



The Ramco Cements Limited

EC for Amalgamated Periyagalur Limestone Mine

Extent - 53.32 Ha

Production in Plan Period - 15 Million Tonnes @ 3.00 MTPA Limestone

S.F. Nos. 51/2, 51/3, 51/4, 229/1, 267, 268/1, 269, 271, etc.,

Periyagalur Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu

Amalgamation GO (Ms) No. 126 dated 26.02.2021 with validity till 19.08.2053

Mining Plan Approval by IBM, Chennai vide

Letter No. TN/ALR/LST/MP-2079.MDS dated 23.07.2021 valid till 31.03.2025

ROMP for Plan Period 2025-26 to 2029-30 - submitted for Approval

Environmental Clearance under EIA Notification 2006

Schedule SI. No. 1(a) & Category 'B' (<250 Ha)

Draft Environmental Impact Assessment Report

(after TOR for Public Hearing)

Awarded TOR : SEIAA-TN/F.No.9220/TOR-1215/2022 dated 14.07.2022

July 2024

EIA Consultant

ABC Techno Labs India Private Limited, Chennai

Accreditation Certificate : NABET/EIA/2225/RA0290 dated 11.06.2023

with Validity till 16.11.2025

(SI. No. 4 of QCI/NABET List dated 15.07.2024)

Lab Accreditation : NABL Certificate No. TC-5770 dated 03.04.2022

Lab Recognition : MoEF&CC vide Letter F. No. Q-15018/04/2019-CPW dated 14.10.2019

Content

<u>Sl. No.</u>	<u>Description</u>	<u>Page No.</u>
I	Content	2-6
II	Amalgamated Periyagalur Mine Details	7
III	ML Area FMB Sketch	9
IV	Project Proponent Declaration	10
V	EIA Consultant Undertaking	11
VI	Affidavit	12
VII	VAO Certificate	13
VIII	DFO NOC	14
IX	ROMP Submissions for the Period 2025-26 to 2029-30	16
X	Awarded TORs	17-44
XI	Awarded TORs & their Incorporation in the EIA Report	45-66
1.0	Introduction	67
1.1	Purpose of the Report	67
1.2	Project Proponent	69
1.3	Govindapuram Cement Plant	70
1.4	RCL Periyagalur Mining Leases	74
1.5	Production from the Leases	74
1.6	Need for the Proposal	75
1.7	Amalgamated Periyagalur Lease (53.320 Ha)	76
1.8	Statutory Approvals	82
1.9	The Proposal	83
1.10	Environmental Setting	83
1.11	EIA Study	89
2.0	Project Description	90
2.1	Type of the Project	90
2.2	Magnitude of Operation	90
2.3	Technology & Project Description	91
2.4	Mining Method	96
2.5	Yearwise Development & Production Plan	96
2.6	Mining Machineries with Justification	103
2.7	Competent Mining Personnel	103
2.8	Dumps Rehandling & Utilisation	104
2.9	Conceptual Plan & Land Use Pattern	104
2.10	Financial Closure Plan	106
2.11	Green Belt	106
2.12	Power & Fuel Demand	106
2.13	Other Facilities	108
2.14	Water Demand & Balance	108
2.15	Occupational Health	108
3.0	Description of the Environment	109
3.1	Study Area	109
3.2	Environmental Components	113
3.3	Methodology Adopted	114
3.4	Micrometeorology	118
3.5	Ambient Air Quality	123
3.6	Noise Levels	136

Sl. No.	Description	Page No.
3.7	Water Environment	139
3.8	Land Environment	150
3.9	Biological Environment	154
3.10	Socioeconomic Environment	168
3.11	Summary of Baseline Status	179
4.0	Anticipated Environmental Impact and Mitigation Measures	180
4.1	Identification of Impacts	180
4.2	Construction Phase	180
4.3	Impacts during Operation Phase	180
5.0	Analysis of Alternatives (Technology & Site)	212
5.1	Technology	212
5.2	Alternative Sites Considered	212
6.0	Environmental Monitoring Programme	213
6.1	Environment Cell and Compliances	213
6.2	Post Project Monitoring	213
6.3	Current Post Project Monitoring Data	214
7.0	Additional Studies	228
7.1	Hazards Identification & Risk Assessment	228
7.2	Emergency Preparedness Plan	228
7.3	Disaster Management Plan	229
8.0	Project Benefits	233
9.0	Environmental Cost Benefit Analysis	233
10.0	Environmental Management Plan	234
10.1	EMP for Construction Phase	234
10.2	EMP for Operation Phase	234
10.3	Plastic Waste Management	237
10.4	EMP Budget	237
11.0	Summary Environmental Impact Assessment	241
12.0	Disclosure of Consultants	263
	Documents	
Doc 1	MoEF&CC IRO -Certified Compliance Report-Periyagalur Mine	270
Doc 2	MoEF&CC IRO -Certified Compliance Report-Periyagalur West Mine	296
Doc-3	GO 126 for Amalgamation	341
Doc-4	IBM Approval	348
Doc-5	Lab Test Reports	352
Doc-6	Anna University Safety Barrier Report	370
Doc-7	Blasting Report	395
Doc-8	Slope Stability Report	430
Doc-9	Hydrogeology Report	466

List of Figures

<u>Sl. No.</u>	<u>Description</u>	<u>Page No.</u>
Plate I	ML Area FMB Sketch	9
Plate II	Regional Setting	71
Fig. 1.1	Index Map	77
Plate III	Mining Lease Area	78
Plate IV	ML Area Aerial Photographs	79
Plate V	ML Area Photographs	80
Plate VI	ML Area Photographs with its Infrastructures	81
Fig. 1.2	Topo Map – 10 km Radius	84
Fig. 1.3	Environmental Setting	85
Fig. 2.1	Surface & Geological Plan & Sections	94
Fig. 2.2	Development & Production Plan – 2025-26	98
Fig. 2.3	Development & Production Plan – 2026-27	99
Fig. 2.4	Development & Production Plan – 2027-28	100
Fig. 2.5	Development & Production Plan – 2028-29	101
Fig. 2.6	Development & Production Plan – 2029-30	102
Fig. 2.7	Conceptual Plan	105
Plate VII	Transplanted Trees in PNR Old Crusher Area	107
Fig. 2.8	Water Balance Diagram	108
Fig. 3.1	Environmental Quality Monitoring Stations	110
Fig. 3.2	Physiography	111
Fig. 3.3	Drainage Pattern	112
Fig. 3.4	Seasonal Wind Rose	122
Plate VIII	Hydrogeological Study	140
Plate IX	Water Quality Monitoring	141
Plate X	Ground Water Level Contours	143
Fig. 3.5	Satellite Imagery	152
Fig. 3.6	Land Use Pattern	153
Plate XI	Implication of Safety Distance – 150 m for SH-139	182
Plate XII	Radius of Influence / Cone of Depression	201
Fig. 4.1	Predicted GLC - PM10	205
Plate XIII	CSR Activities	209
Plate XIV	CSR Activities	210

List of Tables

<u>Sl. No.</u>	<u>Description</u>	<u>Page No.</u>
Table : I	Amalgamated Periyannagalur Mine Details	7
Table 1.1	RCL Govindapuram Cement Plant & its Statutory Approvals	72
Table 1.2	RCL Captive Mines in Ariyalur Region & their Approvals	72
Table 1.3	Periyannagalur Leases I&II – Production & Royalty Paid	75
Table 1.4	Lease Area Coordinate	86
Table 1.5	Environmental Setting – 15 km Radius	87
Table 2.1	Yearwise Development & Production	91
Table 2.2	Amalgamated Lease – Proved Mineable Reserves ('111') on 01.04.2024	95
Table 2.3	Proved Reserves & Resources	95
Table 2.4	Limestone Quality (Avg.)	95
Table 2.5	Yearwise Development & Production Programme - ROMP Period	97
Table 2.6	Mine Machineries	103
Table 2.7	Mining Personnel	103
Table 2.8	Proposed Land Use	104
Table 2.9	Green Belt Developed	106
Table 3.1	Baseline Data Collection - Monitoring Locations	113
Table 3.2	AAQ Parameters-Detectable Range	116
Table 3.3	Methodology Adopted for Water Analysis	117
Table 3.4	Micrometeorological Data – Dec. 2023	119
Table 3.5	Micrometeorological Data – Jan. 2024	120
Table 3.6	Micrometeorological Data – Feb. 2024	121
Table 3.7	Ambient Air Quality Monitoring Stations – Location & Bearing	123
Table 3.8-3.15	Ambient Air Quality Data	125-132
Table 3.16	Abstract of Ambient Air Quality Data	133
Table 3.17	Ambient Air Quality Status	135
Table 3.18	RSPM Analytical Data	136
Table 3.19	Ambient Noise Level Data (Abstract)	137
Table 3.20	Workzone Noise Level Data	137
Table 3.21	Monitored Ground Water Level Data in PNR Mine	139
Table 3.22	Monitored Ground Water Level Data-2 km from the Lease	142
Table 3.23	Ground Water Level Data (TWAD)	142
Table 3.24	CPCB Criteria for Designated Best Use of Water	145
Table 3.25	Surface Water Quality Data	146
Table 3.26	Ground Water Quality Data	148
Table 3.27	Water Quality Status	150
Table 3.28	Soil Status	151
Table 3.29	Land Use Pattern	151
Table 3.30	List of Flora in the Reserve Forests	154
Table 3.31	List of Flora – Core Zone (including Green Belt)	155
Table 3.32	List of Flora – Distribution of Vegetation in Buffer Zone	155
Table 3.33	List of Fauna in the Reserve Forests	162
Table 3.34	List of Fauna in the Study Area	163
Table 3.35	List of Planktons	167
Table 3.36	List of Aquatic Plants	167
Table 3.37	Diversity Index	168
Table 3.38	Population – Decennial Growth	169
Table 3.39	Periyannagalur Village Profile	170

<u>Sl. No.</u>	<u>Description</u>	<u>Page No.</u>
Table 3.40	Demographic Profile – 2011 Census	171
Table 3.41	Occupation of Population and Work Forces – 2011 Census	172
Table 3.42	Educational Facilities in the Study Area	173
Table 3.43	Medical Facilities in the Study Area	174
Table 3.44	Communication & Transport Facilities in the Study Area	175
Table 3.45	Water & Drainage Facilities in the Study Area	176
Table 3.46	Other Facilities in the Study Area	177
Table 4.1	Industrial Activities Considered for Cumulative Impact	181
Table 4.2	Ground Vibrations recorded during different Blastings	184
Table 4.3	Recommended Blasting Parameters	186
Table 4.4	Existing traffic Volume – Baseline Status	188
Table 4.5	Projected Traffic Volume – Operation Phase	189
Table 4.6	Level of Service & Performance of a Road (IRC:64-1990 Norms)	189
Table 4.7	Predicted Traffic Scenario at the Junction	189
Table 4.8	Pumping Test	192
Table 4.9	Mine Pit Dewatering Data during Apr.2023-Mar.2024	195
Table 4.10	Gainful Utilisation of Mine Pit Water	195
Table 4.11	Estimation of Ground Water Seepage Quantity in Mine Pits	199
Table 4.12	Emission Levels - Inputs	203
Table 4.13	Maximum Mixing Height (meter) with Standard Deviation over Indian Region	203
Table 4.14	Predicted GLCs	204
Table 4.15	CER Budget	208
Table 6.1	Post Project Monitoring Schedule	213
Table 7.1	Potential Hazards due to Proposal	228
Table 7.2	Risk Matrix (R)	228
Table 7.3	DMP Measures	229
Table 10.1	Proposed EMP Budget	237
Table 10.2	EMP Budget	238
Table 10.3	CER Budget	240

Table : I Amalgamated Periyagalur Mine Details

Sl. No.	Project Detail		Lease-I Periyagalur Mine (35.96 Ha)	Lease-II Periyagalur West Mine (17.36 Ha)	Amalgamated Periyagalur Mine 53.32 Ha
1	Land	Own Patta	32.835	0.445	33.280
		Govt. Poramboke	3.125	16.915	20.040
		Total	35.960	17.360	53.320
		Village	Periyagalur	Periyagalur	Periyagalur
2	ML Extension under MMDR Amendment Act, 2015	Period GO (Ms.) No. 77 dated 26.07.2018 valid till 19.08.2053	GO (Ms) No 153 dated 23.12.2016 valid till 09.01.2067	Amalgamation – GO Ms. No.126 dated 26.02.2021 valid till 19.08.2053	
3	Sup. Lease Deed/ Lease Deed Execution	Sup. Lease Deed dt. 28.06.2019 registered on 03.07.2019	Lease Deed dt. 23.12.2016 registered on 10.01.2017	To be executed	
4	Environmental Clearance Details	(i). MoEF Ltr. No. J-11015/10/99-IA. II(M) dt. 26.11.1999 (0.105 MTPA) (ii). MoEF Ltr. No. J-11015/ 556/2007-IA.II(M) dt. 10.10.2007 (Expn 0.105 to 0.9 MTPA)	SEIAA/TN/F.462/2012/EC/45/1(a)/Ariyalur dated 14.11.2016 (for 0.3 MTPA) over an extent of 17.36 Ha	Applied for prior EC for 3.0 MTPA Limestone production over an extent of 53.32 Ha; TOR Granted & Draft EIA submitted	
5	Approved Mining Plan Details	TN/ALR/LST/ROMP-1704.MDS dated 14.12.2022 - valid till 31.03.2028 for the Period 2023-24 to 2027-28	TN/ALR/LST/ROMP-1642 MDS dt. 23.02.2021 - valid till 31.03.2026 for the Period 2021-22 to 2025-26	TN/ALR/LST/MP-2079.MDS. dated 23.07.2021 - valid till 31.03.2025 ROMP for Plan Period 2025-26 to 2029-30 being submitted for Approval	
6	Existing Consent to Operate	2308150516922 (W) & 2308250516922 (A) dated 28.12.2023 - valid till 31.03.2024; CTO Renewal application submitted.	2409157816355 (W) & 2409257816355 (A) dt. 29.02.2024 - valid till 31.03.2026	To be obtained on obtaining EC	
7	Consented Quantity	0.9 MTPA	0.3 MTPA	3.0 MTPA	
8	Method of Mining	Opencast both Conventional & Non-Conventional Method	Opencast both Conventional & Non-Conventional Method	Opencast both Conventional & Non-Conventional Method	
9	Mineable Reserves	0.62 Million Tonnes as on 01.09.2022	6.55 Million Tonnes as on 01.04.2021	15.85 Million Tonnes as on 01.04.2024	
10	Ultimate Depth - Conceptual Stage	63 m BGL	40 m BGL	92 m BGL (from 71 m earlier)	
11	Life of the Mine	5 Years	22 Years	10 Years	

ML Area Survey Numbers

Amalgamated Periyagalur Mining Lease over an extent of **53.32 Ha** is falling in SF Nos. 51/2, 51/3, 51/4, 51/5A, 51/5 B, 51/5C, 51/5D, 51/5E, 51/5F, 51/5G, 51/5H, 224/1, 224/2, 226/1A, 226/1B, 226/2, 226/3, 226/4, 226/5, 226/6A, 226/6B, 226/6C, 226/6D, 226/6E, 226/7, 226/8A, 226/8B, 226/8C, 226/9A, 226/9B, 226/9C, 226/10A, 226/10B, 226/10C, 226/11A, 226/11B, 226/12, 226/13A, 226/13B, 226/13C, 226/14, 226/15A, 226/15B, 226/16, 228/1, 228/2, 228/3A, 228/3B, 228/3C, 228/3D, 228/5, 229/1, 229/2, 229/3, 229/4, 229/7, 229/8, 229/9, 229/11, 230/1A, 230/1B, 230/2A, 230/2B, 230/3, 230/4A, 230/4B, 230/5A, 230/5B, 230/5C, 230/5D, 230/6A, 230/6B, 230/6C, 230/6D, 230/6E, 230/6F, 230/6G, 230/6H, 230/6I, 230/7A, 230/7B, 230/7C, 230/8, 230/9, 230/10, 230/11A, 230/11B, 230/11C, 230/12, 230/13, 230/14, 230/15A, 230/15B, 230/15C, 230/15D, 230/16, 230/17, 230/18, 230/19, 230/20, 231/1A, 231/1B, 231/1C, 231/1D, 231/1E, 231/1F, 231/1G, 231/1H, 231/1I, 231/1J, 231/1K, 231/1L, 231/1M, 231/1N, 231/2A, 231/2B, 231/2C, 231/2D, 231/2E, 231/2F, 231/2G, 231/2H, 231/2I, 231/2J, 231/2K, 231/2L, 231/2M, 231/2N, 231/2O, 231/2P, 231/2Q, 231/2R, 231/2S, 231/2T, 231/2U, 231/2V, 231/2W, 231/2X, 231/3A, 231/3B, 231/3C, 231/4, 231/5A, 231/5B, 231/5C, 231/6A, 231/6B, 231/6C, 231/6D, 231/6E, 231/6F, 231/6G, 231/6H, 231/6I, 231/6J, 231/6K, 231/6L, 231/6M, 231/6N, 231/6O, 231/6P, 231/6Q, 231/6R, 231/7, 231/8, 231/9, 231/10A, 231/10B, 231/10C, 231/11A, 231/11B, 231/11C, 231/11D, 231/12A, 231/12B, 231/12C, 231/12D, 231/12E, 231/12F, 231/12G, 231/12H, 231/12I, 231/12J, 231/12K, 231/12L, 232/1A, 232/1B, 232/1C, 232/1D, 232/1E, 232/1F, 232/2, 232/3, 232/4, 232/5A, 232/5B, 232/5C, 232/5D, 232/5E, 232/5F, 232/5G, 232/5H, 232/6A, 232/6B, 232/6C, 232/6D, 232/7A, 232/7B, 232/8, 232/9A, 232/9B, 232/10A, 232/10B, 232/11, 232/12A, 232/12B, 232/12C, 232/13, 232/14, 232/15A, 232/15B, 232/16, 232/17A, 232/17B, 232/18, 232/19A, 232/19B, 232/19C, 232/19D, 232/20, 233/1, 233/2, 233/3, 233/4, 233/5, 233/6, 233/7A, 233/7B, 233/7C, 233/8A, 233/8B, 233/9, 233/10, 233/11A, 233/11B, 233/11C, 233/11D, 233/11E, 233/11F, 233/11G, 233/11H, 233/12A, 233/12B, 233/12C, 233/12D, 233/12E, 233/12F, 233/12G, 233/12H, 233/12I, 234, 234 Part, 235/1, 235/2, 235/3, 237/1, 267, 268/1, 268/2, 269 & 271 of Periyagalur Village, Ariyalur Taluk & District of Tamil Nadu State.



THE RAMCO CEMENTS LIMITED

(formerly Madras Cements Ltd.)

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Corporate Identity Number: L26941TN1957PLC003566

Project Proponent Declaration

[in compliance with MoEF Office Memorandum No. J-11013/41/2006-IA.II (I) dated 04.08.2009]

We, M/s. The Ramco Cements Limited (RCL), have applied for prior Environmental Clearance for 'Amalgamated Periyagalur Mine under GO 126 over an extent of 53.32.0 hectares at Periyagalur Village, Ariyalur Taluk & District, Tamil Nadu' vide Online Proposal No. SIA/TN/MIN/76439/2022 on 02.05.2022. The Proposal under Sl. No. 1(a), Category B1 was deliberated in State Level Expert Appraisal Committee-Tamil Nadu (SEAC-TN) in its 287th Meeting held on 22.06.2022 and in 532nd SEIAA-TN Meeting held on 14.07.2022. Terms of Reference (TOR) for carrying out Environmental Impact Assessment (EIA) Study has been awarded vide Letter SEIAA-TN/F.No.9220/TOR-1215/2022 dated 14.07.2022 with Public Hearing.

EIA Consultant, M/s. ABC Techno Labs India Private Limited, Chennai has been accredited for various Sectors including Sector-1 (Mining Projects) for Category 'A' by the National Accreditation Board for Education & Training (NABET) vide Certificate NABET/EIA/2225/RA0290 dated 11.06.2023 with validity till 16.11.2025 (Sl. No. 4 of List dated 15.07.2024). ABC Laboratory is accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) vide Certificate No. TC-5770 dated 03.04.2022. The Lab is also recognised by the Ministry of Environment, Forest and Climate Change (MoEF&CC) vide Letter F. No. Q-15018/04/2019-CPW dated 14.10.2019 with validity of 5 years.

The EIA Report and Summary Environmental Impact Assessment Reports (both in English and Tamil versions) have been prepared in compliance with the awarded TORs and as per the generic structure proposed in EIA Notification 2006 and submitted. The data submitted in the EIA Report are factually correct.

For The Ramco Cements Limited

Sr. Vice President (ESG)
Authorised Signatory

Date : 18.07.2024
Place : Chennai

EIA Consultant Undertaking

[in compliance with MoEF Office Memorandum No. J-11013/41/2006-IA.II (I) dated 04.08.2009]

M/s. The Ramco Cements Limited (RCL), have applied for prior Environmental Clearance for '**Amalgamated Periyagalur Mine under GO 126** over an extent of 53.32.0 hectares at Periyagalur Village, Ariyalur Taluk & District, Tamil Nadu' vide Online Proposal No. SIA/TN/MIN/76439/2022 on 02.05.2022. The Proposal under Sl. No. 1(a), Category B1 was deliberated in State Level Expert Appraisal Committee-Tamil Nadu (SEAC-TN) in its 287th Meeting held on 22.06.2022 and in 532nd SEIAA-TN Meeting held on 14.07.2022. Terms of Reference (TOR) for carrying out Environmental Impact Assessment (EIA) Study has been awarded vide Letter SEIAA-TN/F.No.9220/TOR-1215/2022 dated 14.07.2022 with Public Hearing.

EIA Consultant, M/s. ABC Techno Labs India Private Limited, Chennai has been accredited for various Sectors including Sector-1 (Mining Projects) for Category 'A' by the National Accreditation Board for Education & Training (NABET) vide Certificate NABET/EIA/2225/RA0290 dated 11.06.2023 with validity till 16.11.2025 (Sl. No. 4 of List dated 15.07.2024). ABC Laboratory is accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) vide Certificate No. TC-5770 dated 03.04.2022. The Lab is also recognised by the Ministry of Environment, Forest and Climate Change (MoEF&CC) vide Letter F. No. Q-15018/04/2019-CPW dated 14.10.2019 with validity of 5 years.

The EIA Report and Summary Environmental Impact Assessment Reports (both in English and Tamil versions) have been prepared in compliance with the awarded TORs and as per the generic structure proposed in EIA Notification 2006 and submitted. The data submitted in the EIA Report are factually correct.

For ABC Techno Labs India Private Limited

Date: 18.07.2024

Place: Chennai




Authorised Signatory



ABC TECHNO LABS INDIA PRIVATE LIMITED

(Accredited by NABL, NABET, Approved by FSSAI, APEDA & Agmark, Recognised by MoEF&CC, BIS)

(A-50, 100, 50-14301, 50-4301 A-50, 70249 Certified Company)

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THE RAMCO CEMENTS LIMITED

(Formerly Madhav Cements Ltd.)

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Website: www.ramcocements.in
Company Identity Number: L29101TN067910020006

AFFIDAVIT

21.06.2024

The Member Secretary,
State Level EIA Authority - Tamil Nadu,
Panagal Building,
No. 1, Jeeris Road, Saidapet,
Chennai-600 015

Dear Sir,

Sub : Proposed Amalgamated Periyannagalur Limestone Mine (Extent 53.32 Ha & Production 3.00 MTPA) in S.F. Nos: 51/2, 51/3, 51/4, 229/1, 267, 268/1, 269 & 271, etc. in Periyannagalur Village, Ariyalur Taluk & District, Tamil Nadu by M/o: The Ramco Cements Limited – Awarded TORs- Affidavit in compliance with Additional TGR-5 by SEAC-TN- req.

Ref : Awarded TOR vide Letter SEIAA-TN/F.No.9220/TOR-1215/2022 dated 14.07.2022.

We, M/o: The Ramco Cements Limited (RCL), have applied for prior Environmental Clearance for 'Amalgamated Periyannagalur Mine under GO 126 over an extent of 53.32.0 Ha at Periyannagalur Village, Ariyalur Taluk & District, Tamil Nadu' vide Online Proposal No. SIA/TN/MIN/76439/2022 on 02.05.2022. The Terms of Reference (TOR) for carrying out Environmental Impact Assessment (EIA) Study has been awarded vide Letter SEIAA-TN/F.No.9220/TOR-1215/2022 dated 14.07.2022 with Public Hearing.

The mining operation will be carried out by both Opencast Conventional Mining with controlled Drilling & Blasting and Non-Conventional Mining Method with X-Centric Rippers.

In order to comply with Additional TGR-5 by SEAC-TN condition, we hereby affirm solemnly that the Mine will be operated with the required Statutory Officials and Competent Persons such as Blaster, Mining Mate, Mine Foreman & III Class Mines Manager mandatorily appointed by us as per the provisions of Mines Act 1952 and Metalliferous Mines Regulations 1961.

For The Ramco Cements Limited

Gr. Vice President (ESG)
Authorized Signatory

Date : 21.06.2024
Place : Chennai

Document-I : VAO Certificate

சான்றி

அரியலூர் மாவட்டம், அரியலூர் வட்டம்
15-வது மாவட்டம், கிராமம், கீழ்க்கண்ட திட்ட எண் 61/2, 61/3
51/A, 51/B மற்றும் 1421A எண் - 1408 ன்
உள்ள துவாரத்தூட்டிய 58-32-0 ஏக்கர்கள் பரப்பளவில்
கிராமபாளையத்தில் துவாரத்தூட்டிய கிராமம் இத்தகைய
அடிமதி செலுத்தியுள்ளார்.

மேல்கண்ட கிராமம் இத்தகைய அடிமதி
செலுத்தியுள்ள துவாரத்தூட்டிய கிராமம் 300 மீட்டர்
கிராமபாளையம் கோட்டியில், மராதா உறுப்பினர்
கிராமபாளையம் மற்றும் கிராமபாளையத்தில் அடிமதி
மேலும், மேல்கண்ட கிராமம் இத்தகைய அடிமதி
செலுத்தியுள்ள கிராமத்திற்கு 60 மீட்டர் அகலமளவில்
கிராமபாளையம், அதற்குள் உள்ள, கிராமம் அடிமதி துவார
பள்ளிப்பள்ளிக்குள்ளே மரத்திற்கு அகலமளவில் அகலமளவு
கிராம கிராமத்தின் உள்ளே அகலமளவு கிராமம் 60
அகலமளவில் அகலமளவுக்குள்ளே உள்ளது.

P. M. L. S. S.
2025
A. R. S. S.
கிராமபாளையம் & கிராமம்

Document-II : DFO NOC

Tel. No. 04329-299195
E-Mail dfoariyalur@gmail.com

TAMIL NADU FOREST DEPARTMENT

From
Dr.T.Elangovan, M.Com., B.Ld.,
District Forest Officer,
Ariyalur Forest Division,
Ariyalur.

To
Principal Chief Conservator of Forests,
Velachery, Chennai.

(Through Chief Conservator of Forests,
Trichy circle)

C.No.4559/2022/D dated, 04.07.2023

Sir,

- Sub :** Mines and Minerals – Mines and quarries – Amalgamation of Mining Leases – Limestone – Periyannagalur Village – Ariyalur taluk & District SF.No.51/2, 51/3, 267, 268/1 etc., over an extent of 53.32.0 Hectares of patta & Poramboke lands – of Tvl.The Ramco Cements Ltd., Ariyalur – Fulfilling SELAA – Terms of Reference (ToR) Conditions – Regarding.
- Ref 1)** Ramco Cements Ltd, Ariyalur Letter dated.04.11.2022.
- 2)** Forest Range Officer, Ariyalur Range No.509/2022 dated.25.11.2022.

I submit that in the reference 1st cited M/s Ramco Cement Ltd, Periyannagalur Works had requested "No Objection Certificate" for obtaining Environmental Clearance from Ministry of Environment and Climate Change for Periyannagalur in the mining lease area of 53.32 Ha comprised in SF.No.51/2, 51/3, 267, 268/1 etc., Periyannagalur village of Ariyalur Taluk and District.

In this connection the Forest Range Officer, Ariyalur has inspected the mining areas on 22.11.2022 and submitted in his report vide reference 2nd cited above has report as detailed below.

- ❖ The lease area consists of two mining pits – a shallow pit and a deeper pit. And now two pits is going to be amalgamated.
- ❖ At present mining activity is going on which involves blasting.
- ❖ The mine area does not comprise any forest land.
- ❖ No Reserve forest is present within the one kilometer radius of the mines.

- ❖ The nearest reserve forest is Villangudi Extension RF which is 5.51 kilometers away from the mines.
- ❖ Other Reserved Forests lies within ten kilometers radius of the mines are Vinnakurichi RF, Vilangudi RF, Managethi RF which are 6.20, 5.64, 6.58 kilometers away from the mines respectively.

In this regard I submit that as reported by the Forest range Officer, Ariyalur, No Reserved Forests or any other Forest land is situated within 1 Km from the Periphery of the above mining lease area.

The District Forest Officer had have inspected the above mining area on 23.11.2022. The distance between existing lime stone mining area of Ramco Cements Ltd, Govindapuram works, Ariyalur in Periyannagalur village over an extent of 53.32 hectares Karuvetti Birds Sanctuary is 17.5 Kilometers away from the said mines and it also informed that no National park, Sanctuaries, Biosphere Reserves, Wildlife corridors, Ramsar site, Tiger/Elephant Reserves does not lies within 10 Km of the existing lime stone mine area. Further no any Schedule - I Fauna found in the study area. I here with enclose the list of Flora and Fauna the proposed mining lease area.

Therefore I request that necessary orders may kindly be given for the issue of the "No Objection Certificate" in the above matter. Further I submit that there is no objection from Forestry and Wildlife point of view in according the No Objection Certificate for the operation of mining in the above subject lands.

Yours faithfully,
Sd/- T.Flangoon,
District Forest Officer,
Ariyalur Forest Division,
Ariyalur.

Copy :

1. Submitted to Chief Conservator of Forests, Trichy Circle
2. Copy to General Manager (Mines), Ramco Cements Ltd, Govindapuram, Ariyalur (Dt).

FLC/bor

Submitted
Superintendent

12/11/2022

Document-III : ROMP Submission for Plan Period 2025-26 to 2029-30

Chapter I : General Information

I.1 : Lease Details

MSM Registration Number :	MSM/2017/1
Lease Date :	01/04/2016
MSM Code :	MS/2016/000
State of Lease :	INDIVIDUALS COMPANY LIMITED
Address of Lessee :	MS/2016, Arava (Proposed) District, MS, In Kadakalathuram, State, Madhya Pradesh
Type of Lease :	Mining
State of Mining Lease :	Amalgamated Periyannagalur Limestone Mine, District, MS
Block :	TAME, SADC
Terrace :	Arava
Title/Title Mined :	Arava
Title :	Permitting
Lease Area (Ha) :	83.32
Lease Area (M) :	0.000
State of Mining :	LIMESTONE
State of associated resource :	

Type :	Mining Lease
Period of the proposed (PO) lease :	2025 - 26
Period of the proposed (PO) lease :	2025 - 30
Type of bidding :	Open
Source of Use :	Open
Category of Mine :	Category A

I.1.1 : Individual/Company Lease grant details

Grant	From	To	Lease hold acquisition date	Lease registration date
Initial Grant	2016/04/01	2016/04/01	01/04/2016	2016/04/01

I.1.2 : Mining Plan Submission Criteria Details

Type of Submission :	Review of Mining Plan Under Rule 15(1) of MMR, 2016
Reason for Modification :	Existing Plan is Due to Expiry On 01.04.2025. Hence the new Mining Plan is Submitted for the Period 2025-26 To 2029-30
Period for which modification is proposed :	2025-2026 to 2029-2030

I.2 : Land Ownership Details

Area Land Ownership Details (Ha)	Land Ownership Details
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I.3 : Existing Lease

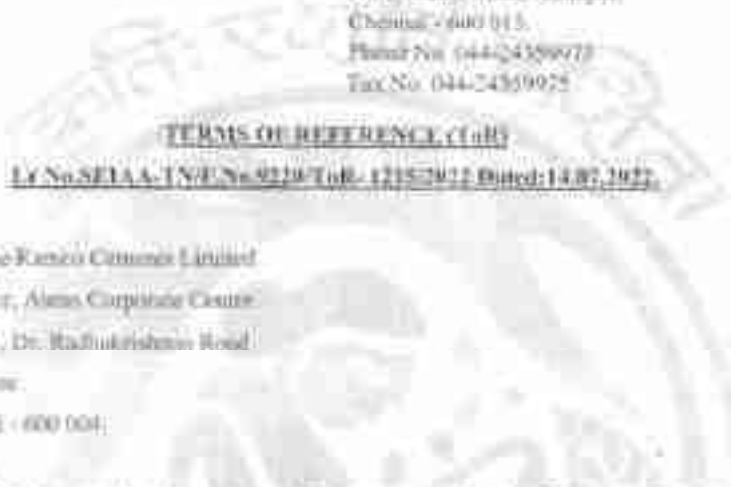
Area of Existing Lease	Nil
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Awarded TORs



THIRU DEEPAK S.H.H.GI, I.P.S.
MEMBER SECRETARY

**STATE LEVEL ENVIRONMENT IMPACT
ASSESSMENT AUTHORITY-TAMILNADU**
1st Floor, Pampad Mallipal,
No 1, Jinnas Road, Sullipet,
Chennai - 600 045.
Phone No: 044-24359977
Fax No: 044-24359975



TERMS OF REFERENCE (ToR)

LT No/SEIAA-TN/No.9129/ToR- 1215/2022 Dated:14.07.2022.

To

M/s. The Ramco Cements Limited
10th Floor, Atlas Corporate Centre
No.98A, Dr. Radhakrishnan Road
Mylapore
Chennai - 600 004

Sir / Madam,

Sub: SEIAA, Tamil Nadu – Terms of Reference with public Hearing (ToR) for the proposed Aluminosilicate based extraction of 35,900t/a located at S.P. 51/2, 51/3, 51/4, 51/5A, 51/5-B, 51/5C, 51/5D, 51/5E, 51/5F, 51/5G, 51/5H, 224/1,224/2, 226/1A, 226/1B, 226/2, 226/3, 226/4, 226/5, 226/6A, 226/6B, 226/6C, 226/6D, 226/6E, 226/7,226/8A, 226/8B, 226/8C, 226/9A, 226/9B, 226/9C, 226/10A, 226/10B, 226/10C, 226/11A, 226/11B, 226/12,226/13A, 226/13B, 226/13C, 226/14, 226/15A, 226/15B, 226/16, 226/17, 226/18, 226/19, 226/20, 226/21, 226/22, 226/23, 226/24, 226/25, 226/26, 226/27, 226/28, 226/29, 226/30, 226/31, 226/32, 226/33, 226/34, 226/35, 226/36, 226/37, 226/38, 226/39, 226/40, 226/41A, 226/41B, 226/41C, 226/41D, 226/41E, 226/41F, 226/41G, 226/41H, 226/41I, 226/41J, 226/41K, 226/41L, 226/41M, 226/41N, 226/41O, 226/41P, 226/41Q, 226/41R, 226/41S, 226/41T, 226/41U, 226/41V, 226/41W, 226/41X, 226/41A, 226/41B, 226/41C, 226/41D, 226/41E, 226/41F, 226/41G, 226/41H, 226/41I, 226/41J, 226/41K, 226/41L, 226/41M, 226/41N, 226/41O, 226/41P, 226/41Q, 226/41R, 226/41S, 226/41T, 226/41U, 226/41V, 226/41W, 226/41X, 226/41Y, 226/41Z, 226/41AA, 226/41AB, 226/41AC, 226/41AD, 226/41AE, 226/41AF, 226/41AG, 226/41AH, 226/41AI, 226/41AJ, 226/41AK, 226/41AL, 226/41AM, 226/41AN, 226/41AO, 226/41AP, 226/41AQ, 226/41AR, 226/41AS, 226/41AT, 226/41AU, 226/41AV, 226/41AW, 226/41AX, 226/41AY, 226/41AZ, 226/41BA, 226/41BB, 226/41BC, 226/41BD, 226/41BE, 226/41BF, 226/41BG, 226/41BH, 226/41BI, 226/41BJ, 226/41BK, 226/41BL, 226/41BM, 226/41BN, 226/41BO, 226/41BP, 226/41BQ, 226/41BR, 226/41BS, 226/41BT, 226/41BU, 226/41BV, 226/41BW, 226/41BX, 226/41BY, 226/41BZ, 226/41CA, 226/41CB, 226/41CC, 226/41CD, 226/41CE, 226/41CF, 226/41CG, 226/41CH, 226/41CI, 226/41CJ, 226/41CK, 226/41CL, 226/41CM, 226/41CN, 226/41CO, 226/41CP, 226/41CQ, 226/41CR, 226/41CS, 226/41CT, 226/41CU, 226/41CV, 226/41CW, 226/41CX, 226/41CY, 226/41CZ, 226/41DA, 226/41DB, 226/41DC, 226/41DD, 226/41DE, 226/41DF, 226/41DG, 226/41DH, 226/41DI, 226/41DJ, 226/41DK, 226/41DL, 226/41DM, 226/41DN, 226/41DO, 226/41DP, 226/41DQ, 226/41DR, 226/41DS, 226/41DT, 226/41DU, 226/41DV, 226/41DW, 226/41DX, 226/41DY, 226/41DZ, 226/41EA, 226/41EB, 226/41EC, 226/41ED, 226/41EE, 226/41EF, 226/41EG, 226/41EH, 226/41EI, 226/41EJ, 226/41EK, 226/41EL, 226/41EM, 226/41EN, 226/41EO, 226/41EP, 226/41EQ, 226/41ER, 226/41ES, 226/41ET, 226/41EU, 226/41EV, 226/41EW, 226/41EX, 226/41EY, 226/41EZ, 226/41FA, 226/41FB, 226/41FC, 226/41FD, 226/41FE, 226/41FF, 226/41FG, 226/41FH, 226/41FI, 226/41FJ, 226/41FK, 226/41FL, 226/41FM, 226/41FN, 226/41FO, 226/41FP, 226/41FQ, 226/41FR, 226/41FS, 226/41FT, 226/41FU, 226/41FV, 226/41FW, 226/41FX, 226/41FY, 226/41FZ, 226/41GA, 226/41GB, 226/41GC, 226/41GD, 226/41GE, 226/41GF, 226/41GG, 226/41GH, 226/41GI, 226/41GJ, 226/41GK, 226/41GL, 226/41GM, 226/41GN, 226/41GO, 226/41GP, 226/41GQ, 226/41GR, 226/41GS, 226/41GT, 226/41GU, 226/41GV, 226/41GW, 226/41GX, 226/41GY, 226/41GZ, 226/41HA, 226/41HB, 226/41HC, 226/41HD, 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226/41SS, 226/41ST, 226/41SU, 226/41SV, 226/41SW, 226/41SX, 226/41SY, 226/41SZ, 226/41TA, 226/41TB, 226/41TC, 226/41TD, 226/41TE, 226/41TF, 226/41TG, 226/41TH, 226/41TI, 226/41TJ, 226/41TK, 226/41TL, 226/41TM, 226/41TN, 226/41TO, 226/41TP, 226/41TQ, 226/41TR, 226/41TS, 226/41TT, 226/41TU, 226/41TV, 226/41TW, 226/41TX, 226/41TY, 226/41TZ, 226/41UA, 226/41UB, 226/41UC, 226/41UD, 226/41UE, 226/41UF, 226/41UG, 226/41UH, 226/41UI, 226/41UJ, 226/41UK, 226/41UL, 226/41UM, 226/41UN, 226/41UO, 226/41UP, 226/41UQ, 226/41UR, 226/41US, 226/41UT, 226/41UU, 226/41UV, 226/41UW, 226/41UX, 226/41UY, 226/41UZ, 226/41VA, 226/41VB, 226/41VC, 226/41VD, 226/41VE, 226/41VF, 226/41VG, 226/41VH, 226/41VI, 226/41VJ, 226/41VK, 226/41VL, 226/41VM, 226/41VN, 226/41VO, 226/41VP, 226/41VQ, 226/41VR, 226/41VS, 226/41VT, 226/41VU, 226/41VV, 226/41VW, 226/41VX, 226/41VY, 226/41VZ, 226/41WA, 226/41WB, 226/41WC, 226/41WD, 226/41WE, 226/41WF, 226/41WG, 226/41WH, 226/41WI, 226/41WJ, 226/41WK, 226/41WL, 226/41WM, 226/41WN, 226/41WO, 226/41WP, 226/41WQ, 226/41WR, 226/41WS, 226/41WT, 226/41WU, 226/41WV, 226/41WW, 226/41WX, 226/41WY, 226/41WZ, 226/41XA, 226/41XB, 226/41XC, 226/41XD, 226/41XE, 226/41XF, 226/41XG, 226/41XH, 226/41XI, 226/41XJ, 226/41XK, 226/41XL, 226/41XM, 226/41XN, 226/41XO, 226/41XP, 226/41XQ, 226/41XR, 226/41XS, 226/41XT, 226/41XU, 226/41XV, 226/41XW, 226/41XX, 226/41XY, 226/41XZ, 226/41YA, 226/41YB, 226/41YC, 226/41YD, 226/41YE, 226/41YF, 226/41YG, 226/41YH, 226/41YI, 226/41YJ, 226/41YK, 226/41YL, 226/41YM, 226/41YN, 226/41YO, 226/41YP, 226/41YQ, 226/41YR, 226/41YS, 226/41YT, 226/41YU, 226/41YV, 226/41YW, 226/41YX, 226/41YY, 226/41YZ, 226/41ZA, 226/41ZB, 226/41ZC, 226/41ZD, 226/41ZE, 226/41ZF, 226/41ZG, 226/41ZH, 226/41ZI, 226/41ZJ, 226/41ZK, 226/41ZL, 226/41ZM, 226/41ZN, 226/41ZO, 226/41ZP, 226/41ZQ, 226/41ZR, 226/41ZS, 226/41ZT, 226/41ZU, 226/41ZV, 226/41ZW, 226/41ZX, 226/41ZY, 226/41ZZ.

[Signature]
MEMBER SECRETARY
SEIAA-TN

LE No:SEIAA-TN/F.No.9220/SEIAA/ToR-1215/2022 Dated:14.07.2022

SEIAA/TN

The proposal was placed in the 287th Meeting of SEAC held on 22.06.2022. The details of the project furnished by the proponent are available in the website (parivethi.tn.ceml.in)

The SEAC noted the following

1. The Project Proponent M/s. The Ramco Cement Limited has applied for Terms of Reference for the proposed amalgamation of lime stone quarry lease over an extent of 5832.12Ha at S.F.No. 51/2, 51/3, 51/4, 51/5A, 51/5 B, 51/5C, 51/5D, 51/5E, 51/5F, 51/5G, 51/5H, 224/1,224/2, 226/1A, 226/1B, 226/2, 226/3, 226/4, 226/5, 226/6A, 226/6B, 226/6C, 226/6D, 226/6E, 226/7,226/8A, 226/8B, 226/8C, 226/9A, 226/9B, 226/9C, 226/10A, 226/10B, 226/10C, 226/11A, 226/11B, 226/12,226/13A, 226/13B, 226/13C, 226/14, 226/15A, 226/15B, 226/16, 226/17, 226/18, 226/19A, 226/19B, 226/19C,226/19D, 226/19E, 226/19F, 226/19G, 226/19H, 226/19I, 226/19J, 226/19K, 226/19L, 226/19M, 226/19N, 226/19O, 226/19P, 226/19Q, 226/19R, 226/19S, 226/19T, 226/19U, 226/19V, 226/19W, 226/19X, 226/19Y, 226/19Z, 226/20, 226/21A, 226/21B, 226/21C, 226/21D, 226/21E, 226/21F, 226/21G, 226/21H, 226/21I, 226/21J, 226/21K, 226/21L,226/21M, 226/21N, 226/21O, 226/21P, 226/21Q, 226/21R, 226/21S, 226/21T, 226/21U, 226/21V, 226/21W, 226/21X, 226/21Y, 226/21Z, 226/22, 226/23, 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2. The proposed quarry/activity is covered under Category "B1" of Item 1(a) "Mining Projects" of the Schedule to the EIA Notification, 2006.

MEMBER SECRETARY

SEIAA/TN

LE No:SEIAA-TN/P.No.9220/SEIAA/ToR-1215/2022 Dated:14.07.2022

SEIAA-TN

3. As per the mining plan the lease period is 50 years. The mining plan is for the period of five years & production should not exceed 92,11,880T of Limestone. The annual peak production is 29,87,000T of Limestone (4th year). The ultimate depth is 71 m BCL.

Based on the presentation made by the proponent SEAC recommended to grant of Terms of Reference (TOR) with Public Hearing subject to the following TORs, in addition to the standard terms of reference for EIA study for non-coal mining projects and details issued by the MOEF & CC to be included in EIA/EMP Report:

1. The PP shall carryout Hydro-geological study through reputed institution and the same shall be included in EIA report.
2. As habitation is located close to the site, the report should assess the implications of the proposal on the habitats.
3. In the case of proposed lease in an existing (or old) quarry where the benches are not fortified (or) partially formed as per the approved Mining Plan, the Project Proponent (PP) shall prepare and submit an "Action Plan" for carrying out the realignment of the benches in the proposed quarry lease after it is approved by the concerned Asst. Director of Geology and Mining during the time of appraisal for obtaining the EC.
4. The Proponent shall submit a conceptual 'Slope Stability Plan' for the proposed quarry during the appraisal while obtaining the EC, when the depth of the working is extended beyond 30 m below ground level.
5. The PP shall furnish the affidavit stating that the blasting operation in the proposed quarry is carried out by the statutory competent person as per the MMR 1961 such as blaster, mining mate, mine foreman, III- Class mines manager appointed by the proponent.
6. The PP shall present a conceptual design for carrying out only controlled blasting operation involving line drilling and muffle blasting in the proposed quarry such that the blast-induced ground vibrations are controlled as well as no fly rock travel beyond 30 m from the blast site.

MEMBER SECRETARY



SEIAA-TN

Lr No. SEIAA-TN/F.No.9128/SEIAA/TnR-1215/2022 Dated: 14.07.2022

SEIAA-TN

7. The EA Coordinators shall obtain and furnish the details of quarry/quarries operated by the proponent in the past, either in the same location or elsewhere in the State with video and photographic evidences.
8. If the proponent has already carried out the mining activity in the proposed mining lease area after 15/01/2016, then the proponent shall furnish the following details from AD/DD mines.
 - a. Quantity of mineral mined out.
 - b. Highest production achieved in any one year.
 - c. Detail of approved depth of mining.
 - d. Actual depth of the mining achieved earlier.
 - e. Name of the person already mined in that lease area.
 - f. If EC and CTO already obtained, the copy of the same shall be submitted.
 - g. Whether the mining was carried out as per the approved mine plan for EC if issued with stipulated benches.
10. All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/Topo sheet, topographic characteristics, morphology, lithology and geology of the mining lease area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).
11. The PR shall carry out Drone video survey covering the cluster, Green belt, fencing etc.
12. The proponent shall furnish photographs of adequate fencing, green belt along the periphery including replantation of existing trees & safety distance between the adjacent quarries & water bodies nearby provided as per the approved mining plan.
13. The Project Proponent shall provide the details of mineral reserves and mineable reserves, planned production capacity, proposed working methodology with justifications, the anticipated impacts of the mining operations on the surrounding environment and the remedial measures for the same.

MEMBER SECRETARY

SEIAA-TN

LE No. SEIAA-TN/No.9220/SEIAA/TsH-1215/2022 Dated:14.07.2022

SEIAA-TN

14. The Project Proponent shall provide the Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of Mines Act 1952 and the MMR, 1961 for carrying out the quarrying operations identically and systematically in order to ensure safety and to protect the environment.
15. The Project Proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells and surface water bodies such as rivers, tanks, canals, ponds etc. within 1 km (radius) along with the collected water level data for both monsoon and non-monsoon seasons from the PWD / TWAD so as to assess the impacts on the wells due to mining activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided.
16. The proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality & flora/fauna including micro/vehicular movement study.
17. The Proponent shall carry out the Cumulative Impact study due to mining operations carried out in the quarry specifically with reference to the specific environment in terms of soil health, biodiversity, air pollution, water pollution, climate change and flood control & health impacts and its mitigation measures. Accordingly, the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind.
18. Rain water harvesting management with recharging details along with water balance (both monsoon & non-monsoon) be submitted.
19. 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.

MEMBER SECRETARY

SEIAA-TN

Lf No:SEIAA-TN/F.No.9220/SEIAA/ToR-1215/2022 Dtd:06/14/07/2022

SEIAA-TN

20. Details of the land for storage of Overburden/Waste Dumps (or) Rejects outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be provided.
21. Proximity to Areas declared as Critically Polluted (or) the Project areas which attract the court restrictions for mining operations, should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the TNPCB for Dept. of Geology and Mining should be worded and furnished to the effect that the proposed mining activities could be considered.
22. Description of water conservation measures proposed to be adopted in the Project should be given. Detail of rainwater harvesting proposed in the Project, if any, should be provided.
23. Impact on local transport infrastructure due to the Project should be indicated.
24. A tree survey study shall be carried out (No., name of the species, age, diameter etc.,) both within the mining lease applied area & 300m buffer zone and its management during mining activity.
25. A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific.
26. Public Hearing points raised and commitments of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project and to be submitted to SEIAA/SEAC with regard to the Office Memorandum of MoEF& CC accordingly.
27. The Public hearing advertisement shall be published in one major National daily and one most circulated vernacular daily.
28. The PP shall produce/display the EIA report, Executive summary and other related information with respect to public hearing in Tamil Language also.
29. As a part of the study of flora and fauna around the vicinity of the proposed site, the EIA coordinator shall strive to educate the local students on the importance of preserving local flora and fauna by involving them in the study, wherever possible.

MEMBER SECRETARY

SE

SEIAA-TN

LE No. SEIAA-TN/F.No.9220/SEIAA/ToR-1215/2022 Dated:14.07.2022

SEIAA-TN

30. The purpose of Green belt around the project is to capture the fugitive emissions, carbon sequestration and to attenuate the noise generated, in addition to improving the aesthetics. A wide range of indigenous plant species should be planted as given in the appendix-I in consultation with the DFO, State Agriculture University and local school/college authorities. The plant species with dense/moderate canopy of native origin should be chosen. Species of small/medium/tall trees alternating with shrubs should be planted in a mixed manner.
31. Tall one year old Saplings raised in appropriate size of bags, preferably eco-friendly bags should be planted as per the advice of local forest authorities/botanist/Horticulturist with regard to site specific choices. The proponent shall earmark the greenbelt area with GPS coordinates all along the boundary of the project site with at least 3 meters wide and in between blocks in an organized manner.
32. A Disaster management Plan shall be prepared and included in the EIA/EEMP Report for the complete life of the proposed quarry (or) till the end of the lease period.
33. A Risk Assessment and management Plan shall be prepared and included in the EIA/EEMP Report for the complete life of the proposed quarry (or) till the end of the lease period.
34. Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-employment 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.
35. 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.
36. The Socio-economic studies should be carried out within a 5 km buffer zone from the mining activity. Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for

MEMBER SECRETARY

SR

SEIAA-TN

LE No:SEIAA-TN/No.9220/SEIAA/ToR-1215/2022 Dated:14.07.2022

SEIAA-TN

Implementation.

- 37. Details of litigation pending against the project, if any, with direction order passed by any Court of Law against the Project should be given.
- 38. Benefits of the Project if the Project is implemented should be spell out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.
- 39. If any quarrying operations were carried out in the proposed quarrying site for which now the EC is sought, the Project Proponent shall furnish the detailed compliance to EC conditions given in the previous EC with the site photographs which shall duly be certified by MoEF&CC, Regional Office, Chennai (or) the concerned DDE/TNPCB.
- 40. The PP shall prepare the EMP for the entire life of mine and also furnish the sworn affidavit stating to abide the EMP for the entire life of mine.
- 41. Concealing any factual information or submission of falsified data and failure to comply with any of the conditions mentioned above may result in withdrawal of this Terms of Conditions besides attracting penal provisions in the Environment (Protection) Act, 1986.

Appendix - I
List of items from Appendix for Quarrying

No	Item Name	Unit/Measure	Value/Status
1	Area of quarrying	Sq. Meters	10000
2	Area of dumping	Sq. Meters	10000
3	Area of road	Sq. Meters	10000
4	Area of site	Sq. Meters	10000
5	Area of site	Sq. Meters	10000
6	Area of site	Sq. Meters	10000
7	Area of site	Sq. Meters	10000
8	Area of site	Sq. Meters	10000
9	Area of site	Sq. Meters	10000
10	Area of site	Sq. Meters	10000
11	Area of site	Sq. Meters	10000
12	Area of site	Sq. Meters	10000
13	Area of site	Sq. Meters	10000
14	Area of site	Sq. Meters	10000
15	Area of site	Sq. Meters	10000
16	Area of site	Sq. Meters	10000
17	Area of site	Sq. Meters	10000
18	Area of site	Sq. Meters	10000
19	Area of site	Sq. Meters	10000
20	Area of site	Sq. Meters	10000
21	Area of site	Sq. Meters	10000
22	Area of site	Sq. Meters	10000
23	Area of site	Sq. Meters	10000
24	Area of site	Sq. Meters	10000
25	Area of site	Sq. Meters	10000
26	Area of site	Sq. Meters	10000
27	Area of site	Sq. Meters	10000
28	Area of site	Sq. Meters	10000
29	Area of site	Sq. Meters	10000
30	Area of site	Sq. Meters	10000
31	Area of site	Sq. Meters	10000
32	Area of site	Sq. Meters	10000
33	Area of site	Sq. Meters	10000
34	Area of site	Sq. Meters	10000
35	Area of site	Sq. Meters	10000
36	Area of site	Sq. Meters	10000
37	Area of site	Sq. Meters	10000
38	Area of site	Sq. Meters	10000
39	Area of site	Sq. Meters	10000
40	Area of site	Sq. Meters	10000
41	Area of site	Sq. Meters	10000
42	Area of site	Sq. Meters	10000
43	Area of site	Sq. Meters	10000
44	Area of site	Sq. Meters	10000
45	Area of site	Sq. Meters	10000
46	Area of site	Sq. Meters	10000
47	Area of site	Sq. Meters	10000
48	Area of site	Sq. Meters	10000
49	Area of site	Sq. Meters	10000
50	Area of site	Sq. Meters	10000

[Signature]
MEMBER SECRETARY
SEIAA-TN

LE No:SEIAA-TN/E.No.9220/SEIAA/ToR-1215/2022 Dated:14.07.2022

SEIAA-TN

Discussion by SEIAA and the Remarks:

The proposal was placed in the 532nd Authority meeting held on 14.07.2022. The Authority after detailed discussion accepts the recommendation of 217th SEAC meeting Dated: 22.06.2022 and the Authority has decided to grant Terms of Reference subject to the standard conditions as per Annexure - (1) of SEAC minutes, under normal conditions, stipulated by MCE&CC & all other specific condition as recommended by SEAC in addition to the following conditions.

1. As per Tamil Nadu Minor Mineral Concession Rules, 1999 a safety distance of 50 Mts. from the highways and railway lines should be left and maintained. The proposed Mine lease area is abutting the State Highway 139, the proposer is requested to leave the tail end area in the Lease II area in the western side of the proposed site for a distance of 100m considering the safety aspects of the vehicles plying through the state Highway 139 and accordingly revise the mining plan. Further, Environmental impact assessment specific to the State Highway 139 may be furnished along with EIA Report (in to the proposed mining activity).
2. Furnish final copy of Environmental and Landuse Plan (Scale:1:10,000), Quarry Lease Plan & Surface Plan (Scale 1:1000), Topography, Geological Plan, Five Year site Development & Production Plan & Sections (Scale 1:1000) approved in the Mining Plan.
3. **Mining Operations/Process:**
 - (i) Appropriate mining process and machinery (i.e. right capacity, fuel efficient) should be selected to carry out various mining operations that generate minimal dust/air pollution, noise, wastewater and solid waste.
 - (ii) Details regarding mitigation steps taken in the existing Lease area to assess and quantify emission load generation (in terms of air pollution, noise, waste water and solid waste) from each of the mining activities (including transportation) on annual basis.
 - (iii) Action plan to eliminate/minimize generation of air pollution/dust, noise, wastewater, solid waste generation in successive years through use of better technology for the proposed amalgamated lease area.
 - (iv) The PP shall explore the possibilities of providing Digital processing of the entire lease area for the existing pit using remote sensing technique.
 - (v) The measures taken to monitor the land use pattern and mining activity for the proposed amalgamated site.

MEMBER SECRETARY

SEIAA-TN

LE No:SEIAA-TN/F.No,9220/SEIAA/ToR-4215/2022 Date:14.07.2022

SEIAA-TN

4. Water/Wastewater

- (i) The mining operations should be restricted to above ground water table and it should not intersect ground water table.
- (ii) However, if enough resources are estimated below the ground water table, the same may be explored after conducting detailed geological studies by GSI and hydro-geological studies by CGWD or NRI or institute of national repute, and ensuring that no damage to the land stability/ water aquifer system shall happen.
- (iii) The details outcome of such study may be reflected/ incorporated in the EIA/TMP report of the mine appropriately.
- (iv) The existing mining pit Lease 1 (35.96 Ha) has intersected the Ground water table. The mitigation measures and Hydro geological report regarding the impact of mining on Ground water quality in the mine lease area and the surrounding water bodies within 1km radius shall be furnished.
- (v) The NOC obtained for intersection of Ground water in the Lease Area from the Central Ground Water Authority (CGWA)/Concerned Local authority shall be furnished.
- (vi) The Depth and the date at which the Ground Water intersected the mine Lease Area.
- (vii) The remediation measures that were taken after the intersection of ground water due to mining activity in the existing Lease Area.
- (viii) The Water quality analysis report of the mine pit water utilized for the water demand and for raising agricultural crops.
- (ix) The details regarding the per acre amount provided for the mine pit water utilized for raising agricultural crops.
- (x) The details about the extent of land for which the mine pit water was utilized for raising the agricultural crops till date shall be furnished.
- (xi) Provisions for regular monitoring of ground water level and its quality provided for the existing lease area and for the proposed amalgamated lease area shall be furnished.
- (xii) Details about the network of existing wells and piezometers provided for monitoring the existing Lease Area.

MEMBER SECRETARY

SEIAA-TN

Le No:SEIAA-TN/F.No.9220/SEIAA/ToR-1215/2022 Dated:14.07.2022

SEIAA-TN

- (xiii) The project proponent shall furnish the contour map of the water table detailing the number of well located around the lease mine area and its impact on the wells due to mining activities.
- (xiv) Details regarding suitable conservation measures to augment ground water resources in the existing Lease area undertaken as per the guidelines of Central Ground Water Board (CGWB) may be furnished.
- (xv) Appropriate mitigation measures (viz. STP, gashand drains, retaining walls, collection of runoff etc.) taken to prevent pollution of nearby (or) other water bodies for the existing Lease area.
- (xvi) Water quality Analysis study conducted by Tamil Nadu Pollution Control Board to assess quality of surface and ground water sources on regular basis for the existing Lease Area shall be furnished.
- (xvii) Details regarding the study of quality of surface and ground water sources along with the frequency in which test was conducted by NABL, NABL/T approved water testing laboratory for the existing lease mine area shall be furnished.
- (xviii) Provisions provided to stop silt originating due to mining activities from entering into the outside water course or any other water body.
- (xix) Appropriate measures for prevention and control of soil erosion and management of silt undertaken for the existing lease area.
- (xx) Details of Quantity of silt/soil generated in the existing lease area, managed on regular basis shall be furnished.
- (xxi) Provision of retaining walls for dumps for protection. Measures taken to prevent erosion from dumps and Details of plantation carried out at the dump slopes.
- (xxii) Details about benches / gashand drain, provided in the existing OB Dump site. Detailed report regarding the siltling or retaining structure carried out.
- (xxiii) Details regarding source of water advised for Open Well development, hand wells shall be furnished. The water source for above mentioned activity for the proposed amalgamated lease area may also be furnished.
- (xxiv) Water balance diagram prepared on monthly basis for efficient consumption/utilization in different activities shall be furnished for existing lease area.

MEMBER SECRETARY

SEIAA-TN

Er No:SEIAA-TN/E.No.922RSEIAA/ToR-1215/2022 Dated:14.07.2022

SEIAA-TN

5. **Land/Soil Overburden**

- (i) The details about top soil stored in earmarked area(s) for the existing Lease area shall be furnished.
 - (ii) Furnish the report of slope stability study conducted on the existing OB Dump site, as per IISL approved mine plan and DCMS guidelines.
 - (iii) The preventive measures adopted at OB dump site to prevent erosion and surface run-off to the existing Lease area.
 - (iv) The preventive measures adopted at OB dump site for stabilization of the dump in critical areas.
6. Stage wise reclamation plan of the mine up to the period of conceptual pit limit shall be provided.
7. The PP shall explore the possibilities of organizing employment based apprenticeship/mentorship training program every year with appropriate stipend for the youth and other programs to enhance the skill of the local people. The data shall be maintained for the training imparted to the persons and the outcome of the training, for the assessment of the training program which should be analyzed periodically.
8. Details regarding occupational health check-up of LT of the persons conducted every year may be furnished.
9. The proponent shall shift (or) shall leave safety distance for the low/high tension line in the proposed mining area accordingly as recommended in previous area communication & Mine plan approval before executing mine lease and obtaining CTO from the TNPCB.
10. A High Tension Power Line located within the mining lease area on the eastern side passing North East - South West direction was proposed to be rerouted away from the lease area. The current status of the proposal shall be furnished along with the time frame in which the High Tension power line will be rerouted.
11. The current status of proposal to reroute shift Five Low Tension Power Lines along with the time frame in which the power lines will be rerouted/shifted shall be furnished.
12. The current status of proposal to reroute a road approaching to Chinnanagala village located on the South-Western side of the Lease boundary in consultation with District Authorities shall be furnished.

MEMBER SECRETARY

SEIAA-TN

Lr No.SEIAA-TN/F.No.9220/SEIAA/ToR-0215/2022 Dated:14.07.2022

SEIAA-TN

13. No trees in the area should be removed and all the trees numbered and protected. In case trees fall within the proposed open quarry site the trees may be transplanted in the Greenbelt zone.
14. The AI/IDD, Dept. of Geology & Mining shall ensure operation of the proposed quarry after the submission slope stability study for the ultimate depths as per approved mining plan conducted through the reputed research & Academic Institutions such as NIRM, IITs, NITS Anna University, and any CSIR Laboratories etc.
15. The AI/IDD, Dept. of Geology & Mining & Director General of Mine safety shall ensure strict compliance and implementation of bench work recommendations as per as recommended in the scientific slope stability study of the reputed research & Academic Institutions as a safety precautionary measure to avoid untoward accidents during mining operation.
16. The proponent shall ensure that the activities should in no way result in disturbance to forest and trees in vicinity.
17. The proponent shall ensure that the operations shall not result in loss of soil biological properties and nutrients.
18. The activity should not result in CO₂ release and temperature rise and add to green climate alterations.
19. The mining scheme plan should be strictly adhered with appropriate soil reclamation measures to ensure ecological stability of the area.
20. Reclamation/Restoration of the mine site should ensure that the Geotechnical, physical, chemical properties are sustainable that the soil structure composition is holistic during the process of reclamation.
21. The proponent shall ensure that the activity does not disturb the movement of grazing animals and free ranging wildlife.
22. The proponent shall ensure that the activity does not disturb the biodiversity, the flora & fauna in the ecosystem.
23. The proponent shall ensure that the activity does not disturb the water bodies and natural flow of surface and ground water, nor cause any pollution to water sources in the area.
24. The proponent shall ensure that the activities undertaken should not result in carbon emission, and temperature rise, in the area.

MEMBER SECRETARY

SEIAA-TN

Le No:SEIAA-TN/F.No.9226/SEIAA/TnR-1215/2022 Dated:14.07.2022

SEIAA-TN

25. The proponent shall ensure that the mine closure plan are followed as per mining plan and the mine restoration should be done with native species, and site restored to near original status.
26. The proponent shall ensure that monitoring be carried out with reference to the quantum of particulate matter during excavation, blasting, material transport and also from cutting, waste dumps and haul roads.
27. The proponent shall ensure that the area is ecologically restored to conserve the ecosystems and ensure flow of goods and services.
28. The proponent shall ensure that the activities shall not disturb the agro biodiversity and agro farms.
29. The proponent shall ensure that the activity shall not result in invasion by invasive alien species.
30. Actions to be taken to promote agro forestry, mixed plants to support biodiversity conservation in the mine restoration effort.
31. The proponent shall ensure that activity shall not deplete the (indigenous soil) and humic and disturb the mycorrhizal fungi, soil organism, soil community nor result in eutrophication of soils and water.
32. The activities should not disturb the soil properties and seed and plant growth. Soil amendments as required to be carried out, to improve soil health.
33. Bio remediation using microorganisms should be carried out to restore the soil environment to enable carbon sequestration.
34. The proponent shall ensure that all mitigation measures listed in the EIA/EMP are taken to protect the biodiversity and natural resources in the area.
35. The proponent shall ensure that the activities should not impact the water bodies/wells in the neighbouring open wells and bore wells.
36. The proponent shall ensure that the activities should neither in any way affect the water quantity and quality in the open wells and bore wells in the vicinity nor impact the water table and levels.
37. The proponent shall ensure that in the green belt development more indigenous tree species (Appendix as per the SEAC Minutes) to be planted.


MEMBER SECRETARY

SEIAA-TN

Lr No/SEIAA-TN/T.No.9276/SEIAA/ToR-1215/2022 Dated:14.07.2022

SEIAA-TN

38. The proponent shall ensure that the activities should not disturb the resident and migratory birds.
39. The proponent shall ensure the area should be restored and rehabilitated with native trees as recommended SEAC Minutes (or Appendix).
40. The proponent shall ensure that the mine reclamation should be done using mycorrhizal VAM, vermicasting, bio fertilizers to ensure soil health and biodiversity conservation.
41. The proponent shall ensure that the topsoil should be protected and used in planting activities in the area.
42. The proponent shall ensure that the activities should not disturb the river flow, nor affect the Odor, Water bodies, Dams in the vicinity.
43. The proponent shall ensure that the activities should not disturb the vegetation and wildlife in the adjacent reserve forests and areas around.
44. The proponent should ensure that there is no disturbance in the agriculture plantations, social forestry plantations, waste lands, forests, sanctuary or national parks. There should be no impact on the land, water, soil and biological environment and other natural resources due to the mining activities.
45. The proponent shall ensure that topsoil to be utilized for soil restoration and Green belt along within the proposed area.
46. The proponent shall ensure that activities should not impact green lands/grazing fields of all types surrounding the mine lease area which are food sources for the grazing cattle.

A. 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 intimated whether there had any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.
- 2) A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.
- 3) All documents including approved lease 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.
- 4) All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/

MEMBER SECRETARY

SEIAA-TN

Lr No/SEIAA-TN/E.No.9220/SEIAA/ToR-1215/2022 Dated:14.07.2022

SEIAA-TN

- type sheet, topographic sheet, geomorphology and geology of the area should be provided. Such an itinerary of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zones).
- 5) Information should be provided in Survey of India Topo sheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.
 - 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.
 - 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/dereliction/ 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.
 - 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 such case should also be provided.
 - 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.
 - 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 delineated. Land use plan of the mine lease area should be prepared to encompass pre-operational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.
 - 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.

MEMBER SECRETARY

SEIAA-TN

LE No/SEIAA-TN/F.No.9220/SEIAA/ToR-1215/2022 Dated:14.07.2022

SEIAA-TN

- 12) Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Officer 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 Project Appraisal Committee.
- 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.
- 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.
- 15) The vegetation in the EF / PF areas in the study area, with necessary details, should be given.
- 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, proposed mitigation measures required, should be worked out with cost implications and submitted.
- 17) Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Reserve and 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.
- 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 RLT Species duly authenticated, separately for core and buffer zone should be furnished based on high primary field survey, clearly indicating the Schedule of the flora present. In case of any scheduled flora 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.

MEMBER SECRETARY

SEIAA-TN

LE No. SEIAA-TN/F.No.5230/SEIAA/T/R-1215/2022 Dated:14.07.2022

SEIAA-TN

- 19) Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to occur under the 'Aravali Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.
- 20) Similarly, for Coastal Projects, a CRZ map duly authenticated by one of the authorized agencies demonstrating LUL, HUL, CRZ area, location of the mine lease with respect to CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).
- 21) R&R Plan/composition 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 programmes prepared and submitted accordingly, integrating the sectoral programmes of like departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.
- 22) One season (June-July/August) [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 2008, water quality, noise level, soil and Run and Runn shall be collected and the AAQ and other data to be sampled presented data-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring station 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 the free silica, should be given.
- 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

MEMBER SECRETARY

SEIAA-TN

Lr No SEIAA-TN/No.9220/SEIAA/ToR-1215/2022 Dated:14.07.2022

SEIAA-TN

- 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 directions may also be indicated on the map.
- 24) The water requirement for the Project, its availability, and source should be furnished. A detailed water balance should also be provided. Freshwater requirement for the Project should be indicated.
 - 25) Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.
 - 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.
 - 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.
 - 28) Based on actual mentioned 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.
 - 29) Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversions proposed, if any, and the impact of the same on the hydrology should be brought out.
 - 30) Information on the elevation, working depth, groundwater table etc. Should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.
 - 31) A time based 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

MEMBER SECRETARY

SEIAA-TN

LT No/SEIAA-TN/F.No.9226/SEIAA/TrR-1215/2022 Dated:14.07.2022

SEIAA-TN

- greater ecological value and should be of great utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.
- 32) Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be stated. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.
 - 33) Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.
 - 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.
 - 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.
 - 36) Public health implications of the Project and related activities for the population in the impact area should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.
 - 37) Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be included. As far as possible, quantitative dimensions may be given with time frames for implementation.
 - 38) Detailed Environmental Management Plan (EMP) to mitigate the environmental impacts which should 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.
 - 39) Public Hearing points raised and commitments of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.

