide Rc.No 700/2021/Mines, Dated 12.05.2022.

The proponent has obtained necessary statutory clearances from the Department of Geology and Mining, Tiruchirapalli District, Tamil Nadu (Statutory Clearance Documents are enclosed along with Mining plan as Annexure No III).

Proponent applied for ToR for Environmental Clearance to SEIAA, Tamil Nadu and obtained ToR vide letter no. SEIAA-TN/F.No.9283/SEAC/ToR-1220/2022 Dated: 22.08.2022 for carrying out EIA and EMP studies.

The proponent has engaged M/s. Geo Exploration and Mining Solutions, Salem, Tamil Nadu for carrying out EIA / EMP Study. The Baseline Monitoring study has been carried out during winter season (December 2022 to February 2023). This EIA Report is prepared in compliance with ToR obtained vide Lr No. SEIAA-TN/F.No. 9283/SEAC/ToR-1220/2022 Dated: 22.08.2022.

1.1 PURPOSE OF THE REPORT

The Ministry of Environment and Forests, Govt. of India, through its EIA notification S.O. 1533(E) of 14th September 2006 and its subsequent amendments as per Gazette Notification S.O. 3977 (E) of 14th August 2018, Mining Projects are classified under two categories i.e., A (> 100 Ha) and B ($\leq$ 100 Ha), and Schematic Presentation of Requirements on Environmental Clearance of Minor Minerals including cluster situation in Appendix-XI.

Now, as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green Tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No. 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018 clarified the requirement for EIA, EMP and therefore, Public Consultation for all areas from 5 to 25 ha falling in Category B- 1 and appraised by SEAC/ SEIAA as well as for cluster situation.

Now, as per Gazette Notification S.O. 1886 (E) of 20th April 2022, Mining Projects are classified under two categories i.e. A (>250 Ha) and B ($\leq$ 250 Ha),

“All mining lease area in respect of minor mineral mining leases and $\leq$ 250 ha mining lease area in respect of major mineral mining lease other than coal”

The proposed project is categorized under category “B1” Activity 1(a) (Total Extent of the area is >5 Ha) and will be considered at SEIAA – TN after conducting Public Hearing and Submission of EIA/EMP Report for Grant of Environmental Clearance.

“Draft EIA report prepared on the basis of ToR Issued for carrying out public hearing for the grant of Environmental Clearance from SEIAA, Tamil Nadu”

1.2 IDENTIFICATION OF PROJECT AND PROJECT PROPONENT

1.2.1 Identification of Project & Project Proponent

Table 1.1: Location of Project

Name and Location of the project	Project proponent address
Mangammalpuram Sand Quarry S.F.No.217Part), Mangammalpuram Village Lalgudi Taluk, Tiruchirappalli District, Tamil Nadu state	The Executive Engineering, Water Resource Department, Mining and Monitoring Division, Tiruchirappalli – 620 020

1.3 BRIEF DESCRIPTION OF THE PROJECT

Table 1.2: Salient features of the project site

DESCRIPTION	DETAILS
Name of the project	Mangammalpuram Sand Quarry
Name of Mineral	Sand
S.F. No's and Village	S.F.No. 217 (Part), Mangammalpuram Village
Extent	20.00.0 ha
Classification of Land	Government Land Water Resource Department, Mining and Monitoring Division, Tiruchirappalli
Taluk	Lalgudi
District	Tiruchirappalli
State	Tamil Nadu
Latitude Between	10°51'02.8306"N to 10°51'17.1354"N
Longitude Between	78°52'16.3469"E to 78°52'43.8956"E
Toposheet No	58- J/13
Topography of the area	The topography of the area is almost plain topography with shoals of Sands having gentle slope towards East side. Highest Elevation between: 50.99m to 53.87m AMSL
Life of Mine	2 years
Geological Reserves	10,00,000m ³ of Sand
Mineable Reserves	5,00,000m ³ of Sand
Yearwise Production (2 Years)	1st Year 3,00,000m ³
	2nd Year 2,00,000m ³
Mining Method	Opencast Mechanized Method of Mining without Drilling and Blasting
Proposed depth of mining for this plan period	2.5m (1.5m abl + 1m bbl)
Ultimate Pit Dimension	800m (Length) X 300m X 2.5m (Depth) (1.5m abl + 1m bbl)
Employment Potential	38 Nos
Ground Water table	11-16 m BGL
Ground Water Table Intersection	Quarrying operation will be carried out well above the ground water table, hence ground water will not be affected by proposed mining.
Drainage Pattern	The drainage pattern of the area is dendritic.
Water Requirement & Source	Total water requirement for dust suppression, Greenbelt and drinking is 3.0 KLD. Water will be sourced from nearby villages by water tankers and drinking water will be sourced from approved water vendors.

500m Radius Letter from the Assistant Director, Tiruchirappalli District	Existing Quarry Expired/Abandoned Quarries Proposed Quarry	- 1 No (24.00.0ha) - Nil - 1 No (20.00.0ha)
Project Cost	Rs 89,93,000 /-	

Source: Approved Mining Plan

1.3.1 Nature and Size of Project

The Sand deposit is proposed to be excavated by deploying Hydraulic Excavator. No drilling and Blasting are involved in this quarry operation, since the deposit is soft and fragile in nature. The quarrying operations involve removal of Sand using hydraulic excavator by opencast mechanized mining method. Sand will be transported by 10/20 Tonnes capacity to the needy customers.

Resources and Reserves are calculated in Cross Section method after leaving necessary safety distance and bench loss.

Table 1.3: Resources and Reserves

Description	ROM in m ³
Geological Resources	10,00,000
Mineable Reserves	5,00,000
Year-wise production	5,00,000

Source: Approved Mining Plan

1.3.2 Need for the Project

- * To enhance the Functional Efficiency of the Coleroon River

Importance for the Region (Study Area)

- * This project will enhance the Functional efficiency of the river flow, through this, floods are protected from entering the nearby Village during rainy season
- * This Project will help to reduce demand and supply gap to the Construction industries.

1.3.3 Location of the Project

- * The area lies between the Latitude of 10°51'02.8306"N to 10°51'17.1354"N and Longitude of 78°52'16.3469"E to 78°52'43.8956"E and marked in the Survey of India, Toposheet No. 58- J/13.

Figure 1.1: Key Map - Location of the Project Site

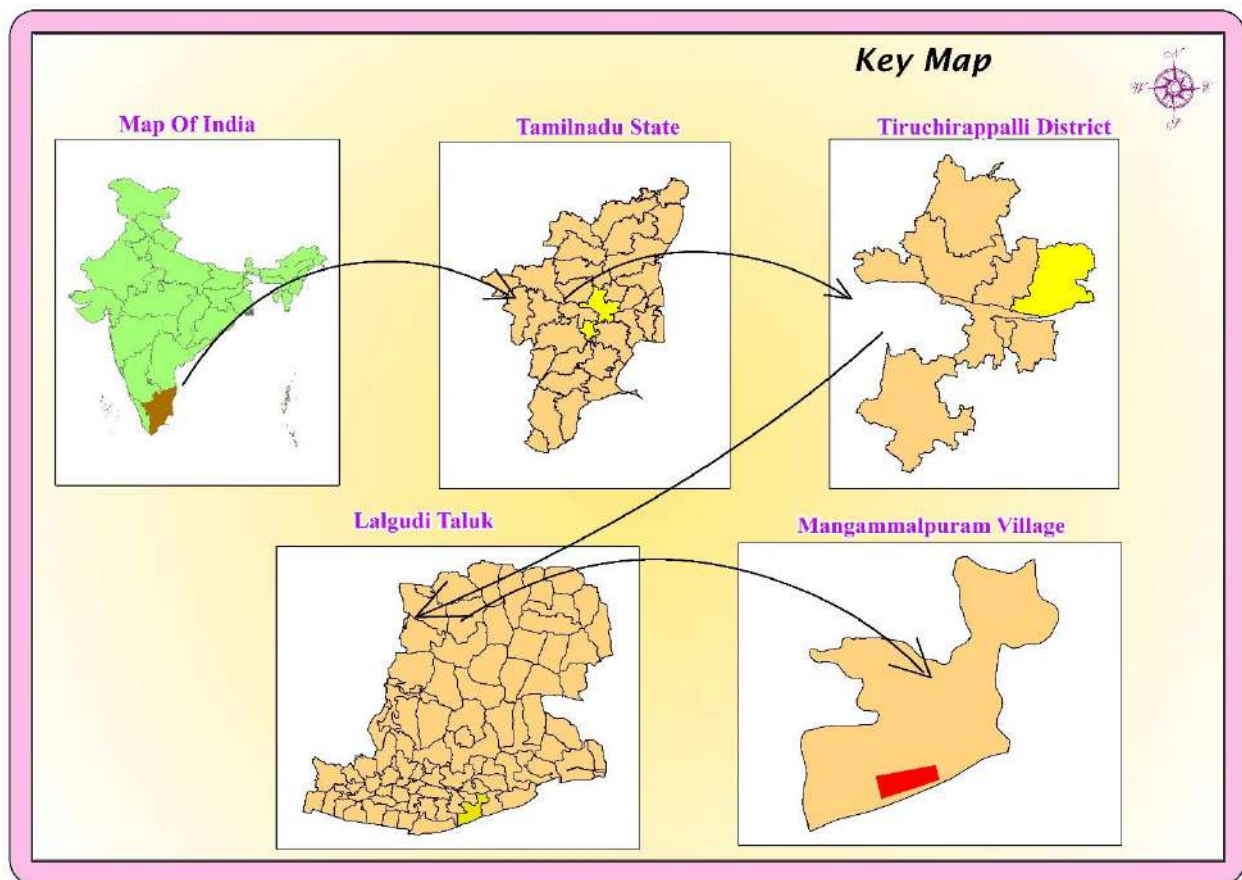
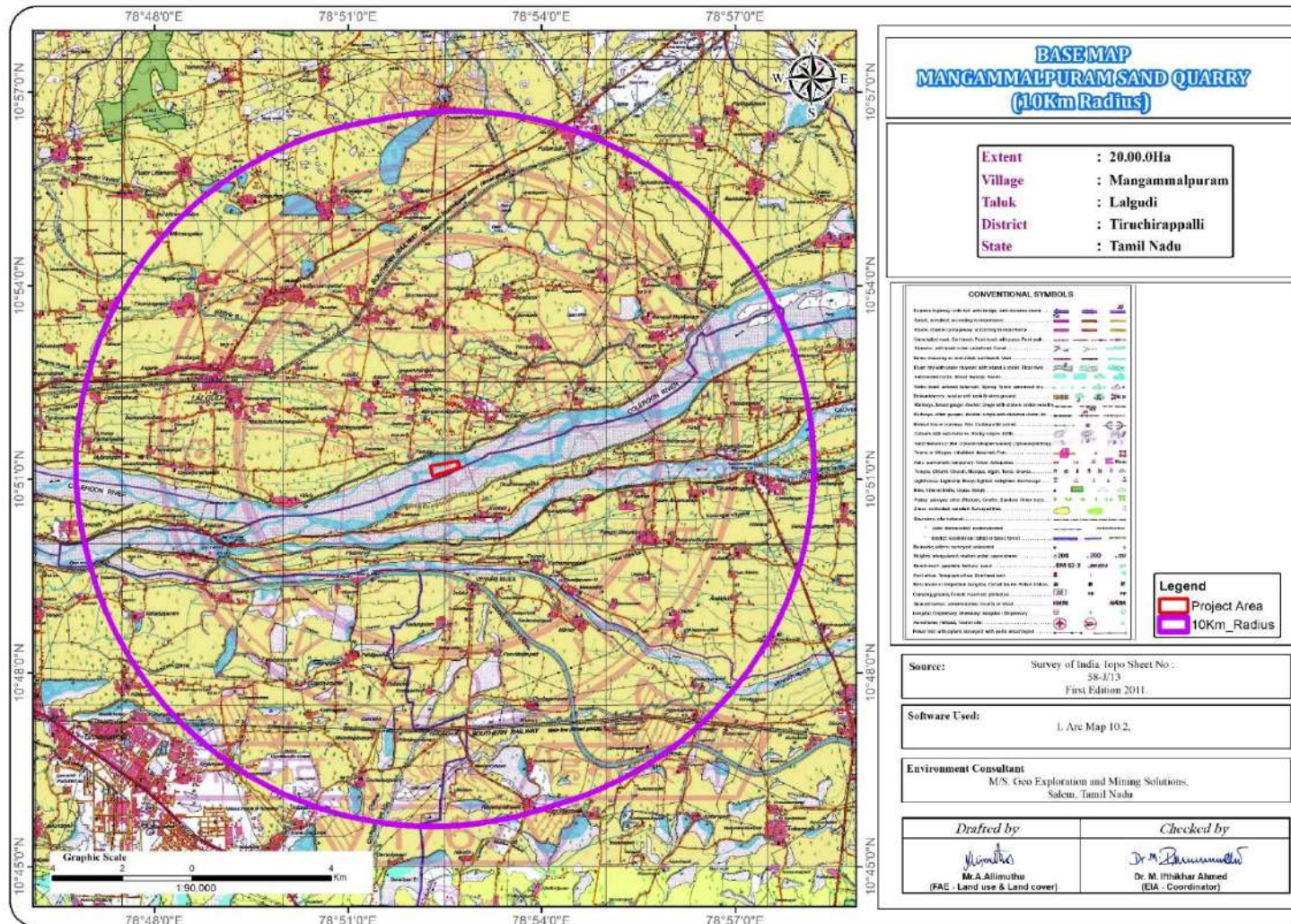


Figure 1.2: Toposheet showing Location of the Project Site & 10km Radius



1.4 ENVIRONMENTAL CLEARANCE

The Proponent applied for ToR for Prior Environmental Clearance vide online Proposal No.SIA/TN/MIN/ 77336/2022 dated: 27.05.2022

The Environmental Clearance process for the project will comprise of four stages. These stages in sequential order are given below-

1. Screening,
2. Scoping
3. Public consultation &
4. Appraisal

Screening: -

- * Precise Area Communication letter issued by District Collector, Tiruchirapalli vide Letter No. 700/2021/Mines Dated 22.02.2022 for preparation of Mining Plan and for Obtaining Prior-Environmental Clearance.
- * The Mining Plan was prepared under Rule 41 & 42 of Tamil Nadu Minor Mineral Concession Rules, 1959 and the approved by Deputy Director of Geology and Mining, Tiruchirapalli District vide Letter No: 700/2021/Mines Dated 12.05.2022
- * The proposed project falls under “B1” Category as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018

The proponent applied for ToR for Prior Environmental Clearance vide online Proposal No. No.SIA/TN/MIN/ 77336/2022 dated: 27.05.2022

Scoping: -

- * The proposal was placed in 296th SEAC meeting held on 16.07.2022 and the committee recommended for issue of ToR
- * The proposal was considered in 541st SEIAA meeting held on 22.08.2022 and issued ToR vide Letter No SEIAA-TN/F.No. 9283/SEAC/ToR-1220/2022 Dated 22.08.2022

Public Consultation: -

Application to The Member Secretary of the Tamil Nadu Pollution Control Board (TNPCCB) to conduct Public Hearing in a systematic, time bound and transparent manner ensuring widest possible public participation at the project site or in its close proximity in the district is submitted along with Draft EIA/ EMP Report and the outcome of public hearing proceedings will be detailed in the Final EIA/EMP Report.

Appraisal:-

Appraisal means the detailed scrutiny by the State Expert Appraisal Committee (SEAC) of the application and other documents like the final EIA & EMP report, outcome of the public consultations including public hearing proceedings, submitted by the company to the regulatory authority concerned for grant of environmental clearance.

The report has been prepared using the following references:

- * EIA Notification, 14th September, 2006
- * Guidance Manual of Environmental Impact Assessment for Mining of Minerals, Ministry of Environment and Forests, 2010
- * ToR Letter No. SEIAA-TN/F.No. 9283/SEAC/ToR-1220/2022 Dated 22.08.2022
- * Approved Mining Plan vide letter No. 700/2021/Mines Dated 12.05.2022. In addition, other relevant standards for individual activities such as sampling and testing of environmental attributes have been followed.

1.5 TERMS OF REFERENCE (ToR)

“ToR issued vide Letter No. SEIAA-TN/F.No. 9283/SEAC/ToR-1220/2022 Dated 22.08.2022”

Table 1.4: Compliance of ToR Conditions

SPECIFIC CONDITIONS		
1	The project proponent shall study and report in details of the “Replenishment study” as per Sustainable Sand Mining Management Guidelines, 2016 and Enforcement & Monitoring Guidelines for sand Mining 2020.	Noted and agreed.
2	The PP shall carry out the study on drinking water scheme in 5km, either side of the bank of the river and the same shall be included in the EIA report.	Noted and agreed
3	The details of the location to cover land use and ecologically sensitive areas a. Details of the open wells, bore wells, and other surface water bodies including the details of ground water levels, Quantity in the 500m radius from the boundary of the mine lease area b. Impacts of this mining activity in the above said water bodies in the 500m radius from the boundary of the mine lease area c. Thickness of Sand and its variation covering the entire area; similarly the width of the sand bed, quantification of the shoal formation in that area d. Agricultural land if any, surrounding the quarry site e. Details of longitudinal and cross section of the river bed in the proposed mining area f. Details of earlier of mining carried out in the 500m radius of the mine lease area including the location, quantity of sand mined out, depth of the mining, etc., shall be furnished.	a. There are 6 Numbers of borewell within the radius of 2.0km from the boundary of the mine lease area. Details of the open wells and bore wells given in the Chapter No.3 Page No.47 b. Impacts of the water bodies and mitigation measure described in the Chapter No..4 Page No.91 c. The thickness of the sand deposit is varying from 0.5m to maximum 5m inclusive of shoals. The average depth of the mining is estimated as 2.5m above bed level. d. The area is surrounded by Coleroon river and details of agriculture land in the study area described in Chapter No.3,Page No.41 e. The length of the longitudinal section is 800m and the width of the sections is 200m. f. There is one existing quarry present within the 500m radius and its lease period is 06.06.2020 to 05.06.2023 (3 years). Total extent of two quarries 44.00.0ha. S.F.No. 1/1(Part), Thiruthuraipondi village, Buthalur Taluk, Thanjavur District
4	Reclamation of Sand area after mining needs to be submitted	The land will be getting natural reclamation during the rainy seasons.
5	Adequate plan for traffic management as per the Guidelines for Sustainable Sand mining issued in 2016 by the MoEF & CC, GOI, New Delhi for the loaded vehicles passing through nearby habitation.	Details traffic study is given in the Chapter No.2 Page No.33
6	The PWD has to furnish the details regarding agricultural activities that are taking place around the project area.	Details of the agriculture land near the project area is given in the Chapter No.3 Page No.38, Figure No.3.2
7	Details of the Structures available within 1k from the mine lease area boundary (both upstream and downstream and also study the Impact of Sand mining o the structures located in the said area.	Structures map around the project area within 1km both upstream and downstream is given in the Chapter No.3 Page No.42
8	The Route map for the lorries for accessing the project area and for transporting mined sand should be specified	Transportation route map for accessing the project area is given in the Chapter No.2 Page No.33 Figure No.2.12

9	Suitable working methodology to prevent dust pollution needs to be prepared taking wind direction into consideration	The predominant wind direction in the area is South West to North East direction. The working methodology is given in the Chapter No.2 Page No.32
10	The mining area must be demarcated leaving at least 50m from the river embankment on either side	The project area was demarcated after leaving 50m from the river embankment on either side.
11	Wherever irrigation channels take off from the river within the boundary of the mining project, the mining operation should not affected the flow of water in the irrigation Channels. In such a way a plan of action should be submitted.	No irrigation channels within the mining project area boundary.
12	EMP should contain break up details such as tools, labor and environmental monitoring cost, cost for the ground water monitoring in the surrounding area shall be part of the EMP cost, variation of depth of ground water and quality shall be monitored during the project period by conducting survey once in 3 months. This cost shall also be included in EMP.	Break up details for the monitoring cost included in the EMP cost. Detailed EMP cost given in the Chapter No.2 Table No.2.15. Page No. 35
13	Since there are many proposals for sand mining under the River Coleroon. It is necessary to model the overall impact on sand mining on regional Ground water.	Noted and agreed.
14	The proposal for CER shall be furnished with time frame as per the Office Memorandum of MoEF & CC dated 01.05.2018 a. The following details also included in the EIA report quantity estimated to be mined through machineries & manual mining with extent b. Certificate from the VAO stating the details of habitation located within 300m radius from the boundary of the proposed site along with FMB sketch c. The project proponent has to furnish the affidavit stating there are no bridges, culverts, cross masonries, water head works or any other civil structures within 500mts., of the proposed quarry site. d. The RL upstream, RL Downstream, RL starting, RL Ending, Chainage Starting Km, Ending Km Details shall be furnished. e. Geological sections map should be furnished f. 500m, 1Km & 5Km radius of Clear Google Map showing all the features like agricultural activities, habitations.	Certificate from the VAO stating habitation details within the radius of 300m is enclosed as Annexure No.IIA Affidavit stating there are no bridges, culverts, cross masonries, water head works and civil structures details within 500m radius from the proposed project site is enclosed as Annexure No.II Upstream RL – 53.56m Downstream RL – 52.06m Starting Chainage – 32+610m Ending Chainage – 33+410m Geological plan and section is enclosed as Plate No IIB along with Mining plan. Google map showing agriculture activities and habitation within 500m, 1Km and 5 Km Radius is enclosed with this EIA report.
Additional Conditions		
1	As per the MoEF& CC office memorandum F.No.22-65/2017-IA.III dated: 30.09.2020 and 20.10.2020 the proponent shall address the concerns raised during the public consultation and all the activities proposed shall be part of the Environment Management Plan	Noted and agreed
2	The Project Proponent shall study and report in detail the following, as provided in Sustainable Sand Mining Management Guidelines, 2016 and Enforcement and Monitoring Guidelines for Sand mining, MoEF & CC 2020	Noted and agreed
3	Furnish the details with route map and the transportation route	Transportation route details along with map detailed in Chapter No.2. Figure No.2.12 Page No.33

4	The details of maximum production from the mines	The mining operation is proposed to carry out for the period of two years the peak production capacity in the mine is 3,00,000m ³ .
5	Demarcation of mining area with pillars and geo-referencing shall be made by furnishing photographs taken on site prior to the start of mining.	Noted and agreed.
6	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.	Carbon emission is only due to the using Excavators and tippers. Greenbelt development will be carried out in the river bank and Village roads to reduce Carbon emission.
7	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	Detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] was carried out and discussed under Chapter No. 3, Page No. 68. There is no schedule I species of animals observed within study area as per Wildlife Protection Act 1972 as well as no species is in vulnerable, endangered or threatened category as per IUCN. There is no endangered red list species found in the study area.
8	Action should specifically be suggested for sustainable management of the area and restoration of ecosystem for flow of goods and services.	Noted and agreed
9	The project proponent shall study impact on indigenous flora and fauna.	Discussed in chapter no.3, page no.68-77
10	The project proponent shall study impact on fish habitats and the food web/ food chain in the water body and Reservoir.	The mining operation will be carried out without drilling and blasting and the excavation will be carried out only in non-flow of water in the river. Study of impact on fish habitats and food web. Food chain is described in the Chapter No.3 Page No.77
STANDARD TERMS OF REFERENCE		
1.	Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.	Not Applicable This is a New Proposal for Quarrying of Sand and silt over an extent of 20.00.0 ha.
2.	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	The Precise area communication letter granted in the name of Lessee, The Executive Engineer, Water Resource Department, Mining and Monitoring Division.
3.	All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.	The project area, production levels, method of mining etc., are compatible with all documents including approved mine plan & Draft EIA/EMP Report and is in the name of project proponent.
4.	All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/ toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	Map showing – Project area is superimposed on Satellite imagery is enclosed in Chapter No.2, Figure No. 2.5 page No. 23 Project area boundary coordinates superimposed on Toposheet – Figure No. 2.3, Page No. 21 Toposheet of the project area covering 10km radius – Figure No. 2.1, Page No. 19

		Geomorphology of the project area covering 10km radius - Figure No. 2.11, Page No. 30 Geology map of the project area covering 10km radius - Figure No. 2.10, Page No. 29
5.	Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.	Geomorphological features are incorporated in the Toposheet map covering 10km radius around the project area Figure No. 2.11, Page No. 30.
6.	Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.	The proposed project area conforms to the land use policy of the state and necessary permissions concerned authorities are obtained before grant of Precise Area Communication Letter and Mining Plan is Approved by Assistant Director, Department of Geology and Mining, Tiruchirapalli.
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 infringement/deviation/ violation of the environmental or forest norms/conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.	The project proponent is the Government organization, Separate Division has been formed in the name of Mining and Monitoring Division in Water Resource Department. The proponent has framed its Environmental Policy. The Approved copy of Environmental Policy is discussed as Chapter No.6 The detailed operating process, hierarchical system and compliance monitoring is discussed in Chapter No. 6, Page No. 101
8.	Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc., should be detailed. The proposed safeguard measures in each case should also be provided.	Not applicable the mining operation will be carried out without drilling and blasting upto the depth of 2.5m (average).
9.	The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc. should be for the life of the mine / lease period.	The EIA Study Area considered for this project is 10 km radius from the Project Area. All the production and waste generation details discussed in the EIA/ EMP report is for the entire life of the mine.
10.	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.	Land use land cover of the study area covering 10 km radius from the project site was studied using BHUVAN and LU/LC classification map has been prepared delineating Forest area, Agricultural land, Grazing land, Wildlife sanctuary, National park, Migratory routes of fauna, Water bodies, Human settlements and other Ecological features. Details are discussed in Chapter No. 3, Table No 3.2, Figure No.3.3 & 3.3A, Page Nos. 38, 41-42.
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	Not Applicable No waste anticipated from this mining project as the entire mined out Sand and silt Mining.
12.	A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the	Not Applicable There is no Forest Land involved in the Project Area.

	involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.	
13.	Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	Not Applicable There is no Forest Land involved in the Project Area.
14.	Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.	Not Applicable There is no Forest Land involved in the Project Area.
15.	The vegetation in the RF / PF areas in the study area, with necessary details, should be given.	The details of vegetation are given in the Chapter No.3, Page No. 42
16.	A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.	There is no Schedule I species observed within study area as per Wildlife Protection Act 1972 as well as no species is in vulnerable, endangered or threatened category as per IUCN. There is no endangered red list species found in the study area.
17.	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished	There are No National parks, Sanctuaries, Biosphere reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/ (existing as well as proposed) within 10 km of the project area.
18.	A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.	The Ecology and Biodiversity study was carried out for 10 km radius from the project area and the details of the flora and fauna are detailed in Chapter No. 3, Page No. 68-77. There is no other Schedule I species observed within study area as per Wildlife Protection Act 1972 as well as no species is in vulnerable, endangered or threatened category as per IUCN. There is no endangered red list species found in the study area.
19.	Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravalli Range', (attracting court restrictions for mining operations), should also be indicated and where so	Not Applicable. No Critically Polluted Areas within a radius of 10 km from project area.

	required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.	
20.	Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL, HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).	Not Applicable. The project doesn't attract CRZ Notification.
21.	R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action program prepared and submitted accordingly, integrating the sectoral program of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.	The project area over an extent of 20.00.0 ha in Mangammalpuram is a Government Land classified as Coleroon River and there is no habitation within a radius of 300 meters from the proposed project area. Therefore, R&R Plan / Compensation details for the Project Affected People (PAP) is not anticipated and Not Applicable for this project.
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 compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.	Baseline Data Collection for one season (winter Season) December 2022 to February 2023 is collected for various environmental attributes like Air, Water, Noise and Soil, Details of flora and fauna & meteorological data are as well collected and incorporated under Chapter No. 3. One monitoring station within 500m of the project area in the pre-dominant downwind direction is monitored and the mineralogical composition of free silica is discussed in Chapter No. 3.0,
23.	Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.	Air quality modeling was carried out using AERMOD to predict the incremental concentration due to the proposed mining activities and transportation of mineral. The particulate matter concentration is well within the prescribed limits as per CPCB norms, details in Chapter No. 4, Page No. 91-95 The air quality contour is also prepared indicating the location of sensitive receptors, mining site, habitations etc., and wind rose is plotted showing pre dominant down wind direction.

24.	The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.	The total Water Requirement is 3.0 KLD, utilization and sources of water is discussed in the Chapter No.2, Table No.2.13, Page No. 34
25.	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	The water will be sourced from the nearby water vendors through water tankers and no additional permissions are required. No water is withdrawn for the mining operations nor involving for quarrying activity.
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.	In this mining operation water will not be utilized for mining purpose. The main aim of the project is enhance the functional efficiency of the Coleroon river.
27.	Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.	No Negative impacts are anticipated on surface water quality. The depth of quarrying is proposed upto 2.5m, which is well above the water table. Mitigations measures to maintain the surface water & ground water quality are discussed in Chapter No. 4, Page No. 91
28.	Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.	The maximum depth of the mining operation is 2.5m (1.5m abl + 1m bbl). The ground water table is at 11-16m below ground level. The mining operation will not intersect the Ground water table.
29.	Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.	Not applicable.
30.	Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.	Maximum site elevation within the project area is 50.99m to 53.87mm above Mean Sea level. It is proposed to excavate 2.5m average depth.
31.	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.	The plant species recommended for greenbelt development is shown in Chapter No.10, page No. 112
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	The transportation will not have significant impact on the existing traffic density/ existing road. The transported vehicles are likely to move in the Major

	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.	District Roads (MDR) and State Highways. The haulage road does not enroute any nearby villages. Vehicular Traffic Density Study details are discussed in Chapter No. 2, Page No. 33-34
33.	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	Onsite temporary shelter and facilities will be provided to the mine workers. The details are discussed in Chapter No.2, Page No. 34
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.	The lease area is lies on the river bed, depth of the mining average 2.5m (1.5m abl + 1m bbl). Mined out land will be got natural replenishment during the rainy seasons.
35.	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	Impacts and mitigation measures on occupational health and safety are discussed in Chapter No. 4, Page No.99.
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.	No negative health impacts on public health are anticipated due this mining project.
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 mitigation measures w.r.t Socio economic factors is detailed in Chapter No.4, Page No. 98.
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.	A detailed Environmental Management Plan is prepared and discussed in Chapter No. 10, Page No. 119-117
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.	The outcome of Public Hearing will be updated in the Final EIA/EMP Report.
40.	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.	No litigation is pending in any court against this project.
41.	The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.	The project cost (capital cost and recurring cost) is detailed in chapter No.2.0, Table No.2.15 Page No.35
42.	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	A Disaster Management Plan is prepared and discussed in Chapter No. 7, Page No. 104.
43.	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.	Details in Chapter 8, Page No. 106 -107

44.	Besides the above, the below mentioned general points are also to be followed:-	
a.	Executive Summary of the EIA/EMP Report	Enclosed as separate volume
b.	All documents to be properly referenced with index and continuous page numbering.	All the documents are properly referenced with index and continuous page numbering
c.	Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.	List of Tables and source of the data collected are given properly
d.	Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project	Baseline monitoring reports are enclosed as Annexure number – V
e.	Where the documents provided are in a language other than English, an English translation should be provided.	Not Applicable
f.	The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.	Questionnaire will be submitted with Final EIA/EMP report.
g.	While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF & CC vide O.M. No. J-11013/41/2006-IA.II (I) Dated: 4th August, 2009, which are available on the website of this Ministry, should be followed.	Instructions issued by MoEF & CC O.M. No. J-11013/41/2006-IA.II (I) Dated: 4th August, 2009 are followed
h.	Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation	Public hearing yet to be conducted.
i.	As per the circular no. J-11011/618/2010-IA.II(I) Dated: 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.	Not applicable
j.	The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.	Surface and Geological plan – Figure Number 2.8, Page No 26.

1.6 POST ENVIRONMENT CLEARANCE MONITORING

The Proponent will carry out Compliance Monitoring Studies every six months once for Air, Water, Noise and other Environmental parameters as per the MoEF & CC and CPCB Guidelines & EC Conditions. As per the ToR Condition Ground water level and quality will be monitored once in 3 months. The half-yearly compliance status reports will be submitted in respect of stipulated Environmental Clearance terms and conditions to MoEF & CC Regional Office & SEIAA after grant of EC on 30th June and 31st December of each calendar year.

1.7 GENERIC STRUCTURE OF EIA DOCUMENT

The overall contents of the EIA report follow the list of contents prescribed in the EIA Notification 2006 and the “Environmental Impact Assessment Guidance Manual for Mining of Minerals” published by MoEF & CC. Brief descriptions of each Chapter are presented in Table No. 1.5.

Table 1.5: Structure of the EIA report

S. No	Chapters	Title	Particulars
1	Chapter 1	Introduction	Presents an Introduction along with Scope and Objective of this EIA/EMP Study
2	Chapter 2	Project Description	Presents the Technical Details of the Project
3	Chapter 3	Description of Environment	Presents the Baseline Status for various Environmental Parameters in the Study Area for One Season (3 Months)
4	Chapter 4	Anticipated Environmental Impacts and Mitigation Measures	Presents the Identification, Prediction and Evaluation of Environmental Impacts due to the Proposed Project Activities and presents Proposed Mitigation Measures
5	Chapter 5	Analysis of Alternatives (Technology & Site)	Presents Analysis of alternatives with respect to site
6	Chapter 6	Environment Monitoring Program	Present details of post project environment monitoring
7	Chapter 7	Additional Studies	Presents Public Consultation, Risk Assessment and Disaster Management Plan
8	Chapter 8	Project Benefits	Presents project benefits as: Improvements in the Physical Infrastructure, Social Infrastructure Employment Potential –Skilled; Semi-Skilled and Unskilled etc.,
9	Chapter 9	Cost Benefit Analysis	Environmental Cost Benefit Analysis has not been recommended at Scoping Stage – thus no analysis carried out separately in this EIA/EMP Report
10	Chapter 10	Environmental Management Plan	Description of the administrative aspects to ensure the Mitigation Measures are implemented and their effectiveness monitored, after approval of the project
11	Chapter 11	Summary & Conclusion	Summary of the EIA Report
12	Chapter 12	Disclosure of Consultants Engaged	Disclosure of the Consultants

Source: EIA Notification, 2006, Appendix – III

1.8 SCOPE OF THE STUDY

The main scope of the EIA study is to quantify the impact in the study area due to the proposed sand quarry and formulate the effective mitigation measures. A detailed account of the emission sources, emissions control equipment, background Air quality levels, Meteorological measurements, Dispersion model and all other aspects of pollution like effluent discharge, Dust generation etc., have been discussed in this report. The baseline monitoring study has been carried out during the season (December 2022 to February 2023) for various environmental components so as to assess the anticipated impacts of the quarry project on the environment and suggest suitable mitigation measures for likely adverse impacts due to the proposed project.

Table 1.6: Environment attributes

Sl.No.	Attributes	Parameters	Source and Frequency
1	Ambient Air Quality	PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂	24 hourly samples twice a week for three months at 8 locations
2	Meteorology	Wind speed and direction, temperature, relative humidity and rainfall	Near project site continuous for three months with hourly recording and from secondary sources of IMD station, Tiruchirapalli
3	Water quality	Physical, Chemical and Bacteriological parameters	Grab samples were collected at 4 ground water and 2 surface water locations once during study period
4	Ecology	Existing terrestrial and aquatic flora and fauna within 10 km radius circle.	Limited primary survey and secondary data was collected from the Forest department
5	Noise levels	Noise levels in dB(A)	At 8 locations data monitored once for 24 hours during EIA study
6	Soil Characteristics	Physical and Chemical Parameters	Once at 6 locations during study period
7	Land use	Existing land use for different categories	Based on Survey of India Toposheet and satellite imagery and primary survey
8	Socio-Economic Aspects	Socio-economic and demographic characteristics, worker characteristics	Based on primary survey and secondary sources data like census of India 2011
9	Hydrology	Drainage area and pattern, nature of streams, aquifer characteristics, recharge and discharge areas	Based on data collected from secondary sources as well as hydro-geology study report prepared
10	Risk assessment and Disaster Management Plan	Identify areas where disaster can occur by fires and explosions and release of toxic substances	Based on the findings of Risk Modeling done for the risk associated with mining

Source: Onsite monitoring/ sampling

The data has been collected as per the requirement of the ToR issued by SEIAA – TN. The compliance of the ToR has been given in Table 1.4.

1.8.1 Regulatory Compliance & Applicable Laws/Regulations

- * Submitted application for Quarrying Lease as per Tamil Nadu Minor Mineral Concession Rules, 1959
- * Obtained Precise Area Communication Letter for Preparation of Mining Plan and obtaining Prior – Environmental Clearance as per Sub-Rule 13 of Rule 19 A, Tamil Nadu Minor Mineral Concession Rules, 1959
- * The Mining Plan has been approved under Rule 43 (8) of Tamil Nadu Minor Mineral Concession Rules, 1959
- * ToR Letter No. SEIAA-TN/F.No.9283/SEAC/ToR-1220/2022 Dated: 22.08.2022

CHAPTER – 2: PROJECT DESCRIPTION

2.0 GENERAL

This project is proposed to excavate 5,00,000m³ of Sand by Opencast Mechanized Mining Method without drilling and blasting. Sand will be transported by 10/20 Tonnes. The sand will be loaded directly to the trucks/ lorries to nearby approved Government Sand Depot for Transportation to the needy customers, hence no mineral processing is involved.

The Trucks are loaded by excavators in direct supervision of the Assistant/ Junior Engineers Water Resources Department. The Competent Statutory Mines foreman will also be deployed for the Safety movement of vehicles inside the quarry. The sand is soft and fragile in nature and proposed to excavate 2.5m (1.5m abl + 1m bbl).

2.1 DESCRIPTION OF THE PROJECT

The proposed project is site specific and there is no additional area required for this project. There is no effluent generation/discharge from the project. Sand is proposed to be excavated by opencast mechanized method without drilling and blasting.

2.2 LOCATION OF THE PROJECT

- * The area lies between the Latitude of 10°51'02.8306"N to 10°51'17.1354"N and Longitude of 78°52'16.3469"E to 78°52'43.8956"E and marked in the Survey of India, Toposheet No. 58- J/13.