MEMBER SECRETARY

SEIAA-TN

Er No. SEIAA-TN/F.No.922B/SEIAA/ToR-1215/2022 Dated:14.07.2022.

SEIAA-TN

- 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.
- 41) The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spell out.
- 42) A Disaster management Plan shall be prepared and included in the EIA/EMP Report.
- 43) Benefits of the Project if the Project is implemented should be spell out. The benefits of the Project shall clearly include environmental, social, economic, employment potential, etc.
- 44) Besides the above, the below mentioned general points are also to be followed:-
 - a) Executive Summary of the EIA/EMP Report
 - b) All documents to be 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.
 - d) Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise, etc. using the MoEFACC/NABL, accredited laboratories. All the original analysis/testing reports should be available during approval of the Project.
 - e) Where the documents provided are in a language other than English, an English translation should be provided.
 - f) The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.
 - g) While preparing the EIA report, the instructions for the Proponents and consultants for the Consultants issued by MoEFACC vide G.O. No. J-11017-41/2009-IA III dated 4th August, 2009, which are available on the website of the Ministry, should be followed.
 - h) Changes, if any, made in the basic scope and project parameters (as stipulated in Form I and the EPR, the outlining the TOR) should be brought to the attention of MoEFACC 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.
 - i) As per the circular no. J-11011/018/2010-IA III 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

MEMBER SECRETARY

SEIAA-TN

LE No. SEIAA-TN/F.No.9220/SEIAA/ToR-1215/2022 Dated:14.07.2022

SEIAA-TN

Ministry of Environment, Forest and Climate Change, as may be applicable.

- (i) The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections, and (iii) sections of the mining pit and eventual dumps, if any, clearly showing the land features of the adjoining area.

In addition to the above, the following shall be furnished:-

The Executive summary of the EIA/EEMP report in about 8-10 pages should be prepared incorporating the information on following points:

1. Project name and location (Village, District, State, Industrial Estate (if applicable).
2. Process description in brief, specifically indicating the gaseous emission, liquid effluent and solid and hazardous wastes.
3. Measures for mitigating the impact on the environment and mode of discharge or disposal.
4. Capital cost of the project, estimated time of completion.
5. The proponent shall furnish the contour map of the water table detailing the number of wells located around the site and impacts on the wells due to mining activity.
6. A detailed study of the lithology of the mining lease area shall be furnished.
7. Details of village map, "A" register and FMH (lease) shall be furnished.
8. Detailed mining closure plan for the proposed project approved by the Geology of Mining department shall be shut or submitted along with EIA report.
9. Obtain a letter/certificate from the Assistant Director of Geology and Mining stating that there is no other Minerals/resources than sand in the quarrying area within the approved depth of mining and below depth of mining and the same shall be furnished in the EIA report.
10. EIA report should strictly follow the Environmental Impact Assessment Guidance Manual for Mining of Minerals published February 2010.
11. Detail plan on rehabilitation and reclamation carried out for the stabilization and restoration of the mined areas.
12. The EIA study report shall include the surrounding mining activity, if any.
13. Modeling study for Air, Water and noise shall be carried out in this field and incremental increase in the above study shall be substantiated with mitigation measures.
14. A study on the geological resources available shall be carried out and reported.
15. A specific study on agriculture & livelihood shall be carried out and reported.

MEMBER SECRETARY

SEIAA-TN

LE No.SEIAA-TN/E.No.9220/SEIAA/ToR-1215/2022 Dated:14.07.2022

SEIAA-TN

16. Impact of soil erosion, soil physical/chemical and biological property changes may be assessed.
17. Site selected for the project - Nature of land - Agricultural (single/double crop), barren, Govt./ private land, status of its acquisition, nearby (in 2-3 km.) water body, population, within 10km other industries, forest, eco-sensitive zones, accessibility, (000) - in case of industrial estate this information may not be necessary)
18. Baseline environmental data - air quality, surface and ground water quality, soil characteristic, physical data, socio-economic condition of the nearby population
19. Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.
20. Likely impact of the project on air, water, land, flora/fauna and nearby population.
21. Emergency preparedness plan in case of natural or in plant emergencies
22. Issues raised during public hearing (if applicable) and response given
23. CER plan with proposed expenditure.
24. Occupational Health Measures
25. Post project monitoring plan
26. The project proponent shall carry out detailed hydro-geological study through institutions/NARETA/consulted agencies.
27. A detailed report on the green belt development already undertaken is to be furnished and also submit the proposal for green belt activities.
28. The proponent shall propose the suitable control measure, in control for fugitive emissions during the operations of the mines.
29. A specific study should include impact on flora & fauna, disturbance to migratory patterns of animals.
30. Reserve funds should be earmarked for proper closure plan.
31. A detailed plan on plastic waste management shall be furnished. Further, the proponent should strictly comply with Tamil Nadu Government Order (M) No.84 Environment and forests (EC-2) Department dated 25.06.2018 regarding ban on one time use and throw away plastics irrespective of thickness with effect from 01.01.2019 under Environment (Protection) Act, 1986. In this connection, the project proponent has to furnish the action plan.

MEMBER SECRETARY

SEIAA-TN

LT No:SEIAA-TN/F.No.9220/SEIAA/ToR-1215/2022 Dated:14.07.2022

SEIAA-TN

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

- a. A note confirming compliance of the TOR, with cross referencing of the relevant sections / pages of the EIA report should be provided.
- b. All documents may be properly referenced with index, page numbers 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.
- d. While preparing the EIA report, the instructions for the proposers and restrictions for the consultants issued by MoEF & CC vide O.M. No. J-11013-41/2006(A,B (I) dated 4th August, 2009, which are available on the website of this Ministry should also be followed.
- e. The consultants involved in the preparation of EIA/EMP report after accreditation with Quality Council of India (QCI)/National Accreditation Board of Education and Training (NABET) would have to include a certificate in this regard in the EIA/EMP reports prepared by them and data provided by other organization/laboratories including their status of approvals etc. In this regard circular no F. No.J-11013/77/2004-IA/III dated 27th December, 2009, 18th March 2010, 24th May 2010, 28th June 2010, 31st December 2010 & 30th September 2014 posted on the Ministry's website <http://www.moef.nic.in> may be referred.
 - After preparing the EIA report the generic structure prescribed in Appendix-III of the EIA Notification, 2006 covering the above mentioned points, the proposer will take further necessary action for obtaining environmental clearance in accordance with the procedure prescribed under the EIA Notification, 2006.
 - The final EIA report shall be submitted to the SEIAA, Tamil Nadu for obtaining Environmental Clearance.
 - The TORs with public hearing prescribed shall be **valid for a period of three years** from the date of issue, for submission of the EIA/EMP report as per O.M.No.J-11013/41/2006-IA-II(D(part) dated 29th August, 2017.

MEMBER SECRETARY

SEIAA-TN

Lr.No:SEIAA-TN/F.No.9220/SEIAA/ToR-4215/2022 Dated:14.07.2022

SEIAA-TN

Copy to:

1. The Additional Chief Secretary to Government, Environment & Forests Department, Govt. of Tamil Nadu, Fort St. George, Chennai - 9
2. The Chairman, Central Pollution Control Board, Purvash Bhawan, CHD Curo-Office, Kirtiplace, East Arjun Nagar, New Delhi 110022.
3. The Member Secretary, Tamil Nadu Pollution Control Board, 5A, Mount Road, Guindy, Chennai-600 032.
4. The APCCB (C), Regional Office, MoEF & CC (CG), J4, HEPB Building, 1st & 2nd Floor, Cathedral Garden Road, Nanganallur, Chennai-34.
5. Monitoring Cell, IA Division, Ministry of Environment, Forests & CC, Purvash Bhawan, CGO Complex, New Delhi 110002.
6. The District Collector, Ariyalur District.
7. Ssd File.



Awarded TORs & their incorporation in EIA Report

I. Additional TORs by SEAC-TN

Sl. No.	Awarded TOR	Compliance	EIA Report Page No.
1	The PP shall carryout Hydro geological study through reputed institution and the same shall be included in EIA report.	Department of Remote Sensing, Bharathidasan University, Trichy conducted the Hydrological Study along with Officials of M/s. Thrust Geo-consultants Private Limited, an Accredited Ground Water Professionals by CGWA and submitted the Report.	Doc-9 466 191-202
2	As habitation is locater close to the site, the report should assess the implication of the proposal on the habitants.	RCL had engaged NITK, Surathkal, a Govt. of India Institute, for Study out the scientific investigation on "Blasting Parameters & Design of Safe Bench Geometry and Evaluation of Slope Stability of existing benches. Safety measures are being implemented.	Doc-7 396 183-186
3	In the case of processed lease in an existing (or old) quarry where the benches are not formed (or) partially formed as per the approved mining plan. Project Proponent (PP) shall prepare submit an 'Action Plan' for carrying out the realignment of the benches in the proposed quarry lease after it is approved by the concerned Asst. Director of Geology and Mining during the time of approved by the concerned Asst. Director of Geology and Mining during the time of appraisal for obtaining the EC.	This is an existing Mine of RCL in operation since 2005 onwards with proper benches in compliance with approved Mining Plans/Schemes.	Plates in 78-79 83
4	The Proponent shall submit a conceptual 'Slope Stability Plan' for the proposed quarry during the appraisal while obtaining the EC, when the depth of the working is extended beyond 30 m below ground level.	NITK, Surathkal, carried out the Study on Slope Stability of existing benches. Safety measures are recommended.	Doc-8 430 186-187
5	The PP shall furnish the affidavit stating that the blasting operation in the proposed quarry is carried out by the statutory competent person as per the MMR 1961 such as blaster, mining mate, mine foreman, II/I Class mines manager appointed by the Proponent.	The Undertaking/Affidavit is submitted.	12
6	The PP shall present a conceptual design for carrying only controlled blasting operation involving line drilling and muffle blasting in the proposed quarry such that the blast-induced ground vibrations are controlled as well as no	NITK, Surathkal, carried out the Blastings Study and give the recommendations to control the impact.	Doc-7 396 183-186

Sl. No.	Awarded TOR	Compliance	EIA Report Page No.
	fly rock travel beyond 30 m from the blast site.		
7	The EIA Co-ordinator shall obtain and furnish the details of quarry/quarries operated by the proponent in the past, either in the same location or elsewhere in the state with video and photographic evidences.	RCL Mines in the Region are given in Table 1.2 and shown in the Plate-II Regional Setting Map.	72 71
8	If the proponent has already carried out the mining activity in the proposed mining lease area after 15.01.2016, then the proponent shall furnish the following details from AD/DD-Mines.	This is an existing Mines of RCL in operation since 2005 onwards and there is no production violation as such.	75
9	What was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines? a. Quality of minerals mined out. b. Highest production achieved in any one year. c. Detail of approved depth of mining. d. Actual depth of the mining achieved earlier. e. Name of the person already mined in that leases area. f. If EC and CTO already obtained, the copy of the same shall be submitted. g. Whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches.	a. Cement grade mineral. b. The maximum production from Lease-I was 0.868 MTPA during 2012-13 against consented quantity of 0.9 MTPA. The maximum production from Lease-II was 0.299 MTPA during 2022-23 against consented quantity of 0.3 MTPA. c. Lease-I is 63 m BGL & Lease-II is 40 m BGL. d. Lease-I is 50 m BGL & Lease-II is 15 m BGL. e. RCL f. Given in Docs 1 & 2. g. Yes.	95 74 7 - - 284-295 316-340
10	All corner coordinates of the mine lease area, super imposed on a High-Resolution Imagery/Topo sheet, topographic sheet, geomorphology, lithology and geology of the mining lease area should be provided. Such an imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	All corner coordinates of the ML is given Table 1.4 and shown in Figs. 1.2 & 1.3.	86 84-85
11	The PP shall carry out Drone video survey covering the cluster, Green belt, fencing etc.	Drone video survey carried out and shown as Plate IV.	79
12	The Proponent shall furnish photographs of adequate fencing, green belt along the periphery including replantation of existing trees & safety distance between the adjacent quarries & water bodies nearby provided as per the approved mining plan.	Required photographs are given in Plates V-VI.	
13	The Project Proponent shall provide the details of mineral reserves and mineable reserves. Planned production capacity, proposed working methodology with justifications, the anticipated impacts of the mining operations on the surrounding environment and the remedial measures for	As per UNFC Norms, the reserve has been estimated as 15.85 Million Tonnes, as on 01.04.2024. The Reserves & Resources are re-estimated as 22.14 Million Tonnes. The mining	90

Sl. No.	Awarded TOR	Compliance	EIA Report Page No.
	the same.	operation will be carried out by both Opencast Conventional Mining with controlled Drilling & Blasting and Non-Conventional Mining Method with X-Centric Rippers @ 3.00 MTPA. Limestone production during ROMP period will be 15 Million Tonnes. Balance Reserves will be mined out in subsequent Plan Period. The Life of the Mine is 10 years based on established Reserves now. Ultimate Pit Depth on proposed Plan Period will be 92 m BGL from 71 m arrived in the earlier Mining Plan. Mining will intersect the Ground water-table – Para 2.2.	
14	The Project Proponent shall provide the Organization chart indicating the appointment of various statutory official and other competent persons to be appointed as per the provisions of Mines Act'1952 and the MMR. 1961 for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment.	Given I Para 2.7 and Table 2.7.	103
15	The Project Proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within 1 km (radius) along with the collected water level data for both monsoon and non-monsoon seasons from the PWD/TWAD so as to assess the impacts on the wells due to mining activity. Based on actual monitored data. It may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided.	On the monitoring day, the water levels observed in the 6 Borewells in the PNR-A Mine vicinity (within 2 km) are given in Table 3.22. The levels were found to be 8.14 m BGL to 22.30 m BGL while it was 15.50 m BGL at PNR Mine. Water table Contour is given as Plate X.	142 143
16	The Proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality & flora/fauna including traffic/vehicular movement study.	Chapter-3 provides all Baseline Data for the Winter 2023-24 Season. Traffic study details are provided in Para 4.3.5.	109-179 188-189
17	The Proponent shall carry out the Cumulative	Chapter 4 dealt the	180-181

Sl. No.	Awarded TOR	Compliance	EIA Report Page No.
	impact study due to mining operations carried out in the quarry specifically with reference to the specific environment in terms of soil health, biodiversity, air pollution, water pollution, climate change and flood control & health impacts and its mitigation measures. Accordingly, the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind.	anticipated impacts of the Project on the environmental components and their mitigation measures. Accordingly, EMP has been formulated and submitted in Chapter 10.	234-240
18	Rain water harvesting management with recharging details along with water balance (both monsoon & non-monsoon) be submitted.	The Water Balance Diagram is given as Fig. 2.8. Mine Pits dewatering quantity Minimum was about 754 KLD during Apr. 2023-Mar. 2024 Period (Table 4.9) with Non-monsoon Season Discharge-Avg. of 725 KLD and Monsoon Season Discharge-Avg. of 840 KLD.	108 195
19	Land use of the study area delineating forest area, agricultural land, grazing land, wild life 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 phase and submitted. Impact, if any, of change of land use should be given.	Satellite Imagery/data (dated 14.03.2022) is used (Fig. 3.5) land use mapping (Fig. 3.6).	150-153
20	Details of the land for storage of Overburden/ Waste Dumps (or) Rejects outside the mine lease area such as extent of land area distance from mine lease, its land use, R&R issues, if any, should be provided.	Existing Dump details are dealt in Para 2.8. Entire OB quantity in the Dumps will be rehandled and utilized for backfilling in the ROMP period. Thus, there will be no Top Soil Dump or OB Dump in the Lease at the end. No R&R due to the Proposal.	104 76
21	Proximity to Areas declared as 'Critically Polluted' (or) the Project areas which attracts the court restrictions for mining operations, should also be indicated and where so required, clearance certifications from the prescribed authorities, such as the TNPCB (or) Dept. of Geology and Mining should be secured and furnished to the effect that the proposed mining activities could be considered.	Project area does not fall in Critically Polluted Industrial Clusters listed by CPCB. There is no court restrictions / litigation for the mining operations.	109 76
22	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting	About 14.00 Ha will be Backfilled & Reclaimed and balance 25.17 Ha will be left	104

Sl. No.	Awarded TOR	Compliance	EIA Report Page No.
	proposed in the Project. If any, should be provided.	out as water reservoir (Fig. 2.7) for harvesting Rain water and recharge the ground water-table.	
23	Impact on local transport infrastructure due to the project should be indicated.	Traffic study details are provided in Para 4.3.5.	188-190
24	A tree survey study shall be carried out (nos., name of the species, age, diameter etc.) both within the mining lease applies area & 300 m buffer zone and its management during mining activity.	So far, about 19.70 Ha is brought under green belt (including Dumps) with 44,980 trees @ 2,283 plants per Ha and survival rate is about 90% (Table 2.9). Herbs and shrubs are also made besides tree plantation – Para 2.11. About 216 trees along the common boundaries & OB Dumps are already transplanted in PNR Old Crusher area and maintained as such (Plate VII).	106 104
25	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site specific.	Para 2.9 & Fig. 2.7	104-105
26	Public Hearing points raised and commitments of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project and to be submitted to SEIAA/SEAC with regard to the Office Memorandum of MoEF&CC accordingly.	To be incorporated after the Public Hearing.	-
27	The Public Hearing advertisement shall be published in one major National daily and one most circulated vernacular daily.	To be complied.	-
28	The PP shall produce/display the EIA report, Executive summary and other related information with respect to public hearing in Tamil Language also.	Summary EIA Reports (both in English and Tamil versions) along with Draft EIA Report are submitted for the Public Hearing.	-
29	As part of the study of flora and fauna around the vicinity of the proposed site, the EIA coordinator shall strive to educate the local students on the importance of preserving local flora and fauna by involving them in the study, wherever possible.	Para 3.9 provides the details on Flora & Fauna of Core & Buffer Zones with EMP measures in Chapter 10.	154-168 234-240
30	The purpose of Green belt around the project is to capture the fugitive emissions, carbon sequestration and to attenuate the noise gathered, in addition to improving the aesthetics. A wide range of indigenous plant	Para 2.11 provides the details.	106

Sl. No.	Awarded TOR	Compliance	EIA Report Page No.
	species should be planted as given in the appendix-I in consultation with the DFO, State Agriculture University and local school/college authorities. The plant species with dense/moderate canopy of native origin should be planted in a mixed manner.		
31	Taller/one year old saplings raised in appropriate size of bags; preferably eco-friendly bags should be planted as per the advice of local forest authorities/botanist/Horticulturist with regard to site specific choices. The proponent shall earmark the greenbelt area with GPS coordinates all along the boundary of the project site with at least 3 meters wide and in between blocks in an organized manner.	Para 2.11 provides the details.	106
32	A disaster management plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period.	DMP is dealt in Para 7.3.	229-232
33	A Risk Assessment and management plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period.	Paragraphs 7.1 & 7.2 provide the details.	228
34	Occupational Health Impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of the pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The Project specific Occupational Health mitigation measures with required facilities proposed in the mining area may be detailed.	Occupational Health Surveillance Programme is being carried out for all the Mine Employees periodically – Para 4.3.12.	211
35	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.	Public health details are provided under Para 3.10.	178
36	The Socio-economic studies should be carried out within a 5 km buffer zone from the mining activity. Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	Para 3.10 and Tables 3.40 – 3.46.	168 171-177
37	Details of litigation pending against the project, if any, with direction/order passed by the Court of Law against the Project should	No litigation against the Project.	76

Sl. No.	Awarded TOR	Compliance	EIA Report Page No.
	be given.		
38	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.	Chapter 8.0 provides the benefits of the project on environmental, social, economic, employment potential, etc.	233
39	If any quarrying operations were carried out in the proposed quarrying site for which now the EC is sought, the Project Proponent shall furnish the detailed compliance to EC Conditions given in the previous EC with the site photographs which shall duly be certified by MoEF&CC, Regional Office, Chennai (or) the concerned DEE/TNPCB.	CCRs are issued by IRO, Chennai for Periyagalur Mine EC vide Letter F.No. EP/12.1/940/TN/542 dated 18.04.2024 (<u>Document-1</u>) and for Periyagalur West Mine EC vide Letter F.No. EP/12.1/2016-17/SEIAA/30/TN/1057 dated 15.07.2024 (<u>Document-2</u>). All the EC conditions are complied and no Non-compliance as certified.	74 270-340
40	The PP shall prepare the EMP for the entire life of mine and also furnish the sworn affidavit stating to abide the EMP for the entire life of mine.	As per SEAC Guidelines, Capital EMP Budget arrived is Rs.6.70 Lakhs and Rs.11.27 Lakhs per Annum as EMP Operating Cost (Table 10.2).	237-240
41	Concealing any factual information or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this Terms of Conditions besides attracting penal provisions in the Environment (Protection) Act, 1986.	Agreed. Factual informations submitted.	-

II. Additional TORs by SEIAA-TN

Sl. No.	Awarded TOR	Compliance	EIA Report Page No.
1	As per Tamil Nadu Minor Mineral Concession Rules, 1959 a safety distance of 50 Mts, from the highways and railway lines should be left and maintained. The proposed mine lease area is abutting the State Highway 139; the proponent is requested to leave the tail end area in the Lease II area in the western side of the proposed site for a distance of 150m considering the safety aspects of the vehicles playing through the State Highway 139 and accordingly revise the mining plan. Further, Environmental Impact Assessment specific to the State Highway 139 and may be furnished along with EIA Report due to the proposed mining activity.	State Highway (SH)-139 (Ariyalur-V.Kaikatti-Jayamkondam Section) is passing in east-west direction in southern boundary of the PNR-West Mine (Lease-II) and a Safety Distance of 50 m has already been provided as per GO, approved Mining Plan & MCR 1959. The Department of Mining Engineering, Anna University carried out the detailed Study on the safety aspect of Vehicular Traffic in SH-139 and recommended 50 m buffer.	181-183
2	Furnish Hard copy of Environmental and Land use plan (Scale 1:10,000), Quarry Lease Plan & Surface Plan (Scale 1:1000), Topography, Geological Plan, Five Year wise Development & Production Plan & Sections (Scale 1:1000) approved in the Mining Plan.	IBM Approved Plans are submitted as Figs. 2.1-2.7.	94 98-102 105
3	<p>Mining Operations/Process:</p> <p>i. Appropriate mining process and machinery (viz. right capacity, fuel efficient) should be selected to carry out various mining operations that generate minimal dust/air pollution, noise, wastewater and solid waste.</p> <p>ii. Details regarding mitigation steps taken in the existing Lease area to assess and quantify emission load generation (in terms of air pollution, noise, waste water and solid waste) from each of the mining activity (including transportation) on annual basis.</p> <p>iii. Action plan to eliminate/ minimize generation of air pollution/dust, noise, waste water, solid waste generation in successive years through use of better technology for the proposed amalgamated lease area.</p> <p>iv. The PP shall explore the possibilities of providing Digital processing of the entire lease area for the existing pit using remote sensing technique.</p>	<p>(i) The List of Machineries proposed are given in Table 2.6.</p> <p>(ii) Air pollutant emissions are predicted by using standard equations given in 'Indian Mine and Engineering Journal' and suggested by USEPA (Emission Factors as referred in AP-42) for Mining and Allied activities.</p> <p>(iii) Non-conventional method of Mining is to be adopted preferably. Controlled Drilling & Blasting is being practiced whenever required. On Amalgamation of the Mine, about 1245 KLD mine pit seepage water realization will be there. . As in current practice, the pumped out water from Settling Tanks, after 20 KLD consumption for Mine use, will be utilised for Irrigation (Agricultural) activities in eastern side.</p> <p>(iv). DGPS survey completed.</p>	103 202-203 90 195 199 -

Sl. No.	Awarded TOR	Compliance	EIA Report Page No.
	v. The measures taken to monitor the land use pattern and mining activity for the proposed amalgamated site.	(v) Progressive Mine Closure Plan as approved by IBM.	104
4	<p>Water /Wastewater:</p> <p>i) The mining operations should be restricted to above ground water table and it should not intersect groundwater table.</p> <p>ii) However, if enough resources are estimated below the ground water table, the same may be explored after conducting detailed geological studies by GSI and hydro-geological studies by SGWB or NIH or institute of national repute, and ensuring that no damage to the land stability/water aquifer system shall happen.</p> <p>iii) The details/ outcome of such study may be reflected/ incorporated in the EIA/EMP report of the mine appropriately.</p> <p>iv) The existing mining pit Lease I (35.96 Ha) has intersected the Ground water table. The mitigation measures and Hydro geological report regarding the impact of mining on Ground water quality in the mine lease area and the surrounding water bodies within 1km radius shall be furnished.</p> <p>v) The NOC obtained for intersection of Ground water in the Lease I area from the Central Ground Water Authority (CGWA)/ Concerned Local Authority shall be furnished.</p> <p>vi) The depth and the date at which the Ground Water intercepted the mine Lease Area.</p> <p>vii) The remediation measures that were taken after the interception of ground water due to mining activity in the existing Lease I area.</p> <p>viii) The Water quality analysis report of the mine pit water utilized for raw water demand and for raising agricultural crops.</p> <p>ix) The details regarding the pre-treatment provided for the mine pit water utilized for raising agricultural crops.</p> <p>x) The details about the extent of land for which the mine pit water was utilized for raising the agricultural crops till date shall be furnished.</p> <p>xi) Provisions for regular monitoring of ground water level and its quality</p>	<p>Existing PNR mine has already intersected the GWT. As reserves established and approved, mining will be upto 92 m BGL.</p> <p>(ii) A detailed hydro-geological study has been conducted and submitted.</p> <p>(iii) Covered under Para 4.3.7.</p> <p>(iv) Plate VIII. The levels were found to be 8.14 m BGL to 22.30 m BGL while it was 15.50 m BGL at PNR Mine. The anticipated cone of depression in such aquifers with low T values will be highly localized, and does not spread beyond the Mine due to poor permeability of limestone aquifer.</p> <p>(v) RCL has applied to State Ground Water Department (SGWB), WRO, Taramani, Chennai for NOC for dewatering. However, the Applications are still under the Department perusal for want of State Govt. Policy or direction.</p> <p>(vi) Based on the mine workings, the Ground water-table level in the mine vicinity is at 40 m BGL during Postmonsoon & 45 m BGL during Premonsoon periods.</p> <p>(vii, ix & x) Mine Pits dewatering quantity was about 754 KLD during Apr. 2023-Mar. 2024 Period. The pumped out water from Settling Tanks, after 20 KLD consumption for Mine use, is being utilised for Irrigation (Agricultural) activities in eastern side for about 46 Ha. About 26 Families are the beneficiaries.</p> <p>(viii, xi & xii) : Existing monitored WQ Data are provided under Para 6.3.</p> <p>(xiv) Area of excavation at the end of the life of the mine will be 39.17 Ha, out of which about 14.00 Ha will be Backfilled & Reclaimed and balance 25.17 Ha</p>	<p>90</p> <p>Doc-9 191-201</p> <p>140</p> <p>196-198</p> <p>199</p> <p>195</p> <p>214 218-223</p> <p>104</p>

Sl. No.	Awarded TOR	Compliance	EIA Report Page No.
	<p>provided for the existing lease area and for the proposed amalgamated lease area shall be furnished.</p> <p>xii) Details about the network of existing wells and piezometers provided for monitoring the existing Lease I area.</p> <p>xiii) The project proponent shall furnish the contour map of the water table detailing the number of well located around the lease mine area and its impact on the wells due to mining activity.</p> <p>xiv) Details regarding suitable conservation measures to augment ground water resources in the existing Lease area undertaken as per the guidelines of Central Ground Water Board (CGWB) may be furnished.</p> <p>xv) Appropriate mitigation measures (viz. STP, garland drains, retaining walls, collection of runoff etc..) taken to prevent pollution of nearby river/other water bodies for the existing Lease area.</p> <p>xvi) Water Quality Analysis study conducted by Tamil Pollution Control Board to ensure quality of surface and ground water sources on regular basis for the existing Lease Area shall be furnished.</p> <p>xvii) Details regarding the study of quality of surface and ground water sources along with the frequency in which test was conducted by NABL/NABET approved water testing laboratory for the existing lease mine area shall be furnished.</p> <p>xviii) Provisions provided to trap silt originating due to mining activity from entering into the surface water course or any other water body.</p> <p>xix) Appropriate measures for prevention and control of soil erosion and management of silt undertaken for the existing lease area.</p> <p>xx) Details of Quantity of silt/soil generated in the existing lease area, measured on regular basis shall be furnished.</p> <p>xxi) Provision of retaining walls for dumps for protection. Measures taken to prevent erosion from dumps site. Details of plantation carried out at the dump slopes.</p>	<p>will be left out as water reservoir for recharging the ground water table in the vicinity. (xv, xvi, xvii, xviii, xix, xx, xxii & xxiii)- Para 6.3.</p> <p>(xxi) Existing OB Dumps are being rehandled for backfilling the mined out voids.</p> <p>(xxiv) Table 4.11</p>	<p>218-223 142-143</p> <p>104</p> <p>199</p>

Sl. No.	Awarded TOR	Compliance	EIA Report Page No.
	<p>xxii) Details about trenches/garland drain provided in the existing OB Dump site. Detailed report regarding de-silting at regular intervals carried out.</p> <p>xxiii) Details regarding source of water utilized for Green Belt development, haul roads shall be furnished. The water source for above mentioned activity for the proposed amalgamated lease area may also be furnished.</p> <p>xxiv) Water balance diagram prepared on monthly basis for efficient consumption/utilization in different activities shall be furnished for existing lease area.</p>		
5	<p>Land / Soil / Overburden:</p> <p>i) The details about top soil stored at earmarked site(s) for the existing Lease area shall be furnished.</p> <p>ii) Furnish the report of slope stability study conducted on the existing OB Dump site as per IBM approved mine plan and DGMS guidelines.</p> <p>iii) The preventive measures adopted at OB dump site to prevent erosion and surface run off for the existing Lease area.</p> <p>iv) The preventive measures adopted at OB dump site for stabilization of the dump in critical areas.</p>	<p>(i) Topsoil of 332,600 Tons was removed and 301,022 Tons was used for Green Belt development. Balance 31,578 Tons Topsoil was stacked & maintained at the earmarked site (0.17 Ha) and will be used for rehabilitation of backfilled areas during the Plan Period.</p> <p>(ii to iv) There are 4 Nos. OB Dumps with 23,68,205 Tons OB. Existing OB Dumps are being rehandled for backfilling the mined out voids.</p>	Para 2.8 104
6	<p>Stage wise reclamation plan of the mine up to the period of conceptual pit limit shall be provided.</p>	<p>Area of excavation at the end of the mine will be 39.17 Ha, out of which about 14.00 Ha will be Backfilled & Reclaimed and balance 25.17 Ha will be left out as water reservoir – Para 2.9.</p>	104
7	<p>The PP shall explore the possibilities of organizing employment-based apprenticeship/ internship training program every year with appropriate stipend for the youth and other programs to enhance the skill of the local people. The data shall be maintained for the training imparted to the persons and the outcome of the training for the assessment of the training program which should be analyzed periodically.</p>	Plates XIII & XIV	209-210
8	<p>Details regarding occupational health check-up of 1/3 of the persons conducted every year may be furnished.</p>	Details provided in Para 4.3.12	211
9	<p>The proponent shall shift (or) shall leave safety distance for the Low/high tension</p>	<p>Details provided in Para 1.7. Five Low Tension Power Lines</p>	82

Sl. No.	Awarded TOR	Compliance	EIA Report Page No.
	line in the proposed mining area accordingly as recommended in precise area communication & Mine plan approval before executing mine lease and obtaining CTO from the TNPCB.	are rerouted/shifted away from the Lease boundary.	
10	A High-Tension Power Line located within the mining lease area on the eastern side passing North East – South West direction was proposed to be rerouted away from the lease area. The current status of the proposal shall be furnished along with the time frame in which the High-Tension power line will be rerouted.	Details provided in Para 1.7. The High Tension Power Line located within the ML area on the eastern side passing Northeast – Southwest direction is rerouted away from the Lease area.	82
11	The current status of proposal to reroute/shift Five Low Tension Power Lines along with the time frame in which the power lines will be rerouted /shifted shall be furnished.	Details provided in Para 1.7. Five Low Tension Power Lines are rerouted/shifted away from the Lease boundary	82
12	The current status of proposal to reroute a road approaching to Chinnanagalur village located on the South-Western side of the Lease boundary in consultation with District Authorities shall be furnished.	Details provided in Para 1.7. It is proposed to be rerouted from SH-139 along the existing dump area and the consultation with the District Authorities is underway.	82
13	No trees in the area should be removed all the trees numbered and protected. In case trees fall within the proposed quarry site the trees may be transplanted in the Greenbelt zone.	About 216 trees along the common boundaries & OB Dumps are already transplanted in PNR Old Crusher area and maintained as such (Plate VII).	106-107
14	The AD/DD. Dept. of Geology & Mining shall ensure operation of the proposed quarry after the submission slope stability study for the ultimate depth as per approved mining plan conducted through the reputed research & Academic Institutions such as NIRM, IITs, NITS Anna University, and any CSIR laboratories etc.	NITK, Surathkal, carried out the Study on Slope Stability of existing benches. Safety measures are recommended.	Doc-8 430 186-187
15	The AD/DD. Dept. of Geology & Mining & Director General of Mine safety shall ensure strict compliance and implementation of bench wise recommendations /action plans as recommended in the scientific slope stability study of the reputed research & Academic Institutions as a safety precautionary measure to avoid untoward accidents during mining operation.	NITK, Surathkal, carried out the Study on Slope Stability of existing benches. Safety measures are recommended.	Doc-8 430 186-187
16	The Proponent shall ensure that the activities should in no way result in disturbance to forest and trees in vicinity.	Parts of Managethi RF (6.6 km in east), Vannankurichi RF (7.0 km in NE), Kallankuthu RF (10.0 km ENE), Vilangudi Extn. RF (8.0 km	86 84-85

Sl. No.	Awarded TOR	Compliance	EIA Report Page No.
		in ESE), Vilangudi RF (8.2 km in ESE), Sundaresapuram RF (9.5 km in SE) and Ulliyakudi RF (10.0 km in SE) fall in the Study Area – All well away from the Mine.	
17	The Proponent shall ensure that the operations shall not result in loss of soil biological properties and nutrients.	Garland drains are connected to the sedimentation tanks of 3 (L) x 3 (W) x 2 m (D) at the corners to settle the solids before final disposal. Periodical desilting of garland drains and sedimentation tanks is made.	214
18	The activity should not result in CO ₂ release and temperature rise and add to micro climate alternations.	Due to mineral transportation, the total CO ₂ Emission due to the Proposal will be 0.045 Tons/Annum.	190
19	The mining closure plan should be strictly adhered with appropriate soil reclamation measures to ensure ecological stability of the area.	Approved PMCP will be adhered.	104
20	Reclamation/Restoration of the mine site should ensure that the Geotechnical, physical, chemical properties are sustainable that the soil structure composition is build-up, during the process of restoration.	Soil amendments as required will be carried out to improve soil health. Bio remediation using micro organisms will be carried out to restore the soil environment.	236
21	The Proponent shall ensure that the activity does not disturb the movement of grazing animals and free ranging wildlife.	There is no grazing land nearby.	87
22	The Proponent shall ensure that the activity does not disturb the biodiversity, the flora & fauna in the ecosystem.	Reserved Forests are away from the Lease.	86
23	The Proponent shall ensure that the activity does not disturb the water bodies and natural flow of surface and ground water, nor cause any pollution, to water source in the area.	Recharge cum Settling Pond of 100 (L) x 50 (W) x 2 m (D) is made in the eastern side of the Lease area to collect the surface runoffs through garland drains. Water collected in the settling pond is utilized for green belt and dust control measures. Excess water is drained to nearby irrigation pond for raising agricultural crops in nearby areas.	214
24	The Proponent shall ensure that the activities undertaken should not result in carbon emission, and temperature rise, in the area.	Due to mineral transportation, the total CO ₂ Emission due to the Proposal will be 0.045 Tons/Annum.	190
25	The Proponent shall ensure that the mine closure plan are followed as per mining plan and the mine restoration should be	Approved PMCP & CP will be adhered. Bio remediation using micro organisms will be carried	104

Sl. No.	Awarded TOR	Compliance	EIA Report Page No.
	done with native species, and site restored to near original status.	out to restore the soil environment.	
26	The Proponent shall ensure that Monitoring be carried out with reference to the quantum of particulate matter during excavation; blasting; material transport and also from cutting waste dumps and haul roads.	The Drilling & Blasting, Excavating, Loading, Unloading, Transporting and Rehandling activities are considered.	202-203
27	The Proponent shall ensure that the area is ecologically restored to conserve the ecosystems and ensure flow of goods and services.	Area of excavation at the end of the life of the mine will be 39.17 Ha, out of which about 14.00 Ha will be Backfilled & Reclaimed and balance 25.17 Ha will be left out as water reservoir for recharging the ground water table in the vicinity.	104
28	The Proponent shall ensure that the activities shall not disturb the agro biodiversity and agro farms.	The mine pit water, after TSS settlement, is discharged for Agricultural activities nearby.	195
29	The Proponent shall ensure that the activity shall not result in invasion by invasive alien species.	There is no invasion of any invasive alien species.	236
30	Actions to be taken to promote agro forestry, mixed plants to support biodiversity conservation in the mine restoration effort.	Fruit bearing trees may also be preferred	236
31	The Proponent shall ensure that activity shall not deplete the indigenous soil seed bank and disturb the mycorrhizal fungi, soil organism, soil community nor result in eutrophication of soils and water.	Garland Drains and Settling Tanks will be maintained and desilted periodically. The desilted quantity from the Garland Drains will be used for Green Belt/Afforestation	214
32	The activities should not disturb the soil properties and seed and plant growth. Soil amendments as required to be carried out to improve soil health.	Soil amendments as required will be carried out to improve soil health. Bio remediation using micro organisms will be carried out to restore the soil environment to enable carbon sequestration	236
33	Bio remediation using microorganisms should be carried out to restore the soil environment to enable carbon sequestration.	SOM is a complex mixture of carbon compounds, consisting of decomposing plant and animal tissue, microbes (protozoa, nematodes, fungi, and bacteria), and carbon associated with soil minerals. It will be ensured that Plant operations do not result in loss of soil biological properties and nutrients.	236
34	The Proponent shall ensure that all mitigation measure listed in the EIA/EMP	EMP measures are proposed to protect the biodiversity and natural resources in the area.	234-240

Sl. No.	Awarded TOR	Compliance	EIA Report Page No.
	are taken to protect the biodiversity and natural resources in the area.		
35	The Proponent shall ensure that the activities should not impact the water bodies/wells in the neighboring open wells and bore wells.	There is no impact on water bodies.	191
36	The Proponent shall ensure that the activities should neither in any way affect the water quantity and quality in the open wells and bore wells in the vicinity nor impact the water table and levels.	There is no impact on quantity and quality in the open wells and bore wells in the vicinity	191
37	The Proponent shall ensure that in the green belt development more indigenous trees species (Appendix as per the SEAC Minutes) to be planted.	Native species are preferred.	236
38	The Proponent shall ensure that the activities should not disturb the resident and migratory birds.	There is no migratory corridor in the mine vicinity.	207
39	The Proponent shall ensure the area should be restored and rehabilitated with native trees as recommended SEAC Minuets (in Appendix).	Native species are preferred and planted.	236
40	The Proponent shall ensure that the mine restoration should be done using mycorrhizal VAM, vermicasting, Bio fertilizers to ensure soil health and, biodiversity conservation.	Carbon compounds, consisting of decomposing plant and animal tissue, microbes (protozoa, nematodes, fungi, and bacteria), and carbon associated with soil minerals. It will be ensured that Plant operations do not result in loss of soil biological properties and nutrients.	190
41	The Proponent shall ensure that the topsoil should be protected and used in planting activities in the area.	Balance 31,578 Tons Topsoil was stacked & maintained at the earmarked site (0.17 Ha) and will be used for rehabilitation of backfilled areas during the Plan Period.	104
42	The Proponent shall ensure that the activities should not disturb the river flow, nor affect Odai, Water bodies, Dams in the vicinity.	There is no impact on water bodies.	191
43	The Proponent shall ensure that the activities should not disturb the vegetation and wildlife in the adjoin reserve forest and area around.	Reserved Forests are away from the Lease.	86
44	The Proponent should ensure that there is no disturbances to the agriculture plantations, waste lands, forests, sanctuary or national parks. There should be no impact on the land, water, soil and biological environment and other natural resources due to the mining activities.	There is no impact on the land, water, soil and biological environment and other natural resources due to the mining activities.	180-211

Sl. No.	Awarded TOR	Compliance	EIA Report Page No.
45	The Proponent shall ensure that topsoil to be utilized for site restoration and Green belt alone within the proposed area.	Balance 31,578 Tons Topsoil was stacked & maintained at the earmarked site (0.17 Ha) and will be used for rehabilitation of backfilled areas during the Plan Period.	104
46	The Proponent shall ensure that activities should not impact green lands/grazing fields of all types surrounding the mine lease area which are food source for the grazing cattle.	There is no impact on surrounding land use due to the mine.	187

III. Standard Terms of Reference

Sl. No.	Standard TOR	EIA Report Page No.
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 increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.	Para 1.5 74-75 No violation in EC Qty.
2	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	68 Doc-3; 341
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 and mining technology and should be in the name of the lessee.	Complied. All documents are compatible
4	All corner coordinates of the mine lease area, superimposed on a high Resolution Imagery/Topo sheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	84-86
5	Information should be provided in Survey of India Top sheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing mineral and mining history of the area, important water bodies, streams and rivers and soil characteristics.	84-85
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 mining should have approval from State land use board or the concerned authority.	Existing mines being amalgamated
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 shareholders at large, may also be detailed in the EIA Report.	70
8	Issues relating to Mine Safety, including subsidence study in case of underground mining and slope in case of opencast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.	183-185
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.	109-110 91
10	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary and 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.	150-153 104
11	Details for the land 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.	No external dump & No R&R - 76
12	A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of the 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	Not Applicable; No Forest land is involved. 14-15

Sl. No.	Standard TOR	EIA Report Page No.
	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.
14	Implementation status of recognition of forest rights under the Schedule Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.	Not Applicable.
15	Vegetation in the RF / PF areas in the study area, with necessary details should be given.	154
16	A study shall be got done to ascertain in 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.	Not Applicable; No wildlife sanctuary exists in 10 km
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 location map duly authenticated by Chief Wildlife Warden. Necessary Clearance as may be applicable to such projects due to the proximity of ecologically sensitive areas as mentioned above, should be Obtained from the Standing Committee of National Board of Wildlife and copy furnished.	Not Applicable; No eco sensitive zone within the Study Area
18	A detailed biological study for 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, duly authenticated, separately for core and buffer zone should be furnished based on primary field survey clearly indicating the Schedule of the fauna present.	154-168 14-15
19	Proximity to Area declared as 'Critically Polluted' or the Project areas likely to come under the "Aravali Range", (attracting court restrictions for mining operations), should also be indicated and where so required, clearance clarifications from the Prescribed authorities, such as the SPCB or State Mining Department should also be secured and furnished to the effect that the proposed mining activities could be considered.	Nil 109
20	Similarly, for coastal projects, A CRZ map duly authenticated by one of the authenticating 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 approved of the concerned Coastal Management Authority)	Not Applicable 109
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 undertaken to assess their requirements, and action programmes prepared and submitted accordingly, interacting with sectoral 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 issue relating to shifting of village(s) inducing their R&R and Socio-Economic aspects should be discussed in the report.	58 No R&R issue
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 fauna shall be collected and AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific Metrological data should also be collected. The locations of the monitoring stations should be such as to represent whole of the study area and justified	Winter Season (Dec. 2023- Feb.2024) Data 109-179 118-122

Sl. No.	Standard TOR	EIA Report Page No.
	keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be atleast 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.	123 136
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 predominant wind direction may also be indicated on the map.	202-206 122
24	The water requirement for the project, its availability and source to be furnished. A detailed water balance should also be provided. Fresh water requirement for the project should be indicated.	108
25	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the project should be provided.	195-198
26	Description of water conservation measures proposed to be adopted in the project should be given. Details of rainwater harvesting proposed, if any, in the project should be provided.	195 & 199
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.	191-201
28	Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect the 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 the mining activities on these aquifers. Necessary permission from Central Groundwater Authority for working below ground water and for pumping of groundwater should also be obtained and furnished.	83 191-201 Doc-9-466
29	Details of any stream, seasonal or otherwise, passing through lease area and modification / diversion proposed, if any and the impact of the same on the hydrology should be brought out.	Nil Existing Mines
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.	83
31	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear 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 with local and native species which are tolerant to pollution.	104 106
32	Impact on local transport infrastructure due to the project should be indicated. Projected increase in truck traffic as a result of the project in the present road network (including those outside the project area) should be worked out, indicating whether it is capable of handling the increased 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.	188-189
33	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	108
34	Conceptual post mining land use and Reclamation and Restoration of mined out	104-105

Sl. No.	Standard TOR	EIA Report Page No.
	Areas (with plans and with adequate number of sections) should be given in the EIA report.	
35	Occupational health impact of project should be anticipated and preventive measures initiated. Details in this regard should be provided. Details of preplacement 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 detailed.	211
36	Public health implication 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 allocation.	178
37	Measures of socio economic significance and influence to the local community proposed to be provided by project proponent should be indicated. As far as possible, quantitative dimensions may be given with time frame for implementation.	207-210
38	Detailed Environmental Management Plan (EMP) to mitigate the environmental 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.	234-240
39	Public hearing points raised and commitment of the project proponent on the same along with time bound action plan to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.	To be complied
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.	Nil 76
41	The cost of the project (capital cost and recurring cost) as well as the cost towards implementation of EMP should clearly be spelt out.	237
42	A Disaster Management Plan shall be prepared and included in the EIA/EMP of Report.	229-232
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.	233
44	Besides the above, the below mentioned general points should also be followed:-	
(a)	Executive summary of the EIA/EMP Report.	241-262
(b)	All documents may be properly referenced with index and continuous page numbering.	Complied
(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.	Complied
(d)	Project Proponent shall enclose all the analysis/testing reports of water, soil, noise, etc. using the MoEF&CC/NABL accredited laboratories. All the original/testing reports should be available during the appraisal of Project.	Complied
(e)	Where the documents provided are in a language other than English, an English translation should be provided.	Complied
(f)	The Questionnaire for environmental appraisal of mining projects as prescribed by the Ministry shall also be filled and submitted.	Complied with
(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-11013/41/2006-1a.II(I) dated 4 th August, 2009, which are available on the website of this Ministry, should be followed.	10 & 11
(h)	Changes, if any made in the basic scope and project parameters(as submitted in Form-I and the Feasibility Report for securing the TOR) should be brought to the attention of MoEF&CC/SEIAA 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 PH process) will entail conducting the PH again with the revised Documentation.	Complied
(i)	As per the circular no. J-11011/618/2010-IA.II(I) dated 30.05.2012, certified	Complied

Sl. No.	Standard TOR	EIA Report Page No.
	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 many be applicable.	Docs 1 & 2 270-340
(j)	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.	Complied 94
	In addition to the above the following shall be furnished:-	
	Executive Summary of EIA/EMP Report in about 8-10 pages should be prepared incorporating the information on following points:	241-262
1	Project name and location (Village, District, State, Industrial Estate (if applicable)).	243
2	Process description in brief, specifically indicating the gaseous emission, liquid effluent and solid and hazardous wastes.	245
3	Measures for mitigating the impact on the environment and mode of discharge or disposal.	256
4	Capital cost of the project, estimated time of completion.	262
5	The Proponent shall furnish the contour map of the water table detailing the number of wells located around the site and impacts on the wells due to mining activity.	139 142, 143 255
6	A detailed study of the lithology of the mining lease area shall be furnished.	93
7	Details of village map, "A" register and FMB sketch shall be furnished.	243
8	Detailed mining closure plan for the proposed project approved by the Geology of Mining Department shall be submitted along with EIA report.	256
9	Obtain a letter/ certificate from the Assistant Director of Geology and Mining standing that there is no other Minerals/resources like sand in the quarrying area within the approved depth of mining and below depth of mining and the same shall be furnished in the EIA report.	Limestone established upto 92 m BGL
10	EIA report should strictly follow the Environmental Impact Assessment Guidance Manual for Mining Minerals published February 2010.	Complied
11	Detail plan on rehabilitation and reclamation carried out for the stabilization and restoration of the mined areas.	No R&R 245
12	The EIA study report shall include the surrounding mining activity, if any.	248-249
13	Modeling study for Air, Water and noise shall be carried out in this field and incremental increase in the above study shall be sustained with mitigation measures.	256
14	A study on the geological resources available shall be carried out and reported.	245
15	A specific study on agriculture & livelihood shall be carried out and reported.	257
16	Impact of soil erosion, soil physical chemical and biological property changes may be assumed.	257
17	Site selected for the project – Name of land – agricultural (single/double crop), barren, Govt./Private land, Status of its acquisition, nearby (in 2-3 k.m) water body, population, within 10 km, other industries, forest, eco-sensitive zones, accessibility, (note – in case if industrial estate this information may not be necessary)	Existing Mine 245 248-249
18	Baseline environmental data – air quality, surface and ground water quality, soil characteristic, flora and fauna, socio-economic condition of the nearby population.	250-252

Sl. No.	Standard TOR	EIA Report Page No.
19	Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.	258
20	Likely impact of the project on air, water. Land flora fauna and nearby population.	253-257
21	Emergency preparedness plan in case of natural or in plant emergencies.	258
22	Issues raised during public hearing (if applicable) and response given.	To be complied
23	CER plan with proposed expenditure.	262
24	Occupational health measures	261
25	Post Project monitoring plan.	258
26	The Project Proponent shall carry out hydro geological study through institutions /NABET accredited agencies.	256
27	A detailed report on the green belt development already undertaken is to be furnished and also submit the proposal for green belt activities.	261
28	The proponent shall propose the suitable control measure to control the fugitive emissions during the operations of the mines.	259-260
29	A specific study should include impact on flora & fauna, disturbance to migratory pattern of animals.	Nil 248-249
30	Reserve should be earmarked for proper closure plan.	245
31	A detailed plan on plastic waste management shall be furnished. Further, the proponent should strictly comply with, Tamil Nadu Government order (Ms) No. 84 Environment and Forests (EC.2) Department dated 25.06.2018 regarding ban on one time use and throw away plastics irrespective of thickness with effect from 01.01.2019 under Environment (Protection) act, 1986. In this connection, the project proponent has to furnish the action plan.	262

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

(a)	A note confirming compliance of the TOR, with cross referencing of the relevant / pages of the EIA report should be provided.	Complied 45-66
(b)	All documents may be properly referenced with index, page numbers and continuous page numbering.	Complied
(c)	Where data are presented especially in the tables, the period in which the data were collected and the sources should be indicated.	Complied
(d)	While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA.II(I) dated 4 th August, 2009, which are available on the website of Ministry should also be followed.	Complied 10 & 11
(e)	The consultants involved in the preparation of EIA / EMP report after accreditation with Quality Council of India (QCI) / National Accreditation Board of Education and Training (NABET) would need to include a certificate in this regard the EIA / EMP reports prepared by them and data provided by other organization / Laboratories including their status of their approvals etc. In this regard circular no F.No.J-11013/77/2004-IA-II(I) dated 2 nd December, 2009, 18 th March 2010, 28 th May 2010, 28 th June 2010 & 30 th September 2011 posted on the Ministry's website http://www.moef.nic.in may be referred.	Complied 248

1.0 Introduction

1.1 Purpose of the Report

M/s. The Ramco Cement Limited (RCL) is operating its Govindapuram Cement Plant near Ariyalur for 3.62 MTPA Clinker & 5.50 MTPA Cement production. The Plant requires about 6.5-7.0 MTPA of different grade Limestone and Kankar depending on the production. The existing Captive Mines viz. Periyanaalur, Periyanaalur-West, Kattupirangium, Reddipalayam, Pudupalayam-North & Usenabad-South Limestone Mines and Illupaiyur & Ottakovil Kankar Quarries in the Ariyalur Region supply the Raw Materials Limestone & Kankar to the Plant.

Periyanaalur Mine (Lease-I; PNR) over an extent of 36.29.5 Ha in Periyanaalur Village was granted to RCL (MCL-Madras Cements Limited at that time) vide GO (3D) No. 2 dated 13.01.2003 for a period of 20 years. Lease Deed was executed for actual worked out Lease Area of **35.960 Ha** on 02.06.2003 with validity from 20.08.2003 to 19.08.2023. Subsequently, extension of mining lease validity upto 50 years has been granted vide GO (Ms) No. 77 dated 26.07.2018 over an extent of 35.96 Ha and is **valid till 19.08.2053**. The supplementary lease deed has been executed and registered on 03.07.2019. First EC dated 26.11.1999 was for 0.105 MTPA Limestone production. The mine was operated for 0.105 MTPA quantity from 2005-06 to 2007-08. Expansion EC dated 10.10.2007 is for 0.90 MTPA (Clean Limestone) production and the mine is operating for this quantity from 2008-09 to till date. Crusher established over an extent of 4.22 Ha in the non-lease area was shifted to RCL Govindapuram Cement Plant. Both Opencast Conventional Mining with controlled Blasting & Non-Conventional Mining Method with X-Centric Rippers are adopted.

Periyanaalur-West Mine (Lease-II; PNR-W) over an extent of **17.360 Ha** in Periyanaalur Village was granted for Limestone & Marl vide GO (Ms) No. 153 dated 23.12.2016 for a period of **50 years**. EC for the production of **0.3 MTPA Limestone & Marl** over an extent of 17.36 Ha was awarded by SEIAA-TN vide Letter No. SEIAA-TN/F.No.-462/2012/EC-45/1(a)/ARY/2016 dated 14.11.2016. Lease Deed is executed on 10.01.2017 with validity from 10.01.2017 to 09.01.2067. Both Opencast Conventional Mining with controlled Drilling & Blasting and Non-Conventional Mining Method with X-Centric Rippers are adopted. Existence of Mineral Marl is not proved.

Need for Amalgamation : The two existing Captive Mines in Ariyalur Region are in Conceptual Stage and will be completely exhausted in another 2 years period. Thus, other Limestone sources are being explored for sustained supply of Limestone to Govindapuram Cement Plant. PNR & PNR-W Leases are located adjacent to each other and are in compact & contiguous nature. With long barriers (550 m long & 35 m depth) between the two leases, about 1.50 Million Tonnes of Limestone reserves would be un-exploited. By amalgamation of both the leases, the Mineable Reserves will be enhanced. Also, '**Common Boundary Workings**' with **Dalmia PNR Mine** is now proposed. Thus, it is proposed to amalgamate both these mining leases.

Amalgamated Periyagalur Mine under GO 126 : The State Government has granted **permission vide GO (Ms.) No. 126 dated 26.02.2021** under Rule 56 of the Minerals (other than Atomic and Hydrocarbons Energy Minerals) Concession Rules, 2016 for amalgamating the two Periyagalur mining leases totalling over an extent of **53.320 hectares** into a single lease for mining Limestone only, duly co-terminus with the Lease Period ending on 19.08.2053. IBM, Chennai has approved the Mining Plan for amalgamated Lease vide its Letter TN/ALR/LST/MP-2079.MDS dated 23.07.2021 for the Period 2020-21 to 2024-25 with its validity till 31.03.2025. With '**Common Boundary Workings**' with **Dalmia PNR Mine** proposed now, the Review of Mining Plan (ROMP) for Plan Period of **2025-26 to 2029-30 is being submitted with updated data** to IBM for its approval.

The established **Mineable Reserves now is 15.85 Million Tonnes**. The mining operation will be carried out by both Opencast Conventional Mining with controlled Drilling & Blasting and Non-Conventional Mining Method with X-Centric Rippers @ **3.00 MTPA**. Limestone production during ROMP period will be **15 Million Tonnes**. Balance Reserves will be mined out in subsequent Plan Period. The **Life of the Mine is 10 years** based on established Reserves now. Ultimate Pit Depth on ROMP Period will be **92 m BGL** from 71 m established in earlier Plan. Mining will intersect the Ground water-table. Fragmented limestone will be loaded by Hydraulic Excavators into Tippers. The Tippers transport limestone to Govindapuram Cement Plant. Limestone transportation will be **in all 3-Shifts** as District Administration restricted Limestone transportation during peak hours of the day in Ariyalur. The Project Cost is **Rs.9.00 Crores**.

The Limestone to be mined out from this Amalgamated Lease is a Major Mineral over an extent of **<250 Ha** and falls in **Category 'B'** of Sl. No. 1(a) of EIA Notification 2006, as amended vide Notification SO 1886(E) dated 20.04.2022, for prior Environmental Clearance (EC) from the State Level Environmental Impact Assessment Authority, Tamil Nadu (SEIAA-TN). Accordingly, RCL has applied for prior EC to SEIAA-TN vide Online Proposal No. **SIA/TN/MIN/76439/2022 on 02.05.2022**. The Proposal under Sl. No. 1(a), Category B1 was deliberated in State Level Expert Appraisal Committee-Tamil Nadu (SEAC-TN) in its 287th Meeting held on 22.06.2022 and in 532nd SEIAA-TN Meeting held on 14.07.2022. Terms of Reference (TOR) for carrying out Environmental Impact Assessment (EIA) Study has been awarded vide **Letter SEIAA-TN/F.No.9220/TOR-1215/2022 dated 14.07.2022 with Public Hearing**.

EIA Consultant, M/s. ABC Techno Labs India Private Limited, Chennai has been accredited for various Sectors including **Sector-1 (Mining Projects) for Category 'A'** by the National Accreditation Board for Education & Training (**NABET**) vide Certificate NABET/EIA/2225/RA0290 dated 11.06.2023 with validity till 16.11.2025 (Sl. No. 4 of List dated 15.07.2024). ABC Laboratory is accredited by the National Accreditation Board for Testing and Calibration Laboratories (**NABL**) vide Certificate No. TC-5770 dated 03.04.2022. EIA Report has been **prepared in compliance with awarded TORs** and submitted. Summary EIA Reports (both in **English and Tamil versions**) along with Draft EIA Report are submitted for Public Consultation & Public Hearing.

1.2 Project Proponent

Ramco Group is one of the leading, highly reputed and Second Largest Industrial Group in South India. It is well diversified in the fields of Cement, Ready Mix Concrete, Cement Fiber Products, Cotton and Synthetic Yarn, Software Systems, Wind Farms, Research & Development, Dry Mortar Plants, Cotton Textiles and Surgical. The total employees are about 15,700 and the Turnover of the Group is Rs.8,000 Crores. The main companies of RAMCO Group are:

- ❖ **M/s. The Ramco Cements Limited** (formerly M/s. Madras Cements Limited).
- ❖ M/s. Rajapalayam Mills Limited.
- ❖ M/s. Ramco Industries Limited.
- ❖ M/s. Ramco Systems Limited.

The Ramco Cements Limited (RCL) is one of the reputed Cement Companies in India. The Company is the Second Largest cement producer in South India and sixth largest manufacturer of cement in the Country. The cement production of RCL is about 17.70 million tons per annum (MTPA) from their **Cement Plants** in India.

- ❖ Ramasamy Raja Nagar near Virudhunagar, Tamil Nadu (established in 1961) with 3 Lines - 2.7 MTPA Cement.
- ❖ Kumarasamy Raja Nagar, near Jaggayyapeta, Andhra Pradesh (1986)-3.65 MTPA (3 Lines).
- ❖ Alathiyur near Vriddhachalam, Tamil Nadu (1997): 3.0 MTPA (2 Lines).
- ❖ Mathod near Chithradurga, Karnataka : 0.3 MTPA (2000; not in operation now).
- ❖ Govindapuram near Ariyalur, Tamil Nadu-5.5 MTPA (2009) (2 Lines).
- ❖ Kolimigundla, Andhra Pradesh (Cement 2.0 MTPA).

RCL is operating **Cement Grinding Units** at:

- ❖ Kolaghat (2.0 MTPA) in West Bengal.
- ❖ Kattuputtur (0.75 MTPA) near Chennai, Tamil Nadu.
- ❖ Valapadi (2.0 MTPA) near Salem, Tamil Nadu.
- ❖ Vizag (2.0 MTPA) near Anakapalli, Andhra Pradesh.
- ❖ Haridaspur (0.9 MTPA), Jajpur District, Odisha.

It is also operating a **Packing Plant** at Nagercoil.

RCL is producing Ordinary Portland Cement (**OPC**), Portland Pozzolana Cement (**PPC**), Slag Cement (PSC), Composite Cement (CC), etc. The cement produced by RCL is marketed in the brand name of 'RAMCO'. The market centers are mainly in Tamil Nadu, Andhra Pradesh, Telangana, Kerala, Karnataka, Odisha and West Bengal States.

RCL which has always been striving for Total Quality, possesses International Certificate **ISO:9001, ISO:14001, ISO:45001 (18001) and ISO:50001**. The company has achieved various awards for '**Best Performance**' in the Cement Industry.

The Ramco Cements Limited is managed by a Board of Directors comprising of eminent personalities as its members. Under the dynamic leadership of **Late Shri.P.R.Ramasubrahmaneya Rajha**, the company has grown into a massive organization. **Shri.P.R.Venketrama Raja** is the **Managing Director (MD)** of the Board. **Shri.A.V.Dharmakrishnan, Chief Executive Officer (CEO)** is heading the Cement Division. Each Unit is headed by a Unit Head in the President Level.

RCL has the well laid down Safety, Health and Environmental (SHE) Policy approved by the CMD. The units are having their **Integrated Management System (IMS)** Policy. The Environmental Management Plan (EMP) Cell is functioning under the Unit Head and Corporate Social Responsibility (CSR) Committee is functioning under the Corporate Office. There is a **Hierarchical System** in the company **to deal with the environmental issues and for ensuring compliance** with the environmental clearance conditions. Any non-compliance/violations of environmental norms and corrective actions taken will be reported by the Unit Heads to EDO & CEO and by CEO to the Chairman, the Board and the Shareholders.

The **Contact information of RCL Corporate Office** is :

Shri.M.Srinivasan,
Executive Director (Operations),
The Ramco Cements Limited,
5th Floor, Auras Corporate Centre,
No. 98A, Dr.Radhakrishnan Road,
Mylapore, Chennai-600 004.
Tel. No. : 044-28478666/28478661/28478656
Fax No. : 044-28478676
e-Mail : ramcoenv@ramcocements.co.in

1.3 Govindapuram Cement Plant

RCL Govindapuram Cement Plant along with its Captive Power Plant (CPP) and Township have been established in an extent of 157.625 Ha in Govindapuram & Aminabad villages, Ariyalur Taluk & District of Tamil Nadu State. The Cement Plant is being operated for **3.62 MTPA Clinker and 5.50 MTPA Cement** production. Captive Power generation is **66 MW**. The statutory approvals for the Plant are listed in **Table 1.1**. The Cement Plant is supported by Captive Limestone Mines in Ariyalur Region (**Table 1.2**). Centralised Crushers are operated at the Cement Plant. The **Plant and Mines operations are in full compliance with the conditions** stipulated in the Environmental Clearances and Consent Orders issued by TNPCB. Regional Setting of the Plant & Mines is shown in **Plate II**.

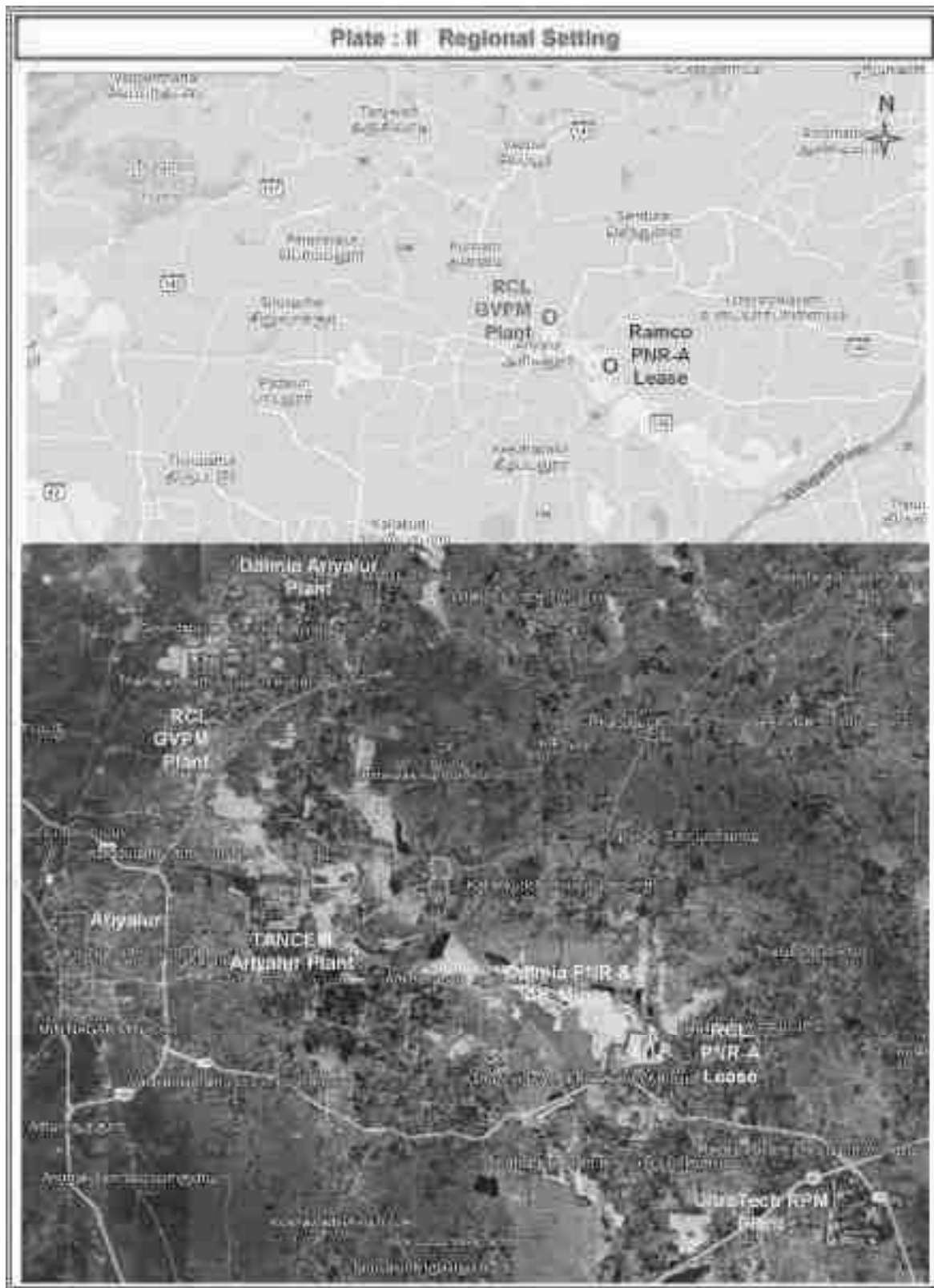


Table : 1.1 RCL Govindapuram Cement Plant & its Statutory Approvals

Production of	Source	Production	MoEF&CC EC References	TNPCB CTOs
Clinker & Cement	Line-I	Clinker 1.55 MTPA & Cement 3.00 MTPA	F. No. J-11011/509/2006 IA.II(I) dt. 24.08.2007	CTO Orders 2307154336340 (Water) & 2307254336340 (Air) dt. 14.11.2023-valid till 31.03.2028
	Line-II	Clinker 1.70 MTPA & Cement 2.50 MTPA	F. No. J-11011/82/2010 IA.II(I) dt. 23.11.2010	
	Lines I & II	Clinker 3.62 MTPA & Cement 5.50 MTPA	NIPL Order T1/TNPCB/F.006053/Ar y/ Cement/2023 dt. 25.07.2023	
Thermal Power Generation	1x40 MW 1x20 MW 1x6 MW	66 MW	EC dt. 23.11.2010 & F. No. J-13012/20/2014 IA.I(T) dt. 07.08.2015 for 6 MW Turbine Addition	DCTO Orders 2305151650241 (Water) & 2305251650241 (Air) dt. 24.06.2023- valid till 31.03.2028

Table : 1.2 RCL Captive Mines in Ariyalur Region & their Approvals

Sl. No.	Mine	Extent, Ha	ML Ref.	Latest EC Ref.	CTO Orders	Prodn., MTPA
1	Reddipalayam	63.600	GO No. 224 dt. 27.10.2020	SEIAA-TN/F.No.6907/1(a)/EC.No:5145/2020 dt. 11.07.2022	2307149389486 (W) & 2307249389486 (A) dt. 20.01.2023-valid till 31.03.2027	3.00
2	Kattupiringium (Conceptual Stage)	44.580	GO No. 221 dt. 21.10.2020	MoEF Ltr. J-11015/ 557/2007-IA.II(M) dt. 10.10.2007	2308150520129 (W) & 2308250520129 (A) dt. 28.12.2023 - valid till 31.03.2025	0.90
3	Periyannagalur	35.960	GO No. 77 dt. 26.07.2018	MoEF Ltr. J-11015/ 556/2007-IA.II(M) dt. 10.10.2007	2308150516922 (W) & 2308250516922 (A) dt. 28.12.2023-valid till 31.03.2024. CTO Renewal application submitted.	0.90
4	Periyannagalur West	17.360	GO No. 153 dt. 23.12.2016	SEIAA/TN/F.462/2012/EC/45/1(a)/Ariyalur dt. 14.11.2016	2409157816355 (W) & 2409257816355 (A) dt. 29.02.2024 - valid till 31.03.2026	0.30
5	Pudupalayam North (Conceptual Stage)	26.075	GO 4(D) No. 1 dt. 02.01.2007	MoEF Ltr. J-11015/ 118/2007-IA.II(M) dt.15.10.2012	2108137877418 (W) & 2108237877418 (A) dt. 28.07.2021 - valid till 31.03.2024	1.50
6	Usenabad South	25.105	GO No. 152 dt. 23.12.2016	SEIAA/TN/F.461/2012/EC/44/1(a)/Ariyalur dt. 14.11.2016	2308150521228 (W) & 23082505212281 (A) dt. 29.12.2023 valid till 31.03.2026	1.00
Total		212.680	-	-	-	7.60

RCL Govindapuram Plant has bagged several Awards/Certificates of Recognition as detailed below :

- ❖ Successfully implemented Five-S Workplace Management System Certificate from Quality Circle Forum of India (QCFI) jointly with Union of Japanese Scientists and Engineers (JUSE) on 30.08.2021.
- ❖ '5 Star Rating' for Commitment in the southern region EHS meet by CII for two consecutive years (2019 & 2020).
- ❖ Economics Times Now 'Best Environmental Sustainability for Water Conservation-8th Edition 2018'.
- ❖ Gold Medal and Overall 3rd Prize in the country for India Green Manufacturing Challenge 2018 & 2019.
- ❖ RCL Pudupalayam Mine received **5-Star Rating** given by Ministry of Mines, Government of India for three consecutive years i.e. 2016-2018.
- ❖ 18th Annual Greentech Occupational Health, Safety Award-2019.
- ❖ 19th Annual Greentech Environment Award for the Year 2019.
- ❖ Best CSR Impact Award in the CSR Summit & Awards – 2019.
- ❖ Won best water management award by CII for the year 2019.
- ❖ Won special award for best green belt development for the community by CII for the year 2020
- ❖ Won Best CSR in Water Management award in the 1st edition of CII SR Industrial Water Management Competitions by CII.
- ❖ Apex India Environment Excellence Award 2019 & 2020.
- ❖ CSR Summit & Awards – 2019 (9th Aug. 2019, New Delhi).
- ❖ World CSR Congress (9th Edition) – Best CSR Award – 2019.
- ❖ 14th Employer Branding Awards (2019-20) - Asia's Best CSR Practices Award.
- ❖ ZEE Business National CSR Leadership – Award.

The contact information of the RCL Govindapuram Unit is as detailed below :

The Sr. Vice President (Mfg.) & Unit Head,
 The Ramco Cements Limited,
 Govindapuram Cement Plant,
 Sendurai Road,
 Ariyalur District-621 713.
 Tel. No. : 04329-226001 to 226004
 Fax No. : 04329-226005
 e-Mail : madhusudan.k@ramcocements.co.in

1.4 RCL Periyagalur Mining Leases

Periyagalur Mine (Lease-I; PNR) over an extent of 36.295 Ha in Periyagalur Village was granted to RCL (MCL-Madras Cements Limited at that time) vide GO (3D) No. 2 dated 13.01.2003 for a period of 20 years. Lease Deed was executed for actual worked out Lease Area of **35.960 Ha** on 02.06.2003 with validity from 20.08.2003 to 19.08.2023. Subsequently, extension of mining lease validity upto 50 years has been granted vide GO (Ms) No. 77 dated 26.07.2018 over an extent of 35.96 Ha and is **valid till 19.08.2053**. The supplementary lease deed has been executed and registered on 03.07.2019. First EC dated 26.11.1999 was for 0.105 MTPA Limestone production. The mine was operated for 0.105 MTPA Limestone quantity from 2005-06 to 2007-08. Expansion EC dated 10.10.2007 is for 0.90 MTPA (Clean Limestone) production and the mine is operating for this quantity from 2008-09 to till date. Crusher established over an extent of 4.22 Ha in the non-lease area was shifted to RCL Govindapuram Cement Plant. Both Opencast Conventional Mining with controlled Blasting & Non-Conventional Mining Method with X-Centric Rippers are adopted.

Periyagalur-West Mine (Lease-II; PNR-W) over an extent of 17.360 Ha in Periyagalur Village was granted for Limestone & Marl vide GO (Ms) No. 153 dated 23.12.2016 for a period of **50 years**. EC for the production of **0.3 MTPA Limestone & Marl** over an extent of 17.36 Ha was awarded by SEIAA-TN vide Letter No. SEIAA-TN/F.No.-462/2012/EC-45/1(a)/ARY/2016 dated 14.11.2016. Lease Deed is executed on 10.01.2017 with validity from 10.01.2017 to 09.01.2067. Both Opencast Conventional Mining with controlled Drilling & Blasting and Non-Conventional Mining Method with X-Centric Rippers are adopted. Existence of Mineral Marl is not proved.

CCRs : Existing ECs, CTOs, approved Mining Plans, **existing Mine Profiles including Depth**, Audit Proceedings, etc. of **both Leases I & II** were submitted and deliberated in **issuing the TORs** for amalgamated Lease. The Integrated Regional Office (IRO) of MoEF&CC, Chennai has issued the **Certified Compliance Reports (CCRs)** for Periyagalur Mine ECs vide Letter F.No. EP/12.1/940/TN/542 dated 18.04.2024 (**Document-1**) and for Periyagalur West Mine EC vide Letter F.No. EP/12.1/2016-17/SEIAA/30/TN/1057 dated 15.07.2024 (**Document-2**). **All the EC conditions are complied and no Non-compliance as certified.**

1.5 Production from the Leases

Limestone production from both Leases & Royalty paid details are given in **Table 1.3**. The maximum production quantity from Lease-I was 0.868 MTPA (8,67,844.09 Tonnes) during 2012-13 and average production was 0.454 MTPA (4,54,076.92 Tonnes) against consented quantity of 0.9 MTPA. The maximum production quantity from Lease-II was 0.299 MTPA (2,99,937.32 Tonnes) during 2022-23 and average production was 0.299 MTPA (2,99,725.39 Tonnes) against consented quantity of 0.3 MTPA. There is **no production violation** in the Leases.

Table : 1.3 Periyagalur Leases I & II – Production & Royalty Paid

Production Year	Lease-I PNR Mine		Lease-II PNR-West Mine	
	Audit Proceeding Quantity, Tonnes	Royalty Paid. Rs.	Audit Proceeding Quantity, Tonnes	Royalty Paid. Rs.
2004-05	0	0	-	-
2005-06	95,020.170	42,75,907.65	-	-
2006-07	1,04,838.690	47,17,741.05	-	-
2007-08	99,854.730	44,93,462.85	-	-
2008-09	5,39,932.030	2,42,96,941.35	-	-
2009-10	6,13,668.100	3,52,83,590.60	-	-
2010-11	7,80,484.410	4,91,70,517.83	-	-
2011-12	7,70,063.340	4,85,13,990.00	-	-
2012-13	8,67,844.090	5,46,74,178.00	-	-
2013-14	4,99,436.620	3,14,64,507.00	-	-
2014-15	5,76,822.260	4,39,27,664.00	-	-
2015-16	1,84,860.330	1,47,88,826.00	-	-
2016-17	8,24,730.630	6,59,78,450.00	-	-
2017-18	7,97,279.290	6,37,82,343.00	0	0
2018-19	3,44,908.580	2,75,92,686.00	2,99,809.940	2,39,84,795.00
2019-20	2,89,131.560	2,31,30,525.00	2,99,888.700	2,39,91,096.00
2020-21	3,41,572.540	2,73,25,803.00	2,99,538.070	2,39,63,046.00
2021-22	2,98,456.540	2,38,76,560.00	2,99,289.650	2,39,43,172.00
2022-23	2,99,204.900	2,39,36,392.00	2,99,937.320	2,39,94,986.00
2023-24	2,99,352.730	2,39,48,219.00	2,99,888.660	2,43,91,093.00
Total	86,27,461.540	59,51,78,304	17,98,352.340	14,42,68,188

The total production from Lease-I (PNR) during 2005-06 to 2023-24 was 86,27,461.54 Tonnes and the total production from Lease-II (PNR-W) during 2018-19 to 2023-24 was 17,98,352.34 Tonnes. For the Limestone quantity of 1,04,25,813.88 Tonnes transported from these two leases (PNR & PNR-W), an amount of **Rs.73.95 Crores** was paid by RCL as **Royalty alone** to the Exchequer.

1.6 Need for the Proposal

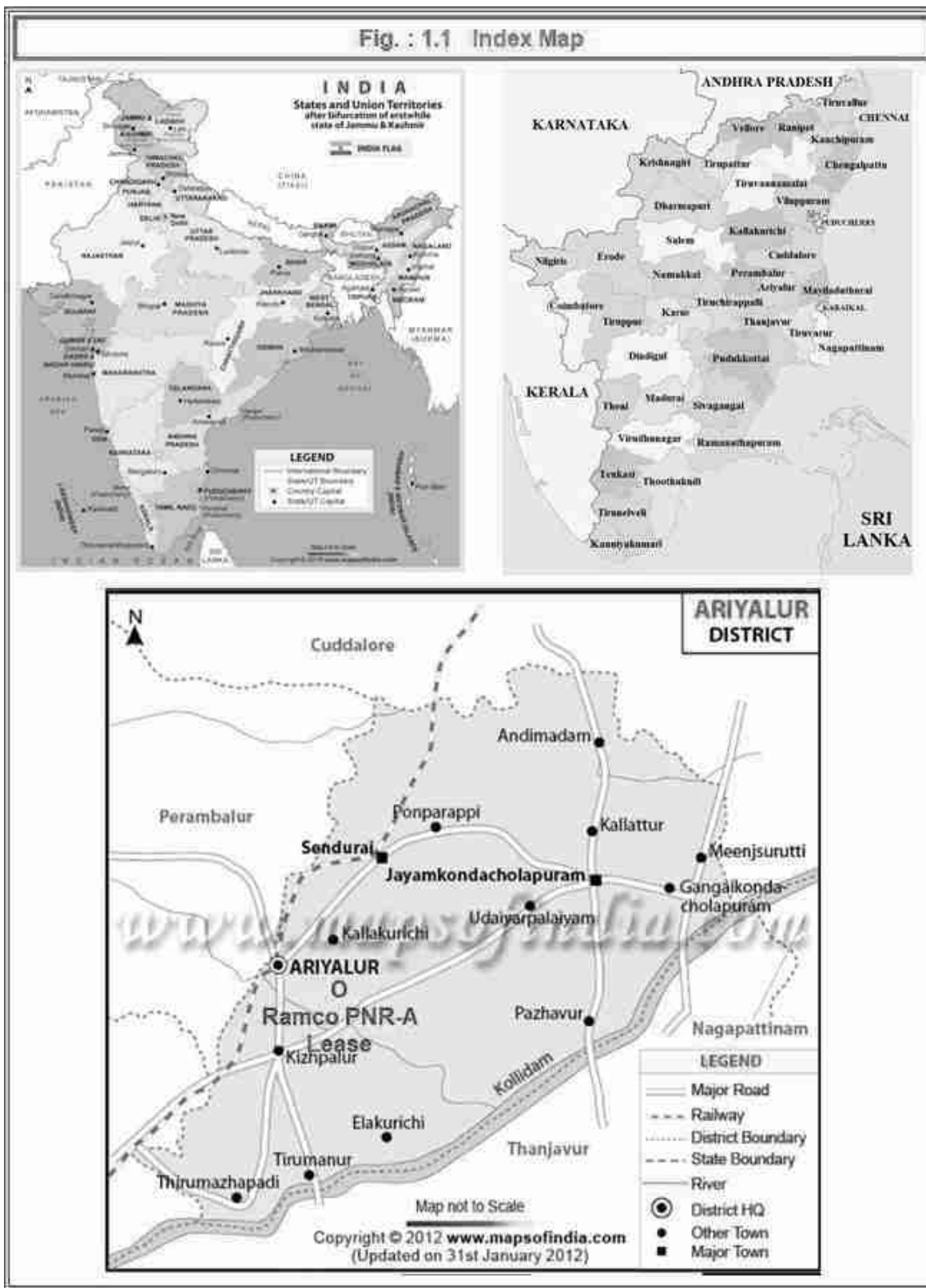
The production capacity of existing working Mines is about 7.60 MTPA. Also, two existing Captive Mines in Ariyalur Region are in Conceptual Stage and will be completely exhausted in another 2 years period. Thus, other Limestone sources are being explored. Periyagalur & Periyagalur West Limestone Mining Leases are located adjacent to each other and are in compact & contiguous nature. With long barriers (550 m long & 35 m depth) between the two leases, about 1.50 Million Tonnes of Limestone reserves would be un-exploited. By amalgamation of both the leases, the Mineable Reserves will be enhanced. Also, '**Common Boundary Workings**' with Dalmia PNR Mine is also proposed. Thus, both PNR Mining leases I & II are being amalgamated.

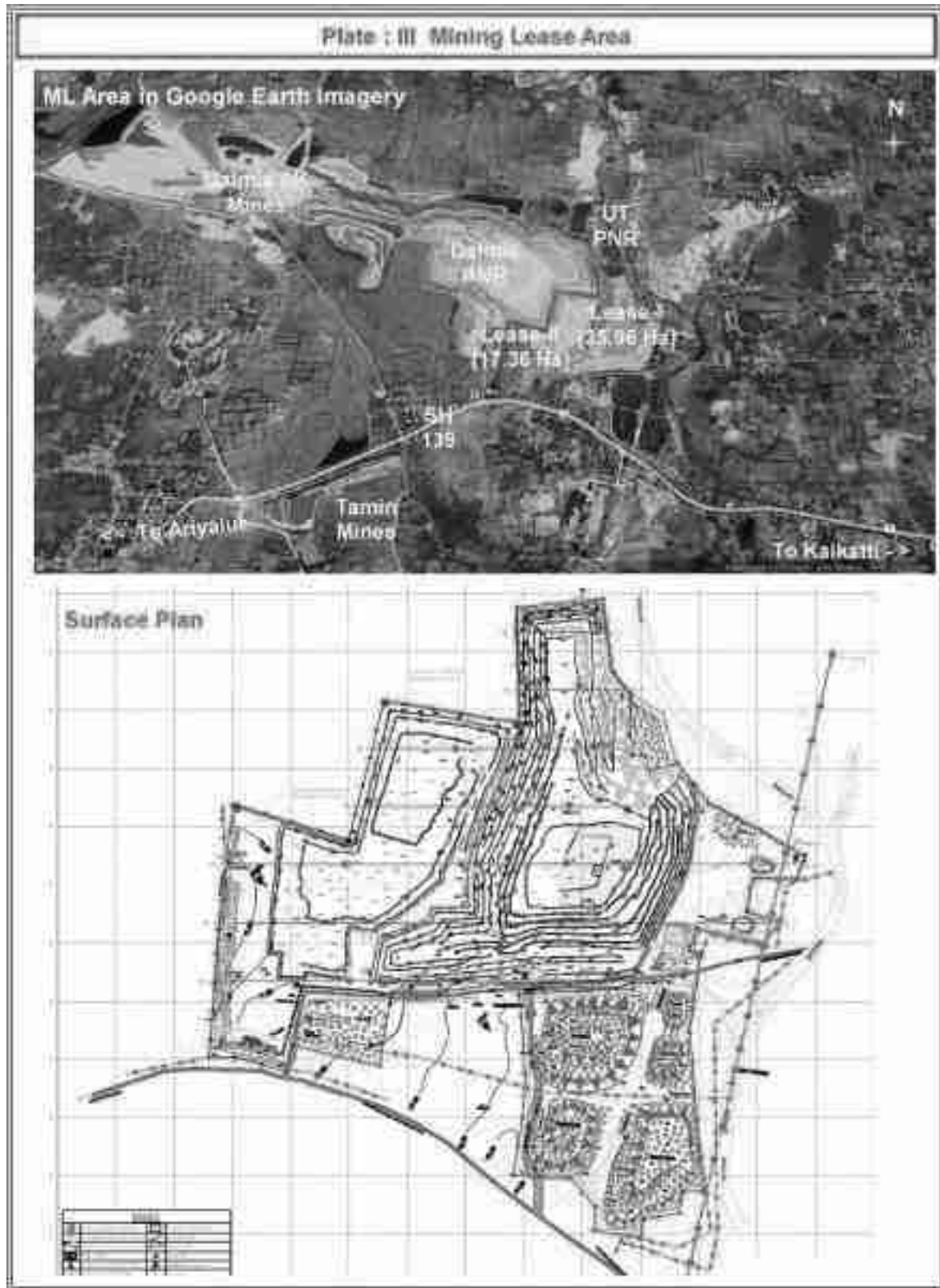
1.7 Amalgamated Periyannagalur Lease (53.320 Ha)

The State Government has granted permission vide **GO (Ms.) No. 126 dated 26.02.2021** under Rule 56 of the Minerals (other than Atomic and Hydrocarbons Energy Minerals) Concession Rules, 2016 for amalgamating the two PNR Mining Leases granted to RCL totaling over an extent of **53.320 Ha as a single lease for mining limestone only** duly co-terminus with the **Lease Period ending on 19.08.2053 (Document-3)**.

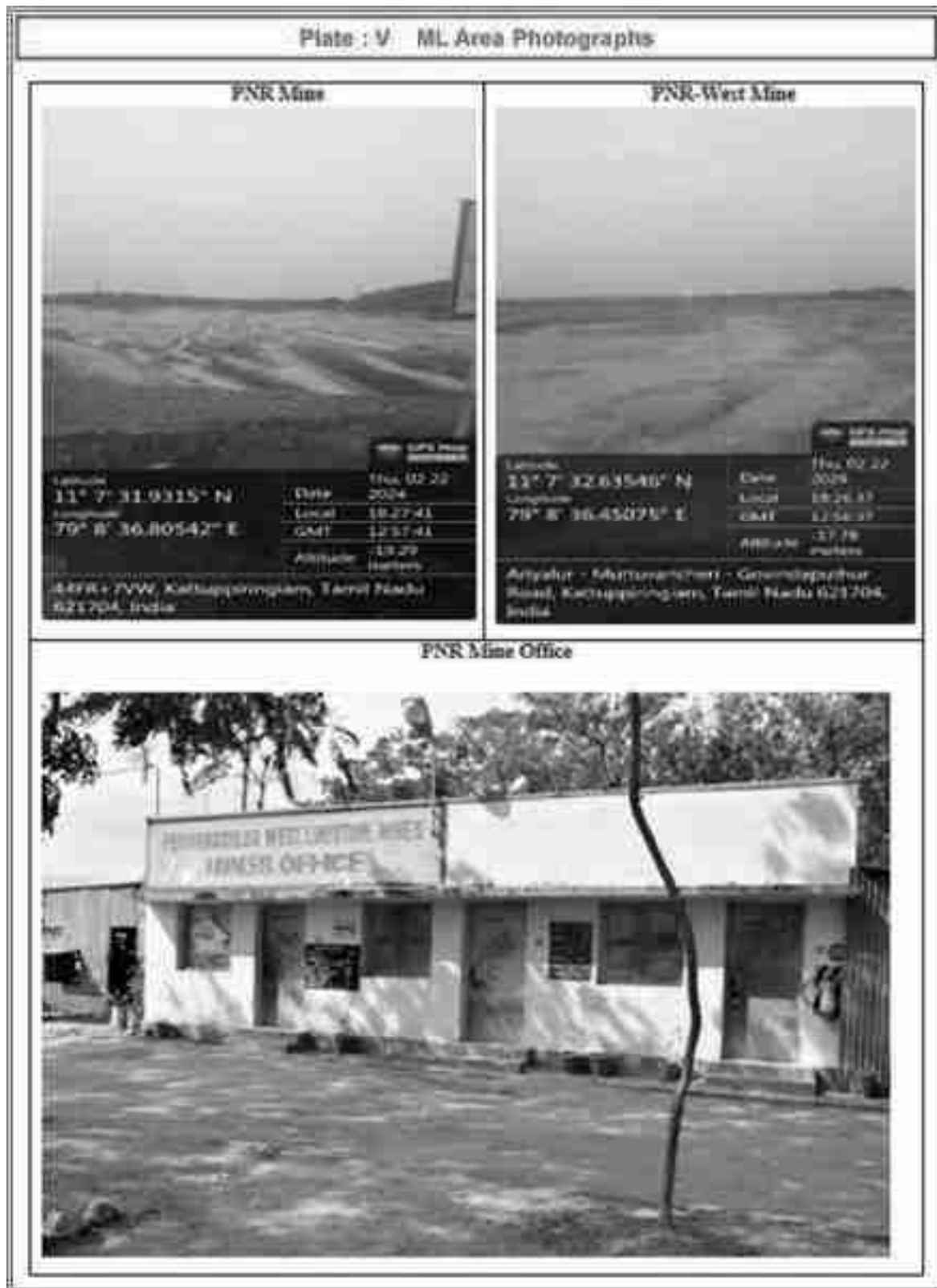
Amalgamated Periyannagalur Mining Lease over an extent of **53.32 Ha** is falling in SF Nos. 51/2, 51/3, 51/4, 51/5A, 51/5 B, 51/5C, 51/5D, 51/5E, 51/5F, 51/5G, 51/5H, 224/1, 224/2, 226/1A, 226/1B, 226/2, 226/3, 226/4, 226/5, 226/6A, 226/6B, 226/6C, 226/6D, 226/6E, 226/7, 226/8A, 226/8B, 226/8C, 226/9A, 226/9B, 226//9C, 226/10A, 226/10B, 226/10C, 226/11A, 226/11B, 226/12, 226/13A, 226/13B, 226/13C, 226/14, 226/15A, 226/15B, 226/16, 228/1, 228/2, 228/3A, 228/3B, 228/3C, 228/3D, 228/5, 229/1, 229/2, 229/3, 229/4, 229/7, 229/8, 229/9, 229/11, 230/1A, 230/1B, 230/2A, 230/2B, 230/3, 230/4A, 230/4B, 230/5A, 230/5B, 230/5C, 230/5D, 230/6A, 230/6B, 230/6C, 230/6D, 230/6E, 230/6F, 230/6G, 230/6H, 230/6I, 230/7A, 230/7B, 230/7C, 230/8, 230/9, 230/10, 230/11A, 230/11B, 230/11C, 230/12, 230/13, 230/14, 230/15A, 230/15B, 230/15C, 230/15D, 230/16, 230/17, 230/18, 230/19, 230/20, 231/1A, 231/1B, 231/1C, 231/1D, 231/1E, 231/1F, 231/1G, 231/1H, 231/1I, 231/1J, 231/1K, 231/1L, 231/1M, 231/1N, 231/2A, 231/2B, 231/2C, 231/2D, 231/2E, 231/2F, 231/2G, 231/2H, 231/2I, 231/2J, 231/2K, 231/2L, 231/2M, 231/2N, 231/2O, 231/2P, 231/2Q, 231/2R, 231/2S, 231/2T, 231/2U, 231/2V, 231/2W, 231/2X, 231/3A, 231/3B, 231/3C, 231/4, 231/5A, 231/5B, 231/5C, 231/6A, 231/6B, 231/6C, 231/6D, 231/6E, 231/6F, 231/6G, 231/6H, 231/6I, 231/6J, 231/6K, 231/6L, 231/6M, 231/6N, 231/6O, 231/6P, 231/6Q, 231/6R, 231/7, 231/8, 231/9, 231/10A, 231/10B, 231/10C, 231/11A, 231/11B, 231/11C, 231/11D, 231/12A, 231/12B, 231/12C, 231/12D, 231/12E, 231/12F, 231/12G, 231/12H, 231/12I, 231/12J, 231/12K, 231/12L, 232/1A, 232/1B, 232/1C, 232/1D, 232/1E, 232/1F, 232/2, 232/3, 232/4, 232/5A, 232/5B, 232/5C, 232/5D, 232/5E, 232/5F, 232/5G, 232/5H, 232/6A, 232/6B, 232/6C, 232/6D, 232/7A, 232/7B, 232/8, 232/9A, 232/9B, 232/10A, 232/10B, 232/11, 232/12A, 232/12B, 232/12C, 232/13, 232/14, 232/15A, 232/15B, 232/16, 232/17A, 232/17B, 232/18, 232/19A, 232/19B, 232/19C, 232/19D, 232/20, 233/1, 233/2, 233/3, 233/4, 233/5, 233/6, 233/7A, 233/7B, 233/7C, 233/8A, 233/8B, 233/9, 233/10, 233/11A, 233/11B, 233/11C, 233/11D, 233/11E, 233/11F, 233/11G, 233/11H, 233/12A, 233/12B, 233/12C, 233/12D, 233/12E, 233/12F, 233/12G, 233/12H, 233/12I, 234, 234 Part, 235/1, 235/2, 235/3, 237/1, 267, 268/1, 268/2, 269 & 271 of Periyannagalur Village, Ariyalur Taluk & District of Tamil Nadu State (**Fig. 1.1**).

Out of 53.32 Ha, **Patta Land is 33.28 Ha and Govt. Poramboke Land is 20.04 Ha**. There is **no Forest Land** involved. The Lease Area is shown as **Plate III**. The Aerial Photographs are shown in **Plates IV-V**. **Real time video footage** will also be submitted. There is **no Rehabilitation & Resettlement** issue. **There is no litigation/pending case against the Proposal**.











The mine area is accessible from SH-139, Ariyalur-V.Kaikatti Section and is about 8 km from Ariyalur in the west. Govindapuram Cement Plant is located at a distance of 6.8 km aerial distance (14 km by road) in northwest.

During the Amalgamation, the following proposals of **re-rerouting / shifting** of existing structures are carried out:

- ✓ A High Tension Power Line located within the ML area on the eastern side passing Northeast – Southwest direction is rerouted away from the Lease area. RCL has remitted the payment of Rs.1,19,85,701/- with acknowledged invoice vide CI3310200015 & CI3310200015 dated 18.01.2021 from Power Grid Corporation of India, Madurai and the EB lines are shifted.
- ✓ Five Low Tension Power Lines are rerouted/shifted away from the Lease boundary.
- ✓ A road approaching to Chinnanalur Village located on the south-western side of the Lease Boundary is proposed to be rerouted from SH-139 along the existing dump area and the consultation with the District Authorities is underway.

1.8 Statutory Approvals

Amalgamated Lease : The State Government has granted **permission vide GO (Ms.) No. 126 Ind. (MMA.2) Department dated 26.02.2021** under Rule 56 of the Minerals (other than Atomic and Hydrocarbons Energy Minerals) Concession Rules, 2016 for amalgamated PNR Mine over an extent of 53.320 Ha as a single lease for mining limestone only duly co-terminus with the Lease Period ending on **19.08.2053**.

Approved Mining Plan : IBM, Chennai has approved the Mining Plan with Progressive Mine Closure Plan for Amalgamated Periyanaalur (PNR-A) Mine over 53.32 Ha vide its Letter TN/ALR/LST/MP-2079.MDS dated 23.07.2021 for the Period 2020-21 to **2024-25 (Document-4)**. Also, 'Common Boundary Workings' with Dalmia PNR Mine is now proposed. Accordingly, Review of Mining Plan (**ROMP**) for Plan Period of **2025-26 to 2029-30 has been submitted with updated data** to IBM for its approval (**Document-III**).

EC : The mineral Limestone to be mined out from this Amalgamated Lease is a Major Mineral over an extent of **<250 Ha** and falls in **Category 'B'** of Sl. No. 1(a) of EIA Notification 2006, as amended vide Notification SO 1886(E) dated 20.04.2022, for prior Environmental Clearance (EC) from the State Level Environmental Impact Assessment Authority, Tamil Nadu (SEIAA-TN). Accordingly, RCL has applied for prior EC to SEIAA-TN vide Online Proposal No. **SIA/TN/MIN/76439/2022 on 02.05.2022**. The Terms of Reference (TOR) for carrying out Environmental Impact Assessment (EIA) Study has been awarded vide **Letter SEIAA-TN/F.No.9220/TOR-1215/2022 dated 14.07.2022 with Public Hearing**. EC will be obtained after the Public Hearing and Final EIA Report submission.

CTO : On obtaining the EC, Consents to Operate (CTO) for the Mine will be applied and obtained from TNPCB.

1.9 The Proposal

The established **Mineable Reserves now is 15.85 Million Tonnes upto 92 m BGL. There is no other minerals** like sand in the existing Limestone Mine area till the depth of 92 m now.

The mining operation will be carried out by both Opencast Conventional Mining with controlled Drilling & Blasting and Non-Conventional Mining Method with X-Centric Rippers @ **3.00 MTPA**. Limestone production during ROMP period will be **15 Million Tonnes**. Balance Reserves will be mined out in subsequent Plan Period. The **Life of the Mine is 10 years** based on established Reserves now. Ultimate Pit Depth on ROMP Period will be **92 m BGL** from 71 m established in earlier Mining Plan. Mining will intersect the Ground water-table.

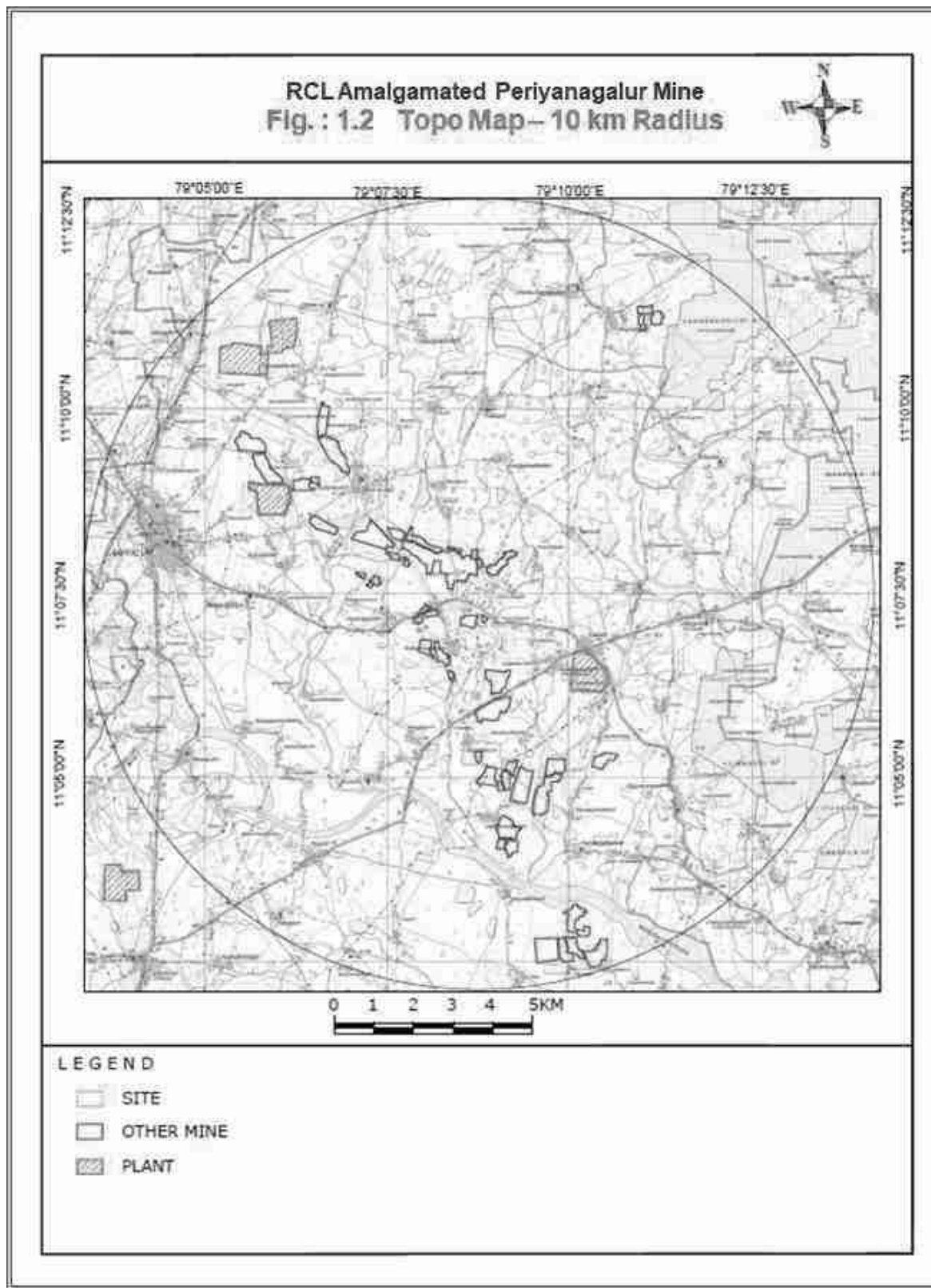
Fragmented limestone will be loaded by Hydraulic Excavators into Tippers. The Tippers transport limestone to Govindapuram Cement Plant. Limestone transportation will be **in all 3-Shifts** as District Administration restricted Limestone transportation during peak hours of the day in Ariyalur.

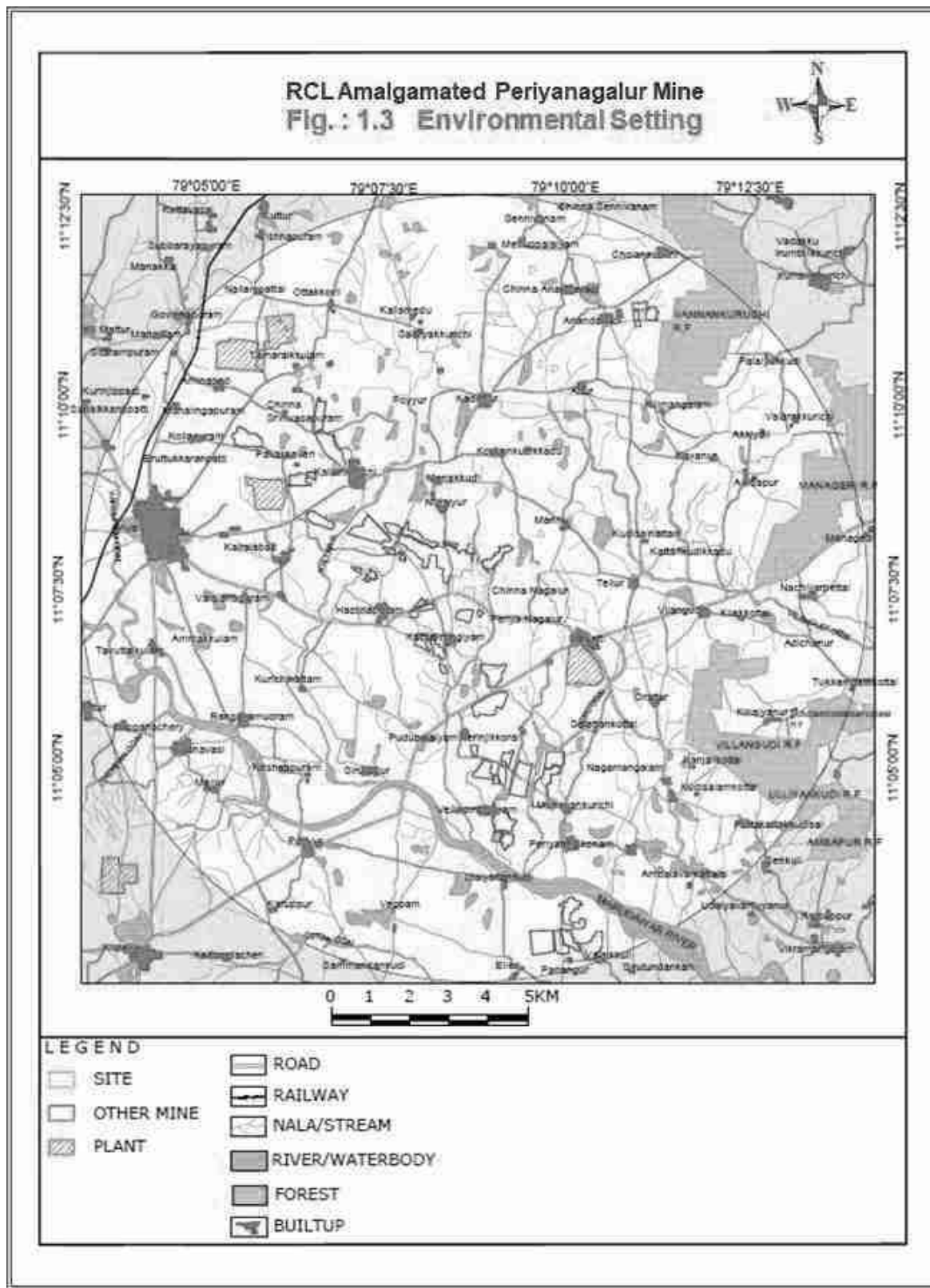
Mine Profile :

Mineable Reserves	:	15.85 Million Tonnes
Proposed Production	:	3.0 MTPA
No. of working days/annum	:	300 (3 shifts)
Life of the Mine	:	10 years (based on established Reserves now)
Ore:Waste Ratio	:	1:0.26 (ROMP)
Pit Configuration-Conceptual	:	630 (L) x 560 (W) x 92 m (D)
Bench height	:	6 m
Bench width	:	6 m
Bench slope	:	45°
Ultimate Pit Limit	:	92 m (BGL); Top RL 73 m Bottom RL -19 m
Ground Water-table at	:	40-45 m BGL.

1.10 Environmental Setting

Digital processing of entire Lease Area for existing Pits using remote sensing technique has been done. PNR-A Mining Lease Area falls in the Survey of India Topo Sheet No. 58 M/4 (**Fig. 1.2**). Environmental Setting of the Project Site is given as **Fig. 1.3**. Administrative unit within 10 km radius area comprises of parts of Ariyalur, Sendurai and Udayarpalayam Taluks of Ariyalur District and Kunnam Taluk of Perambalur District.





The ML is located inbetween the following geographical co-ordinates (Table 1.4).

North Latitude : 11° 07' 15.8"- 11° 07' 51.4"
 East Longitude : 79° 08' 26.9"- 79° 09' 01.0".

Table : 1.4 Lease Area Coordinate

Boundary Pillar Numbers	North Latitude	East Longitude	Boundary Pillar Numbers	North Latitude	East Longitude
BP-1	11° 07'30.3"	79° 08'46.1"	BP-28	11° 07'34.1"	79° 08'57.7"
BP-2	11° 07'29.9"	79° 08'44.8"	BP-29	11° 07'33.6"	79° 08'59.0"
BP-3	11° 07'29.7"	79° 08'42.8"	BP-30	11° 07'32.5"	79° 08'58.8"
BP-4	11° 07'29.4"	79° 08'37.6"	BP-31	11° 07'33.0"	79° 08'54.9"
BP-5	11° 07'28.0"	79° 08'37.0"	BP-32	11° 07'32.2"	79° 08'54.4"
BP-6	11° 07'29.0"	79° 08'38.0"	BP-33	11° 07'30.8"	79° 08'54.3"
BP-7	11° 07'29.7"	79° 08'36.3"	BP-34	11° 07'30.8"	79° 08'53.0"
BP-8	11° 07'28.8"	79° 08'37.4"	BP-35	11° 07'30.7"	79° 08'52.6"
BP-9	11° 07'24.9"	79° 08'37.6"	BP-36	11° 07'30.3"	79° 08'51.1"
BP-10	11° 07'26.3"	79° 08'32.3"	BP-37	11° 07'30.0"	79° 08'50.5"
BP- 11	11° 07' 24.0"	79° 08' 31.5"	BP-38	11° 07'29.9"	79° 08'47.7"
BP-12	11° 07' 24.8"	79° 08' 26.9"	BP-39	11° 07'29.4"	79° 08'49.0"
BP-13	11° 07' 31.1"	79° 08' 27.4"	BP-40	11° 07'29.7"	79° 08'51.3"
BP-14	11° 07' 39.8"	79° 08' 28.5"	BP-41	11° 07'29.9"	79° 08'51.2"
BP-15	11° 07' 37.8"	79° 08' 35.0"	BP-42	11° 07'30.2"	79° 08'53.2"
BP-16	11° 07' 45.7"	79° 08' 37.0"	BP-43	11° 07'30.1"	79° 08'54.9"
BP-17	11° 07' 44.9"	79° 08' 44.3"	BP-44	11° 07'27.4"	79° 08'54.2"
BP-18	11° 07'44.4"	79° 08'44.7"	BP-45	11° 07'17.9"	79° 08'54.2"
BP-19	11° 07'50.7"	79° 08'44.5"	BP-46	11° 07'16.9"	79° 08'53.8"
BP-20	11° 07'51.4"	79° 08'49.3"	BP-47	11° 07'15.8"	79° 08'51.8"
BP-21	11° 07'46.9"	79° 08'50.0"	BP-48	11° 07'16.4"	79° 08'49.4"
BP-22	11° 07'45.9"	79° 08'51.0"	BP-49	11° 07'17.5"	79° 08'49.3"
BP-23	11° 07'45.0"	79° 08'53.1"	BP-50	11° 07'17.6"	79° 08'48.6"
BP-24	11° 07'40.5"	79° 08'55.0"	BP-51	11° 07'29.4"	79° 08'44.9"
BP-25	11° 07'40.2"	79° 08'55.5"	BP-52	11° 07'24.9"	79° 08'45.5"
BP-25	11° 07'37.1"	79° 09'00.8"	BP-53	11° 07'29.4"	79° 08'44.9"
BP-26	11° 07'35.8"	79° 09'00.1"	-		
BP-27	11° 07'35.9"	79° 08'58.0"	-		

The area is having almost a gentle slope topography with an elevation of about 65-73 m above mean sea level (aMSL). The site is free from seismic effects (**Seismic Zone-III**). There are **no eco sensitive areas like National Parks, Wildlife Sanctuaries, Biosphere Reserves, Elephant Corridor, Mangroves, Archaeological/Historical Monuments, Heritage sites, etc. within 10 km from the Lease boundary.** Parts of **Managethi RF** (6.6 km in east), **Vannankurichi RF** (7.0 km in NE), **Kallankuthu RF** (10.0 km ENE), **Vilangudi Extn. RF** (8.0 km in ESE), **Vilangudi RF** (8.2 km in ESE), **Sundaresapuram RF** (9.5 km in SE) and **Ulliyakudi RF** (10.0 km in SE) fall in the Study Area.

There is **no Forest Land involved and no Reserved Forest (RF) exists within 1 km of the Mine. No grazing land exist in the study area.** Environmental Setting is given in **Table 1.5.**

Table : 1.5 Environmental Setting – 15 km Radius

Sl. No.	Areas	Aerial Distance(within 15 km) Proposed Project location boundary
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value	Nil
2	Areas which are important or sensitive for ecological reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests	Managethi RF – 6.6 km (E) Vannankurichi RF – 7.0 km (NE) Kallankuthu RF – 10.0 (ENE) Vilangudi Extension RF-8.0 km (ESE) Vilangudi RF – 8.2 km (SE) Sundaresapuram RF – 9.5 km (ESE) Ulliyakudi RF – 10.0 km (SE) Ambapur RF – 10.5 km (SE) Alvoy RF – 12.3 km (SE) Suttamalli RF-12.0 (ESE) VadakadalcRF-12.5 (ESE) Udayarpalayam RF – 13.5 (ENE)
3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	Karaivetti Bird Sanctuary is at 17.7 km (SW)
4	Inland, coastal, marine or underground waters	Marudaiyar River – 4.9 km (S) Kallar River - 2.9 km (NW) Uppu Odai-2.7 km (E) Vilangudi Odai - 3.7 km (ENE) Vanchiyam Odai - 8.8 km (WNW)
5	State, National boundaries	Nil
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	Kallankurichi Kaliyuga Varadharaja Perumal Temple is at 3.4 km in NW
7	Defence installations	Nil
8	Densely populated or built-up area & Areas occupied by sensitive man-made land uses (<i>hospitals, schools, places of worship, community facilities</i>)	District Headquarters Ariyalur Town is at a distance of 6.3 km in west
9	Areas containing important, high quality or scarce resources(<i>ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals</i>)	Limestone bearing areas in Ariyalur Region.
10	Areas already subjected to pollution or environmental damage. (<i>those where existing legal environmental standards are exceeded</i>)	Nil
12	Areas susceptible to natural hazard which could cause the project to present environmental problems	The region falls in Seismic Zone III. Seasonal Kallar River flows at 2.9 km (NW).

None of the followings are also located in the Study Area :

- ❖ **Protected areas** notified under the Wild life (Protection) Act, 1972,
- ❖ **Critically polluted area** as notified by the Central Pollution Control Board constituted under Water (Prevention and Control of Pollution) Act, 1974,
- ❖ **Eco -Sensitive areas** as notified,
- ❖ **Interstate boundaries** within 5 km radius from the boundary of the proposed site.
- ❖ Coastal Regulation Zone (**CRZ**) Area.

Seasonal **River Marudaiyar** drains the region (flows at 4.9 km in the south). Seasonal Nallah Kallar River flows at 2.9 km in northwest. A seasonal nalla flows in the eastern boundary of the Lease from north to south. High Flood Level recorded in the seasonal nalla is 63.9 m in the north to 62.2 m in the south. The Lease is located in an elevation of 66.8 m to 65.7 m and thus, **no flood hazard due to the nearby seasonal nalla.**

State Highway (SH)-139 (Ariyalur-V.Kaikatti-Jayamkondam Section) is passing in east-west direction in southern boundary of the Lease-II and a **Safety Distance of 50 m has been provided as per GO, approved Mining Plan, Tamil Nadu Mineral Concession Rules 1959 & Anna University Recommendations** and will be maintained till end of the mining.

National Highway (NH)- 81 connecting Trichy-Kilapaluvur-Chidambaram runs at @ 2.5 km (in SE), NH-136 connecting Tanjore-Ariyalur-Perambalur runs at 6.2 km (W). Southern Railway BG Line runs through Ariyalur at a distance of 8.5 km in the west. The nearest Airport Trichy is at 60 km in southwest. The nearest Ports are at Chennai (300 km) and Cuddalore (95 km).

RCL Govindapuram Cement Plant is located at a distance of 6.8 km aerial distance (14 km by road) in northwest. From the Lease, Ultratech Cement Plant-Reddipalayam is at 3.2 km (SE), TANCEM Cement Plant-Kallankurichi at 4.7 km (WNW), Dalmia Ariyalur Plant at 7.2 km (NW) and Chettinad Kilapaluvur Cement Plant at 10.6 km (SW).

The Lease is adjacent to Dalmia Cement Periyagalur Limestone Mines (west @ 15 m), UltraTech Periyagalur Limestone Mine (north @ 15 m) and TANCEM PNR & Kallankurichi Mines are (@ 550 m in NW). From the Lease, RCL Mines viz. Usenabad South (@ 4.3 km in NW), Kattupirangium (1.2 km; SW), Pudupalayam-North (1.5 km in S) & Reddipalayam Mines (4.0 km in SE) are existing. Along TANCEM, TAMIN & Dalmia Aminabad-Khairulabad Mines in the west, UltraTech Vellipiringiyum Mine at 4.0 (SE) & Ottakovil Mine at 8.5 km (NNW), ICL Periyathirukonam Mine (5.8 km in SSE) & Chettinad Periyathirukonam Mine (8.2 km in SE), Dalmia Periyathirukonam Mines (8.8 km in SSE), etc. are located in the Study area.

The nearest Town & District Headquarters is Ariyalur at a distance of 6.3 km in the west. ML Area is about 1.0 km from nearby Kattupirangium village. Periyagalur village is at 1.0-1.5 km in the east.

1.11 EIA Study

The mineral Limestone to be mined out from this Amalgamated Lease is a Major Mineral over an extent of <250 Ha and falls in **Category 'B'** of Sl. No. 1(a) of EIA Notification 2006, as amended vide Notification SO 1886(E) dated 20.04.2022, for prior EC from SEIAA-TN. Accordingly, RCL has applied for TOR to SEIAA-TN vide Online Proposal No. **SIA/TN/MIN/76439/2022 on 02.05.2022**. The Proposal under Sl. No. 1(a), Category B1 was deliberated in State Level Expert Appraisal Committee-Tamil Nadu (SEAC-TN) in its 287th Meeting held on 22.06.2022 and in 532nd SEIAA-TN Meeting held on 14.07.2022. Terms of Reference (TOR) for Environmental Impact Assessment (EIA) Study has been awarded vide **Letter SEIAA-TN/F.No.9220/TOR-1215/2022 dated 14.07.2022 with Public Hearing**.

Baseline Data has been collected during December 2023-February 2024 representing **Winter 2023-24 Season**. EIA Report has been **prepared in compliance with awarded TORs** and submitted as per generic structure proposed in Appendix-III of EIA Notification 2006 with the following Chapters :

- Chapter-1 : Introduction with Need for the Project & Environmental Setting of the Project.
- Chapter-2 : Project Profile - an outline of the Project and allied activities.
- Chapter-3 : Description of Environment (Baseline Status).
- Chapter-4 : Anticipated Impacts along with Prediction of Impacts and Mitigation Measures.
- Chapter-5 : Analysis of Alternatives (Technology & Site).
- Chapter-6 : Environmental Quality Monitoring Programme.
- Chapter-7 : Additional Studies like Risk Assessment, DMP, Hydrogeological Study, etc.
- Chapter-8 : Project Benefits.
- Chapter-9 : Cost-Benefit Analysis, if any.
- Chapter-10 : Environmental Management Plan
- Chapter-11 : Summary EIA.
- Chapter-12 : Disclosure of Consultants engaged.

Summary EIA Reports (both in **English and Tamil versions**) along with Draft EIA Report are submitted for Public Consultation & Public Hearing.

EIA Consultant, M/s. ABC Techno Labs India Private Limited, Chennai has been accredited for various Sectors including **Sector-1 (Mining Projects) for Category 'A'** by the National Accreditation Board for Education & Training (**NABET**) vide Certificate NABET/EIA/2225/RA0290 dated 11.06.2023 with validity till 16.11.2025 (Sl. No. 4 of List dated 15.07.2024). ABC Laboratory is accredited by the National Accreditation Board for Testing and Calibration Laboratories (**NABL**) vide Certificate No. TC-5770 dated 03.04.2022. The Lab is also recognised by **MoEF&CC** vide Letter F. No. Q-15018/04/2019-CPW dated 14.10.2019 with validity of 5 years.

2.0 Project Description

2.1 Type of the Project

The Limestone to be mined out from this Amalgamated Lease is a Major Mineral over an extent of <250 Ha and falls in Category 'B' of Sl. No. 1(a) of EIA Notification 2006, as amended vide Notification SO 1886(E) dated 20.04.2022, for prior EC from SEIAA-TN. Accordingly, RCL has filed the TOR Application with Project Feasibility Report (PFR), approved Mining Plans, existing ECs & CTOs and their Compliances, existing Mine Profiles including Depth, Audit Proceedings, etc. of both Leases I & II were submitted to SEIAA-TN vide Online Proposal No. SIA/TN/MIN/76439/2022 on 02.05.2022. Project details were deliberated and TOR for carrying out the EIA Study has been awarded vide Letter SEIAA-TN/F.No.9220/TOR-1215/2022 dated 14.07.2022. EIA Report has been prepared in compliance with awarded TORs and submitted as per generic structure proposed in Appendix-III of EIA Notification 2006.

2.2 Magnitude of Operation

Mining operations will be carried out by working the deposit by systematic formation of benches as per Metalliferous Mines Regulations 1961. During the Mining Plan Period of 2020-21 to 2024-25, it is proposed to excavate 92,11,880 Tonnes of Limestone @ 3.00 MTPA maximum till 71 m BGL. However, there was no production of 3.00 MTPA in the Amalgamated Lease as scheduled in the approved Mining Plan for want of prior EC. The **existing mining operations are continued** in the Leases (PNR & PNR-W) for respective **consented production quantities**.

Subsequently, the **Mineable Reserves** has been reassessed as **15.85 Million Tonnes**, as on 01.04.2024. The Review of Mining Plan (ROMP) for Plan Period of **2025-26 to 2029-30** has been prepared and **submitted with updated data** to IBM for its approval. The mining operation will be carried out by both Opencast Conventional Mining with controlled Drilling & Blasting and Non-Conventional Mining Method with X-Centric Rippers @ **3.00 MTPA**. Limestone production during ROMP period will be **15 Million Tonnes**. Balance Reserves will be mined out in subsequent Plan Period. The **Life of the Mine is 10 years** based on established Reserves now. **Ultimate Pit Depth** on proposed Plan Period will be **92 m BGL** from 71 m arrived in the earlier Mining Plan. Mining will intersect the Ground water-table.

The Blocks SL-1 to SL-7 will be opted for mining with a bench height and width of 6 meters. Fragmented limestone will be loaded by Hydraulic Excavators into Tippers. The Tippers transport limestone to Govindapuram Cement Plant. Limestone transportation will be **in all 3-Shifts** as District Administration restricted Limestone transportation during peak hours of the day in Ariyalur. After exhaustion of all limestone, part of the pit on the northern, eastern & southern sides will be **reclaimed and rehabilitated** and the remaining exhausted pit will be used as water Reservoir for harvesting thr rain water. The proposed Production Schedule is given in **Table 2.1**.

Table : 2.1 Yearwise Development & Production

Sl. No.	Plan Period & Year	Top Soil, Tons	OB/SB/IB, Tons	Total Waste, Tons	ROM Limestone, Tonnes	Mineral Reject, Tonnes	Ore:OB Ratio
I	2020-21 to 2024-25 (Non operative period)	3,83,560	12,34,120	16,17,680	92,11,880	0	1:0.18
II	ROMP Period (Commencement of operation)						
1	2025-26	1,42,960	9,24,336	10,67,296	30,00,000	0	1:0.36
2	2026-27	49,760	2,42,288	2,92,048	30,00,000	0	1:0.10
3	2027-28	0	0	0	30,00,000	0	1:0
4	2028-29	1,00,480	13,96,512	14,96,992	30,00,000	0	1:0.50
5	2029-30	31,578	9,71,693	10,03,271	30,00,000	0	1:0.33
	Total	3,24,778	35,34,829	38,59,607	1,50,00,000	0	1:0.26

2.3 Technology & Project Description

2.3.1 Regional Geology

The limestone deposit of the study area forms a part of Kallankurichi limestone formations of Middle Ariyalur stage of Cretaceous beds in South India. In the Cauvery basin carbonate rock form a sizable part of the stratigraphic column from the Lower Cretaceous to Recent. These deposits are geologically called the Maestrichian Limestones. This limestone bed is sandwiched between two sandstone/Marl beds. It can be traced continuously for more than 9 km in the North - South direction starting from Srinivasapuram in the north through Kairulabad, Ameenabad, Periyannagalur, Hasthinapuram, Kattupiringium, Pudupaalyam, Nerunchikorai, Vilipiringium and further South up to Idaiyathankudi on the banks of Marudaiyar river.

Limestone of Cretaceous and early Tertiary are also exposed in the three principal outcrop areas viz. Trichirapalli, Virudhachalam, and Pondicherry along the western margin of the basin. The western margin of these sediments have NE- SW trend. The formation in the east trends NE-SW in the north and changes to NW-SE in the Southern part. The dip direction also changes accordingly.

Limestone is exposed on the surface in the nearby TANCEM mines of Kallankurichi and Dalmia Mines of Periyannagalur. Limestone is yellowish brown in colour with prominent and well preserved shells. From the core drilling it is found that top red soil thickness ranges between 1.5-2 m, followed by alternate bands of Sandstone / Marl and limestone. Limestone thickness is 7-9 m with various grades. The strike direction of the formation is limestone deposit is NNE-SSW & NNW- SSE and dips towards south east with dip angle varying from 3-5°. Local variation in dip amount and direction are seen between Kallankurichi and Pudupalayam villages.

The stratigraphic succession for the cretaceous basin of Tiruchirapalli is given below:

Age	Group	Formation	Litho Stratigraphy
MioplIOCene		Cuddalore	Ferruginous sand stone laterite and clay
-----Unconformity-----			
Palaeocene	ARIYALUR	Niniyur	Predominantly limestone with sandstone and marl parting White sandstone and Fossiliferous Limestone calcareous shale marl and sandstone
Upper Cretaceous		Kallamedu	
		Kallankurichi	
-----Unconformity-----			
		Sillakudi	Upper member-sandstone dominant Lower member - limestone / calc. Sandstone dominant
-----Unconformity-----			
Upper Cretaceous	Tiruchirapalli	Anaipadi	Upper-standstone Lower- Shale
		Kulakkantham	
-----Unconformity-----			
Upper Cretaceous	Uttattur	Karai Maruvattur	Coral limestone, Shaly limestone, sandstone & marl
-----Unconformity-----			
Upper Jurassic to Lower Cretaceous	Upper Gondwana	Thappai	Brownish, micaceous & silty ferruginous sandstone
-----Unconformity-----			
Archaean		Crystalline	Charnockite & Gneisses

2.3.2 Local Geology

The general trend of the limestone deposit in this study area is N-S direction, with dipping Easterly with 3-5°. The deposit covers about 630 m in strike length and has a width of 560 m. The limestone is brown to yellow, reddish brown medium grained and well preserved shells of Gryphea, Exogyra, Alectronia and shells of Ammonites and Echinoid group. The average Thickness of the lithounits such as Topsoil, Micaceous Sandstone, Shell Limestone and Sandstone are detailed below;

Average Top soil Thickness	: 0.5 - 2.0 m
Average Micaceous Sandstone Thickness	: 2.0 - 36.0 m
Average Shell limestone Thickness	: 35.0 - 48.0 m
Average Bottom sandstone	: 4.0 - 6.0 m below.

Topsoil with Sandstone: Underlying the top red soil cover is the whitish weathered friable sandstone. This horizon has to be rejected as waste at the time of mining. The thickness varies between 0.5-2.0 m.

Shell Limestone: Brown to Yellow, reddish brown medium grained and well preserved shells. They do not exhibit any other feature except bedding.

Sandstone: Calcareous in nature with quartz grains and this litho unit is considered as a marker horizon.

Surface & **Geological Plan along with Geological Sections** is given as **Fig. 2.1**

2.3.3 Reserves & Resources

Exploration carried out till date is sufficient enough to delineate the limestone band in entire area of 53.320 Ha. RCL has drilled totally 25 Bore Holes covering a meterage of 1138.20 meterage for the purpose of UNFC Reserve Estimation. It has also drilled 2 boreholes on the eastern side of the Lease boundary for 173.00 meterage in 2021-22 and proposes 2 boreholes in this Plan Period. The area between SL- 1-1' to SL 7-7' has been taken for calculation of proved reserves. Tonnage Conversion Factor of **2.0 Tonnes/cu.m** for Limestone has been considered for Reserve Estimation. Proved Mineable Reserves under UNFC Category '111' is given in **Table 2.2**.

As per UNFC Norms, the reserve has been estimated as **15.85 Million Tonnes**, as on 01.04.2024. The Reserves & Resources are re-estimated as 22.14 Million Tonnes.

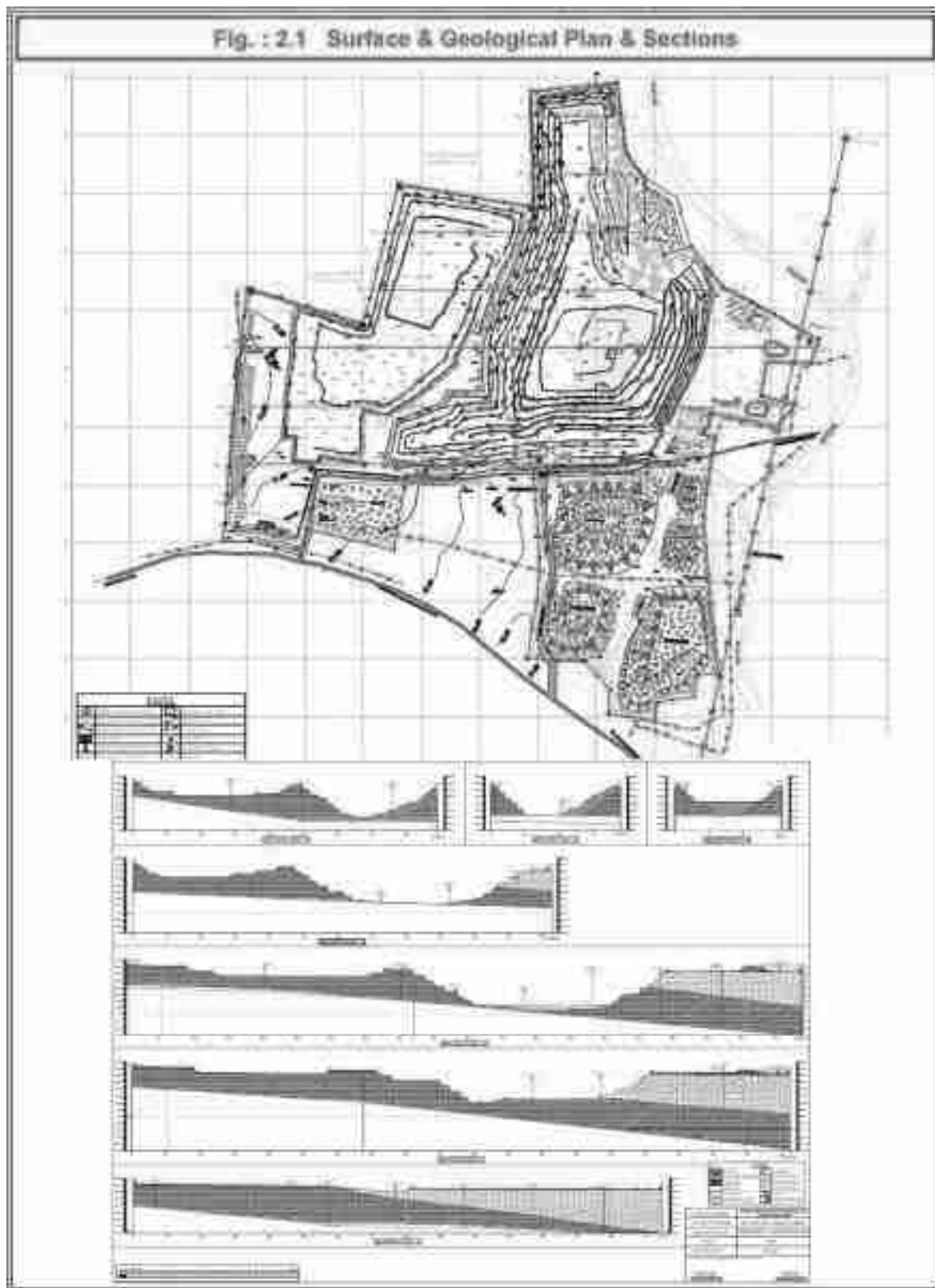


Table : 2.2 Amalgamated Lease – Proved Mineable Reserves ('111') on 01.04.2024

Sl. No.	Section Line	Sectional Area, sq. m	Influence, m	Volume, cu.m	Reserves, Tonnes	Grade, CaO %
1	SL 1	10,624	150	15,93,600	31,87,200	43
2	SL 2	24,776	100	24,77,600	49,55,200	43
3	SL 3	19,615	100	19,61,500	39,23,000	43
4	SL 4	9,164	100	9,16,400	18,32,800	43
5	SL 5	7,467	100	7,46,700	14,93,400	43
6	SL 6	1,199	100	1,19,900	2,39,800	43
7	SL 7	1,345	80	1,07,600	2,15,200	43
Total Mineable Reserves ('111' Category)					1,58,46,600	43

Table 2.3 Proved Reserves & Resources

Classification	Code	Quantity, Million Tonnes
A. Mineral Reserves		
1. Proved Mineral Reserve	111	15.85
2. Probable Mineral Reserve	121 & 122	-
B. Remaining Resources		
1. Feasibility Mineral Resource	211	-
2. Pre-feasibility Mineral Resource	221	6.29
3. Measured Mineral Resource	331	-
4. Indicated Mineral Resource	332	-
5. Inferred Mineral Resource	333	-
6. Reconnaissance Mineral Resource	334	-
Total Mineral Resources(A+B)		22.14 (CaO +35%)

2.3.4 Ore Quality

Chemical analysis was performed over the individual sample data of 0.50 m interval for each borehole corresponding to the litho units in, total 46 Check Samples. The entire estimated reserves falls within the threshold limit of CaO % as prescribed by Indian Bureau of Mines (CaO +35%) (Table 2.4). The entire limestone from this lease area, will be captive use.

Table : 2.4 Limestone Quality (Avg.)

Category	Reserves, Million Tonnes	SiO ₂ , %	Al ₂ O ₃ , %	Fe ₂ O ₃ , %	CaO, %
Fossiliferous Limestone	15.85	6.97	1.7	4.73	46.49

2.4 Mining Method

Both Opencast Conventional Mining (with controlled Drilling & Blasting) and **Non-Conventional Mining Method** (with X-Centric Ripper), for 3.00 MTPA Limestone, will be adopted. The mining comprises the following activities :

- ❖ Preparing the face by Excavator EX-350 (1.5 cu.m Bucket capacity).
- ❖ Drilling by Atlas Copco Drills (115 mm dia; 25 m/hr.) and Compressor (XA-175).
- ❖ Blasting by Controlled Techniques Method to avoid vibration & noise.
- ❖ Removal of in-situ limestone by Excavator.
- ❖ Transport from mine head to the Crusher by 25 T Tippers.

Pneumatically operated wagon drills (Atlas Copco make) of 115 mm diameter holes are engaged for carrying out the drilling operations. The drills are operated with the help of diesel operated screw compressors. For the maximum targeted production of 3.00 MTPA, it requires 21,000 Holes of spacing x burden x depth (4 x 3 x 6 m) which will yield roughly of 144 T/Hole. For blasting, 40% of booster and 60% Column Explosive will be used with electric detonator for initiation. Since adopting controlled technique blasting, the Secondary Blasting will not arise.

Blasting Parameters :

Dia of the hole	:	115 mm
Depth	:	6 m
Spacing	:	4 m
Burden	:	3 m
Yield/ hole	:	144 Tons
Charge / hole	:	27 kg.

Type of Explosive :

- Cap and non-cap sensitive , slurry explosives.
- ANFO.
- Detonating fuse.
- Millisecond delay detonators.
- Ordinary and electric detonators.

For storage of explosives, 25 Tonnes **Magazine at Nagamangalam village** will be utilized [License No. E/HQ/TN/22/162 (E39422) dated 04.06.2020 valid up to 31.03.2025]. For the transport of explosives, RCL has an **approved Explosive Van** bearing Registration No TN 46H 7237 with License No: E/SC/TN/25/526(E47710) dated 15.03.2024 with validity up to 31.03.2029. Adequate safety precautions will be taken while drilling and blasting. **A safety distance of 500 m all around the blasting site will be kept.** Proper sentries will be posted to clear the men from the blasting zone. Charging and blasting will be avoided on overcast sky.

The blasted limestone will be excavated with the hydraulic excavators, Tata Hitachi EX-350 of 1.5 cu.m bucket capacity. The limestone is transported to Cement Plant by 25 Ton Tippers. During this ROMP Period, it is proposed to excavate 15.00 Million Tonnes of Limestone and the balance Reserves will be mined out in forthcoming ROMP Period. **Life of the Mine is 10 years.** Ultimate Pit Depth will be **92 m BGL.**

No Mineral Beneficiation is required as the mined out Limestone will be used for Cement manufacturing in RCL Govindapuram Cement Plant.