Table 2.1: Salient Features around the project area

Nearest Roadway	Nearest National Highway (NH-81) Trichy – Chidambaram – 7.0km -North West The Nearest State Highway (SH-22) Trichy – Kumbakonam – 1.2km-South
Nearest Village	Anbil – 1.5km - Northeast
Nearest Town	Lalgudi – 6.5km- North West
Nearest Railway	Lalgudi Railway station – 6.5km- North West
Nearest Airport	Trichy Airport – 20 km – Southwest
Seaport	Tuticorin – 255 Km-Southwest

Source: Survey of India Toposheet

Table 2.2: Boundary Co-Ordinates

Boundary Pillar No.	Latitude	Longitude
1	10° 51' 12.2899"N	78° 52' 16.3469"E
2	10° 51' 17.1354"N	78° 52' 42.2716"E
3	10° 51' 10.8291"N	78° 52' 42.8956"E
4	10° 51' 02.8306"N	78° 52' 18.7831"E

Figure 2.1: Digitized location map covering 10 km radius

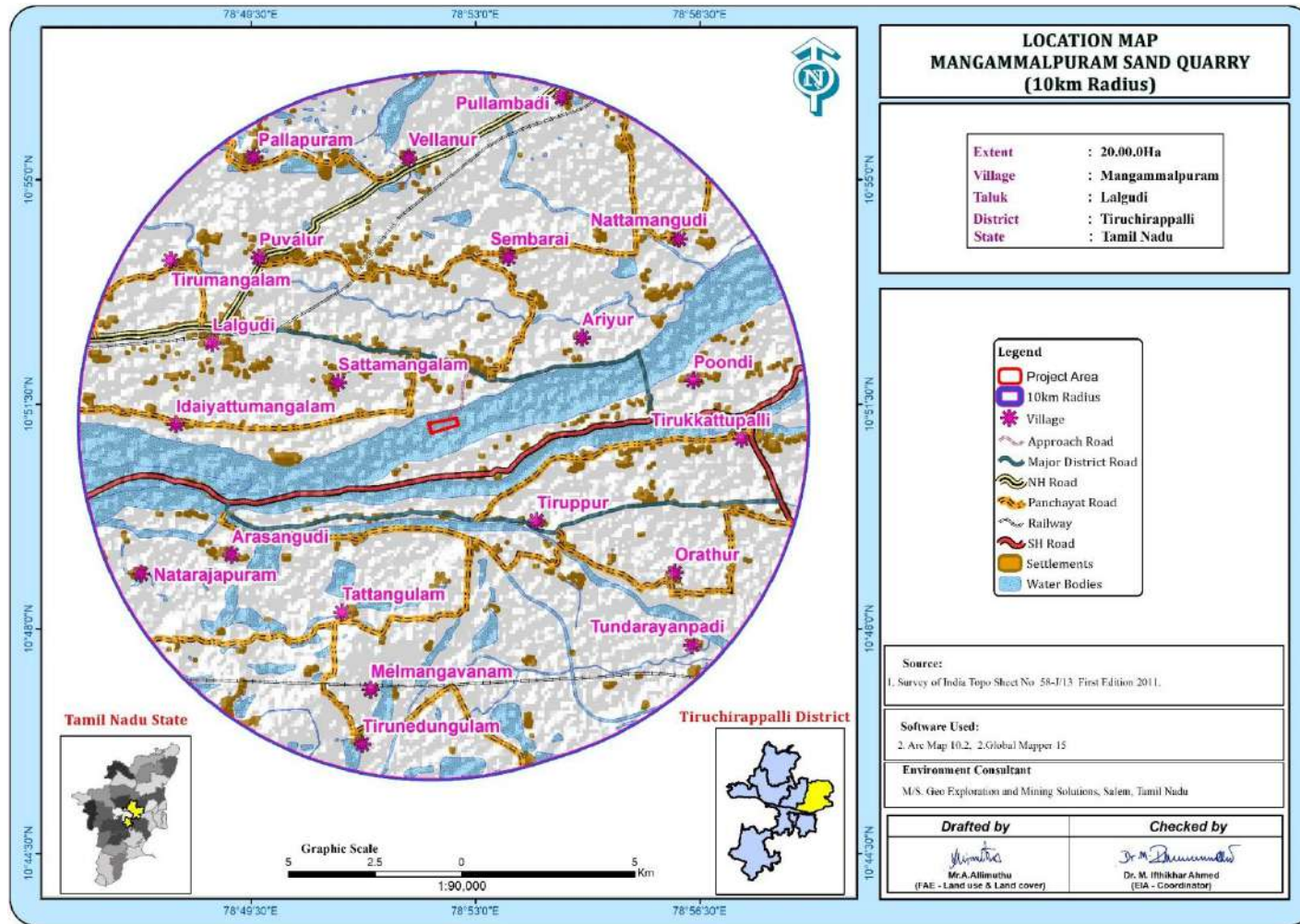


Figure 2.2: Digitized location map covering 5 km radius

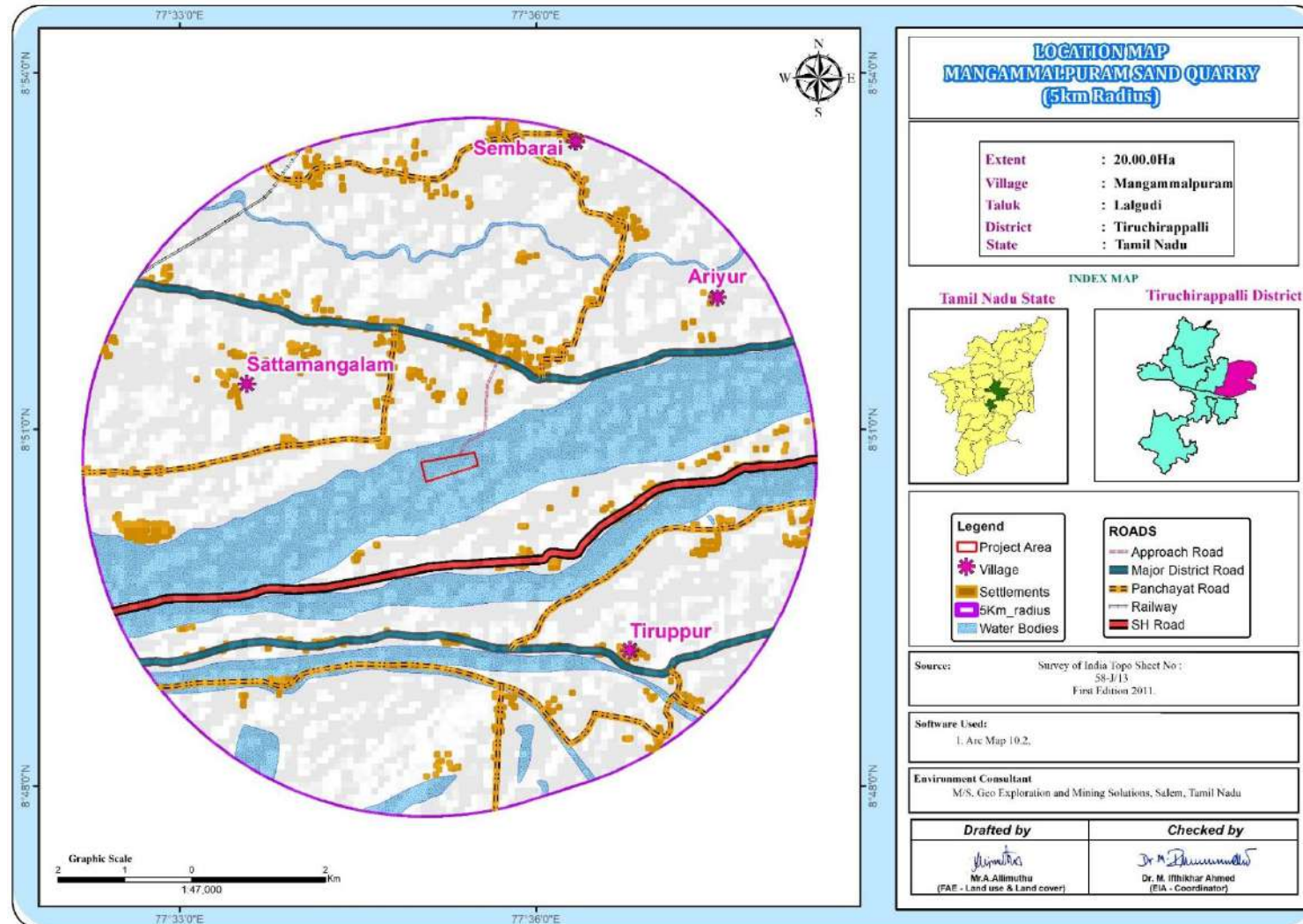


Figure 2.3: Location map on the geo referenced Toposheet (2km radius)

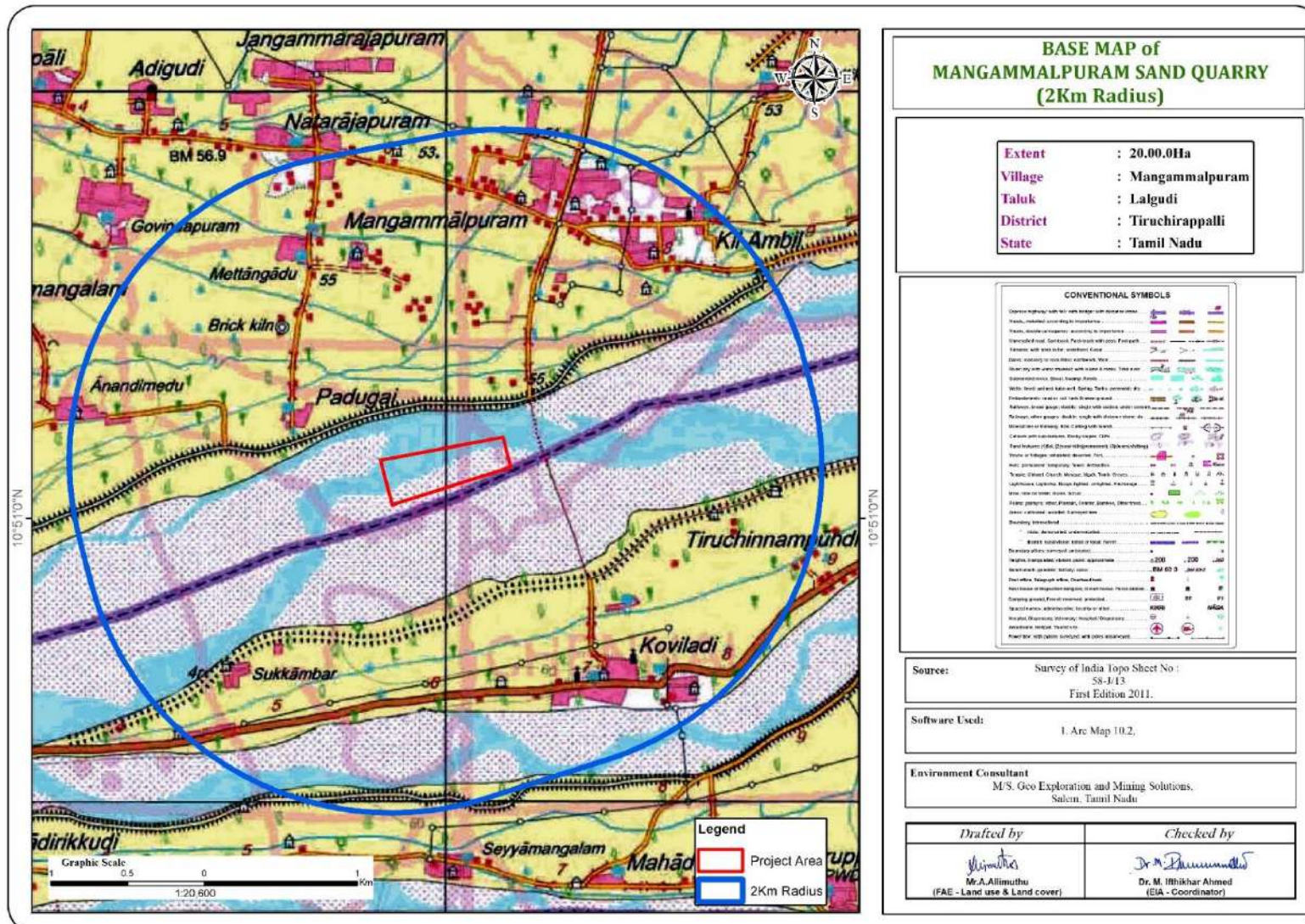


Figure 2.4: Digitized location map covering 1km radius

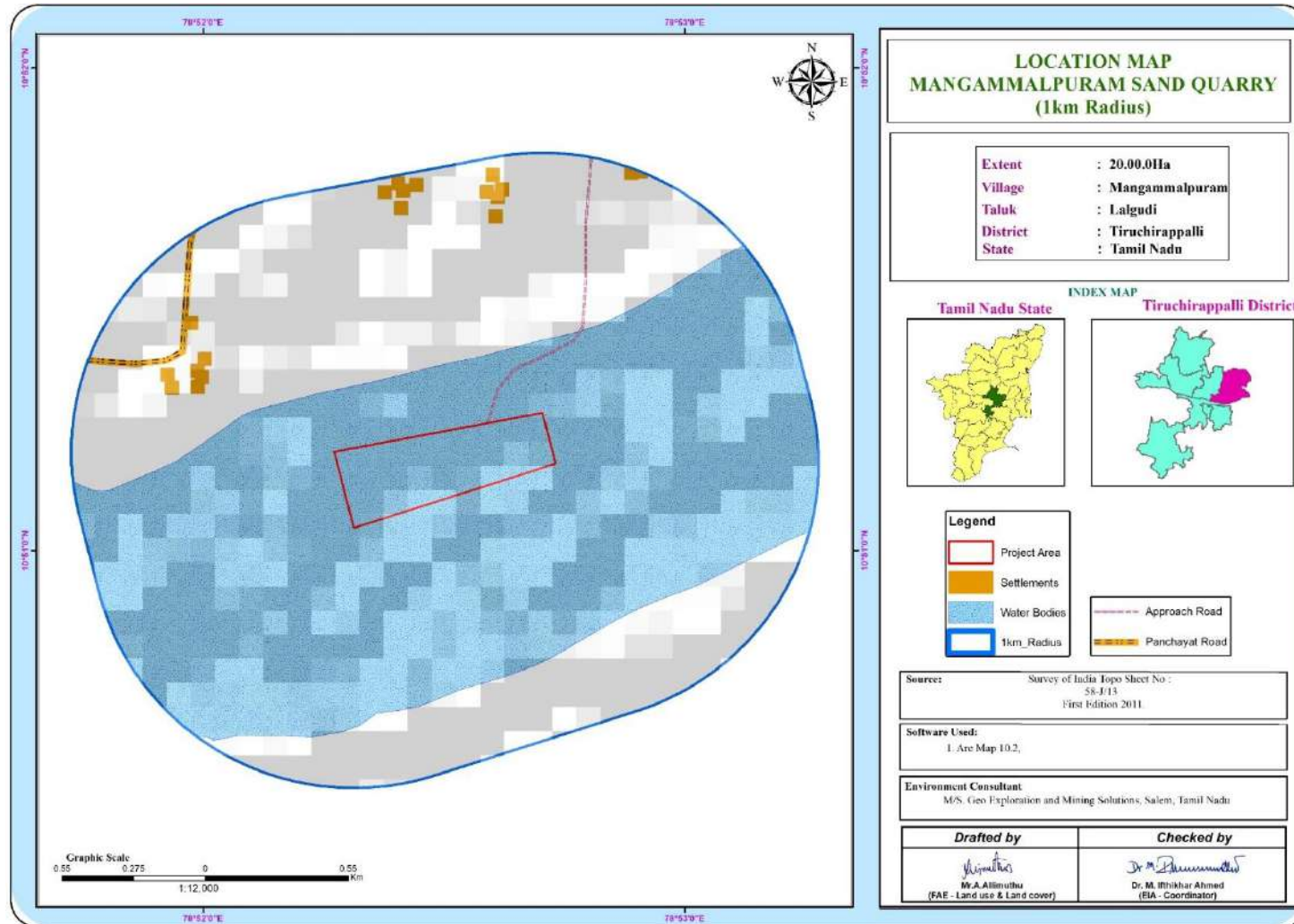


Figure 2.5: Quarry Boundary superimposed on Satellite Imagery

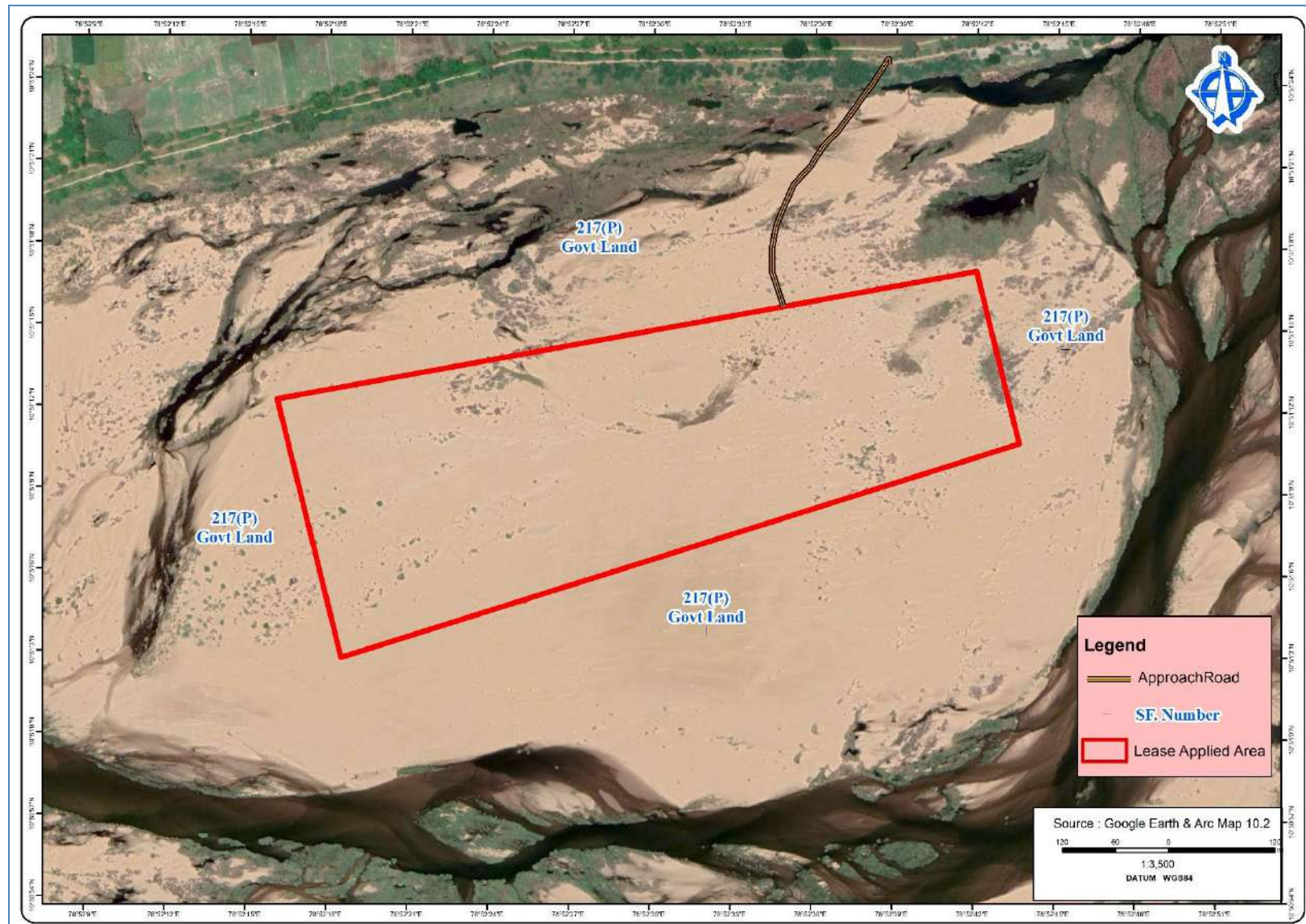
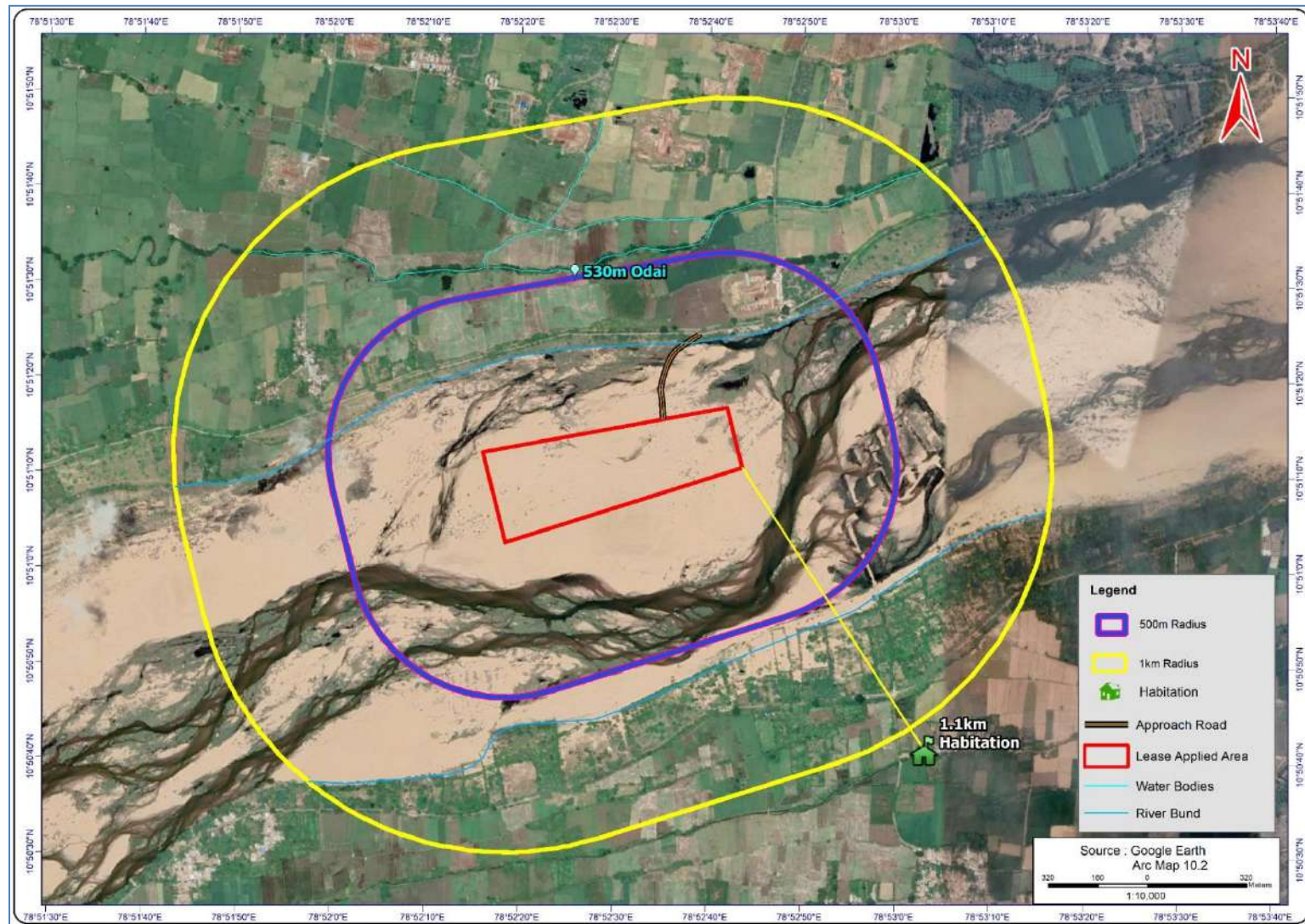


Figure 2.6: Google Earth Image showing 300 and 500m radius from Project area

2.2.1 Project Area

- * The Sand quarry is proposed to operate by opencast mechanized method of mining and the project is site specific
- * There is No beneficiation or processing proposed inside the project area.
- * The river bed level is 50.99 on the upstream side and 53.87m on the downstream side
- * It is a Government land maintained by Water Resources Department, Tiruchirappalli District.

Figure 2.7: Topographical view of the project area



2.2.2 Land Use Pattern of the Core Zone

The project area is falls in the Coleroon River, topography of the area is exhibits plain topography with gentle ups and downs, Sloping towards East side. The altitude of the area is varying from 50.99m to 53.87m above MSL and the river bed level is 51.195 on the upstream side and 50.779m on downstream side.

Figure 2.8: Topography, Geological Plan

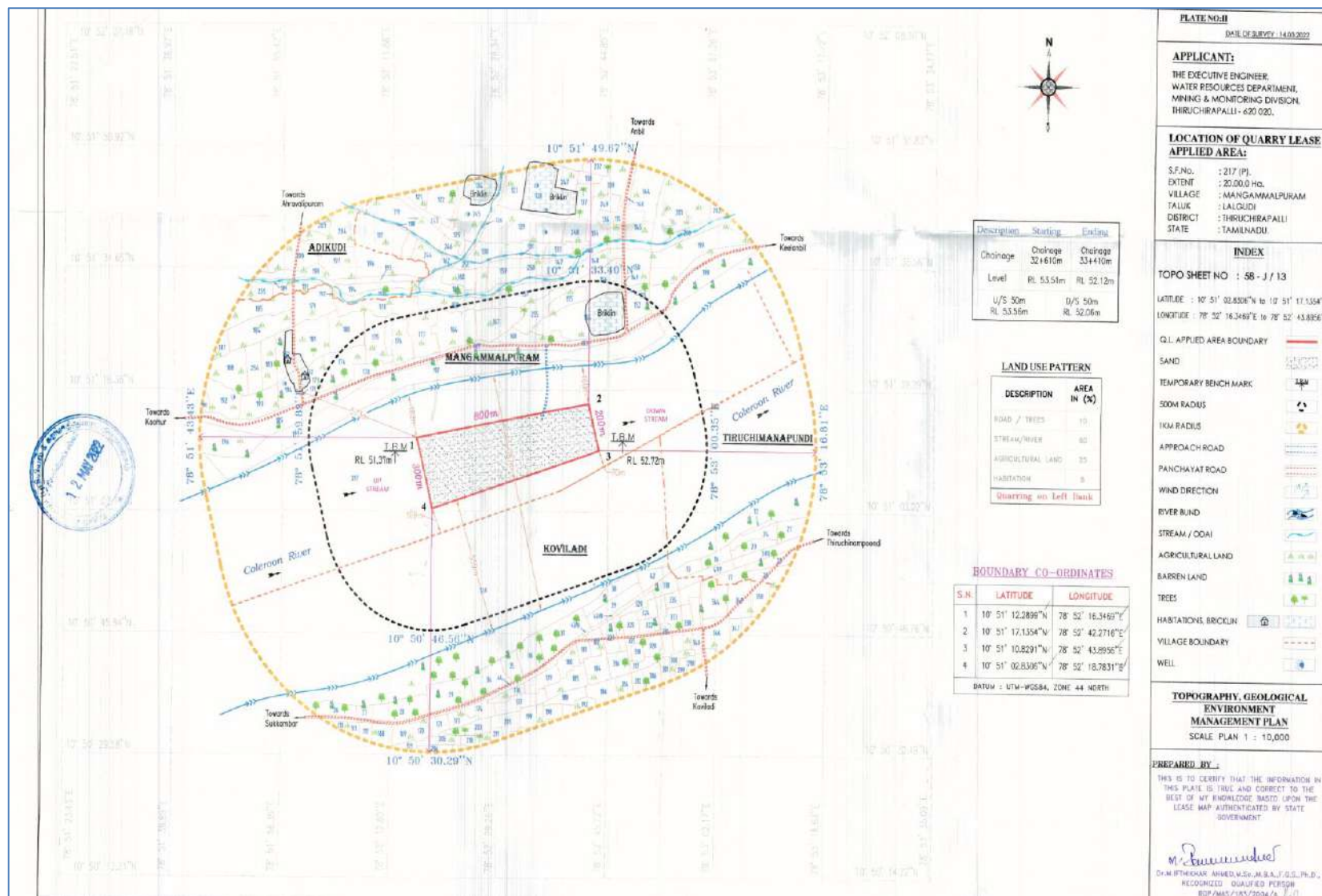


Figure 2.9A: Topography, Geological Sections



Source: Approved Mining plan

Table 2.3: External infrastructures

<i>S. No</i>	<i>Particulars</i>	<i>Location</i>	<i>Direction</i>	<i>Approximate Aerial Distance in Km</i>
1	Nearest Post Office	Adhikudi	NW	3km
2	Nearest School	Anbil	NE	1.5km
3	Nearest Dispensary	Anbil	NE	1.5km
4	Nearest Town	Lalgudi	NW	6.5km
5	Nearest Police Station	Lalgudi	NW	6.5km
6	Nearest Hospital	Lalgudi	NW	6.5km
7	Nearest D.S.P. Office	Lalgudi	NW	6.5km
8	Nearest Railway Station	Lalgudi	NW	6.5km
9	Nearest Airport	Tiruchirappalli	SW	20km
10	Nearest Harbour	Thoothukudi	SW	244km
11	District Head Quarters	Tiruchirappalli	SW	20km

2.2.3 Size or Magnitude of Operation

Table 2.4: Mining details

Particulars	Details
Method of Mining	Opencast mechanized
Geological resources	10,00,000m ³
Mineable reserves	5,00,000m ³
Production for two years plan period	3,00,000m ³ for first year 2,00,000m ³ for 2 nd year
Depth of Mining	2.5m (1.5m abl + 1m bbl)
Water table	11 in summer and 16m in rainy season

Source: Approved mining plan

2.3 GEOLOGY

2.3.1 Regional Geology

The entire area is covered by Sand, the Cuavery river is generated at Tala Kaveri, Kodagu District, Karnataka State and the river is encountered in Tamil Nadu via Hogenakkal, Dharmapuri District and Cauvery River passess through Salem, Erode, Namakkal, Karur, Thiruchirappalli, Thanjavur and Mayiladuthurai Districts. The Main Catchment area of Cauvery River is Sathyamangalam Hill Ranges, ooty and Palani hill ranges in Tamil Nadu State and the area consists mainly Gneissic rocks, Charnockites, Migmatites etc., The Kollidam River splits from the main branch of the Cauvery River at the island of Srirangam and flows eastward Direction for diversion of water during heavy rain and flood in the Cauvery River also for irrigation purpose and confluence with Bay of Bengal.

The Coloeroon River is more widen in Mangammalpuram area, hence the areas contain more siltation and the rate of sedimentation is quite high which leads to the reduction in carrying capacity resulting in a loss of functional efficiency/ carrying capacity of the river.

Figure 2.10: Geology map of the area

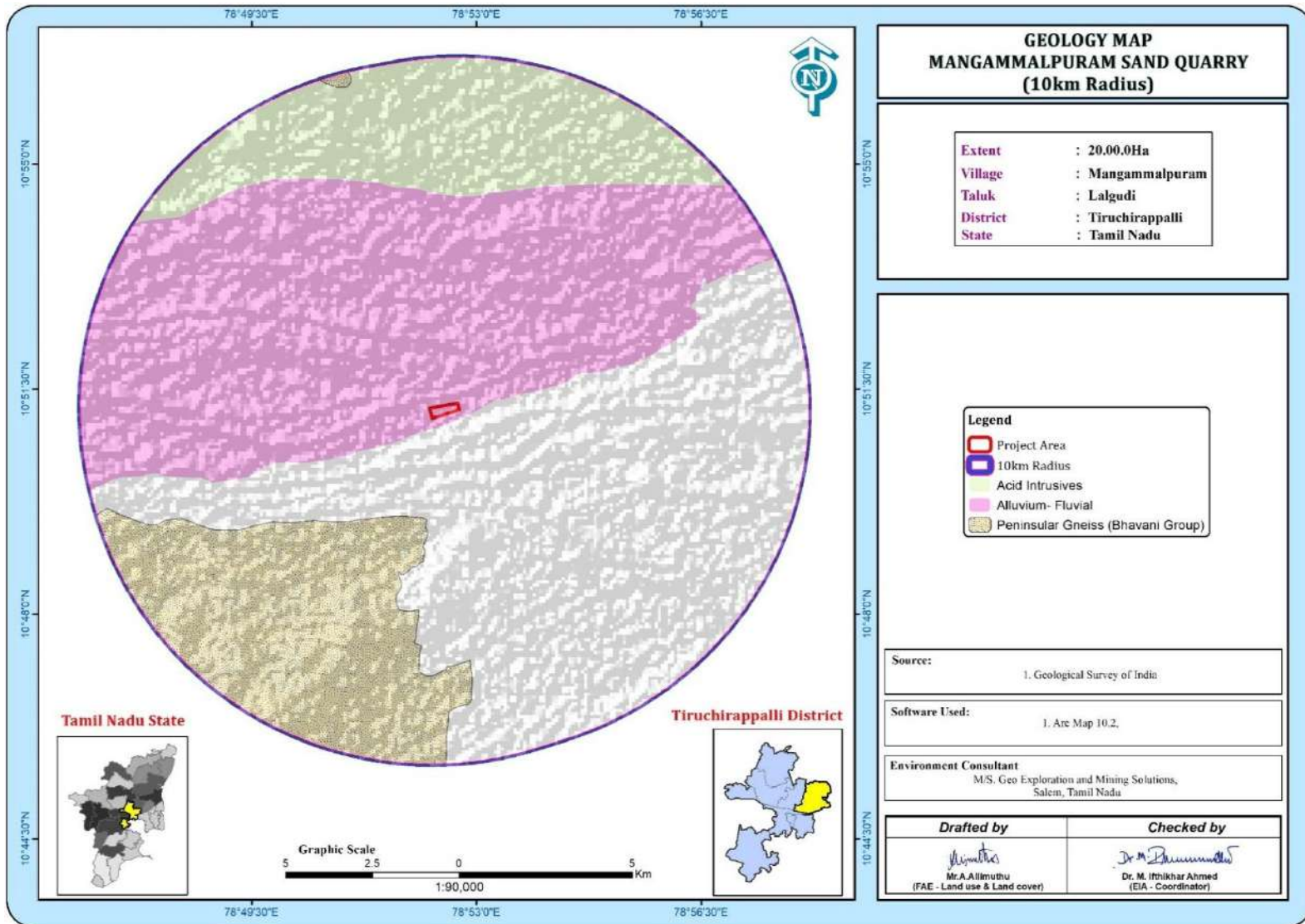
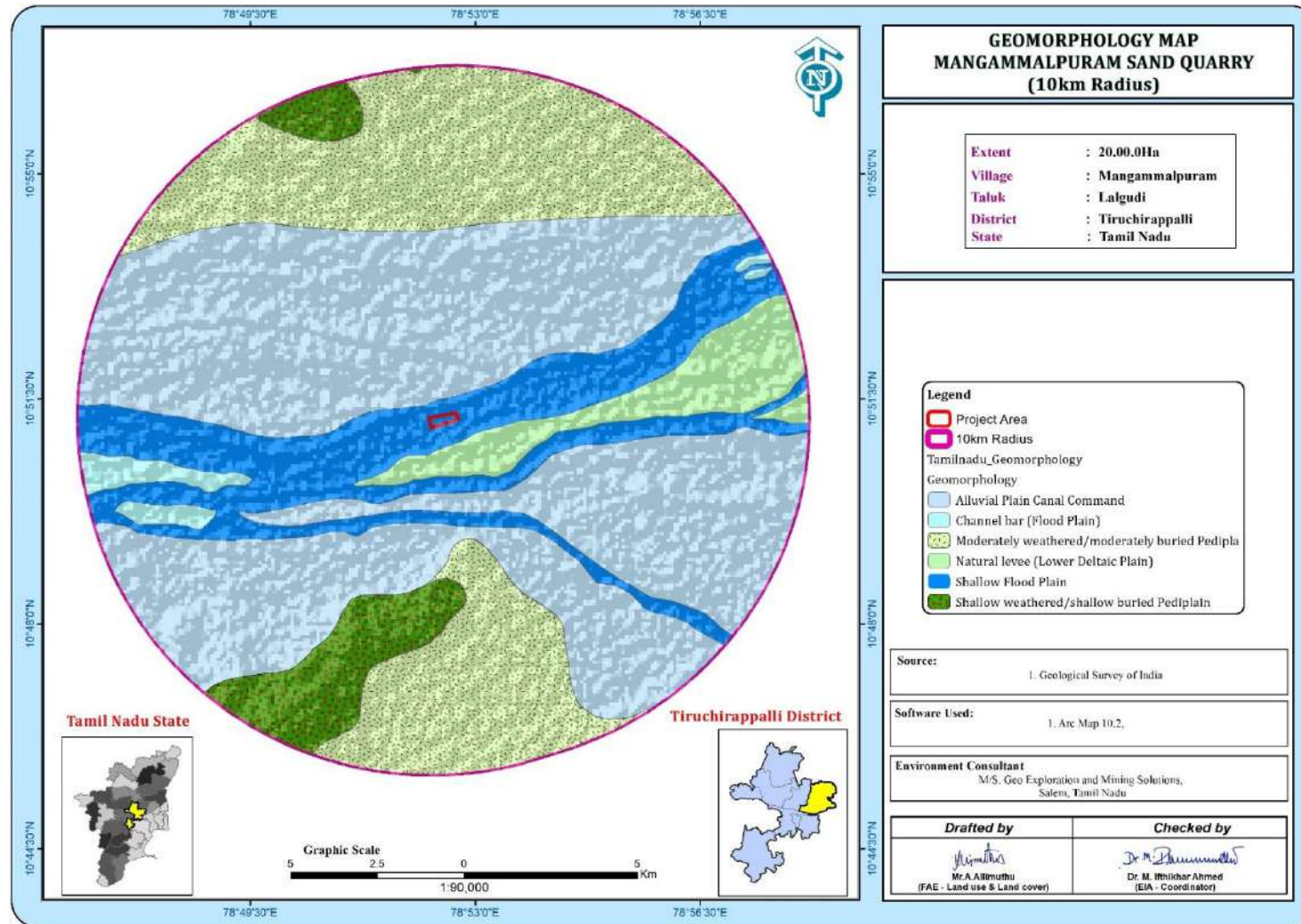


Figure 2.11: Geomorphology map of the area



2.3.2 Site Specific Geology

The area is fully covered by Sand Deposit, the altitude of the area varies from 50.99m to 53.87m above MSL and the river bed level is 51.195m on the upstream side and 50.779m on the downstream side.

2.4 QUALITY OF RESERVE

The entire area is covered by sand. The sand is derived by erosion and transportation of rock.

2.5 RESERVE ESTIMATION AND PRODUCTION

The Sand deposit in the area recommended for quarrying lease is simple flat-bedded deposit of shallow depth. The geological resources of Sand in the area are estimated by Cross sectional method, The Geological plan and Sections for every 50m interval with 10m interval of spot level is prepared based on the Topographical plan.

The Geological plan demarcating the commercially viable sand has been prepared in 1:1,000 Scale. The quantity of the Sand to be desilted is calculated by length and width of the lease area, which is suitably chosen to cover the maximum area.

The total quantity of production for the two years has been estimated as 5,00,000 m³ of Sand for a total depth of 2.5m (1.5m abl + 1m bbl).

Table 2.5: Resources and Reserves

Description	Sand Quantity in m ³
Geological Resources	10,00,000
Mineable Reserves	5,00,000
Yearwise Production	5,00,000
Peak Production Proposed	3,00,000
Peak Production per Day	1200

Source: Approved Mining Plan

Table 2.6: Year wise Production details

Year	Sand (m ³)
1	3,00,000
2	2,00,000
Total	5,00,000

Source: Approved Mining Plan

One lorry load	=	6m ³
No.of working days	=	250 days
Sand		
Total sand for the 2 years	=	5,00,000m ³
Total lorry loads per day	=	5,00,000/6
	=	83,333 Lorry loads
	=	83,333/2 years
	=	41,667/250 days
	=	167 Lorry loads per day
Total Lorry loads per day	=	167 loads

2.5.1 Disposal of overburden / Waste

There is no over burden / waste within the applied area. The quarried out sand will be directly loads into tippers to the Government stock yard unit.



2.6 METHOD OF MINING

Opencast method of shallow mining is proposed. Initially to approach the proposed site a temporary road will be formed by using of Gravel mixed with bio-degradable materials and formed a grit around the sand desilting site to move the vehicles easily. During forming the approach road and grit, necessary temporary pipes will be provided wherever necessary for free flow of water to downstream. After forming this approach roads, the trucks/ lorries are allowed for transportation after paying the necessary fees to the Government bodies. In this process contract labours from neighboring villages are engaged for the purpose of maintaining the approaches. Regulating the vehicle movements, assisting to take levels, issuing of permits etc., to regulate the desilting operation in a scientific and systematic manner. The sand will be loaded directly to the trucks / Lorries for transportation to the needy customers and the Silt will be directly loaded to the trucks / Lorries for transportation to the nearby Farmers for Agriculture purpose with free of cost. Hence, no mineral processing is involved.

The trucks are loaded by excavators in direct supervision of the Assistant / Junior Engineers Public Works Department. The competent statutory mines foreman will also be deployed for the safety movement of vehicles inside the quarry.

After that the loaded vehicles are allowed to go out only after covering the sand and silt load properly by tarpaulin to avoid any spillage.