2.5 Yearwise Development & Production Plan

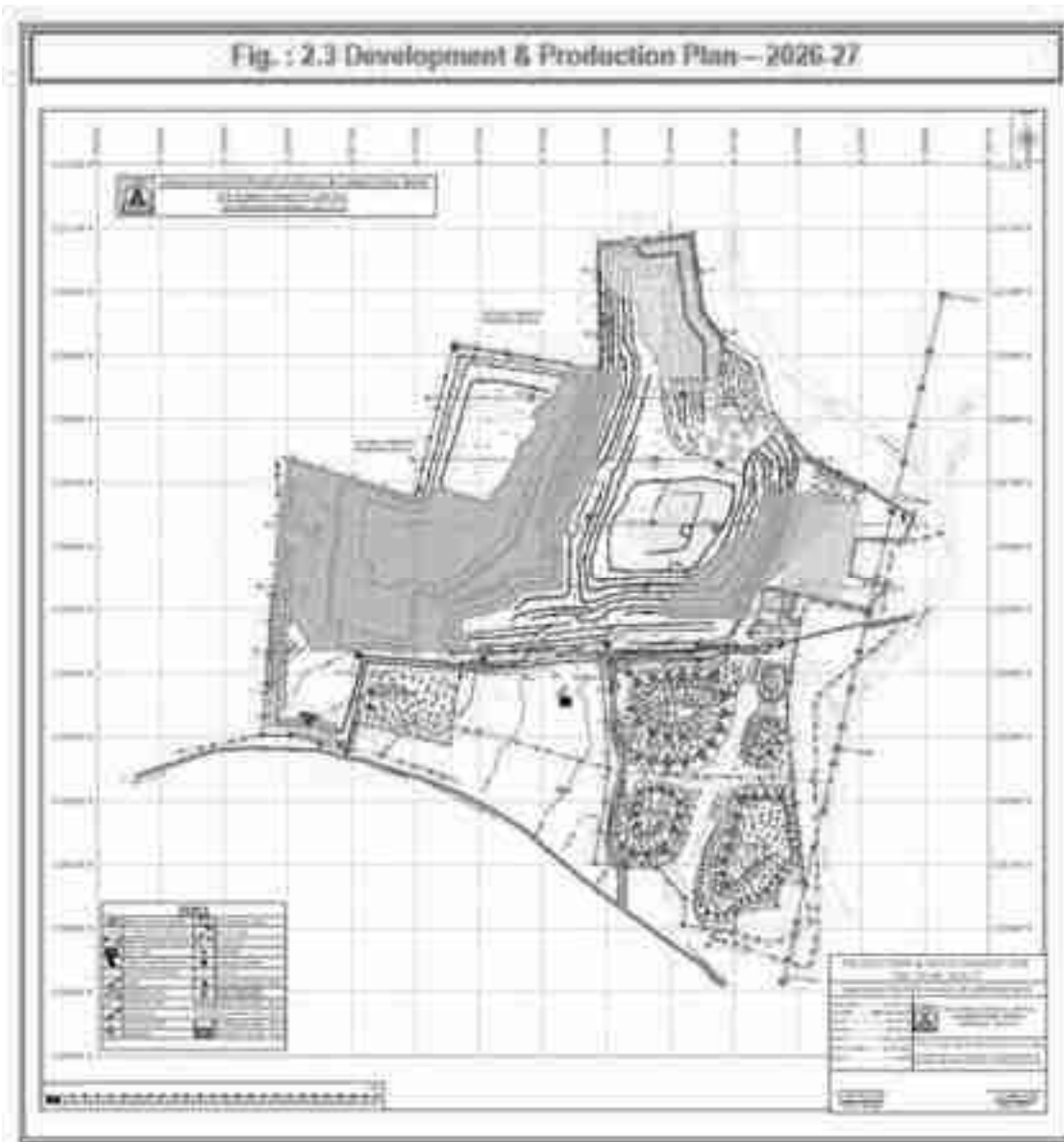
During this Plan Period, it is proposed to remove 3,24,778 Tons Top Soil and will be fully utilized for development of Green Belt & Afforestation. Further, overburden (OB) quantity of 35,34,829 Tons will be used for backfilling the Northern side of the Lease. Also, it is proposed to rehandle the Dump yard quantity of 0.56 lakhs M³ located on the eastern side of the Lease for backfilling the Northern side of the Lease. The yearwise Development & Production programme is given in **Table 2.5.** The Yearwise Plans are given as **Figs. 2.2-2.6.**

Table : 2.5 Yearwise Development & Production Programme – ROMP Period

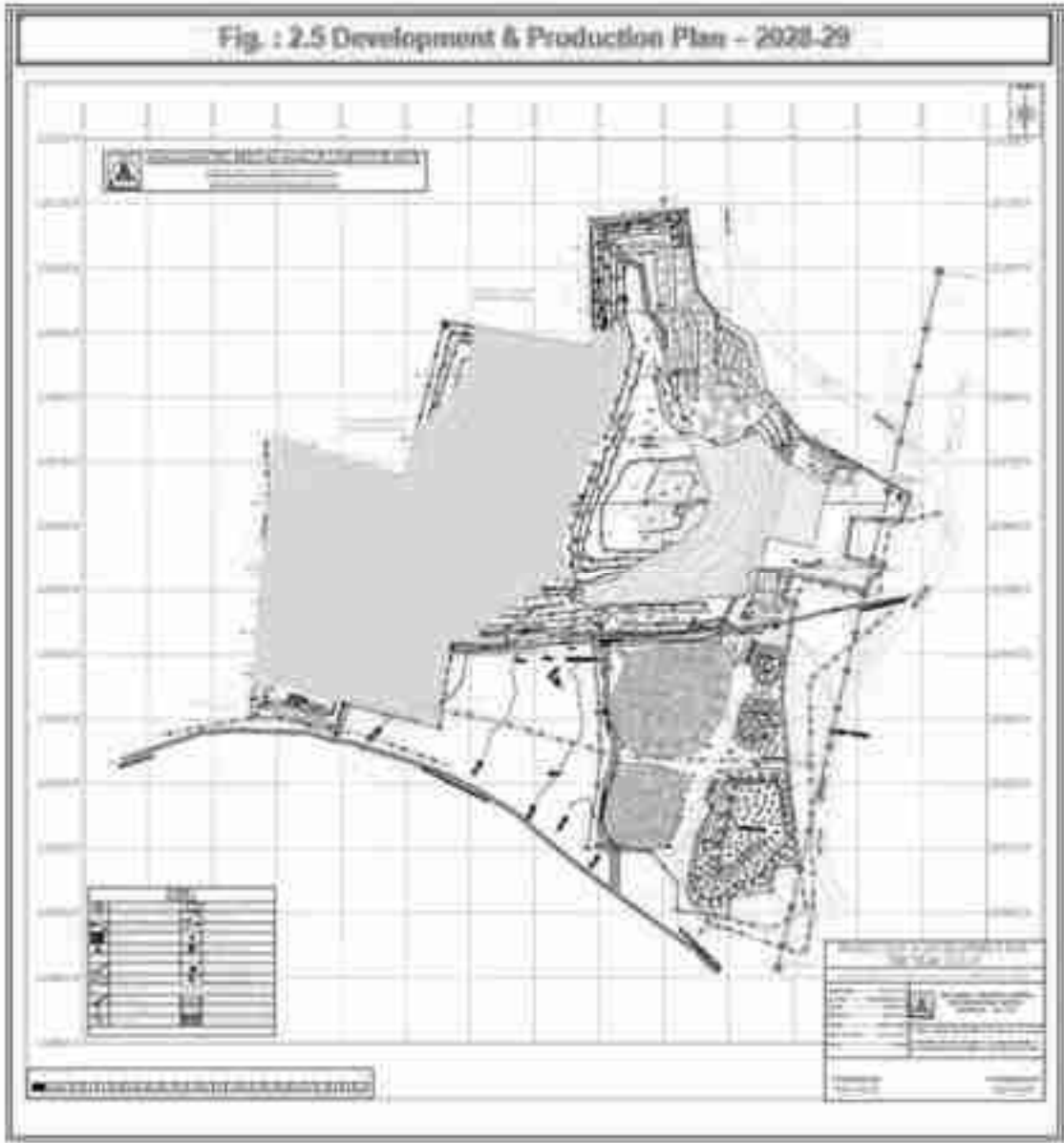
Sl. No.	Year	Working Benches	Direction	Top Soil, Tons	Over Burden, Tons	Limestone (ROM), Tonnes	Ore:Waste Ratio
1	2025-26	Topsoil, Sandstone & Limestone	West & East	142960	9,24,336	30,00,000	1:0.36
2	2026-27	Topsoil, Sandstone & Limestone	West & East	49760	2,42,288	30,00,000	1:0.10
3	2027-28	Sandstone & Limestone	West	0	0	30,00,000	1:0
4	2028-29	Sandstone & Limestone	West & South	100480	13,96,512	30,00,000	1:0.50
5	2029-30	Limestone	West & South	31578	9,71,693	30,00,000	1:0.33
Total				3,24,778	35,34,829	1,50,00,000	1:0.26

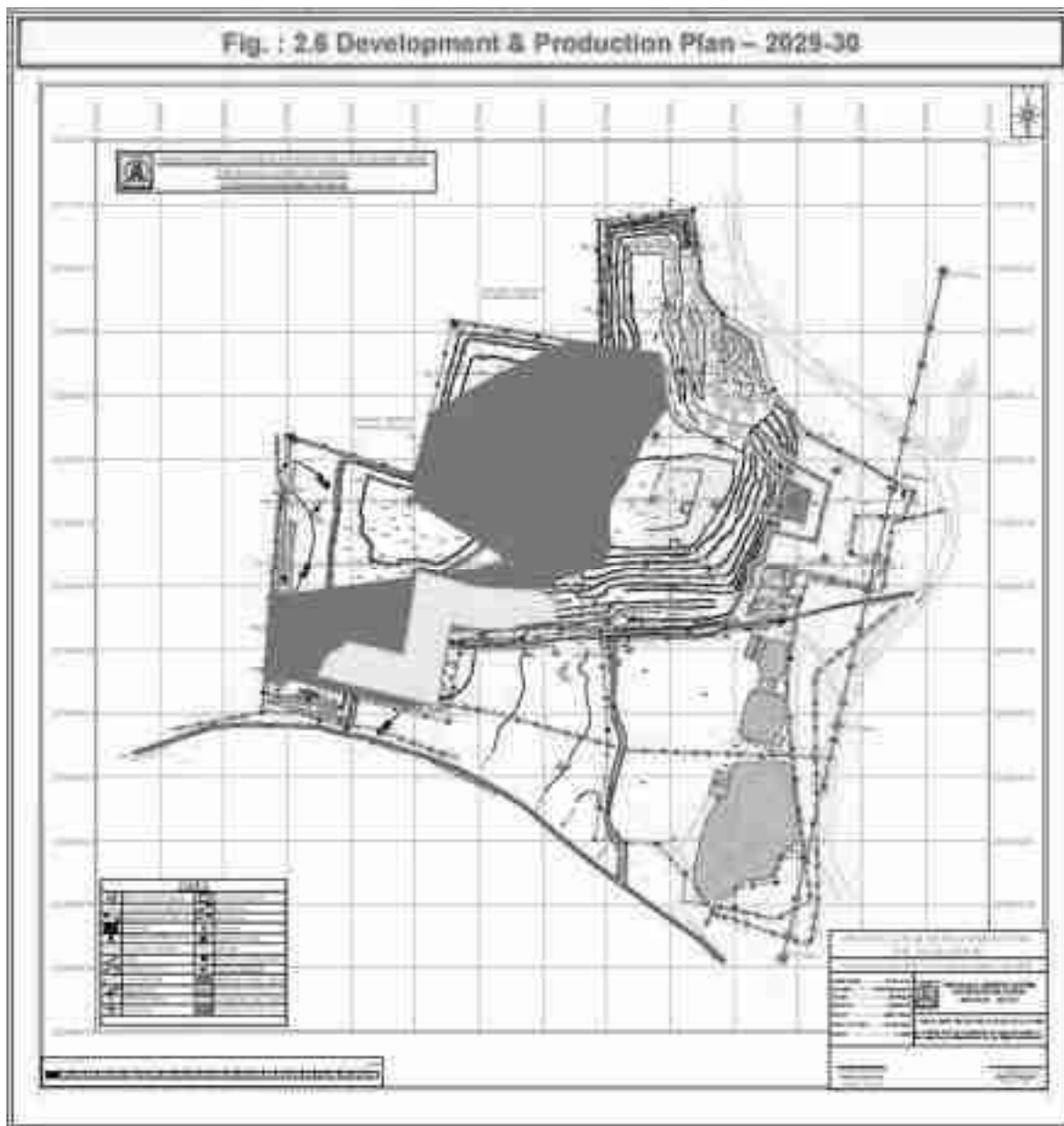
Presently, there are 4 Nos. OB Dumps with 23,68,205 Tons of OB material which will be rehandled in 4th & 5th years of the Plan Period for backfilling the mined out voids in the eastern and southern parts of the Lease.











2.6 Mining Machineries with Justification

The List of Machineries proposed are given in Table 2.6.

Table : 2.6 Mine Machineries

Sl. No.	Name of the Machinery	Nos.	Capacity	Make	HP
1	Xcentric Rippers (XR-40)	4	180 TPH	Tata Hitachi	226
2	Drilling machine - Pneumatic	2	25 m/hr. (115 mm hole dia)	Atlas Copco	-
3	Compressor -XA-175	2	-	Atlas Copco	140
4	Excavator-EX-350- 1.50 cu.m	3	230 TPH	TATA Hitachi	250
5	Tippers	23	25 Tonnes	AMW	125
6	Lorry (Water Sprinkler)	1	12,000 L	Leyland	128

2.7 Competent Mining Personnel

The Mine will be operated with the required Statutory Officials and Competent Persons mandatorily appointed as per the provisions of Mines Act 1952 and Metalliferous Mines Regulations 1961 (Table 2.7).

Table : 2.7 Mining Personnel

Sl. No	Post	Qualification/ Experience	Numbers		Category
			Direct	Indirect	
1	Mines Manager	I Class Manager's Certificate of Competency.	2		Skilled
2	Geologist	Master Degree in Geology	1		Skilled
3	Asst. Manager cum Mining Engineer	II class Manager Certificate holder	1		Skilled
4	Foreman	Foreman's Certificate of Competency	2		Skilled
5	Blaster	Blaster Certificate of Competency	1		Skilled
6	Mechanical Engineer	BE (Mech)/ Diploma in Mech. Engg.	1		Skilled
7	Clerical	----	1		Skilled
8	Driller	-----	1		Skilled
9	Mechanical Helpers	ITI	4	6	Semi-Skilled
10	HEMM Operators	Heavy & Light vehicles license holders	16	20	Skilled
11	Workers	-----	3	24	Un Skilled
Total			33	50	

2.8 Dumps Rehandling & Utilisation

Topsoil of 332,600 Tons was removed and 301,022 Tons was used for Green Belt development. Balance **31,578 Tons Topsoil** was stacked & maintained at the earmarked site (0.17 Ha) and will be used for rehabilitation of backfilled areas during the Plan Period. Also, there are 4 Nos. OB Dumps with 23,68,205 Tons OB. The dimension of Dumps are :

Dump-1 : 63 m (L) x 53 m (W) x 12 m (H)

Dump-2 : 120 m (L) x 110 m (W) x 13 m (H)

Dump-3 : 155 m (L) x 174 m (W) x 26 m (H)

Dump-4 : 174 m (L) x 163 m (W) x 20 m (H).

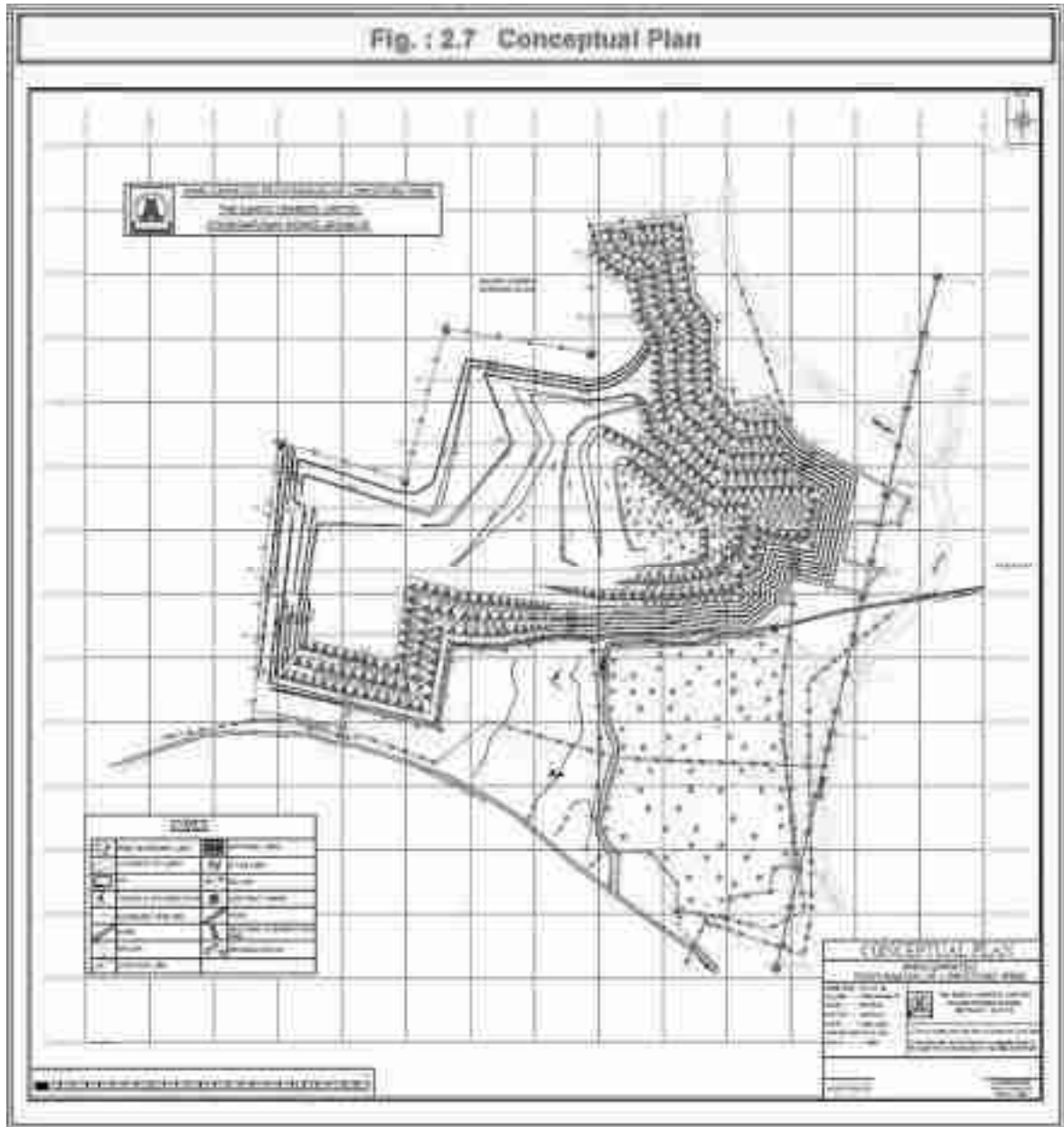
Backfilling with 1,79,638 OB materials was already done and 7,86,278 Tons OB is being utilized for backfilling in northern side of the Pit. Entire OB quantity in the Dumps will be rehandled and utilized for backfilling in the ROMP period. Thus, there will be no Top Soil Dump or OB Dump in the Lease at the end of ROMP Period viz. Year 2039.

2.9 Conceptual Plan & Land Use Pattern

Out of 53.32 Ha, Area of excavation at the end of the life of the mine will be 39.17 Ha, out of which about 14.00 Ha will be Backfilled & Reclaimed and balance 25.17 Ha will be left out as water reservoir (**Fig. 2.7**) for **harvesting Rain water and recharge the ground water-table** in its vicinity. Total Greenbelt (13.45 Ha) & Afforested (14.00 Ha) Area will be **27.45 Ha (51.48% coverage)**. Proposed Land Use Pattern is given in **Table 2.8**.

Table : 2.8 Proposed Land Use

Sl. No.	Head		Start of Plan Period, Ha		At the end of Plan Period, Ha		Conceptual Stage, Ha	
1	Area of Excavation	Backfilled	27.370	2.700	36.210	11.300	39.170	Reclaimed : 14.000
		Void		24.670		24.910		Water Res. : 25.170
2	Storage of top soil		0.170		0		0	
3	Overburden Dump		6.660		0		0	
4	Mineral Storage		0		0		0	
5	Infrastructure		0.200		0.200 (Rehabilitated)		0.200 (Rehabilitated)	
6	Roads		0.500		0.500		0.500	
7	Green Belt		6.690		10.650		13.450	
8	Backfilled for Reclamation		-		2.700		-	
9	Others (Unutilised)		11.730		3.060		-	
Total			53.320		53.320		53.320	



2.10 Financial Closure Plan

The financial assurance as per the Rule 27(1) of amended Mineral Conservation and Development Rules, (MCDR) 2021 is Rs. 2,57,05,000/- (@ Rs.5,00,000/- per Hectare) for 51.410 Hectares will be submitted vide a Bank Guarantee.

2.11 Green Belt

Green belt is developed around the ML areas, all along haulage road, waste dump and around the mine site office. The green belt developed in a phased manner. So far, about 19.70 Ha is brought under green belt (including Dumps) with 44,980 trees @ 2,283 plants per Ha and survival rate is about 90% (Table 2.9). Herbs and shrubs are also made besides tree plantation.

Table : 2.9 Green Belt Developed

Year	No. of Plants Planted	Area, Ha	Location	Survival Rate, %	Species Name
2009-10	10000	2.70	All along the mining lease boundary, dump slopes, haul road, office, etc.	90	Predominantly, local species like Azadirachta indica (Neem), Cassia siamea (Manjakondrai), Pongamia pinnata (Pungan), Holoptelia integrifolia (Arali), Tecoma stans (Thangarali), Cassia fistula (Sarakondrai), Samanea saman (Thoongumoonji), Albizia lebbeck (Vagai), etc. are developed and maintained.
2010-11	6000	2.50		90	
2011-12	11000	2.50		90	
2012-13	5000	2.00		90	
2013-14	4000	2.00		90	
2014-15	3000	3.00		90	
2015-16	500	0.50		90	
2016-17	1000	1.00		90	
2017-18	1000	1.00		90	
2018-19	500	0.50		90	
2019 – 20	1000	0.50		90	
2020 – 21	660	0.50		90	
2021-22	660	0.50			
2022-23	660	0.50			
Total	44,980	19.70			

About 216 trees along the common boundaries & OB Dumps are already transplanted in PNR Old Crusher area and maintained as such (Plate VII).

2.12 Power & Fuel Demand

About 50 KVA industrial supply for lighting is required which will be met from TANGEDCO Grid. For operating the mining equipments, High Speed Diesel (HSD) is required @ 3,000 Liters/day. There will be **no standby DG set**.

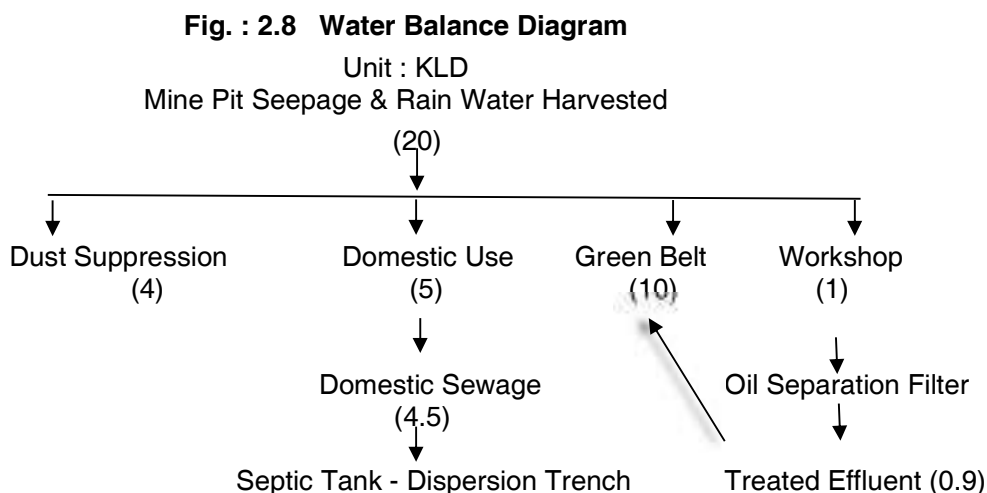


2.13 Other Facilities

All the services viz. Mines Office, **First Aid Room**, Rest Shelters, **Drivers Rest Room**, **Toilet**, potable water and other necessary amenities are provided at the Mine. To facilitate the maintenance of all equipments, there is a central workshop available at Factory for electrical, mechanical and instrumentation repairs. Occupational Health Center is established at the Factory. A well established Township exists near the Factory and **no Township is proposed for the Mine**. A licensed fuel storage tanks is established at the Factory and the daily requirement of HSD and other lubricants is met by the mobile bowser.

2.14 Water Demand & Balance

The Mine requires about 20 KLD towards Domestic consumption (5 KLD), Workshop & Dust Control Measures (5 KLD) and Green Belt (10 KLD) which will be met from mine pit seepage water. As per the State Ground Water Board (SGWB), the area falls in **Safe Area Category**. Domestic sewage generation will be about 4.5 KLD which will be biologically treated in a Septic Tank followed by a Dispersion Trench. About 0.9 KLD effluent generation from the small Workshop which is treated in a Oil Separation Filter and treated effluent is used for Green Belt. 'Zero Effluent Discharge' will be adopted. The **Water Balance Diagram** is given as **Fig. 2.8**.



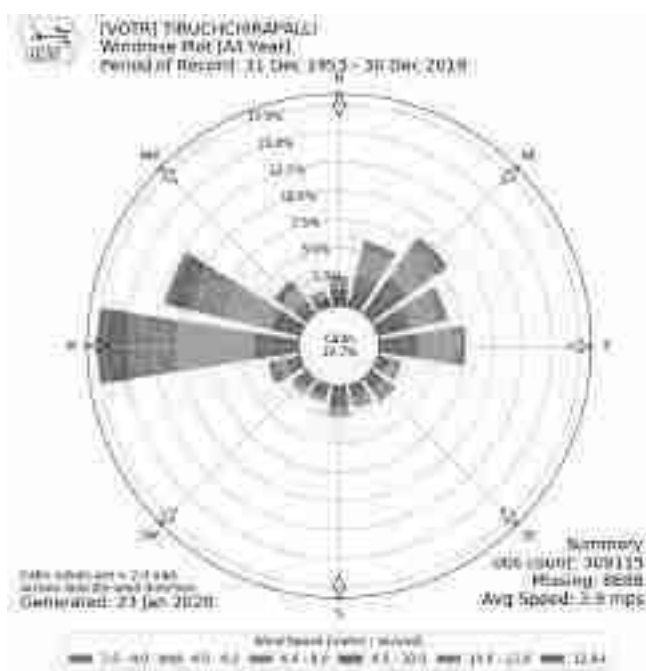
2.15 Occupational Health

The Occupational Health Surveillance Program is being conducted for the Mine workers periodically. An Occupational Health Center is at the Cement Plant. A dedicated dispensary with qualified Doctor in OHS and pharmacy are provided for Occupational Health Surveillance and Monitoring. Personal Protective Equipment are provided for all employees working in the mines. Adequate training on Safety and health aspect has been provided. Review of Impact of various health measures is being undertaken.

3.0 Description of the Environment (Baseline Status)

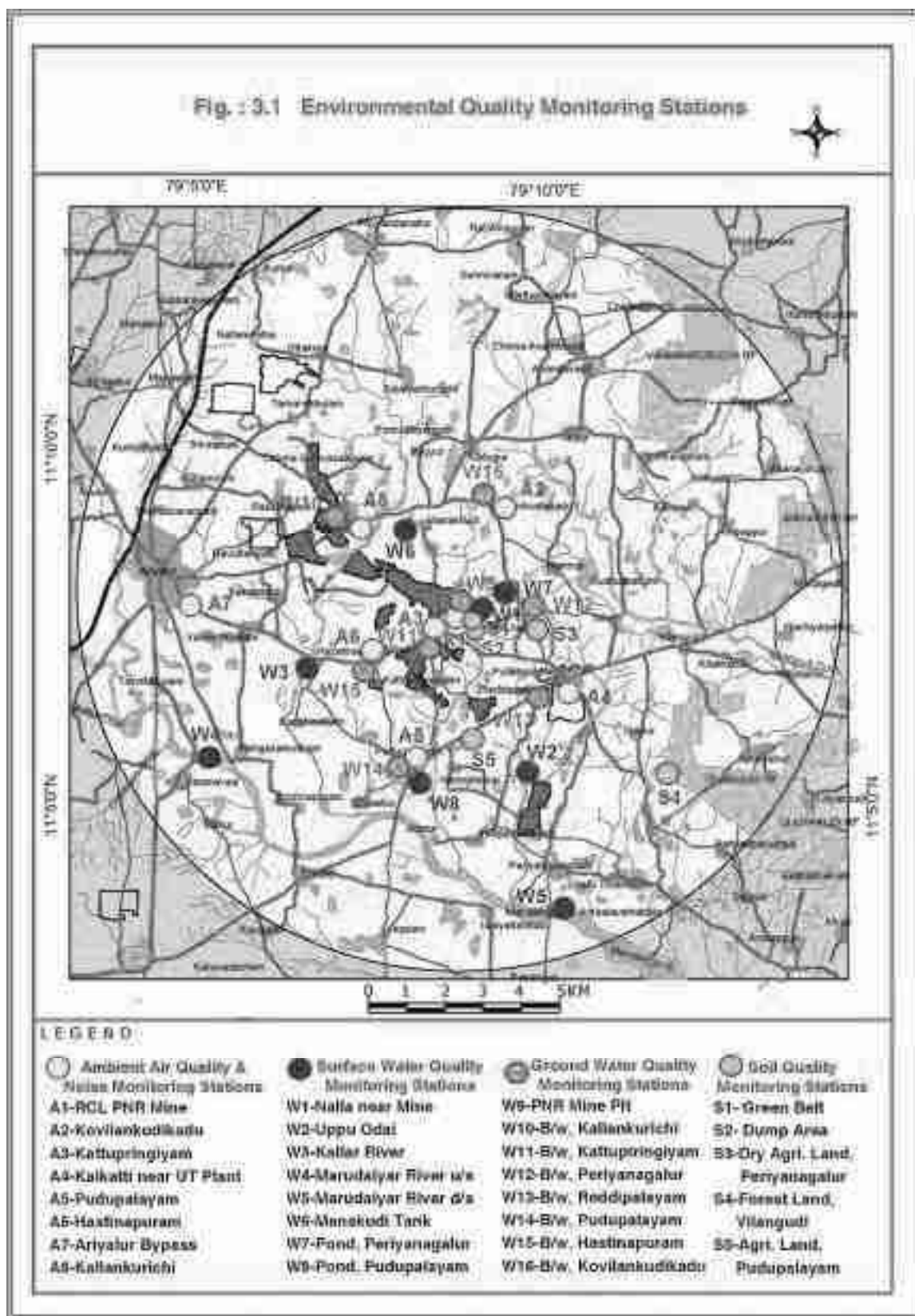
3.1 Study Area

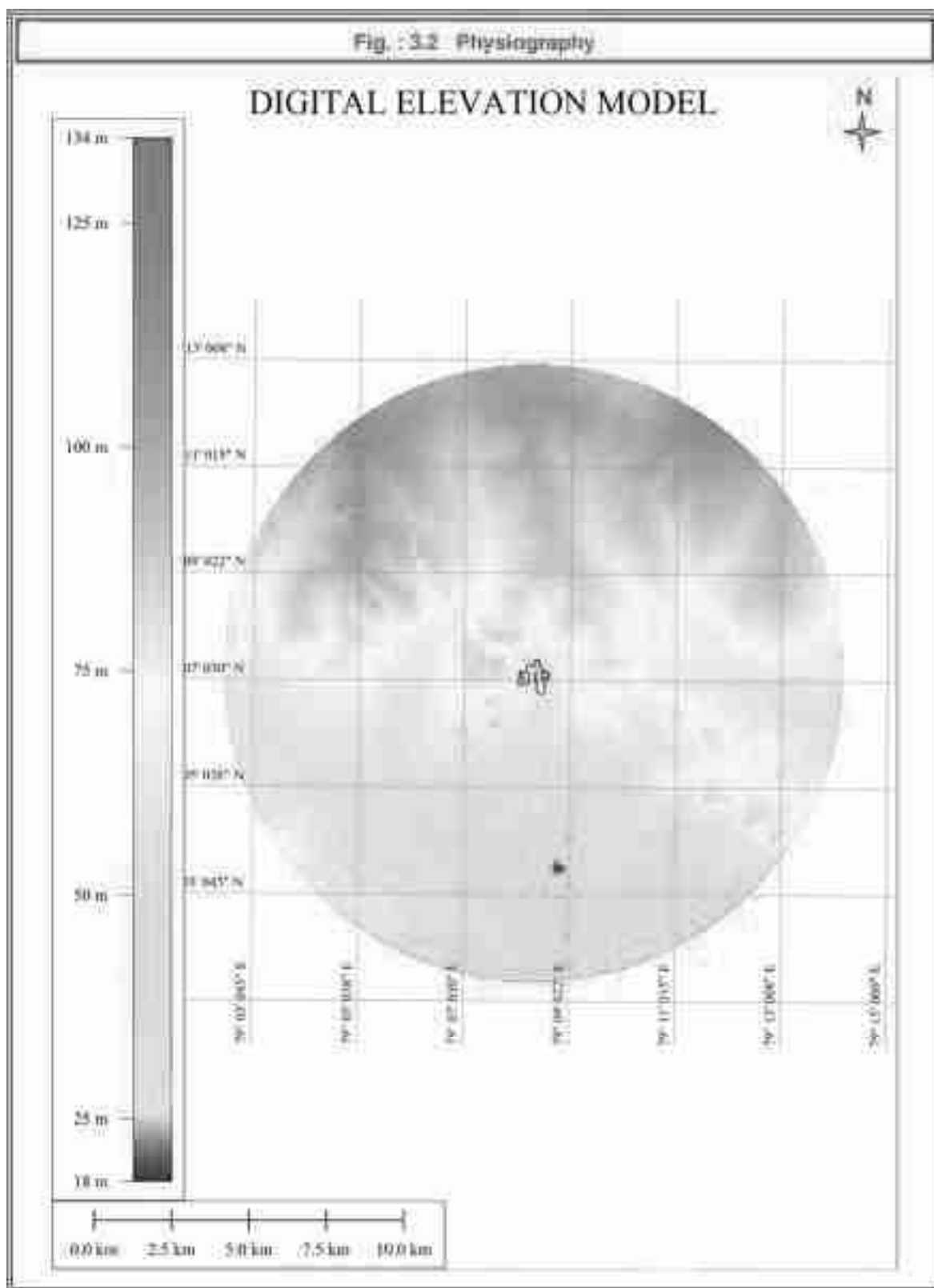
The study area of **10 km radius (from boundary)** (Fig. 3.1) has been considered for assessing the baseline environmental status. **Project area does not fall in Critically Polluted Industrial Clusters** listed by CPCB. As Bay of Bengal is at 100 km from the Lease, Coastal Regulation Zone (**CRZ applicability is not there**). The nearest IMD Station is Trichy Airport. The monitoring stations were selected in such a way that the baseline environmental data reflects the **Cumulative Impact of existing Mines and Industries** in the Study area. Annual Wind Rose of Trichy for the Period 1953 to 2019 (Source IEM Website) is referred while fixing the Monitoring Stations (appended).

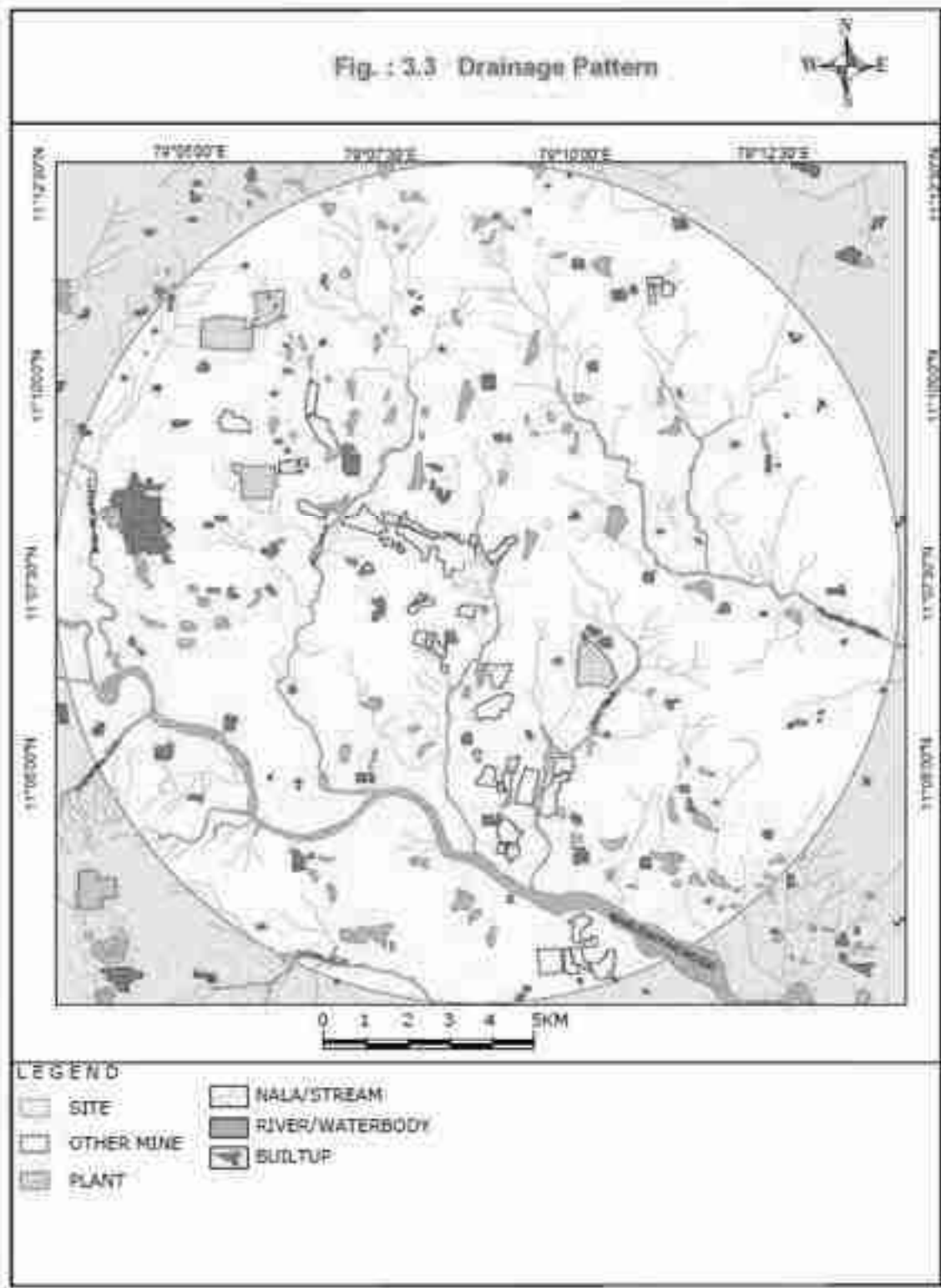


Physiography : The minimum and maximum elevation of the study area is 30 m and <120 m aMSL respectively (Fig. 3.2). Mine area has the elevation of **65-73 m aMSL**. It is almost flat with gentle gradient towards south and southeast. There is no hillocks noticed in the study area.

Drainage Pattern : There is **no nallah/stream crossing** at the Mine. There is no perennial river in the study area. Seasonal **Marudaiyar River drains** the region and flows at 4.9 km in SSW direction (Fig. 3.3). Seasonal Nallah Kallar River flows at 2.9 km in northwest. A seasonal nalla flows in the eastern boundary of the Lease from north to south. High Flood Level recorded in the seasonal nalla is 63.9 m in the north to 62.2 m in the south. The Lease is located in an elevation of 66.8 m to 65.7 m. The overall drainage pattern of the region appears to be dendritic. There are also rainfed irrigation tanks and ponds in the study area.







3.2 Environmental Components

Considering the environmental setting of the project, project activities and their interaction, environmental regulations and standards, the Environmental Attributes covered for the EIA Study is given in **Table 3.1**.

Table : 3.1 Baseline Data Collection – Monitoring Locations

Attributes		Sampling		Remarks
		No. of Locations	Frequency	
Air	Meteorological Parameters	1	For a Season	Wind speed, wind direction (wind rose), temperature, humidity, cloud cover, atmospheric pressure, rainfall, etc.
	AAQ Parameters	8	24-hourly basis, continuously for 2 days in a week for 4 weeks in a month for a season	For the parameters as per Revised NAAQ Norms
Noise		8	Once in the season	For Leq, Lday and L night values
Water	Surface Water Quality Parameters	8	Once in the Season	As per CPCB Norms (including existing Plant Raw Water)
	Ground Water Quality Parameters	8		As per IS:10500 Norms
Land	Soil Quality	8	Once in the Season	Season for Textural & Physical Parameters & Nutrients.
	Land Use	Study Area	Once during the Study Period	Based on recent available Satellite Imagery
Biological	Aquatic	Study Area	Once during the Study Period	Flora & Fauna in Core & Buffer Zones
	Terrestrial			
Socio economic Parameters		Study Area	Once during the Study Period	Based on 2011-Census and Need Based Assessment, once in the study period for: Total Population / Household Size, Gender Composition, S.C / S.T Population, Literacy Levels, Occupational Structure, etc.

3.3 Methodology Adopted

Micrometeorology : As a part of the study, the micrometeorology and microclimatic parameters were recorded by installing a weather monitoring station (Envirotech WM 200) near the Lease at 10 m height. Data of wind velocity, wind direction, ambient temperature, relative humidity, cloud cover and atmospheric pressure were recorded at hourly intervals along with rainfall during the monitoring period.

Ambient Air Quality : The study area represents the Industrial, Residential, Rural and other Areas with respect to Revised National Ambient Air Quality (NAAQ) Norms stipulated by CPCB. Calibrated Fine Particulate Samplers (Envirotech APM 550) & Respirable Dust Samplers (Envirotech APM 460) were used for monitoring of PM_{2.5} & PM₁₀. Gaseous samples are collected by integrated gas sampling assembly (Envirotech APM 411). A tapping provided in the hopper of the sampler is utilised for gaseous sampling. with proper flow controller and a flow of 1.0 l/min.

PM_{2.5} & PM₁₀ : APM 550 system is a manual method for sampling fine particles and is based on impactor designs standardized by EPA for Ambient Air Quality Monitoring. Ambient Air enters the APM 550 system through an omni-directional inlet designed to provide a clean aerodynamic cut point for particles greater than 10 microns. Particles in the air stream finer than 10 microns proceed to a second impactor that has an aerodynamic cut point at 2.5 microns. The air sample and the fine particulates existing from the PM_{2.5} impactor is passed through a 47 mm dia filter. Teflon filter membrane that retains the FPM. The APM 550 system allows removal of the PM_{2.5} impactor from the sample stream so that the same system may be optionally used as a PM₁₀ sampler also.

SO₂ : Modified West & Gaeke method (spectrophotometric) was adopted. SO₂ was collected in a scrubbing solution of sodium tetrachloro mercurate (TCM) and was allowed to react with sulphamic acid, formaldehyde and then with pararosaniline hydrochloride. The absorbance of product red-violet dye was measured using UV Visible Spectrophotometer at a wavelength of 560 nm. Concentration of SO₂ was calculated by multiplying the absorbance with calibration factor and dividing by volume of air sampled.

NO_x : Jacob and Hocheiser modified method was adopted. Nitrogen oxides as nitrogen dioxide were collected by bubbling air through sodium hydroxide-sodium arsenite solution to form a stable solution of sodium nitrite. The nitrite ion produced during sampling was determined spectrophotometrically (at 540 nm) by reacting the exposed absorbing reagent with phosphoric acid, sulphanilamide and N (1-naphthyl) ethylamine dihydrochloride. Concentration of NO_x was calculated as described in SO₂ measurement.

Ammonia : Indophenols method (APHA Method 401, Air Sampling and Analysis, 3rd Edition) was adopted. Ammonia in the atmosphere is collected by bubbling a measured volume of air through a dilute solution of sulphuric acid to form ammonium sulphate. The ammonium sulphate formed in

the sample is analysed colorimetrically by reaction with phenol and alkaline sodium hypochlorite to produce indophenols. The reaction is accelerated by addition of Sodium nitroprusside as catalyst.

Ozone : IS:5182 Part IX (Methods for Measurement of Air Pollution - Oxidants)/ APHA Method 410 was adopted. Micro amounts of ozone and the oxidants liberate iodine when absorbed in a 1% solution of potassium iodine buffered at pH 6.8 \pm 0.2. The iodine is determined spectrophotometrically by measuring the absorption of tri-iodide ion at 352 nm. Drager Multiwarn Detector was also used for real time value.

CO : Envirotech APM 850 Organic Vapour Samplers are used for CO monitoring. Standard MSA tubes are used for monitoring carbon monoxide. A measured volume of air is passed at the flow rate of 100 to 200 ml/min for 1 to 8 hours and the colour change (yellow to green) in indicating gel filled in the detector tubes and is matched with the colour chart provided with detector tubes for finding out CO concentration. Drager Multiwarn Detector was also used for real time value.

Particulate Lead : The exposed glass fibre filter papers were cut into small pieces and to it 100 ml distilled water and 10 ml nitric acid were added and heated on a hot plate for 4-6 hours. The clear solution obtained after digestion was filtered and made upto 25 ml and were analysed on a Analytic Jena Atomic Absorption Spectrophotometer (AAS) employing Lead Hollow Cathode Lamp. Concentration of lead was calculated by taking the result obtained from AAS analysis and dividing it with the volume of air sampled.

Benzene : The charcoal tubes are available in different sizes and contain varying amount of activated charcoal. The ambient air was sucked through the tube using a low flow sampler used for collection of BTX sample in a way that results in an enrichment of the relevant substances in the activated charcoal. Desorption of the adsorbed benzene was done using Carbon disulphide (CS₂). The substances desorbed in CS₂ were analyzed by capillary Gas Chromatography.

Benzo (a) Pyrene (BaP) is one of the most important constituent of PAH compounds and also one of the most potent carcinogens. This can be measured in both particulate phase and vapour phase. In the vapour phase the concentration of B(a)P is significantly less than the particulate phase. Therefore, more care to be taken for the measurement of Benzo(a) Pyrene in the particulate phase. It is based on BIS method IS 5182 (Part XII). This method is designed to collect particulate phase PAHs in ambient air and fugitive emissions and to determine individual PAH compounds using capillary Gas Chromatography equipped with flame ionization detector.

Nickel and Arsenic : The Atomic Absorption Spectroscopy (AAS) technique makes use of absorption spectrometry to assess the concentration of an analyte in the sample. The method is based on active sampling using PM10 High Volume Sampler and then sample analysis is done by atomic absorption spectroscopy.

The **detectable range** of the Air Pollutants are given in **Table 3.2**.

Table : 3.2 AAQ Parameters– Detectable Range

Parameter	Method	Range
Respirable Particulate Matter (less than 10 µm or PM10)	IS 5182: (Part 23) : 2006 RA: 2017	5-1000 µg/m ³
Particulate matter (less than 2.5 µm or PM2.5)	USEPA Quality Assurance Handbook Vol II Part II - Guidance Documents 2.12 issue year: Nov-1998	10-1000 µg/m ³
Sulphur Dioxide	IS 5182: (Part 2), 2001 RA: 2017	5-1000 µg/m ³
Nitrogen Dioxide	IS 5182: (Part 6), 2006 RA: 2017	6-750 µg/m ³
Carbon Monoxide	IS 5182: (Part 10), 1999 RA: 2014	1-200 mg/m ³
Ammonia	Indophenol Method (Method of Air sampling and analysis 3 rd edition method 401)	5-700 µg/m ³
Ozone	IS 5182: (Part 9), 1974, RA 2014	10-19000 µg/m ³
Benzene (C ₆ H ₆)	IS 5182 (Part 11), 2006 RA: 2017	0.01-1000 µg/m ³
Banzo (α) Pyrene Particulate Phase only	IS 5182: (Part 12): 2004, RA: 2014	0.1-10,000 ng/ m ³
Nickel	IS 5182: (Part 22), 2004, RA: 2014 /NAAQS Monitoring & Analysis Guidelines Volume-I	1.0 -50 ng/m ³
Arsenic		1.0-10 ng/ m ³
Lead		0.1-50 µg/m ³

Noise Levels : Noise levels were monitored at all air monitoring locations during day time as well as night time in a day. A totally portable measurement systems, Lutron SL 4001 with an internal calibrator and wind screen was used. The built-in internal oscillation system 1 KHz sine wave generator is used for on the spot calibration at 94.0 dB(A) at 1000 Hz. The basic unit of measurement is A-weighted sound level.

Water Quality : Water samples of both surface and ground waters were collected during the survey period and analysed for physico-chemical and bacteriological parameters (Table 3.3). Parameters like pH, conductivity, temperature, DO, etc. were measured in the field itself while collecting the samples using a microprocessor based Portable Water Analysis Kit (Elico Model PE136). Samples for chemical analysis were collected as per IS:2488. Sterilised bottles were used for collection of bacteriological samples.

Soil Quality : Samples at 3 depths viz. 0-30 cm, 30-60 cm and 60-90 cm were collected using sampling augers and field capacity apparatus. Soil extraction (10%) were used for analysis.

Calibration : The monitoring and analytical instruments are being calibrated periodically. The correction factors, if any, are being used in computation of the data.

Flora & Fauna : A general ecological survey covering an area of 10 km radius area were conducted and reported. Faunal survey covers the Terrestrial and Avian Fauna. This study included the identification of endangered and rare species as per Red Book.

Socio-Economic profile of population in study area is based on Census 2011 data.

Table : 3.3 Methodology Adopted for Water Analysis

Sl. No.	Parameter	Unit	Reference	Method
1	Taste & Odour	-	IS:3025 (5/7)*	As perceived
2	pH	-	IS:3025 (11)	Digital pH meter
3	Colour	Hazen units	IS:3025 (4)	Comparison with Standards
4	Turbidity	NTU	IS:3025 (10)	Nephelometric
5	Total Dissolved Solids	mg/l	IS:3025 (16)	Gravimetric
6	Total Hardness	mg/l	IS:3025 (21)	Titrimetric (EDTA)
7	Iron (as Fe)	mg/l	32 of IS3025	Colorimetric (Phenonthroline)
8	Chlorides (as Cl)	mg/l	IS:3025 (32)	Titrimetric (Argentometric)
9	Residual Chlorine	mg/l	IS:3025 (26)	Titrimetric
10	Calcium (as Ca)	mg/l	IS:3025 (40)	Titrimetric (EDTA)
11	Magnesium (as Mg)	mg/l	IS:3025 (46)	Titrimetric (by difference between Total Hardness and Calcium Hardness)
12	Alkalinity (as CaCO ₃)	mg/l	IS:3025 (23)	Colour indicator titration
13	Dissolved Oxygen	mg/l	IS:3025 (38)	Winkler titrimetric-azide modification
14	Sulphate (as SO ₄)	mg/l	IS:3025 (24)	Turbidimetric/Gravimetric
15	Fluoride (as F)	mg/l	IS:2488 (II)+	Distillation followed by Colorimetric (SPADNS)
16	Nitrate (as NO ₃)	mg/l	IS:3025 (34)	Colorimetric (PDA)
17	Cyanide (as CN)	mg/l	IS:3025 (27)	Colorimetric (Pyridine-Bispyrazolone)
18	Pesticides	mg/	IS:2488 (III)	Gas chromatograph
19	Phenols (as C ₆ H ₅ OH)	mg/l	IS:3025 (43)	Distillation followed by colorimetric (4-Aminoantipyrine)
20	Manganese (as Mn)	mg/l	35 of IS3025	Colorimetric (Persulpahte)
21	Chromium (as Cr ⁶⁺)	mg/l	IS:2488 (II)	Colorimetric (Diphenyl carbazide)
22	Copper (as Cu)	mg/l	IS:3025 (42)	Atomic Absorption Spectrophotometric
23	Selenium (as Se)	mg/l	IS:2488 (II)	Atomic Absorption Spectrophotometric
24	Cadmium (as Cd)	mg/l	IS:3025 (41)	Atomic Absorption Spectrophotometric
25	Arsenic (as As)	mg/l	IS:3025 (37)	Atomic Absorption Spectrophotometric
26	Boron (as B)	mg/l	IS:2488 (III)	Colorimetric (Curcumin)
27	Mercury (as Hg)	mg/l	IS:3025 (48)	Mercury analyser
28	Lead (as Pb)	mg/l	IS:3025 (47)	Atomic Absorption Spectrophotometric
29	Zinc (as Zn)	mg/l	IS:3025 (49)	Colorimetric (Dithizone)
30	Percent sodium	%	IS:2488 (V)	From Na, K, Ca & Mg values
31	BOD-3 days@27 °C	mg/l	IS:3025 (44)	3 days @ 27°C
32	COD	mg/l	IS:2488 (V)	Dichromate reflux
33	Oil & Grease	mg/l	IS:3025 (39)	Gravimetric
34	Coliforms	MPN/100 ml	IS:1622	Multiple tube fermentation (5 tubes)
35	Plate Counts	No. of Colonies/ml	IS:1622	Colony count in Agar-agar medium

* : IS:3025 (Parts)-Methods of Sampling and Test (Physical and Chemical) for Water and Wastewater;

+ : IS:2488 (Parts)-Methods of Sampling and Test for Industrial Effluents.

3.4 Micrometeorology

Regional Status : Sub-tropical climate prevails over the study area. The nearest IMD station is Trichy Airport. The maximum temperature ranges from 40 °C to 44 °C and minimum temperature from 22 °C to 27 °C. As per TWAD Data, **70 year Normal Rainfall** of nearby Ariyalur Rain Gauge Station is **1,096 mm**. Around 50% of the rainfall occurs during Northeast monsoon and the remaining rainfall occurs during Southwest and Transitional periods. The chances of receiving normal annual rainfall is about 40-45%.

Site Specific Status : The abstract of collected hourly meteorological data are presented in **Tables 3.4-3.6**. Based on the wind parameters, wind rose is drawn and presented as **Fig. 3.4**.

December 2023 : Predominant winds were from NE & NNE directions. Mean Wind velocity was 6.0 kmph. Temperature values were ranging from 21.3 °C to 36.0 °C with mean value of 27.3 °C. Mean maximum relative humidity value was 80.3%. Mean atmospheric pressure value was computed as 759.4 mm of mercury. There were 9 rainy days with total rainfall of 20.4 mm.

January 2024 : Predominant winds were from NE & ENE directions. Mean Wind velocity was 5.2 kmph. Temperature values were ranging from 21.0 °C to 35.0 °C with mean value of 26.8 °C. Mean maximum relative humidity value was 77.4%. Mean atmospheric pressure value was computed as 760.3 mm of mercury. There were 3 rainy days with total rainfall of 12.4 mm.

February 2024 : Predominant winds were from NE & ENE directions. Mean Wind velocity was 6.0 kmph. Temperature values were ranging from 20.1 °C to 38.0 °C with mean value of 28.5 °C. Mean maximum relative humidity value was 70.2%. Mean atmospheric pressure value was computed as 760.4 mm of mercury. There was one rainy day with total rainfall of 0.6 mm in this month.

Winter Season 2023-24 :

- ❖ Predominant winds were from NE directions.
- ❖ Mean Wind velocity was 5.7 kmph.
- ❖ Temperature values were ranging from 20.1 °C to 38.0 °C with mean value of 27.5 °C.
- ❖ Mean maximum relative humidity value was 76.0%.
- ❖ Mean atmospheric pressure value was computed as 760.0 mm of mercury.
- ❖ There were 13 rainy days with total rainfall of 33.4 mm.

The monitored meteorological data were found to be **in compliance with local weather phenomena**.

Table : 3.4 Micrometeorological Data – December 2023

Location : PNR Mine Area

Date	Mean Wind Velocity, kmph	Pred. Wind Direction, ° (from)	Temperature, °C			Relative Humidity (Mean), %	Cloud Cover, oktas	Atm. Pressure (Mean), mm of Hg	Rain-fall, mm
			Min.	Max.	Mean				
01.12.2023	4.1	10.5	24.8	33.0	28.0	80	5	757.9	0
02.12.2023	4.6	348.9	25.0	33.0	28.1	77	7	756.8	0
03.12.2023	4.0	294.1	25.0	31.0	27.8	82	7	756.3	0.2
04.12.2023	7.7	274.3	23.9	34.0	28.9	75	7	755.2	0
05.12.2023	6.2	252.5	24.9	36.0	29.8	76	6	755.6	0
06.12.2023	5.1	191.7	24.9	36.0	29.4	80	5	756.9	4.0
07.12.2023	4.1	103.4	26.0	36.0	29.2	82	4	757.9	0
08.12.2023	4.1	67.9	26.0	34.0	28.9	84	5	758.7	5.0
09.12.2023	5.1	54.2	25.8	33.6	28.5	83	5	759.3	0
10.12.2023	6.2	44.9	24.9	33.0	28.2	80	6	758.8	0
11.12.2023	6.2	42.4	24.8	31.0	27.6	80	5	759.3	0
12.12.2023	6.2	51.1	24.0	32.0	26.8	82	4	758.8	0
13.12.2023	7.2	45.5	23.0	32.0	26.6	77	4	759.3	0
14.12.2023	6.7	29.7	22.5	32.0	26.8	75	4	760.2	0
15.12.2023	7.2	26.0	24.9	29.2	26.5	80	6	760.2	0
16.12.2023	5.1	23.6	22.7	30.0	25.6	89	6	759.6	9.0
17.12.2023	7.2	38.3	24.8	30.1	26.3	88	7	759.0	0.6
18.12.2023	6.2	36.7	24.0	28.0	26.1	85	7	760.2	0
19.12.2023	7.2	34.7	24.8	30.0	26.8	77	7	760.3	0
20.12.2023	6.3	30.6	23.2	29.0	26.2	80	7	760.3	0.2
21.12.2023	5.6	34.9	24.0	29.0	25.5	89	7	760.4	1.0
22.12.2023	4.6	50.3	22.2	31.0	26.3	80	3	760.6	0
23.12.2023	6.2	48.7	22.0	32.0	26.1	73	3	761.3	0
24.12.2023	6.2	38.8	22.2	30.0	25.8	77	6	761.7	0
25.12.2023	6.0	45.9	24.0	33.0	27.4	81	5	760.8	0
26.12.2023	6.2	43.3	21.3	32.0	26.9	77	4	761.4	0
27.12.2023	7.7	42.4	22.6	33.0	27.1	77	4	761.2	0.2
28.12.2023	6.2	42.4	24.0	32.0	27.3	80	6	760.4	0.2
29.12.2023	7.7	44.1	24.0	31.0	27.1	82	6	760.7	0
30.12.2023	6.2	48.4	24.0	31.0	27.1	82	5	760.6	0
31.12.2023	6.2	48.3	23.0	32.0	26.7	78	4	760.2	0
Monthly Abstract	6.0	80.3	21.3	36.0	27.3	80.3	5.4	759.4	20.4

Note : Abstract values are taken from the hourly readings (00:00-24:00 hrs.) recorded continuously during the monitoring period.

Table : 3.5 Micrometeorological Data – January 2024

Location : PNR Mine Area

Date	Mean Wind Velocity, kmph	Pred. Wind Direction, ° (from)	Temperature, °C			Relative Humidity (Mean), %	Cloud Cover, oktas	Atm. Pressure (Mean), mm of Hg	Rain-fall, mm
			Min.	Max.	Mean				
01.01.2024	5.1	49.3	22.0	32.0	26.6	77	4	760.5	0
02.01.2024	5.7	47.4	23.8	31.1	26.6	78	6	759.9	0
03.01.2024	5.1	57.3	23.0	32.0	26.8	77	5	759.6	0
04.01.2024	5.1	54.9	22.5	30.5	26.8	81	6	759.3	0
05.01.2024	4.6	49.5	24.0	30.0	26.9	82	7	759.4	0
06.01.2024	5.7	41.6	24.8	32.0	27.6	80	6	759.1	0
07.01.2024	5.7	43.5	24.1	30.0	26.8	84	7	759.4	3
08.01.2024	4.1	39.1	23.8	28.0	25.4	92	8	760.1	1
09.01.2024	5.3	39.2	24.6	28.0	26.0	89	7	759.9	8.4
10.01.2024	6.2	35.8	24.0	30.0	26.7	81	7	759.9	0
11.01.2024	6.7	45.2	24.0	31.4	27.0	77	4	760.4	0
12.01.2024	6.2	43.9	23.9	32.0	26.8	76	4	760.4	0
13.01.2024	4.1	48.2	22.0	32.0	26.5	80	4	760.8	0
14.01.2024	4.6	61.5	22.0	32.0	26.4	79	3	760.2	0
15.01.2024	5.1	56.8	21.3	32.0	26.2	77	3	760.0	0
16.01.2024	4.6	67.5	22.0	32.0	26.3	75	3	759.3	0
17.01.2024	3.1	67.9	21.0	33.0	26.0	72	3	758.9	0
18.01.2024	5.1	55.3	22.0	33.0	27.1	78	5	759.1	0
19.01.2024	6.2	66.5	23.8	32.0	26.7	83	6	759.4	0
20.01.2024	4.1	50.5	25.0	31.2	27.6	77	7	760.1	0
21.01.2024	5.1	60.6	24.3	33.3	28.0	76	5	760.2	0
22.01.2024	5.7	63.5	22.0	33.0	27.0	75	2	760.9	0
23.01.2024	4.1	68.8	21.0	32.0	26.4	76	3	761.0	0
24.01.2024	3.3	72.5	21.9	33.0	26.7	73	3	760.5	0
25.01.2024	5.1	75.2	21.8	33.0	26.8	72	3	761.1	0
26.01.2024	6.2	55.0	22.0	33.0	26.9	72	3	762.1	0
27.01.2024	6.2	51.8	22.8	33.0	27.2	70	4	762.3	0
28.01.2024	5.6	52.9	22.9	33.0	27.3	74	4	761.8	0
29.01.2024	6.2	53.0	23.0	31.9	26.7	74	4	761.4	0
30.01.2024	6.7	51.3	22.9	35.0	27.3	70	3	760.8	0
31.01.2024	5.7	58.3	23.0	34.0	28.0	73	3	760.8	0
Monthly Abstract	5.2	54.3	21.0	35.0	26.8	77.4	4.6	760.3	12.4

Note : Abstract values are taken from the hourly readings (00:00-24:00 hrs.) recorded continuously during the monitoring period.

Table : 3.6 Micrometeorological Data – February 2024

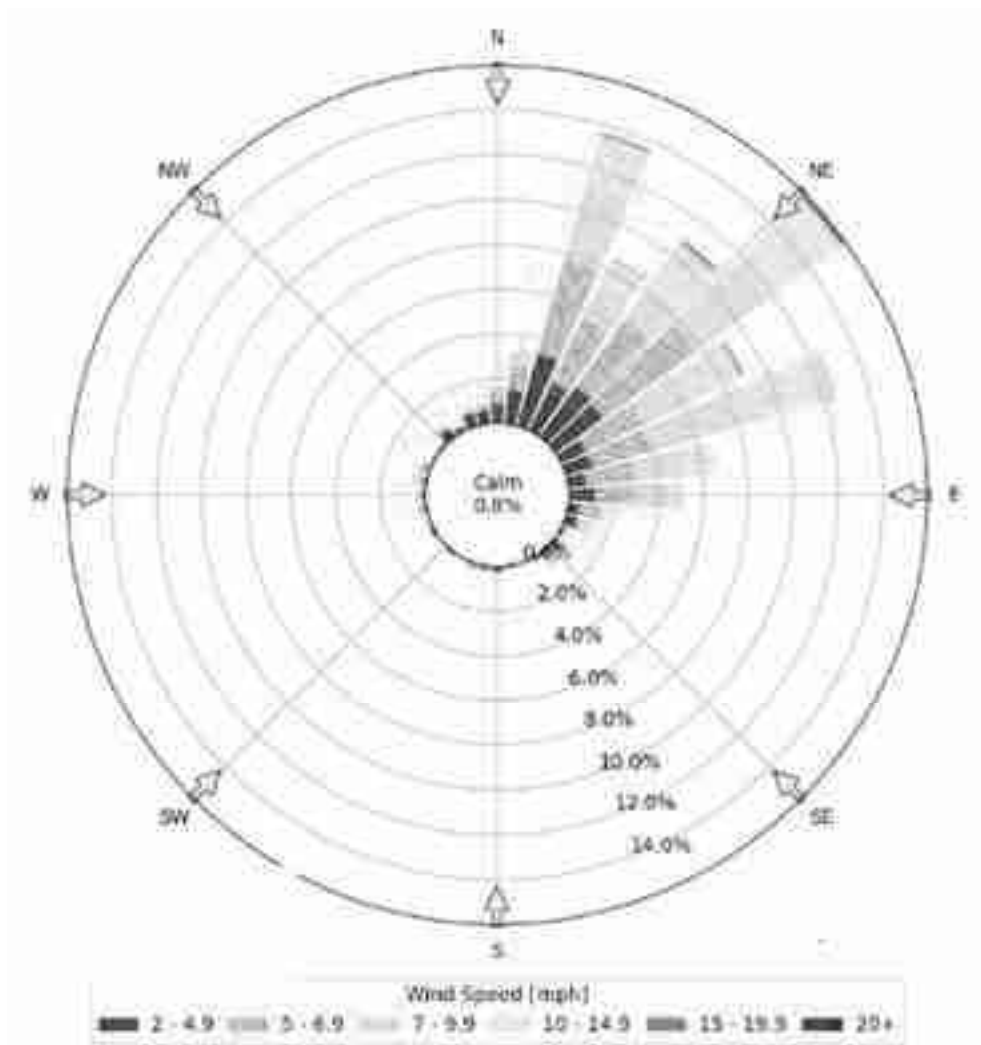
Location : PNR Mine Area

Date	Mean Wind Velocity, kmph	Pred. Wind Direction, ° (from)	Temperature, °C			Relative Humidity (Mean), %	Cloud Cover, oktas	Atm. Pressure (Mean), mm of Hg	Rain-fall, mm
			Min.	Max.	Mean				
01.02.2024	4.1	63.6	25.0	35.0	29.1	76	5	760.8	0
02.02.2024	5.1	73.7	25.0	35.0	29.3	76	4	760.5	0
03.02.2024	5.1	68.8	24.9	34.0	28.6	74	4	760.8	0
04.02.2024	6.2	48.6	23.0	34.0	27.8	73	3	762.1	0
05.02.2024	5.7	53.6	21.1	33.0	27.3	73	3	762.4	0
06.02.2024	5.1	52.7	21.0	33.0	27.1	74	3	761.9	0
07.02.2024	5.1	62.4	21.0	34.0	27.0	72	2	761.6	0
08.02.2024	5.7	62.5	20.3	35.0	27.2	71	4	760.8	0
09.02.2024	5.4	65.4	22.8	34.0	27.8	74	3	761.2	0
10.02.2024	7.4	52.0	23.2	34.0	28.0	73	4	762.2	0
11.02.2024	6.9	54.5	24.0	34.0	27.8	74	3	762.3	0.6
12.02.2024	6.2	49.2	20.1	34.0	27.4	71	3	762.0	0
13.02.2024	7.2	45.7	23.0	34.0	28.0	75	3	761.3	0
14.02.2024	7.5	51.2	25.0	34.5	28.6	72	3	760.9	0
15.02.2024	6.4	53.1	23.3	35.0	28.0	73	3	760.8	0
16.02.2024	5.7	48.6	23.8	34.0	28.2	71	3	761.1	0
17.02.2024	6.4	51.2	24.0	34.4	28.5	71	2	760.2	0
18.02.2024	6.2	66.8	22.0	35.4	28.3	71	3	759.7	0
19.02.2024	5.1	59.7	24.0	35.0	28.9	72	3	759.9	0
20.02.2024	5.1	70.6	23.8	36.0	28.9	70	3	759.9	0
21.02.2024	5.4	89.0	24.0	37.0	29.4	68	3	759.0	0
22.02.2024	5.1	153.9	24.8	37.0	30.3	67	4	758.8	0
23.02.2024	6.1	137.4	25.8	38.0	30.8	68	3	758.3	0
24.02.2024	6.2	115.7	27.0	36.1	30.4	71	4	758.5	0
25.02.2024	6.2	66.5	24.5	35.0	29.0	70	4	758.4	0
26.02.2024	8.2	57.2	24.9	35.0	29.0	71	3	758.9	0
27.02.2024	6.7	54.5	24.9	35.0	28.9	72	3	759.5	0
28.02.2024	6.7	60.4	23.8	36.0	29.2	69	3	758.9	0
29.02.2024	6.7	61.3	24.0	36.0	29.0	66	3	759.2	0
Monthly Abstract	6.0	67.2	20.1	38.0	28.5	71.7	3.2	760.4	0.6

Note : Abstract values are taken from the hourly readings (00:00-24:00 hrs.) recorded continuously during the monitoring period.

Fig. : 3.4 Seasonal Wind Rose

**Period : Dec. 2023-Feb. 2024
(Winter Season)**



3.5 Ambient Air Quality

3.5.1 Monitoring Locations

AAQ Monitoring Stations were selected based on the **Upwind & Downwind directions for the Season (Table 3.7)** and covering the existing Mines & Industries. **Mobile Stations were also deployed** for the monitoring. All **12 AAQ parameters (24/8/1 hourly basis)** were monitored in compliance with NAAQ Norms. The monitored ambient air quality data are presented in **Tables 3.8-3.15**. The abstract of those monitored data is given as **Table 3.16** and ambient air quality status in the study area as **Table 3.17**.

Table : 3.7 Ambient Air Quality Monitoring Stations-Location & Bearing

Sl. No.	Location	N-Latitude	E-Longitude	Direction from Mine	Distance from Mine, km	Location Scenario
1	A1-PNR Mine Office	11°07'27.9"	79°08'33.0"	-	-	Core zone
2	A2-Kovilankudikadu	11°09'10.6"	79°09'13.1"	NE	2.2	Upwind
3	A3-Kattupirangiyam	11°07'25.1"	79°08'22.4"	SW	0.9	Downwind
4	A4- Kaikatti near UT Cement Plant	11°06'28.3"	79°10'29.2"	SE	4.0	Crosswind
5	A5-Pudupalayam	11°05'28.8"	79°08'05.3"	SSW	4.7	Downwind
6	A6-Hastinapuram	11°07'10.4"	79°07'43.6"	SW	2.3	Downwind
7	A7-Ariyalur Bypass	11°07'40.7"	79°05'03.8"	WSW	6.7	Downwind
8	A8-Kallankurichi	11°08'52.8"	79°07'13.6"	NW	3.0	Upwind

3.5.2 AAQ Status

During the study, each 192 samples were collected, analysed and reported. On the synthesized data, the following observations are made :

PM_{2.5} values (24 hours Time Weighted) were monitored in the range between 10-46 **microgram/cu.m (ug/m³)** in the Study Area with **mean value of 25.1 ug/m³** against NAAQ Norm value of **60 ug/m³** (24 hours Time Weighted).

PM₁₀ values were monitored in the range between 20-74 **ug/m³** with **mean value of 44.6 ug/m³** against NAAQ Norm value of **100 ug/m³** (24 hours Time Weighted).

SO₂ values were monitored in the range between 6-22 **ug/m³** with **mean value of 10.9 ug/m³** against NAAQ limit value of **80 ug/m³** (24 hours Time Weighted).

NO_x values were monitored in the range between 6-26 **ug/m³** with **mean value of 13.3 ug/m³** against NAAQ limit value of **80 ug/m³** (24 hours Time Weighted).

Ammonia (NH₃) concentrations were monitored less than 5 **ug/m³** at all monitoring locations against NAAQ limit value of 400 **ug/m³** (24 hours Time Weighted).

O₃ concentrations (**hourly samples reported for 8-hour average**) were monitored in the range between <10-38.4 ug/m³ with **mean value of 23.7 ug/m³** against NAAQ limit value of 100 ug/m³ (8 hours Time Weighted).

CO : Monitored CO values were less than 1000 ug/m³ during the study period against NAAQ limit value of 2 mg/m³ (2,000 ug/m³) (8 hours Time Weighted).

Particulate Lead (Pb) concentrations were monitored less than 0.1 ug/m³ at all monitoring locations against NAAQ limit value of 1.0 ug/m³ (24 hours Time Weighted).

Arsenic (As) concentrations were monitored less than 1 **nanogram/cu.m (ng/m³)** at all monitoring locations against NAAQ limit value of 6 ng/m³ (annual mean).

Nickel (Ni) concentrations were monitored less than 1 ng/m³ at all monitoring locations against NAAQ limit value of 20 ng/m³ (annual mean).

Benzene (C₆H₆) concentrations were monitored less than 0.01 ug/m³ at all monitoring locations against NAAQ limit value of 5 ug/m³ (annual mean).

Benzo(a) Pyrene (BaP) concentrations were monitored less than 0.1 ng/m³ at all monitoring locations against NAAQ limit value of 1.0 ng/m³ (annual mean).

While comparing with the National Ambient Air Quality (NAAQ) Standards revised as per GSR 826(E) dated 16.11.2009, **all monitored values were found to be well within the respective limit values for 24-hourly periods** for Industrial, Residential, Rural and other Areas.

Exceedance Factor (EF) : (Monitored Avg. Value of criteria Pollutant/NAAQ Norm of the Pollutant) : Critical Pollution if EF is 1.5; High Pollution if EF is between 1.0-<1.5, Moderate Pollution if EF is between 0.5-<1.0 and Low Pollution if EF is <0.5. **Study Area is falling under Low to Moderate Pollution Level.**

Pollutant	Mean Concentration	NAAQ Norm	Exceedance Factor (EF)	Pollution Category
PM2.5, ug/m ³	25.1	60	0.42	Low
PM10, ug/m ³	44.6	100	0.45	Moderate
SO ₂ , ug/m ³	10.9	80	0.14	Low
NO ₂ , ug/m ³	13.3	80	0.17	Low

Table : 3.8 Ambient Air Quality Data at A1- PNR Mine Office

Season : Winter 2023-24

Sample Size : 24 hly. (otherwise mentioned)

Monitoring		Particulates, ug/m ³		Gaseous Pollutants, ug/m ³					Other Pollutants (Particulate Phase)				
Date	Period, hrs.	PM2.5	PM10	SO ₂	NOx	NH ₃	O ₃ (8-hly Avg.)	CO (8-hly Avg.)	Pb, ug/m ³	As, ng/m ³	Ni, ng/m ³	C ₆ H ₆ , ug/m ³	BaP, ng/m ³
01-02.12.2023	06:00-06:00	14	30	7	9	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
02-03.12.2023	06:00-06:00	18	28	6	7	<5	11.5	<1000	<0.1	<1	<1	<0.01	<0.1
10-11.12.2023	06:00-06:00	21	30	8	9	<5	13.6	<1000	<0.1	<1	<1	<0.01	<0.1
11-12.12.2023	06:00-06:00	17	27	7	8	<5	21.7	<1000	<0.1	<1	<1	<0.01	<0.1
18-19.12.2023	06:00-06:00	14	25	9	11	<5	18.2	<1000	<0.1	<1	<1	<0.01	<0.1
19-20.12.2023	06:00-06:00	19	34	8	9	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
26-27.12.2023	06:00-06:00	21	36	12	15	<5	16.1	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.12.2023	06:00-06:00	23	39	10	12	<5	20.4	<1000	<0.1	<1	<1	<0.01	<0.1
01-02.01.2024	06:00-06:00	22	42	9	12	<5	13.6	<1000	<0.1	<1	<1	<0.01	<0.1
02-03.01.2024	06:00-06:00	26	40	10	12	<5	10.7	<1000	<0.1	<1	<1	<0.01	<0.1
14-15.01.2024	06:00-06:00	24	44	9	11	<5	11.2	<1000	<0.1	<1	<1	<0.01	<0.1
15-16.01.2024	06:00-06:00	25	47	7	8	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.01.2024	06:00-06:00	25	42	11	13	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
22-23.01.2024	06:00-06:00	27	45	12	15	<5	11.4	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.01.2024	06:00-06:00	33	56	11	14	<5	10.7	<1000	<0.1	<1	<1	<0.01	<0.1
30-31.01.2024	06:00-06:00	26	45	8	10	<5	11.3	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.02.2024	06:00-06:00	19	40	7	9	<5	12.1	<1000	<0.1	<1	<1	<0.01	<0.1
06-07.02.2024	06:00-06:00	28	48	12	16	<5	17.9	<1000	<0.1	<1	<1	<0.01	<0.1
16-17.02.2024	06:00-06:00	25	43	8	10	<5	15.6	<1000	<0.1	<1	<1	<0.01	<0.1
17-18.02.2024	06:00-06:00	21	44	8	11	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.02.2024	06:00-06:00	27	51	10	12	<5	18.6	<1000	<0.1	<1	<1	<0.01	<0.1
22-23.02.2024	06:00-06:00	23	43	9	12	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.02.2024	06:00-06:00	30	54	11	14	<5	17.5	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.02.2024	06:00-06:00	26	47	12	15	<5	20.2	<1000	<0.1	<1	<1	<0.01	<0.1
Range (Minimum-Maximum)		14-33	25-56	6-12	7-16	<5	<10-21.7	<1000	<0.1	<1	<1	<0.01	<0.1
Mean Value		23.1	40.8	9.2	11.4	<5	15.1	<1000	<0.1	<1	<1	<0.01	<0.1
NAAQ Norms*		60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2,000 (8 hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)

Legend : **PM2.5**-Particulate Matter size less than 2.5 um; **PM10**-Respirable Particulate Matter size less than 10 um; **SO₂**-Sulphur dioxide; **NOx**-Oxides of Nitrogen; **NH₃**-Ammonia; **O₃**-Ozone; **CO**-Carbon monoxide; **Pb**-Particulate Lead; **As**-Particulate Arsenic; **Ni**-Particulate Nickel; **C₆H₆**-Benzene & **BaP**- Benzo (a) pyrene in particulate phase. ug-microgram & ng-nanogram. * : **NAAQ Norms**-National Ambient Air Quality Norms-**Revised as per GSR 826(E) dated 16.11.2009** for Industrial, Residential, Rural and other Areas.

Table : 3.9 Ambient Air Quality Data at A2-Kovilankudikadu

Season : Winter 2023-24

Sample Size : 24 hly. (otherwise mentioned)

Monitoring		Particulates, ug/m ³		Gaseous Pollutants, ug/m ³					Other Pollutants (Particulate Phase)				
Date	Period, hrs.	PM2.5	PM10	SO ₂	NOx	NH ₃	O ₃ (8-hly Avg.)	CO (8-hly Avg.)	Pb, ug/m ³	As, ng/m ³	Ni, ng/m ³	C ₆ H ₆ , ug/m ³	BaP, ng/m ³
01-02.12.2023	06:00-06:00	10	21	6	7	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
02-03.12.2023	06:00-06:00	12	22	9	11	<5	12.4	<1000	<0.1	<1	<1	<0.01	<0.1
10-11.12.2023	06:00-06:00	14	25	7	8	<5	11.6	<1000	<0.1	<1	<1	<0.01	<0.1
11-12.12.2023	06:00-06:00	11	20	8	10	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
18-19.12.2023	06:00-06:00	13	23	8	9	<5	11.7	<1000	<0.1	<1	<1	<0.01	<0.1
19-20.12.2023	06:00-06:00	12	25	6	7	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
26-27.12.2023	06:00-06:00	17	30	8	9	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.12.2023	06:00-06:00	15	27	7	8	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
01-02.01.2024	06:00-06:00	17	32	7	7	<5	18.2	<1000	<0.1	<1	<1	<0.01	<0.1
02-03.01.2024	06:00-06:00	12	23	8	8	<5	17.3	<1000	<0.1	<1	<1	<0.01	<0.1
14-15.01.2024	06:00-06:00	15	28	7	8	<5	15.6	<1000	<0.1	<1	<1	<0.01	<0.1
15-16.01.2024	06:00-06:00	15	34	7	8	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.01.2024	06:00-06:00	12	21	8	10	<5	18.2	<1000	<0.1	<1	<1	<0.01	<0.1
22-23.01.2024	06:00-06:00	13	24	7	8	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.01.2024	06:00-06:00	14	25	8	8	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
30-31.01.2024	06:00-06:00	12	22	7	9	<5	14.5	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.02.2024	06:00-06:00	12	28	6	7	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
06-07.02.2024	06:00-06:00	10	20	7	8	<5	21.2	<1000	<0.1	<1	<1	<0.01	<0.1
16-17.02.2024	06:00-06:00	12	23	8	10	<5	15.7	<1000	<0.1	<1	<1	<0.01	<0.1
17-18.02.2024	06:00-06:00	15	31	7	7	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.02.2024	06:00-06:00	12	20	7	7	<5	11.4	<1000	<0.1	<1	<1	<0.01	<0.1
22-23.02.2024	06:00-06:00	15	23	7	9	<5	15.2	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.02.2024	06:00-06:00	11	21	6	6	<5	13.7	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.02.2024	06:00-06:00	13	24	8	9	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
Range (Minimum-Maximum)		10-17	20-34	6-9	6-11	<5	<10-21.2	<1000	<0.1	<1	<1	<0.01	<0.1
Mean Value		13.1	24.7	7.3	8.3	<5	15.1	<1000	<0.1	<1	<1	<0.01	<0.1
NAAQ Norms*		60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2,000 (8 hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)

Legend : **PM2.5**-Particulate Matter size less than 2.5 um; **PM10**-Respirable Particulate Matter size less than 10 um; **SO₂**-Sulphur dioxide; **NOx**-Oxides of Nitrogen; **NH₃**-Ammonia; **O₃**-Ozone; **CO**-Carbon monoxide; **Pb**-Particulate Lead; **As**-Particulate Arsenic; **Ni**-Particulate Nickel; **C₆H₆**-Benzene & **BaP**- Benzo (a) pyrene in particulate phase. ug-microgram & ng-nanogram. * : **NAAQ Norms**-National Ambient Air Quality Norms-**Revised as per GSR 826(E) dated 16.11.2009** for Industrial, Residential, Rural and other Areas.

Table : 3.10 Ambient Air Quality Data at A3-Kattupirangiyam (on SH-139)

Season : Winter 2023-24

Sample Size : 24 hly. (otherwise mentioned)

Monitoring		Particulates, ug/m ³		Gaseous Pollutants, ug/m ³					Other Pollutants (Particulate Phase)				
Date	Period, hrs.	PM2.5	PM10	SO ₂	NOx	NH ₃	O ₃ (8-hly Avg.)	CO (8-hly Avg.)	Pb, ug/m ³	As, ng/m ³	Ni, ng/m ³	C ₆ H ₆ , ug/m ³	BaP, ng/m ³
01-02.12.2023	06:00-06:00	16	34	7	8	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
02-03.12.2023	06:00-06:00	23	38	8	9	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
10-11.12.2023	06:00-06:00	20	36	10	12	<5	13.8	<1000	<0.1	<1	<1	<0.01	<0.1
11-12.12.2023	06:00-06:00	25	41	9	10	<5	17.2	<1000	<0.1	<1	<1	<0.01	<0.1
18-19.12.2023	06:00-06:00	24	37	9	11	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
19-20.12.2023	06:00-06:00	18	38	9	11	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
26-27.12.2023	06:00-06:00	22	40	11	15	<5	26.3	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.12.2023	06:00-06:00	24	44	9	12	<5	25.2	<1000	<0.1	<1	<1	<0.01	<0.1
01-02.01.2024	06:00-06:00	15	31	7	8	<5	24.1	<1000	<0.1	<1	<1	<0.01	<0.1
02-03.01.2024	06:00-06:00	22	45	10	12	<5	25.3	<1000	<0.1	<1	<1	<0.01	<0.1
14-15.01.2024	06:00-06:00	26	49	8	10	<5	23.7	<1000	<0.1	<1	<1	<0.01	<0.1
15-16.01.2024	06:00-06:00	19	40	7	9	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.01.2024	06:00-06:00	27	49	9	10	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
22-23.01.2024	06:00-06:00	31	52	11	13	<5	27.9	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.01.2024	06:00-06:00	28	43	8	10	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
30-31.01.2024	06:00-06:00	33	54	10	13	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.02.2024	06:00-06:00	17	38	8	9	<5	13.6	<1000	<0.1	<1	<1	<0.01	<0.1
06-07.02.2024	06:00-06:00	27	50	10	14	<5	11.2	<1000	<0.1	<1	<1	<0.01	<0.1
16-17.02.2024	06:00-06:00	30	52	8	11	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
17-18.02.2024	06:00-06:00	19	42	7	9	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.02.2024	06:00-06:00	26	47	13	15	<5	20.4	<1000	<0.1	<1	<1	<0.01	<0.1
22-23.02.2024	06:00-06:00	27	50	10	13	<5	21.3	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.02.2024	06:00-06:00	32	53	9	11	<5	20.7	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.02.2024	06:00-06:00	26	45	11	13	<5	20.2	<1000	<0.1	<1	<1	<0.01	<0.1
Range (Minimum-Maximum)		15-33	31-54	7-13	8-15	<5	<10-27.9	<1000	<0.1	<1	<1	<0.01	<0.1
Mean Value		24.0	43.7	9.1	11.2	<5	20.8	<1000	<0.1	<1	<1	<0.01	<0.1
NAAQ Norms*		60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2,000 (8 hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)

Legend : **PM2.5**-Particulate Matter size less than 2.5 um; **PM10**-Respirable Particulate Matter size less than 10 um; **SO₂**-Sulphur dioxide; **NOx**-Oxides of Nitrogen; **NH₃**-Ammonia; **O₃**-Ozone; **CO**-Carbon monoxide; **Pb**-Particulate Lead; **As**-Particulate Arsenic; **Ni**-Particulate Nickel; **C₆H₆**-Benzene & **BaP**- Benzo (a) pyrene in particulate phase. ug-microgram & ng-nanogram. * : **NAAQ Norms**-National Ambient Air Quality Norms-**Revised as per GSR 826(E) dated 16.11.2009** for Industrial, Residential, Rural and other Areas.

Table : 3.11 Ambient Air Quality Data at A4- Kaikatti near UT Cement Plant

Season : Winter 2023-24

Sample Size : 24 hly. (otherwise mentioned)

Monitoring		Particulates, ug/m ³		Gaseous Pollutants, ug/m ³					Other Pollutants (Particulate Phase)				
Date	Period, hrs.	PM2.5	PM10	SO ₂	NOx	NH ₃	O ₃ (8-hly Avg.)	CO (8-hly Avg.)	Pb, ug/m ³	As, ng/m ³	Ni, ng/m ³	C ₆ H ₆ , ug/m ³	BaP, ng/m ³
01-02.12.2023	06:00-06:00	26	50	11	13	<5	28.0	<1000	<0.1	<1	<1	<0.01	<0.1
02-03.12.2023	06:00-06:00	19	40	9	11	<5	29.6	<1000	<0.1	<1	<1	<0.01	<0.1
10-11.12.2023	06:00-06:00	30	55	11	14	<5	31.2	<1000	<0.1	<1	<1	<0.01	<0.1
11-12.12.2023	06:00-06:00	28	51	12	14	<5	33.5	<1000	<0.1	<1	<1	<0.01	<0.1
18-19.12.2023	06:00-06:00	34	57	14	16	<5	30.3	<1000	<0.1	<1	<1	<0.01	<0.1
19-20.12.2023	06:00-06:00	21	44	9	11	<5	32.4	<1000	<0.1	<1	<1	<0.01	<0.1
26-27.12.2023	06:00-06:00	30	52	9	11	<5	31.8	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.12.2023	06:00-06:00	26	44	11	12	<5	20.2	<1000	<0.1	<1	<1	<0.01	<0.1
01-02.01.2024	06:00-06:00	22	45	9	12	<5	29.3	<1000	<0.1	<1	<1	<0.01	<0.1
02-03.01.2024	06:00-06:00	30	53	11	15	<5	21.4	<1000	<0.1	<1	<1	<0.01	<0.1
14-15.01.2024	06:00-06:00	25	47	9	11	<5	20.2	<1000	<0.1	<1	<1	<0.01	<0.1
15-16.01.2024	06:00-06:00	25	48	10	13	<5	21.7	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.01.2024	06:00-06:00	28	50	14	18	<5	20.2	<1000	<0.1	<1	<1	<0.01	<0.1
22-23.01.2024	06:00-06:00	31	53	11	14	<5	25.1	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.01.2024	06:00-06:00	34	58	10	12	<5	28.3	<1000	<0.1	<1	<1	<0.01	<0.1
30-31.01.2024	06:00-06:00	27	51	9	11	<5	20.4	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.02.2024	06:00-06:00	23	48	9	13	<5	18.2	<1000	<0.1	<1	<1	<0.01	<0.1
06-07.02.2024	06:00-06:00	26	45	10	12	<5	19.0	<1000	<0.1	<1	<1	<0.01	<0.1
16-17.02.2024	06:00-06:00	28	48	14	18	<5	23.6	<1000	<0.1	<1	<1	<0.01	<0.1
17-18.02.2024	06:00-06:00	27	51	10	13	<5	27.1	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.02.2024	06:00-06:00	32	57	10	13	<5	20.2	<1000	<0.1	<1	<1	<0.01	<0.1
22-23.02.2024	06:00-06:00	24	41	10	12	<5	25.4	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.02.2024	06:00-06:00	35	58	12	15	<5	27.9	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.02.2024	06:00-06:00	30	54	13	15	<5	30.1	<1000	<0.1	<1	<1	<0.01	<0.1
Range (Minimum-Maximum)		19-35	40-58	9-14	11-18	<5	18.2-33.5	<1000	<0.1	<1	<1	<0.01	<0.1
Mean Value		27.5	50.0	10.7	13.3	<5	25.6	<1000	<0.1	<1	<1	<0.01	<0.1
NAAQ Norms*		60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2,000 (8 hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)

Legend : **PM2.5**-Particulate Matter size less than 2.5 um; **PM10**-Respirable Particulate Matter size less than 10 um; **SO₂**-Sulphur dioxide; **NOx**-Oxides of Nitrogen; **NH₃**-Ammonia; **O₃**-Ozone; **CO**-Carbon monoxide; **Pb**-Particulate Lead; **As**-Particulate Arsenic; **Ni**-Particulate Nickel; **C₆H₆**-Benzene & **BaP**- Benzo (a) pyrene in particulate phase. ug-microgram & ng-nanogram. * : **NAAQ Norms**-National Ambient Air Quality Norms-**Revised as per GSR 826(E) dated 16.11.2009** for Industrial, Residential, Rural and other Areas.

Table : 3.12 Ambient Air Quality Data at A5-Pudupalayam (on NH-81)

Season : Winter 2023-24

Sample Size : 24 hly. (otherwise mentioned)

Monitoring		Particulates, ug/m ³		Gaseous Pollutants, ug/m ³					Other Pollutants (Particulate Phase)				
Date	Period, hrs.	PM2.5	PM10	SO ₂	NOx	NH ₃	O ₃ (8-hly Avg.)	CO (8-hly Avg.)	Pb, ug/m ³	As, ng/m ³	Ni, ng/m ³	C ₆ H ₆ , ug/m ³	BaP, ng/m ³
01-02.12.2023	06:00-06:00	36	64	11	14	<5	27.9	<1000	<0.1	<1	<1	<0.01	<0.1
02-03.12.2023	06:00-06:00	21	43	9	13	<5	30.4	<1000	<0.1	<1	<1	<0.01	<0.1
10-11.12.2023	06:00-06:00	29	53	12	14	<5	31.2	<1000	<0.1	<1	<1	<0.01	<0.1
11-12.12.2023	06:00-06:00	33	61	13	15	<5	28.8	<1000	<0.1	<1	<1	<0.01	<0.1
18-19.12.2023	06:00-06:00	25	52	16	18	<5	28.4	<1000	<0.1	<1	<1	<0.01	<0.1
19-20.12.2023	06:00-06:00	23	48	10	13	<5	30.6	<1000	<0.1	<1	<1	<0.01	<0.1
26-27.12.2023	06:00-06:00	28	52	15	18	<5	33.8	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.12.2023	06:00-06:00	31	55	14	17	<5	34.0	<1000	<0.1	<1	<1	<0.01	<0.1
01-02.01.2024	06:00-06:00	25	57	11	13	<5	30.6	<1000	<0.1	<1	<1	<0.01	<0.1
02-03.01.2024	06:00-06:00	37	63	11	15	<5	28.4	<1000	<0.1	<1	<1	<0.01	<0.1
14-15.01.2024	06:00-06:00	41	68	13	18	<5	20.9	<1000	<0.1	<1	<1	<0.01	<0.1
15-16.01.2024	06:00-06:00	28	52	12	15	<5	28.1	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.01.2024	06:00-06:00	31	57	12	15	<5	30.6	<1000	<0.1	<1	<1	<0.01	<0.1
22-23.01.2024	06:00-06:00	27	51	14	18	<5	24.2	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.01.2024	06:00-06:00	34	63	11	14	<5	21.37	<1000	<0.1	<1	<1	<0.01	<0.1
30-31.01.2024	06:00-06:00	32	57	12	16	<5	22.4	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.02.2024	06:00-06:00	27	55	12	15	<5	20.65	<1000	<0.1	<1	<1	<0.01	<0.1
06-07.02.2024	06:00-06:00	35	62	12	15	<5	25.1	<1000	<0.1	<1	<1	<0.01	<0.1
16-17.02.2024	06:00-06:00	31	57	10	13	<5	27.2	<1000	<0.1	<1	<1	<0.01	<0.1
17-18.02.2024	06:00-06:00	29	59	12	16	<5	22.6	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.02.2024	06:00-06:00	35	66	16	20	<5	20.7	<1000	<0.1	<1	<1	<0.01	<0.1
22-23.02.2024	06:00-06:00	33	58	13	15	<5	28.5	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.02.2024	06:00-06:00	42	71	12	14	<5	20.4	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.02.2024	06:00-06:00	34	61	10	13	<5	24.6	<1000	<0.1	<1	<1	<0.01	<0.1
Range (Minimum-Maximum)		21-42	43-71	9-16	13-20	<5	20.4-28.5	<1000	<0.1	<1	<1	<0.01	<0.1
Mean Value		31.1	57.7	12.2	15.3	<5	30.9	<1000	<0.1	<1	<1	<0.01	<0.1
NAAQ Norms*		60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2,000 (8 hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)

Legend : **PM2.5**-Particulate Matter size less than 2.5 um; **PM10**-Respirable Particulate Matter size less than 10 um; **SO₂**-Sulphur dioxide; **NOx**-Oxides of Nitrogen; **NH₃**-Ammonia; **O₃**-Ozone; **CO**-Carbon monoxide; **Pb**-Particulate Lead; **As**-Particulate Arsenic; **Ni**-Particulate Nickel; **C₆H₆**-Benzene & **BaP**- Benzo (a) pyrene in particulate phase. ug-microgram & ng-nanogram. * : **NAAQ Norms**-National Ambient Air Quality Norms-**Revised as per GSR 826(E) dated 16.11.2009** for Industrial, Residential, Rural and other Areas.

Table : 3.13 Ambient Air Quality Data at A6-Hastinapuram (on SH-139)

Season : Winter 2023-24

Sample Size : 24 hly. (otherwise mentioned)

Monitoring		Particulates, ug/m ³		Gaseous Pollutants, ug/m ³					Other Pollutants (Particulate Phase)				
Date	Period, hrs.	PM2.5	PM10	SO ₂	NOx	NH ₃	O ₃ (8-hly Avg.)	CO (8-hly Avg.)	Pb, ug/m ³	As, ng/m ³	Ni, ng/m ³	C ₆ H ₆ , ug/m ³	BaP, ng/m ³
01-02.12.2023	06:00-06:00	26	45	11	12	<5	23.5	<1000	<0.1	<1	<1	<0.01	<0.1
02-03.12.2023	06:00-06:00	18	38	9	11	<5	29.4	<1000	<0.1	<1	<1	<0.01	<0.1
10-11.12.2023	06:00-06:00	27	45	12	14	<5	21.2	<1000	<0.1	<1	<1	<0.01	<0.1
11-12.12.2023	06:00-06:00	31	48	14	18	<5	27.8	<1000	<0.1	<1	<1	<0.01	<0.1
18-19.12.2023	06:00-06:00	35	60	14	16	<5	32.5	<1000	<0.1	<1	<1	<0.01	<0.1
19-20.12.2023	06:00-06:00	30	54	13	15	<5	27.9	<1000	<0.1	<1	<1	<0.01	<0.1
26-27.12.2023	06:00-06:00	21	43	8	11	<5	30.4	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.12.2023	06:00-06:00	25	43	13	15	<5	28.2	<1000	<0.1	<1	<1	<0.01	<0.1
01-02.01.2024	06:00-06:00	22	46	9	11	<5	25.6	<1000	<0.1	<1	<1	<0.01	<0.1
02-03.01.2024	06:00-06:00	24	40	12	13	<5	30.4	<1000	<0.1	<1	<1	<0.01	<0.1
14-15.01.2024	06:00-06:00	31	44	15	18	<5	22.1	<1000	<0.1	<1	<1	<0.01	<0.1
15-16.01.2024	06:00-06:00	25	42	14	15	<5	28.9	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.01.2024	06:00-06:00	20	37	9	11	<5	32.2	<1000	<0.1	<1	<1	<0.01	<0.1
22-23.01.2024	06:00-06:00	24	40	12	15	<5	30.7	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.01.2024	06:00-06:00	27	43	14	18	<5	27.6	<1000	<0.1	<1	<1	<0.01	<0.1
30-31.01.2024	06:00-06:00	31	45	13	16	<5	30.4	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.02.2024	06:00-06:00	26	44	9	12	<5	28.1	<1000	<0.1	<1	<1	<0.01	<0.1
06-07.02.2024	06:00-06:00	34	59	13	16	<5	25.9	<1000	<0.1	<1	<1	<0.01	<0.1
16-17.02.2024	06:00-06:00	32	47	12	15	<5	30.2	<1000	<0.1	<1	<1	<0.01	<0.1
17-18.02.2024	06:00-06:00	27	45	14	18	<5	32.3	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.02.2024	06:00-06:00	23	44	9	11	<5	34.7	<1000	<0.1	<1	<1	<0.01	<0.1
22-23.02.2024	06:00-06:00	25	38	15	18	<5	30.2	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.02.2024	06:00-06:00	20	36	14	16	<5	30.4	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.02.2024	06:00-06:00	22	39	12	15	<5	25.3	<1000	<0.1	<1	<1	<0.01	<0.1
Range (Minimum-Maximum)		18-35	36-60	8-15	11-18	<5	21.2-34.7	<1000	<0.1	<1	<1	<0.01	<0.1
Mean Value		26.1	44.4	12.1	14.6	<5	28.6	<1000	<0.1	<1	<1	<0.01	<0.1
NAAQ Norms*		60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2,000 (8 hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)

Legend : **PM2.5**-Particulate Matter size less than 2.5 um; **PM10**-Respirable Particulate Matter size less than 10 um; **SO₂**-Sulphur dioxide; **NOx**-Oxides of Nitrogen; **NH₃**-Ammonia; **O₃**-Ozone; **CO**-Carbon monoxide; **Pb**-Particulate Lead; **As**-Particulate Arsenic; **Ni**-Particulate Nickel; **C₆H₆**-Benzene & **BaP**- Benzo (a) pyrene in particulate phase. ug-microgram & ng-nanogram. * : **NAAQ Norms**-National Ambient Air Quality Norms-**Revised as per GSR 826(E) dated 16.11.2009** for Industrial, Residential, Rural and other Areas.

Table : 3.14 Ambient Air Quality Data at A7-Ariyalur Bypass

Season : Winter 2023-24

Sample Size : 24 hly. (otherwise mentioned)

Monitoring		Particulates, ug/m ³		Gaseous Pollutants, ug/m ³					Other Pollutants (Particulate Phase)				
Date	Period, hrs.	PM2.5	PM10	SO ₂	NOx	NH ₃	O ₃ (8-hly Avg.)	CO (8-hly Avg.)	Pb, ug/m ³	As, ng/m ³	Ni, ng/m ³	C ₆ H ₆ , ug/m ³	BaP, ng/m ³
01-02.12.2023	06:00-06:00	36	60	21	24	<5	38.4	<1000	<0.1	<1	<1	<0.01	<0.1
02-03.12.2023	06:00-06:00	32	55	18	21	<5	30.1	<1000	<0.1	<1	<1	<0.01	<0.1
10-11.12.2023	06:00-06:00	34	58	19	23	<5	32.5	<1000	<0.1	<1	<1	<0.01	<0.1
11-12.12.2023	06:00-06:00	33	53	17	20	<5	27.9	<1000	<0.1	<1	<1	<0.01	<0.1
18-19.12.2023	06:00-06:00	37	62	18	23	<5	32.7	<1000	<0.1	<1	<1	<0.01	<0.1
19-20.12.2023	06:00-06:00	46	74	15	18	<5	32.0	<1000	<0.1	<1	<1	<0.01	<0.1
26-27.12.2023	06:00-06:00	41	70	18	22	<5	28.4	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.12.2023	06:00-06:00	38	67	14	18	<5	29.1	<1000	<0.1	<1	<1	<0.01	<0.1
01-02.01.2024	06:00-06:00	40	71	16	20	<5	30.4	<1000	<0.1	<1	<1	<0.01	<0.1
02-03.01.2024	06:00-06:00	35	64	18	23	<5	29.5	<1000	<0.1	<1	<1	<0.01	<0.1
14-15.01.2024	06:00-06:00	37	68	21	24	<5	32.7	<1000	<0.1	<1	<1	<0.01	<0.1
15-16.01.2024	06:00-06:00	43	72	22	26	<5	33.4	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.01.2024	06:00-06:00	36	65	17	19	<5	30.8	<1000	<0.1	<1	<1	<0.01	<0.1
22-23.01.2024	06:00-06:00	39	68	18	23	<5	36.1	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.01.2024	06:00-06:00	25	48	11	14	<5	29.1	<1000	<0.1	<1	<1	<0.01	<0.1
30-31.01.2024	06:00-06:00	41	64	14	19	<5	27.2	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.02.2024	06:00-06:00	38	61	16	21	<5	29.0	<1000	<0.1	<1	<1	<0.01	<0.1
06-07.02.2024	06:00-06:00	36	55	18	23	<5	30.4	<1000	<0.1	<1	<1	<0.01	<0.1
16-17.02.2024	06:00-06:00	22	45	11	13	<5	32.0	<1000	<0.1	<1	<1	<0.01	<0.1
17-18.02.2024	06:00-06:00	34	55	14	17	<5	30.5	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.02.2024	06:00-06:00	39	59	16	20	<5	28.9	<1000	<0.1	<1	<1	<0.01	<0.1
22-23.02.2024	06:00-06:00	27	56	12	15	<5	32.7	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.02.2024	06:00-06:00	40	63	13	17	<5	31.7	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.02.2024	06:00-06:00	37	57	15	19	<5	33.5	<1000	<0.1	<1	<1	<0.01	<0.1
Range (Minimum-Maximum)		22-46	45-74	11-22	13-26	<5	27.2-38.4	<1000	<0.1	<1	<1	<0.01	<0.1
Mean Value		36.1	61.3	16.3	20.1	<5	31.2	<1000	<0.1	<1	<1	<0.01	<0.1
NAAQ Norms*		60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2,000 (8 hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)

Legend : **PM2.5**-Particulate Matter size less than 2.5 um; **PM10**-Respirable Particulate Matter size less than 10 um; **SO₂**-Sulphur dioxide; **NOx**-Oxides of Nitrogen; **NH₃**-Ammonia; **O₃**-Ozone; **CO**-Carbon monoxide; **Pb**-Particulate Lead; **As**-Particulate Arsenic; **Ni**-Particulate Nickel; **C₆H₆**-Benzene & **BaP**- Benzo (a) pyrene in particulate phase. ug-microgram & ng-nanogram. * : **NAAQ Norms**-National Ambient Air Quality Norms-**Revised as per GSR 826(E) dated 16.11.2009** for Industrial, Residential, Rural and other Areas.

Table : 3.15 Ambient Air Quality Data at A8-Kallankurichi

Season : Winter 2023-24

Sample Size : 24 hly. (otherwise mentioned)

Monitoring		Particulates, ug/m ³		Gaseous Pollutants, ug/m ³					Other Pollutants (Particulate Phase)				
Date	Period, hrs.	PM2.5	PM10	SO ₂	NOx	NH ₃	O ₃ (8-hly Avg.)	CO (8-hly Avg.)	Pb, ug/m ³	As, ng/m ³	Ni, ng/m ³	C ₆ H ₆ , ug/m ³	BaP, ng/m ³
01-02.12.2023	06:00-06:00	12	26	7	7	<5	18.7	<1000	<0.1	<1	<1	<0.01	<0.1
02-03.12.2023	06:00-06:00	18	31	12	15	<5	17.3	<1000	<0.1	<1	<1	<0.01	<0.1
10-11.12.2023	06:00-06:00	15	27	12	14	<5	15.2	<1000	<0.1	<1	<1	<0.01	<0.1
11-12.12.2023	06:00-06:00	13	22	10	12	<5	18.6	<1000	<0.1	<1	<1	<0.01	<0.1
18-19.12.2023	06:00-06:00	16	28	10	13	<5	20.6	<1000	<0.1	<1	<1	<0.01	<0.1
19-20.12.2023	06:00-06:00	14	30	7	9	<5	11.4	<1000	<0.1	<1	<1	<0.01	<0.1
26-27.12.2023	06:00-06:00	15	27	9	11	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.12.2023	06:00-06:00	12	22	11	13	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
01-02.01.2024	06:00-06:00	20	39	7	9	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
02-03.01.2024	06:00-06:00	18	30	13	15	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
14-15.01.2024	06:00-06:00	22	36	11	12	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
15-16.01.2024	06:00-06:00	23	44	8	9	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.01.2024	06:00-06:00	24	41	10	12	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
22-23.01.2024	06:00-06:00	20	38	14	16	<5	18.4	<1000	<0.1	<1	<1	<0.01	<0.1
29-30.01.2024	06:00-06:00	23	37	11	13	<5	11.6	<1000	<0.1	<1	<1	<0.01	<0.1
30-31.01.2024	06:00-06:00	21	34	10	12	<5	15.9	<1000	<0.1	<1	<1	<0.01	<0.1
05-06.02.2024	06:00-06:00	19	37	7	8	<5	10.5	<1000	<0.1	<1	<1	<0.01	<0.1
06-07.02.2024	06:00-06:00	28	45	11	13	<5	17.1	<1000	<0.1	<1	<1	<0.01	<0.1
16-17.02.2024	06:00-06:00	32	48	12	14	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
17-18.02.2024	06:00-06:00	21	41	8	9	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
21-22.02.2024	06:00-06:00	23	38	13	15	<5	<10	<1000	<0.1	<1	<1	<0.01	<0.1
22-23.02.2024	06:00-06:00	20	33	10	12	<5	18.3	<1000	<0.1	<1	<1	<0.01	<0.1
27-28.02.2024	06:00-06:00	22	35	12	14	<5	10.4	<1000	<0.1	<1	<1	<0.01	<0.1
28-29.02.2024	06:00-06:00	27	42	11	13	<5	11.5	<1000	<0.1	<1	<1	<0.01	<0.1
Range (Minimum-Maximum)		12-32	22-48	7-14	7-16	<5	<10-20.6	<1000	<0.1	<1	<1	<0.01	<0.1
Mean Value		19.9	34.6	10.3	12.1	<5	15.4	<1000	<0.1	<1	<1	<0.01	<0.1
NAAQ Norms*		60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2,000 (8 hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)

Legend : **PM2.5**-Particulate Matter size less than 2.5 um; **PM10**-Respirable Particulate Matter size less than 10 um; **SO₂**-Sulphur dioxide; **NOx**-Oxides of Nitrogen; **NH₃**-Ammonia; **O₃**-Ozone; **CO**-Carbon monoxide; **Pb**-Particulate Lead; **As**-Particulate Arsenic; **Ni**-Particulate Nickel; **C₆H₆**-Benzene & **BaP**- Benzo (a) pyrene in particulate phase. ug-microgram & ng-nanogram. * : **NAAQ Norms**-National Ambient Air Quality Norms-**Revised as per GSR 826(E) dated 16.11.2009** for Industrial, Residential, Rural and other Areas.

Table : 3.16 Abstract of Ambient Air Quality Data

Sl. No.	Parameter	Pollutant Concentration, ug/m ³							
		PM2.5	PM10	SO ₂	NO _x	PM2.5	PM10	SO ₂	NO _x
		A1- PNR Mine Office				A2-Kovilankudikadu			
1	No. of Observations	24	24	24	24	24	24	24	24
2	Minimum	14	25	6	7	10	20	6	6
3	10 th Percentile Value	17	29	7	8	11	20	6	7
4	20 th Percentile Value	19	32	8	9	12	21	7	7
5	30 th Percentile Value	21	39	8	10	12	22	7	8
6	40 th Percentile Value	22	40	8	11	12	23	7	8
7	50 th Percentile Value	24	43	9	12	13	24	7	8
8	60 th Percentile Value	25	44	10	12	13	25	7	8
9	70 th Percentile Value	26	45	10	12	14	25	8	9
10	80 th Percentile Value	26	47	11	14	15	28	8	9
11	90 th Percentile Value	28	50	12	15	15	31	8	10
12	95 th Percentile Value	30	54	12	15	17	32	8	10
13	98 th Percentile Value	32	55	12	16	17	33	9	11
14	Maximum	33	56	12	16	17	34	9	11
15	Arithmetic Mean	23.1	40.8	9.2	11.4	13.1	24.7	7.3	8.3
16	Geometric Mean	22.6	39.9	9.0	11.1	12.9	24.4	7.2	8.2
17	Standard Deviation	4.7	8.4	1.9	2.5	2.0	4.0	0.8	1.2
18	NAAQ Norms*	60	100	80	80	60	100	80	80
19	% Values exceeding Norms*	0	0	0	0	0	0	0	0
		A3-Kattupirangiyam				A4-Kaikatti/UT Cement Plant			
1	No. of Observations	24	24	24	24	24	24	24	24
2	Minimum	15	31	7	8	19	40	9	11
3	10 th Percentile Value	17	36	7	9	22	44	9	11
4	20 th Percentile Value	19	38	8	9	25	45	9	12
5	30 th Percentile Value	22	40	8	10	26	48	10	12
6	40 th Percentile Value	23	41	9	10	26	48	10	12
7	50 th Percentile Value	25	44	9	11	28	51	10	13
8	60 th Percentile Value	26	45	9	12	28	51	11	13
9	70 th Percentile Value	27	49	10	12	30	53	11	14
10	80 th Percentile Value	27	50	10	13	30	54	12	15
11	90 th Percentile Value	31	52	11	14	33	57	14	16
12	95 th Percentile Value	32	53	11	15	34	58	14	18
13	98 th Percentile Value	33	54	12	15	35	58	14	18
14	Maximum	33	54	13	15	35	58	14	18
15	Arithmetic Mean	24.0	43.7	9.1	11.2	27.5	50.0	10.7	13.3
16	Geometric Mean	23.5	43.2	9.0	11.0	27.2	49.7	10.6	13.1
17	Standard Deviation	5.1	6.5	1.5	2.1	4.1	5.2	1.7	2.1
18	NAAQ Norms*	60	100	80	80	60	100	80	80
19	% Values exceeding Norms*	0	0	0	0	0	0	0	0

Legend : PM2.5-Particulate Matter size less than 2.5 um; PM10-Respirable Particulate Matter size less than 10 um; SO₂-Sulphur dioxide; NO_x-Oxides of Nitrogen. ug-microgram. O₃-Ozone values are reported locationwise.

NH₃-Ammonia; CO-Carbon monoxide; Pb-Particulate Lead; As-Particulate Arsenic; Ni-Particulate Nickel; C₆H₆-Benzene and BaP-Benzo (a) pyrene in particulate phase levels were monitored below respective detectable limits.

* : NAAQ Norms-National Ambient Air Quality Norms-Revised as per GSR 826(E) dated 16.11.2009 for Industrial, Residential, Rural and other Areas.

Table : 3.16 (Contn.) Abstract of Ambient Air Quality Data

Sl. No.	Parameter	Pollutant Concentration, ug/m ³							
		PM2.5	PM10	SO ₂	NOx	PM2.5	PM10	SO ₂	NOx
		A5-Pudupalayam				A6-Hastinapuram			
1	No. of Observations	24	24	24	24	24	24	24	24
2	Minimum	21	43	9	13	18	36	8	11
3	10 th Percentile Value	25	51	10	13	20	38	9	11
4	20 th Percentile Value	27	52	11	14	22	40	9	12
5	30 th Percentile Value	28	55	11	14	24	42	12	13
6	40 th Percentile Value	29	57	12	15	25	43	12	15
7	50 th Percentile Value	31	57	12	15	26	44	13	15
8	60 th Percentile Value	33	59	12	15	27	45	13	15
9	70 th Percentile Value	34	61	13	16	27	45	14	16
10	80 th Percentile Value	35	63	13	17	31	46	14	17
11	90 th Percentile Value	37	65	15	18	32	52	14	18
12	95 th Percentile Value	40	68	16	18	34	58	15	18
13	98 th Percentile Value	42	70	16	19	35	60	15	18
14	Maximum	42	71	16	20	35	60	15	18
15	Arithmetic Mean	31.1	57.7	12.2	15.3	26.1	44.4	12.1	14.6
16	Geometric Mean	30.7	57.3	12.1	15.2	25.7	44.0	11.9	14.4
17	Standard Deviation	5.3	6.5	1.8	2.0	4.6	6.1	2.2	2.5
18	NAAQ Norms*	60	100	80	80	60	100	80	80
19	% Values exceeding Norms*	0	0	0	0	0	0	0	0
		A7-Ariyalur Bypass				A8-Kallankurichi			
1	No. of Observations	24	24	24	24	24	24	24	24
2	Minimum	22	45	11	13	12	22	7	7
3	10 th Percentile Value	29	54	12	16	13	26	7	9
4	20 th Percentile Value	34	55	14	18	15	28	8	9
5	30 th Percentile Value	35	57	15	19	18	30	10	12
6	40 th Percentile Value	36	59	16	19	19	33	10	12
7	50 th Percentile Value	37	62	17	20	20	36	11	13
8	60 th Percentile Value	38	64	18	21	21	37	11	13
9	70 th Percentile Value	39	65	18	23	22	38	11	13
10	80 th Percentile Value	40	68	18	23	23	41	12	14
11	90 th Percentile Value	41	71	20	24	26	43	13	15
12	95 th Percentile Value	43	72	21	24	28	45	13	15
13	98 th Percentile Value	45	73	22	25	30	47	14	16
14	Maximum	46	74	22	26	32	48	14	16
15	Arithmetic Mean	36.1	61.3	16.3	20.1	19.9	34.6	10.3	12.1
16	Geometric Mean	35.6	60.8	16.1	19.8	19.3	33.9	10.0	11.8
17	Standard Deviation	5.5	7.5	3.0	3.3	5.1	7.2	2.1	2.4
18	NAAQ Norms*	60	100	80	80	60	100	80	80
19	% Values exceeding Norms*	0	0	0	0	0	0	0	0

Legend : PM2.5-Particulate Matter size less than 2.5 um; PM10-Respirable Particulate Matter size less than 10 um; SO₂-Sulphur dioxide; NOx-Oxides of Nitrogen. ug-microgram. O₃-Ozone values are reported locationwise.

NH₃-Ammonia; CO-Carbon monoxide; Pb-Particulate Lead; As-Particulate Arsenic; Ni-Particulate Nickel; C₆H₆-Benzene and BaP-Benzo (a) pyrene in particulate phase levels were monitored below respective detectable limits.

* : NAAQ Norms-National Ambient Air Quality Norms-Revised as per GSR 826(E) dated 16.11.2009 for Industrial, Residential, Rural and other Areas.

Table : 3.17 Ambient Air Quality Status

Season : Winter 2023-24

No. of Locations : 8

Sample Size : 24-Hourly

Sl. No.	Parameter	Pollutant Concentration, ug/m ³			
		PM2.5	PM10	SO ₂	NO _x
1	No. of Observations	192	192	192	192
2	Minimum	10	20	6	6
3	10 th Percentile Value	14	25	7	8
4	20 th Percentile Value	18	33	8	9
5	30 th Percentile Value	21	38	9	11
6	40 th Percentile Value	23	42	10	12
7	50 th Percentile Value	25	45	11	13
8	60 th Percentile Value	27	48	11	14
9	70 th Percentile Value	30	52	12	15
10	80 th Percentile Value	32	56	13	16
11	90 th Percentile Value	36	61	15	18
12	95 th Percentile Value	38	65	17	21
13	98 th Percentile Value	41	70	18	23
14	Maximum	46	74	22	26
15	Arithmetic Mean	25.1	44.6	10.9	13.3
16	Geometric Mean	23.8	42.6	10.5	12.7
17	Standard Deviation	8.0	12.9	3.2	4.0
18	NAAQ Norms*	60	100	80	80
19	% Values exceeding NAAQ Norms	0	0	0	0

Legend : PM2.5-Particulate Matter size less than 2.5 um; PM10-Respirable Particulate Matter size less than 10 um; SO₂-Sulphur dioxide; NO_x-Oxides of Nitrogen. ug-microgram. O₃-Ozone values are reported locationwise.

NH₃-Ammonia; CO-Carbon monoxide; Pb-Particulate Lead; As-Particulate Arsenic; Ni-Particulate Nickel; C₆H₆-Benzene and BaP-Benzo (a) pyrene in particulate phase levels were monitored below respective detectable limits.

* : NAAQ Norms-National Ambient Air Quality Norms-Revised as per GSR 826(E) dated 16.11.2009 for Industrial, Residential, Rural and other Areas.

National Ambient Air Quality Standard : The levels of air quality with an adequate margin of safety, to protect the public health, vegetation and property. Whenever and wherever two consecutive values exceed the limit specified above for the respective category, it would be considered adequate reason to institute regular/continuous monitoring and further investigations.

1. 24-hly./8-hly. values should be met 98% of the time in a year; however, 2% of the time it may exceed but not on two consecutive days.

2. Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24-hourly at uniform interval.

3.5.3 RSPM Analysis

With the samples of Respirable Suspended Particulate Matter (RSPM or PM₁₀) monitored, the main focus is on characterization and apportionment of PM₁₀ to have a better understanding and correlation between the RSPM fraction at source and receptor. The results are tabulated in **Table 3.18**. There was no significant variation in the characteristics of RSPM values in the upwind and downwind direction locations. Free Respirable Silica in RSPM was also monitored using Personal Sampler and FTIR Method of Analysis. The Silica Content was found to be 2.9% of RSPM that monitored in the Study Area.

Free Respirable Silica Content (FTIR Method) : 2.9%.

Table : 3.18 RSPM Analytical Data

Parameter	Percentage in RSPM Content	
	Upwind Direction (Location A2)	Downwind Direction (Location A6)
Loss on Ignition	18.4	18.1
Iron oxides (Fe ₂ O ₃)	7.8	7.4
Calcium oxide (CaO)	19.6	20.8
Magnesium oxide (MgO)	14.4	14.6
Sodium oxide (Na ₂ O)	0.32	0.34
Potassium oxide (K ₂ O)	0.20	0.22
Aluminium oxide (Al ₂ O ₃)	17.7	18.2
Titanium oxide (TiO ₂)	0.04	0.05

3.6 Noise Levels

3.6.1 Ambient Noise Levels

Study area represents Industrial, Commercial & Residential Areas to compare with the MoEF&CC Ambient Noise Norms. The abstract of monitored noise data are presented in **Table 3.19**. Ambient Noise Levels were ranging from 32.5 dB(A) to 101.2 dB(A) during day times and from 32.1 dB(A) to 102.4 dB(A) during night times on the monitoring days. Day Equivalent Noise (Leq-d) level was found to be 45.1 dB(A) and Night Equivalent Noise (Leq-n) level was 42.1 dB(A). While comparing with the MoEF&CC Leq Norms for day and night times, the monitored **ambient noise levels were well within the limit values** for their respective Category Area.

3.6.2 Workzone Noise Levels

Workzone Noise Levels (**Table 2.20**) within the Mines at a distance of 1.0-1.5 m from the source is maintained at **<85 db(A)** well within **OSHA Standard of 85 dB(A) for 8-hours exposure**. However, Leq Noise levels at the boundaries were <55 dB(A) during day times and <45 dB(A) during night times.

Table : 3.19 Ambient Noise Level Data (Abstract)

Monitoring Dates : 19-20.01.2024

Sl. No.	Location	Area	Noise Levels, dB(A)					
			Day Time (06:00-22:00 hrs.)			Night Time (22:00-06:00 hrs.)		
			Lmin.	Lmax.	Leq	Lmin.	Lmax.	Leq
1	A1- PNR Mine Office	Industrial	34.9	93.5	44.8	33.6	92.1	42.3
2	A2-Kovilankudikadu	Residential	32.5	85.9	40.4	32.1	78.7	38.2
3	A3-Kattupirangiyam	Residential	34.3	98.4	42.8	33.4	96.7	36.2
4	A4- Kaikatti near UT Cement Plant	Industrial	37.4	100.2	49.3	34.7	97.8	46.4
5	A5-Pudupalayam	Residential	34.4	92.6	43.9	33.9	96.8	42.2
6	A6-Hastinapuram	Residential	34.2	100.1	46.9	34.6	93.9	42.4
7	A7-Ariyalur (Bypass)	Commercial	35.4	101.2	48.1	34.9	102.4	46.8
8	A8-Kallankurichi	Residential	32.9	85.7	44.4	32.1	81.9	42.0
Study Area			32.5	101.2	45.1	32.1	102.4	42.1
MoEF&CC Norms* for Residential Areas			-		55	-		45
MoEF&CC Norms for Commercial Areas			-		65	-		55
MoEF&CC Norms for Industrial Areas			-		75	-		70

* : MoEF&CC Norms-Ministry of Environment, Forest & Climate Change Ambient Noise Norms (Leq).

Day time is reckoned in between 6 a.m and 10 p.m. and Night time is reckoned in between 10 p.m. and 6 a.m.

Table : 3.20 Work Noise Level Data

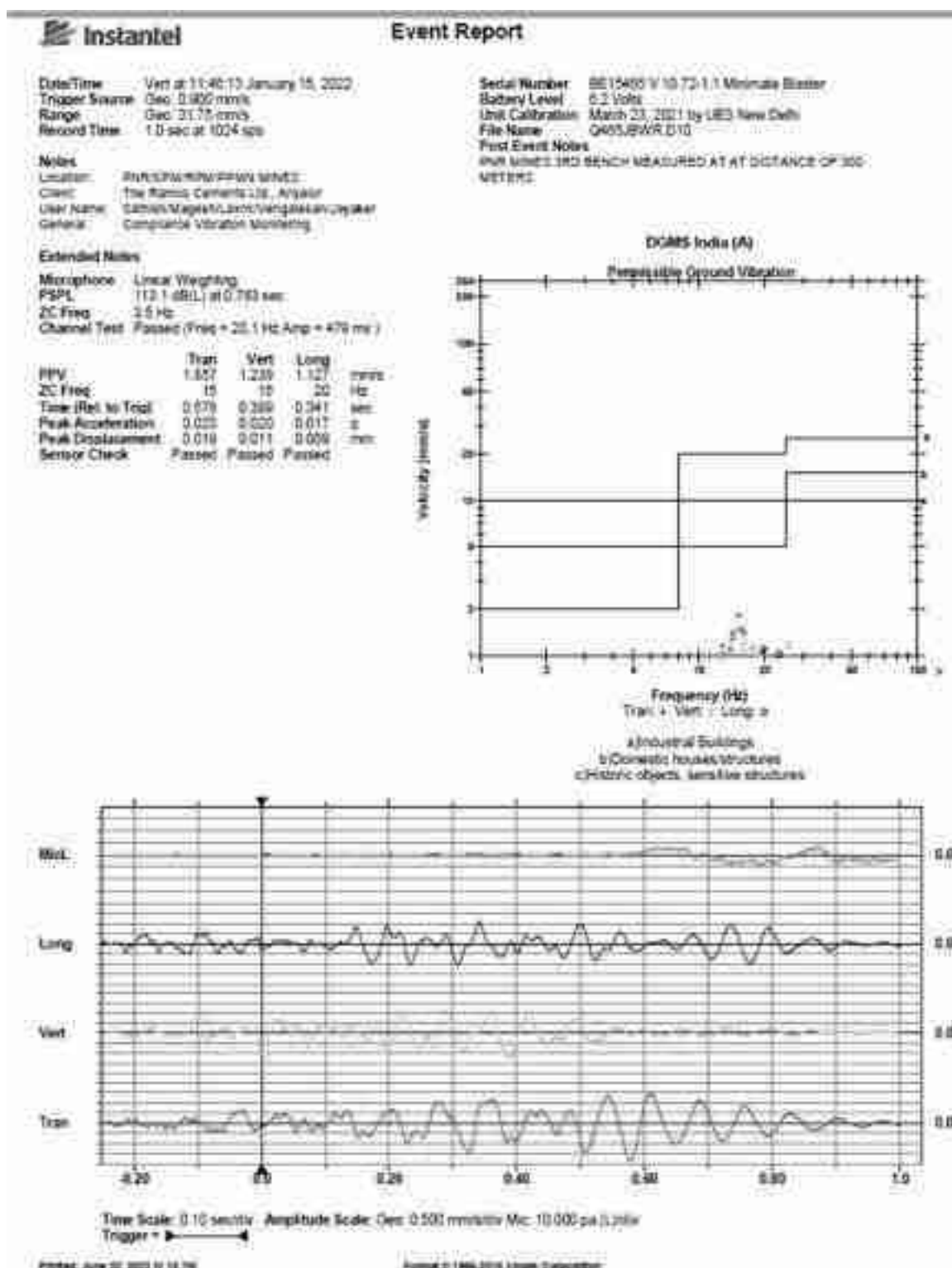
Monitoring Dates : 19-20.01.2024

Equipment	Location	Noise Level (Leq), dB(A)	DGMS/ OSHA Norm for 8-hours Exposure
Rippers/Rock Breakers, Operating	Operator's Position	82.6	<85 dB(A)
Dozer & Loader, both operating	1.0 m away	83.8	
Tipper, operating	1.0 m away	82.1	

3.6.3 Ground Vibration during Blasting

Vibration levels are monitored with Minimate instruments whenever blastings are done and records are maintained as per DGMS requirement. Vibration Parameters viz. Peak Particle Velocity (PPV) at 300 m distance and Noise Levels during Blastings were in compliance with DGMS Norms for Residential Areas.

An Event Report is appended.



3.7 Water Environment

3.7.1 Hydrogeology

RCL has engaged the **Department of Remote Sensing, Bharathidasan University, Trichy** for 'Integrated Hydrological Investigations-A Geospatial Approach' in and around their Mine Lease Areas in Ariyalur Region (Project 'Hydrolime') since May 2017 and submitted the periodical Reports to the Authorities. Also, the EIA Coordinator and Officials of M/s. Thrust Geo-consultants Private Limited, an **Accredited Ground Water Professionals** for 'Hydrogeological Report for Mining Projects' by Central Ground Water Authority (CGWA) have carried out the Hydrogeological Survey including a Pumping Test during 18-19.12.2023 and submitted the Report (Plates VIII & IX).

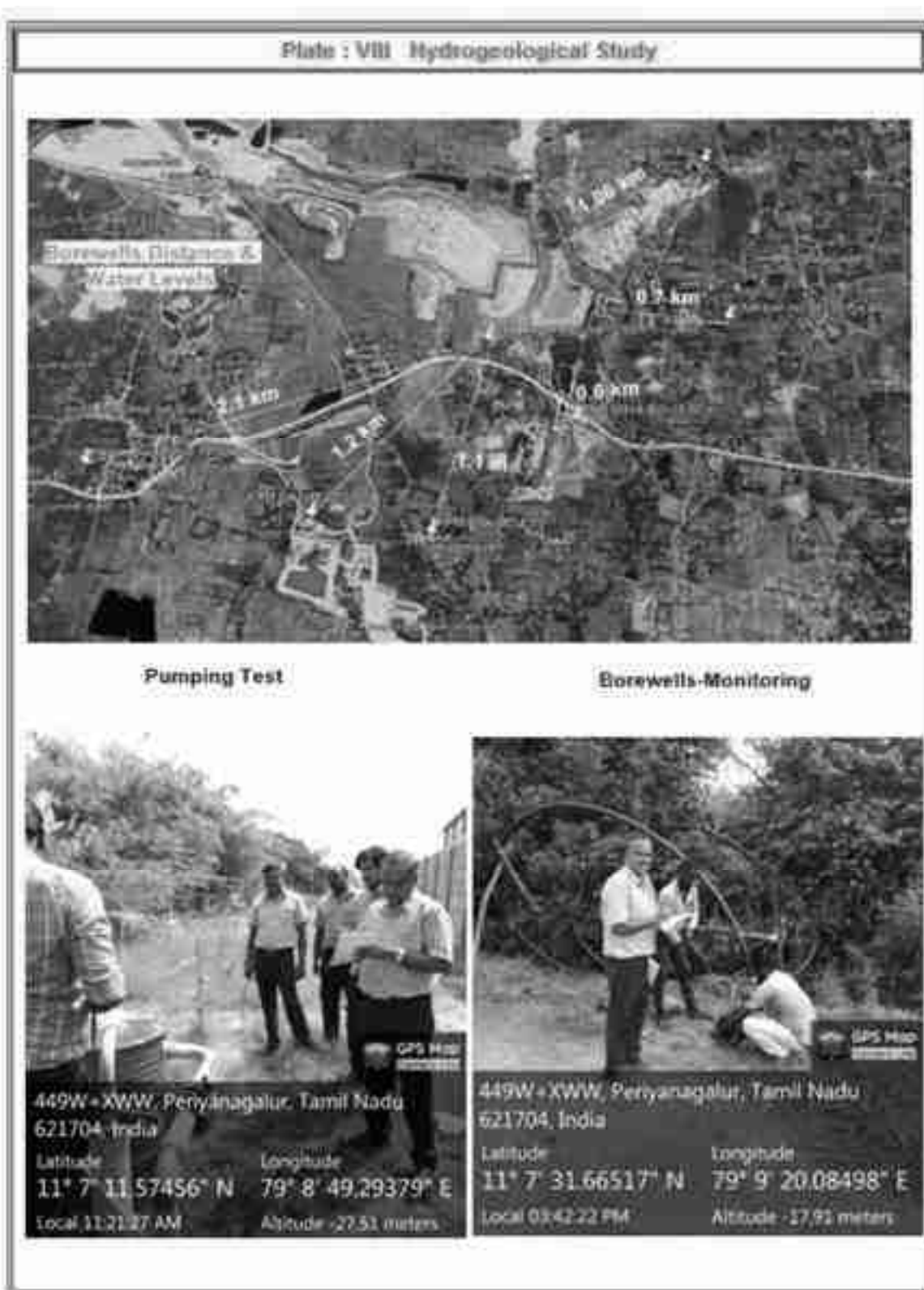


Ground Water Levels : As per TWAD Data, **70 year Normal Rainfall** of Ariyalur Rain Gauge Station is **1,096 mm** viz. Transitional Period (Jan.-May)-199 mm, SW Monsoon Period (Jun.-Sep.)-379 mm & NE Monsoon Period (Oct.-Dec.)-518 mm.

Based on the mine workings, the Ground water-table level in the mine vicinity is at **40 m BGL during Postmonsoon & 45 m BGL during Premonsoon periods**. RCL has installed a Piezometer in the Mine Area and monitoring the ground water level periodically (**Table 3.21**). Also, Periodical monitoring of ground water level is being carried out 3 locations on quarterly basis and the periodical data are submitted to IBM on quarterly basis and IRO, MoEFCC & SGWB on six monthly basis.

Table : 3.21 Monitored Ground Water Level Data in PNR Mine

Month/Year	Piezometer Water Level Readings, m BGL				
	2019	2020	2021	2022	2023
January	20.76	14.87	14.94	8.35	16.81
February	22.32	15.64	15.31	9.83	15.32
March	24.90	16.35	14.96	11.57	16.40
April	26.45	17.51	16.13	13.23	17.16
May	27.32	18.47	17.25	16.08	17.54
June	26.70	19.07	17.16	15.10	18.22
July	25.79	20.08	17.63	15.42	18.81
August	23.89	20.32	18.40	15.95	19.31
September	22.24	20.60	18.80	15.75	19.00
October	19.25	19.16	17.13	15.46	18.50
November	16.30	17.21	11.43	15.29	16.55
December	18.94	14.81	8.73	13.72	16.32





On the monitoring day, the water levels observed in the 6 Borewells in the PNR-A Mine vicinity (within 2 km) are given in **Table 3.22**. The levels were found to be 8.14 m BGL to 22.30 m BGL while it was 15.50 m BGL at PNR Mine.

Table : 3.22 Monitored Ground Water Level Data – 2 km from the Lease

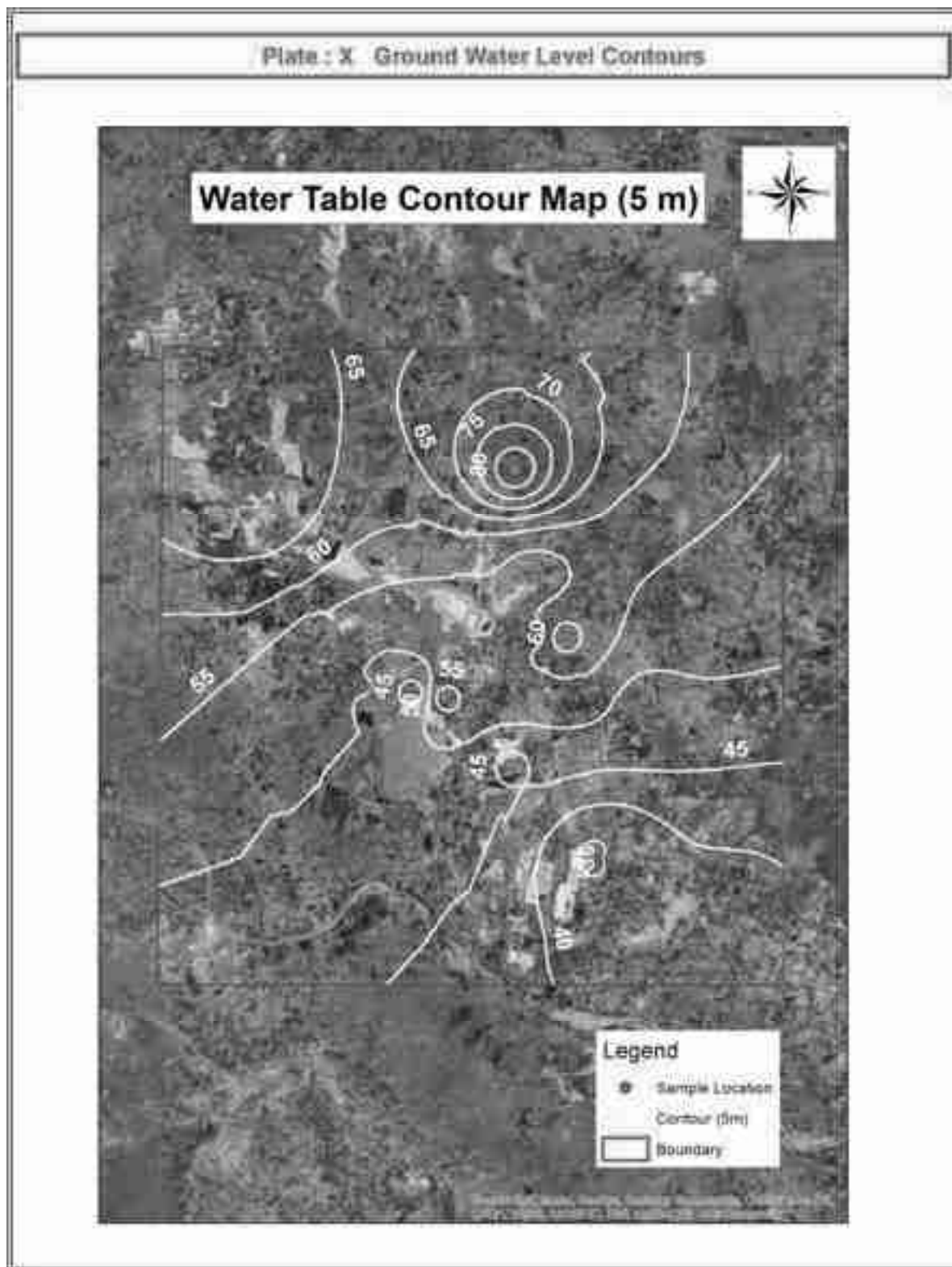
Sl. No.	Borewell at	Coordinates	Distance from the Mine, km	Water Level Readings, m BGL
1	Periyannagalur	11° 8'8.20"N - 79° 9'19.94"E	1.06	18.84
2	Chinnanagalur	11° 7'31.73"N- 79° 9'20.04"E	0.7	17.17
3	PNR Mine	11° 7'27.85"N- 79° 8'33.59"E	-	15.50
4	RCL Mine Office	11° 7'11.45"N- 79° 8'49.24"E	0.6	15.90
5	Kattupiringiyam	11° 6'50.37"N- 79° 8'22.30"E	1.1	8.14
6	Kattupiringiyam Mine	11° 6'53.80"N- 79° 8'1.08"E	1.2	22.30
7	Hastinapuram	11° 7'3.97"N- 79° 7'19.98"E	2.1	18.93

The monitored water levels in the Study Area are brought to Reduced Levels (RLs) for comparison and 'Water Level Contours' are plotted in Google Earth Imagery and appended as **Plate X**.

Ground Water Levels from the **27 number of Observation Wells** of TWAD in Ariyalur District have been analysed for Post-Monsoon and Pre-Monsoon periods (**Table 3.23**). Ground Water-table in the District ranges from 23.0 m to 28.7 m with average level at **25.4 m BGL during Post-monsoon** and 25.6 m to 31.7 m with average level at **29.2 m BGL during Premonsoon Period**.

Table : 3.23 Ground Water Level Data (TWAD)

Monitored Month & Ground Water Level, m BGL													
Jan 2015	May 2015	Jan 2016	May 2016	Jan 2017	May 2017	Jan 2018	May 2018	Jan 2019	May 2019	Jan 2020	May 2020	Jan 2021	May 2021
23.6	25.6	23.0	28.7	28.7	31.7	25.0	31.3	26.9	30.0	26.1	29.1	24.6	27.9
Source : TWAD Data for Ariyalur District.													



3.7.2 Stage of Development

The ground water in Ariyalur region occurs in three different geological formations viz. River Alluvium, Marine Limestone and Tertiary Formations (Central Ground Water Board - CGWB District Brochure; March 2011). In the river alluvium, the ground water occurs under water table condition. The average thickness of the river alluvium varies from 12 m to 22 m. The ground water in these formations serves as irrigation and drinking water sources. In the Cretaceous limestone formations the ground water occurs in water table conditions. The depth of the wells in these formations ranges between 10-20 m and some area has high ground water potential due to the presence of limestone cavities. In the Tertiary formations, the ground water occurs predominantly in semi-confined and confined conditions which yield good quantity and quality of waters. The depth of bore wells in these formation ranges from 30 to 120 m BGL.

Aquifer Parameters	<u>Alluvium</u>	<u>Sedimentary</u>	<u>Hard Rock</u>
Well Yield, lpm	300-950	300-550	80-210
Transmissivity (T), m ² /day	225-1500	90-190	35-130
Permeability (K), m/day	20-50	15-30	5-20
Net Groundwater Availability, MCM			314.97
Existing Gross Groundwater Draft for All Users, MCM			161.52
Stage of Groundwater Development			51 %
Categorization of the District			Safe

The **Stage of Development of Ariyalur Block is Safe (<70%) Category.**

3.7.3 Water Quality

The Central Pollution Control Board (CPCB) has identified Five **Designated Best Use of Surface Waters** viz. **Class A** (Drinking Water Source without Conventional Treatment but after Disinfection), **B** (Out Door Bathing-Organised), **C** (Drinking Water Source after Conventional Treatment and Disinfection), **D** (Propagation of Wild life and Fisheries) & **E** (Irrigation, Industrial Cooling, Controlled Waste Disposal) and stipulated the Norms for the Classes; for few Parameters (**Table 3.24**). Further, Bureau of Indian Standards (BIS) had also recommended Tolerance Limits for Inland Surface Waters for the different uses (**IS 2296:1982**). Even though, IS 2296:1982 has been withdrawn, the analysed data are compared with this Standard to have better understanding about the Surface Water Quality in the Study Area.

Table : 3.24 CPCB Criteria for Designated Best Use of Water

Parameter	Designated Best Use Class & Required Criteria				
	A	B	C	D	E
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5	6.5-8.5
EC, umhos/cm (max.)	-	-	-	-	2,250
DO, mg/l	6 or more	5 or more	4 or more	4 or more	6 or more
BOD-3 days @ 27 °C	2 or less	3 or less	3 or less	-	2 or less
Total Coliforms, MPN/100 ml	50 or less	500 or less	5000 or less	-	50 or less
Free Ammonia (as N), mg/l	-	-	-	1.2 or less	-
Boron, mg/l (max.)	-	-	-	-	2
Sodium Absorption Ratio (max.)	-	-	-	-	26

- : Not included/Not specified.

The Ground Water Quality Parameters are compared with **BIS 10500:2012 Standards** of Acceptable and Permissible Limits for Drinking purpose with Ground Water as source. The monitored water quality data are presented in **Tables 3.25-3.26** and the abstract of those data is given as **Table 3.27**.

The **Surface Water** samples were monitored with pH in the range 7.43-7.83 against the Limit value of 6.5-9.0. DO levels were in the range 4.8-5.6 mg/l against the minimum requirement value of 4.0 mg/l. TDS values were monitored in the range of 320-500 mg/l. Chloride values ranging from 82 mg/l to 148 mg/l. Iron content was found to be in the range 0.06-0.12 mg/l. Oil and grease, phenolic compounds, cyanides, sulphides and insecticides were found to be absent. Trace metals were found to be in traceable levels. BOD and COD values were found to be <2 mg/l and 4-18 mg/l respectively. The surface water quality were found to be within the prescribed CPCB Norms.

The pH of **Ground Water** samples were ranging from 7.61-7.82 against the BIS Norm of 6.5-8.5. TDS and Chloride values were found to be in the range 360-550 mg/l (Norm 500 mg/l or 2,000 mg/l in the absence of alternate source) and 93-156 mg/l (Norm 250/1000 mg/l) respectively. Iron content was found to be in the range 0.06-0.14 mg/l. Oil & Grease, Cyanides, Phenols, Pesticides, etc. were found to be absent. Most of the trace metals were monitored to be below their detectable limits. In general, the water quality of ground waters were found to be within the prescribed IS 10500:2012 Norms for Drinking in the absence of an alternative source.