Table 2.7: Lists of Machineries Proposed

Sl.No.	Machinery	Numbers of Units	Capacity	Make	Motive Power
1	Excavator attached with bucket	3	0.90m ³	TATA Hitachi	Diesel Drive
2	Tipper	15	10/20 tons	Tata	Diesel Power

Source: Approved Mining plan

The total direct manpower requirement for the full scale quarrying operations is given below.

Table 2.8: Man power requirement

1. Supervisory and Skilled Persons		
S.No.	Designation	No. of Person
1	WRD Assistant Engineer	1
2	Technical Assistant	1
3	Excavator Operator	3
4	Permit Slip issuer	3
5	Office Helper	1
Total		9
2. Unskilled		
6	Excavator Co – operator	3
7	Traffic Regulator	Entrance
		Exit
		Quarrying Site
8	Bucket Watcher /Stopper	3
9	Track Maintainer	10
10	Watchman (Three Shift)	6
Total		29
Grand Total		38

Source: Approved Mining plan

2.6.1 Conceptual Mining Plan/ Final Mine Closure Plan

The sand deposit is soft & fragile in nature and occurring as a layer of around 5 thickness it is proposed to excavate 2.5m (1.5m abl + 1m bbl). After the completion of quarrying operation the land will be got natural replenishment in the upcoming rainy seasons.

2.6.2 Traffic Density:

Traffic density measurements were performed at two locations at one location is Ariyur - Aharavallipuram village road which is about 4.5km in the Northeast and another location is Aharavallipuram – Lalgudi Road which is about 4.0Km in the Northwest side as per IRC – 86 – 1983 Guidelines. Traffic density measurement were made continuously for 24 hours by visual observation and counting of vehicles under three categories, viz., heavy motor vehicles, light motor vehicles and two/three wheelers. As traffic densities on the roads are high, two skilled persons were deployed simultaneously at each station during each shift- one person on either direction for counting the traffic. At the end of each hour, fresh counting and recording was undertaken.

Figure.2.12: Mineral Transportation route map



The traffic volume survey was done at two locations as given in the table 2.12. The location for the survey was identified in accordance with mineral transportation route from the mines.

The monitoring was performed on 09.12.2022. Traffic density measurement were made continuously for 24 hours by visual observation and counting of vehicles under three categories, viz., Heavy motor vehicles (HMTV), Light Motor Vehicles (LMV) and two/three wheelers. Two skilled persons were involved in the traffic survey, simultaneously at each station during each shift- one person on either direction for counting the traffic. At the end of each hour, fresh counting and recording was undertaken.

Table.2.9: Traffic Survey Locations

Station code	Station location	Distance and Direction	Type of Road
TS1	Ariyur - Aharavallipuram	4.5km – Northeast	MDR (Two lane)
TS2	Aharavallipuram – Lalgudi	4.0km – Northwest	MDR (Two lane)

Source: On-site monitoring by GEMS FAE & TM

Table 2.10: Existing Traffic Volume

Station code	HMV		LMV		2/3 Wheelers		Total PCU
	No	PCU	No	PCU	No	PCU	
TS1	115	345	55	55	218	109	509
TS2	95	285	42	42	196	98	425

Source: On-site monitoring by GEMS FAE & TM

- PCU conversion factor for HMV (Trucks and Bus) = 3, LMV (Car, Jeep and Auto) = 1 and 0.5 for Motor Vehicles (2/3 Wheelers)

Table 2.11: Sand Hourly Transportation Requirement

Transportation of Sand per day		
Capacity of trucks	No Trips per day	Volume in PCU
20 tonnes	138	46

Source: Data analyzed from Approved Mining plan

Table 2.12: Summary of Traffic Volume

Route	Capacity of the traffic in PCU	Incremental traffic from the mine in PCU	Total traffic volume	Hourly Capacity in PCU as per IRC – 1960 guidelines
Ariyur - Aharavallipuram	509	46	555	1200
Aharavallipuram – Lalgudi	425	46	471	1200

Source: On-site monitoring analysis summary by GEMS FAE & TM

Due to this project the existing traffic volume will not exceed

As per the IRC 1960 this existing road can handle 1,200 PCU in hour and Major district road can handle 1500 PCU in hour hence there will not be any conjunction due to this proposed transportation.

2.6.3 Mineral Beneficiation and Processing

There is no proposal for the mineral processing or ore beneficiation in the project area

2.7 PROJECT REQUIREMENT

2.7.1 Water Source & Requirement

Detail of water requirements in KLD as given below:

Water will be purchased from water vendors by water tankers. Packaged Drinking Water is available from the nearby approved water vendors.

Table 2.13: Water Requirements

Purpose	Quantity	Sources
Domestic purpose	1.0 KLD	Drinking water is available from the nearby community wells
Dust suppression	1.0 KLD	From existing bore well on nearby mine
Green belt	1.0 KLD	From existing bore well on nearby mine
Total	3.0 KLD	

* Drinking water will be sourced from approved water vendors

Source: Approved Mining Plan & Pre – Feasibility Report

2.7.2 Power and Other Infrastructure Requirement

The project does not require power supply for the mining operations. The quarrying activity is proposed during day time only (General Shift 8 AM – 5 PM, Lunch Break 1 PM – 2 PM).

The temporary infrastructures such as Mine Office, First Aid Room, Rest Shelter etc., will be constructed outside the lease hold area after the Lease deed execution. No workshops are proposed inside the area hence there will not be any process effluent generation from the proposed project area. There is no toxic effluent expected to generate in the form of solid, liquid or gaseous form hence there is no requirement of waste treatment.

2.7.3 Fuel Requirement

Fuels are used for operating machineries and vehicles during desilting process. Fuels required for excavator for the entire project life is **83,330 liters** of HSD (High Speed Diesel).

2.8 PROJECT IMPLEMENTATION SCHEDULE

The Sand quarry operation will commence after the grant of Environmental Clearance, CTO from the State Pollution Control Board. The conditions imposed during the Environmental Clearance will be compiled before the start of mining operation.

Table 2.14 Expected time schedule for the project

Sl. No.	Particulars	Time Schedule (In Month)*					Remark if any
		1 st	2 nd	3 rd	4 th	5 th	
1	Environmental Clearance						
2	Consent To Operate						Production Start Period

*Time line may vary; subjected to rules and regulations /& other unforeseen circumstances

Source: Anticipated based on Timelines framed in EIA Notification & CPCB Guidelines

Table 2.15 Project cost

Sl.No	Description	Cost in Rupees
1	Project cost	Rs.88,43,000/-
2	EMP	Rs. 1,50,000/-
Total cost		Rs.89,93,000/-

Source: Approved Mining Plan

CSR/CER –

It is a public and Government bonafied project hence, cost for Corporate Environment Responsibilities (CER) does not involved in this project. If any direction given by the competent authority for CER activity, the same will be followed by WRD department after obtained permission from the Government.

CHAPTER – 3: DESCRIPTION OF ENVIRONMENT

3.0 GENERAL

This chapter presents a regional background to the baseline data at the very onset, which will help in better appreciation of micro-level field data, generated on several environmental and ecological attributes of the study area. The baseline status of the project environment is described section wise for better understanding of the broad-spectrum conditions.

As per the MoEF & CC Office Memorandum F. No IA3-22/10/2022.IA.III (E 177258) Dated 8th June, 2022 the baseline data is utilized for this proposal.

The baseline environment quality represents the background environmental scenario of various environmental components such as Land, Water, Air, Noise, Biological and Socio-economic status of the study area. Field monitoring studies to evaluate the base line status of the project site were carried out covering December 2022 – February 2023 with CPCB guidelines. Environmental data has been collected with reference to cluster quarries by EHS 360 LABS PRIVATE LIMITED (Approved by ISO/IEC 17025:2017), Laboratory, for the below attributes-

- Land
- Water
- Air
- Noise
- Biological
- Socio-economic status

Study Area

An area of 10 km radius (aerial distance) from the periphery of the project is considered for EIA study. The data collection has been used to understand the existing environment scenario around the project site against which the potential impacts of the project can be assessed. The study area has been divided into two zones viz core zone and buffer zone where core zone is considered as project site and buffer zone taken as 10km radius from the periphery of the project site. Both Core zone and Buffer zone is taken as the study area.

Study Period

The baseline study was conducted during the winter season i.e. December 2022 – February 2023 (3 Months).

Study Methodology

Standard methodologies have been followed in developing the baseline report. The methodology adopted for the study is outlined below:

- * Conducting reconnaissance surveys for understanding the study area; and
- * Selecting sampling locations for conducting various environment baseline studies.

The sampling locations have been selected based on the following:

- * Predominant wind directions recorded at project site and comparison with secondary source recorded by the Indian Meteorological Department (IMD) observatory nearest to the site;
- * Existing topography;
- * Drainage pattern and location of existing surface water bodies like lakes/ponds, rivers and streams;
- * Locations of villages / towns / sensitive areas; and

- * Areas, which represent baseline conditions

The field observations have been used to:

- * Assess the positive and negative impacts due to the proposed project;
- * Suggest appropriate mitigation measures for remediating the adverse environmental impacts, if any; and
- * Suggesting post-project monitoring requirements and suitable mechanism for it

The sampling methodologies for the various environmental parameters required for the study, frequency of sampling and method of sample analysis are given below in Table 3.1.

Table 3.1: Environmental monitoring attributes and frequency of monitoring

Attribute	Parameters	Frequency of monitoring	No. of locations	Protocol
Land-use	Land-use Pattern within 10 km radius of the study area	Data's from census handbook 2011 and from the satellite imagery	Study Area	Satellite Imagery Primary Survey
Soil Characteristics	Physio-Chemical Characteristics	Once during the study period	6 (1 core & 5 buffer zone)	IS 2720 Agriculture Handbook - Indian Council of Agriculture Research, New Delhi
Water Quality	Physical, Chemical and Bacteriological Parameters	Once during the study period	6 (2 surface water & 4 ground water)	IS 10500& CPCB Standards
Meteorology	Wind Speed Wind Direction Temperature Cloud cover Dry bulb temperature Rainfall	1 Hourly Continuous Mechanical/Automatic Weather Station	1	Site specific primary data& Secondary Data from IMD Station
Ambient Air Quality	PM ₁₀ PM _{2.5} SO ₂ NO _x CO	24 hourly twice a week (December 2022 to February 2023)	8 (1 core & 7 buffer)	IS 5182 Part 1-23 National Ambient Air Quality Standards, CPCB
Noise Levels	Ambient Noise	Hourly observation for 24 Hours per location	8 (1 core & 7 buffer)	IS 9989 As per CPCB Guidelines
Ecology	Existing Flora and Fauna	Through field visit during the study period	Study Area	Primary Survey by Quadrate & Transect Study Secondary Data – Forest Working Plan
Socio Economic Aspects	Socio-Economic Characteristics, Population Statistics and Existing Infrastructure in the study area	Site Visit & Census Handbook, 2011	Study Area	Primary Survey, census handbook & need based assessments.

Source: On-site monitoring/sampling by EHS 360 Labs Private Limited Laboratories in association with GEMS

* All monitoring and testing are been carried out as per the Guidelines of CPCB and MoEF & CC.

3.1 LAND ENVIRONMENT

The main objective of this section is to provide a baseline status of the study area covering 10km radius around the cluster site so that temporal changes due to the mining activities on the surroundings can be assessed in future.

3.1.1 Land Use/ Land Cover

Indian Remote Sensing satellite IRS-P6, LISS III of Bhuvan (ISRO), multi-spectral digital data has been used for the preparation of land use/ land cover map of present study.

A visual interpretation technique has been adopted for land use classification based on the keys suggested in the chapter – V of the guidelines issued by NNRMS Bangalore & Level III classification with 1:50,000 scale for the preparation of land use mapping.

An image interpretation keys were developed based on such image characteristics, which enable interpretation of satellite images for land use/land cover features. Further, the land use / land cover and other baseline layers was put in GIS database for integration, analysis, statistics generation and final out in the form of land use land cover map.

Interpreted thematic details were transferred on the base map. Besides, other supporting data like project reports and statistical data published by various Government departments have also been used.

Table 3.2: Major land use/land cover of the study area

S.No	Classification	Area_Ha	Area_%
BUILTUP			
1	Builtup Urban	387.86	1.20
2	Builtup Rural	1303.02	4.02
3	Builtup Mining	382.24	1.18
AGRICULTURAL LAND			
4	Crop Land	21878.78	67.56
5	Agricultural Plantation	1172.66	3.62
6	Fallow Land	1909.52	5.90
BARREN/WASTELAND			
7	Scrub Land	126.45	0.39
8	Salt Affected Area	26.01	0.08
WETLANDS/WATERBODIES			
9	Waterbodies	5198.66	16.05
Total		32385.20	100.00

Figure 3.1: Physiography Map of the study area

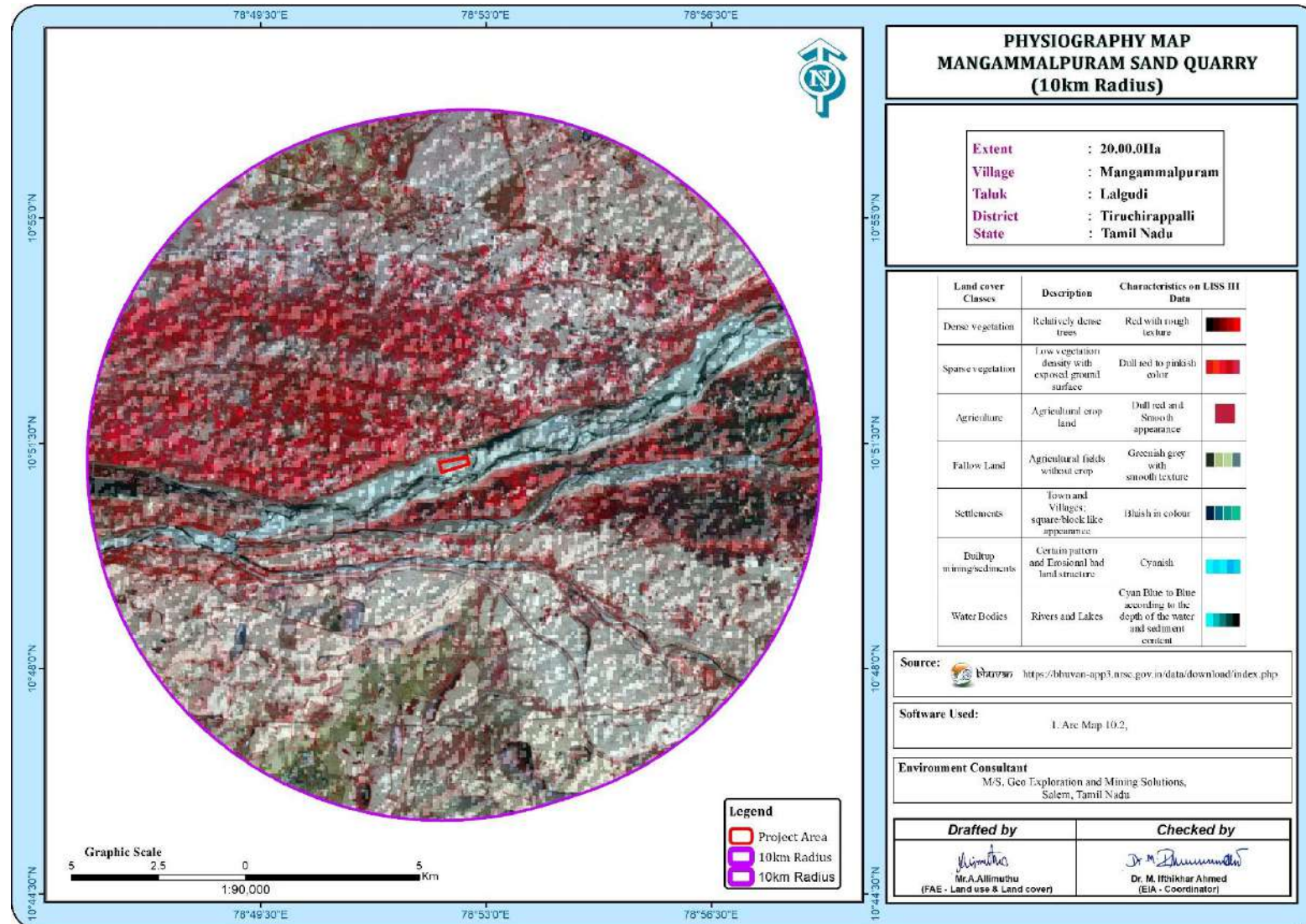


Figure 3.2: Land use – Land cover map of the study area

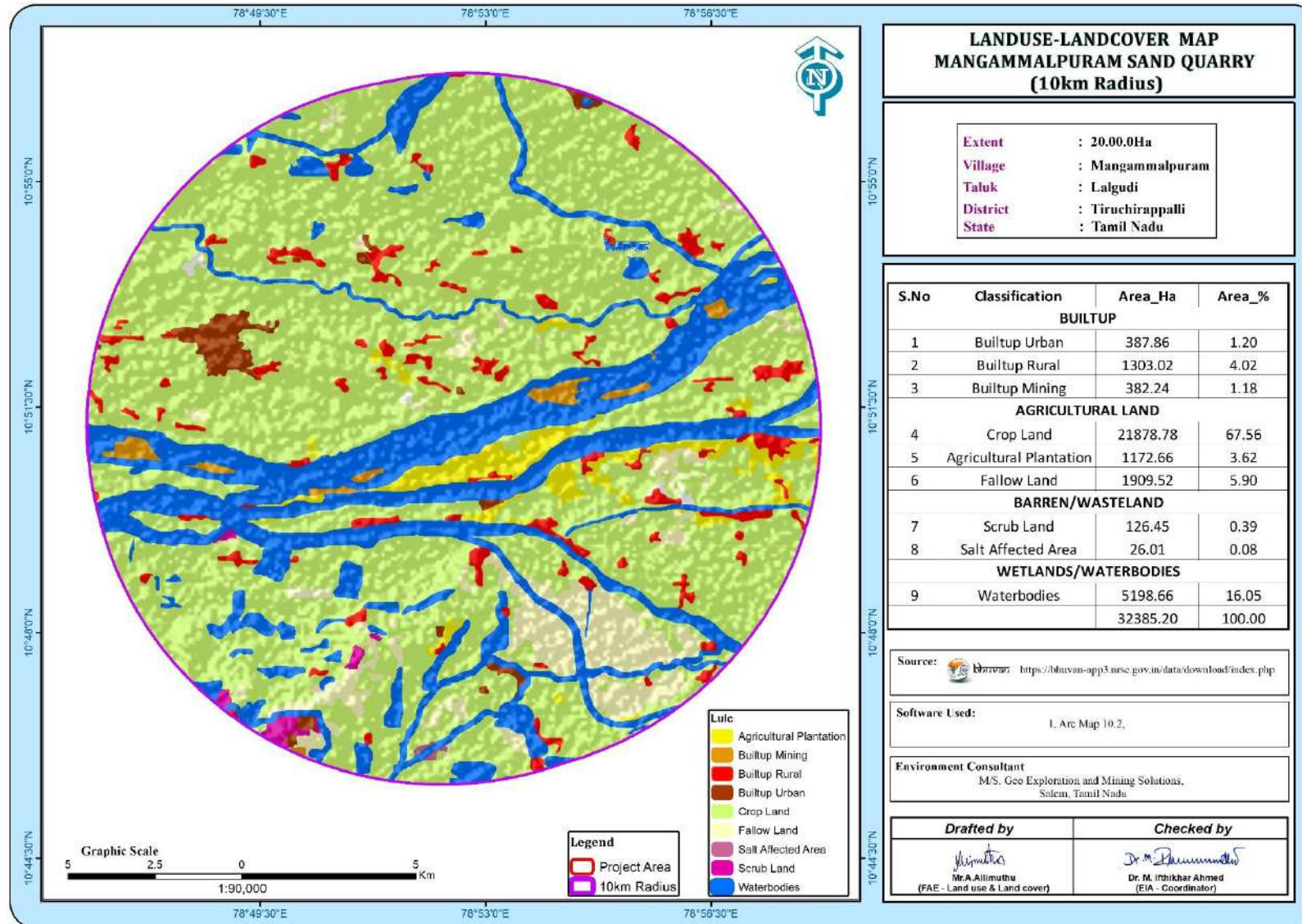
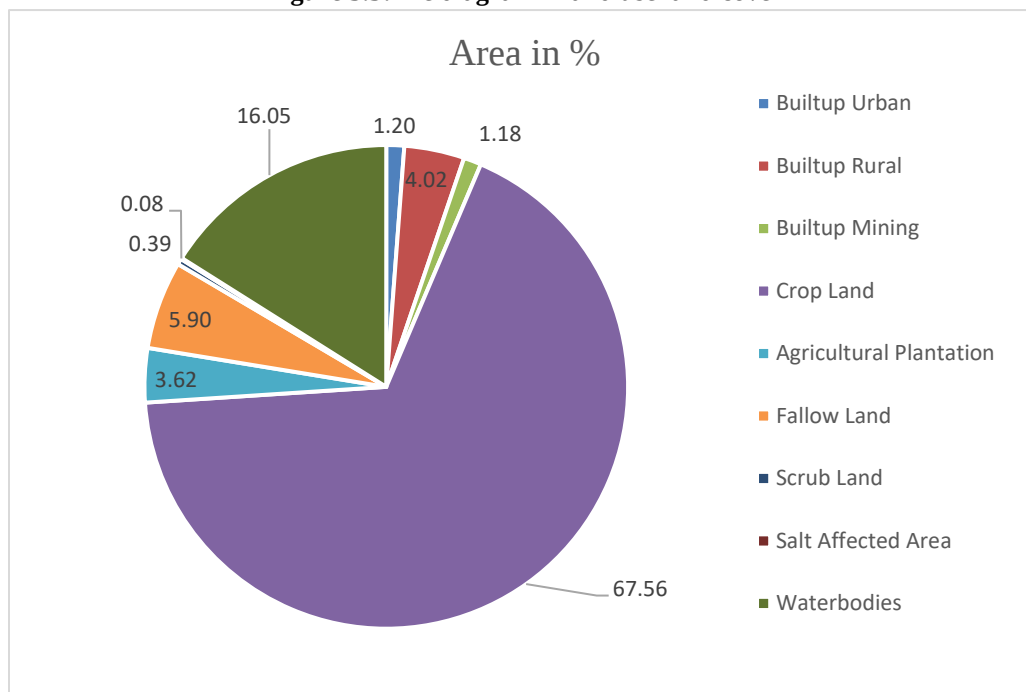


Figure 3.3: Pie diagram – land use land cover

Source: Bhuvan Land use/ Land Cover Data

Interpretation:

- Built-up area = 1690.88ha ie., 5.22 %
- Agriculture land = 24960.97 ha ie., 77.08 %
- Barren land = 152.45 ha ie., 0.47 %
- Mining area = 382.24ha ie., 1.18 %

Total Mining area in the study area is 382.24 Ha ie.,1.18%. This proposed project area occupies 5.23 % overall area. This small percentage of Mining Activities shall not have any significant impact on the environment.

3.1.2 Topography

The lease applied area exhibits flat topography with ups and downs of sand shoals, having gentle slope towards east side. The altitude of the area varies from 50.99m to 53.87m above MSL and the river bed level is 51.195m on the Upstream side and 50.779m on downstream side above from MSL.

3.1.3 Drainage Pattern of the Area

The project located at Coleroon River, the general drainage pattern of the area is of sub dendritic and dendritic pattern. No prominent water course or nallah is inferred. During rainy season the surface runoff flows in W to E direction. The drainage pattern of the study area is given in Fig. 3.5. The quarrying activity will not hinder the natural flow of rainwater.

3.1.4 Environmental Features in the Study Area

There is no Wildlife Sanctuaries, National Park and Archeological monuments within the study area. No protected and reserved forest area is involved in the project area. Therefore, there will be no need to acquisition/diversion of forest land. The details related to the environment sensitivity around the project area i.e. 10 km radius of the project area, are given in the below Table 3.3.

Table 3.3: Environmental Settings in the study area

S.No	Sensitive Ecological features	Name	Arial Distance in km from project boundary
1	National Park/ Wild life sanctuaries	Karaivetti Birds Sanctuary	21.5 Km – Northeast
2	Reserve forest	Nagavalli R.F	8.97 Km- Southwest
3	Tiger Reserve/Elephant Reserve	Sathyamangalam Tiger Reserve	172 km – North West side
4	Core Zone of Biosphere Reserve	None	Nil within 10 km Radius
5	Migratory birds	None	Nil within 10 km Radius
6	Mangroves	None	Nil within 10 km Radius
7	Mountains/Hills	None	Nil within 10 km Radius
8	Notified Archaeological sites	None	Nil within 10 km Radius
10	Defense Installation	None	Nil within 10 km Radius

Source: Survey of India Toposheet, Village Cadastral Map& Google Earth/Maps

Table 3.4: List of Water bodies near the project site

S.No	Label	Distance & Direction
1	Kaveri River	1.5km & South
2	Anicut Canal	3Km & South
3	Vennar River	2.5Km & South
4	Kiliyur Lake	4.5Km & SW
5	Sangenthi Dam	8Km & North
6	Nandhiyar Stream	6.5Km & NE
7	Odai	590m & North
8	Kundan Lake	9.3Km & NE
9	Pulambadi Dam	9Km & N

Table 3.4A: List of Water bodies near the project site

No	Name	Distance & Direction
1	Indian oil Corporation Limited	9Km_SW

3.1.5 Seismic Sensitivity

Zone II, low damage risk zone as per BMTPC, Vulnerability Atlas of Seismic zone of India IS: 1893 – 2002. No history of such incidents in the area. The project area falls in the sedimentary terrain on the peninsular shield of south India which is highly stable.

3.1.6 Soil Environment

Soil quality of the study area is one of the important components of the land environment. The composite soil samples were collected from the study area and analyzed for different parameters. The locations of the monitoring sites are detailed in Table 3.4 and Figure 3.3.

Table 3.5 – Soil Sampling Locations

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	S-1	Near Project Area	560m NW	10°51'17.50"N 78°51'58.04"E
2	S-2	Mullal	6.5km NE	10°54'7.64"N 78°54'49.11"E
3	S-3	Arasangudi	6.5km SW	10°49'03.71"N 78°49'16.44"E
4	S-4	Kadambangudi	4.8km SE	10°49'3.93"N 78°54'17.65"E
5	S-5	Kodayakkudi	6km South	10°47'46.37"N 78°52'12.19"E
6	S-6	Sirumayankudi East	4.5km North	10°53'40.58"N 78°52'17.57"E

Source: On-site monitoring/sampling by EHS 360 Labs Private Limited Laboratories in association with GEMS

The objective of the soil sampling is -

1. To determine the baseline soil characteristics of the study area;
2. To determine the impact of proposed activity on soil characteristics and;

To determine the impact on soil more importantly agriculture production point of view.

Methodology –

For studying soil quality, sampling locations were selected to assess the existing soil conditions in and around the proposed project site representing various land use conditions. The samples were collected by auger boring into the soil up to 90-cm depth. Six (6) locations were selected for soil sampling on the basis of soil types, vegetative cover, industrial & residential activities including infrastructure facilities, which would accord an overall idea of the soil characteristics. The samples were analysed for physical and chemical characteristics. The sealed samples were sent to laboratory for analysis. The samples were filled in Polythene bags, coded and sent to laboratory for analysis and the details of methodology in respect are given in below Table 3.5.

Table 3.6 – Methodology of Sampling Collection

Particulars	Details
Frequency	One grab sample from each station-once during the study period
Methodology	Composite grab samples of the topsoil were collected from 3 depths, and mixed to provide a representative sample for analysis. They were stored in airtight Polythene bags and analyzed at the laboratory.

Source: On-site monitoring/sampling by EHS 360 Labs Private Limited in association with GEMS

Soil Testing Result –

The samples were analyzed as per the standard methods prescribed in “Soil Chemical Analysis (M.L. Jackson, 1967) & Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Government of India”. The important properties analyzed for soil are bulk density, porosity, infiltration rate, pH and Organic matter, kjeldahi Nitrogen, Phosphorous and Potassium. The standard classification of soil and physico-chemical characteristics of the soils are presented below in Table 3.6 & Test Results in Table 3.7.

Figure 3.4: Soil Sampling Locations around 10 km radius

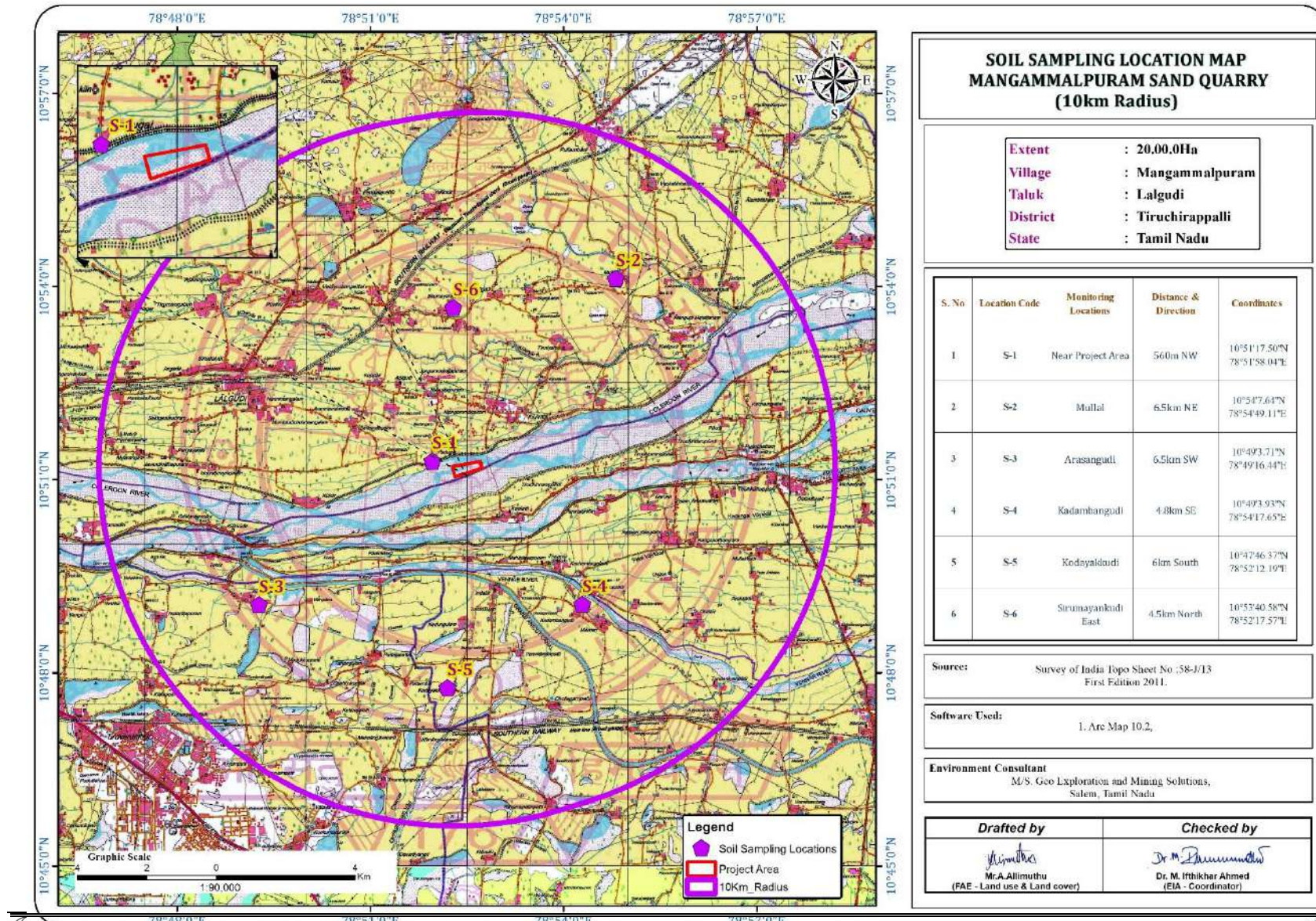


Figure 3.5: Soil Map of the study area

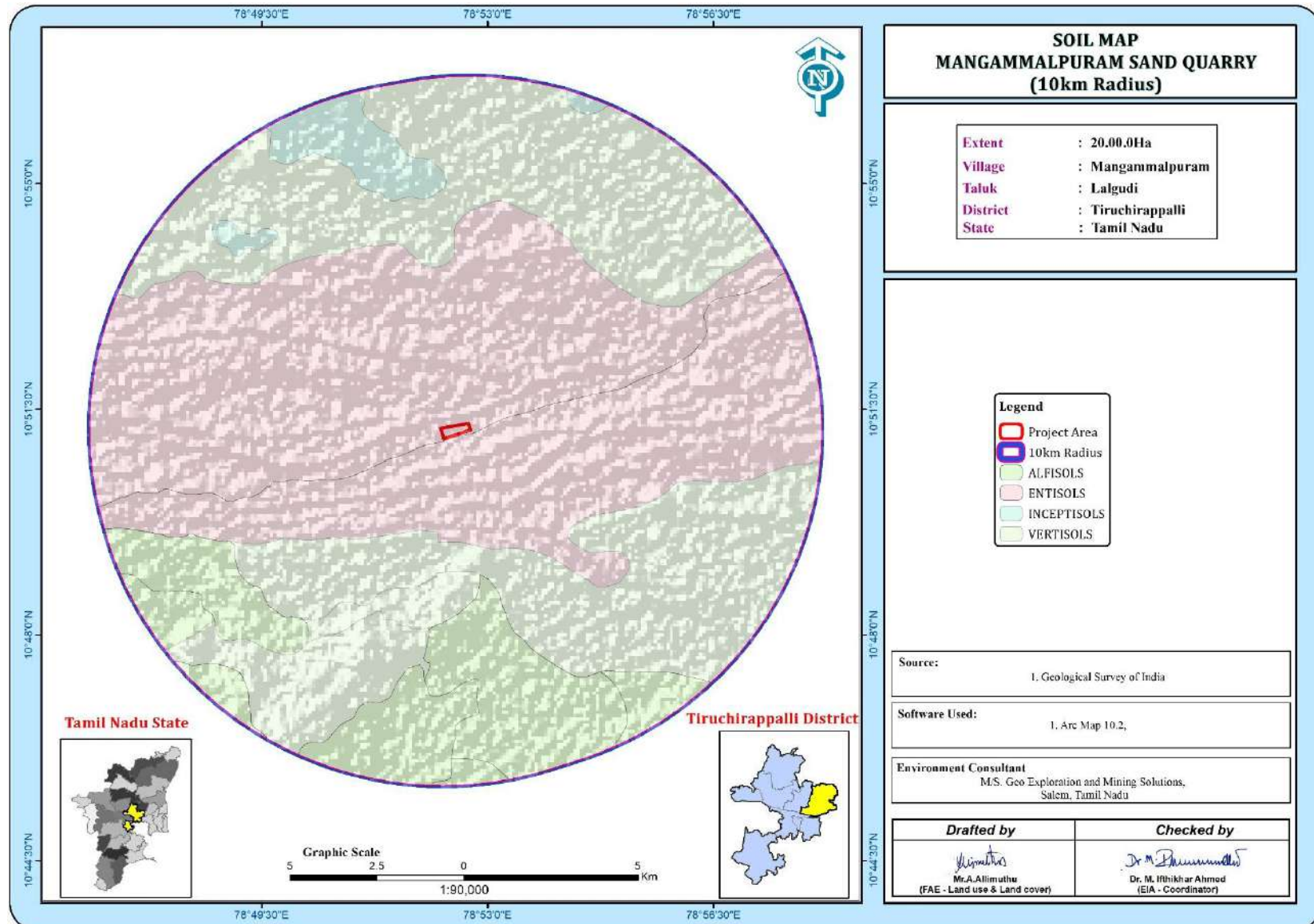


Table 3.7: Soil sampling results

S.No	Test Parameters	units	S1	S2	S3	S4	S5	S6
01	pH @ 25°C	-	8.88	8.01	8.67	8.75	8.87	8.53
02	Conductivity @ 25°C	µmhos/cm	410	600	505	550	438	483
03	Texture :							
	Clay	%	35.0	39.4	36.8	35.4	37.4	31.5
	Sand	%	36.2	34.3	31.8	31.1	34.5	28.7
	Silt	%	28.8	26.3	31.4	33.5	28.1	39.8
04	Water Holding Capacity	%	42.2	45.4	44.1	45.1	40.8	39.7
05	Bulk Density	g/cm ³	1.23	1.07	0.97	1.23	1.25	1.26
06	Porosity	%	45.8	48.4	44.1	45.6	40.2	40.5
07	Calcium as Ca	mg/kg	153.4	167.5	225	165	150	169
08	Magnesium as Mg	mg/kg	78.5	128	70.5	97.6	110	125
09	Manganese as Mn	mg/kg	26	30.0	23	26.7	20.5	18.4
10	Zinc as Zn	mg/kg	1.01	1.08	2.51	1.53	2.05	1.10
11	Boron as B	mg/kg	1.34	1.56	1.06	0.76	2.67	1.23
12	Chloride as Cl	mg/kg	190	200	180	71.3	153	138
13	Total Soluble Sulphate as SO ₄	%	0.015	0.010	0.010	0.009	0.008	0.012
14	Potassium as K	mg/kg	30.1	50.2	43.5	30.9	27.7	30.8
15	Total Phosphorus as P	mg/kg	1.25	1.35	1.13	1.53	1.03	2.1
16	Total Nitrogen as N	mg/kg	298	580	413	473	353	349
17	Cadmium as Cd	mg/kg	BDL (DL: 1.0)	BDL (D :1.0)	BDL (DL:1.0)	BDL (DL: 1.0)	BDL (DL: 1.0)	BDL (DL: 1.0)
18	Total Chromium as Cr	mg/kg	BDL (D : 1.0)	BDL (DL :1.0)	BDL (DL:1.0)	BDL (D : 1.0)	BDL (DL: 1.0)	BDL (DL=: 1.0)
19	Copper as Cu	mg/kg	BDL (DL: 1.0)	BDL (DL:1.0)	BDL (D: 1.0)	BDL (DL: 1.0)	BDL (DL:1.0)	BDL (DL: 1.0)
20	Lead as Pb	mg/kg	0.50	0.70	0.37	0.71	0.29	0.60
21	Iron as Fe	mg/kg	1.73	2.15	1.03	2.06	1.15	2.32
22	Organic Matter	%	2.31	1.99	2.36	2.83	1.48	2.05
23	Organic Carbon	%	1.34	1.16	1.97	1.64	0.86	1.19
24	Cation Exchange Capacity	meq/100g of soil	38.4	36.6	40.0	35.7	47.8	45.5

Source: Sampling Results by EHS 360 Labs Private Limited Laboratories

Interpretation & Conclusion**Physical Characteristics –**

The physical properties of the soil samples were examined for texture, bulk density, porosity and water holding capacity. The soil texture found in the study area is Clay to Sandy Soil and Bulk Density of Soils in the study area varied between 1.07 – 1.26 g/cc. The Water Holding Capacity and Porosity of the soil samples is found to be medium i.e. ranging from 39.7 to 45.4.

Chemical Characteristics –

- The nature of soil is slightly alkaline to strongly alkaline in nature with pH range 8.01 to 8.88
- The available Nitrogen content range between 349 mg/kg to 580 kg/ha
- The available Phosphorus content range between 1.13 to 2.1 kg/ha
- The available Potassium range between 27.7 to 50.2 mg/kg

Whereas, the micronutrient as zinc (Zn), iron (Fe) and copper (Cu) were found in the range of 1.01 to 2.51 mg/kg; 1.03 to 2.32 mg/kg and ND

Wilting co efficient in significant level would mean that the soil would support the vegetation. The soil properties in the buffer zone reveal that the soil can sustain vegetation. If amended suitability the core area can also withstand plantation.

3.2 WATER ENVIRONMENT

The water resources, both surface and groundwater play a significant role in the development of the area. The purpose of this study is to assess the water quality characteristics for critical parameters and evaluate the impacts on agricultural productivity, domestic community usage, recreational resources and aesthetics in the vicinity. The water samples were collected and transported as per the norms in pre-treated sampling cans to laboratory for analysis.