The pH value of **Mine Pit water** was found to be 7.69. TDS value was 410 mg/l. Chloride value was 122 mg/l. Iron content was found to be 0.09 mg/l. BOD and COD values were monitored in lower levels. Oil & Grease value was found to be Nil. In general, mine pit water quality was found to be within the prescribed **TNPCB Norms** for Onland irrigation.

Exceedance Factor (EF) : All the monitored Water Quality Parameters were found to be well within the respective Limit Values and there was no Exceedance of the Norms.

Table : 3.25 Surface Water Quality Data

Monitoring Dates : 09.01.2024
(Worst case & Mean values are reported)

Sl. No.	Parameter	W1 Nalla near Mine	W2 Uppu Odai	W3 Kallar River	W4 Marudaiyar River Up stream	CPCB Norms*
1	pH	7.83	7.47	7.43	7.61	6.5-8.5
2	Colour, Hazen units	BDL(DL:5.0)	BDL(DL:5.0)	BDL(DL:5.0)	BDL(DL:5.0)	10-30
3	Temperature, °C	26.4	26.8	26.6	27.1	-
4	Turbidity, NTU	0.8	1.2	1.5	1.8	-
5	Residual Chlorine, mg/l	BDL(DL:1.0)	BDL(DL:1.0)	BDL(DL:1.0)	BDL(DL:1.0)	-
6	Dissolved Oxygen, mg/l	4.8	5.3	5.6	5.4	4.0-6.0
7	Total Suspended Solids, mg/l	13	24	29	36	-
8	Electrical Conductivity, umhos/cm	590	580	630	700	-
9	Total Dissolved Solids, mg/l	380	370	400	440	500-2100
10	Total Hardness (as CaCO ₃), mg/l	190	160	170	190	-
11	Calcium Hardness, mg/l	110	90	90	100	-
12	Magnesium Hardness, mg/l	80	70	80	90	-
13	Calcium (as Ca), mg/l	44	36	36	40	-
14	Magnesium (as Mg), mg/l	19	17	19	22	-
15	Sodium (as Na), mg/l	28	39	45	49	-
16	Potassium (as K), mg/l	2	3	5	6	-
17	Chlorides (as Cl), mg/l	88	110	119	127	250-600
18	Sulphates (as SO ₄), mg/l	26	23	27	32	400-1000
19	Total Alkalinity (as CaCO ₃), mg/l	90	70	80	100	-
20	BOD-3 days @ 27°C, mg/l	BDL(DL:2.0)	BDL(DL:2.0)	BDL(DL:2.0)	BDL(DL:2.0)	<3
21	COD, mg/l	6	8	11	13	-
22	Oil & Grease, mg/l	BDL(DL:1.0)	BDL(DL:1.0)	BDL(DL:1.0)	BDL(DL:1.0)	-
23	Iron (as Fe), mg/l	0.06	0.09	0.11	0.09	0.3-5.0
24	Fluorides (as F), mg/l	0.11	0.16	0.21	0.18	1.5
25	Nitrates (as NO ₃), mg/l	0.10	0.12	0.16	0.15	20-50
26	Phosphates (as PO ₄), mg/l	<0.01	<0.01	<0.01	<0.01	-
27	Cyanides (as CN), mg/l	<0.01	<0.01	<0.01	<0.01	-
28	Pesticides (as Malathion), mg/l	<0.01	<0.01	<0.01	<0.01	-
29	Phenols (as C ₆ H ₅ OH), mg/l	<0.01	<0.01	<0.01	<0.01	-
30	Manganese (as Mn), mg/l	<0.01	<0.01	<0.01	<0.01	-
31	Chromium (as Cr), mg/l	<0.01	<0.01	<0.01	<0.01	-
32	Copper (as Cu), mg/l	<0.01	<0.01	<0.01	<0.01	1.5
33	Selenium (as Se), mg/l	<0.01	<0.01	<0.01	<0.01	-
34	Aluminium (as Al), mg/l	<0.01	<0.01	<0.01	<0.01	-
35	Cadmium (as Cd), mg/l	<0.01	<0.01	<0.01	<0.01	-
36	Arsenic (as As), mg/l	<0.01	<0.01	<0.01	<0.01	0.05-0.2
37	Boron (as B), mg/l	<0.01	<0.01	<0.01	<0.01	2
38	Mercury (as Hg), mg/l	<0.01	<0.01	<0.01	<0.01	-
39	Lead (as Pb), mg/l	<0.01	<0.01	<0.01	<0.01	0.1
40	Zinc (as Zn), mg/l	<0.01	<0.01	<0.01	<0.01	1.5-15
41	Percent Sodium, %	24.0	34.1	35.7	35.0	-
42	Total Coliforms, MPN/100 ml	8	41	47	56	50-5000
43	Faecal Coliforms, MPN/100 ml	4	22	28	32	-
44	E. Coli, MPN/100 ml	2	17	20	23	-

* : CPCB Norms-Central Pollution Control Board Norms for Surface Waters-Class C.

- : Not included/Not available.

Table : 3.25 (Contn.) Surface Water Quality Data

Monitoring Dates : 09.01.2024
(Worst case & Mean values are reported)

Sl. No.	Parameter	W5 Marudaiyar River Down stream	W6 Manakudi Tank	W7 Pond, Periyannagalur	W8 Pond, Pudupalayam	CPCB Norms*
1	pH	7.68	7.74	7.68	7.69	6.5-8.5
2	Colour, Hazen units	BDL(DL:5.0)	BDL(DL:5.0)	BDL(DL:5.0)	BDL(DL:5.0)	10-30
3	Temperature, °C	27.2	27.0	26.8	26.4	-
4	Turbidity, NTU	1.6	2.1	1.7	1.9	-
5	Residual Chlorine, mg/l	BDL(DL:1.0)	BDL(DL:1.0)	BDL(DL:1.0)	BDL(DL:1.0)	-
6	Dissolved Oxygen, mg/l	5.5	5.1	5.3	4.8	4.0-6.0
7	Total Suspended Solids, mg/l	22	23	18	41	-
8	Electrical Conductivity, umhos/cm	700	560	500	790	-
9	Total Dissolved Solids, mg/l	450	350	320	500	500-2100
10	Total Hardness (as CaCO ₃), mg/l	210	140	130	220	-
11	Calcium Hardness, mg/l	110	80	70	120	-
12	Magnesium Hardness, mg/l	100	60	60	100	-
13	Calcium (as Ca), mg/l	44	32	28	48	-
14	Magnesium (as Mg), mg/l	24	14	14	24	-
15	Sodium (as Na), mg/l	44	32	24	54	-
16	Potassium (as K), mg/l	4	2	2	8	-
17	Chlorides (as Cl), mg/l	130	88	82	148	250-600
18	Sulphates (as SO ₄), mg/l	28	24	20	42	400-1000
19	Total Alkalinity (as CaCO ₃), mg/l	90	80	60	110	-
20	BOD-3 days @ 27°C, mg/l	BDL(DL:2.0)	BDL(DL:2.0)	BDL(DL:2.0)	BDL(DL:2.0)	<3
21	COD, mg/l	8	6	4	18	-
22	Oil & Grease, mg/l	BDL(DL:1.0)	BDL(DL:1.0)	BDL(DL:1.0)	BDL(DL:1.0)	-
23	Iron (as Fe), mg/l	0.08	0.12	0.06	0.11	0.3-5.0
24	Fluorides (as F), mg/l	0.21	0.21	0.13	0.26	1.5
25	Nitrates (as NO ₃), mg/l	0.18	0.18	0.11	0.21	20-50
26	Phosphates (as PO ₄), mg/l	<0.01	<0.01	<0.01	<0.01	-
27	Cyanides (as CN), mg/l	<0.01	<0.01	<0.01	<0.01	-
28	Pesticides (as Malathion), mg/l	<0.01	<0.01	<0.01	<0.01	-
29	Phenols (as C ₆ H ₅ OH), mg/l	<0.01	<0.01	<0.01	<0.01	-
30	Manganese (as Mn), mg/l	<0.01	<0.01	<0.01	<0.01	-
31	Chromium (as Cr), mg/l	<0.01	<0.01	<0.01	<0.01	-
32	Copper (as Cu), mg/l	<0.01	<0.01	<0.01	<0.01	1.5
33	Selenium (as Se), mg/l	<0.01	<0.01	<0.01	<0.01	-
34	Aluminium (as Al), mg/l	<0.01	<0.01	<0.01	<0.01	-
35	Cadmium (as Cd), mg/l	<0.01	<0.01	<0.01	<0.01	-
36	Arsenic (as As), mg/l	<0.01	<0.01	<0.01	<0.01	0.05-0.2
37	Boron (as B), mg/l	<0.01	<0.01	<0.01	<0.01	2
38	Mercury (as Hg), mg/l	<0.01	<0.01	<0.01	<0.01	-
39	Lead (as Pb), mg/l	<0.01	<0.01	<0.01	<0.01	0.1
40	Zinc (as Zn), mg/l	<0.01	<0.01	<0.01	<0.01	1.5-15
41	Percent Sodium, %	30.8	32.8	28.2	33.8	-
42	Total Coliforms, MPN/100 ml	47	26	12	72	50-5000
43	Faecal Coliforms, MPN/100 ml	26	17	8	35	-
44	E. Coli, MPN/100 ml	17	11	4	25	-

* : CPCB Norms-Central Pollution Control Board Norms for Surface Waters-Class C.

- : Not included/Not available.

Table : 3.26 Ground Water Quality Data

Monitoring Dates : 09.01.2024
(Worst case & Mean values are reported)

Sl. No.	Parameter	W9 PNR Mine Pit	W10 Borewell, Kallankurichi	W11 Borewell, Kattupirin- giyam	W12 Borewell, Periya- nagarur	IS:10500 Norms*
1	pH	7.69	7.67	7.78	7.68	6.5-8.5
2	Colour, Hazen units	BDL(DL:5.0)	BDL(DL:5.0)	BDL(DL:5.0)	BDL(DL:5.0)	5/15#
3	Temperature, °C	27.8	27.2	26.9	27.0	-
4	Turbidity, NTU	1.6	0.7	0.9	0.9	1/5
5	Residual Chlorine, mg/l	BDL(DL:1.0)	BDL(DL:1.0)	BDL(DL:1.0)	BDL(DL:1.0)	0.2/1.0
6	Dissolved Oxygen, mg/l	4.1	3.8	4.4	4.7	-
7	Total Suspended Solids, mg/l	27	10	19	11	-
8	Electrical Conductivity, umhos/cm	660	670	840	730	-
9	Total Dissolved Solids, mg/l	410	440	530	460	500/2000
10	Total Hardness (as CaCO ₃), mg/l	250	210	250	220	200/600
11	Calcium Hardness, mg/l	120	110	140	120	-
12	Magnesium Hardness, mg/l	130	100	110	100	-
13	Calcium (as Ca), mg/l	48	44	56	48	75/200
14	Magnesium (as Mg), mg/l	31	24	26	24	30/100
15	Sodium (as Na), mg/l	47	36	46	39	-
16	Potassium (as K), mg/l	8	2	5	2	-
17	Chlorides (as Cl), mg/l	122	124	156	132	250/1000
18	Sulphates (as SO ₄), mg/l	38	36	52	41	200/400
19	Total Alkalinity (as CaCO ₃), mg/l	130	100	120	110	200/600
20	BOD-3 days @ 27°C, mg/l	BDL(DL:2.0)	BDL(DL:2.0)	BDL(DL:2.0)	BDL(DL:2.0)	-
21	COD, mg/l	2	4	5	8	-
22	Oil & Grease, mg/l	BDL(DL:1.0)	BDL(DL:1.0)	BDL(DL:1.0)	BDL(DL:1.0)	-
23	Iron (as Fe), mg/l	0.09	0.08	0.13	0.10	0.3
24	Fluorides (as F), mg/l	0.14	0.14	0.27	0.17	1.0/1.5
25	Nitrates (as NO ₃), mg/l	0.18	0.15	0.26	0.23	45
26	Phosphates (as PO ₄), mg/l	<0.01	<0.01	<0.01	<0.01	-
27	Cyanides (as CN), mg/l	BDL(DL:0.02)	BDL(DL:0.02)	BDL(DL:0.02)	BDL(DL:0.02)	0.05
28	Pesticides (as Malathion), mg/l	<0.01	<0.01	<0.01	<0.01	Abs./0.001
29	Phenols (as C ₆ H ₅ OH), mg/l	BDL(DL:0.001)	BDL(DL:0.001)	BDL(DL:0.001)	BDL(DL:0.001)	0.001/0.002
30	Manganese (as Mn), mg/l	<0.01	<0.01	<0.01	<0.01	0.1/0.3
31	Chromium (as Cr), mg/l	<0.01	<0.01	<0.01	<0.01	0.05
32	Copper (as Cu), mg/l	<0.01	<0.01	<0.01	<0.01	0.05/1.5
33	Selenium (as Se), mg/l	<0.01	<0.01	<0.01	<0.01	0.01
34	Aluminium (as Al), mg/l	<0.01	<0.01	<0.01	<0.01	0.03/0.2
35	Cadmium (as Cd), mg/l	<0.01	<0.01	<0.01	<0.01	0.003
36	Arsenic (as As), mg/l	<0.01	<0.01	<0.01	<0.01	0.01/0.05
37	Boron (as B), mg/l	<0.01	<0.01	<0.01	<0.01	0.5/1.0
38	Mercury (as Hg), mg/l	<0.001	<0.001	<0.001	<0.001	0.001
39	Lead (as Pb), mg/l	<0.01	<0.01	<0.01	<0.01	0.01
40	Zinc (as Zn), mg/l	<0.01	<0.01	<0.01	<0.01	5/15
41	Percent Sodium, %	28.2	26.9	28.1	27.6	-
42	Total Coliforms, MPN/100 ml	<2	<2	<2	<2	Absent
43	Faecal Coliforms, MPN/100 ml	<2	<2	<2	<2	Absent
44	E. Coli, MPN/100 ml	<2	<2	<2	<2	Absent

* : IS:10500 :2012-Drinking Water Standards; # : Requirement/Permissible Limit in the absence of alternate source.

Table : 3.26 (Contn.) Ground Water Quality Data

Monitoring Dates : 09.01.2024
(Worst case & Mean values are reported)

Sl. No.	Parameter	W13 Borewell, Reddipalayam	W14 Borewell, Pudupalayam	W15 Borewell, Hastinapuram	W16 Borewell, Kovilan-kudikadu	IS:10500 Norms*
1	pH	7.75	7.82	7.61	7.66	6.5-8.5
2	Colour, Hazen units	BDL(DL:5.0)	BDL(DL:5.0)	BDL(DL:5.0)	BDL(DL:5.0)	5/15#
3	Temperature, °C	27.3	27.1	27.0	27.3	-
4	Turbidity, NTU	1.0	1.1	0.9	1.0	1/5
5	Residual Chlorine, mg/l	BDL(DL:1.0)	BDL(DL:1.0)	BDL(DL:1.0)	BDL(DL:1.0)	0.2/1.0
6	Dissolved Oxygen, mg/l	4.5	4.4	4.9	4.4	-
7	Total Suspended Solids, mg/l	14	17	12	14	-
8	Electrical Conductivity, umhos/cm	820	870	650	570	-
9	Total Dissolved Solids, mg/l	520	550	410	360	500/2000
10	Total Hardness (as CaCO ₃), mg/l	260	270	200	170	200/600
11	Calcium Hardness, mg/l	140	150	110	90	-
12	Magnesium Hardness, mg/l	120	120	90	80	-
13	Calcium (as Ca), mg/l	56	60	44	36	75/200
14	Magnesium (as Mg), mg/l	29	29	22	19	30/100
15	Sodium (as Na), mg/l	47	54	42	35	-
16	Potassium (as K), mg/l	4	6	3	2	-
17	Chlorides (as Cl), mg/l	148	154	114	93	250/1000
18	Sulphates (as SO ₄), mg/l	49	49	29	21	200/400
19	Total Alkalinity (as CaCO ₃), mg/l	120	130	90	80	200/600
20	BOD-3 days @ 27°C, mg/l	BDL(DL:2.0)	BDL(DL:2.0)	BDL(DL:2.0)	BDL(DL:2.0)	-
21	COD, mg/l	6	5	2	3	-
22	Oil & Grease, mg/l	BDL(DL:1.0)	BDL(DL:1.0)	BDL(DL:1.0)	BDL(DL:1.0)	-
23	Iron (as Fe), mg/l	0.10	0.14	0.10	0.06	0.3
24	Fluorides (as F), mg/l	0.21	0.28	0.22	0.16	1.0/1.5
25	Nitrates (as NO ₃), mg/l	0.28	0.31	0.25	0.12	45
26	Phosphates (as PO ₄), mg/l	<0.01	<0.01	<0.01	<0.01	-
27	Cyanides (as CN), mg/l	BDL(DL:0.02)	BDL(DL:0.02)	BDL(DL:0.02)	BDL(DL:0.02)	0.05
28	Pesticides (as Malathion), mg/l	<0.01	<0.01	<0.01	<0.01	Abs./0.001
29	Phenols (as C ₆ H ₅ OH), mg/l	BDL(DL:0.001)	BDL(DL:0.001)	BDL(DL:0.001)	BDL(DL:0.001)	0.001/0.002
30	Manganese (as Mn), mg/l	<0.01	<0.01	<0.01	<0.01	0.1/0.3
31	Chromium (as Cr), mg/l	<0.01	<0.01	<0.01	<0.01	0.05
32	Copper (as Cu), mg/l	<0.01	<0.01	<0.01	<0.01	0.05/1.5
33	Selenium (as Se), mg/l	<0.01	<0.01	<0.01	<0.01	0.01
34	Aluminium (as Al), mg/l	<0.01	<0.01	<0.01	<0.01	0.03/0.2
35	Cadmium (as Cd), mg/l	<0.01	<0.01	<0.01	<0.01	0.003
36	Arsenic (as As), mg/l	<0.01	<0.01	<0.01	<0.01	0.01/0.05
37	Boron (as B), mg/l	<0.01	<0.01	<0.01	<0.01	0.5/1.0
38	Mercury (as Hg), mg/l	<0.001	<0.001	<0.001	<0.001	0.001
39	Lead (as Pb), mg/l	<0.01	<0.01	<0.01	<0.01	0.01
40	Zinc (as Zn), mg/l	<0.01	<0.01	<0.01	<0.01	5/15
41	Percent Sodium, %	27.8	29.7	30.9	30.6	-
42	Total Coliforms, MPN/100 ml	<2	<2	<2	<2	Absent
43	Faecal Coliforms, MPN/100 ml	<2	<2	<2	<2	Absent
44	E. Coli, MPN/100 ml	<2	<2	<2	<2	Absent

* : IS:10500 :2012-Drinking Water Standards; # : Requirement/Permissible Limit in the absence of alternate source.

Table : 3.27 Water Quality Status

Monitoring Dates : 09.01.2024

Sl. No.	Parameter	Concentration Range & Norms			
		Surface Waters	CPCB Norms* for Surface Waters	Ground Waters	IS:10500 Norms** for Drinking Waters
1	pH	7.43-7.83	6.5-8.5	7.61-7.82	6.5-8.5
2	Total Dissolved Solids, mg/l	320-500	-	360-550	500-2000*
3	Dissolved Oxygen, mg/l	4.8-5.6	4.0-6.0	3.8-4.9	-
4	BOD (3 days @ 27 °C), mg/l	BDL(DL:2.0)	<3	BDL(DL:2.0)	-
5	COD, mg/l	4-18	-	2-8	-
6	Oil & Grease, mg/l	BDL(DL:1.0)	-	BDL(DL:1.0)	-
7	Chlorides (as Cl), mg/l	82-148	250-600	93-156	250-1000
8	Iron (as Fe), mg/l	0.06-0.12	0.3-5.0	0.06-0.14	0.3
9	Trace Metals, mg/l	<0.01	-	<0.01	<0.001-<0.01
10	Total Coliforms, MPN/100 ml	8-72	50-5000	<2	Absent

* : CPCB Norms-Central Pollution Control Board Norms for Surface Waters-**Class C**. - : Not included/Not available.

** : * : IS:10500 :2012-Drinking Water Standards; # : Requirement/Permissible Limit in the absence of alternate source.

3.8 Land Environment

3.8.1 Soil Status

The collected soil quality data are given as **Table 3.28**. Soils with medium compaction and silty loam texture were predominant in the study area. Soil pH values (7.59-7.81) were found to be in alkaline range and Electrical Conductivity values were in the range 1.50-1.79 mmhos/cm. There was low moisture at all the monitoring locations. Low levels of Nitrogen, Phosphorous and Potassium (NPK) values were monitored at all locations. Sodium Absorption Ratio was in the range 1.96-2.79 (desirable value being <5). There was **no heavy metals intrusion**/leaching into the ground strata. Wilting coefficient in significant levels would mean that these soils would support the vegetation, if amended suitably and will suit for salt tolerant & semisalt tolerant plants

3.8.2 Land Use Pattern

For Land use study of the Study Area, IRS P6 LISS-III **Satellite Imagery**/data (dated 14.03.2022) is used (**Fig. 3.5**). Visual interpretation technique has been adopted for the interpretation keys suggested in guidelines of NNRMS, Bangalore. Level-3 Classification with 1:50,000 scale was made for the preparation of land use mapping (**Fig. 3.6**). Land Use Pattern is given in **Table 3.29**. The Crop Land occupies about 40.11%. Fallow Land occupies about 24.28%. Water body occupies about 3.01%. Only 3.69% of the study area is covered by built-up land.

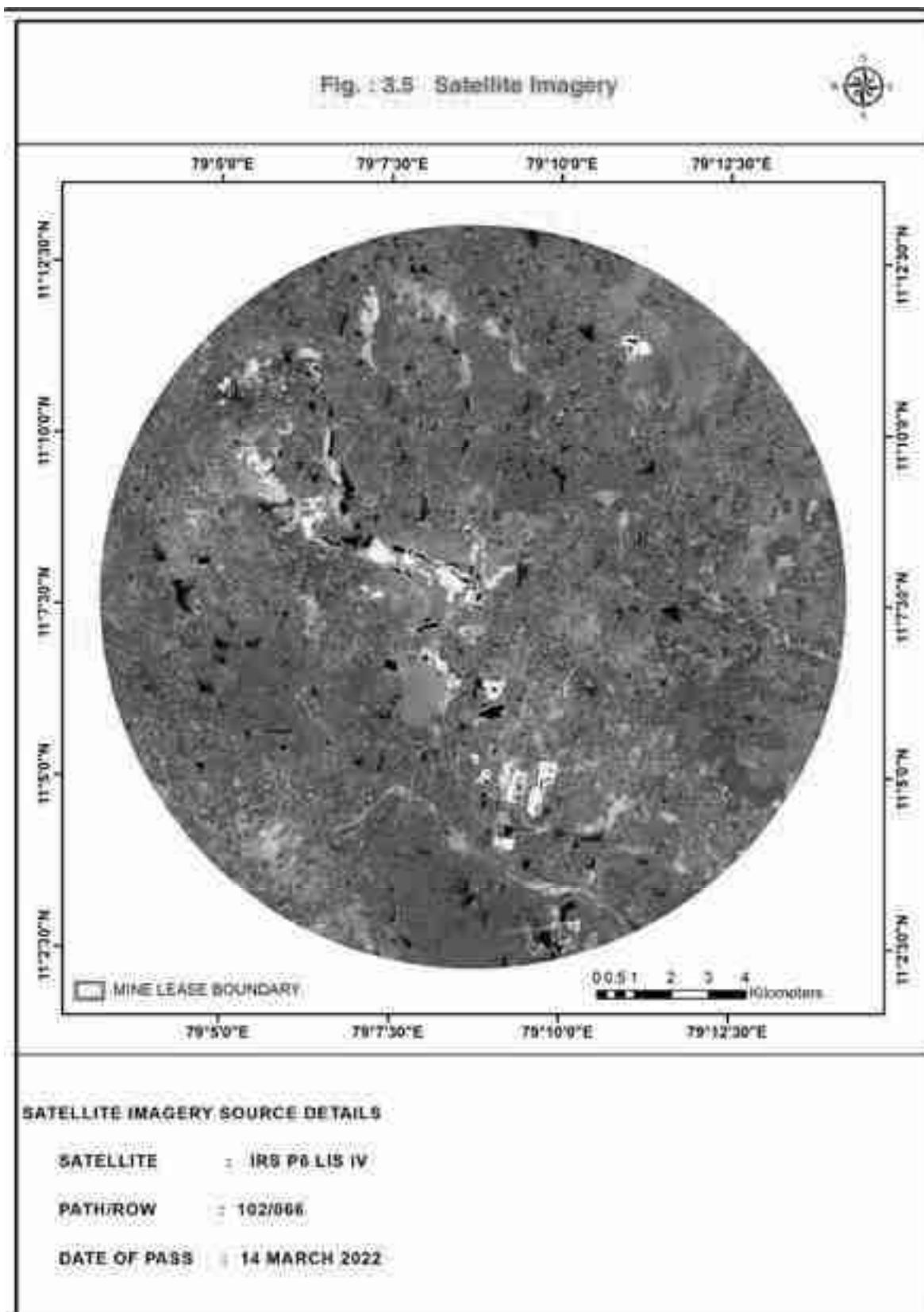
Table : 3.28 Soil Status
Monitoring Date : 09.01.2024

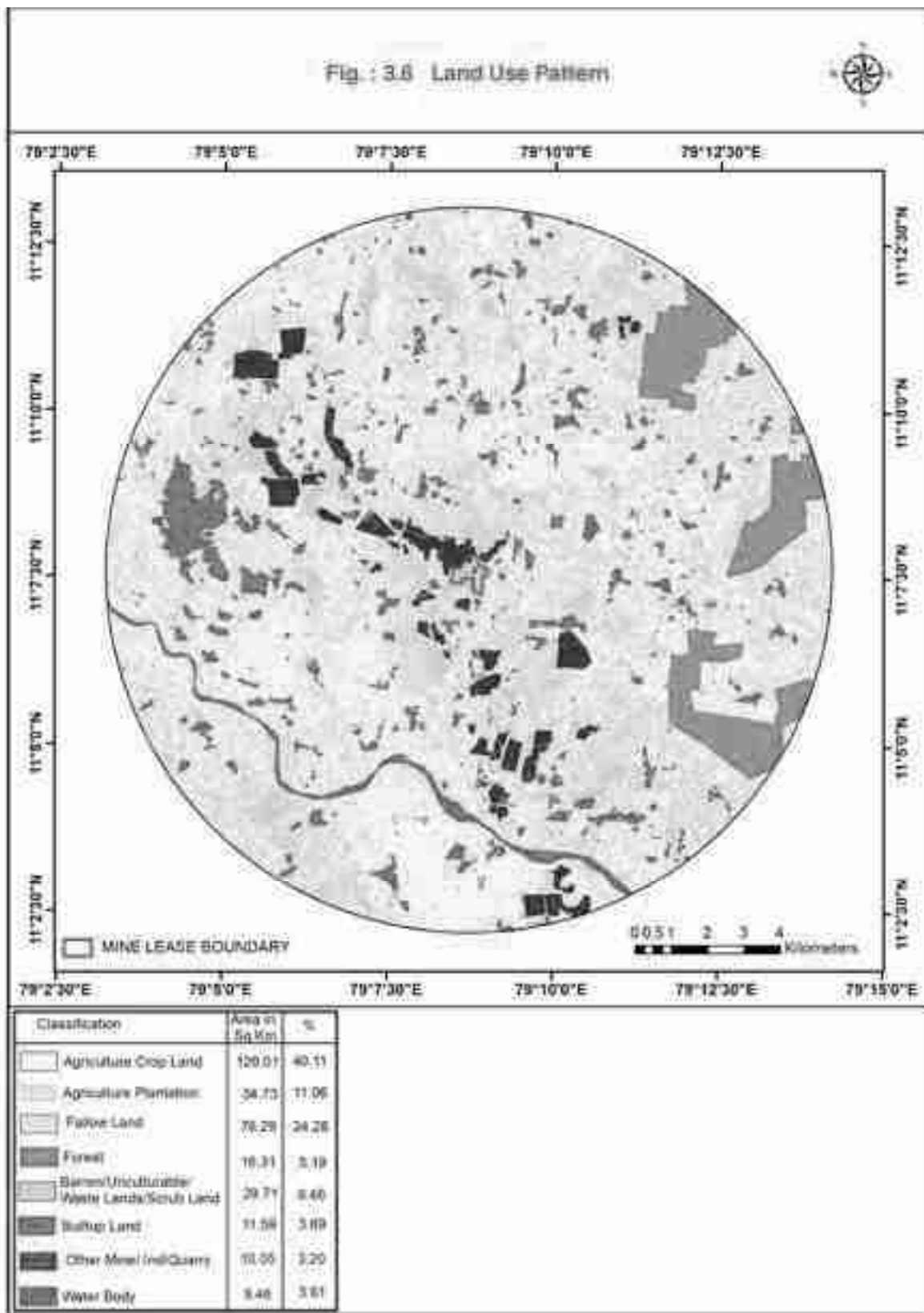
Sl. No.	Parameter	S1 Green Belt	S2 Dump Area	S3 Dry Agri. Land, Periyannagalur	S4 Forrest Land, Vilangudi	S5 Agri. Land, Pudukpalayam	Desirable Range*
i	Colour	Brown	Brown	Grey	Reddish Brown	Brown	-
ii	Compaction	Medium	Low	Medium	Medium	Medium	-
1	pH (10% Solution)	7.68	7.81	7.59	7.74	7.59	5.5-9.0
2	Electrical Conductivity, mmhos/cm	1.64	1.79	1.53	1.50	1.74	0.2-0.5
3	Natural Moisture Content, %	11.7	9.6	10.2	9.4	12.6	-
4	Organic Carbon, %	0.98	0.91	1.09	1.14	1.10	>0.75
5	Nitrogen (as N), %	0.010	0.007	0.013	0.016	0.012	0.01-0.02
6	Phosphorus (as P), %	0.006	0.003	0.009	0.010	0.009	0.002-0.004
7	Potassium (as K), %	0.012	0.009	0.010	0.008	0.014	>0.01
8	Sodium (as Na), ppm	110	140	90	110	110	-
9	Calcium (as Ca), ppm	70	90	60	80	80	-
10	Magnesium (as Mg), ppm	60	60	60	70	60	-
11	Chlorides (as Cl), ppm	210	230	180	160	210	-
12	Sulphates (as SO ₄), ppm	120	150	110	90	130	-
13	Cation Exchange Capacity, meq/100 g	23.1	21.7	22.6	24.1	23.6	10-30
14	Grain Size Distribution :i. Sand, %	33.7	31.9	62.4	28.6	31.8	-
ii	Silt, %	60.9	63.4	31.5	63.4	60.4	-
iii	Clay, %	5.4	4.7	6.1	8.0	7.8	-
15	Textural Class	Silty loam	Silty loam	Sandy loam	Silty loam	Silty loam	Loam
16	Bulk Density, g/cc	1.35	1.33	1.32	1.35	1.37	-
17	Infiltration Rate, cm/hr	3.8	4.4	3.5	3.8	3.6	-
18	Field Capacity, %	21.7	20.3	19.4	25.1	21.4	-
19	Wilting Coefficient, %	0.4	0.6	0.4	0.8	0.4	>0.4
20	Available Water Storage Capacity, %	21.4	19.6	22.3	24.3	21.9	-
21	Sodium Absorbing Ratio	2.32	2.79	1.96	2.16	2.25	<5

* : Desirable Range for High Production Soil.

Table : 3.29 Land Use Pattern

Land Use	Area, sq.km	Coverage, %
Agricultural Crop Land	126.01	40.11
Agri. Plantations	34.73	11.06
Fallow Land	76.29	24.28
Forests	16.31	5.19
Barren/Scrub Land	29.71	9.46
Other Mines, Industries, Quarries, etc.	10.05	3.20
Built-up Land	11.59	3.69
Water Bodies	9.46	3.01
Total	314.15	100





3.9 Flora and Fauna

3.9.1 Flora

A general ecological survey was carried out in the study area of 10 km radius around the Mine area. **Study Area is not part of any National Park, Sanctuary, Biosphere Reserve, Wildlife Corridors, Migratory Path, etc.** The primary data was generated through 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 list of plant species in the **Reserved Forests Area** are presented in **Table 3.30**. The list of plant species in the Core and Buffer Zones are presented in **Table 3.31 & Table 3.22** respectively.

Table : 3.30 List of Flora in the Reserve Forests

Sl. No.	Botanical Name	Family	Common Name	Local Name
1	Acacia arabica (wild)	Mimosaceae	Karuvel	Black babool
2	Acaia catechu	Fabaceae	Karungali	-
3	Aegle marmelos	Rutaceae	Vilam	-
4	Albizia amara (Roxb).	Mimosaceae	Ushilai	Slris
5	Anacardium occidentale	Anacardiaceae	Mundiri	Cashew
6	Azadirachta indica	Meliaceae	Vembu, Veppa	Neem
7	Bambusa vulgaris	Bambusaceae	Mungil	Bamboo
8	Borassus flabelliformis	Arecaceae	Panai	Palm
9	Butea monosperma	Fabaceae	Purasu	Flame of the forest
10	Cassia siamea	Caesai-pinaceae	Konnai	Kassod
11	Eucalyptus globulus	Myrtaceae	Araspadi, Thailam	Eucalyptus
12	Ficus benghalensis	Moraceae	Alamaram	Banyan
13	Lannea coromandelica	Anacardiaceae	Udhaiyam	Indian ash tree
14	Peltophorum peterocarpum	Fabaceae	Perunkonai	Pettophorum
15	Phoenix sylvestris	Arecaceae	Echcha	Indian date
16	Pongamia pinnata	Fabaceae	Pungai, Pungan	Indian Beech
17	Prosopis juliflora	Fabaceae	Velikathan, Velikaruvel	Babool
18	Senna occidentalis	Fabaceae	Ponnavarai	Coffe senna
19	Swietenia macrophylla	Meliaceae	Mahogany	-
20	Tectona garandis	Lamiaceae	Tekku	Teak
21	Ziziphus oenoplia	Rhamnaceae	Suraimul	-

The nature of shrubs and trees in the study areas were of drought resistant types. Besides the natural vegetation, the agricultural and commercial crops were cultivated in and around the study area. Paddy, Maize, Green Gram, Black gram, Groundnut, Ragi, etc. were found to be cultivated among the agricultural crops whereas Sugarcane, Cotton, Turmeric, Cashew, etc. were commercially cultivated.

Table : 3.31 List of Flora - Core Zone (including Green Belt)

Sl. No.	Botanical Name	Family	Common Name	Habit
1	<i>Azadirachta indica</i>	Meliaceae	Vembu, Veppa	Tree
2	<i>Abutilon indicum</i>	Malvaceae	Country Mallow, Tutti	Herb
3	<i>Acalypha indica</i>	Euphorbiaceae	Kuppaimeni	Herb
4	<i>Albizia lebbek</i>	Mimosaceae	Siris Tree, Vagai	Tree
5	<i>Aristida adscensionis</i>	Poaceae	Common Needle grass	Herb
6	<i>Cassia auriculata</i>	Fabaceae	Aavarampoo	Shrub
7	<i>Cassia fistula</i>	Fabaceae	Golden shower tree,	Tree
8	<i>Cassia siamea</i>	Caesalpiniaceae	Manja konnai	Tree
9	<i>Datura metel</i>	Solanaceae	Thorn apple, Oomathai	Shrub
10	<i>Holoptelea integrifolia</i>	Aavimaram, Indian elm	Ulmaceae	Tree
11	<i>Leucaena leucocephala</i>	Fabaceae	Periyatagarai, Horse	Tree
12	<i>Morinda tinctoria</i>	Rubiaceae	Nuna	Tree
13	<i>Pongamia pinnata</i>	Fabaceae	Pungai, Pungan	Tree
14	<i>Samanea saman</i>	Mimosodeae	Thoongumoonij maram	Tree
15	<i>Tecoma stans</i>	Majarali, Yellow Bells	Bignoniaceae	Shrub
16	<i>Vitex negundo</i>	Lamiaceae	Nochi	Shrub

Table : 3.32 List of Flora - Distribution of Vegetation in Buffer Zone

Sl. No.	Scientific Name	Family Name	Common Name	Habit
Agricultural Crops				
1	<i>Arachis hypogea</i>	Fabaceae	Groundnut	Herb
2	<i>Oryza sativa</i>	Poaceae	Rice	Herb
3	<i>Phaseolus mungo</i>	Fabaceae	Black gram	Herb
4	<i>Sacharum officinarum</i>	Poaceae	Sugarcane	Herb
5	<i>Zea mays</i>	Poaceae	Maize	Herb
Commercial Crops (including vegetables)				
1	<i>Capsicum frutescens</i>	Solanaceae	Milagaai	Herb
2	<i>Carica papaya</i>	Caricaceae	Papaya	Tree
3	<i>Citrus limon</i>	Rutaceae	Lemon	Tree
4	<i>Cocus nucifera</i>	Arecaceae	Coconut, Thennai	Tree
5	<i>Cucurbita pepo</i>	Cucurbitaceae	Pumpkin	Creeper
6	<i>Cyamopsis tetragonoloba</i>	Fabaceae	Cluster bean	Shrub
7	<i>Gossypium arboreum</i>	Malvaceae	Cotton, Paruthi	Shrub
8	<i>Hibiscus esculentus</i>	Malvaceae	Lady's finger, Vendai	Herb
9	<i>Lagenaria vulgaris</i>	Cucurbitaceae	Bottle gourd	Creeper
10	<i>Lycopersicum esculentum</i>	Solanaceae	Tomato	Herb
11	<i>Mangifera indica</i>	Anacardiaceae	Mango	Tree
12	<i>Momordica charantia</i>	Cucurbitaceae	Bittergourd	Creeper
13	<i>Moringa oleifera</i>	Moringaceae	Drumstick, Murungai	Tree
14	<i>Musa paradisiaca</i>	Musaceae	Plantain, Vazhai	Tree
15	<i>Psidium gujava</i>	Myrtaceae	Guava	Tree
16	<i>Ricinus communis</i>	Euphorbiaceae	Castor Bean Plant	Shrub
17	<i>Sesamum indicum</i>	Pedaliaceae	Seasame, Ellu	Herb
18	<i>Solanum melongena</i>	Solanaceae	Brinjal	Herb
19	<i>Solanum torvum</i>	Solanaceae	Turkey berry	Shrub
20	<i>Trichosanthes cucurmina</i>	Cucurbitaceae	Snake gourd	Creeper
21	<i>Vicia faba</i>	Fabaceae	Broad Bean	Creeper
Plantations				
1	<i>Anacardium occidentale</i>	Anacardiaceae	Cashew	Tree
2	<i>Cocus nucifera</i>	Arecaceae	Coconut, Thennai	Tree

Sl. No.	Scientific Name	Family Name	Common Name	Habit
3	Casuarina equisetifolia	Casuarinaceae	Casuarina, Savukku	Tree
4	Eucalyptus sp.	Myrtaceae	Eucalyptus	Tree
5	Musa paradisiaca	Musaceae	Plantain, Vazhai	Tree
6	Tectona grandis	Lamiaceae	Teak	Tree
Natural Vegetation				
1	Abrus precatorius	Fabaceae	Coral bead vine, Rosary pea,	Climber
2	Abutilon indicum	Malvaceae	Country Mallow, Tutti	Herb
3	Acacia leucophloea	Mimosaceae	Velvelam, White babool	Tree
4	Acacia nilotica	Mimosaceae	Babul, Karuvelam	Tree
5	Acalypha indica	Euphorbiaceae	Kuppaimeni	Herb
6	Acanthospermum hispidum	Asteraceae	Seruppadithazhai,	Herb
7	Achchyranthes aspera	Amaranthaceae	Prickly Chaff flower, Nayuruvi	Herb
8	Adathoda vasica	Acanthaceae	Vasaca, Adathodai	Shrub
9	Adina cordifolia	Rubiaceae	Manjakadambu	Tree
10	Aegle marmelos	Rutaceae	Wood Apple, Vilvam	Tree
11	Aerva lanata	Amaranthaceae	Sirupulai	Herb
12	Agave sisalana	Agavaceae	Kathalai, Sisal	Herb
13	Ageratum conyzoides	Asteraceae	Goat weed, Pumppillu	Herb
14	Ailanthus excelsa	Simaroubaceae	Indian Tree of Heaven, Perumaram	Tree
15	<i>Alangium salviifolium</i>	Cornaceae	Alingi	Tree
16	Albizia amara	Mimosaceae	Usilamaram	Tree
17	Albizia lebbek	Mimosaceae	Siris Tree, Vagai	Tree
18	Aloe vera	Liliaceae	Kathalai	Herb
19	Alternanthera sessilis	Amaranthaceae	Dwarf Copperleaf, Ponnanganni	Herb
20	Amaranthus spinosus	Amaranthaceae	Mullukkirai	Herb
21	Amaranthus viridis	Amaranthaceae	Kuppaikeerai	Herb
22	Ammannia baccifera	Lythraceae	Acrid weed, Kalluruvi	Herb
23	Anacardium occidentale	Anacardiaceae	Cashew	Tree
24	<i>Anisomeles malabarica</i>	Lamiaceae	Malabar Catmint/ Peimiratti	Shrub
25	Anona squamosa	Anonaceae	Custard apple	Tree
26	Apluda mutica	Poaceae	Mauritian Grass	Herb
27	Arachis hypogea	Faboideae	Ground nut	Herb
28	Argemone mexicana	Papaveraceae	Prickly poppy, Kudiyotti	Shrub
29	Aristida adscensionis	Poaceae	Coomon Needle grass	Herb
30	Artocarpus heterophyllus	Moraceae	Jackfruit	Tree
31	Azadirachta indica	Meliaceae	Neem, Vembu	Tree
32	Bambusa arundanacea	Poaceae	Bamboo	Tree
33	<i>Barleria buxifolia</i> L.	Acanthaceae	Box-leaved Barleria/ Rosemullipoondu	Herb
34	Barleria prionitis	Acanthaceae	Porcupine flower, Kundan	Herb
35	Bassia latifolia	Sapotaceae	Iluppai	Tree
36	Blumea lacera	Asteraceae	Kattumullangi, Narakkarandai	Herb
37	Boerheavia diffusa	Nyctaginaceae	Pig weed, Mukkarattai Keerai	Herb
38	Borassus flabellifer	Arecaceae	Palmyra Palm	Tree
39	Bougainvillea spectabilis	Nyctaginaceae	Kaakithapoo	Shrub
40	Bulbostylis barbatta	Cyperaceae	Mukkutikorei	Herb
41	Butea monosperma	Fabaceae	Flame of Forest	Tree
42	Caesalpinia pulcherrima	Caesalpinaceae	Peacock Flower, Mayurkondrai	Tree
43	Calendula officinalis	Asteraceae	Marigold	Herb
44	Calophyllum inophyllum	Clusiaceae	Punnai	Tree
45	Calotropis gigantea	Asclepiadaceae	Crown Flower, Erukku	Shrub

Sl. No.	Scientific Name	Family Name	Common Name	Habit
46	<i>Calotropis procera</i>	Asclepiadaceae	Vellerukku	Shrub
47	<i>Canna indica</i>	Cannaceae	Indian shot, Kalvalai	Shrub
48	<i>Capparis sepiaria</i>	Capparaceae	Kattukkathiri	Shrub
49	<i>Carica papaya</i>	Caricaceae	Pappaali	Tree
50	<i>Cassia auriculata</i>	Fabaceae	Aavarampoo	Shrub
51	<i>Cascabela thevetia</i>	Apocynaceae	Yellow oleander/ Arali	Shrub
52	<i>Cassia fistula</i>	Fabaceae	Golden shower tree, Kondrai	Tree
53	<i>Cassia occidentalis</i>	Caesalpinieae	Coffee weed, Payaverai	Herb
54	<i>Cassia siamea</i>	Caesalpinieae	Manja konnai	Tree
55	<i>Cassia tora</i>	Caesalpinieae	Sickle senna, Tagarai	Herb
56	<i>Casuarina equisetifolia</i>	Casuarinaceae	Whistling Pine, Savukku	Tree
57	<i>Ceiba pentandra</i>	Bombacaceae	Silk-Cotton Tree, Ilavampanchumaram	Tree
58	<i>Cenchrus ciliaris</i>	Poaceae	Buffel grass	Herb
59	<i>Chloris barbata</i>	Poaceae	Finger grass	Grass
60	<i>Chloris dolichostachya</i>	Poaceae	Finger grass, Kuruthupillu	Herb
61	<i>Chloroxylon swietenia</i>	Rutaceae	Porasu maram	Tree
62	<i>Chrysanthemum sp.</i>	Asteraceae	Chrysanthemum, Samanthi	Herb
63	<i>Cissus quadrangularis</i>	Vitaceae	Devil's Backbone, Pirandai	Climber
64	<i>Citrus limon</i>	Rutaceae	Lemon	Tree
65	<i>Clausena anisate</i>	Rutaceae	Horse wood/Kaatu Karuveppillai	Shrub
66	<i>Cleome gynandra</i>	Cleomaceae	Wild Spider flower, Nalvelai	Herb
67	<i>Cleome viscosa</i>	Cleomaceae	Tickweed, Naikkaduku	Herb
68	<i>Clitoria ternatea</i>	Fabaceae	Sankupushpam	Climber
69	<i>Coccinia indica</i>	Cucurbitaceae	Kovai	Climber
70	<i>Cocculus hirsutus</i>	Menispermaceae	Broom Creeper, Kattukkodi	Climber
71	<i>Cocos nucifera</i>	Palmae	Coconut	Tree
72	<i>Codiaeum variegatum</i>	Euphorbiaceae	Croton	Shrub
73	<i>Commelina benghalensis</i>	Commelinaceae	Dew Flower, Kanavachai	Herb
74	<i>Corchorus olitorius</i>	Tiliaceae	Perattikkirai	Shrub
75	<i>Crotalaria retusa</i>	Fabaceae	Rattlepod	Herb
76	<i>Croton bonplandianus</i>	Euphorbiaceae	Ban Tuli/ Railpoonda	Herb
77	<i>Cucumis melo</i>	Cucurbitaceae	Musk melon, Thumattikai	Herb
78	<i>Cucumis sativus</i>	Cucurbitaceae	Cucumber	Climber
79	<i>Cuscuta reflexa</i>	Convolvulaceae	Verillakothan, Kodyagundal	Climber
80	<i>Cymbopogon sp.</i>	Poaceae	Lemon grass	Herb
81	<i>Cynodon dactylon</i>	Poaceae	Bermuda grass, Arugampul	Herb
82	<i>Cyperus difformis</i>	Cyperaceae	Smallflower umbrella-sedge	Herb
83	<i>Cyperus rotundus</i>	Cyperaceae	Korai, Nut grass	Herb
84	<i>Datura metel</i>	Solanaceae	Thorn apple, Oomathai	Shrub
85	<i>Delonix regia</i>	Fabaceae	Gulmohar	Tree
86	<i>Dendrophthoe falcata</i>	Loranthaceae	Honey Suckle Mistletoe, Pulluruvi	Herb
87	<i>Dentella repens</i>	Rubiaceae	Creeping lickstooop	Herb
88	<i>Desmostachya bipinnata</i>	Poaceae	Tharpai grass/halfa grass	Grass
89	<i>Dichanthium annulatum</i>	Poaceae	Marvel grass	Herb
90	<i>Digetaria adscendens</i>	Poaceae	Crab grass	Herb
91	<i>Digetaria bicornis</i>	Poaceae	Finger grass	Herb
92	<i>Dodonaea viscosa</i>	Sapindaceae	Hopbush/Virali	Shrub
93	<i>Dolichandrone falcata</i>	Bignoniaceae	Medhshingi	Tree
94	<i>Eclipta alba</i>	Asteraceae	Bhringaraj, Karisalankanni	Herb
95	<i>Eclipta prostrata</i>	Asteraceae	False daisy, Karisalankanni	Herb

Sl. No.	Scientific Name	Family Name	Common Name	Habit
96	<i>Eichhornia crassipes</i>	Pontederiaceae	Water hyacinth	Aquatic
97	<i>Emblica officinalis</i>	Phyllanthaceae	Indian gooseberry, Nelli	Tree
98	<i>Enicostemma axillare</i>	Gentianaceae	Vellarugu	Herb
99	<i>Eragrostis spectabilis</i>	Poaceae	Bunchgrass	Herb
100	<i>Erythrina indica</i>	Fabaceae	Mullu murungai	Tree
101	<i>Erythrina variegata</i>	Fabaceae	Indian coral tree, Kalyanamurungai	Tree
102	<i>Eucalyptus globulus</i>	Myrtaceae	Blue gum	Tree
103	<i>Euphorbia antiquorum</i>	Euphorbiaceae	Kalli, Triangular Spurge	Tree
104	<i>Euphorbia heterophylla</i>	Euphorbiaceae	Painted euphorbia	Herb
105	<i>Euphorbia hirta</i>	Euphorbiaceae	Asthma weed, Ammam	Herb
106	<i>Euphorbia lactea</i>	Euphorbiaceae	Indian spurge tree	Tree
107	<i>Euphorbia prostrata</i>	Euphorbiaceae	Prostrate sandmat	Herb
108	<i>Euphorbia tirucalli</i>	Euphorbiaceae	Pencil cactus, Thirukalli	Shrub
109	<i>Evolvulus alsinoides</i>	Convolvulaceae	Dwarf Morning Glory, Vishnukranthi	Herb
110	<i>Ficus benghalensis</i>	Moraceae	Banyan, Alamaram	Tree
111	<i>Ficus religiosa</i>	Moraceae	Peepal, Arasamaram	Tree
112	<i>Fimbristylis cymose</i>	Cyperaceae	Button sedge, grass	Herb
113	<i>Fimbristylis dichotoma</i>	Cyperaceae	Forked fimbry	Grass
114	<i>Gardenia jasminoides</i>	Rubiaceae	Cape jasmine, Kumbai	Shrub
115	<i>Gisekia pharnaceoides</i>	Aizoaceae	Manal keerai	Herb
116	<i>Gloriosa superba</i>	Colchicaceae	Flame lily, Kallappai kilangu	Herb
117	<i>Gomphrena globosa</i>	Amaranthaceae	Globe Amaranth, Vaadamalli	Herb
118	<i>Heliotropium indicum</i>	Boraginaceae	Indian heliotrope, Thel kodukku	Herb
119	<i>Hemidesmus indicus</i>	Apocynaceae	Indian sarasaparilla, Nannari	Herb
120	<i>Heterostemma tanjorensis</i>	Asclepiadaceae	Palakeerai	Herb
121	<i>Hibiscus cannabinus</i>	Malvaceae	Pulichakeerai	Shrub
122	<i>Hibiscus esculentus</i>	Malvaceae	Lady's finger, Vendai	Herb
123	<i>Hibiscus micranthus</i>	Malvaceae	Tiny Flower Hibiscus	Herb
124	<i>Hibiscus rosasinensis</i>	Malvaceae	Shoeflower, Sembaruthi	Shrub
125	<i>Holoptelea integrifolia</i>	Ulmaceae	Indian elm/Tambachi	Tree
126	<i>Hygrophila auriculata</i>	Acanthaceae	Marsh Barbel, Neermulli	Herb
127	<i>Hyptis suaveolens</i>	Lamiaceae	Pignut	Shrub
128	<i>Impatiens balsamina</i>	Balsaminaceae	Garden Balsam,	Herb
129	<i>Indigofera linnaei</i>	Fabaceae	Birdsville indigo	Herb
130	<i>Indigofera tinctoria</i>	Fabaceae	Cassia Indigo, Avuri	Shrub
131	<i>Ipomea carnea</i>	Convolvulaceae	Bush Morning Glory	Shrub
132	<i>Ipomea hederifolia</i>	Convolvulaceae	Kanavalikkodi	Herb
133	<i>Ipomea obscura</i>	Convolvulaceae	Obscure morning glory, Chirutali	Herb
134	<i>Ixora coccinea</i>	Rubiaceae	Ixora, Vedchi	Shrub
135	<i>Ixora parviflora</i>	Rubiaceae	Torch tree, Shulundu	Tree
136	<i>Jasmimunofficinalae L.</i>	Oleaceae	Jasmine	Shrub
137	<i>Jasminum arborescens</i>	Oleaceae	Shrubby Jasmine, Kattumalligai	Shrub
138	<i>Jatropha gossypifolia</i>	Euphorbiaceae	Bellyache Bush/ Adalai	Shrub
139	<i>Jatropha glandulifera</i>	Euphorbiaceae	Kaatuamanakku	Shrub
140	<i>Kyllinga triceps</i>	Cyperaceae	Spikes edge, Velutta Nirbasi	Herb
141	<i>Lannea coromandelica</i>	Anacardiaceae	Indian Ash Tree, Othiyamaram	Tree
142	<i>Lantana camara</i>	Verbenaceae	Lantana, Unnichi	Shrub
143	<i>Lawsonia inermis</i>	Lythraceae	Henna, Maruthondri	Shrub
144	<i>Lemna minor</i>	Arecaceae	Common Duckweed	Weed
145	<i>Leucaena leucocephala</i>	Fabaceae	Periyatagarai, Horse Tamarind	Shrub
146	<i>Leucas aspera</i>	Lamiaceae	Common Leucas, Thumbai	Herb

Sl. No.	Scientific Name	Family Name	Common Name	Habit
147	<i>Limonia acidissima</i>	Rutaceae	Wood apple, Vilampazham	Tree
148	<i>Lycopersicon esculentum</i>	Solanaceae	Thakkali	Herb
149	<i>Malvastrum</i>	Malvaceae	False Mallow	Herb
150	<i>Mangifera indica</i>	Anacardiaceae	Mango	Tree
151	<i>Marselia quadrifolia</i>	Marsileaceae	Four Leaf Clover, Araaikkeerai	Herb
152	<i>Melia azadirachta</i>	Meliaceae	Indian Liliac, Malaivembu	Tree
153	<i>Merremia emarginata</i>	Convolvulaceae	Kidney Leaf Morning Glory, Elikkadhukeerai	Herb
154	<i>Millingtonia hortensis</i>	Bignoniaceae	Tree Jasmine, Katmalli	Shrub
155	<i>Mimosa hamata</i>	Mimosaceae	Hooked Mimosa	Shrub
156	<i>Mimosa pudica</i>	Mimosaceae	Touch-me-not, Thottachurungi	Herb
157	<i>Morinda coreia</i>	Rubiaceae	Indian Mulberry/ Manjal athi	Tree
158	<i>Morinda tinctoria</i>	Rubiaceae	Nuna	Tree
159	<i>Moringa oleifera</i>	Moringaceae	Drumstick, Murungai	Tree
160	<i>Murraya koengii</i>	Rutaceae	Curry leaf, Karuveppilai	Shrub
161	<i>Musa paradisiaca</i>	Musaceae	Banana	Tree
162	<i>Nelumbo nucifera</i>	Nelumbonacea	Lotus	Aquatic
163	<i>Nerium indicum</i>	Apocynaceae	Sevvarali	Shrub
164	<i>Nerium oleander</i>	Apocynaceae	Oleander, Arali	Shrub
165	<i>Nymphaea sp.</i>	Nymphaeaceae	Water Lily	Aquatic
166	<i>Ocimum americanum</i>	Lamiaceae	Hoary Basil, Nai Thulasi	Herb
167	<i>Ocimum basilicum</i>	Lamiaceae	Sweet Basil, Thirunitruthulasi	Herb
168	<i>Ocimum gratissimum</i>	Lamiaceae	Wild Basil, Peruntulasi	Herb
169	<i>Ocimum sanctum</i>	Lamiaceae	Holy Basil, Thulasi	Herb
170	<i>Oldenlandia umbellata</i>	Rubiaceae	Choyroot, Chayaver	Herb
171	<i>Opuntia dillenii</i>	Cactaceae	Prickly Pear, Chappathikkalli	Shrub
172	<i>Opuntia ficus-indica</i>	Cactaceae	Fig opuntia/Kalli	Shrub
173	<i>Opuntia vulgaris</i>	Aizoaceae	Pricklypear	Shrub
174	<i>Ouret lanata</i>	Amaranthaceae	Mountain Knot grass	Herb
175	<i>Oxalis corniculata</i>	Oxalidaceae	Creeping Wood Sorrel, Paliakiri	Climber
176	<i>Pandanus odoratissimus</i>	Pandanaceae	Thazhai	Shrub
177	<i>Parthenium hysterophorus</i>	Asteraceae	Congress grass	Herb
178	<i>Passiflora foetida</i>	Passifloraceae	Stinking passionflower, Mosukkattan	Climber
179	<i>Pavetta indica</i>	Rubiaceae	Indian Pavetta, Kattukkarana	Shrub
180	<i>Pavonia zeylanica</i>	Malvaceae	Sittamutti, Thengai poondu	Shrub
181	<i>Peltophorum pterocarpum</i>	Fabaceae	Copperpod, Perunkondrai	Tree
182	<i>Pergularia daemia</i>	Asclepiadaceae	Pergularia, Uttamani, Seendhal	Climber
183	<i>Phoenix acaulis</i>	Arecaceae	Stemless Date Palm	Shrub
184	<i>Phoenix sylvestris</i>	Arecaceae	Eecham	Tree
185	<i>Phyla nodifolia</i>	Verbanaceae	Poduthalai	Herb
186	<i>Phyllanthus</i>	Phyllanthaceae	Madras Leaf flower/Nila neli	Herb
187	<i>Phyllanthus nirurii</i>	Phyllanthaceae	Keelanelli, Seed under leaf	Herb
188	<i>Phyllanthus reticulatus</i>	Phyllanthaceae	Black-berried featherfoil,	Herb
189	<i>Phyllanthus virgatus</i>	Phyllanthaceae	Joint weed/Kaadu nelli	Herb
190	<i>Physalis minima</i>	Solanaceae	Ground Cherry, Kupanti	Herb
191	<i>Pigea enneasperma</i>	Violaceae	Spade Flower/ Oorithal thamarai	Herb
192	<i>Pistia stratiotes</i>	Arecaceae	Water lettuce, Agasatamarai	Aquatic
193	<i>Pithecellobium dulce</i>	Mimosaceae	Sweet tamarind, Kodukkappuli	Tree
194	<i>Polygala erioptra</i>	Polygalaceae	Wolly-winged	Shrub
195	<i>Polypogon viridis</i>	Poaceae	Rabbit foot grass.	Grass
196	<i>Polyalthia longifolia</i>	Annonaceae	Indian mast tree, Vansulam	Tree

Sl. No.	Scientific Name	Family Name	Common Name	Habit
197	<i>Pongamia pinnata</i>	Fabaceae	Indian Beech, Pungam	Tree
198	<i>Portulaca oleracea</i>	Portulacaceae	Common Purslane, Paruppu	Herb
199	<i>Premna tomentosa</i>	Verbenaceae	Bastard Teak, Malaithaekku	Tree
200	<i>Prosopis glandulosa</i>	Mimosodeae	Vaelikkaruvai	Tree
201	<i>Prosopis juliflora</i>	Fabaceae	Algaroba, Seemaikaruvel	Tree
202	<i>Psidium gujava</i>	Myrtaceae	Guava	Tree
203	<i>Punica granatum</i>	Lythraceae	Pomegranate, Mathulai	Shrub
204	<i>Rosa indica</i>	Rosaceae	Rose	Herb
205	<i>Saccharum munja</i>	Poaceae	Munja grass	Herb
206	<i>Saccharum spontaneum</i>	Poaceae	Kans grass, Pekkarimpu	Herb
207	<i>Samanea saman</i>	Mimosodeae	Thoongumoonij maram	Tree
208	<i>Scoparia dulcis</i>	Plantaginaceae	Goat weed/Sarakkothhini	Herb
209	<i>Senna auriculata</i>	Fabaceae	Avaram	Shrub
210	<i>Senna siamea</i>	Fabaceae	Ironwood/ Majal Konai	Tree
211	<i>Senna tora</i>	Fabaceae	Sickle senna/ Thagarai	Herb
212	<i>Sesbania grandiflora</i>	Fabaceae	Agathikeerai	Tree
213	<i>Sida acuta</i>	Malvaceae	Common Wireweed, Palambasi	Herb
214	<i>Sida cordifolia</i>	Malvaceae	Country Mallow, Kurunthotti	Herb
215	<i>Sida rhombifolia</i>	Malvaceae	Wild mallow, Jelly Leaf	Herb
216	<i>Solanum nigrum</i>	Solanaceae	Black-berry night	Herb
217	<i>Solanum surattense</i>	Solanaceae	Kandan kattiri	Herb
218	<i>Solanum torvum</i>	Solanaceae	Turkey berry, Sundaikkai	Shrub
219	<i>Solanum trilobatum</i>	Solanaceae	Thoodhuvalai	Shrub
220	<i>Solanum virginianum</i>	Solanaceae	Yellow fruit night shade	Herb
221	<i>Sorghum bicolor</i>	Poaceae	Fox tail millet, Maize	Herb
222	<i>Syzygium cumini</i>	Myrtaceae	Jamun, Navalpazham	Tree
223	<i>Tabernaemontana coronaria</i>	Apocynaceae	Nandiyarvattam	Shrub
224	<i>Tamarindus indica</i>	Fabaceae	Tamarind, Puliyamaram	Tree
225	<i>Tectona grandis</i>	Lamiaceae	Teak	Tree
226	<i>Tephrosia purpurea</i>	Fabaceae	Fish poison, Kollukkai Velai	Herb
227	<i>Thespesia lampas</i>	Malvaceae	Common Mallow, Kattupparuthi	Herb
228	<i>Thespesia populnea</i>	Malvaceae	Indian Tulip Tree, Poovarasu	Tree
229	<i>Thevetia peruviana</i>	Apocynaceae	Yellow Oleander, Arali	Tree
230	<i>Tinospora cordifolia</i>	Menispermaceae	Guduchi, Shindilakodi	Climber
231	<i>Tribulus terrestris</i>	Zygophyllaceae	Puncture Vine, Nerunji	Herb
232	<i>Tridax procumbens</i>	Asteraceae	Tridax daisy, Vettukkaayapoondu	Herb
233	<i>Typha angustifolia</i>	Typhaceae	Narrow Leaf Cat tail reed	Herb
234	<i>Vachellia leucophloea</i>	Fabaceae	White bark Acacia/ Velvelam	Tree
235	<i>Vachellia nilotica</i>	Fabaceae	Balck bark Acacia/ Karuvelam	Tree
236	<i>Vernonia cinerea</i>	Asteraceae	Purple Fleabane, Mookuthipoondu	Herb
237	<i>Vicoa indica</i>	Asteraceae	Mukkuthipoo	Herb
238	<i>Vinca rosea</i>	Apocynaceae	Nithyakalyani	Herb
239	<i>Vitex negundo</i>	Lamiaceae	Nochi	Shrub
240	<i>Xanthium strumarium</i>	Asteraceae	Common Cocklebur, Marulumattai	Shrub
241	<i>Ziziphus jujube</i>	Rhamnaceae	Jujube, Elandhai	Tree
242	<i>Ziziphus mauritiana</i>	Rhamnaceae	Jujube/Ezhanthai	Tree
243	<i>Ziziphus nummularia</i>	Rhamnaceae	Jhar Beri, Narielandai	Shrub
244	<i>Ziziphus oenoplia</i>	Rhamnaceae	Jackal Jujube, Suraimullu	Shrub

Sl. No.	Scientific Name	Family Name	Common Name	Habit
Medicinal species				
1	<i>Abrus precatorius</i>	Fabaceae	Coral bead vine, Rosary pea,	Creepers
2	<i>Achchyranthes aspera</i>	Amaranthaceae	Prickly Chaff flower, Nayuruvi	Herb
3	<i>Adathoda vasica</i>	Acanthaceae	Vasaca, Adathodai	Shrub
4	<i>Aegle marmelos</i>	Rutaceae	Wood Apple, vilvam	Tree
5	<i>Aloe vera</i>	Liliaceae	Kathalai	Herb
6	<i>Alternanthera sessilis</i>	Amaranthaceae	Dwarf Copperleaf, Ponnanganni	Herb
7	<i>Amaranthus viridis</i>	Amaranthaceae	Kuppaikeerai	Herb
8	<i>Asparagus racemosus</i>	Asparagaceae	Satawari, Tannir muttan	Herb
9	<i>Azadirachta indica</i>	Meliaceae	Neem, Vembu	Tree
10	<i>Calotropis gigantea</i>	Asclepiadaceae	Crown Flower, Erukku	Shrub
11	<i>Cassia auriculata</i>	Fabaceae	Tanners cassia, Avaram	Shrub
12	<i>Cissus quadrangularis</i>	Vitaceae	Devil's Backbone, Pirandai	Climber
13	<i>Cynodon dactylon</i>	Poaceae	Bermuda grass, Arugampul	Herb
14	<i>Eclipta alba</i>	Asteraceae	Bhringaraj, Karisalankanni	Herb
15	<i>Enicostemma axillare</i>	Gentianaceae	Vellarugu	Herb
16	<i>Euphorbia hirta</i>	Euphorbiaceae	Asthma weed, Ammam	Herb
17	<i>Ficus benghalensis</i>	Moraceae	Banyan, Alamaram	Tree
18	<i>Heterostemma tanjorensis</i>	Asclepiadaceae	Palakeerai	Herb
19	<i>Jatropha glandulifera</i>	Euphorbiaceae	Kaatuamanakku	Shrub
20	<i>Leucas aspera</i>	Lamiaceae	Common Leucas, Thumbai	Herb
21	<i>Ocimum sanctum</i>	Lamiaceae	Holy Basil, Thulasi	Herb
22	<i>Solanum surattense</i>	Solanaceae	Yellow-berried Nightshade,	Herb
23	<i>Solanum trilobatum</i>	Solanaceae	Thoodhuvalai	Shrub
24	<i>Tridax procumbens</i>	Asteraceae	Tridax daisy,	Herb
25	<i>Vitex negundo</i>	Lamiaceae	Nochi	Shrub

The Plant species recorded are as follows :

Agricultural Crops	:	5 species
Commercial Crops including Vegetables	:	21 species
Plantations	:	6 species
Natural Vegetations	:	244 species
Medicinal Plants	:	25 species
Endangered Species	:	Nil
Endemic Species	:	Nil

The vegetation of the study area was found to be predominantly occupied by dry deciduous species. The recorded plant species are largely herbaceous and grass species with some climbers and Trees. Tree species planted in social forestry, tree plantation program and along road side were recorded. Direct observation showed that *Pongamia pinnata*, *Delonix elata*, *Tamarindus indica* and *Delonix regia* are the common plant species planted along the road side. The other tree species recorded were part of the social forestry and in the home gardens.

The **air pollutant resistant plant species** such as Ficus, Borassus, Eucalyptus, Bambusa, Zizyphus, Acacia, Prosopis, Jatropha and Sorghum were found to be without any setback in their growth and development. The moderately resistant plant species such as Tamarindus, Azadirachta indica and sugarcane have shown moderate growth.

The sensitive plant species such as Morinda, Ipomoea, Moringa have shown minimum numbers in their population. Thick population of herbs was formed due to the moderate rainfall. The emergence of herbs in vacant places indicates the formation of **plant diversity**.

Besides the natural vegetation, the agricultural and commercial crops were cultivated in and around the study area. Paddy, Sorghum, Black gram, Groundnut, etc. were found to be cultivated among the agricultural crops. Sugarcane, Cotton, etc. were commercially cultivated.

Plants of Economic Importance : Cultivated plants like cereals, vegetables, pulses, fruits, fodder, timber and wood provide valuable resources to mankind for agricultural implements. The plant species of economic importance observed in the study area are:

Cereals : *Oryza sativa* (rice), *Zea mays* (Maize).

Pulses : *Phaseolus sp.* (beans), *Phaseolus mungo* (green gram), *Phaseolus radiates* (Black gram).

Vegetables (leafy) : *Hibiscus cannabinus* (Pulicha keerai), *Amaranthus viridis* (math)

Vegetables (Fruit) : *Solanum melongena* (Brinjal), *Momordica charantia* (Bitter gourd), *Lycopersium esculentum* (Tomato), *Hibiscus esculentus* (Ladies finger), *Carica papaya* (Pappali)

Fruits : *Carica papaya* (Papaya), *Cucurbita sp.*, *Cucumis melo* (Pumpkin), *Feronia elephantum* (Wood apple), *Tamarindus indicus* (tamarind), *Musa paradisiaca* spp.(Banana), *Cocos nucifera* (Coconut), *Citrus limon* (Lemon), *Anacardium occidentale* (Cashew), *Psidium gujava* (Koyya), *Mangifera indica* (Mango)

3.9.2 Fauna

Both direct and indirect observation methods were used to survey the fauna. Visual Encounter (search) Method was employed to record vertebrate species. Additionally, survey of relevant literature was also done to consolidate the list of vertebrate fauna distributed in the area. Since birds may be considered as indicators for monitoring and understanding human impacts on ecological systems, attempt was made to gather quantitative data on the group.

The list of Fauna is given with reference to the **Wild Life (Protection) Amendment Act, 2022** by clearly indicating the type and short-listed as Schedule II or I and considered as endangered species. The details of fauna recorded are given in **Tables 3.33-3.34**.

Table : 3.33 List of Fauna in the Reserve Forests

Sl. No.	Scientific Name	Family	Common Name
Mammals			
1.	<i>Felis chaus</i>	Felidae	Cat
2.	<i>Funambulus palmarum</i>	Sciuridae	Squirrel
3.	<i>Herpestes auropunctatus</i>	Herpestidae	Mongoose
4.	<i>Oryctolagus cuniculus</i>	Leporidae	Rabbit
5.	<i>Paradoxurus henmaphroditurs</i>	Viverridae	Civit
6.	<i>Ratturs rattus</i>	Muridae	Rat

Sl. No.	Scientific Name	Family	Common Name
Reptiles			
1.	Bungaruscaeruleus	Elapidae	Krait
2.	Calotesversicolor	Agamidae	Common garden lizard
3.	Lygosomapunctata	Scincidae	Spotted supple skink
4.	Ptyasmuscosa	Colubridae	Indian rat snake
5.	Xenochrophispiscator	Colubridae	Checkered keel back
Birds			
1.	Ardea alba	Ardeidae	Large egret
2.	Ardeola grayli	Ardeidae	Pond heron
3.	Athene brama	Strigidae	Owl
4.	Bubulcus ibis	Ardeidae	Cattle egret
5.	Corvus macrorhynchos	Corvidae	Jungle crow
6.	Corvus splendens	Corvidae	House crow
7.	Dicrurus macrocercus	Dicruridae	Black drongo
8.	Egretta garzetta	Ardeidae	Little egret
9.	Haliaeetus albicilla	Accipitridae	Eagle

Table : 3.34 List of Fauna in the Study Area

Sl. No.	Scientific Name	Common Name	WPA Schedule	IUCN Status
Insects				
1	Myrmarachne plateloides	Ant mimicking jumping spider	Unlisted	C
2	Camponotus compressus	Black Ant	Unlisted	C
3	Heterometrus sp.	Black scorpion	Unlisted	C
4	Apis florea	Flower Bee	Unlisted	C
5	Aiolopus thalassinus tumulus	Green grass hopper	Unlisted	C
6	Asemonea sp.	Green leaf spider	Unlisted	C
7	Musca domestica	Housefly	Unlisted	C
8	Episyrphus sp.	Hoverfly	Unlisted	C
9	Apis cerana indica	Indian Honey Bee	Unlisted	C
10	Attacus selene	Indian Lunar Moth	Unlisted	C
11	Carrhotus viduus	Jumping spider	Unlisted	C
12	Hyllus semicuperus	Jumping spider	Unlisted	C
13	Cheilomenes sexmaculata	Ladybird Beetle	Unlisted	C
14	Trigoniulus sp.	Millipede	Unlisted	C
15	Aedes sp.	Mosquito	Unlisted	C
16	Culex sp.	Mosquito	Unlisted	C
17	Creobroter sp.	Praying mantis	Unlisted	C
18	Dysdercus sp.	Red Silk Cotton Bug	Unlisted	C
19	Argiope pulchella	Signature spider	Unlisted	C
20	Chrysilla sp.	Spider	Unlisted	C
21	Acrida exaltata	Toothpick grasshopper	Unlisted	C
22	Grylloides sigillatus	Tropical house cricket	Unlisted	C
23	Hippasa sp.	Tunnel sheet spider	Unlisted	C
24	Limnogonus nitidus	Water Strider	Unlisted	C
25	Pardosa sp.	Wolf Spider	Unlisted	C
Butterflies				
1	Papilio polymnestor Cramer	Blue Mormon	Unlisted	
2	Tirumala limniace Cramer	Blue Tiger	Unlisted	LC

Sl. No.	Scientific Name	Common Name	WPA Schedule	IUCN Status
3	<i>Appias albina</i> Boisduval	Common Albatross	II	
4	<i>Hasora chromus</i> Cramer	Common Banded Awl	Unlisted	
5	<i>Jamides celeno</i> Cramer	Common Cerulean	Unlisted	
6	<i>Euploea core</i> Cramer	Common Crow	Unlisted	LC
7	<i>Catopsilia pomona</i>	Common Emigrant	Unlisted	
8	<i>Melanitis leda</i>	Common Evening Brown	Unlisted	LC
9	<i>Eurema hecabe</i>	Common Grass Yellow	Unlisted	
10	<i>Cepora nerissa</i>	Common Gull	Unlisted	
11	<i>Graphium doson</i>	Common Jay	Unlisted	
12	<i>Delias eucharis</i>	Common Jezebel	Unlisted	
13	<i>Papilio polytes</i>	Common Mormon	Unlisted	
14	<i>Pachliopta aristolochiae</i>	Common Rose	II	
15	<i>Pachliopta hector</i>	Crimson Rose	II	
16	<i>Hypolimnas misippus</i>	Danaid Eggfly	Unlisted	LC
17	<i>Tirumala septentrionis</i>	Dark Blue Tiger	Unlisted	LC
18	<i>Freyeria trochylus</i>	Grass Jewel	Unlisted	
19	<i>Hypolimnas bolina</i>	Great Egg fly	Unlisted	
20	<i>Chilades lajus</i>	Lime Blue	Unlisted	
21	<i>Papilio demoleus</i>	Lime Butterfly	Unlisted	
22	<i>Catopsilia pyranthe</i>	Mottled Emigrant	Unlisted	
23	<i>Anaphaeis aurota</i>	Pioneer	Unlisted	
24	<i>Danaus chrysippus</i>	Plain Tiger	Unlisted	LC
25	<i>Eurema brigitta</i>	Small Grass Yellow	Unlisted	
26	<i>Danaus genutia</i>	Striped Tiger	Unlisted	LC
27	<i>Graphium agamemnon</i>	Tailed Jay	Unlisted	
28	<i>Zizula hylax</i>	Tiny Grass Blue	Unlisted	
Mammals				
1	<i>Bandicota indica</i>	Large (Greater) Bandicoot-rat	Unlisted	LC
2	<i>Bos indicus</i>	Cow	Unlisted	LC
3	<i>Bubalus bubalis</i>	Buffalo	Unlisted	LC
4	<i>Canis familiaris</i>	Dog	Unlisted	LC
5	<i>Capra hircus</i>	Goat	Unlisted	LC
6	<i>Cynopterus sphinx</i>	Short-nosed Fruit Bat	Unlisted	LC
7	<i>Funambulus palmarum</i>	Three-striped Palm Squirrel	Unlisted	LC
8	<i>Hemiechinus micropus</i>	Indian Hedgehog	II	LC
9	<i>Lepus nigricollis</i>	Indian Hare, Black-naped Hare	II	LC
10	<i>Mus booduga</i>	Indian Field Mouse	Unlisted	LC
11	<i>Mus musculus</i>	House Mouse	Unlisted	LC
12	<i>Ovis aries</i>	Sheep	Unlisted	LC
13	<i>Pipistrellus coromandra</i>	Indian Pipistrelle	Unlisted	LC
14	<i>Pteropus giganteus</i>	Indian Flying Fox	II	LC
15	<i>Rattus norvegicus</i>	Field mouse	Unlisted	LC
16	<i>Rattus rattus</i>	House (Roof, Black) Rat	Unlisted	LC
17	<i>Sauria lacertidae</i>	Lizard	Unlisted	LC
18	<i>Sorex caerulescens</i>	Common mush shrew	Unlisted	LC
19	<i>Suncus murinus</i>	House (Grey Musk) Shrew	Unlisted	LC
20	<i>Vulpus benghalensis</i>	Indian Fox	II	LC
Birds				

Sl. No.	Scientific Name	Common Name	WPA Schedule	IUCN Status
1	<i>Alcedo atthis</i>	Common kingfisher	II	R
2	<i>Accipiter badius</i>	Shikra	Unlisted	R
3	<i>Acridotheres tristis</i>	Common myna	II	R
4	<i>Actitis hypoleucos</i>	Common sandpiper	II	M
5	<i>Aegithina tiphia</i>	Common iora	II	R
6	<i>Anas porcorhyncha</i>	Spot billed duck	Unlisted	R
7	<i>Anas querquedula</i>	Garganey	II	R
8	<i>Anastomus oscitans</i>	Asian openbill	II	R
9	<i>Anhinga melanogaster</i>	Oriental Darter	II	R
10	<i>Ardea cinerea</i>	Grey heron	II	R
11	<i>Ardea purpurea</i>	Purple heron	II	R
12	<i>Ardeola grayii</i>	Indian pond heron	II	R
13	<i>Athene brama</i>	Spotted owlet	Unlisted	R
14	<i>Bubulcus ibis</i>	Cattle egret	II	R
15	<i>Centropus sinensis</i>	Southern coucal	Unlisted	R
16	<i>Ceryle rudis</i>	Pied kingfisher	II	R
17	<i>Charadrius dubius</i>	Little ringed plover	II	M
18	<i>Cinnyris asiaticus</i>	Purple sunbird	II	R
19	<i>Clamator jacobinus</i>	Pied cuckoo	II	R
20	<i>Columba livia</i>	Rock pigeon	Unlisted	R
21	<i>Corvus macrorhynchos</i>	Large-billed crow	II	R
22	<i>Corvus splendens</i>	House crow	Unlisted	R
23	<i>Cypsiurus balasiensis</i>	Asian palm swift	II	R
24	<i>Dendrocitta vagabunda</i>	Rufous treepie	II	R
25	<i>Dicrurus macrocercus</i>	Black drongo	II	R
26	<i>Egretta garzetta</i>	Little egret	II	R
27	<i>Eudynamys scolopacea</i>	Asian koel	II	R
28	<i>Fulica atra</i>	Common coot	Unlisted	R
29	<i>Gallinula chloropus</i>	Common moorhen	II	R
30	<i>Haliastur indus</i>	Brahminy kite	Unlisted	R
31	<i>Halycon smyrensis</i>	White-throated kingfisher	II	R
32	<i>Hierococcyx varius</i>	Common hawk cuckoo	II	R
33	<i>Himantopus himantopus</i>	Black-winged stilt	II	R
34	<i>Hirundo rustica</i>	Barn swallow	II	R
35	<i>Lanchura punctulata</i>	Scaly-breasted munia	II	R
36	<i>Leptocoma zeylonica</i>	Purple-rumped sunbird	II	R
37	<i>Mesophoyx intermedia</i>	Intermediate egret	II	R
38	<i>Milvus migrans</i>	Black kite	II	R
39	<i>Mycteria leucocephala</i>	Painted storks	II	R
40	<i>Oriolus oriolus</i>	Eurasian golden oriole	II	M
41	<i>Passer domesticus</i>	House sparrow	II	R
42	<i>Pelecanus philippensis</i>	Spot-billed pelican	II	R
43	<i>Phalacrocorax carbo</i>	Great cormorant	II	R
44	<i>Phalacrocorax niger</i>	Little cormorant	II	R
45	<i>Plegadis falcinellus</i>	Glossy ibis	II	R
46	<i>Porphyrio porphyrio</i>	Purple swamphen	Unlisted	R

Sl. No.	Scientific Name	Common Name	WPA Schedule	IUCN Status
47	<i>Psittacula krameri</i>	Rose-ringed parakeet	Unlisted	R
48	<i>Streptopelia chinensis</i>	Spotted dove	II	R
49	<i>Streptopelia decaocto</i>	Eurasian collared dove	II	R
50	<i>Streptopelia senegalensis</i>	Laughing dove	II	R
51	<i>Threskiornis melanocephalus</i>	Black-headed ibis	II	R
52	<i>Turdoides affinis</i>	Yellow-billed babbler	II	R
53	<i>Tyto alba</i>	Barn owl	Unlisted	R
54	<i>Vanellus indicus</i>	Red-wattled lapwing	II	R
55	<i>Vanellus malarbaricus</i>	Yellow-wattled lapwing	II	R
Reptiles				
1	<i>Ahaetulla nasuta</i>	Common vine snake	II	LC
2	<i>Amphiesma stolatum</i>	Striped keelback	II	LC
3	<i>Boiga trigonata</i>	Common cat snake	II	LC
4	<i>Bungarus caeruleus</i>	Common Indian Krait	II	LC
5	<i>Calotes versicolor</i>	Indian garden lizard	Unlisted	LC
6	<i>Coelognathus helena</i>	Common trinket snake	II	LC
7	<i>Dendrelaphis tristis</i>	Common bronzeback	II	LC
8	<i>Dryocalamus nympha</i>	Bridal snake	II	LC
9	<i>Echis carinatus</i>	Indian saw scaled viper	II	LC
10	<i>Eyrx conicus</i>	Common Sand boa	II	LC
11	<i>Gongylophis conicus</i>	Rough tailed Sand boa, Pudaiyan	II	LC
12	<i>Hemidactylus flaviviridis</i>	House gecko	II	LC
13	<i>Indotyphlops braminus</i>	Brahminy worm snake	II	LC
14	<i>Lissemys punctata</i>	Indian mud turtle	II	LC
15	<i>Lycodon aulicus</i>	Common wolf snake	II	LC
16	<i>Mabuya carinata</i>	Brahminy Skink	II	LC
17	<i>Oligodon arnensis</i>	Common kukri snake	II	LC
18	<i>Passerita mycterizaris</i>	Common Green Snake	II	LC
19	<i>Sitana ponticeriana</i>	Pondichery Fan throated lizard	Unlisted	LC

Legend : C- Common, M- Migratory, R- Resident, T- Threatened

Endangered Species: Among the fauna recorded, most of them are common resident population and no Schedule-I or endangered species encountered in the study area.

Planktons : The aquatic ecosystems present in the study area of 10 km radius include lentic and lotic water body. To assess the planktonic profile of Phytoplankton and Zooplankton, water samples from 5 locations were collected at sub-surface level using standard methods and analyzed for plankton diversity in the study area. The analysis of Phyto and Zoo-plankton was carried out as per the procedures of APHA (Table 3.35).

The **Fish fauna** of the area includes Major carps like Catla, Rohu, Mirgal, Exotic carps like Silver carp, Grass carp, Minor carps, etc.

Table : 3.35 List of Planktons

Sl. No.	Scientific Name	Group Name	Species Population in identified Stations				
1	<i>Acartia tonsa</i>	Copepods	2	-	-	-	5
2	<i>Alona quadria</i>	Cladocera	11	-	-	21	22
3	<i>Branchionus</i>	Rotifers	9	-	5	5	8
4	<i>Ceriodaphnia cornuta</i>	Cladocera	3	7	-	1	-
5	<i>Cypris sp.</i>	Ostrocoda	6	-	1	-	18
6	Flatworm larvae	Trematods	-	-	3	-	-
7	Freshwater shrimp larvae	Small crustaceans	-	5	11	-	-
8	Hookworm larvae	Nematods	8	4	2	29	-
9	<i>Keratella tropica</i>	Rotifers	2	2	4	10	3
10	<i>Nauplius sp.</i>	Copepods	1	-	-	7	22
11	Shrimp larvae	Crustaceans	20	-	-	-	-

Aquatic weeds are found to be growing everywhere in 10 km radius study area, in every water body, pond, etc. (Table 3.36). *Typha angustata* is found growing all along the drains of villages, small water-logged depressions, and agricultural fields lacking water but containing enough moisture to support its growth. And where water is present, *Eichhornia crassipes* has taken its roots and covers the entire water surface by its sprawl and invasion.

Table : 3.36 List of Aquatic Plants

Sl. No.	Scientific Name	Common Name	Type
1	<i>Cyperus articulatus</i>	Jointed flats edge	Emergent Hydrophytes
2	<i>Eichhornia crassipes</i>	Common water hyacinth	Free floating hydrophytes
3	<i>Hydrilla verticillata</i>	Hydrilla	Submerged hydrophytes
4	<i>Ipomea aquatica</i>	Water Morning Glory	Marshy amphibious hydrophytes
5	<i>Pistia stratiotes</i>	Water lettuce	Free floating hydrophytes
6	<i>Typha angustifolia</i>	Lesser Bulrush	Emergent hydrophytes

Shanon Weaver Index (SWI) : The SWI is a measure of diversity and it may be considered as an overall index of diversity as it concedes a true picture of the information theory. The species diversity of such a community may be computed by employing the SWI of diversity by applying the Index.

$$H = - \sum n/N \log n/N$$

Or

$$H = - \sum p_i \log p_i$$

where,

n = Number of individual species

N = Total number of individual species

Pi = Importance value for each species n/N

SWI can be interpreted based on the SWI-H values obtained by computing the values of quantitative plankton analysis. Based on the H-values of SWI, the quality of water can be classified into the following three categories.

<u>SWI-H values</u>	<u>Quality of Water</u>
X>3	Clear
1<X<3	Moderately polluted
X<1	Heavily Polluted

SWI-H values were calculated and the results indicate that the water bodies in the study area are moderately polluted (**Table 3.37**).

Table : 3.37 Diversity Index

Sl. No.	Water body	Usage	SWI – H Value	Quality of Water
1	Pond, Periyannagalur	Bathing, Washing & irrigation	3.185	Clear
2	Pond, Chinnanagalur	Irrigation, Bathing & washing	3.652	Clear
3	Pond, Kattupiringiyam	Bathing, Washing & irrigation	3.295	Clear
4	Pond, Nagamangalam	Bathing, Washing & irrigation	3.465	Clear
5	Pond, Pudupalayam	Irrigation, Bathing & washing	3.842	Clear

The SWI – H values were calculated and the results show that the water quality is clear in all the identified locations.

3.10 Socio-economic Environment

Ariyalur District consists of two Revenue Divisions viz., Ariyalur and Udayarpalayam, four Taluks viz., Ariyalur, Udayarpalayam, Sendurai and Andimadam comprising of 195 Revenue Villages. The District has six blocks viz. Ariyalur, Thirumanur, Sendurai, Jayankondam, Andimadam and T.Palur comprising 201 Village Panchayats. There are two Municipalities viz. Ariyalur & Jayankondam and two Town Panchayats viz. Udayarpalayam & Varadharajanpettai. Salient features of Census Data (2001 & 2011) (Ariyalur District Statistical Hand Book 2019-20) are given in **Table 3.38**.

District Population by Religion is as follows :

Hindu	:	93.44%
Muslim	:	2.73%
Christian	:	3.76%
Not Stated	:	0.07%

Table : 3.38 Population – Decennial Growth

Description	Census-2001	Census-2011
Population :		
Male	346763	374703
Female	348761	380191
Total	695524	754894
Urban	78985	94362
Rural	616539	660532
Density per sq. km	358	390.33
Literacy Rate		71.45%
Male	64.10%	81.2%
Female		61.7%
Sex Ratio	1006	1015
Juvenile Sex Ratio (JSR)	949	930

Workers Population in the District along with comparison of State Data is appended.

POPULATION BY BROAD INDUSTRIAL CATEGORIES OF WORKERS

Sl. No. (1)	Industrial Category (2)	YEAR : 2019-2020			
		District		Tamil Nadu	
		Persons (3)	% to total workers (4)	Persons (5)	% to total workers (6)
1.	Total Workers (Man)	272241	75.7	27942181	65.0
	a) Cultivators	94912	26.4	3855375	11.7
	b) Agricultural Labourers	106252	29.5	7234101	22.0
	c) Household Industry Manufacturing, Processing, Servicing and Repairs	10756	3.0	1119458	3.4
	d) Other Workers	60321	16.8	15733047	47.8
2.	Marginal Workers	87610	24.3	4947500	15.0
	a. Cultivators	12400	5.4	393062	1.2
	b. Agricultural Labourers	60585	16.8	2072446	7.2
	c. HHI	2808	0.8	245435	0.8
	d. Others	11817	3.3	1931537	5.9
	Total Workers	369851	100	32884681	100
Non Workers	395043	—	39262349	—	
	Total Population	754894	---	72147030	

The available **Health Infrastructures** in the District are :

No. of PHCs	39
No. of Sub-Centres	118
No. of Nursing Colleges	2 (Private)
No. of Taluk Hospitals	3
No. of Non-Taluk Hospitals	1
No. of Private Hospitals	32
No. of Private Clinics	29
No. of Blood Storage units	5
No. of Scan Centres	8 (Govt.) & 9 (Private)
No. of ICTCs	8

Periyaganalur Village Profile : Periyaganalur is a large village with total population of 3538 (1762 males & 1776 females) in 1041 Households. Average Sex Ratio was 1008 which is higher than Tamil Nadu State average of 996. Literacy Rate was 61.56%. In the total population, 1805 were engaged in work activities. 87.53% of workers were Main workers and 12.47% were involved in Marginal activity. Of 1805 workers engaged in Main Works, 756 were cultivators (owner or co-owner) while 331 were Agricultural labourers (**Table 3.39**).

Table : 3.39 Periyaganalur Village Profile

Particulars	Total	Male	Female
Total No. of Houses	1,041	-	-
Population	3,538	1,762	1,776
Child (0-6)	330	191	139
Schedule Caste	692	347	345
Schedule Tribe	0	0	0
Literacy	61.56%	74.79%	48.87%
Total Workers	1,805	1,021	784
Main Workers	1,580	936	644
Main Workers Cultivators	756	452	304
Agriculture Labourer	331	123	208
Household Industries	62	33	29
Other Workers	431	328	103
Marginal Workers	225	85	140
Non Working Persons	1,733	741	992

There are 29 Revenue villages including Ariyalur Town Panchayat (TP) in the study area of 10 km radius. The relevant socio-economic data such as demographic features including population distribution, literacy rate, occupational status, educational facilities, medical facilities, etc. are reported in **Tables 3.40-3.46**.

Table : 3.40 Demographic Profile- 2011 Census

Sl. No.	Name of the Village	No. of House-holds	Population			Scheduled Castes			Scheduled Tribes			Literates			Illiterates		
			Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
1	Ambbappur	824	3159	1594	1565	1103	556	547	48	25	23	2060	1168	892	1099	426	673
2	Ammenabath	170	654	315	339	122	59	63	0	0	0	349	218	131	305	97	208
3	Anandavadi	1087	4262	2108	2154	1436	731	705	132	61	71	2461	1437	1024	1801	671	1130
4	Ariyalur (TP)	7319	28902	14349	14553	3254	1620	1634	8	5	3	21977	1156	10413	6925	278	4140
5	Edayathankudi	604	2191	1135	1056	109	52	57	81	43	38	1261	778	483	930	357	573
6	Govindapuram	1242	4996	2502	2494	1347	674	673	0	0	0	3260	1871	1389	1736	631	1105
7	Kadugur	866	3217	1627	1590	493	253	240	1	1	0	1893	1172	721	1324	455	869
8	Kallankurichi	1380	5385	2663	2722	1383	699	684	1	1	0	3392	1957	1435	1993	706	1287
9	Karuppur	1239	4773	2385	2388	1031	530	501	120	53	67	2680	1516	1164	2093	869	1224
10	Kavanur	841	3242	1634	1608	594	307	287	11	7	4	1790	1092	698	1452	542	910
11	Kayalabath	1349	5215	2602	2613	881	451	430	5	3	2	3937	2128	1809	1278	474	804
12	Kilimangalam	818	2926	1481	1445	640	326	314	0	0	0	1777	1077	700	1149	404	745
13	Mallur	734	2956	1500	1456	956	493	463	0	0	0	1662	979	683	1294	521	773
14	Managethi	1042	3916	1998	1918	1209	604	605	74	37	37	2423	1427	996	1493	571	922
15	Nagamangalam	868	3360	1716	1644	1295	652	643	90	40	50	1878	1143	735	1482	573	909
16	Ottakoil	1210	4703	2344	2359	1769	899	870	0	0	0	2748	1640	1108	1955	704	1251
17	Papanacheri	400	1492	736	756	342	171	171	0	0	0	1036	592	444	456	144	312
18	Periyagalur	1041	3538	1762	1776	692	347	345	0	0	0	1975	1175	800	1563	587	976
19	Periyathirukonam	718	2708	1320	1388	593	291	302	0	0	0	1639	963	676	1069	357	712
20	Pudupalayam	922	3535	1750	1785	1072	536	536	3	2	1	2009	1187	822	1526	563	963
21	Rayampuram	947	3718	1846	1872	1456	726	730	0	0	0	2095	1229	866	1623	617	1006
22	Reddipalayam	1125	4126	2095	2031	516	260	256	5	3	2	2457	1432	1025	1669	663	1006
23	Sennivanam	474	1870	932	938	1179	586	593	0	0	0	1257	711	546	613	221	392
24	Siruvalur	594	2155	1043	1112	453	230	223	0	0	0	1261	743	518	894	300	594
25	Thealur	1094	4215	2136	2079	794	400	394	4	3	1	2407	1423	984	1808	713	1095
26	Valaikurichi	571	2210	1144	1066	912	471	441	0	0	0	1623	886	737	587	258	329
27	Valajanagaram	1945	7355	3702	3653	1550	805	745	0	0	0	5078	2873	2205	2277	829	1448
28	Varanavasi	1091	4087	1947	2140	1412	651	761	0	0	0	2521	1359	1162	1566	588	978
29	Vilangudi	683	2635	1312	1323	1058	533	525	128	64	64	1526	860	666	1109	452	657
Total		33198	127501	63678	63823	29651	14913	14738	711	348	363	82432	46600	35832	45069	17078	27991
Percentage		-	-	49.9	50.1	23.3	11.7	11.6	0.6	0.3	0.3	64.6	36.5	28.1	35.4	13.4	22.0

Table : 3.41 Occupation of Population and Work Forces- 2011 Census

Sl. No.	Name of the Census Village	Total Population	Workers			Non-Workers			Main Workers				Marginal Workers			
			Total	Male	Female	Total	Male	Female	Cultivators	Agricultural Labourers	Household Industrial Workers	Other Workers	Cultivators	Agricultural Labourers	Household Industrial Workers	Other Workers
1	Ambbappur	3159	1447	980	467	1712	614	1098	232	572	8	272	5	330	1	27
2	Ammenabath	654	243	167	76	411	148	263	32	0	0	19	0	15	1	176
3	Anandavadi	4262	1931	1130	801	2331	978	1353	712	648	31	201	30	212	12	85
4	Ariyalur (TP)	28902	10283	7815	2468	18619	6534	12085	315	670	298	7165	159	175	150	1351
5	Edayathankudi	2191	1321	698	623	870	437	433	656	419	19	154	5	61	0	7
6	Govindapuram	4996	2399	1486	913	2597	1318	1581	600	843	28	712	26	79	10	101
7	Kadugur	3217	1977	1018	959	1240	609	631	862	570	33	79	74	329	9	21
8	Kallankurichi	5385	2335	1480	855	3050	1183	1867	649	500	71	713	25	274	9	94
9	Karuppur	4773	2716	1518	1198	2057	867	1190	853	1337	54	179	29	247	3	14
10	Kavanur	3242	1808	970	838	1434	664	770	1080	299	13	133	39	165	9	70
11	Kayarlabath	5215	1878	1414	464	3337	1188	2149	238	351	34	1059	17	108	5	66
12	Kilimangalam	2926	1451	850	601	1475	631	844	251	1041	7	124	3	22	0	3
13	Mallur	2956	1500	910	590	1456	590	866	829	423	22	184	8	13	6	15
14	Managethi	3916	2225	1296	929	1691	702	989	529	834	12	153	306	353	14	24
15	Nagamangalam	3360	1629	984	645	1731	732	999	743	570	1	128	3	167	1	16
16	Ottakoil	4703	2543	1396	1147	2160	948	1212	704	541	40	425	215	553	18	47
17	Papanacheri	1492	936	467	469	556	269	287	339	363	3	94	16	67	6	48
18	Periyanaalur	3538	1805	1021	784	1733	741	992	756	331	62	431	4	195	1	25
19	Periyathirukona	2708	1565	820	745	1143	500	643	899	86	28	169	5	342	2	34
20	Pudupalayam	3535	1691	1015	676	1844	735	1109	143	261	2	303	153	691	9	129
21	Rayampuram	3718	1969	1073	896	1749	773	976	678	260	36	210	50	502	14	219
22	Reddipalayam	4126	1946	1210	736	2180	885	1295	362	569	33	577	28	321	8	48
23	Sennivanam	1870	1144	590	554	726	342	384	225	336	9	135	22	388	9	20
24	Siruvalur	2155	1125	629	496	1030	414	616	440	273	5	160	4	229	1	13
25	Thelur	4215	2077	1278	799	2138	858	1280	736	586	48	380	5	313	1	8
26	Valaikurichi	2210	1247	749	498	963	395	568	457	431	17	129	8	50	10	145
27	Valajanagaram	7355	3033	2017	1016	4322	1685	2637	528	475	44	1089	108	563	11	215
28	Varanavasi	4087	1802	1117	685	2285	830	1455	287	1010	17	447	4	14	0	23
29	Vilangudi	2635	1297	783	514	1338	829	809	258	616	17	349	0	24	1	32
	Total	127501	59323	36881	22442	68178	26797	41381	15393	15215	992	16173	1351	6802	321	3076
	Percentage	-	46.5	28.9	17.6	53.5	21.0	32.5	12.1	11.9	0.8	12.7	1.1	5.3	0.3	2.4

Note : Others category includes Constructions, Trade & Commerce, Transport Storage & Communications, Other Services, etc.

Table : 3.42 Educational Facilities in the Study Area

Sl. No.	Name of the Village	PPS*	PS*	MS*	SS*	SSS*	DC*	EC*	MC*	MI*	PT*	VTS*	SSD*
1	Ambbappur	1	1	1	1	1	c	c	c	c	c	c	c
2	Ammenabath	1	1	a	a	b	b	c	c	b	c	a	c
3	Anandavadi	1	1	1	1	1	c	c	c	c	c	b	c
4	Ariyalur (TP	1	1	1	1	1	1	c	c	c	1	1	c
5	Edayathankudi	1	1	1	a	a	c	c	c	c	c	c	c
6	Govindapuram	1	1	1	1	b	b	c	c	c	c	c	c
7	Kadugur	1	1	a	a	b	c	b	c	c	c	c	c
8	Kallankurichi	1	1	1	1	b	b	b	c	c	c	a	b
9	Karuppur	1	1	1	1	1	c	c	c	c	c	c	b
10	Kavanur	1	1	1	1	b	b	1	c	b	b	c	b
11	Kayarlabath	1	1	1	1	1	a	c	c	a	c	a	b
12	Kilimangalam	1	1	1	b	b	c	c	c	c	c	c	c
13	Mallur	1	1	a	b	b	b	c	c	b	c	b	c
14	Managethi	1	1	1	1	0	a	a	c	a	a	c	c
15	Nagamangalam	1	1	1	1	a	c	b	c	b	b	c	b
16	Ottakoil	1	1	b	1	b	b	c	c	c	c	a	c
17	Papanacheri	1	1	1	1	b	b	c	c	b	c	b	b
18	Periyanaalur	1	1	1	1	b	b	b	c	c	c	b	1
19	Periyathirukonam	1	1	1	1	1	c	c	c	c	c	c	c
20	Pudupalayam	1	1	1	b	b	b	c	c	b	c	b	a
21	Rayampuram	1	1	1	1	b	c	c	c	c	c	c	c
22	Reddipalayam	1	1	1	1	a	c	c	c	c	c	c	b
23	Sennivanam	1	1	1	a	a	c	c	c	c	c	b	c
24	Siruvalur	1	1	1	1	b	b	c	c	b	c	b	b
25	Thelur	1	1	1	a	c	c	b	c	b	b	c	a
26	Valaikurichi	1	1	1	b	b	c	c	c	c	c	c	c
27	Valajanagaram	1	1	1	a	a	a	c	c	a	a	1	c
28	Varanavasi	1	1	1	b	b	b	c	c	b	c	b	c
29	Vilangudi	1	1	1	1	b	b	a	c	b	b	c	b

PPS-Pre-Primary
PS-Primary School
MS-Middle School
SS-Secondary

SSS-Senior Secondary

DC-Degree College
EC-Engineering College
MC-Medical College
MI-Management College /

PT-Polytechnic
VTS-Vocational School/ITI
SSD-Special School for

*-Numbers
a-Facility available at <5
b-Facility available at 5-10
c-Facility available at >10

Table : 3.43 Medical Facilities in the Study Area

Sl. No.	Name of the Village	CHC*	PHC*	PHSC*	MCW*	TBC*	HA*	HAM*	D*	VH*	MHC*	FWC*	NGM-I/O*
1	Ammbappur	c	1	1	1	1	c	c	1	1	0	1	0
2	Ammenabath	a	a	a	b	b	b	b	a	b	0	a	0
3	Anandavadi	b	1	1	1	1	b	b	1	b	0	1	0
4	Ariyalur (TP)	1	1	1	1	1	1	1	1	1	0	1	1
5	Edayathankudi	b	b	a	b	b	c	c	b	b	0	b	0
6	Govindapuram	b	1	1	1	1	b	b	1	b	0	1	0
7	Kadugur	1	1	1	1	1	c	c	1	b	0	1	0
8	Kallankurichi	b	b	1	b	b	b	b	b	b	0	b	0
9	Karuppur (Senapathy)	c	1	1	1	1	c	c	1	1	0	1	0
10	Kavanur	b	b	1	b	b	c	c	b	b	0	b	0
11	Kayarlabath	b	b	1	a	a	a	a	b	a	0	b	1
12	Kilimangalam	b	b	b	b	b	c	c	b	b	0	b	0
13	Mallur	c	a	a	a	b	b	b	a	a	0	a	0
14	Mangethi	c	a	1	1	b	c	c	a	b	0	a	0
15	Nagamangalam	c	b	1	b	b	c	c	b	b	0	b	0
16	Ottakoil	b	a	1	a	b	b	b	a	b	0	a	0
17	Papanacheri	c	b	a	b	b	b	b	b	b	0	b	0
18	Periyagalur	b	b	1	1	b	b	b	b	1	0	b	0
19	Periyathirukonam	c	b	1	b	c	c	c	b	c	0	b	0
20	Pudupalayam	b	b	1	b	b	b	b	b	b	0	b	0
21	Rayampuram	b	b	1	b	c	c	c	b	b	0	b	1
22	Reddipalayam	c	a	1	a	c	c	c	a	b	0	a	0
23	Sennivanam	b	b	a	b	b	c	c	b	b	0	b	0
24	Siruvalur	c	b	a	b	b	b	b	b	b	0	b	0
25	Thealur	b	a	1	a	b	c	c	a	a	0	a	1
26	Valaikurichi	b	b	1	b	b	c	c	b	b	0	b	0
27	Valajanagaram	b	b	1	a	a	a	a	b	a	0	b	0
28	Varanavasi	c	b	1	b	b	b	b	b	b	0	b	0
29	Vilangudi	c	1	1	1	1	c	c	1	1	0	1	1

CHC-Community Health Centre

PHC-Primary Health Centre

PHSC-Primary Health Sub Centre

MCW- Maternity and Child Welfare Centre

TBC-TB Clinic

HA-Aallopathic Hospital

HAM- Alternative Medicine

D-Dispensary

VH-Veterinary Hospital

FWC-Family Welfare Centre

MH-Mobile Health Clinic

NGM-I/O-Non Government Medical facilities In & Out

*-Numbers

a-Facility available at <5

b-Facility available at 5-10

c-Facility available at >10

Table : 3.44 Communication & Transport Facilities in the Study Area

Sl. No.	Name of the Village	PO*	SPO*	P&T*	T*	PCO*	MP*	IC*	PCF*	BS*	PBS*	RS*	NH*	SH*	MDR*	BTR*	GR	AWR*
1	Ammbappur	1	b	1	1	1	1	c	b	1	1	c	b	b	1	1	1	1
2	Ammenabath	b	1	b	1	1	1	b	b	1	1	b	b	b	b	1	1	1
3	Anandavadi	a	1	a	1	b	1	b	b	1	1	b	c	c	b	1	1	1
4	Ariyalur (TP)	1	1	1	1	1	1	1	1	1	1	1	C	1	1	1	1	1
5	Edayathankudi	c	1	c	1	1	1	b	c	1	1	c	b	c	c	1	1	1
6	Govindapuram	b	1	b	1	1	1	b	b	1	1	b	b	b	b	1	1	1
7	Kadugur	b	1	b	1	1	1	a	c	1	1	c	c	c	a	1	1	1
8	Kallankurichi	1	1	1	1	1	1	1	b	1	1	b	b	b	1	1	1	1
9	Karuppur	b	1	c	1	b	1	b	b	1	1	c	1	1	1	1	1	1
10	Kavanur	c	1	c	1	1	1	c	c	1	1	c	c	b	b	1	1	1
11	Kayarlabath	a	1	a	1	1	1	1	1	1	1	a	1	a	c	1	1	1
12	Kilimangalam	c	1	c	1	1	1	c	c	1	b	c	c	c	b	1	1	1
13	Mallur	b	1	b	1	1	1	b	b	1	a	b	a	a	a	1	1	1
14	Managethi	b	1	b	1	1	1	a	b	1	1	c	1	1	1	1	1	1
15	Nagamangala	b	1	b	1	1	1	c	c	1	1	c	a	1	1	1	1	1
16	Ottakoil	b	1	b	1	1	1	1	1	1	1	1	b	b	b	1	1	1
17	Papanacheri	b	a	b	1	1	1	b	b	1	1	b	a	a	a	1	1	1
18	Periyagalur	b	1	b	1	1	1	b	b	1	1	b	a	1	1	1	1	1
19	Periyathirukona	c	1	b	1	1	1	b	b	1	1	c	c	a	a	1	1	1
20	Pudupalayam	b	a	b	1	2	1	b	b	1	1	b	b	1	1	1	1	1
21	Rayampuram	1	1	1	1	1	1	b	1	1	1	b	c	b	b	1	1	1
22	Reddipalayam	c	1	c	1	1	1	1	1	1	1	c	c	1	1	1	1	1
23	Sennivanam	a	1	a	1	1	1	b	a	1	1	b	c	c	b	1	1	1
24	Siruvalur	b	1	b	1	1	1	b	1	1	b	b	a	1	1	1	1	1
25	Thealur	c	1	c	1	1	1	c	c	1	1	c	c	1	1	1	1	1
26	Valaikurichi	b	1	b	1	1	1	b	b	1	b	c	c	b	1	1	1	1
27	Valajanagaram	a	1	a	1	1	1	1	1	1	1	a	1	1	1	1	1	1
28	Varanavasi	b	1	b	1	1	1	b	b	b	b	b	1	1	1	1	1	1
29	Vilangudi	c	1	c	1	1	1	c	c	1	1	c	c	1	1	1	1	1

PO-Post Office

PCO- Public Call Office/Mobile PCO)

BS-Public Bus Service

GR-Gravel (kuchha) Roads

*-Status

a-Facility available at <5 Kms

SPO-Sub Post Office

MP- Mobile Phone Coverage

PBS-Private Bus Service

AWR-All Weather Road

1-Available

b-Facility available at 5-10 Kms

P&T-Post/Telegraph Office

IC-Internet Cafes / Common Service Centre (CSC)

RS-Railway Station

MDR – Major District Road

2-Not

c-Facility available at >10 Kms

T-Telephones (landlines)

PCF-Private Courier Facility

NH – National Highways

BTR-Black Topped (Pucca) Roads

Available

SH- State Highways

Table : 3.45 Water & Drainage Facilities in the Study Area

Sl. No.	Name of the Village	TP	CW	UCW	HP	TW/BH	S	R/C	T/P/L	CD	OD	CT
1	Ambbappur	1	1	1	1	2	2	2	1	1	2	1
2	Ammenabath	1	2	2	1	2	2	2	1	1	2	1
3	Anandavadi	1	2	1	1	2	2	2	1	1	1	1
4	Ariyalur (TP)	1	1	1	1	1	2	2	1	1	1	1
5	Edayathankudi	1	1	1	2	2	2	2	2	1	2	1
6	Govindapuram	1	1	2	1	1	2	2	1	1	1	1
7	Kadugur	1	2	2	1	2	2	2	1	1	2	1
8	Kallankurichi	2	2	1	1	1	2	2	1	1	1	2
9	Karuppur	1	2	1	1	1	1	2	1	1	2	1
10	Kavanur	1	1	1	1	1	2	1	1	1	1	1
11	Kayarlabath	1	1	1	1	2	2	2	1	1	1	1
12	Kilimangalam	1	1	2	1	1	2	1	1	1	2	1
13	Mallur	1	2	1	1	2	2	2	2	1	2	1
14	Managethi	1	2	1	1	2	2	2	1	1	1	1
15	Nagamangalam	1	2	2	1	2	2	2	1	1	1	1
16	Ottakoil	1	1	1	1	2	2	2	1	1	2	1
17	Papanacheri	1	2	2	1	2	2	2	1	1	1	1
18	Periyaganalur	1	1	1	1	2	2	1	1	1	1	1
19	Periyathirukonam	1	1	1	1	1	2	2	1	1	2	1
20	Pudupalayam	1	1	1	1	2	2	1	1	1	2	1
21	Rayampuram	1	2	1	1	2	2	1	1	1	1	1
22	Reddipalayam	1	1	1	1	2	2	2	1	1	1	1
23	Sennivanam	1	2	2	2	2	2	1	1	1	2	1
24	Siruvalur	1	2	1	1	1	2	2	2	1	2	1
25	Thelur	1	2	1	1	1	1	2	1	1	2	1
26	Valaikurichi	2	2	1	2	2	2	2	2	1	1	2
27	Valajanagaram	1	1	1	1	2	2	2	1	1	1	1
28	Varanavasi	1	2	1	1	2	2	2	1	1	2	1
29	Vilangudi	1	1	1	1	2	2	2	1	1	2	1

T-Tap Water

CW-Covered Well

UCW-Uncovered Well

HP-Hand Pump

TW/BH-Tube Well/Bore Well

S-Spring

R/C- River/Canal

T/P/L-Tank/Pond/Lake

CD-Covered Drainage

OD-Open Drainage

CT-Community Toilet Complex for General Public

*-Status

1-Available

2-Not Available

Table : 3.46 Other Facilities in the Study Area

Sl. No.	Name of the Village	ATM	CB	COB	ACS	SHG	PDS	RM	AMS	NC	NC-AC	CC	SF	PL	NP	APS	BDRO	PS
1	Ammbappur	b	b	c	1	1	1	c	c	1	1	1	b	1	1	1	1	1
2	Ammenabath	b	b	b	a	1	1	b	b	1	1	b	b	b	1	1	a	1
3	Anandavadi	b	1	b	1	1	1	c	c	1	1	b	1	b	a	1	1	1
4	Ariyalur (TP)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	Edayathankudi	b	b	a	a	1	1	c	c	1	1	b	1	1	1	1	1	1
6	Govindapuram	b	b	b	1	1	1	b	b	1	1	1	1	b	1	1	1	1
7	Kadugur	c	c	a	a	1	1	c	c	1	1	c	1	1	1	1	1	1
8	Kallankurichi	b	b	b	b	1	1	b	b	1	1	1	1	a	1	1	1	1
9	Karuppur	b	b	1	1	1	1	c	c	1	1	b	b	1	1	1	1	1
10	Kavanur	b	b	c	b	1	1	c	c	1	1	b	1	1	1	1	1	1
11	Kayarlabath	a	a	a	b	1	1	a	a	1	1	1	1	1	1	1	1	1
12	Kilimangalam	c	b	a	b	1	1	c	c	1	1	1	1	1	1	1	1	1
13	Mallur	b	b	b	b	1	1	b	b	1	1	1	a	a	1	1	1	1
14	Managethi	b	a	a	b	1	1	c	c	1	1	1	1	1	1	1	1	1
15	Nagamangalam	a	a	b	b	1	1	c	c	1	1	1	1	a	1	1	1	1
16	Ottakoil	b	b	b	b	1	1	b	b	1	1	1	1	b	1	1	1	1
17	Papanacheri	b	b	b	a	1	1	b	b	1	1	a	1	1	1	1	1	1
18	Periyagalur	b	b	b	1	1	1	b	b	1	1	a	b	b	1	1	1	1
19	Periyathirukonam	b	c	1	1	1	1	c	c	1	1	b	b	1	1	1	1	1
20	Pudupalayam	b	b	1	1	1	1	b	b	1	1	b	a	a	1	1	1	1
21	Rayampuram	b	b	b	1	1	1	c	c	1	1	1	1	1	1	1	1	1
22	Reddipalayam	1	1	1	b	1	1	c	c	1	1	a	a	1	1	1	1	1
23	Sennivanam	b	b	b	a	1	1	c	c	1	1	a	a	a	1	1	1	1
24	Siruvalur	b	b	a	a	1	1	b	b	1	1	a	1	1	1	1	1	1
25	Thealur	a	c	c	a	1	1	c	c	1	1	b	a	a	1	1	1	1
26	Valaikurichi	b	b	b	b	1	1	b	c	1	1	b	b	b	1	1	1	1
27	Valajanagaram	a	a	a	b	1	1	a	a	1	1	1	1	1	1	1	1	1
28	Varanavasi	b	b	1	b	1	1	b	b	1	1	1	b	b	1	1	1	1
29	Vilangudi	a	a	c	1	1	1	c	c	1	1	a	1	1	1	1	1	1

CB-Commercial Bank PDS-Public Distribution System (Shop)

NC-AC-Nutritional Centres-
Anganwadi Centre
CC-Community Centre
with/without TV

NP-Daily Newspaper Supply

ATM-Automatic Teller Machine

a-Facility available at <5 Kms

COB-Co-operative Bank RM-Regular Market

APS-Assembly Polling Station

*-Status

b-Facility available at 5-10 Kms

ACS-Agricultural Credit Societies AMS-Agricultural Marketing Society

SF-Sports Field

BDRO-Birth and Death
Registration Office

1-Available

c-Facility available at >10 Kms

SHG-Self Help Group NC-Nutritional Centres-ICDS

PL-Public Library

PS-Power Supply

2-Not Available

Population : In the study area of 10 km radius, there are 1,27,501 persons (63,678 males-49.9% and 63,823 females-50.1%) in 33198 Households (HHs) in the 28 villages and 1 Town Panchayat. As far as the population of Scheduled Castes and Scheduled Tribes are concerned, there were 29,651 (23.3%) Scheduled Castes Population and 711(0.6%) Scheduled Tribes. In the total population, the Literate population was 82,432 (64.7%) whereas the illiterate population was 45,069 (35.3%).

Occupational Structure : According to the 2011 census, Total Workers in the total population were about 59,323 (46.5%). About 68,178 (53.5%) persons were non-workers. About 16.2% of the people were engaged in tertiary activities which included different services. The workers in the primary activities (Cultivators) and the secondary activities (Agricultural Labourers) were 13.2% and 17.2% respectively.

Educational, Medical & Infrastructural Facilities : Common diseases were only reported. Primary and Middle Schools are available in almost all villages whereas Senior secondary schools, are available in some of the villages. However, college education is available only at Ariyalur, Thathanur, Jayamkondam, etc. Almost all villages are having one or more Women Self Help Groups through which the people earn various sources of livelihood and are financially secured. There are community based organizations in some of the villages.

Public Health : Local people are frequently suffering from fever, diarrhea, etc. and no occupational related disease recorded. Primary Health Centres Maternity & Child Welfare Centre are available only in some of the villages. For major ailments villagers have to go to Ariyalur, Perambalur, Thanjavur and Trichy.

Other infrastructural Facilities : Drinking water facilities are available almost in all villages in the study area. Wells and hand pumps are the major source of drinking water. Villagers depend upon both rain water and also irrigation tanks for the agriculture needs. Public water supply and Power supply are available in most of the villages.

There are good approach roads in the form of panchayat roads and State Highways passing through the study area and bus transportation is there to almost all villages. The villages situated on the main road have marketing facilities for their day to day requirements and for major purchases they go to Ariyalur, Perambalur, Thanjavur and Trichy. Post and Telecommunications facilities are available in all villages. All the villages in the study area have the basic medical facilities, transport, phone connection, post and telegraph, Banking services and market facilities.

Need Based Assessment : Based on the details collected by Household Survey, the following assessments are made. In general, there have been the following demands/expectations from the public:

- ❖ Job opportunities.
- ❖ Training of local youths for suitable jobs.
- ❖ Training in computer typing, driving heavy vehicles, etc.

- ❖ Employment for older people and unskilled persons in gardening, cleaning, etc.
- ❖ Facilities like ambulance, health care, educational, community centres, etc.

Perception of the Project : Almost all villagers are aware about the Ramco Cement Plant & its Captive Mines in the region and supporting the Proposal.

3.11 Summary of Baseline Status

The copies of Laboratory Test Report (Extracts) are given as **Document-5**.

The findings of baseline environmental status of the study area are summarized below :

- ❖ The collected meteorological data during this season represented the local weather phenomena.
- ❖ The monitored ambient air quality in the study area was found to be in compliance with the Revised National Ambient Air Quality (NAAQ) 24-hourly Norms for Industrial, Residential, Rural and other areas.
- ❖ Ambient equivalent noise levels (Leq) during day and night times were found to be well within the MoEF&CC Norms.
- ❖ The water quality of surface waters was found to be in compliance with CPCB Norms.
- ❖ The ground water quality was found to be in compliance with the IS:10500-2012 Norms.
- ❖ The soil in the study area would very well support vegetation after amending it suitably.
- ❖ There is no eco sensitive area exists in the study area and only domesticated animals exist.
- ❖ The area is thinly populated and basic amenities are available almost in all villages.

Thus, there is **adequate buffer** for the proposed Project in the physical, biological and edaphic environments of the study area.

4.0 Anticipated Environmental Impact and Mitigation Measures

4.1 Identification of Impacts

Environmental Impacts are categorized as Primary and Secondary Impacts. **Primary Impacts** are those which are attributed directly to the project and **Secondary Impacts** are those which are indirectly induced by the Project. Any Project would create impact on the environment in two distinct phases viz. Construction Phase which may be regarded as temporary & short term and Operation Phase which would have long term effects. Identification of all potential environmental impacts due to the Proposal are critically examined and major impacts (both **Beneficial & Adverse**) are studied.

4.2 Construction Phase

Being an existing Mines with all required infrastructures, it **does not involve any major establishment or construction**. Thus, Construction Phase Impacts are not there for Impact Assessment and Environmental Management Plan (EMP).

4.3 Impacts during Operation Phase

The impacts have been divided into two categories, viz. **Localised and Cumulative**. Localised Impact is confined to the area of influence of the Project and is not transmitted beyond its area. On the other hand, Cumulative Impact is aggregate impact of a number of projects on any component. Cumulative impacts can result from individually minor but collectively significant over a period of time. There are Cement Plants and Limestone Mines in the Study Area. However, following industrial activities are considered for **Cumulative Impact Assessment** for assessing their contribution (**Table 4.1**). Cumulative Impact has been assessed for the identified Industries and assumed that the **pollution due to other existing Industrial & Mining activities have already been covered under baseline environmental status** and continue to remain same till the operation of the project. The following activities related to the Operational Phase of the Project are considered for the impact assessment :

- ❖ Safeguard to State Highway Traffic.
 - ❖ Safeguard to nearby Habitations.
 - ❖ Slope Stability.
 - ❖ Blasting & Vibration.
 - ❖ Land Environment.
 - ❖ Traffic Volume.
 - ❖ Water Environment - Hydrogeological Impact.
 - ❖ Air Quality.
 - ❖ Noise Levels.
 - ❖ Biological Environment.
 - ❖ Socio-economics.
-

Table : 4.1 Industrial Activities considered for Cumulative Impact

Sl. No.	Industry / Mine	Extent & Consented Production	Bearing & Contribution during Study Period
1	Ramco Amalgamated Mining Lease	53.320 Ha (3.00 MTPA)	Study Lease
2	UltraTech Periyagalur Limestone Mine (ML5)	4.985 Ha (0.15 MTPA)	Adjacent Lease in Upwind side & not in operation.
3	Dalmia Periyagalur & AK Limestone Mines	167.605 Ha (1.9 MTPA)	Adjacent Lease in operation. Downwind side & not contributing other than Traffic Volume
4	TANCEM Periyagalur & Khairulabad, Mines	194.165 Ha 66.110 Ha	Adjacent Lease; Not in operation. Downwind side & not contributing
5	TANCEM Kallankurichi Mine	240.610 Ha (expansion 0.2 to 0.7 MTPA)	Downwind side & not contributing
6	Ultratech Cement Plant, Reddipalayam	1.6 MTPA	Plant located near the Lease & not contributing other than Traffic Volume

4.3.1 Safeguard to State Highway Traffic

State Highway (SH)-139 (Ariyalur-V.Kaikatti-Jayamkondam Section) is passing in east-west direction in southern boundary of the PNR-West Mine (Lease-II) and a **Safety Distance of 50 m has already been provided as per GO, approved Mining Plan & Tamil Nadu Mineral Concession Rules 1959.**

SEIAA-TN has requested to leave a safety distance of 150 m in the tail end of Lease-II (**Plate-XI**). Leaving 150 m of Lease Area from SH **will block about 2.40 Million Tonnes** of Limestone Reserves which will reduce about 20% of Mineable Reserves based on this Expansion is proposed. Also, it reduces the Royalty amount of **Rs.19.20 Crores** to the State exchequer. There are Limestone Mines being operated adjacent to the Highways & other MDRs in Ariyalur Region. With National Mineral Policy norms in place, the Ministry of Mines & IBM will not mandate the wasting of mineral resources beyond the statutory requirements.

RCL has entrusted the **Department of Mining Engineering, Anna University** to carry out a detailed Study on the safety aspect of Vehicular Traffic in SH-139 w.r.t mining in Lease-II and propose the suitable mitigating measures. The Team of Experts visited the Mines in Aug. 2023 and submitted the Report in October 2023 which is appended as **Document-6**.



The findings and recommendations of Anna University Study are :

- ❖ It is observed that the State Highway-139 road exists in the southern side of the mine. The road is measuring 15 m including the trench and shoulder. From road, trench and shoulder, the distance of boundary pillar 31 & 34, at 7 m in the southwest side and 6 m in the southwest side of the mine respectively. ECL has provided a safety barrier distance at 50 m from the SH in the western side. So, it is concluded that as per the MCR guidelines, 50 m safety distance with including the trench and shoulder from the SH road is more than sufficient for the safe working condition.
- ❖ It is observed that safety barrier distance at 50 m in the east side of the mine from the SH-139 roadway.
- ❖ Wire fencing is established in the south side of the mine from the SH-139 roadway at the distance of 5 m from the lease boundary Pillar No. 33.
- ❖ It is observed that the safety bund of about 2.5 m height is maintained in the southern side of the proposed mine from the SH-139 road in the lease boundary area.
- ❖ It is observed that trench is established in the south and east side of the mine which could damp the dynamic wave propagation from the mining operations.

Proposed EMP Measures : The following Safety/Preventive measures will be implemented :

- ✓ In addition to 50 m Green Belt developed in the safety barrier, a Galvanium sheet fencing will be erected for 150 m length & 3 m height along SH-139 at a cost of **Rs.13.80 Lakhs**.
- ✓ With the help of State Highway department, safety measures like cautionary signals, speed brakers, sign boards, etc. will be installed and monitored.
- ✓ The existing OB Dumps are being handled for backfilling and the tail end of Lease-II western parts will be backfilled upto 150 m and reclaimed at the end.

4.3.2 Safeguard to nearby Habitations due to Mining

RCL had engaged **NITK, Surathkal, a Govt. of India Institute**, for Study out the scientific investigation on "Blasting Parameters & Design of Safe Bench Geometry and Evaluation of Slope Stability of existing benches and also the proposed working benches for ensuring safety of men and machinery deployed in the Lease. The updated Report is annexed as **Document-7**.

There are houses existing in nearby Kattupringiyam Ayyanagar and Chinna Nagalur Villages at a minimum distance of about 175 m from the Mine. The houses are made up of mud with proper cement lining on the outer walls, completely mud construction with a hut type structure, mud construction with cement sheets and tiled house with mud walls. The **scientific study was taken up to assess the effect of mining & blasting operations in PNR Mines** on these habitations by studying 10 production scale blasts. Blastholes of 110 mm diameter with depth of blastholes varying from 5 m to 10 m were used for the studies.

Number of blastholes per blast round varied from 10 to 25, covering different locations representing the entire mines. Slurry explosives available in the form of 83 mm diameter cartridges were used as primer and column charges. Shock tube system of initiation was used for achieving delay in blast rounds. Explosive charge per hole was varying from 16.02 kg to 40.03 kg. Total explosive charge per blast round varied from 225.18 kg to 800.64 kg in the studies. Initiation was done by Exel Dueldet system, which includes both down-the-hole and surface initiations, along with D-Cord. Four (4) Microprocessor based Blast Vibration Monitors, Minimate Plus, Instanetel, Canada were used for the monitoring. Summary of ground vibrations recorded from all the blasts studied are given in **Table 4.2**.

Table : 4.2 Ground Vibrations Recorded during different Blastings

Blast No.	No. of Holes	Explosive Charge/Hole (kg)	Total Explosive/Blast (kg)	Distance (m)	PPV (mm/s)
1	20	40.03	800.64	80	24.30
				94	16.80
				107	10.80
				120	9.40
2	21	27.40	575.46	155	4.44
				166	2.67
				177	2.29
				188	1.65
3	23	29.37	675.54	56	25.90
				122	8.00
				133	7.49
				144	7.24
4	20	22.52	450.36	300	2.29
				325	1.52
				335	0.76
				350	0.76
5	18	33.36	600.48	350	1.14
				360	0.89
				370	<0.51
				380	<0.51
6	13	19.25	250.2	250	1.78
				275	1.78
				285	1.27
				335	<0.51
7	24	25.02	600.48	140	3.81
				150	3.68
				160	3.43
				175	2.16
8	16	25.02	400.32	193	2.54
				230	1.52
				235	1.14
				306	0.76
9	10	22.52	225.18	216	1.27
				254	0.89
				260	0.76
				330	0.51
10	25	16.02	400.32	250	1.52
				253	2.16
				304	1.65
				310	1.52

The findings are :

- ❖ In general, the PPV levels reduced considerably from 100 m distance onwards from the blast site.
- ❖ The PPVs recorded from 5 blasts at structures of Kattupringiyam Ayyanagar and Chinna Nagalur villages are lesser than the suggested limits.
- ❖ Shock tube system of initiation was effective in containing the Fly Rock to a maximum distance of 30 m from blast site.
- ❖ Studies with given blast configurations having 10 to 25 holes of 5 m to 10 m average depth and each blasthole charged with 16.02 kg – 40.03 kg of explosive, indicated that there is no effect of ground vibrations and fly rock caused due to blasting operations carried out in the Mine, on the stability of village structures vis-à-vis the present distances.

The following Safety measures are be implemented :

- ✓ When the mine benches approach the village structures to about 100 m, the depth of blastholes should be restricted to 6 m.
- ✓ The blasthole should have two explosive decks, each being detonated separately, with different delays, i.e., implementation of down-the-hole delay system.
- ✓ The explosive charge per delay should be a maximum of 11kg.
- ✓ In case the MCD has to be increased beyond this, techniques like pre-splitting or line drilling are to be used.
- ✓ Periphery of the mine closer to villages may be line drilled, to arrest the propagation of ground vibrations. Depth of hole should be 5 m more than the depth of pit.
- ✓ Following recommendations are made based on the studies carried out, in order to improve the blasting operations further:
 - Number of rows in blast round may be restricted to a maximum of two (2), when the distance between the mine and the villages is $\leq 150\text{m}$.
 - The maximum number of blastholes per round may be restricted to a maximum of 25.
 - Burden x Spacing pattern of 3.5 m x 5 m may be used.
 - Blastholes may be drilled vertically, as this would ensure equal burden along the entire bench and also will reduce unnecessary movement / throw of material, minimizing the fly rock.
 - Sequential blasting with shock tube system should be continued.
 - While blasting from distances of $\leq 100\text{m}$ from village structures, Depth of blastholes should be a maximum of 6 m. Double Decking of explosive column should be done, with each deck detonated at different timings like 450ms and 500ms or similar as per availability of down-the-hole delays. A maximum of 11kg per delay should be used for protecting the structures from ground vibrations.

For normal conditions , the Blasting parameters suggested are given in **Table 4.3**.

Table : 4.3 Recommended Blasting Parameters

Blasthole Diameter	110 mm
Bench Height	5-8 m
Depth of blastholes	5-8 m (Maximum)
No. of Blastholes / Round	25 (Maximum)
No. of Rows	2 (Maximum)
Burden	3.5m
Spacing	5m
Pattern of Holes	Staggered
Initiation	Shock tube system
Explosive Charge / Hole	30 kg (Maximum)
Type of Explosive	Slurry explosives
Maximum Charge / Delay	40 kg (Maximum)
Total Charge / Blast	1000 kg (Maximum)

Proposed EMP Measures : The following Safety/Preventive measures will be implemented :

- ✓ There is a level difference of 6-25 m between the Mine and the Habitations. All these houses may be assigned with a PPV of 2 mm/s due to their condition as per DGMS Standards. The public road passing through the Lease and other village structures may be assigned a PPV of 25 mm/s during Blastings.
- ✓ Blasting operations in the Periyagalur Limestone Mine should, therefore, be carried out in such a way that the ground vibrations at different structures are always maintained below the assigned permissible PPV values. Fly rock should be controlled to within mine limits, without causing any problems to the structures around and the villagers.

4.3.3 Scientific Study on Slope Stability

This is an existing Mines of RCL in operation since 2005 onwards with proper benches in compliance with approved Mining Plans/Schemes. **NITK, Surathkal** carried out the Study on ‘**Slope Stability**’ for the Mine and updated Report is annexed as **Document-8**. The stability analysis and determination of ‘**Factor of Safety (FOS)**’ in the present investigation was carried out using Limit Equilibrium Method. For this purpose, GALENA software available in the Department of Mining Engineering was used. To analyze the “Stress Distribution” within the rock mass, Finite Element Modeling was carried out using ANSYS software.

The factor of safety for planned pit configuration (ideal and special conditions) is determined using GALENA software whereas ANSYS results show the distribution of stress in the slopes. Factor of safety higher than 1.3 shows the safe working conditions regarding stability of slopes.

ANSYS results confirm that the distribution of stress in the slopes is not critical, but requires regular monitoring at the toes of benches.

The results of FOS along Section ML-4 and Section ML-5 (except for 3 m width and 6 m height) of the pit for planned pit configurations are more than 1.3 which is the minimum recommended value required for stability of rock slopes. The FOS of slopes ignoring the lowest bench have been given for Cases I, II & III. This indicates that if the height of the lowest bench can be increased by adjusting with second lowest bench, the FOS for overall slopes can be increased above 1.3. This is because of the smaller bench height of the lowest most bench which causes the tension crack angle for overall slope to decrease, thus increasing the sliding mass.

Proposed EMP Measures : The following Safety measures will be implemented :

- ✓ The pit should be provided with garland drain/ bund / barrier on the upper surface of pit to divert the run-off of rainwater away. It should be kept effective during the monsoon.
- ✓ The open tension cracks should be filled with permeable material. This filled material should be consolidated by dozer. At the top, any impermeable material has to be spread.

4.3.4 Land Environment

Anticipated Impacts : Industrial/Mining activities are being carried out in an extent of **766.965 Ha** in the Impact Zone. **There is no additional Land requirement for the Proposal.** There is **Drilling & Blasting** proposed and thus, vibration impact due to mining will be there. Also, as the entire Top Soil & OB Dumps will be rehandled for Backfilling & Reclamation of mined out voids, there will be no Dump in the Lease. Area of excavation at the end of the life of the mine will be 39.17 Ha, out of which about 14.00 Ha will be Backfilled & Reclaimed and balance 25.17 Ha will be left out as water reservoir for recharging the ground water table in the vicinity.

Mitigating Measures :-

- ❖ No Blastings shall be carried out during night times and overcast conditions.
- ❖ Vibration Studies/Monitoring has to be carried out whenever Blastings are carried out.
- ❖ Vibration Parameters viz. Peak Particle Velocity (PPV) and Noise Levels during Blastings shall comply with DGMS Norms for Residential Areas.
- ❖ Earthen bunds & Garland drains are to be maintained around the Lease.
- ❖ Green Belt has to be developed and maintained along Lease boundary and Safety Barriers.
- ❖ No. of **trees planted shall be numbered** and referenced for review.
- ❖ The mined out Pits shall be converted into a Water Reservoirs to harvest Rain Water and to recharge the Ground Water-table in the vicinity.
- ❖ Backfilled area has to be reclaimed and afforested.
- ❖ In situ **bioremediation** using natural microorganisms shall be carried out.

4.3.5 Traffic Impact

Anticipated Impacts: Limestone Transportation of Ramco Mines, TANCEM Mines and partly Dalmia Mines (meant for Ariyalur Plant) is through SH-139 towards Ariyalur Bypass (in western part). The traffic volume due to other Mines in the vicinity is covered in the Baseline Status. For assessing the baseline status, the Traffic Survey based on Indian Road Congress-IRC: 64/106 Norms were carried out at NH81-Underpass Road Junction on a week day (24.01.2024; Wednesday) and week end (28.01.2024; Sunday).

The existing traffic volume in the Project vicinity was found to be **5,445.1 Passenger Car Units (PCUs)/day (Table 4.4)**. In the Post-Project Scenario, there will be an addition of **468 Vehicle** (in 2 ways) due to the Project. Cumulatively, the traffic volume in the Project vicinity will be **6,410.7 PCU/day**. **The net increase (cumulative) will be 965.6 PCU/day (Table 4.5)**. The existing Roads/SH are adequate to handle the proposed traffic volume due to the Project.

Level of Service (LOS) : Capacity Standards of Roads are fixed in relation with the LOS which is commonly designated from 'A' (best operating condition) to 'F' (forced or breakdown flow). Normally LOS-C will be adopted for smooth traffic flow in Urban/Rural Areas (Table 4.6). At this Level, traffic volume will be 0.7 times of the maximum capacity. Capacity/Design Service Volume is the maximum hourly volume at which a vehicle can be expected to transfer a point/section of a road at a given time period. Ratio of existing Volume of PCU on road (V) and its Capacity (C) with corresponding LOS and their performance is given in Table 4.7.

Table : 4.4 Existing Traffic Volume - Baseline Status

Type of Vehicle	NH-81 Under Pass & SH 139 Road Junction				
	No. of Vehicles/day			PCU Factor	PCU/day
	Week Day (24.01.2024; Wednesday)	Week End (28.01.2024; Sunday)	Avg. Traffic		
2-wheelers	664	552	648.0	0.5	324.0
Autos	58	66	59.1	1.2	71.0
Vans/Tempos	74	57	71.6	1.4	100.2
Cars	358	382	361.4	1	361.4
Buses	168	112	160.0	2.2	352.0
Trucks	2102	664	1896.6	2.2	4172.5
Trailers	18	4	16.0	4.0	64.0
Total	3442	1837	3212.7	-	5445.1

Table : 4.5 Projected Traffic Volume – Operation Phase

Type of Vehicle	NH-81 Under Pass & SH 139 Road Junction		Cumulative Traffic Volume due to Mines, Nos./day	PCU Factor as per IRC	Cumulative Traffic Volume due to Mines, PCU/day
	Avg. Traffic, Nos./day	Projected due to Mines, Nos./day			
2-wheelers	648.0	0	648.0	0.5	324.0
Autos	59.1	0	59.1	1.2	71.0
Vans/Tempos	71.6	0	71.6	1.4	100.2
Cars	361.4	0	361.4	1.0	361.4
Buses	160.0	0	160.0	2.2	352.0
Trucks	1896.6	468	2364.6	2.2	5202.1
Trailers	16.0	0	16.0	4.0	324.0
Total	3212.7	468	3678.7	-	6410.7

Table : 4.6 Level of Service & Performance of a Road (IRC:64-1990 Norms)

Volume/Capacity Ratio	Level of Service	Performance of the Road
0-0.2	A	Excellent
0.2-0.4	B	Very Good
0.4-0.6	C	Good/Average/Fair
0.6-0.8	D	Poor
0.8-1.0	E	Very Poor

Table : 4.7 Predicted Traffic Scenario at the Junction

Road	Volume, PCU/hr.	Capacity of the Road, PCU/hr.	V/C Ratio	Level of Service	Performance of the Road
Existing:-					
NH-81 Underpass	226.9	3600	0.06	A	Excellent
Proposed :-					
NH-81 Underpass	267.1	3600	0.07	A	Excellent

Thus, there will not be any impact on the existing baseline traffic volume due to the Proposal. Adequate parking area is provided in the Mine Area. Facilities for drivers (rest room, toilet, etc.) are also provided.

Mitigating Measures : The following Mitigating Measures are to be followed/adopted to mitigate the impacts due to Transportation of Ore from the Mine to the Cement Plant :

- ❖ Compliance to 'Pollution under Control' Certification has to be ensured for the Tippers.

- ❖ Tippers are to be fully covered with Tarpaulin to avoid any spillage on transportation.
- ❖ No overloading of Tippers is allowed strictly.
- ❖ A strict Speed Limit of 30 km/hr. has to be enforced and monitored continuously.
- ❖ Regular wetting of haul roads has to be undertaken to arrest the fugitive emissions.
- ❖ Restriction of Truck parking in the Public Road has to be implemented.
- ❖ Regular and preventive maintenance of transport vehicles has to be ensured.
- ❖ Effective Green Belt with thick foliage has to be maintained along the haul roads.
- ❖ Security Guards are to be placed at the Public Road-Mine Haulage Road Junction to handle the inward and outward vehicles.

4.3.6 Carbon Emission & Climate Change

Greenhouse gases include carbon dioxide, methane, nitrous oxides, and water vapour. The proposed quarrying and transporting activities will utilise about 4,000 Litres HSD/year. By considering the Transport Emission Factors for Medium & Heavy Duty Trucks viz. 0.997 kg CO₂/km, 0.012 g CH₄/km and 0.008 g N₂O/km [as per US EPA 2014 emission factors for Green House Gases (GHGs) Inventories], the gaseous emissions will be as follows :

HSD consumption	:	4,000 LPA
Total CO ₂ Emissions	:	0.012 Tons/Annum
CO _{2-e} for CH ₄ Emissions	:	0.004 Tons/Annum
CO _{2-e} for N ₂ O Emissions	:	0.029 Tons/Annum.

Thus, total CO₂ Emission due to the Proposal will be **0.045 Tons/Annum**.

Mitigating Measures : -

Carbon sequestration is the long-term storage of carbon in oceans, soils, vegetation (especially forests) and geologic formations. Adequate Green Belt shall be developed around the project for carbon sequestration. As trees grow, they store carbon in woody tissues and soil organic matter. Through the process of photosynthesis, plants assimilate carbon and return some of it to the atmosphere through respiration. The carbon that remains as plant tissue is then consumed by animals or added to the soil as litter when plants die and decompose.

The primary way that carbon is stored in the soil is as *soil organic matter (SOM)*. SOM is a complex mixture of carbon compounds, consisting of decomposing plant and animal tissue, **microbes (protozoa, nematodes, fungi, and bacteria)**, and **carbon associated with soil minerals**. It will be ensured that Plant operations do not result in loss of soil biological properties and nutrients. Soil amendments as required will be carried out to improve **soil heath**. **Bio remediation** using micro organisms will be carried out to restore the soil environment to enable carbon sequestration.