3.2.1 Surface Water

The project area lies in the Coleroon river. The area is studded with few tanks that serve as the source of drinking water and also their surplus feeds adjoining tanks.

3.2.2 Ground Water Conditions

Tiruchirapalli district is underlain entirely by Archaean Crystalline formations with Recent alluvial deposits occurring along the river and streams courses and colluvium of valley-fills. The important aquifer systems in the district are constituted by weathered, fissured and fractured crystalline rocks and the recent alluvial deposits.

Ground water occurs under phreatic conditions. The maximum saturated thickness of these aquifers is upto 5 m depending upon the topographic conditions. The study area falls in the Tiruchirapalli which is categorized as Safe (< 70%) as per G.O (MS) No 113 dated 09.06.2016.

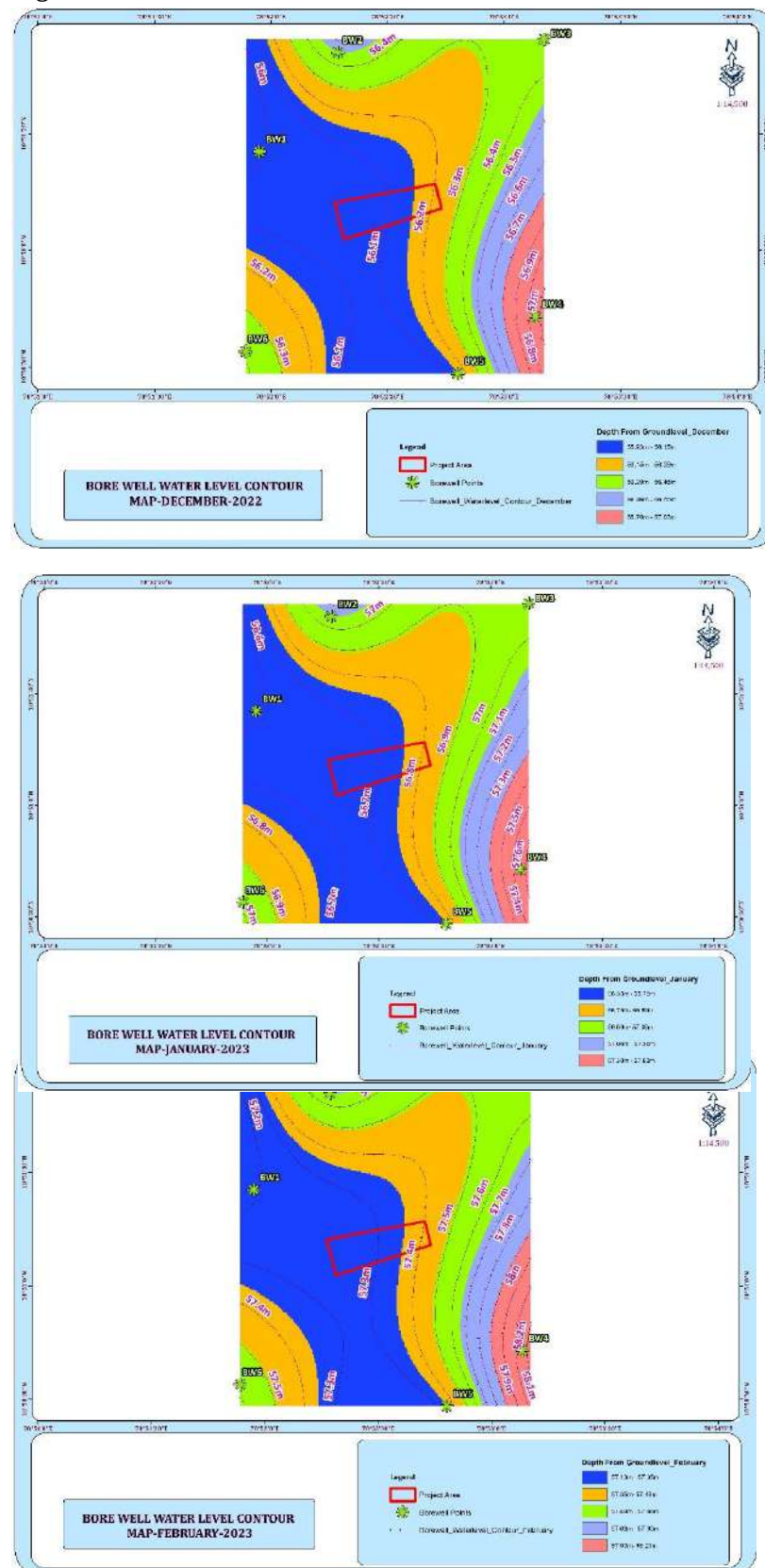
There are six (6) bore wells within the radius of 2km Most of the wells are almost in dry conditions in the summer season. The details of the well and depth in monsoon and non-monsoon is described below

Table 3.8: Details of Bore well in 2km Radius

S.No	Code	Latitude	Longitude	Dec-2022 (m)	Jan-2023 (m)	Feb-2023(m)
1	BW1	10° 51' 25.34"N	78° 51' 57.05"E	56	56.6	57.2
2	BW2	10° 51' 50.82"N	78° 52' 17.24"E	56.5	57.1	57.7
3	BW3	10° 51' 54.31"N	78° 53' 10.32"E	56.3	56.9	57.5
4	BW4	10° 50' 42.88"N	78° 53' 08.15"E	57	57.6	58.2
5	BW5	10° 50' 28.20"N	78° 52' 48.08"E	56.1	56.7	57.3
6	BW6	10° 50' 33.90"N	78° 51' 53.50"E	56.4	57	57.6

Source : Data obtained by the FAE & Team Members



Figure 3.6: Winter Season Water Level Of Bore Wells 2 Km Radius

Methodology for sample collection –

The sample was collected and analyzed as per IS-10500; IS-3025 & IS-2488 (Part 1-5). Grab sample of water was collected. Sample for chemical analysis was collected in polyethylene carboys. Sample for bacteriological analysis was collected in the sterilized bottle. Specified physio-chemical and Bacteriological parameters have been analyzed for projecting the existing water quality status in the study area.

Reconnaissance survey was undertaken to collect the sampling and locations were finalized based on;

1. Drainage pattern;
2. Location of residential areas representing different activities/likely impact areas; and
3. Likely areas, which can represent baseline conditions

Two (2) surface water and four (4) ground water samples were collected in the study area and physico-chemical, heavy metals and bacteriological parameters were analysed. The samples were analysed as per the procedures specified by CPCB, IS-10500:2012 and ‘Standard methods for the Examination of Water and Waste water’ published by American Public Health Association (APHA). The water sampling locations are given in Table 3.8 and shown as Figure 3.5.

Table 3.9 – Water Sampling Locations

S. No	Location code	Monitoring Locations	Distance & Direction	Coordinates
1	SW-1	Kollidam River	Project Area	10°51'5.19"N 78°52'18.43"E
2	SW-2	Kodayakkudi	6km South	10°47'43.07"N 78°52'22.54"E
3	WW-1	Near Project area	900m North	10°51'41.15"N 78°52'9.62"E
4	WW-2	Kadambankudi	7.8km SW	10°47'15.80"N 78°50'15.38"E
5	BW-1	Koviladi	1.3km SE	10°50'30.79"N 78°53'3.46"E
6	BW-2	Kodayakkudi	6km South	10°54'9.66"N 78°54'54.57"E

Source: On-site monitoring/sampling by EHS 360 Labs Private Limited in association with GEMS

Note: SW- Surface water, WW – Well Water, BW – Bore well

Objective of Water sampling –

- * For rational planning of pollution control strategies and their prioritization
- * To assess nature and extent of pollution control needed in different water bodies or their part
- * To assess assimilative capacity of a water body thereby reducing cost on pollution control
- * To assess fitness of water for different uses

Figure 3.7: Water quality monitoring stations around 10km radius

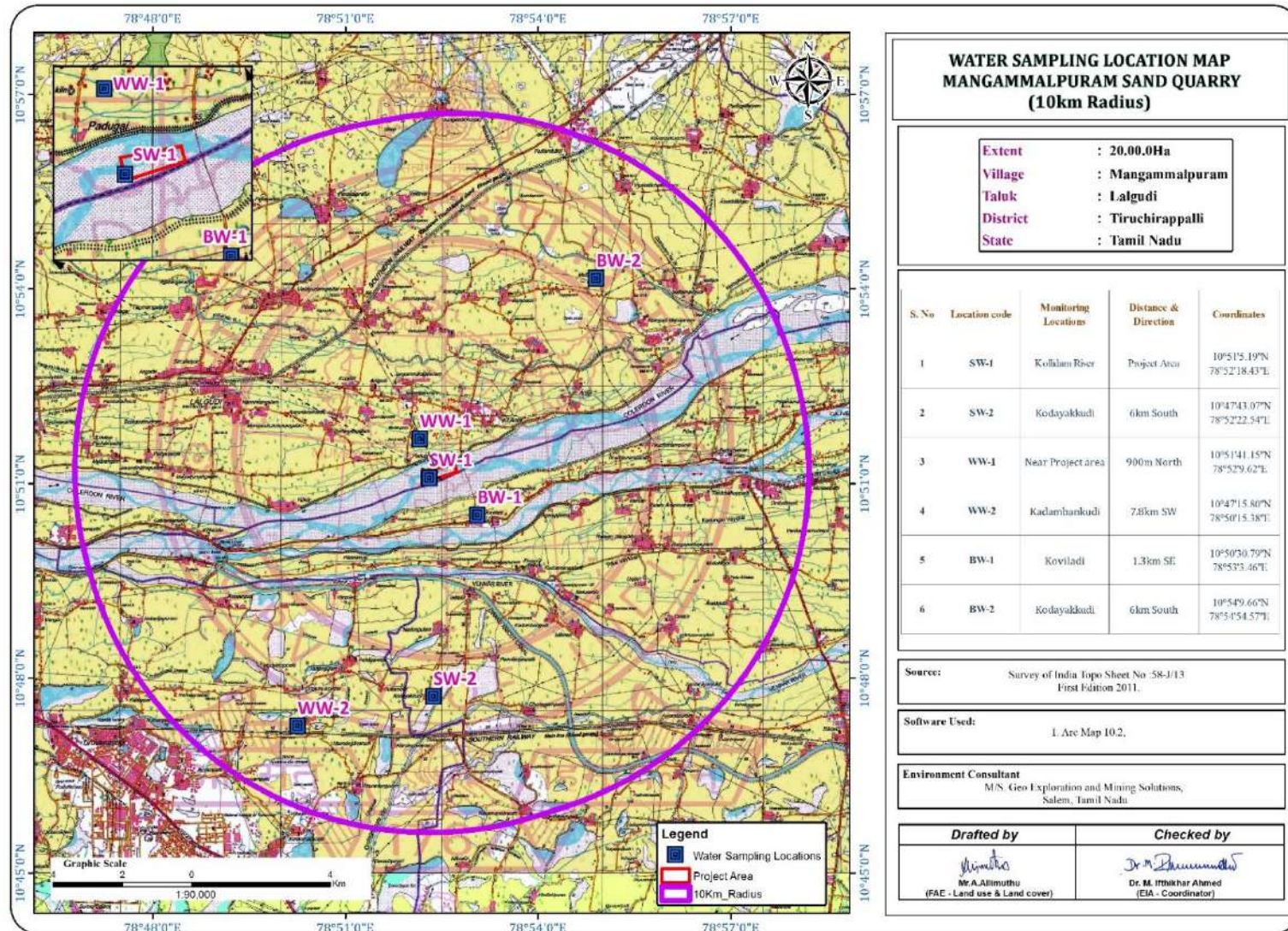


Figure 3.8: Ground Water Level Map

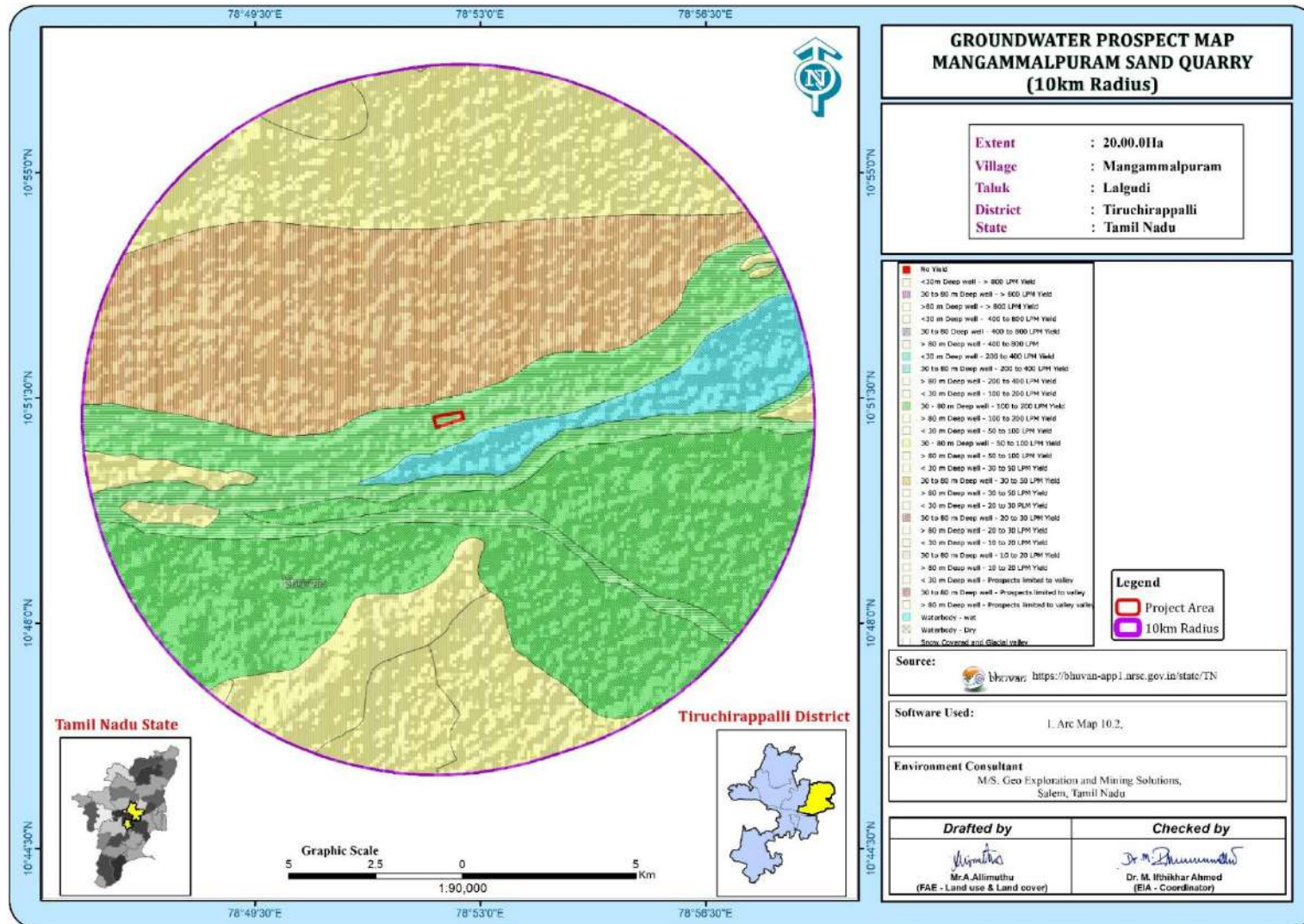


Figure 3.9: Drainage map of the study area - 10km radius

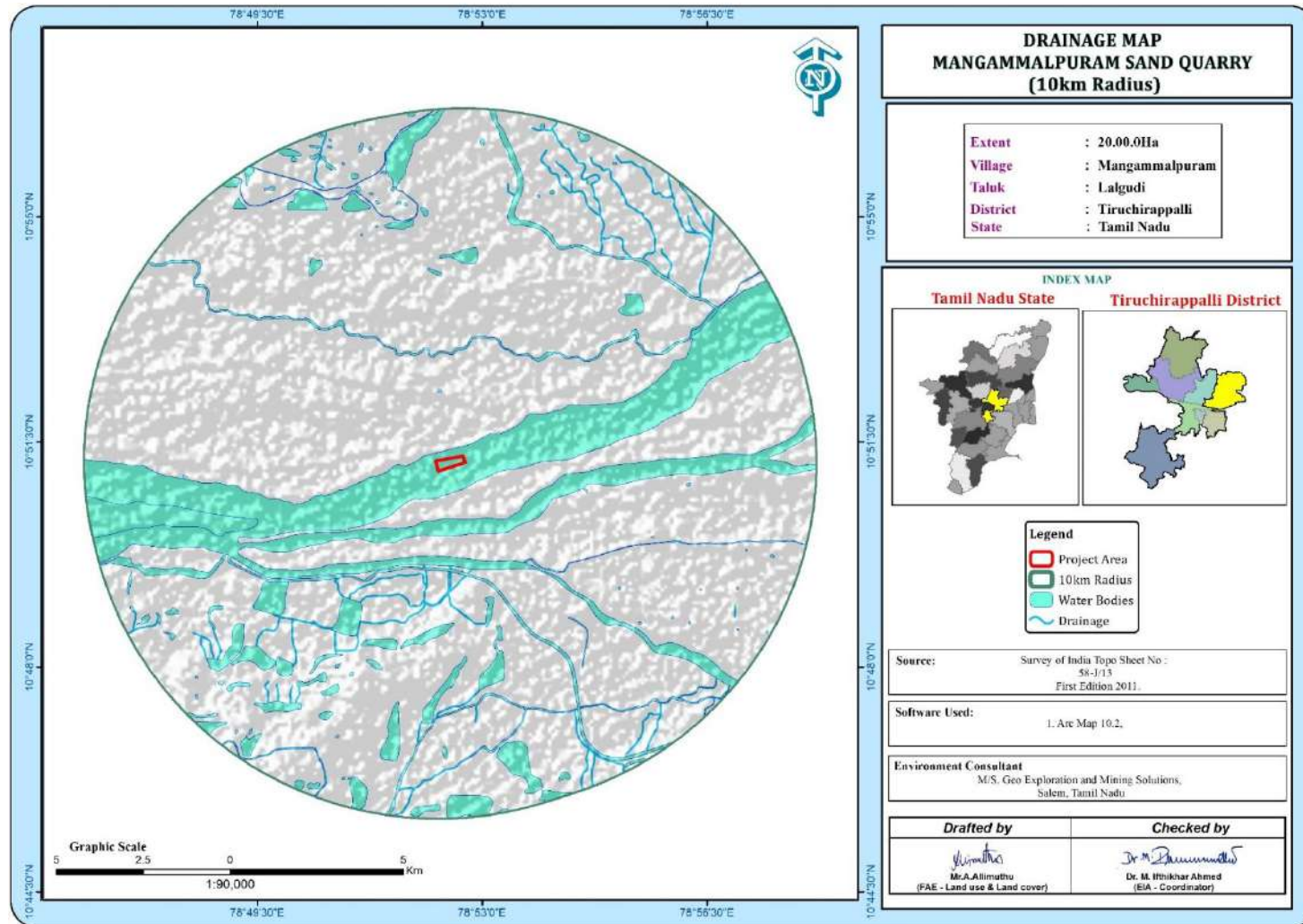


Table 3.10 – Surface Water Analysis Results

S.No.	Parameters	Units	SW1 (Kollidam River)	SW2 (Kodayakkudi)
1	Colour	Hazen	5	10
2	Odour	-	Agreeable	Agreeable
3	pH at 25°C	-	7.44	7.89
4	Conductivity @ 25°C	µmhos/cm	1085	1037
5	Turbidity	NTU	3.1	4.1
6	Total Dissolved Solids	mg/l	640	611
7	Total Hardness as CaCO ₃	mg/l	194.17	215.89
8	Calcium as Ca	mg/l	35.8	39.4
9	Magnesium as Mg	mg/l	25.5	28.6
10	Total Alkalinity as CaCO ₃	mg/l	203	219
11	Chloride as Cl	mg/l	180.4	143
12	Sulphate as SO ₄	mg/l	73	62.1
13	Iron as Fe	mg/l	0.14	0.15
14	Residual Free Chlorine	mg/l	BDL (DL:0.1)	BDL (DL:0.11)
15	Fluoride as F	mg/l	0.20	0.24
16	Nitrate as NO ₃	mg/l	8.1	10.3
17	Copper as Cu	mg/l	BDL (DL:0.01)	BDL (DL:0.01)
18	Manganese as Mn	mg/l	BDL (DL:0.02)	BDL (DL:0.02)
19	Mercury as Hg	mg/l	BDL (DL:0.0005)	BDL (DL:0.0005)
20	Cadmium as Cd	mg/l	BDL (DL:0.001)	BDL (DL:0.001)
21	Selenium as Se	mg/l	BDL (DL:0.005)	BDL (DL:0.005)
22	Aluminium as Al	mg/l	BDL (DL:0.005)	BDL (DL:0.005)
23	Lead as Pb	mg/l	BDL (DL:0.005)	BDL (DL:0.005)
24	Zinc as Zn	mg/l	BDL(DL : 0.05)	BDL(DL : 0.05)
25	Total Chromium as Cr	mg/l	BDL(DL : 0.02)	BDL(DL : 0.02)
26	Boron as B	mg/l	BDL(DL : 0.05)	BDL(DL : 0.05)
27	Mineral Oil	mg/l	BDL(DL : 0.01)	BDL(DL : 0.01)
28	Phenolic compounds as C ₆ H ₅ OH	mg/l	BDL (DL:0.0005)	BDL (DL:0.0005l)
29	Anionic Detergents (as MBAS)	mg/l	BDL (DL:0.01)	BDL (DL:0.01)
30	Cyanide as CN	mg/l	BDL (DL:0.01)	BDL (DL:0.01 l)
31	BOD @ 27°C for 3 days	mg/l	9.3	7.1
32	Chemical Oxygen Demand	mg/l	40	28
33	Dissolved Oxygen	mg/l	5.7	5.1
34	Barium as Ba	mg/l	BDL(DL:0.05)	BDL(DL:0.05)
35	Ammonia (as total ammonia-N)	mg/l	1.8 mg/l	1.8
36	Sulphide as H ₂ S	mg/l	BDL (DL:0.01)	BDL (DL:0.01)
37	Molybdenum as Mo	mg/l	BDL (DL:0.02)	BDL (DL:0.02)
38	Total Arsenic as As	mg/l	BDL (DL:0.005)	BDL (DL:0.005)
39	Total Suspended Solids	mg/l	28.6	20.2
40	Total Coliform	MPN/100ml	930	990
41	<i>Escherichia coli</i>	MPN/100ml	180	120

Source: Sampling Results by EHS 360 Labs Private Limited Laboratories

* IS: 10500:2012-Drinking Water Standards; # within the permissible limit as per the WHO Standard. The water can be used for drinking purpose in the absence of alternate sources. Note: SW- Surface water, GW – Ground water.



Table 3.11 – Ground Water Analysis Results

S.No.	Parameters	Units	WW1 (Near Project area)	WW2 (Kadambankudi)	BW1 (Koviladi)	BW2 (Kodayakudi)
1	Colour	-	5	5	5	5
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable
3	pH at 25°C	-	7.77	7.11	7.29	7.53
4	Conductivity @ 25°C	µmhos/cm	1014	1226	948	1032
5	Turbidity	NTU	1.5	1.8	1.3	1.9
6	Total Dissolved Solids	mg/l	598	723	559	608
7	Total Hardness as CaCO ₃	mg/l	197.91	210.15	151.97	201.87
8	Calcium as Ca	mg/l	34.5	37.1	26.8	35.1
9	Magnesium as Mg	mg/l	27.2	28.6	20.7	27.8
10	Total Alkalinity as CaCO ₃	mg/l	190	255	170	194
11	Chloride as Cl	mg/l	164.7	172	174	150
12	Sulphate as SO ₄	mg/l	63.3	103	62.8	78.3
13	Iron as Fe	mg/l	0.14	0.12	0.26	0.14
14	Residual Free Chlorine	mg/l	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)
15	Fluoride as F	mg/l	0.17	0.26	0.14	0.33
16	Nitrate as NO ₃	mg/l	6.9	8.6	5.0	5.1
17	Copper as Cu	mg/l	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
18	Manganese as Mn	mg/l	BDL (DL:0.02)	BDL (DL:0.02)	BDL (DL:0.02)	BDL (DL:0.02)
19	Mercury as Hg	mg/l	BDL (DL:0.0005)	BDL (DL:0.0005)	BDL (DL:0.0005)	BDL (DL:0.0005)
20	Cadmium as Cd	mg/l	BDL (DL:0.001)	BDL (DL:0.001)	BDL (DL:0.001)	BDL (DL:0.001)
21	Selenium as Se	mg/l	BDL (DL:0.005)	BDL (DL:0.005)	BDL (DL:0.005)	BDL (DL:0.005)
22	Aluminium as Al	mg/l	BDL (DL:0.005)	BDL (DL:0.005)	BDL (DL:0.005)	BDL (DL:0.005)
23	Lead as Pb	mg/l	BDL (DL:0.005)	BDL (DL:0.005)	BDL (DL:0.005)	BDL (DL:0.005)
24	Zinc as Zn	mg/l	BDL(DL : 0.05)	BDL(DL : 0.05)	BDL(DL : 0.05)	BDL(DL : 0.05)
25	Total Chromium as Cr	mg/l	BDL(DL : 0.02)	BDL(DL : 0.02)	BDL(DL : 0.02)	BDL(DL : 0.02)
26	Boron as B	mg/l	BDL(DL : 0.05)	BDL(DL : 0.05)	BDL(DL : 0.05)	BDL(DL : 0.05)
27	Mineral Oil	mg/l	BDL(DL : 0.01)	BDL(DL : 0.01)	BDL(DL : 0.01)	BDL(DL : 0.01)
28	Phenolic compounds as C ₆ H ₅ OH	mg/l	BDL (DL:0.0005)	BDL (DL:0.0005)	BDL (DL:0.0005)	BDL (DL:0.0005)
29	Anionic Detergents (as MBAS)	mg/l	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
30	Cyanide as CN	mg/l	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
31	Barium as Ba	mg/l	BDL(DL:0.05)	BDL(DL:0.05)	BDL(DL:0.05)	BDL(DL:0.05)
32	Ammonia (as total ammonia-N)	mg/l	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
33	Sulphide as H ₂ S	mg/l	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
34	Molybdenum as Mo	mg/l	BDL (DL:0.02)	BDL (DL:0.02)	BDL (DL:0.02)	BDL (DL:0.02 l)
35	Total Arsenic as As	mg/l	BDL (DL:0.005)	BDL (DL:0.005)	BDL (DL:0.005)	BDL (DL:0.005)
36	Total Suspended Solids	mg/l	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:1.0)
37	Total Coliform	MPN/100ml	270	110	100	90
38	<i>Escherichia coli</i>	MPN/100ml	< 1.8	< 1.8	< 1.8	< 1.8

* IS: 10500:2012-Drinking Water Standards; # within the permissible limit as per the WHO Standard. The water can be used for drinking purpose in the absence of alternate sources. Note: SW- Surface water, GW – Ground water.

Source: Sampling Results by EHS 360 Labs Private Limited Laboratories



Conclusion: -

Methodologies adopted for sampling and analysis were according to the IS methods. The parameters thus analyzed were compared with IS 10500:2012.

Surface water

pH varied from 7.44 to 7.89 while turbidity found within the standards. Total Dissolved Solids varied from 611 to 640 mg/l and Chloride varied between 143mg/l and 180.3 mg/l. Nitrates varied from 8.1 to 10.3 mg/l, while sulphates varied from 62.1 to 73.0 mg/l.

Ground water

The pH of the water samples collected ranged from 7.11 to 7.77 and within the acceptable limit of 6.5 to 8.5. pH, Sulphates and Chlorides of water samples from all the sources are within the limits as per the Standard. On Turbidity, the water samples meet the requirement. The Total Dissolved Solids were found in the range of 559 – 723 mg/l in all samples. The Total hardness varied between 151.97 mg/l – 210.15 mg/l for all samples. On Microbiological parameters, the water samples from all the locations meet the requirement. The parameters thus analyzed were compared with IS 10500:2012.

The quality of the surface and Ground water does not have any heavy metal concentration, acidic, Sulphur or suspended solid particles.

3.4 AIR ENVIRONMENT

The prime objective of the ambient air quality study is to assess the existing air quality of study area and its conformity to NAAQS. The observed sources of air pollution in the study area are industrial, traffic and domestic activities. The baseline status of the ambient air quality has been established through a scientifically designed ambient air quality monitoring network considering the followings:

- * Meteorological condition on synoptic scale;
- * Topography of the study area;
- * Representatives of regional background air quality for obtaining baseline status;
- * Location of residential areas representing different activities;
- * Accessibility and power availability

3.4.1 Meteorology & Climate

Meteorology is the key to understand the Air quality. The essential relationship between meteorological condition and atmospheric dispersion involves the wind in the broadest sense. Wind fluctuations over a very wide range of time, accomplish dispersion and strongly influence other processes associated with them.

A temporary meteorological station was installed at project site by covering cluster quarries. The station was installed at a height of 3m above the ground level in such a way that there are no obstructions facilitating flow of wind, wind speed, wind direction, humidity and temperature are recorded on hourly basis.

Climate –

- Tiruchirappalli's climate is classified as tropical. The summers are much rainier than the winters in Tiruchirappalli. As per the Köppen-Geiger classification, the prevailing weather conditions in this region are categorized under Aw.
- The average temperature in Tiruchirappalli is 28.6 °C | 83.4 °F. The rainfall here is around 823 mm | 32.4 inch per year.
- Tiruchirappalli are in the middle of our planet and the summers are not easy to define. The best time to travel is January, February, October, November, December.
- The driest month is February, with 12 mm | 0.5 inch of rainfall. The greatest amount of precipitation occurs in November, with an average of 182 mm | 7.2 inch.
- The warmest month of the year is May, with an average temperature of 31.9 °C | 89.4 °F. The lowest average temperatures in the year occur in December, when it is around 24.8 °C | 76.6 °F.

Source: <https://en.climate-data.org/asia/india/tamil-nadu/tiruchirappalli-4207/>

Rainfall –

The average annual rainfall and the 5 years rainfall is as follows:

Table 3.12 – Rainfall Data

Actual Rainfall In Mm					Normal Rainfall In Mm
2017	2018	2019	2020	2021	
690.0	506.6	635.0	796.6	1222.7	985

Source: <https://www.twadboard.tn.gov.in/content/tiruchirappalli>

Table 3.13: Meteorological Data Recorded at Site

S.No	Parameters		Dec-2022	Jan-2023	Feb-2023
1	Temperature ($^{\circ}\text{C}$)	Max	25.08	25.51	26.37
		Min	21.26	21.35	24.26
		Avg	23.17	23.43	25.31
2	Relative Humidity (%)	Avg	86.38	79.12	67.53
3	Wind Speed (m/s)	Max	5.7	4.67	4.9
		Min	1.95	2.64	2.68
		Avg	3.82	3.65	3.79
4	Cloud Cover (OKTAS)		0-8	0-8	0-8
5	Wind Direction		ENE,NE	NE,ENE	ENE,ESE

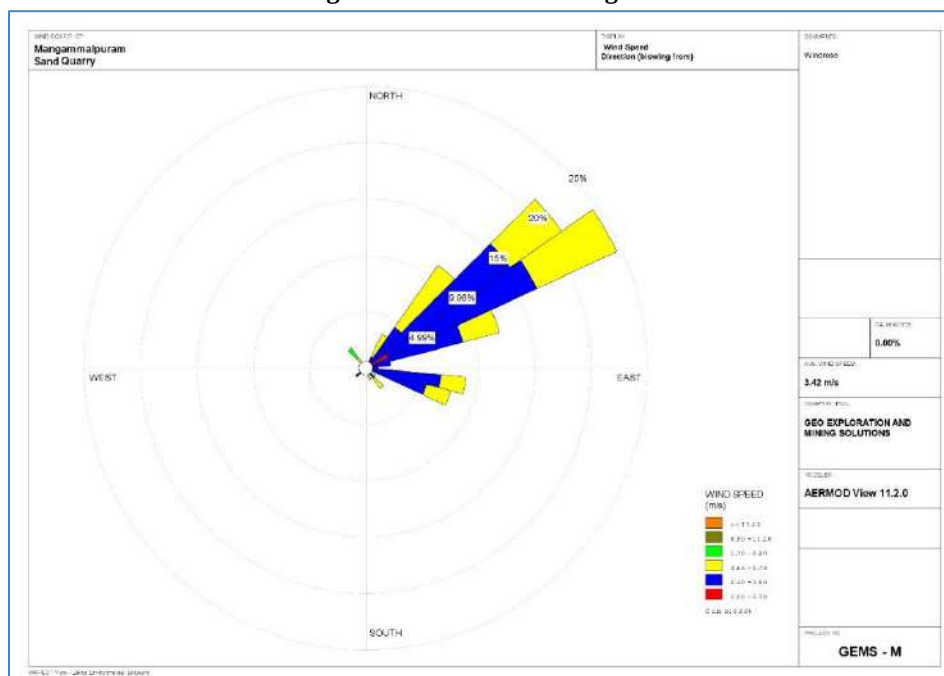
Source: Onsite monitoring data by EHS 360 Labs Private Limited Laboratories

Correlation between Secondary and Primary Data

The meteorological data collected at the site is almost similar to that of secondary data collected from IMD Tiruchirappalli. A comparison of site data generated during the three months with that of IMD, Tiruchirappalli reveals the following:

- The average maximum and minimum temperatures of IMD, Tiruchirappalli showed a higher in respect of on-site data i.e. in Mangammalpuram village.
- The relative humidity levels were lesser at site as compared to IMD, Tiruchirappalli.
- The wind speed and direction at site shows similar trend that of IMD, Tiruchirappalli.

Windrose diagram of the study site is depicted in Figure. 3.11. Predominant downwind direction of the area during study season is North East.

Figure 3.10: Windrose Diagram

Environmental



In the abstract of collected data wind rose were drawn on presented in figure No.3.11 during the monitoring period in the study area

1. Predominant winds were from Northeast
2. Wind velocity readings were recorded between 0.50 to 5.70 km / hour
3. Calm conditions prevail of about 0.00% of the monitoring period
4. Temperature readings ranging from 21.26⁰ to 26.37⁰C
5. Relative humidity ranging from 67.53 to 83.38 %
6. The monitoring was carried out continuously for three months

3.3.2 Methodology and Objective

The prime objective of the ambient air quality study is to assess the existing air quality of study area and its conformity to NAAQS. The observed sources of air pollution in the study area are industrial, traffic and domestic activities. The baseline status of the ambient air quality has been established through a scientifically designed ambient air quality monitoring network considering the followings:

- Meteorological condition on synoptic scale;
- Topography of the study area;
- Representatives of regional background air quality for obtaining baseline status;
- Location of residential areas representing different activities;
- Accessibility and power availability; etc.,

3.3.3 Sampling and Analytical Techniques

Table 3.14 – Methodology and Instrument Used for Air Quality Analysis

Parameter	Method	Instrument
PM _{2.5}	Gravimetric Method	Fine Particulate Sampler
	Beta attenuation Method	Make – Thermo Environmental Instruments – TEI 121
PM ₁₀	Gravimetric Method	Respirable Dust Sampler
	Beta attenuation Method	Make –Thermo Environmental Instruments – TEI 108
SO ₂	IS-5182 Part II (Improved West & Gaeke method)	Respirable Dust Sampler with gaseous attachment
NO _x	IS-5182 Part II (Jacob & Hochheiser modified method)	Respirable Dust Sampler with gaseous attachment
Free Silica	NIOSH – 7601	Visible Spectrophotometry

Source: Sampling Methodology followed by EHS 360 Labs Private Limited Laboratories

Table 3.15 – National Ambient Air Quality Standards

Sl. No.	Pollutant	Time Weighted Average	Concentration in ambient air	
			Industrial, Residential, Rural & other areas	Ecologically Sensitive area (Notified by Central Govt.)
1	Sulphur Dioxide (µg/m ³)	Annual Avg.* 24 hours**	50.0 80.0	20.0 80.0
2	Nitrogen Dioxide (µg/m ³)	Annual Avg. 24 hours	40.0 80.0	30.0 80.0
3	Particulate matter (size less than 10µm) PM ₁₀ (µg/m ³)	Annual Avg. 24 hours	60.0 100.0	60.0 100.0
4	Particulate matter (size less than 2.5 µm PM _{2.5} (µg/m ³)	Annual Avg. 24 hours	40.0 60.0	40.0 60.0

Source: NAAQS CPCB Notification No. B-29016/20/90/PCI-I Dated: 18th Nov 2009

*Annual Arithmetic mean of minimum 104 measurements in a year taken twice a Week 24 hourly at uniform interval,

** 24 hourly / 8 hourly or 1 hourly monitored values as applicable shall be complied with 98 % of the time in a year. However, 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.



3.3.4 Frequency & Parameters for Sampling

Ambient air quality monitoring has been carried out with a frequency of two samples per week at eight (8) locations, adopting a continuous 24 hourly (3 shift of 8-hour) schedule for the period December 2022 to February 2023. The baseline data of ambient air has been generated for PM₁₀, PM_{2.5}, Sulphur Dioxide (SO₂) & Nitrogen Dioxide (NO₂).

3.3.5 Ambient Air Quality Monitoring Stations

Eight (8) monitoring stations were set up in the study area as depicted in Figure 3.6.1 for assessment of the existing ambient air quality. Details of the sampling locations are as per given below.

Table 3.16 – Ambient Air Quality (AAQ) Monitoring Locations

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	AAQ-1	Project Area	480m NW	10°51'17.17"N 78°52'0.98"E
2	AAQ-2	Koviladi	1.3km SE	10°50'31.11"N 78°53'1.98"E
3	AAQ-3	Mullal	6.5km NE	10°54'8.15"N 78°54'49.42"E
4	AAQ-4	Arasangudi	6.5km SW	10°49'4.44"N 78°49'16.54"E
5	AAQ-5	Kadambangudi	4.8km SE	10°49'4.30"N 78°54'16.88"E
6	AAQ-6	Kodayakkudi	6km South	10°47'44.27"N 78°52'18.93"E
7	AAQ-7	Lalgudi	5.5km NW	10°52'1.03"N 78°49'22.24"E
8	AAQ-8	Sirumayankudi East	4.5km North	10°53'42.66"N 78°52'17.15"E

Source: On-site monitoring/sampling by EHS 360 Labs Private Limited Laboratories with GEMS

Figure 3.11: Ambient Air Quality Monitoring Location Map

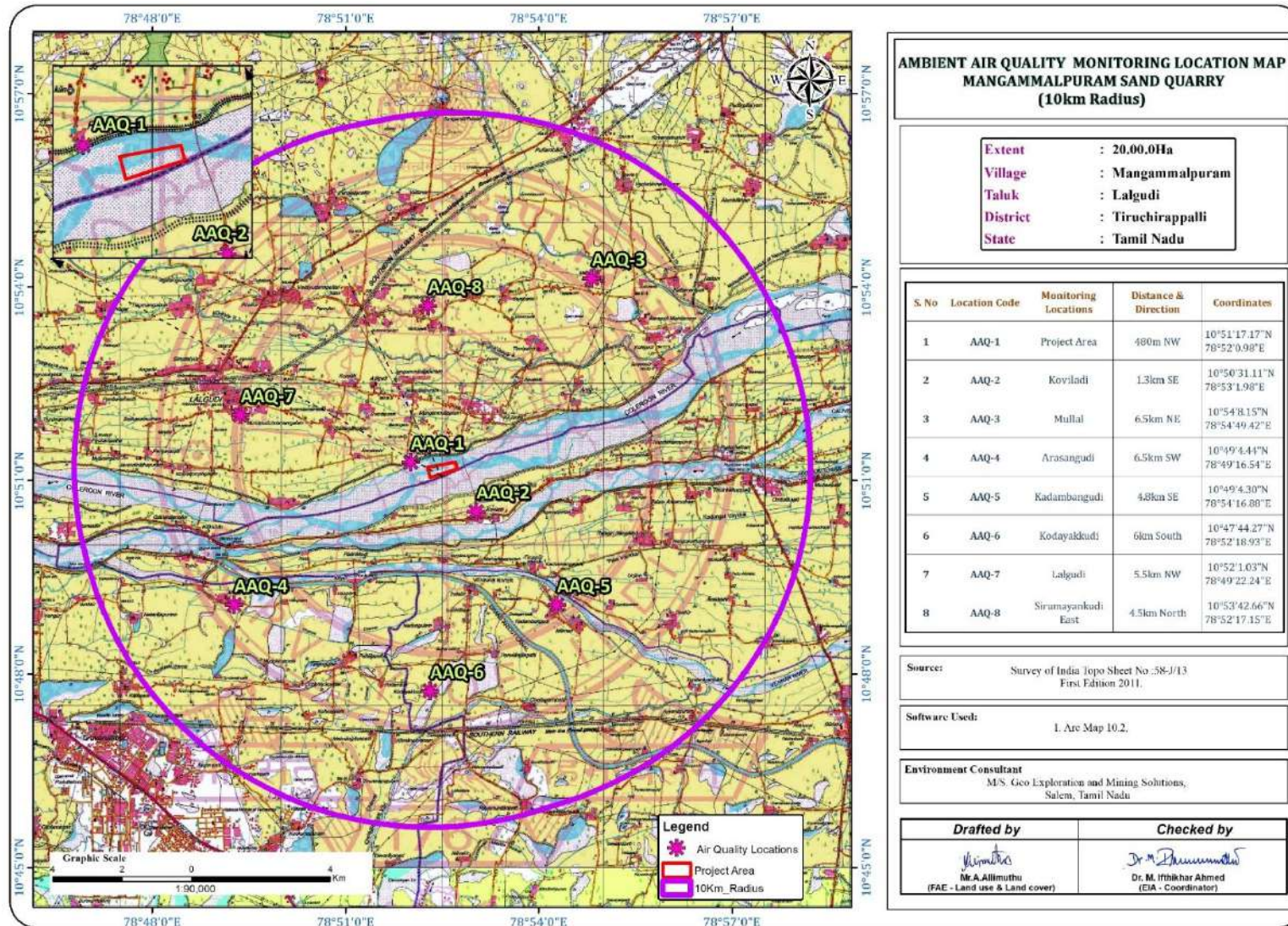
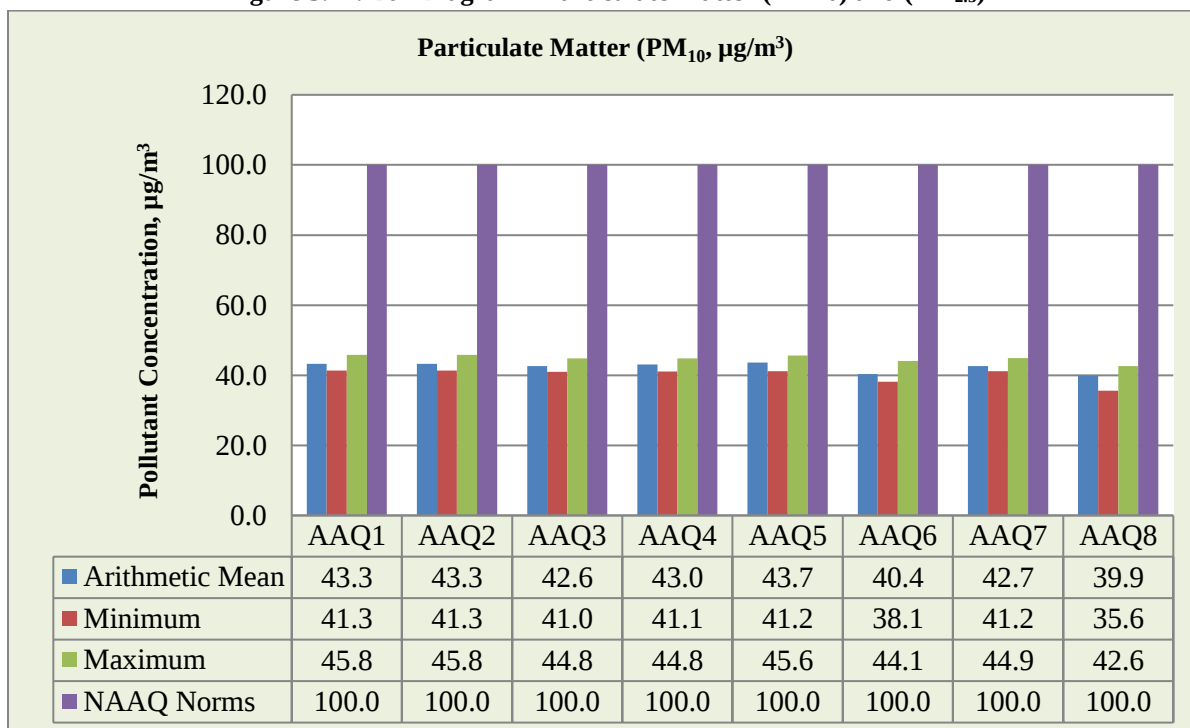
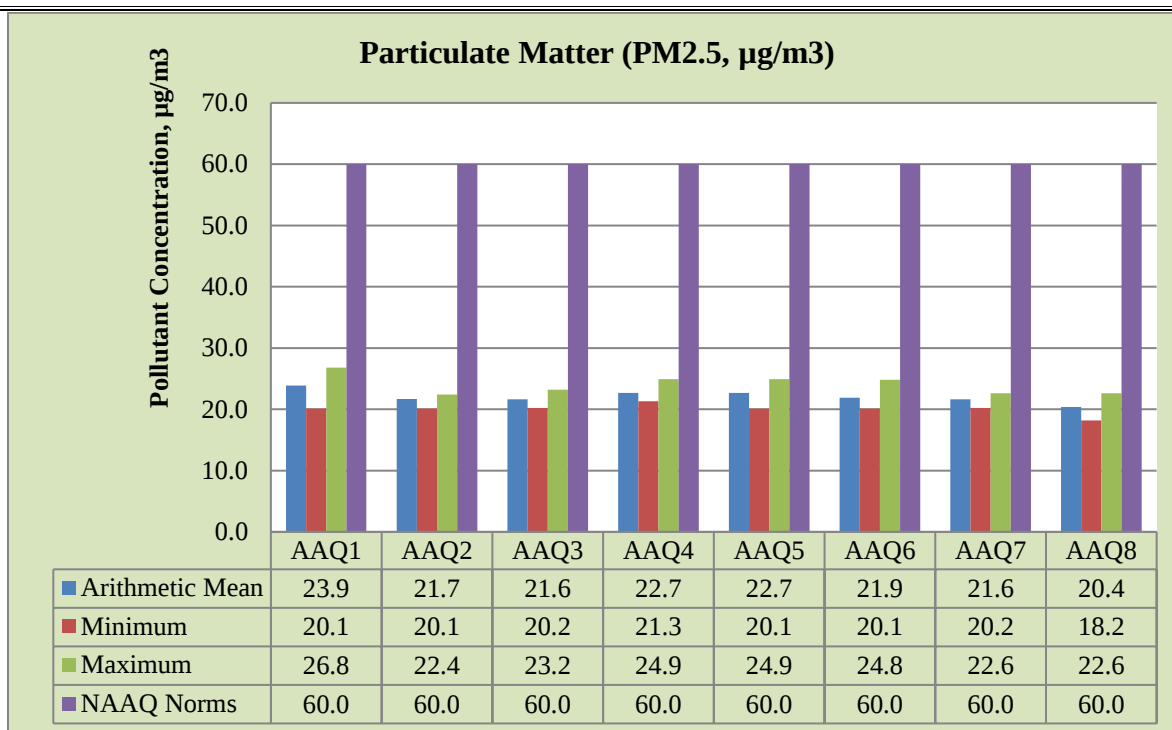
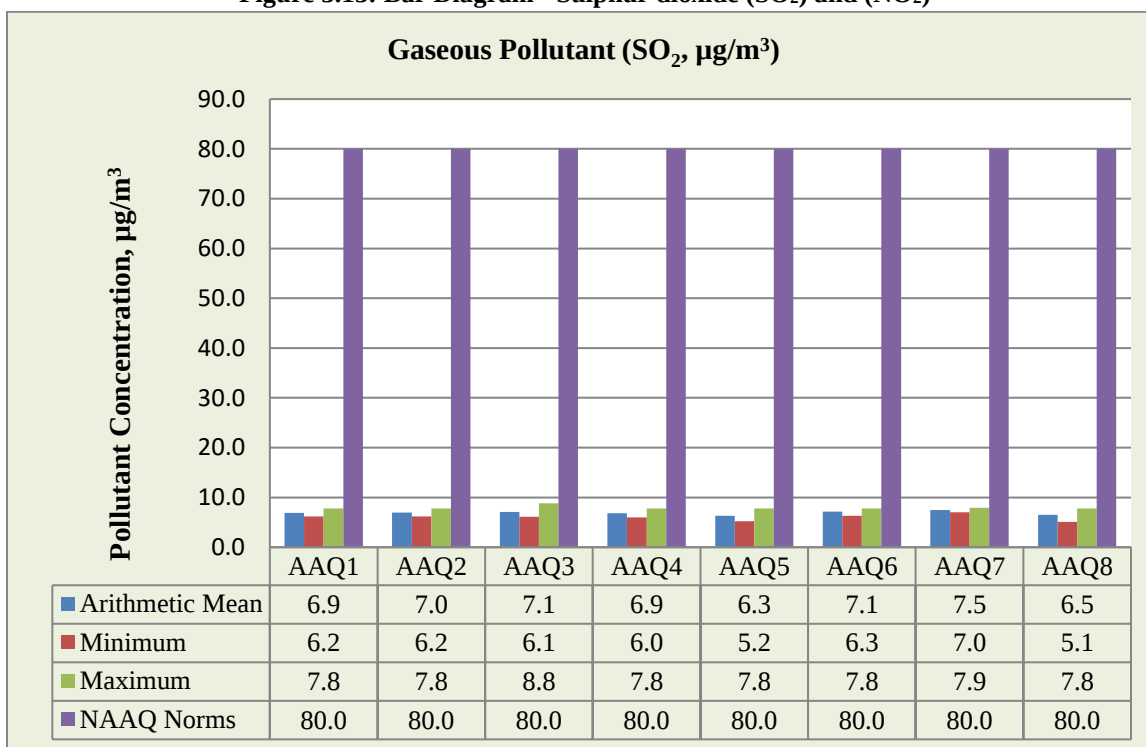
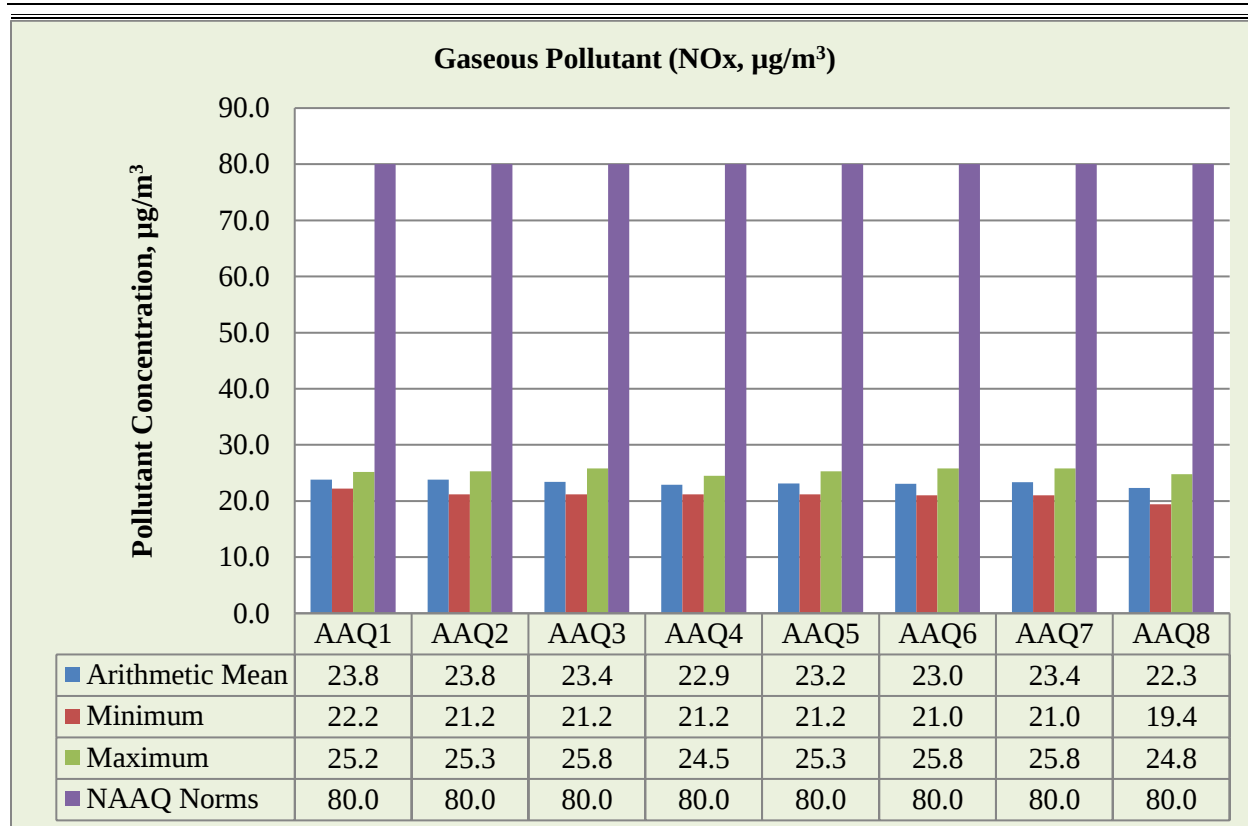


Table 3.17: Abstract of Ambient Air Quality Data

S.No	Parameter	SPM	PM _{2.5}	PM ₁₀	SO ₂	NO ₂
1	No. of Observations	208	208	208	208	208
2	10 th Percentile Value	61.2	20.2	39.5	6.1	21.4
3	20 th Percentile Value	63.4	21.1	41.2	6.3	22.2
4	30 th Percentile Value	64.3	21.3	41.5	6.5	22.4
5	40 th Percentile Value	65.5	21.5	42.1	6.8	22.8
6	50 th Percentile Value	66.5	22.1	42.3	7.0	23.3
7	60 th Percentile Value	67.3	22.3	43.1	7.2	23.5
8	70 th Percentile Value	68.2	22.5	43.2	7.4	23.9
9	80 th Percentile Value	69.2	23.3	44.2	7.5	24.3
10	90 th Percentile Value	71.8	24.1	44.6	7.8	24.8
11	95 th Percentile Value	73.5	24.9	45.2	7.8	25.3
12	98 th Percentile Value	74.7	26.1	45.4	8.3	25.6
13	Arithmetic Mean	67.8	22.7	42.9	7.2	23.6
14	Geometric Mean	67.7	22.6	42.9	7.1	23.6
15	Standard Deviation	4.3	1.8	1.8	0.7	1.3
16	Minimum	61.2	20.2	39.5	6.1	21.4
17	Maximum	74.7	26.1	45.4	8.3	25.6
18	NAAQ Norms*	-	100.0	60.0	80.0	80.0
19	% Values exceeding Norms*	0.0	0.0	0.0	0.0	0.0

Figure 3.12: Bar Diagram - Particulate Matter (PM₁₀) and (PM_{2.5})

Figure 3.13: Bar Diagram - Sulphur dioxide (SO₂) and (NO₂)



Source: Table 3.11 & 3.12.

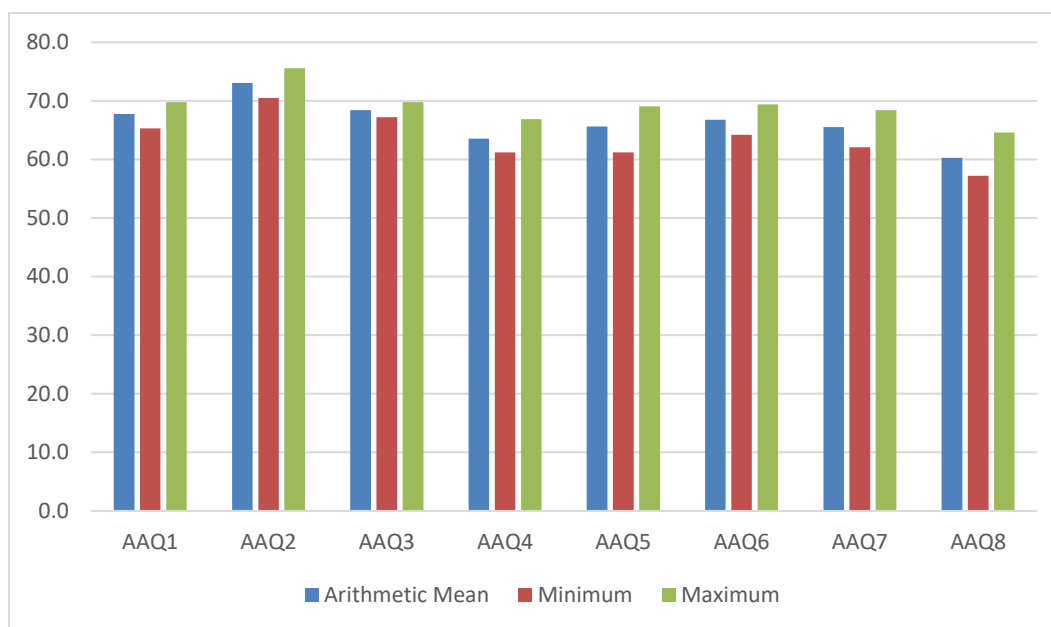
3.3.6 Interpretations & Conclusion

As per monitoring data, PM₁₀ ranges from 35.6 µg/m³ to 45.8 µg/m³, PM_{2.5} data ranges from 18.2 µg/m³ to 26.8 µg/m³, SO₂ ranges from 5.1 µg/m³ to 7.9 µg/m³ and NO₂ data ranges from 19.4 µg/m³ to 25.8 µg/m³. The concentration levels of the above criteria pollutants were observed to be well within the limits of NAAQS prescribed by CPCB.

The minimum & maximum concentrations of PM₁₀ were found to be 36.6 µg/m³ in Sirumayankudi East village & 45.8 µg/m³ in Project area respectively. The minimum & maximum concentrations of PM_{2.5} were found to be 18.2 µg/m³ in Sirumayankudi East village & 26.8 µg/m³ in Project area respectively.

3.3.7 FUGITIVE DUST EMISSION –

Fugitive dust was recorded at 8 AAQ monitoring stations for 30 days average during the study period.



Source: Line Diagram of Table 3.20

table 3.18– Fugitive Dust sample values in µg/m³

SPM	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	67.8	73.1	68.4	63.6	65.7	66.8	65.5	60.3
Minimum	65.3	70.5	67.2	61.2	61.2	64.2	62.1	57.2
Maximum	69.8	75.6	69.8	66.9	69.1	69.4	68.4	64.6
NAAQ Norms	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0

Source: Calculations from Lab Analysis Reports

3.5 NOISE ENVIRONMENT

The vehicular movement on road and mining activities is the major sources of noise in study area, the environmental assessment of noise from the mining activity and vehicular traffic can be undertaken by taking into consideration various factors like potential damage to hearing, physiological responses, and annoyance and general community responses.

The main objective of noise monitoring in the study area is to establish the baseline noise level and assess the impact of the total noise expected to be generated during the project operations around the project site.

3.5.1 Identification of Sampling Locations

In order to assess the ambient noise levels within the study area, noise monitoring was carried out at Eight (8) locations. The noise level monitoring locations were carried out by covering commercial, residential, rural areas within the radius of 10km. A noise monitoring methodology was chosen such that it best suited the purpose and objectives of the study.

Table 3.19 – Details of Surface Noise Monitoring Locations

S. No	Location code	Monitoring Locations	Distance & Direction	Coordinates
1	N-1	Project Area	480m NW	10°51'17.21"N 78°52'1.34"E
2	N-2	Koviladi	1.3km SE	10°50'30.84"N 78°53'1.97"E
3	N-3	Mullal	6.5km NE	10°54'8.09"N 78°54'49.81"E
4	N-4	Arasangudi	6.5km SW	10°49'4.21"N 78°49'16.82"E
5	N-5	Kadambangudi	4.8km SE	10°49'4.11"N 78°54'16.99"E
6	N-6	Kodayakkudi	6km South	10°47'45.76"N 78°52'15.63"E
7	N-7	Lalgudi	5.5km NW	10°52'0.97"N 78°49'23.61"E
8	N-8	Sirumayankudi East	4.5km North	10°53'42.80"N 78°52'17.67"E

Source: On-site monitoring/sampling by EHS 360 Labs Private Limited Laboratories with GEMS

3.5.2 Method of Monitoring

Digital Sound Level Meter was used for the study. All reading was taken on the 'A-Weighting' frequency network, at a height of 1.5 meters from ground level. The sound level meter does not give a steady and consistent reading and it is quite difficult to assess the actual sound level over the entire monitoring period. To mitigate this shortcoming, the Continuous Equivalent Sound level, indicated by Leq , is used. Equivalent sound level, ' Leq ', can be obtained from variable sound pressure level, ' L ', over a time period by using following equation.

$$Leq = 10 \log L / T \sum (10L_n/10)$$

Where L = Sound pressure level at function of time dB (A)

T = Time interval of observation

3.5.3 Analysis of Ambient Noise Level in the Study Area

An analysis of the different Leq data obtained during the study period has been made. Variation was noted during the day-time as well as night-time. The results are presented in below Table 3.6

Day time : 6:00 hours to 22:00 hours.

Night time : 22:00 hours to 6:00 hours



Figure 3.14: Noise Level monitoring Location Map

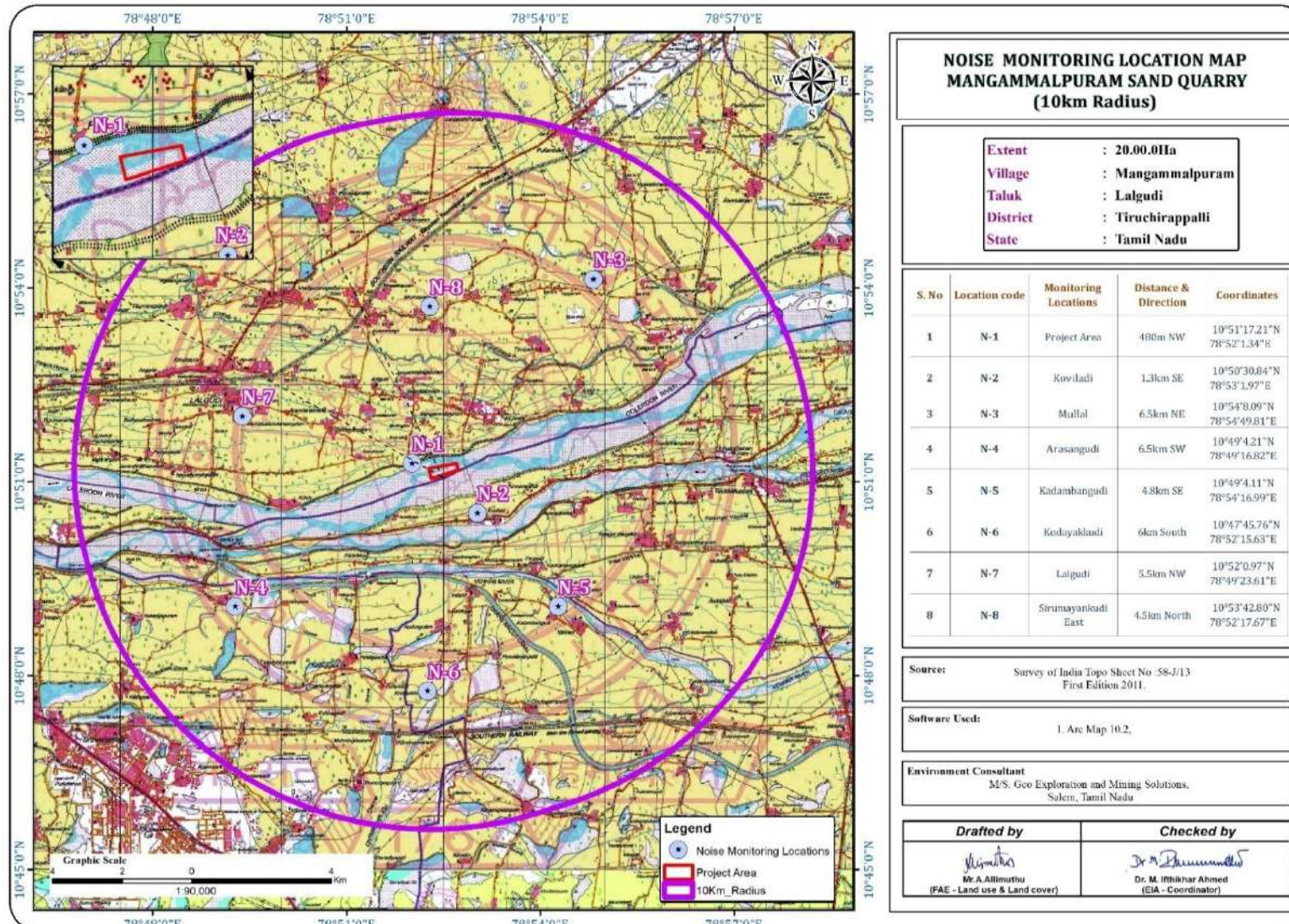
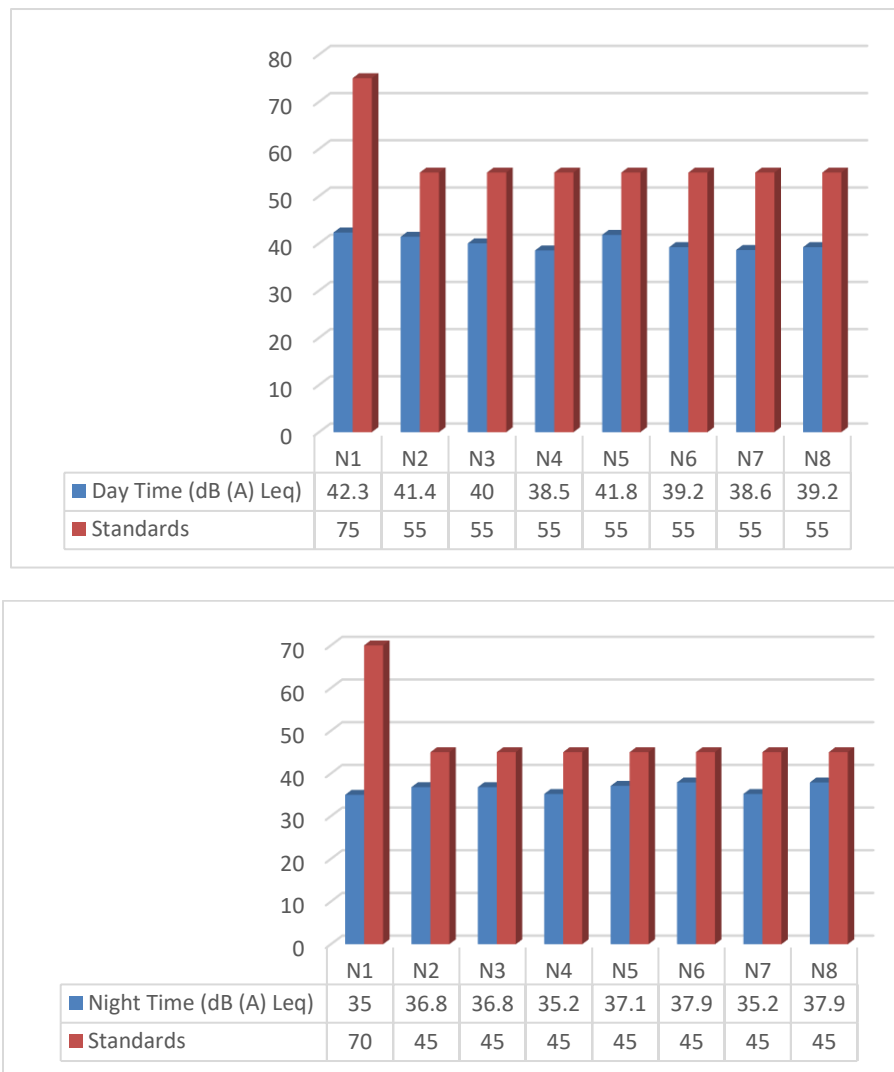


Table 3.20 – Noise Monitoring Results in Core and Buffer Zone

S. No	Locations	Noise level (dB (A) Leq)		Ambient Noise Standards
		Day Time	Night Time	
1	Project Area	42.3	35.0	Industrial Day Time- 75 dB (A) Night Time- 70 dB (A)
2	Koviladi	41.4	36.8	
3	Mullal	40.0	36.8	Residential Day Time- 55 dB (A) Night Time- 45 dB (A)
4	Arasangudi	38.5	35.2	
5	Kadambangudi	41.8	37.1	
6	Kodayakkudi	39.2	37.9	
7	Lalgudi	38.6	35.2	
8	Sirumayankudi East	39.2	37.9	

Source: On-site monitoring/sampling by EHS 360 Labs Private Limited in association with GEMS

Figure 3.15: Day & Night Time Noise Levels in Core and Buffer Zone

3.4.4 Interpretation & Conclusion:

Ambient noise levels were measured at 8 (eight) locations around the project area. Noise levels recorded in core zone during day time is 42.3 dB (A) Leq and during night time were from 35.0dB (A) Leq. Noise levels recorded in buffer zone during day time were from 38.6 – 41.6 dB (A) Leq and during night time were 35.2 – 37.9 dB (A) Leq.

The values of noise observed in some of the areas are primarily due to movement of vehicles and other anthropogenic activities. Thus, the noise level for Industrial and Residential area meets the requirements of CPCB.

3.6 BIOLOGICAL ENVIRONMENT

The study of the biological environment is one of the important aspects of Environmental Impact Assessments. The biotic component comprises both plant and animal communities which interact within the community and between themselves but also with abiotic i.e. physical and chemical components of the environment. A general ecological survey was carried out in the study area of 10 km radius around the Mine area. The study Area is not part of any National Park, Sanctuary, Biosphere Reserve, Wildlife Corridors, Migratory Path, etc. The primary data was generated by preparing a general checklist of all plants encountered in the study area. The species of vegetation found were identified and listed according to their families. The division of core and buffer zone is the best way to study the pattern of biodiversity for environmental impact assessment.

3.6.1 Objective of the study

The major objectives of the study were:

- * To document the diversity of the local flora within core & buffer zone.
- * To enlist the major agricultural crops, plantations and cultivated species.
- * To document the major fauna both invertebrate and vertebrate occurring in the selected 10Km study area.

The flora and fauna studies were carried out at randomly selected different sites representing the study area of 10 km radius. The detailed ecological assessment of the study area has been carried out with the following objectives:

- * Identification of flora and fauna within the study area;
- * Preparation of checklist of species which also include endangered, endemic and protected (both floral and faunal categories); and
- * Evaluation of impact of proposed expansion on flora and fauna of the area.

The ecological status of the study area has been assessed based on the following methodology:

- * Primary field surveys to establish primary baseline of the study area; and
- * Compilation of information available in published literatures and as obtained from Forest survey of India, Environmental Information Centre, Botanical Survey of India and Zoological Survey of India.

3.6.2 Study approach & methodology adopted

The baseline study for existing ecological environment was carried out during December 2022 to February 2023. A participatory and consultative approach was followed. Field visits were undertaken for survey of the vegetation and animals in the study area. The study area has been divided in to two parts as core area consisting of project site and the buffer area as the 10 km radius of the project site.

3.6.3 Sampling Methodology

The main baseline survey was carried out to examine the current habitat and species composition. From December 2022 to February 2023, an ecology and biodiversity study was carried out within a 10-kilometer radius of the sand mine site. Plant taxonomy books, published literature and reports, and Websites (BSI, ZSI, and State/District Forest Departments) were used to identify the plant species. Also, information regarding vernacular names of plant species was gathered from local residents.

The Phyto-sociology study was carried out using the square quadrats technique through random sampling procedure. All the plots sampled were representative of the most common types of suitable areas. Quadrats of 10m x 10m for tree species, 5m x 5m for shrub species and 1m x 1m for herb species were used for sampling purposes.

Different sampling techniques were employed for documenting different faunal groups. For herpetofauna (Amphibians and Reptiles), visual encounter survey; for birds, point count and transect methods and for mammals direct, and indirect sightings (signs like tracks, pellets and pugmarks) were adopted. The water bodies in the area were also assessed for the status of the aquatic life and fishes.

3.6.4 Flora & Fauna at the study area

Table 3.21 : Flora in the Core zone of lease area (Kollidam River bed) Mangammalpuram Village

SI.No	English Name	Vernacular Name	Scientific Name	Family Name
Trees				
1.	Velvet mesquite	Mullu maram	<i>Prosopis juliflora</i>	Fabaceae
Shrubs				
2.	Bush Morning Glory	Neiveli Kattamani	<i>Ipomoea carnea</i>	Convolvulaceae
3.	Milk Weed	Erukku	<i>Calotropis gigantea</i>	Apocynaceae
Herbs				
4.	Cleome viscosa	Nai kadugu	<i>Celome viscosa</i>	Capparidaceae
5.	Fish poison	Kolinchi	<i>Tephrosia purpurea</i>	Fabaceae
6.	Goatweed	Kallurukki	<i>Scoparia dulcis</i>	Plantaginaceae
7.	Yellow-fruit nightshade	Kantang kathrikai	<i>Solanum virginianum</i>	Solanaceae
8.	East Indian globe thistle	kottai-k-karantai	<i>Sphaeranthus indicus</i>	Asteraceae
9.	Holy basil	Thulasi	<i>Ocimum tenuiflorum</i>	Lamiaceae
10.	Indian doab	Arugampul	<i>Cynodon dactylon</i>	Poaceae
11.	Common leucas	Thumbai	<i>Leucas aspera</i>	Lamiaceae
12.	Rough cocklebur	Marul-umattai	<i>Xanthium strumarium</i>	Asteraceae
Grasses				
13.	Eragrostis	Pullu	<i>Eragrostis ferruginea</i>	Poaceae
14.	Kans Grass	Wild sugarcane	<i>Saccharum spontaneum</i>	Poaceae
15.	Umbrella-sedge	Vattakorai	<i>Cyperus difformis</i>	Cyperaceae
16.	Watergrass	Mukkutikorei	<i>Bulbostylis barbatta</i>	Cyperaceae
Creepers				
17.	Bitter Apple	Thumati kai	<i>Colocynthis citrullus</i>	Cucurbitaceae
18.	Bayhops	Atappan-koti	<i>Ipomoea pes-caprae</i>	Convolvulaceae

Fig No: 3.16. Flora species observation in the Core zone area



a. Tephrosia purpurea



b. Saccharum spontaneum



c. Leucas aspera



d. Ipomoea carnea



k. Scoparia dulcis



l. Prosopis juliflora



*o. Solanum virginianum**p. Cynodon dactylon**Plant Observation***Flora in the buffer zone**

Details of flora with scientific name observed in the buffer zone given in the table below.

Table 3.22 : List of Flora in the Buffer Zone

S.No	English Name	Vernacular Name	Scientific Name	Family Name
Trees				
1.	Indian Mulberry	Nuna	<i>Morinda coreia</i>	Rubiaceae
2.	Jujube	Ilanthai	<i>Ziziphus jujubha</i>	Rhamnaceae
3.	Asian Palmyra palm	Panai maram	<i>Borassus flabellifer</i>	Arecaceae
4.	Tamarind	Puliyamaram	<i>Tamarindus indica</i>	Legumes
5.	Millettia Pinnata	Pongam oiltree	<i>Pongamia pinnata</i>	Fabaceae
6.	Bamboo	Moonghil	<i>Bambusa bambo</i>	Poaceae
7.	Gum arabic tree	Karuvelam	<i>Acacia nilotica</i>	Mimosaceae
8.	Indian plum	Elanthai maram	<i>Ziziphus mauritiana</i>	Rhamnaceae
9.	Coconut	Thennai maram	<i>Cocos nucifera</i>	Arecaceae
10.	Lemon	Ezhumuchaipalam	<i>Citrus lemon</i>	Rutaceae
11.	Black plum	Navalmaram	<i>Syzygium cumini</i>	Myrtaceae
12.	Drumstick tree	Karimurungai	<i>Moringa olefera</i>	Moraginaceae
13.	Banana tree	Vazhaimaram	<i>Musa</i>	Musaceae
14.	Senna siamea	Manjal Konnai	<i>Sennasiamea</i>	Fabaceae
15.	Creamy Peacock Flower	Vadanarayani	<i>Delonix elata</i>	Fabaceae
16.	Acacia Nilotica	Karuvelam maram	<i>Vachellia nilotica</i>	Acacia Nilotica
17.	Beauty leaf	Punnai	<i>Calophyllu inophyllum</i>	Calophyllaceae
18.	Mango	Manga	<i>Mangifera indica</i>	Anacardiaceae
19.	Indian fig tree	Athi	<i>Ficus recemosa</i>	Moraceae
20.	Neem or Indian lilac	Vembu	<i>Azadirachta indica</i>	Meliaceae
21.	Woman's tongue	Vagai	<i>Albizia lebbek</i>	Mimosaceae
22.	Banyan tree	Alamaram	<i>Ficus benghalensis</i>	Moraceae
23.	Rain Tree	Thoongu moonji	<i>Albizia saman</i>	Mimosaceae
24.	Muntingia calabura	Singapore cherry	<i>Muntingiacalabura</i>	Malvaceae
25.	Chinesh cheery	Thenpazham	<i>Muntingia calabura</i>	Tiliaceae



26.	Indian bael	Vilvam	<i>Aegle marmelos</i>	Rutaceae
27.	Umbrella thorn	Kodaivelam	<i>Acacia planifrons</i>	Mimosaceae
28.	Henna	Marudaani	<i>Lawsonia inermis</i>	Lythraceae
29.	Eucalyptus	Eucalyptus	<i>Eucalyptus globules</i>	Myrtaceae
30.	Jack fruit	Palamaram	<i>Artocarpus heterophyllus</i>	Moraceae
31.	Curry tree	Karivembu	<i>Murraya kenticia</i>	Rubiaceae
32.	Robber-thorn tree	Anaimullu	<i>Acacia horrida</i>	Mimosaceae
33.	Teak	Thekku	<i>Tectona grandis</i>	Verbenaceae
34.	Indian gooseberry	Nelli	<i>Emblica officinalis</i>	Phyllanthaceae
35.	Chinese chaste tree	Nochi	<i>Vitex negundo</i>	Verbenaceae
36.	Madras Thorn	Kuduka puli	<i>Pithecellobium dulce</i>	Mimosaceae
37.	Cutch tree	Karungali	<i>Acacia sundra</i>	Legumes
38.	Gooseberry	Arai nelli	<i>Phyllanthus acidus</i>	Euphorbiaceae
39.	Five leaf chastera	Nochi	<i>Vitex negundo</i>	Lamiaceae
40.	Papaya	Pappali maram	<i>Carica papaya L</i>	Caricaceae
41.	Peepal	Arasanmaram	<i>Ficus religiosa</i>	Moraceae
42.	Monoon longifolium	Nettilingam	<i>Polyalthia longifolia</i>	Annonaceae
Shrubs				
1.	Milk Weed	Erukku	<i>Calotropis gigantea</i>	Apocynaceae
2.	Puriging nut	Kattamanakku	<i>Jatropha curcas</i>	Euphorbiaceae
3.	Shoe flower	Chemparuthi	<i>Hibiscu rosa-sinensis</i>	Malvaceae
4.	Avaram	Avarai	<i>Senna auriculata</i>	Fabaceae
5.	Touch-me-not	Thottalchinungi	<i>Mimosa pudica</i>	Mimosaceae
6.	Rosy Periwinkle	Nithyakalyani	<i>Cathranthus roseus</i>	Apocynaceae
7.	Ceylon Date Palm	Icham	<i>Phoenix pusilla</i>	Areaceae
8.	Indian Oleander	Arali	<i>Nerium indicum</i>	Apocynaceae
9.	Triangular spruge	Chaturakalli	<i>Euphorbia antiquorum</i>	Euphorbiaceae
10.	Jackal jujube	Surai Ilantai	<i>Ziziphus oenoplia</i>	Rhamnaceae
11.	Plumeria alba	Malaiarali	<i>Plumeria alba</i>	Appocynaceae
12.	Senna alata	Seemaigaththi	<i>Cassia alata</i>	Caesalpinaceae
13.	Datura metel	Uumaththai	<i>Datura metel</i>	Solanaceae
14.	Giant reed	Naanal	<i>Arunudo donax</i>	Poaceae
15.	Malabar nut	Adathodai	<i>Justicia adhatoda</i>	Acanthaceae
16.	Ipomoea cornea	Neivelikattamanaku	<i>Ipomoea carnea</i>	Convolvulaceae
17.	Indian mallow	Thuthi	<i>Abutilon indicum</i>	Meliaceae
18.	Solanum pubescens	Malaisundai	<i>Solanum pubescens Willd</i>	Solanaceae
19.	Hygrophila spinosa	Neermulli	<i>Hydrophila auriculata</i>	Acanthaceae
20.	Chrozophora tinctoria	Puramuttai	<i>Chrozophora rottleri</i>	Euphorbiaceae
21.	Night shade plan	Sundaika	<i>Solanum torvum</i>	Solanaceae
Herbs				
1.	Cleome viscosa	Nai kadugu	<i>Celome viscosa</i>	Capparidaceae
2.	Gotu kola	Vallarai	<i>Centella asiatica</i>	Apiaceae
3.	Common leucas	Thumbai	<i>Leucas aspera</i>	Lamiaceae
4.	Holy basil	Thulasi	<i>Ocimum tenuiflorum</i>	Lamiaceae
5.	Sessile joyweed	Ponnanganni	<i>Alternanthera sessilis</i>	Amaranthaceae
6.	Cyperus difformis	Kudai koori	<i>Cyperus difformis</i>	Cyperaceae
7.	Carrot grass	Partiniyam	<i>Parthenium hysterophorus</i>	Asteraceae

8.	Poor land flatsedg	Kunnakora	<i>Cyperus compressus</i>	Cyperaceae
9.	Goatweed	Pumpillu	<i>Ageratum conyzoides</i>	Asteraceae
10.	Indian doab	Arugampul	<i>Cynodon dactylon</i>	Poaceae
11.	Chinese Spinach	Thandukeerai	<i>Amaranthus tricolor</i>	Amaranthaceae
12.	Prickly chaff flower	Nayuruv	<i>Achyranthes aspera</i>	Amaranthaceae
13.	<i>Digeria muricata</i>	Thoiya keerai	<i>Digeria muricata</i>	Amaranthaceae
14.	Indian Copperleaf	Kuppaimeni	<i>Acalypha indica</i>	Euphorbiaceae
15.	Chocolate weed	Punnakku poondur	<i>Melochia corchorifolia</i>	Sterculiaceae
16.	Riceweeds	Seruppada	<i>Coldenia procumbens</i>	Boraginaceae
17.	Goatweed	Kallurukki	<i>Scoparia dulcis</i>	Plantaginaceae
18.	East Indian globe thistle	kottai-k-karantai	<i>Sphaeranthus indicus</i>	Asteraceae
19.	False daisy	Karisilanganni	<i>Eclipta prostrata</i>	Asteraceae
20.	Tridax daisy	Veetukaayapoondur	<i>Tridax procumbens</i>	Asteraceae
21.	Black Mustard Seed	Kaduku	<i>Brassica juncea</i>	Brassicaceae
22.	Slender amaranth	Sirukeerai	<i>Amaranthus polygonoides</i>	Amaranthaceae
23.	European black nightshade	Manathakkali	<i>Solanum nigrum</i>	Solanaceae
24.	Cat's claw	Thael Kodukku	<i>Martynia annua</i>	Pedaliaceae
25.	Mexican prickly poppy	Eli-yotti	<i>Argemone mexicana</i>	Papaveraceae
26.	Punarnava	Mukkirattai	<i>Boerhaavia diffusa</i>	Nyctaginaceae
27.	Prickly amaranth	Mullukkeerai	<i>Amaranthus spinosus</i>	Amaranthaceae
28.	Porcupine flower	Kundan	<i>Barleria prionitis</i>	Acanthaceae
29.	Billygoat weed	Pumpillu	<i>Ageratum conyzoides</i>	Asteraceae
Climbers				
1.	Stemmed vine	Perandai	<i>Cissus quadrangularis</i>	Vitaceae
2.	Bottle Guard	Sorakkai	<i>Lagenaria siceraria</i>	Cucurbitaceae
3.	Ivy gourd	Kovai	<i>Coccinia grandis</i>	Cucurbitaceae
4.	Balloon vine	Mudakkotan	<i>Cardiospermum helicacabum</i>	Sapindaceae
5.	Rosary pea	Kuntumani	<i>Abrus precatorius L</i>	Fabaceae
6.	Pointed gourd	Kovakkai	<i>Trichosanthes dioica</i>	Cucurbitaceae
7.	Indian sarsaparilla	Nannari	<i>Hemidesmus indicus</i>	Asclepiadaceae
8.	Coral vine	Kodi rose	<i>Antigonon leptopus</i>	Polygonaceae
9.	Butterfly-pea	Sangupoo	<i>Clitoria ternata</i>	Fabaceae
10.	Wild jasmine	Malli	<i>Jasminum augustifolium</i>	Oleaceae
11.	Bitter gourd	Pavakkai	<i>Momordica charantia</i>	Cucurbitaceae
Creepers				
1.	Ground Spurge	Sithrapaalavi	<i>Euphorbia prostrata</i>	Euphorbiaceae
2.	<i>Ipomoea reniformis</i> chois	Elikkathilai	<i>Merremia gangetica</i>	Convolvulaceae
3.	Bitter Apple	Thumattikai	<i>Cucumis callosus</i>	Cucurbitaceae
4.	Merremia	Muthiyar koontha	<i>Merremia tridentata</i>	Convolvulaceae
5.	Frog fruit	Poduthalai	<i>Phyla nodifolia</i>	Verbenaceae
Grasses				
1.	Apluda	Kattu kanchippul	<i>Apluda mutica</i>	Poaceae
2.	Finger grass	Kuruthupillu	<i>Chloris dolichostachya</i>	Poaceae
3.	Nut grass	Korai	<i>Cyperus rotundus</i>	Poaceae
4.	Marvel grass	Marvel grass	<i>Dichanthium annulatum</i>	Poaceae
5.	Jungle rice	Kuthirai vaal Kattu arusi	<i>Echinochloa colona</i>	Poaceae
6.	Windmill grass	Chevvarakupul	<i>Chloris barbata</i>	Amaranthaceae

7.	Eragrostis	Pullu	<i>Eragrostis ferruginea</i>	Poaceae
8.	Umbrella-sedge	Vattakorai	<i>Cyperus difformis</i>	Cyperaceae
Cactus				
1.	Prickly pear	Nagathali	<i>Opuntia</i>	Cactaceae
2.	Triangular spruge	Chaturakalli	<i>Euphorbia antiquorum</i>	Euphorbiaceae

Fauna in the Core zone

The common insects are dragon fly, grass hoper ant scorpion, centipede, millipede, Butterflies, Indian Frags are found in the core zone.

Table 3.23 : List of Fauna in the Core Zone

SI. No	Scientific Name	Common Name	IUCN Red List data
Insects			
1.	<i>Trithemis pallidinervis</i>	Long legged marsh skimmer	LC
2.	<i>Brachythemis contaminata</i>	Ditch jewel	LC
3.	<i>Danaus genutia</i>	Striped Tiger	LC
4.	<i>Diplocodes trivialis</i>	Ground skimmer	-
5.	<i>Junoniahierta</i>	Yellow Pansy	LC
6.	<i>Hieroglyphus sp</i>	Grasshopper	LC
Reptiles			
1.	<i>Mabuya carinatus</i>	Common skink	LC
2.	<i>Calotes versicolor</i>	Garden lizard	LC
Aves			
1.	<i>Dicrurus macrocercus</i>	Black drongo	LC
2.	<i>Pycnonotus cafer</i>	Red vented Bulbul	LC
3.	<i>Milvus migrans</i>	Black kite	LC
4.	<i>Nycticorax nycticorax</i>	Night Heron	IV
5.	<i>Corvus splendens</i>	House crow	LC
6.	<i>Alcedo atthis</i>	Small blue kingfisher	LC
7.	<i>Bubulcus ibis</i>	Cattle egret	LC
8.	<i>Saxicoloides fulicata</i>	Indian Robin	LC
9.	<i>Accipiter badius</i>	Shikra	LC

Fauna in the buffer zone

Details of fauna with scientific name observed in the buffer zone given in the table below.

Table 3.24: List of Fauna's in the buffer zone**Mammals:**

SI. No	Scientific Name	Common Name	IUCN Conservation Status
1.	<i>Funambulus palmarum</i>	Indian palm squirrel	LC
2.	<i>Mus booduga</i>	Indian Field Mouse	LC
3.	<i>Herpestes javanicus</i>	Asian Small Mongoose	LC
4.	<i>Rattus norvegicus</i>	Brown rat	LC

Birds

SI. No	Scientific Name	Common Name	IUCN Conservation Status
1.	<i>Dicrurus macrocercus</i>	Black drongo	LC
2.	<i>Orthotomus sutorius</i>	Tailor Bird	IV
3.	<i>Passer domesticus</i>	House Sparrow	LC
4.	<i>Alcedo atthis</i>	Small blue kingfisher	LC
5.	<i>Bubulcus ibis</i>	Cattle Egret	LC
6.	<i>Saxicoloidesfulicata</i>	Indian Robin	LC
7.	<i>Ardeola grayii</i>	Pond Heron	LC
8.	<i>Anthus rufulus</i>	Paddy field pipit	LC
9.	<i>Columba livia</i>	Blue rock pigeon	IV
10.	<i>Streptopeliachinensis</i>	Spotted Dove	LC
11.	<i>Accipiter badius</i>	Shikra	LC
12.	<i>Corvus macrorhynchos</i>	Jungle Crow	LC
13.	<i>Corvus splendens</i>	House Crow	LC
14.	<i>Turdoides caudatus</i>	Common babbler	LC
15.	<i>Cuculus micropterus</i>	Indian cuckoo	LC
16.	<i>Nectarinia minima</i>	Small Sunbird	LC
17.	<i>Acridotherestrictis</i>	Common Myna	LC
18.	<i>Centropus sinensis</i>	Southern Coucal	LC
19.	<i>Dicrurus macrocercus</i>	Black Drongo	LC
20.	<i>Cinnyris asiaticus</i>	Purple Sunbird	IV
21.	<i>Apus affinis</i>	House swift	LC
22.	<i>Passer domesticus</i>	House sparrow	LC
23.	<i>Nycticorax nycticorax</i>	Night Heron	IV
24.	<i>Turdoides affinis</i>	White headed Babbler	LC
25.	<i>Eudynamys</i>	Koel	LC
26.	<i>Psittacula krameni</i>	Rose ringed parakeet	LC
27.	<i>Corvus splendens</i>	House crow	LC
28.	<i>Alcedo atthis</i>	Small blue kingfisher	LC
29.	<i>Cuculus canorus</i>	Common Cuckoo	LC
30.	<i>Pycnonotus cafer</i>	Red vented Bulbul	LC
31.	<i>Milvus migrans</i>	Black kite	LC
32.	<i>Meropsorientalis</i>	Small Bee-eater	LC
33.	<i>Halcyon smyrnensis</i>	White-breasted Kingfisher	LC

Reptiles

SI. No	Scientific Name	Common Name	IUCN Red List data
1.	<i>Mabuya carinatus</i>	Common skink	LC
2.	<i>Calotes versicolor</i>	Oriental garden lizard	LC
3.	<i>Ptyas mucosa</i>	Rat snake	NA
4.	<i>Ahaetulla nasuta</i>	Green vine snake	LC
5.	<i>Bungarus caeruleus</i>	Common krait	LC
6.	<i>Nerodia piscator</i>	Freshwater snake	NA
7.	<i>Hemidactylus flaviviridis</i>	House lizards	NL
8.	<i>Naja naja</i>	Indian cobra	LC

Insects

SI. No	Scientific Name	Common Name	IUCN Conservation Status
1.	<i>Brachythemis contaminata</i>	Ditch jewe	LC
2.	<i>Diplocodes trivialis</i>	Ground skimmer	LC
3.	<i>Trithemis aurora</i>	Crimson marsh glider	LC
4.	<i>Apis cerana</i>	Indian honey bee	
5.	<i>Trithemis pallidinervis</i>	Long legged marsh skimmer	-

Butterflies

SI. No	Scientific Name	Common Name	IUCN Conservation Status
1.	<i>Junonia lemonias</i>	Lemon Pansy	LC
2.	<i>Danaus genutia</i>	Striped Tiger	LC
3.	<i>Danaus chrysippus chrysippus</i>	Plain Tiger	LC
4.	<i>Acraea terpsicore</i>	Tawny Coster	LC
5.	<i>Jamides celenoceleno</i>	Common Cerulean	LC
6.	<i>Papilio polytes romulus</i>	Common Mormon	LC
7.	<i>Papilio demoleus demoleus</i>	Lime Butterfly	LC
8.	<i>Papilio polytes polytes</i>	Common Mormon	LC
9.	<i>Junonia hierta</i>	Yellow Pansy	LC
10.	<i>Euchrysops cnejus</i>	Gram Blue	LC
11.	<i>Hypolimnasmisippus</i>	Danaid Eggfly	LC
12.	<i>Phalanta phalantha</i>	Common Leopard	LC
13.	<i>Zizula hylax</i>	Tiny Grass Blue	LC
14.	<i>Catochrysops strabo</i>	Forget-Me-Not	LC
15.	<i>Lampides boeticus</i>	Pea Blue	LC
16.	<i>Euploea core</i>	Common Crow	LC
17.	<i>Melanitis leda leda</i>	Common Evening Brown	LC
18.	<i>Hypolimnasmisippus</i>	Danaid Eggfly	LC
19.	<i>Everes lacturnus</i>	Indian Cupid	LC
20.	<i>Pachliopta aristolochiae</i>	Common Rose	LC

Aquatic Ecology**Aquatic Flora Diversity**

S.No	Scientific name	Common Name	IUCN Red List of Threatened Species
1.	<i>Eichornia crassipe</i>	Water hyacinth	NA
2.	<i>Aponogeton natans</i>	Floating laceplant	NA
3.	<i>Carex cruciata</i>	Cross Grass	NA
4.	<i>Nymphaea nouchali</i>	Blue waterlily	LC
5.	<i>Chrysopogon aciculatus</i>	Golden false beardgrass	NA
6.	<i>Hydrilla verticillata</i>	Water thymes	LC
7.	<i>Cyperus exaltatus</i>	Tall Flat Sedge	LC
8.	<i>Marsilea quadrifolia</i>	Water clover	LC

Aquatic Faunal Diversity**Amphibians**

SI. No	Scientific Name	Common Name	IUCN Red List data
1.	<i>Duttaphrynus melanostictus</i>	Common Indian Toad	IV
2.	<i>Rana tiger</i>	Common Frog	NA
3.	<i>Euphlyctis hexadactylus</i>	Indian Pond Frog	LC
4.	<i>Hoplobatrachus tigerinus</i>	Indian Bull Frog	IV/LC

Fishes

S.No	Common name	Scientific name	Family
1.	Catla	<i>Catla Catla</i>	Cyprinidae
2.	Dwarf panchax	<i>Aplocheilus parvus</i>	Aplocheilidae
3.	Tank goby	<i>Glossogobius giuris</i>	Gobiidae
4.	Ticto barb	<i>Pethia ticto</i>	Cyprinidae
5.	Rohu	<i>Labeo rohita</i>	Cyprinidae
6.	Catfish	<i>Siluriformes</i>	Diplomystidae
7.	Mrigal	<i>Cirrhinus mrigala</i>	Chordata
8.	Greenstripe barb	<i>Puntius vittatus</i>	Cyprininae
9.	Pool barb	<i>Puntius sophore</i>	Cyprinidae

Among the fauna recorded most of them are of common residence population and there are no endangered species in the study area.

Interpretation:

There is no schedule I species of animals observed within study area as per Wildlife Protection Act 1972 as well as no species is in vulnerable, endangered or threatened category as per IUCN. There is no endangered red list species found in the study area. Hence this small mining operation over short period of time will not have any significant impact on the surrounding flora and fauna.

3.7 SOCIO ECONOMIC ENVIRONMENT

To assess the impact on the socio economic environment, it is essential to collect the following data:

- * Population surrounding the project site those likely to be targeted receptor of impact
- * Employment pattern
- * Infrastructure facilities available to the local population such as water supply and sanitation electricity, roads, education and medical facilities.
- * Land use pattern.

Information on the Socio economic front has been collected from various secondary sources including 2011 published census data, Government and semi government office.

3.7.1 Objectives

The objectives of the socio-economic study are as follows:

- a) To study the socio-economic status of the people living in the study area of the project.
- b) To identify the basic needs of the nearby villages within the study area.
- c) To assess the impact on socio-economic environment due to the project.
- d) To provide the employment and improved living standards.
- e) To study the socio-economic status of the people living in the study area Sand quarry project region
- f) To assess the impact on socio-economic environment due to Sand quarry project region
- g) To analysis of impact of socio economic and Environmental Infrastructure facilities and road accessibility.

3.7.2 Methodology adopted for the study

The methodology adopted for the socio-economic impact assessment is as follows:

- a) The details of the activities and population structure have been obtained from Census 2001 and 2011 and analyzed.
- b) Based on the above data, impacts due to plant operation on the community have been assessed and recommendations for further improvement have been made.

3.6.5 Primary Survey

The primary data collection includes the collection of data through a structured interview schedule by direct observation method. The questionnaire survey includes both open and closed methods. The sample size is limited respondents, who were selected on the basis of simple random sampling from Mangammalpuram Village, Lalgudi Taluk, Tiruchirappalli District, Tamil Nadu State in the field survey has been divided into three major segments namely Primary Zone (0 - 3 km), Secondary Zone (3 - 7 km) and tertiary Zone (7 - 10 km).

The questionnaires were designed to suit the subjects considering their rural background enabling to furnish correct information and data as far as possible. Data were collected at village level and household level by questionnaires and focused group discussions. The study area for the field survey has been divided into three major segments namely Primary Zone (0 - 3 km), Secondary Zone (3 - 7 km) and Outer Zone (7 - 10 km).

3.10 Tiruchirappalli District

Tiruchirappalli District is located along the Kaveri River in Tamil Nadu, India. The main town in Tiruchirappalli District is the city of Tiruchirappalli, also known as Trichy. During the British Raj, Tiruchirappalli was known as Trichinopoly,

Tiruchirappalli district lies within Tamil Nadu. The district has an area of 4,404 square kilometers. It is bounded in the north by Salem district, in the northwest by Namakkal district, in the northeast by Perambalur district and Ariyalur district, in the east by Thanjavur District, in the southeast by Pudukkottai district, in the south by Madurai district and Sivagangai district, in the southwest by Dindigul district and, in the west by Karur district. The Kaveri River flows through the length of the district and is the principal source of irrigation and drinking water.

. Source: <https://tiruchirappalli.nic.in/about-district/>.

3.11 Study Area

Detailed socio-economic survey was conducted in the study area (Core and buffer zone) within 10 km radius of the area at Mangammalpuram Village, Lalgudi Taluk, Tiruchirappalli district, Tamil Nadu State. In order to determine the impact of the proposed project on nature and inhabitant. To get an overview of the villagers and their perspectives about this proposed activity, different demographic parameters and social aspects such population density, sex ratio, literacy rate, worker ratio etc. has been identified, analyzed, studied together. These impacts may be beneficial or disadvantageous. If disadvantageous anticipated suggestions measures are advocated in order to have collective development.

3.12 Demographic pattern of 10km study area characteristics a comparative analysis

Table 3.25. Shows the socio-economic profile of the study area as compared to district, state and national level socio-economic profile

Particular	India	Tamil Nadu	Tiruchirappalli District	Study Area (10km Radius)
Area (in sq. km.)	3,287,263	130058	4,404	315
Population Density/ sq. Km.	368	554	618	433
No. of Households	249454252	13357027	698404	35333
Population	1210569573	72147030	2722290	136239
Male	623121843	36137975	1352284	67497
Female	587447730	36009055	1370006	68742
Scheduled Tribes	104281034	794697	18198	260
Scheduled Castes	201378086	14438445	466561	31878
Literacy Rate	72.99%	80%	75%	85%
Sex Ratio (Females per 1000 Males)	943	996	1013	1018

Source: Census of India, 2011.

District of Trichy area was 4404 sqkm and study area is about 315 sqkm. Population density is total population per sqkm. So, India population density was 368 sqkm, state of Tamil Nadu density was 554 sqkm, District had density about 618 sqkm and study area density is about 433 sqkm. As per Census 2011, about 5.96percent of population in the state lives in areas. Tiruchy had comparing state wise 4 percent of population lives in the district. In study area has 5 % around 10km radius. State, District and study area.

3.13 Population Projection of the Study Area

A population projection is an estimation of the number of people expected to be alive at a future date that is made based on assumptions of population structure, fertility, mortality and migration. It is an essential to assess the need for new jobs, schools, doctors and nurses, planning urban housing, foods, clothing and requirements of energy and resources. It is also needed for policy discourse i.e., helps to the policy-makers to understand the existing problems and finally supports to develop the suitable solutions

Table 3.26 Total Population of Study Area

Sl No.	Population in 2001	Population in 2011
1	131175	136239

Source: <https://censusindia.gov.in/census.website/>

Table 3.27 Population Projection of Study Area

S. No	Year	Projected Population (Approximately)
1.	2021	141303
2.	2031	146367
3.	2041	151431
4.	2051	156495

Source: Calculated by SPSS v23, 2022.

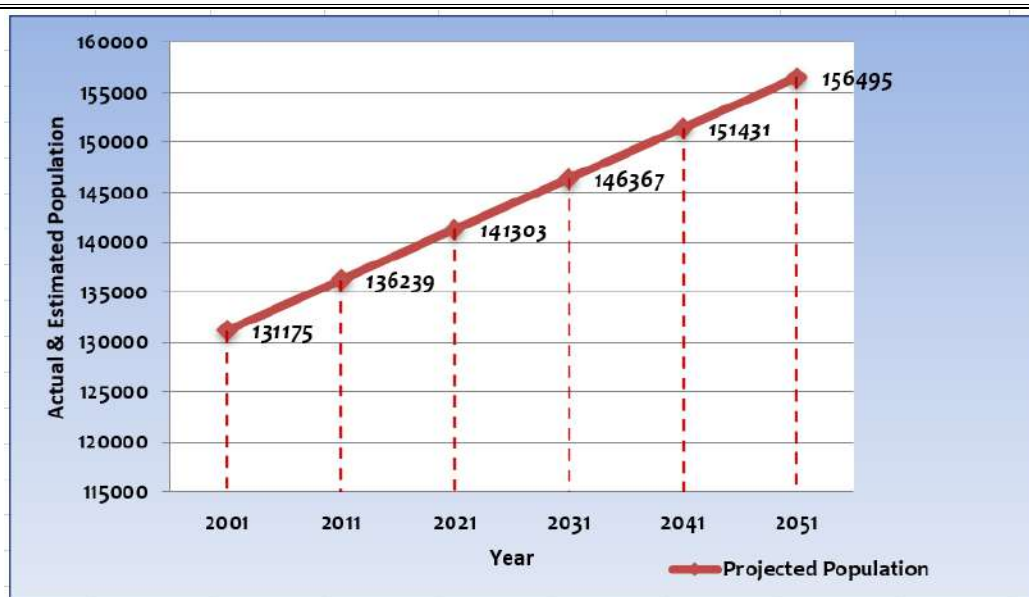


Fig 3.17 Graph Showing Population Projection

3.15 Population Distribution and Composition of Study Area

The population as per 2011 Census records is 136239 (for 10 km radius buffer zone). Total no. of household is 3984, 21838 and 9511 respectively, in primary, secondary and tertiary zone. Sex ratio is 1050, 1020 and 1002 (females per 1000 males) observed in primary, secondary and tertiary zone respectively. SC population distribution is 3737, 20936 and 7205 respectively in primary, secondary and tertiary zone. ST population distribution is 32, 140 and 88 respectively in primary, secondary and tertiary. Average household size is 4. Zone wise Demographic profile of study area is given in the table 3.15.1 below:

Source: <https://censusindia.gov.in/census.website/data/census-tables>

Table 3.28. Zone wise Demographic Profile of Study Area

Zone	No. of Villages	Total Household	Total Population	Male Population	%	Female Population	%
Primary Zone (0 - 3 Km)	5	3984	15454	7540	48.79	7914	51.21
Secondary Zone (3 - 7 Km)	27	21838	83953	41563	49.51	42390	50.49
Tertiary Zone (7 - 10 km)	18	9511	36832	18394	49.94	18438	50.06
Study Area (0-10 km)	50	35333	136239	67497	49.54	68742	50.46

Source: Census of India, 2011

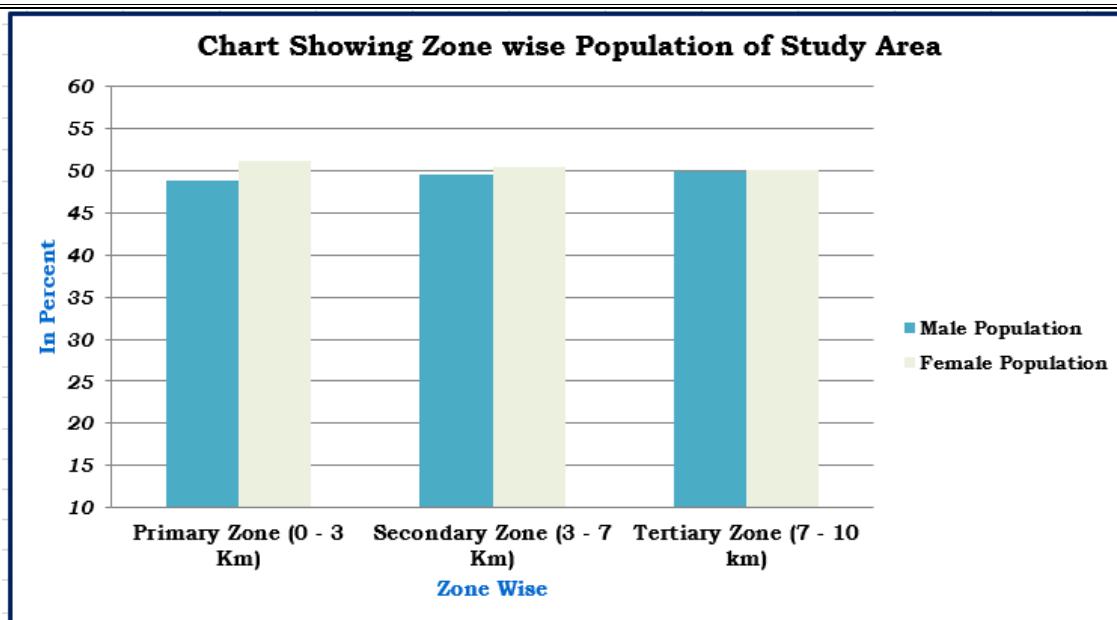


Figure 3.18 Population of study area

Table 3.29 : List of Villages, Demography details within the study area

Sno	Name	Rural/Village/TP	No House Hold	Total Population	Male Population	Female Population	Person 0-6 yr	Male 0-6	Female 0-6	SC Population	SC Male	SC Female	ST Population	ST Male	ST Female	Literate Person	Male Literate	Female Literate	Total Workers	Main workers	Marginal workers	Non workers
0-3km																						
1	Jangamarajapuram	Rural	831	3396	1605	1791	289	153	136	818	399	419	0	0	0	2683	1322	1361	1521	1175	346	1875
2	Adikudi	Rural	990	3719	1833	1886	359	202	157	806	402	404	22	12	10	2760	1472	1288	1833	1722	111	1886
3	Mangammalpuram	Rural	647	2492	1207	1285	226	112	114	659	311	348	10	7	3	1840	986	854	1431	1236	195	1061
4	Tiruchinampoondi	Rural	588	2147	1066	1081	192	97	95	836	424	412	0	0	0	1586	869	717	895	750	145	1252
5	Koviladi	Rural	928	3700	1829	1871	371	183	188	618	316	302	0	0	0	2713	1467	1246	2087	1882	205	1613
		Total	3984	15454	7540	7914	1437	747	690	3737	1852	1885	32	19	13	11582	6116	5466	7767	6765	1002	7687
3-7km																						
1	T.Kallikudi	Rural	680	2654	1315	1339	273	149	124	1165	568	597	0	0	0	2019	1059	960	1454	838	616	1200
2	Edangimangalam	Rural	888	3365	1696	1669	325	175	150	460	233	227	27	16	11	2639	1415	1224	1590	1269	321	1775
3	Peruvalanallur (East)	Rural	1076	3870	1840	2030	371	179	192	1779	873	906	0	0	0	2916	1523	1393	1982	1301	681	1888
4	Sirumayangudi (West)	Rural	949	3645	1778	1867	402	192	210	977	470	507	54	32	22	2847	1479	1368	1488	1143	345	2157
5	Sirumayangudi (East)	Rural	665	2374	1132	1242	222	99	123	894	425	469	0	0	0	1858	953	905	1013	857	156	1361
6	Komagudi	Rural	246	974	481	493	76	40	36	130	56	74	0	0	0	729	386	343	676	656	20	298
7	Sembarai	Rural	549	2365	1189	1176	175	104	71	643	303	340	0	0	0	1874	999	875	1094	586	508	1271
8	Thinniyam	Rural	576	2243	1121	1122	174	92	82	667	322	345	0	0	0	1958	994	964	1293	1172	121	950
9	Mettupatti	Rural	258	938	465	473	79	48	31	404	197	207	0	0	0	739	377	362	374	288	86	564
10	Manakkal (East)	Rural	301	1154	549	605	122	53	69	114	44	70	0	0	0	858	446	412	601	525	76	553
11	Manakkal (West)	Rural	1054	4178	2078	2100	380	217	163	1224	604	620	0	0	0	3408	1748	1660	1925	1857	68	2253
12	Koonur	Rural	608	2339	1160	1179	224	125	99	401	207	194	3	2	1	1780	952	828	1253	1127	126	1086
13	Keelanbil	Rural	464	1692	814	878	159	78	81	765	371	394	0	0	0	1293	677	616	968	683	285	724
14	Ariyur	Rural	873	3385	1701	1684	325	171	154	777	375	402	0	0	0	2335	1285	1050	1611	913	698	1774
15	Puvalur (TP)	Urban	2083	7905	3904	4001	698	367	331	1486	720	766	0	0	0	6280	3321	2959	3294	3131	163	4611
16	Lalgudi (TP)	Urban	6129	23740	11755	11985	2394	1280	1114	3730	1846	1884	36	18	18	19618	9983	9635	8904	8117	787	14836
17	Padirakudi	Rural	372	1534	762	772	153	80	73	976	483	493	0	0	0	1203	651	552	586	525	61	948
18	Katchamangalam	Rural	406	1564	794	770	130	70	60	392	197	195	0	0	0	1227	654	573	589	184	405	975
19	Agarapettai	Rural	445	1700	887	813	168	98	70	707	372	335	0	0	0	1312	744	568	704	479	225	996
20	Rajagiri	Rural	600	2247	1107	1140	188	97	91	947	459	488	0	0	0	1829	952	877	966	501	465	1281
21	Ranganathapuram	Rural	160	572	308	264	72	36	36	266	142	124	0	0	0	402	245	157	285	278	7	287
22	Nemam	Rural	466	1735	845	890	129	72	57	300	148	152	0	0	0	1349	697	652	775	756	19	960
23	Megalathur	Rural	283	1059	536	523	119	65	54	534	265	269	20	12	8	728	398	330	500	121	379	559
24	Indalur	Rural	474	1862	912	950	178	92	86	503	252	251	0	0	0	1273	674	599	935	887	48	927
25	Kadambangudi	Rural	330	1329	674	655	167	89	78	33	18	15	0	0	0	888	480	408	751	448	303	578
26	Maraneri	Rural	465	1794	909	885	160	81	79	429	211	218	0	0	0	1353	763	590	931	914	17	863
27	Kattur	Rural	438	1736	851	885	162	86	76	233	119	114	0	0	0	1209	642	567	736	429	307	1000
		Total	21838	83953	41563	42390	8025	4235	3790	20936	10280	10656	140	80	60	65924	34497	31427	37278	29985	7293	46675
7-10km																						

1	Venkatachalapuram (South)	Rural	653	2230	1119	1111	186	112	74	80	38	42	1	1	0	1636	905	731	1237	1225	12	993
2	Alangudimahajanam	Rural	369	1381	672	709	117	66	51	362	181	181	75	38	37	978	516	462	652	636	16	729
3	Vellanur	Rural	250	1007	519	488	96	42	54	181	86	95	5	4	1	842	465	377	267	166	101	740
4	Nanjaisengandhi	Rural	298	1066	503	563	127	65	62	1061	501	560	0	0	0	749	390	359	667	615	52	399
5	Peruvalanallur (West)	Rural	445	1700	845	855	179	87	92	248	120	128	0	0	0	1224	676	548	933	647	286	767
6	Keelamarimangalam	Rural	47	182	84	98	26	12	14	89	39	50	0	0	0	132	66	66	85	84	1	97
7	Nathamangudi	Rural	561	2162	1093	1069	211	98	113	36	20	16	0	0	0	1639	916	723	1221	1059	162	941
8	Poondi I	Rural	545	2320	1199	1121	195	100	95	662	360	302	7	4	3	1733	968	765	878	877	1	1442
9	Thogur	Rural	609	2312	1119	1193	214	112	102	445	212	233	0	0	0	1741	923	818	1188	572	616	1124
10	Palamaneri	Rural	604	2345	1153	1192	246	120	126	121	57	64	0	0	0	1800	957	843	991	582	409	1354
11	Unjini	Rural	47	176	89	87	11	8	3	0	0	0	0	0	0	148	74	74	69	66	3	107
12	Orathur	Rural	378	1512	777	735	130	75	55	514	269	245	0	0	0	1207	667	540	587	91	496	925
13	Nathamangalam	Rural	90	379	176	203	38	20	18	369	173	196	0	0	0	272	130	142	104	25	79	275
14	Budarayanallur	Rural	270	1043	543	500	113	70	43	303	162	141	0	0	0	778	428	350	474	177	297	569
15	Thirukkattupalli (TP)	Urban	3304	12972	6502	6470	1285	615	670	1454	726	728	0	0	0	10004	5359	4645	4971	4385	586	8001
16	Sholagampatti	Rural	364	1433	717	716	126	54	72	417	201	216	0	0	0	1011	559	452	665	661	4	768
17	Kangeyampatti	Rural	373	1389	671	718	140	70	70	508	242	266	0	0	0	829	451	378	695	354	341	694
18	Thondarayampadi	Rural	304	1223	613	610	115	56	59	355	178	177	0	0	0	883	485	398	574	333	241	649
		Total	9511	36832	18394	18438	3555	1782	1773	7205	3565	3640	88	47	41	27606	14935	12671	16258	12555	3703	20574
		G.Total	35333	136239	67497	68742	13017	6764	6253	31878	15697	16181	260	146	114	105112	55548	49564	61303	49305	11998	74936

Source : Village Wise Demographic Profile of the Study Area, Census of India, 2011

Literacy Rate in Study Area

Literacy Rate is the percentage of people in a country with the ability to read and write. The analysis of the literacy levels is done in the study area. The 10 km radius of study area demonstrates a literacy rate of 85% as per census data 2011. The male literacy rate in the study area indicates 91.4% whereas the female literacy rate, which is an important indicator for social change, is observed to be 79.32% as per the census data 2011. This needs to focus on the region and enhance further development focusing on education. (Table no 3.17.1).

Table 3.30. Literacy Rate of the Study Area

Zone	No. of Villages	Male Literacy Population	Male literacy Rate	Female Literacy Population	Female literacy Rate	Total Literacy	Total Literacy Rate
Primary Zone (0 - 3 Km)	5	6116	90.03	5466	75.66	11582	82.63
Secondary Zone (3 - 7 Km)	27	34497	92.42	31427	81.42	65924	86.82
Tertiary Zone (7 - 10 Km)	18	14935	89.90	12671	76.03	27606	82.96
Study Area (0-10km)	50	55548	91.46	49564	79.32	105112	85.30

Source: Census of India, 2011

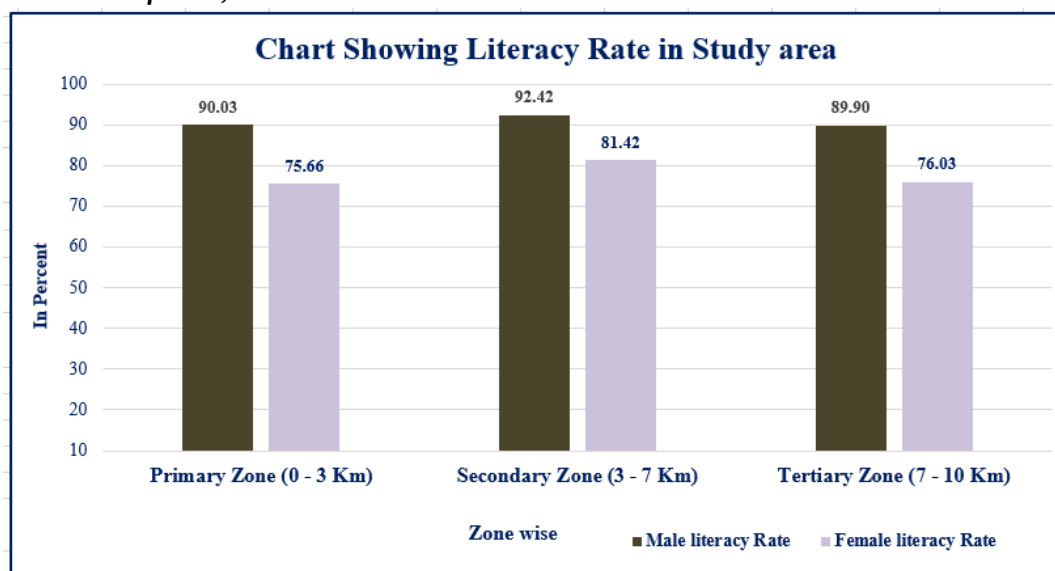


Figure 3.19 Gender wise Literacy Rate in the study area

3.18 Family Size

Size of family also describes about family functioning, resource consumption, total income generated and their expenditure pattern. Census 2011 data suggests that most of these households have a family size of up to 4 members, knowing the size of family also give fair understanding of relating how much resource consumption is being incurred, and annual income being generated and spent.

3.19 Vulnerable Group

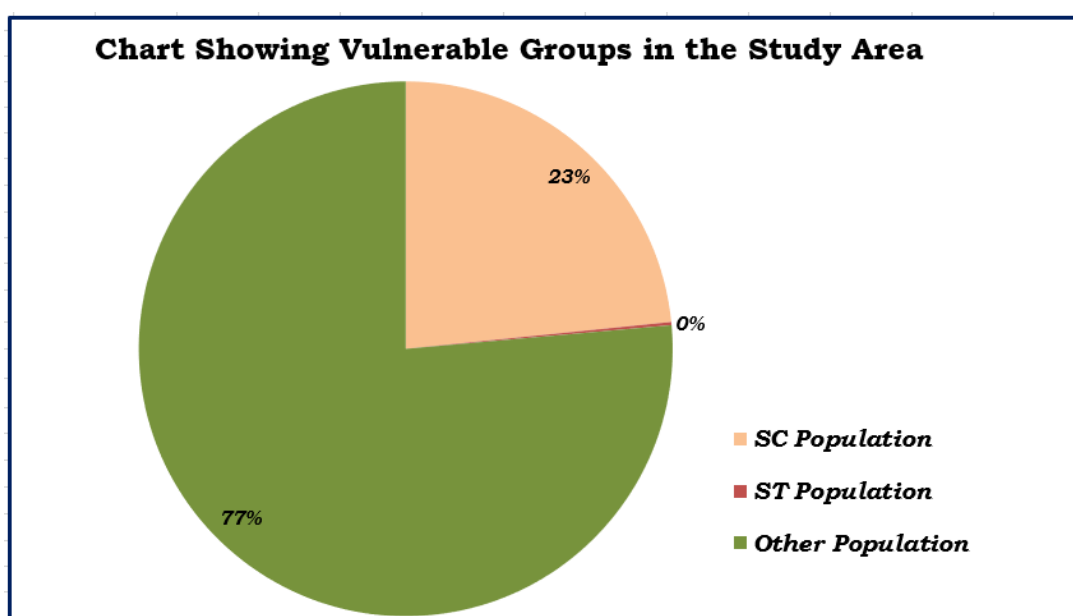
While developing an action plan, it is very important to identify the population who fall under the marginalized and vulnerable groups and special attention has to be given towards these groups while making action plans. Special provisions should be made for them. In the observed villages schedule caste (SC) population is 23.4% and Schedule Tribe population 0.19%, Other Population is 76 % in total study area.



Table 3.31 vulnerable groups of the study area

Zone	No. of Villages	Vulnerable Groups					
		SC Population	%	ST Population	%	Other Population	%
Primary Zone (0 - 3 Km)	5	3737	24.18	32	0.21	11685	75.61
Secondary Zone (3 - 7 Km)	27	20936	24.94	140	0.17	62877	74.90
Tertiary Zone (7 - 10 Km)	18	7205	19.56	88	0.24	29539	80.20
Total area (10km)	50	31878	23.40	260	0.19	104101	76.41

Source: Census of India, 2011

**Figure 3.20 vulnerable groups**

3.20 Economic Activities

The economy of an area is defined by the occupational pattern and income level of the people in the area. The occupational structure of residents in the study area is studied with reference to work category. The population is divided occupation wise into three categories, viz., Total workers, Main workers and non-workers. The main workers include cultivators, agricultural laborers, those engaged in household industry and other services. The non-workers include those engaged in unpaid household duties like, students, retired persons, dependents, beggars, vagrants etc. besides Institutional intimates or all other non-workers who do not fall under the above categories.

Table 3.32 shows the work force of the study area

Zone	No. of Villages	Total Workers	%	Main Workers	%	Marginal Workers	%	Non-Workers	%
Primary Zone (0 - 3 Km)	5	7767	50.26	6765	43.78	1002	6.48	7687	49.74
Secondary Zone (3 - 7 Km)	27	37278	44.40	29985	35.72	7293	8.69	46675	55.60
Tertiary Zone (7 - 10 Km)	18	16258	44.14	12555	34.09	3703	10.05	20574	55.86
Study Area (10 Km)	50	61303	45.00	49305	36.19	11998	8.81	74936	55.00

Source: Census of India, 2011

The above table shows that out of the total working population, the percentage of main workers is 36.19 % while 8.81% are marginal workers. Number of working populations is 45% and non-working population is 55% in the study area. As per the data obtained from the survey (as mentioned previously in occupational structure) most of these people are employed for major period of the year. Also, to mention the natural environment also restricts the people in finding stable business is performed for only certain months. Thus, proposed project will act as possible exposure for them to get enrol and earn sustain livelihood.

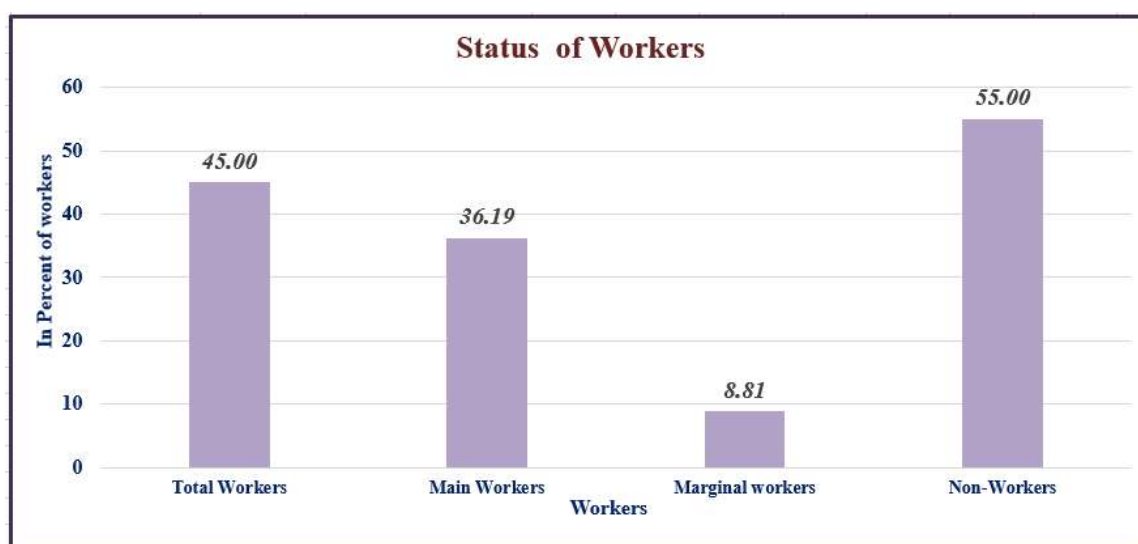


Figure 3.21 Working population in the study area

3.21 Infrastructure Base

A better network of physical infrastructure facilities (built up and roads, irrigation, power and social infrastructure support, viz. health and Education, water and sanitation are essential for the development of the rural economy.

A review of infrastructural facilities available in the area has been done based on the information from baseline survey & census data of the study area. Infrastructural facilities available in the area are described in the subsequent sections.

- **Administrative offices** are located in Tamil Nadu, Trichy district (22km-SW) from site which by local transport.
- **Kollidam River** side around 10 km from mine lease boundary. belongs to Cauvery River near mines. (1.5km-S), Kollidam river a centre of the sand mine area.
- **Availability of Government Higher Secondary school** Anbil Village (NE-1.5km), Government ADW Primary school, Keelanbil village, Government Higher Secondary school, Lalgudi TP (6km-NW), Govt Elementary School, Puvalur (7km-NW), Government Higher Secondary school Agarapettai Village (SE-3.5km), Government Higher Secondary school, Elangadu Village (SE-6km), Government Higher Secondary school Arasangudi Village (SE-7km) and Trichy and Thanjavur Taluk many colleges and Training institute found in study area.
- **Health facilities** covered in the Buffer zone area like Government Hospital, Kattur Village (NW-4.5km), Government Hospital, Lalgudi (6.5km-W), Government Hospital, Arasangudi Village (7km-SW), Government Hospital, Venkatachalapuram (9.5km-N) Trichy and Thanjavur district in number of clinics and medical centre and Government Hospital, etc.

3.23 Interpretation

Based on the data, following inferences could be drawn:

- Total literacy rate in the study area is 85%.
- The study area had good educational facilities. The overall status depicts that the education is limited to primary and middle level.
- The schedule tribe community forms 0.19% and Scheduled Caste forms 23% of the total population of study area.
- The Other Population forms 76% of the total population of study area.
- The study area is well connected by District/Village Road.
- The study area not well health facilities of primary level.
- Considering the above facts, the proposed project will boost the socio-economic development activities in the area and hence will leave positive impact.
- The core area not good mobile connectivity. Buffer area is well connectivity.

3.24 Recommendation and Suggestions

The village development plans are made in consultation with the community through Gram Sabha; these appear to address the needs of the community. However, it may be noted that at the implementation stage these plans often are fraught with problem of inadequate funds, lack of proper planning, corruption, vested interests and political agendas. Hence while ascertaining the scope for convergence with the government activities, care must be taken to ascertain realistic possibilities for implementation.

-
-
- **Women empowerment**– Home based income generation activities, vocational training programs and common education centre for increasing the literacy rate.
 - **Education** – Free uniform, construction of common rooms and library, computer education and physical education, additional schools for girls, furniture and equipment in schools, up-gradation of existing school infrastructure.
 - **Agriculture/livestock** – Infrastructure such as agricultural practices, electricity connections, assistance with buying improved tools and equipment, capacity building, supply and/or knowledge of better variety of seeds, pasture land development and trainings on animal husbandry & facility of veterinary doctor.
 - **Health** – Improvements in sanitary conditions of villages, assistance with construction of latrines, improvement in drainage system, health camps and awareness campaigns for diseases like Covid-19, malaria, typhoid, tuberculosis, yellow fever and pneumonia. Repairing of PHCs and Anganwadi centers.
 - **People with disability** – Establishment of center for special education, sensitization of the community towards disabled and awareness on Government schemes.
 - While **Developing an Action Plan**, it is very important to identify the population who falls under the marginalized and vulnerable groups. So that special attention can be given to these groups with special provisions while making action plans.

Connectivity –Road network and transport connectivity to easiness accessibility to the region

3.25 Conclusion

To evaluate the impacts of proposed Sand quarry project on the surrounding area, it is vital to assess the baseline status of the environmental quality in the locality of the site. Hence it can be concluded that the present environment status of the study area will not be affected by the project as The Executive Engineer, WRD, MMD, Tiruchirappalli, will adopt adequate control measures to protect the surrounding environment and will contribute in development of the study areas.

The proposed project will aim to provide preferential employment to the local people there by improving the employment opportunity in the area and in turn the social standards will improve.

Conclusion SIA has traditionally involved the use of technical and participatory analytical methods to anticipate change but also encouraging the life cycle of projects to minimize negative outcomes and maximize benefits. The early consideration of social impacts, the alignment of activities with regional and community planning objectives, and meaningful participation of community in decision making are key features. Apart from the SIA process and findings it can be concluded that most the respondents have positive pulse towards implementation of the proposed project.

3.8 SUMMARY OF THE BASELINE STATUS:

The interpretations of the baseline environmental status in the study area are following.

- * The monitored Air quality in the project area was found to be in compliance with the NAAQ norms for industrial and residential rural and other areas.
- * The noise level Leq during the day and night was found to be well within the ambient noise quality standards notified under Environmental (Protection) Act 1986.
- * The quality of the surface water and ground water are found well within the prescribed standards of CGWB Norms and drinking water specification IS 10500 and Central Pollution Control Board water quality criteria.
- * There is no eco sensitive zone or any Archeological/ historical places found within the vicinity of the project area.
- * There are no endangered red list species of fauna and the area is thinly populated. All basic facilities like school, hospitals, communication center, transportation center, are available in and around the project area.
- * There is sufficient buffer zone for the project with respect to physical and biological environments. There is no effluent discharge from the mine to the nearby water.

CHAPTER – 4: ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.0 INTRODUCTION: -

The environmental impact can be categorized as either primary or secondary, primary impacts which are attributed directly by the project; secondary impacts are those which are indirectly induced. This particular open cast mining operations involve Excavation of Sand, Approach road, Haul road and handling of material. No drilling and blasting involved in this type of sand mining operation.

In order to maintain the environmental commensuration with the mining operation, it is essential to undertake studies on the existing environmental scenario and assess the impact on different environmental components. This would help in formulating suitable management plans for sustainable resource extraction. Based on the baseline environmental status at the existing mine site, the environmental factors that are likely to be affected (Impacts) are identified, quantified and assessed. The various anticipated impacts will be on

The various anticipated impacts will be in

- * Land environment
- * Soil environment
- * Water Environment
- * Air Environment
- * Noise Environment
- * Socio economic environment
- * Solid waste

Based on the existing baseline environmental status, the environmental factors that are likely to be affected (Impacts) are identified, quantified and assessed.

4.1 LAND ENVIRONMENT

4.1.2 Anticipated Impact

The total project area is 20.00.0 ha is proposed for quarrying activity (Excavation). The proposed area is Coleroon River land. The mining activity is proposed to a maximum depth of 2.5m (1.5m abl + 1m bbl).

Due to mining operation, there is no remarkable impact on environment, except land degradation within project area. No release of toxic elements into the ground. No adverse impact is anticipated on land use of buffer zone associated due to the mining activity, as all the activities will be confined within the project area. The quarrying operations will impact the land usage and land aesthetics of project area. The land degradation is unavoidable during quarry activities like excavation, mineral handling etc.,

4.1.3 Mitigation measures

Due to the mining operation the land will get positive impact, the main aim of the mining operation is to restore the functional efficiency of the river.

4.1.4 Soil Environment

4.1.4.1 Impact on Soil Environment

- * Mining in the riverbed may change complete land use pattern including channel geometry, bed elevation, sediment transportation capacity which can reduce flow of the river and downstream erosion.
- * Mining activity may increase the soil erosion and soil degradation which have adverse impact on soil fertility.

4.1.4.2 Mitigation measures for Soil Conservation

- * The mining is planned in non monsoon seasons only so that the excavated area will be replenished naturally during the subsequent rainy season for the river bed mining block.

4.2 WATER ENVIRONMENT

4.2.1 Anticipated Impact on Surface and ground water

The impact due to quarrying on the water quality is expected to be insignificant because of no use of chemicals or hazardous substances during quarrying process. The quarrying activity will not intersect ground water table as the maximum depth of the quarry is 2.5m (1.5m abl + 1m bbl) and the water table in the area is 11m bgl.

Table 4.1: Water Requirements

*Purpose	Quantity	Source
Dust Suppression	1.0 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Green Belt development	1.0 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Drinking and Domestic purpose	1.0 KLD	Water Tankers
Total	3.0 KLD	

* Water for drinking purpose will be brought from approved water vendors
Source: Approved Mining Plan Pre-Feasibility Report

Total water requirement in the proposed project is about 3.0 KLD, the water for dust suppression and greenbelt development will be sourced from the stagnant water in the river, the water for domestic purpose and drinking will be sourced from the approved water vendors.

4.2.2 Mitigation measures

The quarrying operation is restricted well above the water table. The water table will not be intersected during mining in the riverbed. There is no proposal of any stream modification/diversion due to this mining activity hence there will be no any impact on flow of the river.

4.3 AIR ENVIRONMENT

Quarrying Operations will be to carried out by opencast method without involving drilling and blasting, dust particles are generated only due to Excavation, Loading, handling of mineral and transportation. The air quality in the study area depends upon the nature and concentration of emissions and meteorological conditions. Prediction of impacts on air environment has been carried out taking into consideration proposed production of 5,00,000m³ of sand on air environment and net increase in emissions by Open pit source modeling in AERMOD Software.

The air borne particulate matter is the main air pollutant in this opencast mining. The mining operation will be carried out using Hydraulic Excavators for the excavation of Sand.

The major air pollutants due to mining activity includes:-

- * Particulate Matter (Dust) of various sizes.
- * Gases, such as, Sulphur Dioxide, Oxides of Nitrogen, Carbon Monoxide etc., from vehicular exhaust.
- * Dust is the single air pollutant observed in the open cast mines. Diesel operating vehicles produce NO_x, SO₂ and CO emissions, usually at low levels. Dust can be of significant nuisance surrounding land users and potential health risk in some circumstances.

Meteorological Data –

Meteorology is the key to understand the air quality. The essential relationship between meteorological condition and atmospheric dispersion involves the wind in the broadest sense. Wind fluctuations over a very wide range of time, accomplish dispersion and strongly influence other processes associated with them.

A temporary meteorological station was installed at project site and monitored continually for study period without break. The station was installed at a height of 4 m above the ground level in such a way that there are no obstructions facilitating flow of wind, wind speed, wind direction, humidity and temperature are recorded on hourly basis. A weather data was collected from IMD, Tiruchirappalli for the month of December 2022 to February 2023 to correlate with site data and found not much of change in the parameters.

Figure 4.1: AERMOD Terrain Map

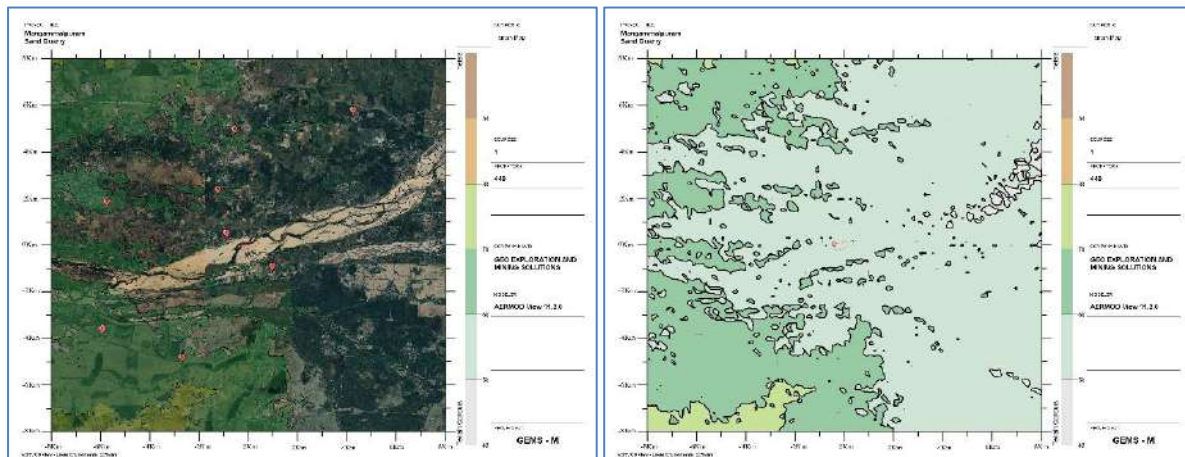


Figure 4.2: Predicted Incremental Concentration of PM₁₀

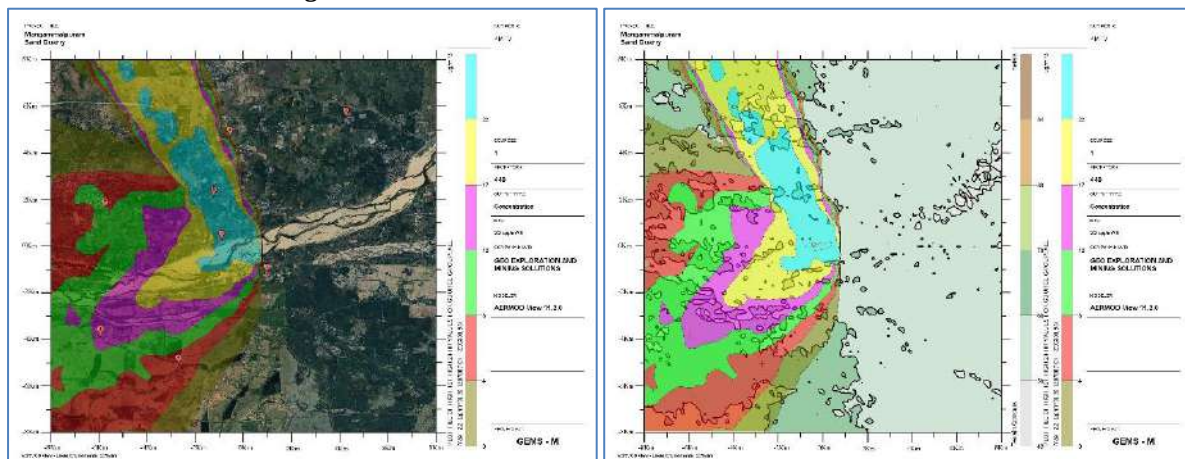


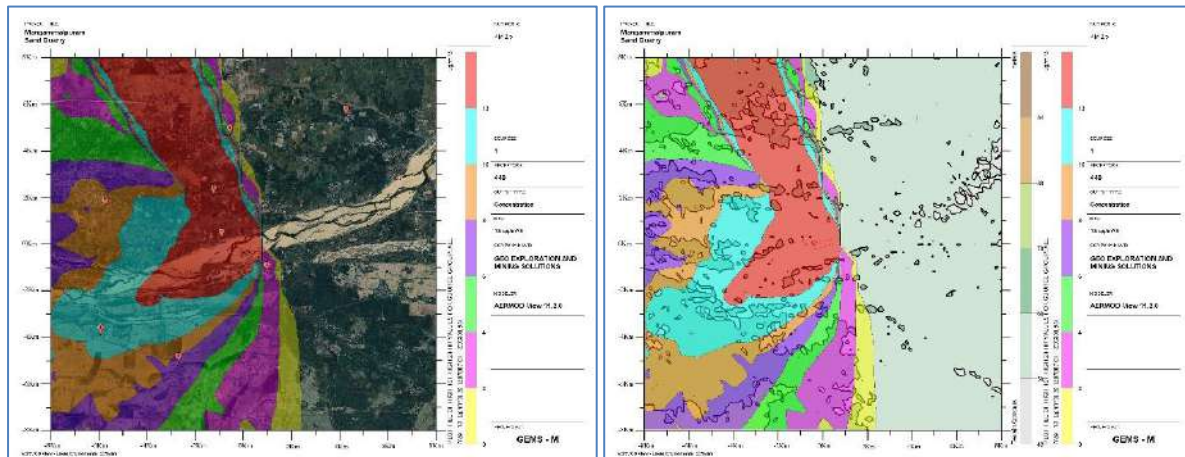
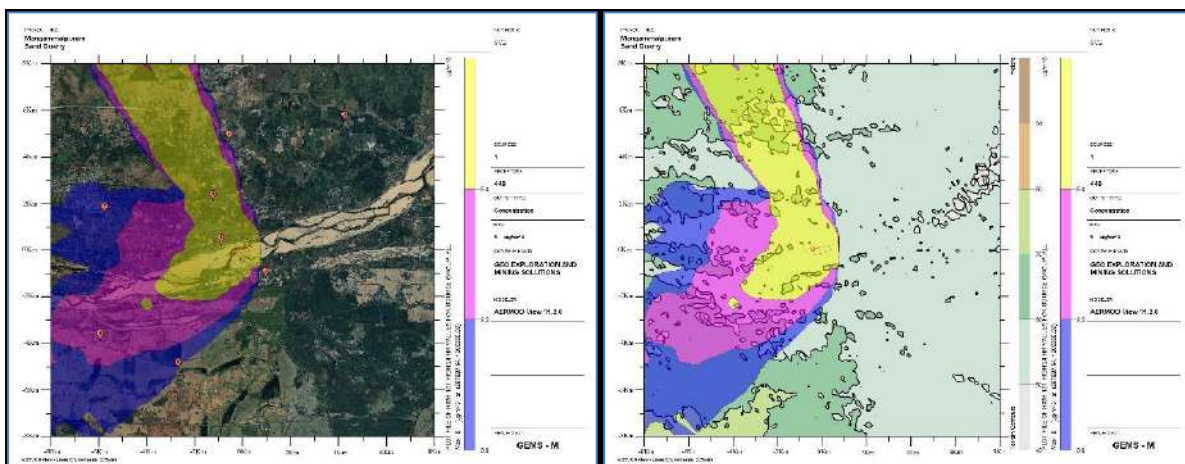
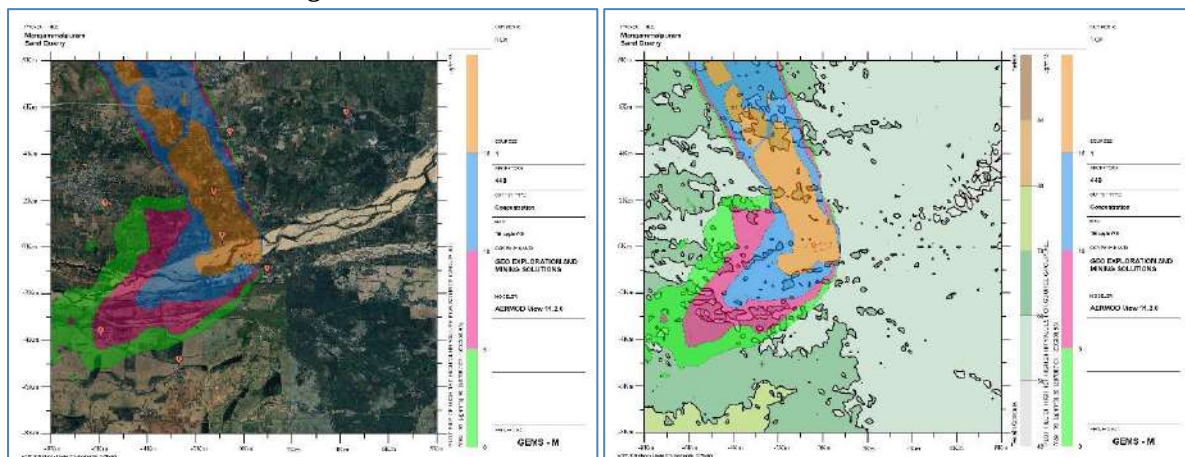
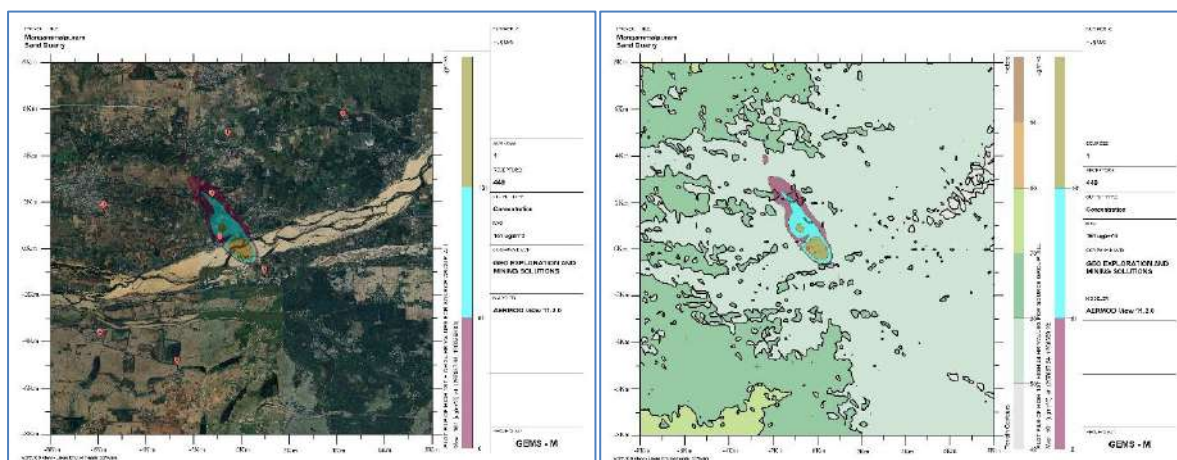
Figure 4.3: Predicted Incremental Concentration of PM_{2.5}Figure 4.4: Predicted Incremental Concentration of SO₂Figure 4.5: Predicted Incremental Concentration of NO_x

Figure 4.6: Predicted Incremental Concentration of Fugitive Dust

4.3.2.1 Model Results

The post project Resultant Concentrations of PM₁₀, PM_{2.5}, SO₂& NO_x (GLC) is given in Table below:

Table 4.2: Incremental & Resultant GLC of PM₁₀

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline PM ₁₀ (µg/m ³)	Incremental value of PM ₁₀ due to mining (µg/m ³)	Total PM ₁₀ (µg/m ³) (5+6)
AAQ1	10°51'17.17"N 78°52'0.98"E	-902	202	43.3	22.78	66.08
AAQ2	10°50'31.11"N 78°53'1.98"E	963	-1222	43.3	0	43.3
AAQ3	10°54'8.15"N 78°54'49.42"E	4250	5498	42.3	0	42.3
AAQ4	10°49'4.44"N 78°49'16.54"E	-5929	-3904	43.0	15.00	
AAQ5	10°52'17.74"N 78°51'50.03"E	-1230	2078	43.7	22.20	58.0
AAQ6	10°48'24.96"N 78°51'2.32"E	-2691	-5127	40.4	6.56	46.96
AAQ7	10°52'1.03"N 78°49'22.24"E	-5754	1562	42.7	11.00	53.7
AAQ8	10°53'41.26"N 78°52'11.89"E	-566	4663	39	2.19	41.19

Table 4.3: Incremental & Resultant GLC of PM_{2.5}

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline PM _{2.5} (µg/m ³)	Incremental value of PM _{2.5} due to mining (µg/m ³)	Total PM _{2.5} (µg/m ³) (5+6)
AAQ1	10°51'17.17"N 78°52'0.98"E	-902	202	23.9	13.81	37.71
AAQ2	10°50'31.11"N 78°53'1.98"E	963	-1222	21.7	3.25	24.95
AAQ3	10°54'8.15"N 78°54'49.42"E	4250	5498	21.6	0	21.6
AAQ4	10°49'4.44"N 78°49'16.54"E	-5929	-3904	22.7	12.00	34.7
AAQ5	10°52'17.74"N 78°51'50.03"E	-1230	2078	22.7	13.21	35.91
AAQ6	10°48'24.96"N 78°51'2.32"E	-2691	-5127	21.9	7.30	29.2
AAQ7	10°52'1.03"N 78°49'22.24"E	-5754	1562	26.6	9.00	35.6
AAQ8	10°53'41.26"N 78°52'11.89"E	-566	4663	20.4	5.65	26.05

Table 4.4: Incremental & Resultant GLC of SO₂

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline SO ₂ (µg/m ³)	Incremental value of SO ₂ due to mining (µg/m ³)	Total SO ₂ (µg/m ³) (5+6)
AAQ1	10°51'17.17"N 78°52'0.98"E	-902	202	6.9	5.46	12.36
AAQ2	10°50'31.11"N 78°53'1.98"E	963	-1222	7.0	0	7.0
AAQ3	10°54'8.15"N 78°54'49.42"E	4250	5498	7.1	0	7.1
AAQ4	10°49'4.44"N 78°49'16.54"E	-5929	-3904	6.9	3.95	
AAQ5	10°52'17.74"N 78°51'50.03"E	-1230	2078	6.3	5.16	10.85
AAQ6	10°48'24.96"N 78°51'2.32"E	-2691	-5127	7.1	0.58	7.68
AAQ7	10°52'1.03"N 78°49'22.24"E	-5754	1562	7.5	2.00	9.5
AAQ8	10°53'41.26"N 78°52'11.89"E	-566	4663	6.5	0	6.5

Table 4.5: Incremental & Resultant GLC of NO_x

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline NO _x (µg/m ³)	Incremental value of NO _x due to mining (µg/m ³)	Total NO _x (µg/m ³) (5+6)
AAQ1	10°51'17.17"N 78°52'0.98"E	-902	202	23.8	16.73	40.53
AAQ2	10°50'31.11"N 78°53'1.98"E	963	-1222	23.8	0	23.8
AAQ3	10°54'8.15"N 78°54'49.42"E	4250	5498	23.4	0	23.4
AAQ4	10°49'4.44"N 78°49'16.54"E	-5929	-3904	22.9	8.00	30.9
AAQ5	10°52'17.74"N 78°51'50.03"E	-1230	2078	23.2	16.00	39.2
AAQ6	10°48'24.96"N 78°51'2.32"E	-2691	-5127	23.0	0	23.0
AAQ7	10°52'1.03"N 78°49'22.24"E	-5754	1562	23.4	1.09	24.49
AAQ8	10°53'41.26"N 78°52'11.89"E	-566	4663	22.3	0	22.3

Table 4.6: Incremental & Resultant GLC of Fugitive Dust

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline Fugitive (µg/m ³)	Incremental value of Fugitive due to mining (µg/m ³)	Total Fugitive (µg/m ³) (5+6)
AAQ1	10°51'17.17"N 78°52'0.98"E	-902	202	67.8	0	67.8
AAQ2	10°50'31.11"N 78°53'1.98"E	963	-1222	73.1	0	73.1
AAQ3	10°54'8.15"N 78°54'49.42"E	4250	5498	68.4	0	68.4
AAQ4	10°49'4.44"N 78°49'16.54"E	-5929	-3904	63.6	0	63.6
AAQ5	10°52'17.74"N 78°51'50.03"E	-1230	2078	65.7	139	
AAQ6	10°48'24.96"N 78°51'2.32"E	-2691	-5127	66.8	0	202.6
AAQ7	10°52'1.03"N 78°49'22.24"E	-5754	1562	65.5	0	65.5
AAQ8	10°53'41.26"N 78°52'11.89"E	-566	4663	60.3	0	60.3

From the resultant of cumulative concentration i.e., Background + Incremental Concentration of pollutant in all the receptor locations without effective mitigation measures are still within the prescribed NAAQ limits of 100, 80 & 80 µg/m³ for PM₁₀, SO₂ & NO_x respectively. By adopting suitable mitigation measures, the pollutant levels in the atmosphere can be further being controlled.

4.4.3 Mitigation Measures

In the study area adequate control measures will be implemented at the time of quarrying operation. Mitigation Measures suggested for air pollution controls are based on the baseline ambient air quality of the area. From the point of view of maintenance of an acceptable ambient air quality in the region, it is desirable that air quality is monitored on a regular basis to check compliance of standards as prescribed by regulatory authorities. In case of non-compliance, appropriate mitigated measures need to be checked.



The following additional measures will also be adopted such as:

- * Water sprinkling on haul roads, service roads will help in reducing considerable dust pollution
- * Closed Cabins with AC for shovel and dumpers and dust masks to workers will be provided
- * Weekly maintenance of quarrying equipment's will be carried out
- * Transport of sand in trucks covered with tarpaulin.
- * Information on wind direction and meteorology will be considered while planning, so that pollutants, which cannot be fully suppressed by engineering technique, will be prevented from reaching the nearby agriculture area.
- * Comprehensive green belt in the river bund will be carried out to reduce to propagation of fugitive dust emissions in order to create clean and healthy environment.
- * The vehicles and machinery will be kept in well maintained condition so that emissions will minimize
- * PPE will be provided to all workers
- * Regular health check-up of workers and nearby villagers in the near vicinity of the project area will be carried out and also yearly occupational health assessment of employees will be carried out as per DGMS Guidelines.
- * Ambient Air Quality Monitoring will be conducted on half-yearly basis to assess the quality of ambient air.

4.5 NOISE ENVIRONMENT

Noise pollution is mainly due to operation like drilling & blasting and plying of trucks & HEMM. In this mining operation drilling and blasting is not involved hence noise is only due to the movement of HEMM and tippers.

These activities will not cause any problem to the inhabitants of this area because there is no human settlement in close proximity to the project area. Noise modelling has been carried out considering blasting and compressor operation (Drilling) and transportation activities.

Predictions have been carried out to compute the noise level at various distances around the working pit due to these major noise-generating sources. Noise modelling has been carried out to assess the impact on surrounding ambient noise levels.

For hemispherical sound wave propagation through homogeneous loss free medium, one can estimate noise levels at various locations at different sources using model based on first principle.

Predicted noise levels due to mining operations using Mathematical Equations

$$L_2 = L_1 - 20 \log_{10} (R_2/R_1)$$

Where L_1 dB(A) = Noise level at a distance R_1 (m)

L_2 dB(A) = Noise level at a distance R_2 (m)

&

$$L = 10 \log_{10} (10^{L_1/10} + 10^{L_2/10} + \dots + 10^{L_n/10}) \text{ Where } L_1, L_2 \text{ and } L_n \text{ are noise level dB(A)}$$

Table 4.7: Anticipated Noise levels

S.No	Locations	Noise level (dB (A) Leq)		Ambient Noise Standards
		Day Time	Night Time	
1	Project Area	42.3	35.0	Industrial Day Time- 75 dB (A) Night Time- 70 dB (A) Residential Day Time- 55 dB (A) Night Time- 45 dB (A)
2	Koviladi	41.4	36.8	
3	Mullal	40.0	36.8	
4	Arasangudi	38.5	35.2	
5	Kadambangudi	41.8	37.1	
6	Kodayakkudi	39.2	37.9	
7	Lalgudi	38.6	35.2	
8	Sirumayankudi East	39.2	37.9	

The anticipated noise level found in the range of 35.0 – 42.3 dB (A) in Core zone and 35.2 – 41.8dB (A) in Buffer zone. The thick green belt development will be carried out around the project area. Hence, the noise level will get reduced while quarrying. The noise level at different receptors is lower due to the distance involved and other topographical features adding to the noise attenuation. The resultant Noise level due to monitored values and calculated values at the receptors are based on the mathematical formula without considering the barrier effect. From the above table, it can be seen that the ambient noise levels at all the locations will remain within permissible limits even when the project will be in operation phase after getting EC.

Mitigation Measures

- * Provision of earplugs to workers exposed to high noise generating activities. Workers and operators at work site will be provided with earmuffs
- * Noise generated by the machinery will be reduced by proper lubrication of the machinery and other equipment
- * Conducting periodical medical checkup of all workers for any noise related health problems.
- * Proper training to personnel to create awareness about adverse noise level effects
- * Periodic noise monitoring at suitable locations in the mining area and nearby habitations to assess efficacy of adopted control measures

4.6 BIOLOGICAL ENVIRONMENT

The impact on biodiversity is not anticipated as there are no Wild life sanctuaries, Eco sensitive zone within the radius of 10Km from the project site. The impact on biodiversity is difficult to quantify because of its diverse and dynamic characteristics.

There are no migratory corridors, Migratory avian-fauna, and rare endemic and endangered species. There are no wild animals in the area. No breeding and nesting site were identified in project site. No National park and Wildlife Sanctuary found within 10km radius. The low concentrations of NOx due to mine operation of the proposed quarry will have insignificant impact on ambient air quality and NOx concentration will remain within the NAAQ standards and will not have an impact on the biological environment.

Mining activities generally result in the deforestation, Land degradation, Water, Air and Noise pollution that directly or indirectly affect the faunal and floral status of the project area.

However, occurrence and magnitude of these impacts are entirely dependent upon the project location, mode of operation and technology involved.

Anticipated impacts and mitigation measures:

- * The proposed project of riverbed sand mining shall be carried out on the riverbed of the Kollidam River. There are no trees in the project area. The project shall also not lead to any change in land use and will be replenished every year after successive rains. The proposed mining activity, which although is an economically gainful activity, also constitutes river training work. There shall be negligible air emissions or effluents from the project site during the loading of the truck. This shall be a temporary effect and not anticipated to affect the surrounding Vegetation significantly.
- * Animals are sensitive to noise and avoid human territory. The project stretch of the river is not an identified drinking water point for the animals. However, any animal desirous of accessing the river can continue to do so upstream or downstream of the stretch during the mining activities, as there will not be any damming or diverting of water. Hence, no significant impact is anticipated from the proposed project.

- * To reduce the adverse effects on flora/fauna status of the area due to deposition of dust generated from mining operations, water sprinkling systems will be installed in all dust prone areas to arrest dust generation. Methodical and well-planned plantation scheme will be carried out
 - * The river bund will be utilized for Greenbelt development with native species like Neem, coconut, Pungan etc.,
 - * Development of dense poly-culture plantation using local flora species in the mining area at conceptual stage.
 - * There's no breeding/ nesting sites of birds and animals in the nearby areas
- To control the dust deposition in the nearby lands and vegetation, water will be sprinkled in the haul road, approach road and dust prone areas.
- Systematic plantation will be carried out in the phased manner in every year. Three tier plantations will be carried out to arrest the dust.

4.7 SOCIO ECONOMIC ENVIRONMENT

The socio-economic impacts of quarrying operation are many. Impacts of a mine project may be positive or Negative. The adverse impacts attribute to physical displacement due to land acquisition, which is followed by loss of livelihood, mental agony, changes in social structure, and risk to food security etc.,

The villages and their inhabitants in the buffer zone will not be disturbed from their settlements due to the mining operations. There is no habitation within the project area and within the radius of 500m from the periphery of the project site. Therefore, neither villages nor any part of village or any hamlet will be disturbed during the short period of the mine. Regular medical checkup / eye-camps will be organized for the villagers. This quarry project will provide job opportunities to 38 workers directly and 20 workers indirectly. Employed for mining work earning wages as per the minimum wages act applicable for un-skilled, semi-skilled and highly skilled categories.

4.8 OCCUPATIONAL HEALTH RISKS

4.8.1 Anticipated Impact

The problem of occupational health, in the operation and maintenance phases is primarily due to dust, which could affect breathing. Health and Safety Measures to control dust inhalation; precautions would be adopted to prevent dust generation at site and dispersing in the environment. Long– term exposure to silica dust may cause silicosis. Workers are likely to get exposed to excessive noise levels during quarrying activities. Occupational Safety hazards related to blasting activities may result in accidental explosions, if not properly mitigated.

Anticipated occupational and safety hazards

- * Health Impact due to Physical activity,
- * Respiratory hazards due to Dust exposure
- * Physical hazards

Anticipated occupational illness sequel to mining activities can be as follows:

- * Dust related pneumonia
- * Segmental vibration \

4.8.2 Mitigation measures

To reduce pollution emanation from the project, following measures will be taken:

- * Water sprinkling on haul roads
- * Green belt development to arrest dust and reduce noise propagation
- * Acceptance of good control measures for reducing air pollution,
- * Control of noise levels through good preventive maintenance of machineries, green belt development, provision of earmuffs to workers, etc.,

In addition to above measures, the following remedial steps will be enforced to ensure minimization of occupational health and safety problems.

- * Medical examination of workers at pre-entry level stage of workers, etc., by qualified doctors, with periodical examination of all workers/staff at least once a year, as per DGMS circulars.
- * Provision of First aid facility as necessary
- * Organization of medical camps at nearby villages for treatment of patients, especially senior citizens, children and ladies.
- * All staff and workers will be provided with PPE to guard against excess noise levels, Dust generation and inhalation, etc., as per standards prescribed by DGMS.

4.8.3 Post COVID Health Management Plan for Workers

The following Health Management plan will be strictly implemented in the Mines, mine officials like Mines Manager and Foreman will be Act as a Controller of Health Management of the workers.

- Temperature will be checked to all the workers while arriving to work on each day
- If any persons/employees have fever of 100.4 or higher, chills, shortness of breath will be sent to Hospital and the persons will be employed after fourteen days
- All the persons inside the mine area instructed to wear fabric or disposable pleated masks covering Nose and Mouth
- Social distancing of 6feet will be maintained all the time
- Temporary Hand washing points will be installed near the working places, workers will be initiated to Wash hands frequently with soap and water for a minimum of 20 seconds and advised to avoid touching face. This is an essential contagion-control mechanism

CHAPTER – 5: ANALYSIS OF ALTERNATIVES (TECHNOLOGY AND SITE)

5.0 INTRODUCTION:

The mining project is site specific and this is specific project for restoring the functional efficiency of river and no alternate sites are proposed. Consideration of alternatives to a project proposal is a requirement of EIA process. There is no ore beneficiation, mineral processing proposed in the project. The entire quarried out sand will be directly located tippers and will be sent to Government Stock yard unit.

No workshops, housing, colonies are proposed within the project area. The workers are being employed from the nearby community/ villages; hence, there is no impact on selection of alternates.

5.1 ANALYSIS OF ALTERNATIVE TECHNOLOGY

There are no changes in the method of mining and technology. The methodology will be carried out as per the Mining plan approved by Department of Geology and Mining. The mineral deposits are site specific in nature; hence, question of seeking alternate site does not arise for this project.

CHAPTER – 6: ENVIRONMENTAL MONITORING PROGRAMME

6.0 INTRODUCTION

Environmental Monitoring will be taken up for various environmental components as per conditions stipulated in Environmental Clearance Letter issued by MoEF & Consent to Operate issued by the State Pollution Control Board. Monitoring reports will be submitted to regulator as per statutory requirements. The entire monitoring work will be carried out by MoEF & CC / NABL recognized laboratories.

The monitoring and evaluation of environmental parameters indicates potential changes occurring in the environment, which paves way for implementation of rectifying measures wherever required to maintain the status of the natural environment. Evaluation is also a very effective tool to judge the effectiveness or deficiency of the measures adopted and provides insight for future corrections.

6.1 MEASUREMENT & METHODOLOGIES

The sampling and analysis of the environmental attributes will be as per the guidelines of Central Pollution Control Board (CPCB)/Ministry of Environment, Forest and Climate Change (MoEF & CC).

The environmental monitoring for the quarry operations will be conducted as follows:

- * Micro-Meteorological data
- * Ambient Air Quality
- * Water quality and water level
- * Ambient and work zone Noise levels
- * Soil Quality and
- * Greenbelt Development

With the knowledge of baseline conditions and continuous post project monitoring, the levels of various environmental attributes can serve as an indicator for any deterioration in environmental conditions due to mining operations and suitable mitigation steps could be taken in time to safeguard the environment.

6.2 MONITORING SCHEDULE AND FREQUENCY

Monitoring programme will be followed till the quarry operation ceases; as per the schedule below.

Table 6.1: Monitoring Schedule

S. No.	Environment Attributes	Location	Monitoring		Parameters
			Duration	Frequency	
1	Air Quality	2 Locations (1 Core & 1 Buffer)	24 hours	Once in 6 months	Fugitive Dust, PM _{2.5} , PM ₁₀ , SO ₂ and NO _x .
2	Meteorology	At mine site before start of Air Quality Monitoring & IMD Secondary Data	Hourly / Daily	Continuous online monitoring	Wind speed, Wind direction, Temperature, Relative humidity and Rainfall
3	Water Quality Monitoring	2 Locations (1SW & 1 GW)	-	Once in 6 months	Parameters specified under IS:10500, 1993 & CPCB Norms
4	Noise	2 Locations (1 Core & 1 Buffer)	Hourly – 1 Day	Once in 6 months	Leq, Lmax, Lmin, Leq Day & Leq Night
5	Soil	2 Locations (1 Core & 1 Buffer)	–	Once in six months	Physical and Chemical Characteristics
6	Greenbelt	Within the Project Area	Daily	Monthly	Maintenance

6.3 IMPLEMENTATION SCHEDULE OF MITIGATION MEASURES

The mitigation measures suggested in Chapter - IV will be implemented to reduce the impact on environment due to the operations of the proposed project. As the mitigation measures with respect to Land, Soil, Water, Air, Noise and Ecological Environment will be implemented immediately as project progress.

6.4 ENVIRONMENTAL MONITORING CELL

For the two years quarrying operation Environmental Monitoring Cell will be formed under the control of Mines Manager. A statutory competent qualified person will be appointed, for looking after the environmental monitoring and compliance with the conditions stipulated in the Environmental clearance for the mines. The environmental monitoring programme will be carried out by external agency approved by MoEF/ NABL for conducting the monitoring.

6.5 BUDGETARY PROVISION FOR ENVIRONMENTAL MONITORING

The cost in respect of monitoring of environmental attributes, parameter to be monitored, sampling/monitoring locations with frequency and cost provision against each is shown in Table 6.3. Monitoring work will be outsourced to external laboratory approved by NABL / MoEF.

The proposed capital cost for Environmental Monitoring Programme is Rs. 50,000/- and the recurring cost is Rs. 2,75,000/- per annum.

Table 6.2: Environment Monitoring Budget

Sl.No.	Parameter	Capital Cost	Recurring Cost per annum
1	Air Quality	-	Rs 25,000/-
2	Meteorology	-	Rs 50,000/-
3	Water Quality	-	Rs 25,000/-
4	Water Sprinkling	-	Rs 50,000/-
5	Soil Quality	-	Rs 50,000/-
6	Noise Quality	-	Rs 25,000/-
7	Greenbelt	Rs 50,000/-	Rs 50,000/-
Total		Rs 50,000/-	Rs 2,75,000/-

7. ADDITIONAL STUDIES

7.0 GENERAL

The following Additional Studies were done as per items identified by project proponent and items identified by regulatory authority. In addition, items identified by public and other stakeholders will be incorporated after Public Hearing.

- * Public Consultation
- * Risk Assessment
- * Disaster Management plan
- * Open pit slope Stability Analysis

7.1 PUBLIC CONSULTATION

Application to the Member Secretary of the Tamil Nadu Pollution Control Board (TNPCB) to conduct public hearing in a systematic, time bound and transparent manner ensuring widest possible public participation at the project site or in its close proximity in the district is submitted along with this Draft EIA / EMP Report and the outcome of public hearing proceedings will be detailed in the Final EIA/EMP report.

7.2 RISK ASSESSMENT

Risk assessment is a process whereby risks are analyzed, assessed and risk management priorities are evaluated. It is defined as the characterization of the potential adverse effect to human health & environment due to environmental hazards.

Risk assessments will help the mine operators to identify high, medium and low risk levels. Risk assessments will help to prioritize risks and provide information on the probability of harm arising and severity of harm by understanding the hazard, combine assessments of probability and severity to produce an assessment of risk and it is used in the assessment of risk as an aid to decision making.

Any mines have dangers or risk like fires, inundation, failure of machinery, which need to be investigated, addressed and mitigated. Preliminary Risk assessment is based on the philosophy that “Prevention is better than cure”. The mining operations will be carried out under supervision of statutory personnel’s as per provisions of MCR 1960, MCDR 1988, Mines Rules 1955, Mines Act 1952 & strictly following safety aspects as per MMR 1961 monitored by Directorate General of Mines safety.

Table 7.1 Risk Assessment & Control Measures

S. No	Risk factors	Causes of risk	Control measures
1	Transportation	Potential hazards and unsafe workings contributing to accident and injuries Overloading of material	▪ Before commencing work, drivers personally check the dumper/truck/tipper for oil(s), fuel and water levels, tyre inflation, general cleanliness and inspect the brakes, steering system, warning devices including automatically operated audio-visual reversing

		While reversal & overtaking of vehicle Operator of truck leaving his cabin when it is loaded.	alarm, rear view mirrors, side indicator lights etc., are in good condition. ▪ Not allow any unauthorized person to ride on the vehicle nor allow any unauthorized person to operate the vehicle. ▪ Concave mirrors should be kept at all corners ▪ All vehicles should be fitted with reverse horn with one spotter at every tipping point ▪ Loading according to the vehicle capacity ▪ Periodical maintenance of vehicles as per operator manual
2	Natural calamities	Unexpected happenings	▪ Escape Routes will be provided to prevent inundation of storm water ▪ Fire Extinguishers & Sand Buckets

7.2 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.

The objective of the Disaster Management Plan is to make use of the combined resources of the mine and the outside services to achieve the following

- Rescue the affected and provide medical treatment of casualties;
- Safeguard other people;
- Minimize damage to property and the environment;
- Initially contain and ultimately bring the incident under control;
- Secure the safe rehabilitation of affected area; and
- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the emergency.

Planning –

Possible emergency situations can broadly be classified into vehicle collision, and inundation. Some of the ways of preventing emergencies are as follows:

- Preparation of a Preventive Maintenance Schedule Programme and also covering maintenance schedules for all mining machinery/equipment and instruments as well as transport vehicles as per recommendations of the manufacturers user manuals
- Ensuring the compliance of traffic rules strictly on haul roads within the project area as well as outside the project area
- Establishment of an ongoing training and evaluation programme, incorporating the development of capabilities amongst employees about potential emergencies and ways and means of identifying and averting the same
- Most emergencies do not occur without some incident or an abnormal situation. So, there is always sometime of few seconds to few minutes to arrest an incident of abnormal situation from turning in to an emergency

Implementation –

Following key personnel, identified for carrying out specific and assigned duties in case of any kind of emergency, shall be available on call on holidays and off duty also.

- PWD Engineer
- Personnel Officer
- Foreman
- Supervisor
- Essential workers

Responsibilities of PWD Engineer

- To take overall charge at the place of incident and activate the Emergency Preparedness Plan according to severity of situation
- Inform doctor to be ready for treatment of affected employees and intimate their relatives.
- To depute staff, carry out following functions -
 - To supervise assembly and evacuation at all points
 - To look after patients casualties and give psychological support
- Inform Police department and District Emergency Authority
- Arrange for chronological records of emergency to be maintained
- Issue authorized statements to news media.

7.3 RECLAMATION AND REHABILITATION

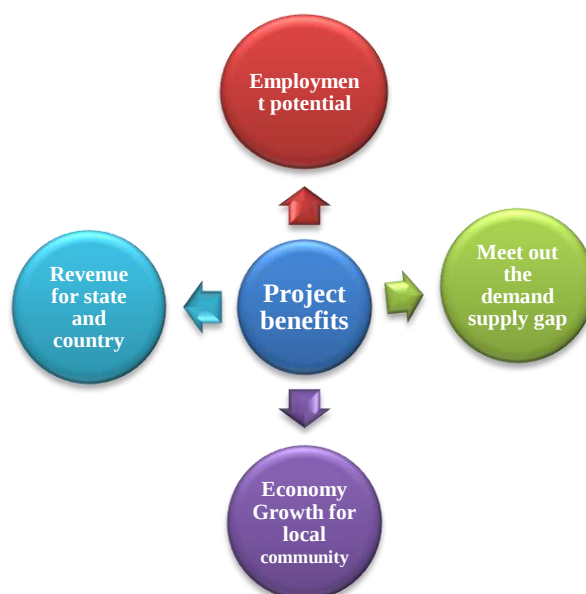
The Main objective of this projects to desilt the sand and enhance the functional efficiency of the river. The sand which has accumulated over a long period of time. This accumulated sand has decrease flowing capacity of the river. It is vital and significant to excavate the sand at present scenario to restore its original capacity. There is no waste hence, no proposal for backfilling or reclamation. The sand will get replenishment naturally during the upcoming rainy seasons.

CHAPTER – 8: PROJECT BENEFITS

8.0 INTRODUCTION

This Sand Quarry project aims to restore the functional efficiency of the Coleroon River by excavating 5,00,000m³ of Sand for a period of 2 years. This will reduce demand and supply gap in the construction industries. The enhancement of production will result the following benefits.

- ✚ Improvement in Physical Infrastructure.
- ✚ Improvement in Social infrastructure.
- ✚ Increase in Employment Potential.
- ✚ Revenue to Both Central Govt. & State Govt.
- ✚ Post mining Enhancement of Green cover.
- ✚ Supply – Demand chain of cement will be maintained without demand to the state.



This chapter gives a comprehensive description of various advantages and benefits anticipated from the project to the locality, neighborhood, region and nation as a whole. Sand will be directly loaded into tippers to the needy customers and silt will be distributed to the neighboring farmers for their agriculture purposed with free of cost.

8.1 PROJECT BENEFITS

Physical and Social infrastructure to the Community

- * Improved road communication,
- * Strengthening of existing community facilities through the existing Community Development Program.
- * Greenbelt will be carried out in the project area to improve the vicinity and environment of mine and its surrounding area.
- * Awareness programme and community activities, like health camps, medical aids, family welfare programmes, immunization camp sports & cultural activities, plantation etc.,
- * Providing essential facilities for the local schools and primary health centers in the nearby villages



8.2 BENEFITS TO LOCAL AND REGIONAL ECONOMY

- * It will generate revenue for the State of Tamil Nadu
- * Direct employment to skilled/unskilled and semiskilled laborers.
- * Indirect employment to local people in different activities such as transportation, food points, plantation activities, water tanker supply, hand equipment's etc.
- * Generation of self-employment through self-help groups.

8.3 EMPLOYMENT POTENTIAL

The local labors shall be engaged for supervising during loading and handling of mineral in mining area, besides, watch and ward and plantation activity with proper maintenance. The total manpower required for material handling and loading, skilled and managerial staff to meet the statutory requirement under MMR 1961 and MCDR 1988 is 38 Nos. The following skilled / unskilled and semi-skilled workers besides managerial and administrative staff shall be employed preferentially from the nearby villages.

8.4 TANGIBLE SOCIAL BENEFITS

There will be positive impact in socio-economic area due to increased economic activities, creation of new employment opportunities, infrastructural development and better educational and health facilities.

8.4.1 Corporate Social Responsibility

It is a public and Government Bonafied project. Hence CER does not involve this project. If any recommended by SEIAA for CER activity, will be followed by the PWD.

Conclusion: -

Due to the project the benefits are given below

- The Direct employment opportunity to the 38 local community people and indirect employment about 20 peoples in various sector.
- The local community will benefit financially like increased income level due to job opportunity.
- The proponent will undertake awareness programme and community activities like health, camps, medical aids, family welfare camps, medical awareness programme etc., Periodic medical checkups as per Mines Act/ Rules and other social development and promotional activities will be undertaken. All this will assist to lift the general health status and enhance the standards of the communities of the area around mines.

CHAPTER – 9: ENVIRONMENTAL COST BENEFIT ANALYSIS

Not Applicable, Since Environmental Cost Benefit Analysis not recommended at the Scoping stage.

CHAPTER - 10: ENVIRONMENTAL MANAGEMENT PLAN

10.0 GENERAL

Environment Management Plan (EMP) aims at the preservation of ecological system by considering in-built pollution abatement facilities at the proposed site. Good practices of Environmental Management plan will ensure to keep all the environmental parameters of the project in respect of Ambient Air quality, Water quality, Socio – economic improvement standards.

Mitigation measures at the source level and an overall environment management plan at the study area are elicited so as to improve the supportive capacity of the receiving bodies. The EMP presented in this chapter discusses the administrative aspects of ensuring that mitigative measures are implemented and their effectiveness monitored after approval of the EIA.

10.1 LAND ENVIRONMENT MANAGEMENT

- Mining operation will not be carried out near the river banks to protect the bank erosion and river mitigation.
- Slopes of the sides will be kept 45° to prevent erosion
- The excavated area shall be replenished during the upcoming rainy seasons.
- The removal of sand will have only positive impact on the river it will enhance the carrying capacity of the river.

10.2 AIR ENVIRONMENT MANAGEMENT

The project is proposed to be carried out without involving drilling and blasting, the mineral will be excavated with the help of Excavator and loaded into the tippers. Therefore, the dust propagation due to Drilling and blasting does not arise.

During the course of mining no toxic substances are released into the atmosphere, gaseous emission only due to the vehicles. It will be controlled by using PUC certified vehicles.

Greenbelt development program will be carried out approach roads and village roads to control the dust emission during operation. A well Standard Operating Procedure will be practiced in the HEMM to reduce gaseous emission and dust propagation.

Table 10.1: Air pollution management and control

Potential impact	Action	Parameters for monitoring	Timing
Air Emission	Optimum loading of mineral to minimized to the extent possible	Vehicle logs / optimum capacity of vehicle	During operational phase.
	Ambient air quality within the premises of the proposed unit to be monitored.	The ambient air quality will conform to the standards for SPM, SO ₂ and NO _x	As per CPCB and TNPCB requirement.

Controlling of Air Environment.

- * Water will be sprinkled twice a day in the approach roads and village roads to wet the surface
- * Overloading of material will be avoided to prevent spillage.
- * The mineral will be covered with tarpaulin to prevent the spillage during transportation and the material will be transported only to the Needy customers and Neighboring Formers.
- * Vehicles will be regularly checked and maintained as per the RTO and TNPCB Norms.

10.3 NOISE AND VIBRATION MITIGATION:**Table 10.2: Noise and Vibration Mitigation**

Potential impact	Action	Parameters for monitoring	Timing
Noise	Noise will be generated only during the movement of HEMM and Tippers, implement good working practices (equipment selection and siting) to minimize noise and also reduce its impacts on human health (ear muffs, safe distances and enclosures).	Site working practices records, noise reading	During Excavation.
	Noise to be monitored in ambient air in the working place	Noise reading	As per TNPCB/ MoEF & CC norms.
Ground vibration due to Movement of HEMM	Controlled customized working techniques will be implemented under the supervision of Mines Manager	Vibrations to be Modeled and customized.	At the time of working.

Control of Noise and vibration during movement of HEMM and Tippers:

- * Hydraulic Excavator with Sound proof cabin shall be used for the excavation of mineral.
- * In order to reduce the effect of noise pollution, earmuffs will be provided to all operators and employees working at mining site as a safety measure.
- * Proper maintenance, oiling and greasing of machines at regular intervals will be done to reduce generation of noise.
- * Periodical monitoring of noise level near the project site and nearest village from the mine will be done with the help of sound level meter & records will be maintained.

10.3 WATER MANAGEMENT & POLLUTION CONTROL

There is no processing and mineral beneficiation within in the project area. No workshop is proposed in the quarry area the major machinery repair work will be carried out in the nearby major town hence effluent due to oil and grease is very minimal.

Domestic effluent is mainly sewage only, septic tank with soak pit arrangement will be provided at the mine site.

The proposed depth of the quarry is 2.5m (1.5m abl + 1m bbl), the quarrying operation will not intersect the ground water table.



SURFACE WATER MANAGEMENT

The project area is Coleroon River, mining operation will be carried out only during the non flow of river water.

GROUND WATER MANAGEMENT

. The water table in the area is 11m BGL (Below ground level) during pre-monsoon and 16m BGL (Below ground level) during post monsoon season. Water table will not be intersected during any stage of mine life. Hence contamination of ground water is redundant.

DETAILS OF WATER CONSERVATION MEASURES PROPOSED

The Main objective of this Projects is to restore the functional efficiency of the river by removal of Sand over the river bed. The sand which has accumulated has been not removed due to cost constrained. This accumulated sand and decreased carrying capacity of River. It is vital and significant to desilt the sand and silt at present scenario to restore its original capacity.

10.4 LAND RECLAMATION AND WASTE MANAGEMENT

No mineral wastages anticipated. The Main objective of this projects restore the functional efficiency of the river. The quarried out land will be naturally reclaimed during the rainy seasons.

10.5 BIOLOGICAL ENVIRONMENT

The proponent will take all necessary steps to avoid the impact on the ecology of the area by adopting suitable management measures in the planning and implementation stage. During mining, thick plantation will be carried on the river bund, village road and nearby school ground consultation with the panchayat authorities.

Following control measures are proposed for its management and will be the responsibility of the Mines Manager.

- Greenbelt development all along the river bund, village roads
- The main attributes that retard the survival of sapling is fugitive dust, this fugitive dust can be controlled by water sprinkling on the haul roads and installing a sprinkler unit near the newly planted area.
- Year wise greenbelt development will be recorded and monitored
 - Based on the area of plantation.
 - Period of plantation
 - Type of plantation
 - Spacing between the plants
 - Type of manuring and fertilizers and its periods
 - Lopping period, interval of watering
 - Survival rate
 - Density of plantation

10.8.1 Green Belt Development Plan

About 10,000nos. of saplings is proposed to be planted for the Mining plan period in village road, School ground and nearby village roads with survival rate 80%. The greenbelt development plan has been prepared keeping in view the land use changes that will occur due to mining operation in the area.

Table 10.3 Proposed Greenbelt Activities For 5 Year Plan Period

Year	No. of trees proposed to be planted	Area to be covered	Name of the species	Survival rate expected in %
I	10000	River bund and Village roads	Neem, Pungam, Sengondrai, Panai, Naval	8000

Source: Conceptual Plan of Approved Mining plan & proposed by FAE's & EIA Coordinator

The objectives of the greenbelt development plan are –

- Provide a green belt in the river bund, village road and School ground
- Restore the ecology of the area, restore aesthetic beauty of the locality and meet the requirement of fodder, fuel and timber of the local community.

A well-planned Green Belt with multi rows (three tiers) preferably with dense canopy leaves shall be developed with dense plantations around the boundary and haul roads to prevent air, dust noise propagation to undesired places and efforts will be taken for the enhancement of survival rate.

10.8.2 Species Recommended for Plantation

Following points have been considered while recommending the species for plantation:

- ❖ Creating of bio-diversity.
- ❖ Fast growing, thick canopy cover, perennial and evergreen large leaf area,
- ❖ Efficient in absorbing pollutants without major effects on natural growth

Table 10.4: Recommended Species to Plant in the Greenbelt

S.No	Botanical Name	Local Name	Importance
1.	Azadirachta indica	Neem, Vembu	Neem oil & neem products
2.	Borassus Flabellifer	Palmyra Palm	Tall Wind breaker tree and its fruits are edible

Source: Proposed by FAE's & EIA Coordinator

10.9 OCCUPATIONAL SAFETY & HEALTH MANAGEMENT

Occupational safety and health are very closely related to productivity and good employer-employee relationship. The main factors of occupational health impact in quarries are fugitive dust and noise. Safety of employees during quarrying operation and maintenance of mining equipment will be taken care as per Mines Act 1952 and Rule 29 of Mines Rules 1955. To avoid any adverse effect on the health of workers due to dust, noise and vibration sufficient measures have been provided.

10.9.1 Medical Surveillance and Examinations –

- Identifying workers with conditions that may be aggravated by exposure to dust & noise and establishing baseline measures for determining changes in health.
- Evaluating the effect of noise on workers
- Enabling corrective actions to be taken when necessary
- Providing health education

The health status of workers in the mine shall be regularly monitored under an occupational surveillance program. Under this program, all the employees are subjected to a detail medical examination at the time of employment. The medical examination covers the following tests under mines act 1952.

- General Physical Examination and Blood Pressure

- X-ray Chest and ECG
- Sputum test
- Detailed Routine Blood and Urine examination

The medical histories of all employees will be maintained in a standard format annually. Thereafter, the employees will be subject to medical examination annually. The below tests keep upgrading the database of medical history of the employees.

Table 10.5: Medical Examination Schedule

Sl.No	Activities	1 st Year	2 nd Year
1	Initial Medical Examination (Mine Workers)		
A	Physical Check-up		
B	Psychological Test		
C	Audiometric Test		
D	Respiratory Test		
2	Periodical Medical Examination (Mine Workers)		
A	Physical Check - up		
B	Audiometric Test		
C	Eye Check - up		
D	Respiratory Test		
3	Medical Camp (Mine Workers & Nearby Villagers)		
4	Training (Mine Workers)		

Age Group	PME as per Mines Rules 1955
Less than 25 years	Once in a Three Years
Between 25 to 40 Years	Once in a Three Years
Above 40 Years	Once in a Three Years

10.9.2 Proposed Occupational Health and Safety Measures –

- The mine site will have adequate drinking water supply so that workers do not get dehydrated.
- Noise exposure measurements will be taken to determine the need for noise control strategies.
- The personal protective equipment will be provided for mine workers.
- Supervisor will be instructed for reporting any problems with hearing protectors or noise control equipment.
- Dust generating sources will be identified and proper control measure will be adopted.
- Periodic medical examinations will be provided for all workers.
- Strict observance of the provisions of DGMS Acts, Rules and Regulations in respect of safety both by management and the workers.
- In respect of contract work, safety code for contractors and workers will be implemented. They will be allowed to work under strict supervision of statutory person/officials only after they will impart training at vocational training centres. All personal protective equipment's will be provided to them.
- A safety committee meeting every month will be organized to discuss the safety of the mines and the persons employed.
- Celebration of annual mines safety week and environmental week in order to develop safety awareness and harmony amongst employees and co quarry owners.

Figure 10.1: Personal Protective Equipment to the Mine Workers

10.9.3 Health and Safety Training Program

The Proponent will provide special induction program along with machinery manufacturers for the operators and co-operators to run and maintain the machinery effectively and efficiently. The training program for the supervisors and office staffs will be arranged in the Group Vocational Training Centres in the State and engage Environmental Consultants to provide periodical training to all the employees to carry out the mining operation in an eco-friendly manner.

Table 10.6: List of Periodical Trainings Proposed For Employees

Course	Personnel	Frequency	Duration	Instruction
New-Employee Training	All new employees exposed to mine hazards	Once	One week	Employee rights Supervisor responsibilities Self-rescue Respiratory devices Transportation controls Communication systems Escape and emergency evacuation Ground control hazards Occupational health hazards Electrical hazards First aid Explosives
Task Training Like Drilling, Blasting, Stemming, safety, Slope stability, Dewatering, Haul road maintenance,	Employees assigned to new work tasks	Before new Assignments	Variable	Task-specific health & safety procedures and SOP for various mining activity. Supervised practice in assigned work tasks.
Refresher Training	All employees who received new-hire training	Yearly	One week	Required health and safety standards Transportation controls Communication systems Escape ways, emergency evacuations Fire warning Ground control hazards First aid Electrical hazards Accident prevention Explosives Respirator devices
Hazard Training	All employees exposed to mine hazards	Once	Variable	Hazard recognition and avoidance Emergency evacuation procedures Health standards Safety rules Respiratory devices

Source: Proposed by FAE's & EIA Coordinator as per DGMS Norms

10.9.4 Budgetary Provision for Environmental Management –

Adequate budgetary provision has been made by the Company for execution of Environmental Management Plan. The Table 10.11 gives overall investment on the environmental safeguards and recurring expenditure for successful monitoring and implementation of control measures.

Table 10.7: EMB Budget

Activities	Mitigation Measure	Provision for Implementation	Capital	Recurring
Air Environment	Compaction, gradation and drainage on both sides for Haulage Road	Rental Dozer & drainage construction on haul road @ Rs. 10,000/- per hectare; and yearly maintenance @ Rs. 10,000/- per hectare	200000	200000
	water will be sprinkled using rental water tankers	Rs 200 per tank - Two times per day	0	120000
	No overloading of trucks/tippers/tractors	Manual Monitoring through Security guard	0	5000
	Sand carrying trucks will be covered by tarpaulin	Monitoring if trucks will be covered by tarpaulin	0	10000
	Enforcing speed limits of 20 km/hr within ML area	Installation of Speed Governors @ Rs. 5000/- per Tipper/Dumper deployed - 15 Unit	75000	3750
	Regular monitoring of exhaust fumes as per RTO norms	Monitoring of Exhaust Fumes by Manual Labour	0	5000
	Regular sweeping and maintenance of approach roads for at least about 200 m from ML Area	Provision for 2 labours @ Rs.10,000/labour (Contractual) per Hectare	0	400000
	Installing wheel wash system near gate of quarry	Installation + Maintenance + Supervision	50000	20000
Noise Environment	Source of noise will be during operation of transportation vehicles, HEMM for this proper maintenance will be done at regular intervals.	Provision made in Operating Cost	0	0
	Oiling & greasing of Transport vehicles and HEMM at regular interval will be done	Provision made in Operating Cost	0	0
	Adequate silencers will be provided in all the diesel engines of vehicles.	Provision made in Operating Cost	0	0
	It will be ensured that all transportation vehicles carry a fitness certificate.	Provision made in Operating Cost	0	0
Waste Management	Waste management (Spent Oil, Grease etc.,)	Provision for domestic waste collection and disposal through authorized agency	5000	20000
		Installation of dust bins	5000	2000
	Bio toilets will be made available outside mine lease on the land of owner itself	Provision made in Operating Cost	0	0
Green Belt Development	1. Progressive Closure Activity Green belt development - 500 trees per one hectare - Proposal for 10000 Trees - (will be planted in the neabry village roads)	Site clearance, preparation of land, digging of pits /trenches, soil amendments, transplantation of saplings @ 300 per plant (capital) for plantation inside the lease area and @ 30 per plant maintenance (recurring)	3000000	300000
	2. Contribution towards Green Fund. As per TNMMCR 1959, Rule 35 A	The Contribution towards Green Funds @ 10% of Seigniorage fee are indicated as part of EMP Budge and not necessarily implemented in the Project Site	3600000	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	Fixed Display Board at the Quarry Entrance as permanent structure mentioning Environmental Conditions	10000	1000
	Air, Water, Noise and Soil Quality Sampling every 6 Months for Compliance Report of EC Conditions	Submission of 2 Half Yearly Compliance - Lab Monitoring Report as per CPCB norms	0	50000
	Workers will be provided with Personal Protective Equipment's	Provision of PPE @ Rs. 4000/- per employee with recurring based on wear	152000	38000

		and tear (say, @ Rs. 1000/- per employee) - 38 Employees		
	Health check up for workers will be provisioned	IME & PME Health check up @ Rs. 1000/- per employee	0	38000
	First aid facility will be provided	Provision of 2 Kits per Hectare @ Rs. 2000/-	0	40000
	Mine will have safety precaution signages, boards.	Provision for signages and boards made	10000	2000
	Installation of CCTV cameras in the mines and mine entrance	Camera 4 Nos, DVR, Monitor with internet facility	30000	5000
	Implementation as per Mining Plan and ensure safe quarry working	Mining Mate under regulation 116 of MMR,1961	0	180000
TOTAL			Rs.35,37,000	Rs.14,39,750

CHAPTER – 11: SUMMARY AND CONCLUSIONS

Mangammalpuram Sand quarry (Extent: 20.00.0 ha) falls under “B1” category as per MoEF & CC Notification (S.O. 3977 (E)).

Now, as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green Tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018 clarified the requirement for EIA, EMP and therefore, Public Consultation for all areas from 5 to 25 ha falling in Category B-1 and appraised by SEAC/ SEIAA as well as for cluster situation.

A detailed Draft EIA EMP Report is prepared for public and other stakeholders' suggestions and a Final EIA EMP Report will be prepared based on the outcome of Public Consultation.

Environmental monitoring and audit mechanism have been recommended before and after commencement of the project, where necessary, to verify the accuracy of the EIA predictions and the effectiveness of recommended mitigation measures.

The main scope of the EIA study is to quantify impact in the study area due to this sand mining project and formulate the effective mitigation measures. A detailed account of the emission sources, emissions control equipment, background Air quality levels, Meteorological measurements, Dispersion model and all other aspects of pollution like effluent discharge, Dust generation etc., have been discussed in this report. The baseline monitoring study has been carried out during the months December 2022 to February 2023 for various environmental components so as to assess the anticipated impacts of the cluster quarry projects on the environment and suitable mitigation measures for likely adverse impacts due to the proposed project is suggested individually for the respective proposed project under Chapter 10.

The project proponent ensures to obtain necessary clearances and quarrying will be carried out as per rules and regulations. The Mining Activity will be carried out in a phased manner as per the approved mining plan after obtaining EC, CTO from TNPCB, execution of lease deed and obtaining DGMS Permission and working will be carried out under the supervision of Competent Persons employed.

Overall, the EIA report has predicted that the project will comply with all environment standards and legislation after commencement of the project and operational stage mitigation measures are implemented.

Mining operations has positive impact on environment and socio economy such as landscape improvement, water as by-product, economy development and better public services, providing and supply of Sand as per market demand.

Sustainable and modern mining leads us to see positive impact of mining operation and providing consistent employment for nearly 38 people directly in the cluster and indirectly around 20 people.

As discussed, it is safe to say that the proposed quarry is not likely to cause any significant impact to the ecology of the area, as adequate preventive measures will be adopted to keep the various pollutants within the permissible limits. Green belt development around the area will also be taken up as an effective pollution mitigate technique, as well as to serve as biological indicators for the pollutants released from the Mangammalpuram Sand Quarry (Extent: 20.00.0 ha)

12.0 DISCLOSURE OF CONSULTANTS ENGAGED

The proponent has engaged M/s Geo Exploration and Mining Solutions is an Accredited Organization under Quality Council of India – National Accreditation Board for Education & Training, New Delhi.

Name and address of the consultants carried out the EIA studies:

GEO EXPLORATION AND MINING SOLUTIONS

No 17, Advaita Ashram Road,

Alagapuram, Salem – 636 004

Tamil Nadu, India

Email: info@geoexploration@gmail.com

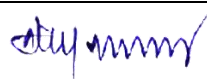
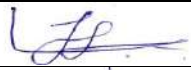
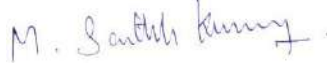
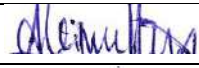
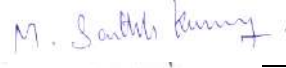
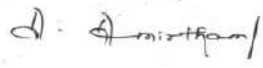
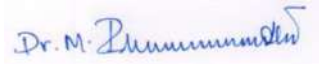
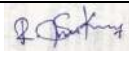
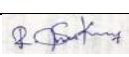
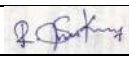
Web: www.gemssalem.com

Phone: 0427 2431989

The accredited Experts and associated members are engaged for this EIA study as given below.

Table 12.1: Details of Experts involved in the project

S.No	Functional Areas		Name of the expert	In house/ Empanelled	Signature
1	WP	FAE	Dr. M. Ifthikhar Ahmed	IH	Dr. M. Ifthikhar Ahmed
		FAA	Mr. N. Sathish Kumar	IH	N. Sathish Kumar
		TM	Mr. S. Nagamani	IH	S. Nagamani
			Mr. P. Viswanathan		P. Viswanathan
			Mr. M. Santhoshkumar		M. Santhoshkumar
2	AQ	FAE	Mr. N. Senthil Kumar	EMP	N. Senthil Kumar
			Mr. P. Panneer selvam	IH	P. Panneer selvam
3	AP	FAE	Mr. A. Jagannathan	IH	A. Jagannathan
		TM	Mr. G. Imram Khan	IH	G. Imram Khan
			Mr. P. Panneer selvam	IH	P. Panneer selvam
4	NV	FAE	Mr. A. Jagannathan	IH	A. Jagannathan
		TM	B. Venkata Giri	IH	B. Venkata Giri
			E. Vadivel		E. Vadivel
5	GEO	FAE	Dr. P. Thangaraju	IH	P. Thangaraju
		FAA	Mr. Abdul Nisaar	IH	M. Abdul Nisaar
		TM	Mr. S. Nagamani	IH	S. Nagamani

6	HG	FAE	Dr. P. Thangaraju	IH	
		FAA	Mr. L. Jayaraj	IH	
		TM	Mr. M.Santhoshkumar	IH	
7	LU	FAE	Mr. A. Allimuthu	IH	
		TM	Mr. M.Santhoshkumar	IH	
8	EB	FAE	Mr. Amirtham Sakthivel	IH	
		TM	Mr. P.Panneer selvam	IH	
9	SC	SC	Dr. M. Ifthikhar Ahmed	IH	
		TM	R. Sivakumar	IH	
10	SH	FAE	Mr. J. R. Vikram Krishna	IH	
		TM	R.Sivakumar	IH	
			S.Uma Maheshwaran	IH	
11	SE	FAE	Mrs. K. Anitha	IH	
		TM	J.Kannan	IH	
		TM	R.Sivakumar	IH	

Signature

: 

Name

: **Dr. M. Ifthikhar Ahmed**

(Authorized Signatory)

Designation

: **EIA Coordinator**

Name of the EIA

Consultant organization

: **M/s. Geo Exploration and Mining Solution**

NABET Certificate no. &

Issue Date

: **NABET/EIA/2225/RA0276 dated 20.02.2023**

Valid

: **valid upto 06.08.2025**

Abbreviations	
EC	EIA Coordinator
AEC	Associate EIA Coordinator
FAE	Functional Area Expert
FAA	Functional Area Associates
TM	Team Member
GEO	Geology
WP	Water pollution monitoring, prevention and control
AP	Air pollution monitoring, prevention and control
LU	Land Use
AQ	Meteorology, air quality modeling, and prediction
EB	Ecology and bio-diversity
NV	Noise and vibration
SE	Socio economics
HG	Hydrology, ground water and water conservation
SC	Soil conservation
RH	Risk assessment and hazard management
SHW	Solid and hazardous wastes
MSW	Municipal Solid Wastes
ISW	Industrial Solid Wastes
HW	Hazardous Wastes
BGL	Below Ground Level
MSL	Mean Sea Level
AMSL	Above Mean Sea Level