4.3.7 Water Environment & Scientific Study on Hydrogeology

There is no nalla crossing in the mine vicinity. Seasonal River Marudaiyar drains the region (flows at 4.9 km in the south). Seasonal Nallah Kallar River flows at 2.9 km in northwest. The entire mine pit water collected & pumped from Settling Tanks, after 20 KLD consumption for Mine use, is being utilised for Irrigation (Agricultural) activities in eastern side for about 46 Ha. There is no impact due to the Surface waters due to mining.

On the monitoring day, the water level was observed in 6 Borewells in the PNR-A Mine vicinity (within 2 km). The levels were found to be 8.14 m BGL to 22.30 m BGL while it was 15.50 m BGL at PNR Mine. The monitored water levels in the Study Area are brought to Reduced Levels (RLs) for comparison and 'Water Level Contours' are plotted in Google Earth Imagery and appended. Ground Water-table in the District ranges from 23.0 m to 28.7 m with average level at 25.4 m BGL during Post-monsoon and 25.6 m to 31.7 m with average level at 29.2 m BGL during Premonsoon Period. Thus, no impact on the ground waters of nearby Borewells due to mining on account of poor transmissivity.

RCL has engaged the **Department of Remote Sensing, Bharathidasan University, Trichy** for '**Integrated Hydrological Investigations-A Geospatial Approach**' in and around their Mine Lease Areas in Ariyalur Region (Project 'Hydrolime') since May 2017 and submitted the periodical Reports to the Authorities. Also, the EIA Coordinator and Officials of M/s. Thrust Geo-consultants Private Limited, an **Accredited Ground Water Professionals** for 'Hydrogeological Report for Mining Projects' by Central Ground Water Authority (CGWA) have carried out the Hydrogeological Survey including a Pumping Test during 18.12.2023 and submitted the Report.

Aquifer Characteristics : In order to find the aquifer characteristics, **Pumping Test** has been conducted in the Borewell near the Mine. The depth of the borewell is 90 m and is pumped with a 5 HP submersible pump. The average discharge of the pump was set for 13.4 cu.m per hour. Pumping was done for a total duration of 66 minutes and the recovery was monitored for about 93 minutes. The water level in the pumping well was monitored at regular intervals along with discharge. The drawdown of water levels in the well was measured and given in the **Table 4.8**. The static water level was at 11.54 m before the starting of the test and went down upto 60.47m. The plot of Drawdown Vs Time and the plot of Residual Drawdown Vs t/t' was done using the pump test data and the draw down per log cycle was estimated in each plot. The transmissivity value is estimated using the formula :

$$T = \frac{2.30 \times Q}{4X \pi * \Delta S}$$

Where T is Transmissivity in m²/day

Q is the pumping rate in m³/day

π is a 3.14 & ΔS is drawdown per log cycle.

The drawdown per log cycle estimated from drawdown data ie., $\Delta S = 22\text{m}$. the estimated transmissivity value is

$$T = \frac{2.30 \times 312}{4 \times 3.14 \times 22} = 2.59 \text{ m}^2/\text{day}$$

The drawdown per log cycle estimated from recovery data ie., $\Delta S = 26\text{m}$. the estimated transmissivity value is

$$T = \frac{2.30 \times 312}{4 \times 3.14 \times 22} = 2.19 \text{ m}^2/\text{day}$$

Average "T" value of the Limestone aquifer is estimated to be 2.39 m²/ day

The limestone aquifer is observed to be very low in terms of transmissibility and hydraulic conductivity.

Table : 4.8 Pumping Test

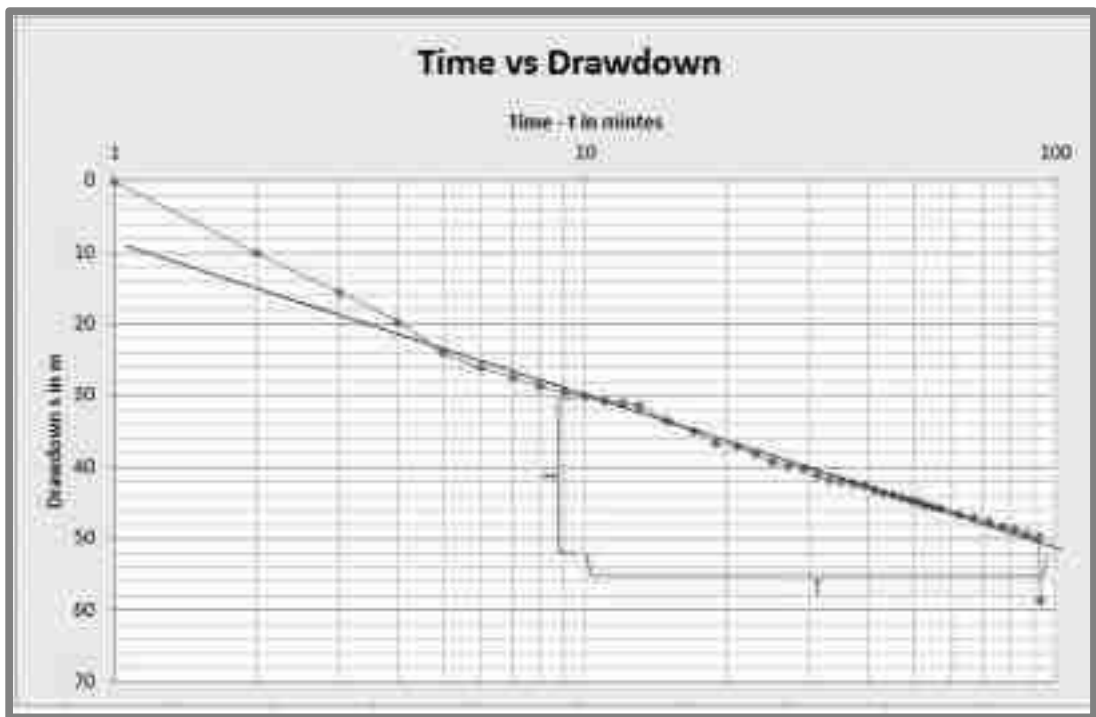
Pumping Test - RCL Borewell ID Location - Near Mine Office	S.W.L = 11.54 m Q= 20 cum/hr.
---	----------------------------------

Time since Pump Start, minutes	Pumping Water Level in meter	Drawdown in meter	Discharge / Remarks
0	11.54	0.00	SWL
1	11.67	0.13	Pump Started
2	21.59	10.05	
3	27.13	15.59	
4	31.24	19.70	Yield : 14000 LPH
5	35.50	23.96	
6	37.58	26.04	
7	38.97	27.43	
8	40.30	28.76	
9	41.02	29.48	
10	41.70	30.16	
11	42.29	30.75	
12	42.57	31.03	
13	42.94	31.40	
15	45.04	33.50	
17	46.52	34.98	
19	48.13	36.59	
21	48.65	37.11	
23	49.64	38.10	
25	50.67	39.13	
27	51.32	39.78	Yield : 13400 LPH
29	51.83	40.29	
31	52.63	41.09	
33	53.26	41.72	
35	53.47	41.93	
37	53.88	42.34	

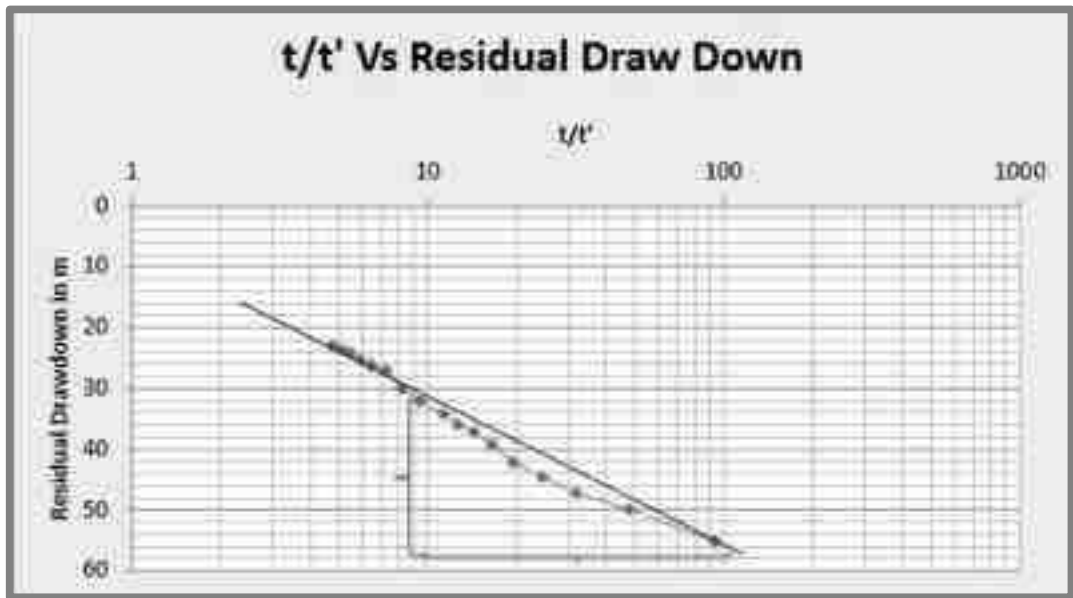
Time since Pump Start, minutes	Pumping Water Level in meter	Drawdown in meter	Discharge / Remarks
39	54.19	42.65	
41	54.77	43.23	Yield : 13200 LPH
43	55.12	43.58	
45	55.47	43.93	
47	55.89	44.35	
49	56.18	44.64	
51	56.46	44.92	
53	56.78	45.24	
55	57.07	45.53	
57	57.39	45.85	
62	58.17	46.63	
67	58.65	47.11	
72	59.18	47.64	
77	59.86	48.32	Yield : 12980 LPH
82	60.34	48.80	
87	60.84	49.30	
92	61.31	49.77	
93	60.47	58.65	Pump Stopped

Recovery Test

Time Since Pumping Started (Minutes) t'	Time Since Pumping Stopped (Minutes) t	t/t'	Depth To Water Level (M)	Residual Draw Down (M)	Remarks
94	1	94.0	56.91	55.09	
95	2	47.5	51.56	49.74	
96	3	32.0	49.02	47.20	
97	4	24.3	46.46	44.64	
98	5	19.6	44.00	42.18	
99	6	16.5	41.09	39.27	
100	7	14.3	39.00	37.18	
101	8	12.6	37.79	35.97	
102	9	11.3	36.07	34.25	
104	11	9.5	33.81	31.99	
106	13	8.2	31.79	29.97	
108	15	7.2	28.74	26.92	
110	17	6.5	28.00	26.18	
112	19	5.9	27.00	25.18	
114	21	5.4	26.03	24.21	
116	23	5.0	25.36	23.54	
118	25	4.7	24.67	22.85	
123	30	4.1	23.49	21.67	
128	35	3.7	22.10	20.28	
133	40	3.3	21.72	19.9	
138	45	3.1	20.86	19.04	
143	50	2.9	20.30	18.48	
148	55	2.7	19.75	17.93	
153	60	2.6	19.23	17.41	
246	153	1.6	15.85	14.03	



Drawdown Curve of the Aquifer



Recovery Curve of the Aquifer

Mine Pits Dewatering – Existing Scenario : Mine Pits dewatering quantity Minimum was about 754 KLD during Apr. 2023-Mar. 2024 Period (Table 4.9).

Table : 4.9 Mine Pit Dewatering Data during Apr.2023-Mar. 2024

Month-2023-24	Mine Pit Dewatering	
	Monthly Pumped out Quantity, KL	Daily Discharge, KLD
Apr.	27,027	901
May	16,258	542
Jun.	24,889	830
Jul.	28,557	952
Aug.	24,176	806
Sep.	23,463	782
Oct.	20,671	689
Nov.	29,997	1,000
Dec.	24,948	832
Jan.	27,057	902
Feb	14,152	472
Mar.	10,374	346
During the Year	2,71,568	754 (Avg.)

Non-monsoon Season Discharge-Avg. : 725 KLD

Monsoon Season Discharge-Avg. : 840 KLD

The pumped out water from Settling Tanks, after 20 KLD consumption for Mine use, is being utilised for Irrigation (Agricultural) activities in eastern side for about 46 Ha. About 26 Families are the beneficiaries (Table 4.10). Thus, Mine Pits water is gainfully utilized.

Table : 4.10 Gainful Utilisation of Mine Pit Water

Utilisation of Mine Pit Water	Area, Ha	Crops Raised	Beneficiaries
Irrigation of nearby Fields	30 Ha	Paddy, Pulses, Vegetables, etc.	18 Families
Recharging GWT in the vicinity (8 Borewells-for Irrigation)	16 Ha	Paddy, Pulses, Vegetables, etc.	8 Families
Total	46 Ha		26 Families

NOC from SGWB for Mine Pits Dewatering : RCL has applied to State Ground Water Department (SGWB), WRO, Taramani, Chennai for NOC for dewatering about 750 KLD from Periyagalur Mine on 13.07.2015 and for NOC for Periyagalur West Mine on 27.07.2016.

However, the Applications are still under the Department perusal for want of State Govt. Policy or direction. **Letter copies are appended.**



IS - 9001:2008
IS - 14001:2004
IS 14001:2007
Certified Company

THE RAMCO CEMENTS LIMITED

(formerly known as Madhav Cements Ltd.)

Coimbatore, Senturai Road,
Ariyalur Taluk - 621713
Ariyalur District, Tamil Nadu, India
Phone: 04325 - 225001 to 225004
Fax: 04325-225005

13/07/2015

To
The Chief Engineer
PWD, WRD
State Ground & Surface Water resources Data Centre
Taramani
Chennai - 600 113

Sir,

Sub: The Ramco Cements Ltd, Periyannagalur Limestone Mine in Periyannagalur village of Ariyalur Taluk & District, Tamil Nadu - Abstraction of ground water Permission / NOC requested for mine pit dewatering for 750 m³/day - Regarding.

Ref: MoEF F. No. J-11015/556/2007-IA II (M) dated 10.10.2007.

We wish to bring to your kind attention the above subject and reference cited. We obtained Environmental Clearance from Ministry of Environmental and Forest (MOEF) for Periyannagalur Mine. In this regard, one of the conditions therein is to obtain Permission / NOC for abstraction of mine pit water from the competent authority.


In this context, we are herewith submitting "Application for Permission to abstract ground water", as a part of mine pit seepage dewatering, along with a detailed hydro-geological report and necessary enclosures.

Hence, we request you to accord permission / NOC for abstraction of ground water from mine pit water pertaining to Periyannagalur limestone mine.

Thanking you.

Yours sincerely,

For The Ramco Cements Limited,


G.R. MAGESH
DGM (Mines)

Encl: As above.



ISO 9001:2008
ISO 14001:2004
ISO 18001:2007
Certified Company



ISO 9001:2008
ISO 14001:2004
ISO 18001:2007
Certified Company

THE RAMCO CEMENTS LIMITED

(Formerly known as Madhav Cements Ltd.)

Govindapuram, Sendurai Road,
Ariyalur Taluk - 621713
Ariyalur District, Tamilnadu, India
Phone: 04329 - 228511 to 228504
Fax: 04329 - 228505

27.07.2016

To
The Chief Engineer
PWD, WRO
State Ground & Surface Water resources Data Centre
Taramani
Chennai - 600 113

Sir,

Sub: The Ramco Cements Ltd, Periyanaalur Limestone West Block in Periyanaalur village of Ariyalur Taluk & District, Tamil Nadu - Abstraction of ground water Permission / NOC requested for mine pit dewatering -Reg

Ref: Letter No:SEAC/F No.9/M-XXVI/TOR-92/2012/Dated : 01.10.2012

We wish to bring to your kind attention on the above subject and reference cited. We have obtained TOR from State Level Expert Appraisal Committee, Chennai for Periyanaalur West Block. In this regard, one of the conditions therein is to obtain necessary clearance from the competent Authority for drawl of requisite quantity of water.

In this context, we are herewith submitting a detailed hydro-geological report and necessary enclosures.

Hence, we request you to accord permission / NOC for abstraction of ground water from mine pit water pertaining to Periyanaalur West limestone Block.

Thanking you,

Yours sincerely,

For The Ramco Cements Limited,



G.R.MAGESH
DGM (Mines)

Encl: As above.

**GOVERNMENT OF TAMILNADU
WATER RESOURCES DEPARTMENT**

From

Er.S.Prabakaran, B.E.
Chief Engineer, WRD,
State Ground & Surface Water
Resources Data Centre,
Tharamani, Chennai-600 113.
Phone : 91-44-22542223 (Direct)
91-44-22541526/27(Board)
Email: cezwchennai@gmail.com
Web site: www.groundwaterinpnwd.org

To

M/s. The Ramco Cements Limited,
Auras Corporate Centre, V Floor,
98-A, Dr. Radhakrishnan Salai,
Mylapore, Chennai -600 004

Lr. No: DDG / OT9 / AG 6/ NOC – Mining/ 2024 / dt: 01.02.2024.

Sr.

- Sub:** Request to expedite issuing NOC for dewatering of mine pit water –
Earlier Applications 14 Nos submitted by The Ramco cements Limited
in the Districts of Ariyalur, Virudhunagar and Thoothukudi – plus in
addition Pudupalayam Limestone mine (45.285Ha), Adhanakurichi &
Manakudayan-Sendurai Taluk, Ariyalur (A Total of 15 mines of The
Ramco cements limited –Reg.
- Ref:** 1 M/s. The Ramco cements Limited letter dt 08.01.2024
2. G.O. (Ms). No. 142, Public Works (R2) Department, dt 23.07.2014.

It is informed that the Chief Engineer (SG&SWRDC) is the competent authority for issuing No Objection Certificate in Semi-Critical and Safe Firkas as per G.O. No.142, Public Works (R2) department, dated 23.07.2014. As such there is no provision for issuing No Objection Certificate for dewatering of Mining Projects in the above mentioned Government Order.

It is informed that, the applications will be kept in file in this office until further directions from the Government regarding issuance of NOC for dewatering in Mines. Hence, the same status-co has been maintained by the department.

Encl: Application details
enclosed in Annexure -I -1 No

Sd/- Er.S.Prabakaran /01.02.2024.
Chief Engineer, SG&SWRDC,
WRD, Tharamani, Chennai-113

For Chief Engineer, SG&SWRDC,
WRD, Tharamani, Chennai-113

112/2024

Mine Pits Dewatering – Proposed Scenario : The limestone mining area, which falls receives a mean annual rainfall of 1096 mm as recorded in the nearest rain gauge station at Ariyalur. Pre monsoon water level inside the mine is 45 m below ground level and post monsoon water level is at 40 m below ground level. The depth of Mine will be 92 m BGL at Conceptual Stage. However, as simultaneous Backfilling is being continued in the Pit, the actual mined out voids will be reduced. Accordingly, the Mine Pit seepage quantity is assessed as given in **Table 4.11**.

Table : 4.11 Estimation of Ground Water Seepage Quantity in Mine Pits

Working Bench RL, m	Void, sq.m	Backfilled Area, sq.m	Effective Void, sq.m	Working Level (BGL), m	Seepage Quantity, KLD
73 - 64	3,81,733	0	0	9	0
64 - 58	3,56,169	7,719	3,48,450	15	0
58 - 52	3,31,077	7,719	3,23,358	21	0
52 - 46	3,06,456	13,010	2,93,446	27	0
46 - 40	2,82,305	13,010	2,69,295	33	0
40 - 34	2,21,240	35,354	1,85,886	39	0
34 - 28	1,60,813	36,534	1,24,279	45	298.270
28 - 22	1,31,081	40,913	90,168	51	216.403
22 - 16	1,01,087	14,022	87,065	57	208.956
16 - 10	88,534	14,018	74,516	63	178.838
10 - 04	59,029	15,268	43,761	69	105.026
04 - (-2)	50,138	13,078	37,060	75	88.944
(-2) - (-8)	36,664	11,978	24,686	81	59.246
(-8) - (-14)	30,079	8,978	21,101	87	50.642
(-14)-(-19)	24,044	4,978	19,066	92	38.132
Total Seepage Realisation at 92 m BGL					1244.458

On Amalgamation of the Mine, about 1245 KLD mine pit seepage water realization will be there. It is about 65.12% increase to the existing discharge of 754 KLD. As in current practice, the pumped out water from Settling Tanks, after 20 KLD consumption for Mine use, will be utilised for Irrigation (Agricultural) activities in eastern side.

Radius of Influence : The hydrogeological parameters arrived for the top water table limestone aquifer from pumping test is : Transmissivity "T" - 2.39 m²/day. Permeability 'K' value has been derived from T value and thickness of Limestone Aquifer. In order to estimate the mine Seepage quantity the Darcy's flow equation is applied. As per Darcy Law Flow through a porous media is a product of Hydraulic gradient, Area of cross section and Hydraulic conductivity and is given by the equation :

$$Q = KIA$$

where K is the Hydraulic conductivity in m/day i.e., 0.04 m/day

I is the hydraulic gradient estimated at 0.01 from earlier studies

A is the area of cross section of the exposed aquifer ie., the perimeter of the mine pit x saturated water column

The estimated average seepages in the mine pit is around **1,245 KLD**. The zone of influence will be of the shape of an ellipsoidal or cylindrical shape unlike a circular shape in isotropic and homogeneous condition. Accordingly, Hudak's method suggest the following formule:

$$i) \quad V_C = Q (t) / \eta_e$$

$$ii) \quad A_C = V_C / b$$

$$iii) \quad R = (\sqrt{A_C / \pi}) + r_c$$

where,

Q = Rate of pumping from the mine in m³/day

t = time of continuous pumping in days

η_e = the effective fractured or secondary porosity,

b = saturated thickness of aquifer around the mine

r_c = the radius or equivalent radius of the mine pit in meters

V_C = Volume of the water pumped from the mine pit in m³

A_C = Area of zone influence in the aquifer in sq meters.

Based on these formulae the radius of influence for Periyagalur mines is estimated.

In the case of Periyagalur mine pumping the quantity of mine dewatering Q at peak is 1,245 KLD for about 300 days, 't' the effective porosity is assumed to be around 4.0% or 0.04; the saturated thickness (b) of the aquifer is 52 m. The mine dimensions of Periyagalur of bottom bench with sump is 19066 sq.m. The equivalent radius of the mine, therefore,

$$r_c^2 = (19066) / \pi, \text{ or } r_c = 77.9 \text{ m}$$

$$V_C = (Q \times t) / \eta_e = (1245 \times 300) / 0.04 = 9337500 \text{ m}^3$$

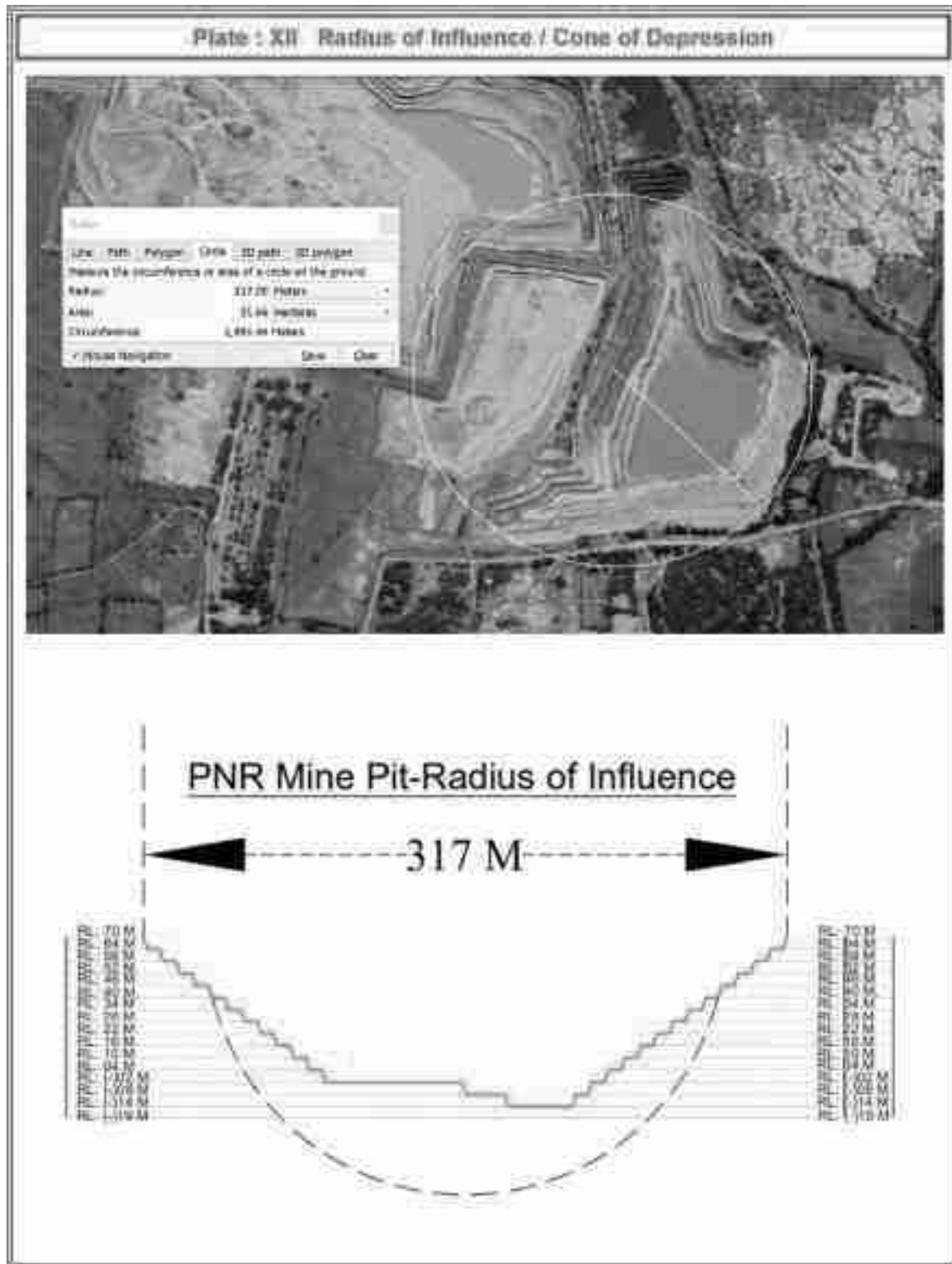
$$A_C = V_C / b = 9337500 / 52 = 179567 \text{ sq.m}$$

$$\text{And therefore } R = (\sqrt{A_C / \pi}) + r_c$$

$$= \sqrt{(179567 / 3.14)} + 77.9 = \sqrt{57187} + 77.9$$

$$= 239.1 + 77.9 = 317 \text{ m.}$$

Therefore, the **radius of zone of influence is 317 m which falls within the mining lease area (Plate-XII).**



When pumping is being done in mine pit, it is the actual quantity that is contributed from the aquifer surrounding the mine pit. Hence inflows into the mine equals the water pumped from the mine pit. As a result, the cone or zone of influence that is formed inside the pit within the saturated aquifer at the Conceptual Stage. Thus, mining even at the depth of 92 m BGL, there will not be having any influence on the nearby ground water structures in the vicinity.

The anticipated cone of depression in such aquifers with low T values will be highly localized, and does not spread beyond the Mine due to poor permeability of limestone aquifer.

Mitigating Measures Following Mitigating Measures are to be implemented :

- ❖ The increased Mine Pit Water has to be utilized gainfully by increasing the supply to nearby Villages for domestic consumption as well as to agricultural use as in the current practice.
- ❖ Mine Pit Water will be treated for TSS before discharging, in compliance with TNPCB Norms for On-land irrigation.
- ❖ Ground Water NOC for Dewatering has to be obtained from SGWB Authority.
- ❖ Effective Afforestation in Backfilled Areas is to be done.
- ❖ Garland drains and Settling Tanks are to be maintained and desilted periodically.
- ❖ The de-silted quantity from the Garland Drains has to be used for Green Belt/Afforestation.
- ❖ Periodical recording of Water Level from existing Piezometer at the Mine is to be continued.
- ❖ Ground Water Levels and Water Quality are to be periodically monitored at the identified Borewells & Dugwells in the Mine vicinity.
- ❖ The monitored data are to be periodically submitted to the IBM and with half-yearly Compliance Reports to the Regional Office, MoEF&CC, Chennai.

4.3.8 Ambient Air Quality

The Drilling & Blasting, Excavating, Loading, Unloading, Transporting and Rehandling activities would generate both fugitive dust emissions and smoke from Heavy Earth Moving (HEM) Machineries and Transporting Tippers. Fugitive emissions are predicted by using standard equations given in 'Indian Mine and Engineering Journal' and suggested by USEPA (Emission Factors as referred in AP-42) for Mining and Allied activities.

Quantification of particulate emissions from the Mine is computed by the Emission Factor Technique. Emission factor is a statistical average of the rate at which a pollutant is released during an activity. This factor when multiplied by the level of that activity in a given situation will give the overall effect.

The equations used for Inputs of various activities are as below :

Activity		Emission Factor
Drilling & Blastings	=	0.6 kg/hole
Excavation of Waste & Ore	=	23.6 kg/hr particulate matter for every 1,000 Tonnes per hour material handling
Ore & Waste transportation	=	0.2 kg/vehicle/km.

Accordingly, the computed values for various activities are given in **Table 4.12**.

Table : 4.12 Emission Levels-Inputs

Activity	PM Emissions- On Amalgamation, g/sec
Excavation	0.000002368
Drilling	0.005881591
Loading	0.000002910
Waste-Haulage	3.54237E-05
Ore transportation	3.5515E-05
Total	0.000595781

As site specific mixing heights were not available, mixing heights based on CPCB publication, "Spatial Distribution of Hourly Mixing Depth over Indian Region", PROBES/88/2002-03 has been considered (**Table 4.13**).

Table : 4.13 Maximum Mixing Height (meter) with Standard Deviation over Indian Region

Name of Station	Seasons					
	Winter		Pre-monsoon		Post-monsoon	
	Mixing Ht.	Std. Dev.	Mixing Ht.	Std. Dev.	Mixing Ht.	Std. Dev.
Chennai	1063.75	153.92	1274.45	111.79	1010.5	109.39

Prediction Modelling : AERMOD View Software is used for Predicting the maximum Ground Level Concentrations (GLCs) including **Transportation Impact**. Model Inputs and Outputs are appended. The predicted GLCs are given in **Table 4.14**. The predicted Ground Level Concentrations (GLCs) for PM10 are **superimposed on the baseline map (Fig. 4.1)** to arrive at the likely resultant concentrations due to the Proposal. Other pollutants SO₂ and NO_x emissions due to mining activities and their Predicted values are found to be low and are not reported.

The predicted maximum GLC-PM10 for cumulative operation of Mining activities is 0.062 ug/m³ and found to be confined locally i.e. within 1.0 km radius from the boundaries. Also, **adequate Buffer Level available (55.34%)** in the Air Environment for the Proposal.

Model Input

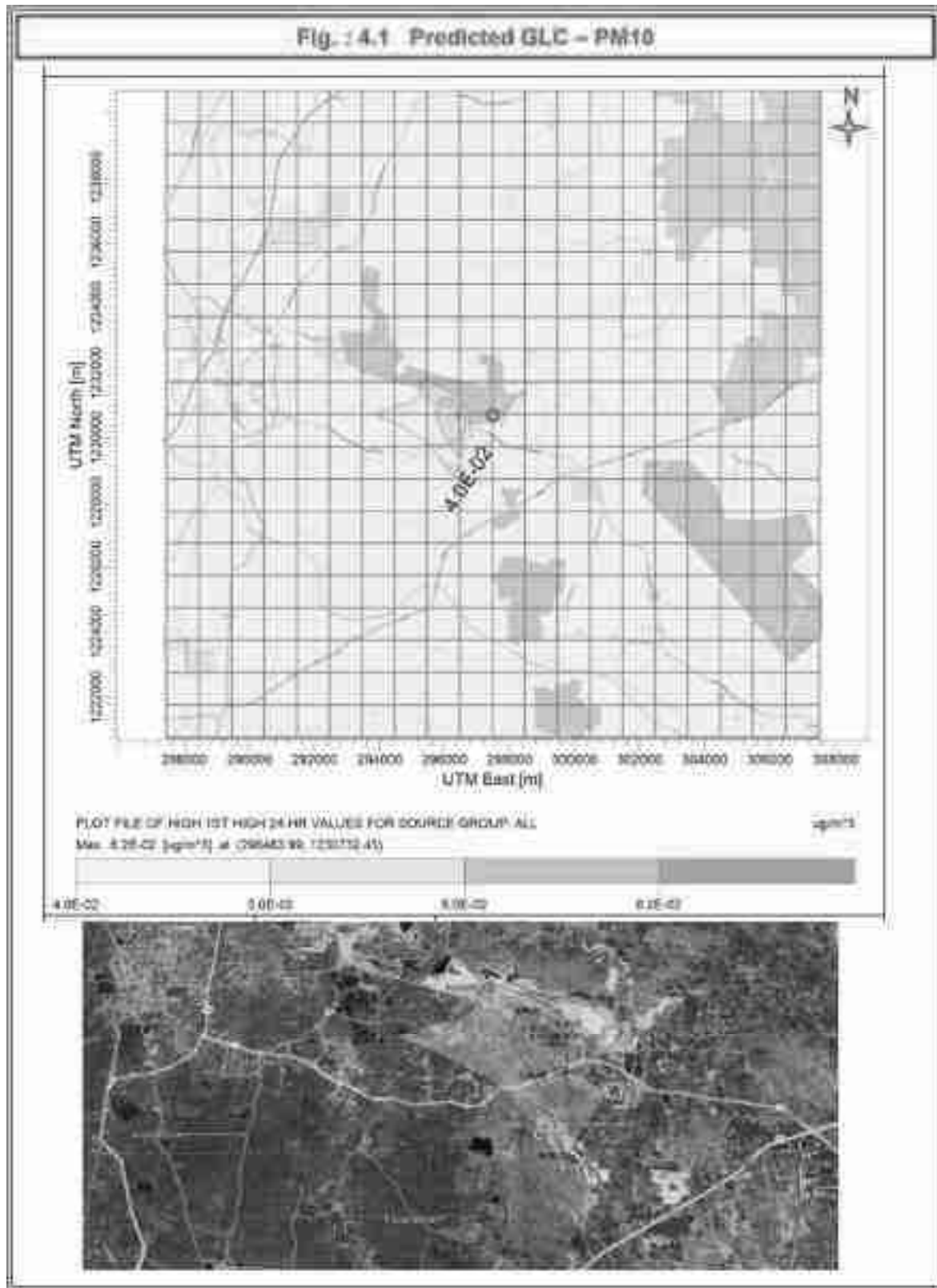
Source Pathway - Source Inputs										
Source Type	Area ID	A (Longitude -m)	A (Latitude -m)	Area Emission (kg/hr)	Release Height (m)	Screening Factor (m ⁻²)	Height of Stack (m)	Length of Tube (m)	Screening Alpha Factor (kg/m ³)	Total Release Rate (kg/hr)
WIND	1	79447.07	123076.26	0.06	41.00	0.0000	50.00	10.00	0.00	

Model Output

Results Summary									
PM10 Concentration - Source Group: ALL									
Averaging Method	Receptor	Peak	Units	X (m)	Y (m)	Z (m)	ZFLAG (m)	ZMEL (m)	Peak Date, Start Hour
24-HR	01T	0.06209	ugm ³	296403.09	1230732.45	00.00	0.00	00.00	19-02-2024, 24
24-HR	2ND	0.06162	ugm ³	296403.09	1230732.45	00.00	0.00	00.00	20-01-2024, 24
24-HR	3RD	0.06031	ugm ³	296403.09	1230732.45	00.00	0.00	00.00	17-01-2024, 24
24-HR	4TH	0.05525	ugm ³	296403.09	1230732.45	00.00	0.00	00.00	26-02-2024, 24
24-HR	5TH	0.06440	ugm ³	296403.09	1230732.45	00.00	0.00	00.00	24-01-2024, 24
24-HR	6TH	0.05200	ugm ³	296403.09	1230732.45	00.00	0.00	00.00	28-01-2024, 24
24-HR	7TH	0.05200	ugm ³	296403.09	1230732.45	00.00	0.00	00.00	24-02-2024, 24
24-HR	8TH	0.04890	ugm ³	296403.09	1230732.45	00.00	0.00	00.00	09-02-2024, 24
24-HR	9TH	0.03004	ugm ³	296403.09	1230732.45	00.00	0.00	00.00	22-01-2024, 24
24-HR	10TH	0.04890	ugm ³	296403.09	1230732.45	00.00	0.00	00.00	27-12-2023, 24
PERIOD		0.02896	ugm ³	296403.09	1230732.45	00.00	0.00	00.00	

Table : 4.14 Predicted GLCs

Sl. No.	Pollutant	Background Concentration (24-hly. Avg.), ug/m ³	Max. Predicted Ground Level Concentration, ug/m ³	Distance from the Plant (max.), km	Total Concentration, ug/m ³	Revised NAAQ Norms, ug/m ³	Buffer Available in the Atmosphere
1	PM10	44.6	0.062	0.1	44.662	100	55.338



Mitigating Measures : Non-conventional method of Mining is to be adopted preferably. Controlled Drilling & Blasting is being practiced whenever required. The following Mitigating Measures are to be followed/adopted to control the Fugitive Emissions :

- ❖ Periodical Water sprinkling on the mining areas, loading point, haul roads, etc. has to be carried out.
- ❖ Controlled Blasting is to be carried out and during day times only.
- ❖ No Blasting is carried out during overcast conditions.
- ❖ Covering of trucks/tippers with tarpaulin is to be done during the transportation.
- ❖ Over loading of Tippers is to be avoided to control the spillages on transportation.
- ❖ Periodical maintenance of mine equipments has to be carried out and replacement of worn out accessories has to be made..
- ❖ Tippers are to be maintained periodically.
- ❖ Periodical check up of vehicles for 'Emission Under Control' measures is to be ensured.
- ❖ Effective Green Belt with thick foliage has to be developed and maintained.
- ❖ Backfilled areas are to be reclaimed at the earliest and afforested.

4.3.9 Noise Levels

The mining operations are being carried out by fully mechanized method with the help of Excavators and Tipping Taurus combination. Blasting is being done with slurry explosives and ANFO and Non-Electric shock tubes are used for controlling ground vibration and noise level. The noise level due to Mining Equipments during operation, is being maintained at <90 db(A) at a distance of 1.5 m from the sources. The blast induced ground vibration is controlled & maintained within permissible limits by using milli second delay detonators (MSDD) and NONEL shock tubes. In general, noise generated by these sources is within the limit of 90 dB(A) prescribed by Director General of Mines Safety (DGMS), Dhanbad. The work force is exposed to <85 dB(A) levels during the 8-hours Shift.

Mitigating Measures : The noise and vibration generated due to the blasting operations can be kept well within the limits by using milli-second delay electric detonators and by using Non-electric initiation system of blasting which completely eliminates air-blasts and thus reduces noise due to blasting. Noise level at the nearest Lease boundary will be <55 dB(A) during day times and <45 dB(A) during night times and which will be within the MoEF&CC Norms for Residential and Rural Areas.

The monitored peak particle velocity (PPV) and noise levels during the blasting is periodically monitored through 'Minimate' Instrument and found to be well within the DGMS norms for Residential Areas. Records are being maintained as per statutory requirements and submitted to the Authorities periodically.

The following Mitigating Measures are suggested :

- ❖ Controlled Blasting is to be carried out and during day times only.
- ❖ No Blastings shall be carried out during night times and overcast conditions.
- ❖ Vibration Studies/Monitoring are to be carried out whenever Blastings are carried out.
- ❖ Vibration Parameters viz. Peak Particle Velocity (PPV) and Noise Levels during Blastings shall comply with DGMS Norms for Residential Areas.
- ❖ Deploying HEM equipments will be with in-built acoustic mechanism for reducing noise.
- ❖ Provision of silencers is to made to control the noise generated by the machines.
- ❖ Provision of ear muffs/ear plugs are to be provided the Workers in higher noise zones.
- ❖ Effective Green Belt with thick foliage has to be developed and maintained along roads and around lease boundary to act as acoustic barriers.

4.3.10 Biological Environment

There is no habitat fragmentation or blocking of migratory corridors due to Project activities since there is no wild life movement or migratory birds movement in the study area. Thus, there will not be any significant impact on the existing flora-fauna of the area. ML area is surrounded by Mines & Mineral bearing areas, barren lands and dry agricultural lands within 1.0 km area. As the baseline AAQ are in lower levels as well as Predicted GLC is very low/insignificant, there **will not be any impact on the surrounding dry agricultural lands** due to the Project.

Mitigating Measures :

- ❖ Effective Green Belt developed is to be maintained with good Survival Rate till Conceptual Stage.
- ❖ Backfilled Areas are to be Afforested with native species and maintained well, as proposed.
- ❖ Total Green Belt & Afforested Area will be **27.45 Ha with coverage of 51.48 %**.
- ❖ The desilted soil from Garland Drains maintenance may be used in Green Belt/Afforested Areas.

4.3.11 Socioeconomics

Action Plan for the Public Hearing (PH) conducted for PNRW Mine on 21.09.2016 **has been completed** in compliance with MoEF&CC OM F No 22-6512017-IA.III dated 30.09.2020 & 20.10.2020. A budget of Rs.10.00 Lakhs was spent in addressing the PH issues. Also, an amount of Rs.2,00,000/- was remitted to the Executive Director, Kalakad–Mundanthurai Tiger Conservation Fund (KMTCF) under CSR Budget for the Mine. The Project Cost is **Rs.9.00 Crores**. Now, about **Rs.21.00 Lakhs** has been allotted as **Corporate Environmental Responsibility (CER) Budget** in compliance with MoEF&CC OM dated 01.05.2018 for execution within 2 years period (**Table 4.15**).

Table : 4.15 CER Budget

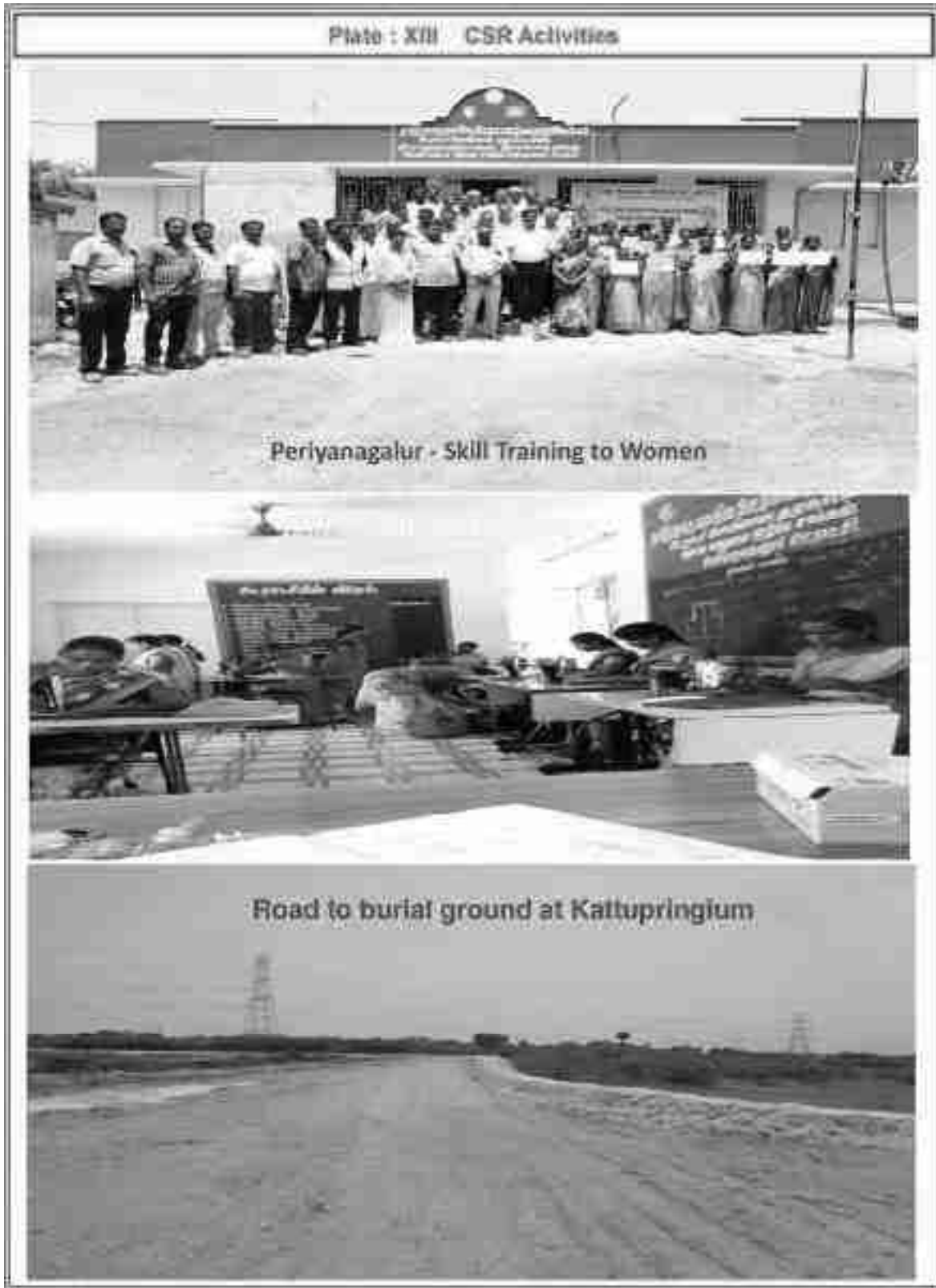
Name of the Village	Particulars	CER Amount
Periyagalur Village	(i) Upliftment of surrounding Government schools - Rs. 10.00 Lakhs (ii) Construction of individual smart toilet - Rs. 9.00 Lakhs. (iii) Skill development, Training of village women for self employment - Rs. 2.00 lakhs	Rs.21.00 Lakhs

RCL is undertaking various CSR activities, @ **Rs.1.00 Crore per annum**, related to health, education, drinking water supply, sanitation, bio-toilets for individual household, infrastructure development activities, construction of bus shelters, road repair work, building class rooms, etc. for the nearby villages (**Plates XIII & XIV**). RCL is submitting the CSR measures carried out to IRO, MoEF&CC in the Six-monthly compliance status report. Allotted funds will not be diverted for any other purpose.

Mitigating Measures :

Based on the CSR Committee and declared CSR Policy of the Company, the following CSR activities will be covered now :

- ❖ Eradicating extreme hunger and poverty.
- ❖ Promotion of education & vocational skills.
- ❖ Ensuring environmental sustainability.
- ❖ Contribution to the Prime Minister's National Relief Fund or any other fund set up by the Central Government or the State Governments for socioeconomic development and relief.
- ❖ CSR activities shall be carried out by providing social and welfare measures for the local residents and nearby villages around the mine area.
- ❖ The prime focus will be on the creating and maintaining of drinking water facilities for the students at the nearby Government Schools, establishing toilets especially for girl students at the schools, setting up of computer centres, maintenance of village roads & ponds, providing solar street lights, conducting free medical camps, etc.
- ❖ As per MMDR Act 2015, 30% of Royalty Amount of **Rs.38.04 Crores will be earmarked for District Mineral Foundation (DMF)** and the amount will be spent for benefit of local villages.
- ❖ Project employs about 33 persons directly and 50 persons indirectly.





4.3.12 Occupational Health

Anticipated impacts : RCL is committed to provide a Safety & Healthy working conditions. RCL's objectives are : to achieve zero accident and safe work environment. The First Aid Box is made available for immediate treatment. First Aid Training is imparted to the selected employees regularly. Personal Protective Equipment (PPEs) are provided for all employees working in the Mines. Adequate training on safety and health aspect has been provided in RCL's Vocational Training Centre. RCL is also providing the ergonomic support in work comfortness with periodical review.

An Occupational Health Centre (OHC), headed by Occupational Health Physician, is run by the Company at Govindapuram Plant. Occupational Health Surveillance Programme is being conducted for the workers periodically and records are maintained. Adequate care is exercised to detect early incidences of Occupational diseases, if any, for prompt treatment and cure.

Mitigating Measures : The following Mitigating Measures are proposed :

Occupational Health Surveillance Programme is to be carried out for all the Mine Employees periodically with the following tests:

- Lung function test
- ECG
- Chest X-ray
- Blood analysis test
- Urine analysis test
- Audiometry
- Checking colour blindness
- Stool Analysis
- Sputum (Optional).

- ❖ All employees are to undergo Medical Check-up on recruitment and periodically during employment.
- ❖ Maintenance of Pre, during & Post Employment Records are to be kept for periodical review.
- ❖ Standard operating procedures for all operations w.r.t occupational safety are to be in place.
- ❖ Required Personal Protective Equipments for the Mine employees are to be provided.
- ❖ Provision of ergonomically designed seats for drivers/operators has to be ensured.
- ❖ Provision of **illumination facilities** are to be made at proper places of mines for ease of working during night times.
- ❖ Work comfort and its periodic review by a Committee is to be ensured.
- ❖ Provision of Rest Shelters at Mines has to be made.
- ❖ Provision of cool drinking water to employees has to be made.

5.0 Analysis of Alternatives (Technology & Site)

5.1 Technology

- ❖ The mining operation is carried out by adopting both conventional mining method involving deephole blasting techniques and non- conventional mining method using X-centric Rippers.
- ❖ The mining operations are being carried out by fully mechanized method with the help of Excavators and Tipping Taurus combination.
- ❖ Blasting is being done with slurry explosives and ANFO and Non-Electric shock tubes are used for controlling ground vibration and noise level.
- ❖ Mine development including mine planning is being practiced in the mines and will be continued in future also.
- ❖ The blast induced ground vibration is controlled & maintained within permissible limits by using milli second delay detonators (MSDD) and NONEL shock tubes.
- ❖ At Conceptual stage. it is proposed to utilise part of the Mine Pit to harvest the rain water so as to recharge the ground water-table.

5.2 Alternative Sites Considered

This is an existing Mineral bearing area and Mineral deposits are site specific. Thus, site selection criteria is not required.

6.0 Environmental Monitoring Programme

6.1 Environment Cell and Compliances

RCL has **EMP Monitoring Cell**. The quality of air, noise, water, soil, etc. are being monitored at the identified locations as per MoEF&CC, IBM & TNPCB Norms by appointing an accredited external agency.

6.2 Post Project Monitoring

For the Lease, periodical monitoring of Ambient Air Quality (3 locations), Fugitive emissions/Workzone Air Quality (4 locations), Ambient & Workzone Noise Levels (4 locations), Water (4 Surface & 4 Ground waters along with Mine Pit water) and Soil Quality (3 Locations) shall be undertaken and reported to Authorities. The monitoring details are given in **Table 6.1**.

Table : 6.1 Post Project Monitoring Schedule

	Environmental Component				
	Ambient Air Quality	Fugitive Emissions	Noise Levels & PPV	Water Quality	Soil Quality
No. of Locations	3 (in & around Mine-Upwind & Downwind directions)	4 (Excavation area, Loading Area, Haul Road & Pit Edge)	Ambient-3 Workzones-4	Surface waters-4 Ground waters-4 Mine Pit water-1	3
Frequency	24-hourly once in fortnight continuously for whole year	Two 8-hourly samples, once in a week for 2 weeks in a Season	Once in a month Vibration Survey during Blastings	Surface & Ground Waters-Once in a Season Mine Pit water-Monthly once	Once in a Season
No. of Samples	72	64	84	32+ 12	12
Parameters	All 12 Parameters	PM10, SPM, SO ₂ , NO _x & CO	Day & Night Leq Noise levels dB(A)	Physico-chemical & Trace Metals	Physico-chemical & Nutrients
Norms to be Complied	NAAQ Norms	IBM Norms for Limestone Mine	MoEF&CC and DGMS Norms	CPCB/ IS:10500 & TNPCB Norms	Soil Fertility
Budget Allotted	Rs.3,60,000	Rs.3,20,000	Rs.42,000	Rs.1,14,000	Rs.36,000

About **Rs.8.72 Lakhs/annum** will be allotted for the Monitoring Works. The periodical reports shall be submitted to TNPCB monthly, IBM Quarterly and MoEF&CC Monitoring Cell & SEIAA as Half Yearly Status Reports.

6.3 Current Post Project Monitoring Data

In consultation with PCB, Ambient air quality is periodically monitored through a NABL Lab at 3 locations in the Mine and 6 locations in the buffer zone, thus total 9 locations, as per the Land Use pattern and environmentally sensitive targets. Periodical reports are submitted to TNPCB on monthly basis, IBM on quarterly basis and IRO on six monthly basis.

Both Ambient & Work zone Noise levels are monitored periodically and submitting the status reports to the Authorities. Vibration levels are monitored with Minimate instruments whenever blastings are done and records are maintained as per DGMS requirement.

Both Surface & Ground water quality are monitored at each 3 locations on quarterly basis and submitting the Reports to the Authorities as Six monthly compliance.

Garland Drains are provided all along periphery of overburden dumps with dimension of 1500 (L) x 2 (W) x 2 m (D). **Recharge cum Settling Pond** of 100 (L) x 50 (W) x 2 m (D) is made in the eastern side of the Lease area to collect the surface runoffs through garland drains. Water collected in the settling pond is utilized for green belt and dust control measures. Excess water is drained to nearby irrigation pond for raising agricultural crops in nearby areas. Garland drains are also provided for working mine pit of size 700 (L) x 2 (W) x 2 (D). Garland drains are connected to the sedimentation tanks of 3 (L) x 3 (W) x 2 m (D) at the corners to settle the solids before final disposal. Periodical desilting of garland drains and sedimentation tanks is made.

There is no trade effluent generation from the mine. **Mine Pit water quality from Recharge cum Settling Pond is periodically monitored and found to be in compliance with TNPCB Norms for On-land irrigation.**

Periodical monitoring of ground water level is carried out 3 locations on quarterly basis in addition to the piezometer readings recorded in the Mine. Periodical water level data are submitted to IBM on quarterly basis and IRO & SGWB on six monthly basis.

Soil quality monitoring is carried out 2 locations and reports submitted to the Authorities on quarterly basis.

All the vehicles used in the mine are on contract basis and servicing is being done in their own places. 'Pollution Under Control' Certificates are checked periodically. It is ensured that transport vehicles are covered with tarpaulin and are not overloaded.

The recent survey Reports by third part accredited Lab as well as TNPCB Lab are appended. TNPCB is not monitoring the WQ of the mine pit.



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ISSUED TO: TEST REPORT

**The Ramco Cement Limited,
Periyanaгалur Limestone Mines,
Ariyalur District.**

Report Number	Ram71/2023/13/1346		
Sample Drawn by	ABC Techno Labs India Private Limited		
Sample Description	Ambient Air Quality Status during First Half Yearly - April-September 2023		
Sampling Method	IS:1802 Part 3 & 4		

Sl. No.	Pollutant	Unit	Number of Exceeding EPD Level during Period					
			PM2.5 ISCN Annual Mean	PM10 ISCN Part 2	SO ₂ ISCN Part 2	NO _x ISCN Part 2	O ₃ ISCN Part 3	CO ISCN Part 2
Over Limit								
1	Waste Odor	Range	12-20	10-17	0-0	0-13	Nil*	Nil**
		Mean	16.7	16.3	0.0	11.3	Nil*	Nil**
2	H2S	Range	20-27	10-17	0-0	0-13	Nil*	Nil**
		Mean	23.5	17.0	0.0	11.3	Nil*	Nil**
4	Smoking Area	Range	27-43	10-17	0-0	0-13	Nil*	Nil**
		Mean	33.8	17.0	0.0	11.3	Nil*	Nil**
Under Limit								
1	Vapour Density	Range	19-20	17-18	0-0	0-13	Nil*	Nil**
		Mean	19.0	17.5	0.0	11.3	Nil*	Nil**
2	pH	Range	16-20	17-18	0-0	0-13	Nil*	Nil**
		Mean	18.0	17.5	0.0	11.3	Nil*	Nil**
4	Particulate Matter	Range	22-28	17-18	0-0	0-13	Nil*	Nil**
		Mean	25.0	17.5	0.0	11.3	Nil*	Nil**
5	Yield Acidity	Range	16-24	17-18	0-0	0-13	Nil*	Nil**
		Mean	20.0	17.5	0.0	11.3	Nil*	Nil**
6	Kalamukhi	Range	16-24	17-18	0-0	0-13	Nil*	Nil**
		Mean	20.0	17.5	0.0	11.3	Nil*	Nil**
1	Range in the vicinity		15-41	27-28	0-13	0-13	Nil*	Nil**
II	Average for Quality Status in the vicinity		23.3	16.8	0.0	11.3	Nil*	Nil**
III	WAQI Range* (IS:1802)		101	100	90	90	100	1.0

* The Standard Limit Value for Ambient Air Quality specified by CPCB for Limestone & Cement Works in Industrial Area.

S. Dharami
Quality Manager



And of Ramco




A. Robben Chinnadurai
Technical Manager - Lab

Verified by: _____


Addressed signature: _____

Notes and conditions:
This report is valid for the period specified in the test report. The data and results are for information only and do not constitute a guarantee or warranty of any kind. The user should refer to the relevant standards and specifications for the interpretation and use of the data. The user should also refer to the relevant standards and specifications for the interpretation and use of the data.



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JANUARY 2023 | 100% ISO 9001 & ISO 17025 CERTIFIED COMPANY

ACCREDITED BY NABL No. EC-0172, TAMIL NADU, INDIA (Reference No. 22070020040001000000) For Environmental

#1949279**TEST REPORT**

The Ramco Cement Limited,
Periyanganur Limestone Mines,
Ariyalur District.

Report Number	: ABC11/2023/08/09799
Sample Drawn by	: ABC Techno Labs India Private Limited
Sample Description	: Noise Levels - Quarter III, 2023
Date of Sampling	: 16.08.2023 to 17.08.2023
Date of Receipt	: 18.08.2023
Report Date	: 22.09.2023


PAGE 1 OF 1

Sl. No.	Location	Noise Levels, (dB(A))					
		Day Time (06:00-22:00 hrs.)			Night Time (22:00-06:00 hrs.)		
		Leq	Lmax	L90	L90	Lmax	L90
1	Quarry Site	55.4	85.6	47.2	31.2	59.2	43.2
2	Loading Area	71.6	96.3	49.3	33.7	61.9	45.4
3	Crusher Road	53.7	85.4	41.8	33.9	59.2	42.3
4	PHR Crusher	72.9	94.2	42.7	32.5	61.0	40.8
Statutory limit* for 8 hrs. Exposure				85			65
Buffer Zone							
5	Periyanganur	72.8	92.9	43.6	33.9	60.5	38.9
6	V. Zakkath	74.3	94.7	52.7	33.4	60.8	43.8
7	Kannayyanpattinam	72.3	92.9	42.9	31.2	59.7	38.3
NoiF Noise**				85			65


Sampling & Test Method: IS: 9999-1991 (Reaff: 2014)


* IS 9999-1991: Bureau of Indian Standards, Ministry of Earthquake, Disaster & Climate Change, Central Building Research Institute, New Delhi (IS) for Residential Areas.
Day time is defined as between 6 a.m. and 10 p.m. and Night time is defined as between 10 p.m. and 6 a.m.
** A warning limit of 85 dB(A) may be set at the limit before which very little risk is expected w.r.t hearing impairment when for an eight hour exposure.

End of Report



S. Dharam
Quality Manager





A. Arshad Chinnadurai
Technical Manager - Lab

Verified by: _____ Authorized signatory: _____

Work and conditions



ABC Techno Labs India Private Limited

(ISO 9001:2001, ISO 14001:2004 & ISO 13528 Certified Company)
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TEST REPORT

The Ramco Cement Limited,
Periyanganal Limestone Mines,
Ariyalur District.

Report Number	: ABCTL/2023/08/00018
Sample Drawn by	: ABC Techno Labs India Private Limited
Sample Description	: Ground Water Levels - Quarter III, 2023
Date of Sampling	: 18.08.2023
Date of Receipt	: 19.08.2023
Report Date	: 12.09.2023

Page 1 of 1

Sl No.	Description	Water Level Measured at (Mg ^m)		
		Naraseli, Periyanganal	Naraseli, P&S Mine Area	Saraseli, Periyanganal
I	Monitoring Well Code	GW1	GW2	GW3
II	Well Depth, m	65	90	70
1	Quarter I/2023 (18.02.2023)	93	14.8	13
2	Quarter II/2023 (18.04.2023)	15.1	6.2	4.2
3	Quarter III/2023 (18.08.2023)	11.9	17.4	18

1 mg^m = Below ground level

— End of Report —



S. Dharami
Quality Manager



A. Robin Chinnadurai
Technical Manager - Lab

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ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 Certified Company
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HR/2023

TEST REPORT

The Ramco Cement Limited,
 Periyanganalur Limestone Mines,
 Ariyalur District.

Report Number	HR/23/2023/04/00001/00001		
Sample Brand/No	ABC Techno Labs India Private Limited		
Sample Description	Surface Water Quality (per IS 3025) (In accordance with ISM (env) (e) Sec 3(1)(c))		
Date of Sampling	18.08.2023	Date of Completion	01.09.2023
Date of Receipt	19.08.2023	Report Date	12.09.2023
Date of Analysis	21.09.2023	Page No	1 of 2

S.No	Parameter	SI Unit	Obs	SI Unit	IS:3025	IS:3025	IS:3025
1	pH	-	7.85	-	6.5-8.5	-	-
2	Colour	PCU	15	PCU	15	-	-
3	Temperature	°C	27.2	°C	26.5	-	-
4	Turbidity	NTU	1.3	NTU	1.3	-	-
5	Dissolved Oxygen	mg/l	8.14(20.2)	mg/l	8.14(20.2)	-	-
6	Dissolved Oxygen	mg/l	8.8	mg/l	8.8	4.0-6.0	-
7	Total Suspended Solids	mg/l	22	mg/l	22	-	-
8	Calcium Carbonate	mg/l	102	mg/l	102	-	-
9	Total Dissolved Solids	mg/l	435	mg/l	435	500-750	-
10	Total Hardness (as CaCO ₃)	mg/l	232	mg/l	232	-	-
11	Calcium Hardness (as CaCO ₃)	mg/l	133	mg/l	133	-	-
12	Magnesium Hardness (as CaCO ₃)	mg/l	99	mg/l	99	-	-
13	Chloride (as Cl ⁻)	mg/l	44	mg/l	44	-	-
14	Nitrate (as NO ₃ ⁻)	mg/l	18	mg/l	18	-	-
15	Sulfate (as SO ₄ ²⁻)	mg/l	24	mg/l	24	-	-
16	Perchlorate (as ClO ₄ ⁻)	mg/l	2	mg/l	2	-	-
17	Chloride (as Cl ⁻)	mg/l	139	mg/l	139	100-400	-
18	Sulfate (as SO ₄ ²⁻)	mg/l	11	mg/l	11	400-1200	-
19	Total Alkalinity (as CaCO ₃)	mg/l	109	mg/l	109	-	-
20	Hardness (as CaCO ₃)	mg/l	204(19.2)	mg/l	204(19.2)	150-200	4.5
21	CO ₂	mg/l	11	mg/l	11	-	-
22	Iron (as Fe)	mg/l	0.18	mg/l	0.18	0.3-0.8	-
23	Fluoride (as F ⁻)	mg/l	0.87	mg/l	0.87	1.5	-
24	Arsenic (as As)	mg/l	0.02	mg/l	0.02	0.05	0.05
25	Phosphate (as PO ₄ ³⁻)	mg/l	0.02	mg/l	0.02	-	-

S. Utharasi
 Quality Manager



R. Robert Christadurai
 Technical Manager - Lab

Verified by

Authorized Signatory

Notes and conditions:
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 3. The laboratory is not responsible for the accuracy of the data provided. The laboratory is not responsible for the accuracy of the data provided.
 4. The laboratory is not responsible for the accuracy of the data provided. The laboratory is not responsible for the accuracy of the data provided.

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ISSUED TO:

153/10247

The Ramco Cement Limited,
Periyannagalur Limestone Mines,
Ariyalur District.

Report Number	ABC/TS/2023/LIME/00001-00001		
Sample Provided by	ABC Techno Labs India Private Limited		
Sample Description	Surface Water Quality - Quamir 01, 2023 (In accordance with ISM (Contract No. 2/14)		
Date of Sampling	18.08.2023	Date of Completion	04.09.2023
Date of Receipt	19.08.2023	Report Date	11.09.2023
Date of Analysis	21.08.2023	Page No.	2 of 2

S.No.	Parameters	IS:10219 No/10	Unit	Obs. Val	Lab. Error	Permissible Limit	CPD Status*
26	Oxygen (dissolved)	17	mg/l	<0.01	<0.01	<0.01	-
27	Total Hardness (CaCO ₃)	43	mg/l	<0.01	<0.01	<0.01	-
28	Manganese (as Mn)	54	mg/l	<0.01	<0.01	<0.01	-
29	Chloride (as Cl)	53	mg/l	19.13	<0.01	<0.01	-
30	Copper (as Cu)	12	mg/l	<0.01	<0.01	<0.01	1.0
31	Selenium (as Se)	36	mg/l	<0.01	<0.01	<0.01	-
32	Fluoride (as F)	33	mg/l	<0.01	<0.01	<0.01	-
33	Calcium (Ca)	41	mg/l	22.15	<0.01	<0.01	-
34	Alumina (as Al)	21	mg/l	<0.01	<0.01	<0.01	0.05-0.2
35	Iron (as Fe)	57	mg/l	<0.01	<0.01	<0.01	2
36	Mercury (as Hg)	48	mg/l	<0.01	<0.01	<0.01	-
37	Lead (as Pb)	67	mg/l	<0.01	<0.01	<0.01	0.1
38	Zinc (as Zn)	45	mg/l	<0.01	<0.01	<0.01	1.5-15
39	Total Coliforms	15.122	MPN/100 ml	56	50	56	50-1000
40	Fecal coliforms	15.122	MPN/100 ml	21	20	21	56
41	E. coli	15.122	MPN/100 ml	07	10	09	-

* : CPD Status - Control Pollution Control Board, Chennai for Surface Water, WC/254 (MCT) (Contract 2/14) issued for four States for all River systems. For details visit: www.cpcb.gov.in

---End of Report---

S. Bharani
S. Bharani
Quality Manager



J. M. Kishore Mohan
J. M. Kishore Mohan
Head - Microbiology

A. Ramesh Chinnadurai
A. Ramesh Chinnadurai
Technical Manager - Lab

Verified by

Authorized signatory

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 Approved by NABL (Lab No. 2342) and ISO 14001:2015 Certified by NABL (Lab No. 41204) and ISO 45001:2018 Certified by NABL (Lab No. 41204)

REGARD TO:

TEST REPORT

The Ramco Cement Limited,
 Periyannagalur Limestone Mines,
 Ariyalur District.

Report Number	ABC/TL/2023/06/29816-09819		
Sample Drawn by	ABC Techno Labs India Private Limited		
Sample Description	Ground Water Quality - Quarter II, 2023 (In compliance with GSI Order No. 3/92)		
Date of Sampling	10.08.2023	Date of Completion	04.09.2023
Date of Receipt	09.08.2023	Report Date	12.09.2023
Date of Analysis	25.08.2023	Page No.	1 of 2

Sl. No.	Parameter	RLMCL & Units	Obs.	Observed Value				SI (SI) (SI) (SI)
				Actual	Permissible	Standard	Observed	
1	pH	6.5	7.5	7.5	7.5	7.5	1.0	65-85
2	Colour	5	None Detr	800/1.0	800/1.0	800/1.0	800/1.0	6/10°
3	Temperature	30 °C	27.5	27.5	27.5	27.5	27.5	-
4	Turbidity	10 NTU	1.2	1.2	1.2	1.2	1.2	1/10
5	Total Hardness	500 mg/l CaCO ₃	340	340	340	340	340	68/500
6	Dissolved Oxygen	5 mg/l	6.5	6.5	6.5	6.5	6.5	-
7	Total Suspended Solids	5 mg/l	17	17	17	17	17	-
8	Total Chloride	250 mg/l Cl ⁻	40	40	40	40	40	-
9	Total Dissolved Solids	500 mg/l	440	440	440	440	440	88/500
10	Total Phosphate (as PO ₄ -P)	0.1 mg/l	0.03	0.03	0.03	0.03	0.03	0.03/0.10
11	Calcium Hardness (as CaCO ₃)	200 mg/l	110	110	110	110	110	-
12	Magnesium Hardness (as CaCO ₃)	200 mg/l	230	230	230	230	230	-
13	Chloride (as Cl ⁻)	400 mg/l	64	64	64	64	64	16/400
14	Magnesium (as Mg)	40 mg/l	26	26	26	26	26	26/40
15	Sulfate (as SO ₄)	400 mg/l	22	22	22	22	22	-
16	Iron (as Fe)	0.3 mg/l	0.1	0.1	0.1	0.1	0.1	-
17	Zinc (as Zn)	0.05 mg/l	0.03	0.03	0.03	0.03	0.03	0.03/0.05
18	Nitrate (as NO ₃)	45 mg/l	22	22	22	22	22	22/45
19	Total Alkalinity (as CaCO ₃)	200 mg/l	190	190	190	190	190	190/200
20	SDS / Soap Residue %	60 mg/l	0.02	0.02	0.02	0.02	0.02	-
21	DO	5 mg/l	6	6	6	6	6	-
22	Iron (as Fe)	0.3 mg/l	0.12	0.12	0.12	0.12	0.12	0.3
23	Fluoride (as F ⁻)	1 mg/l	0.21	0.21	0.21	0.21	0.21	0.2/1.0
24	Nitrate (as NO ₃)	45 mg/l	22	22	22	22	22	45
25	Phosphate (as PO ₄)	1 mg/l	0.03	0.03	0.03	0.03	0.03	-

S. Bharani
Quality Manager



[Signature]
Technical Manager - Lab

Witnessed by

Customer Signature

Terms and conditions:
 1. The laboratory shall not be responsible for the accuracy of the results if the sample is not properly preserved or if the sample is not properly labeled.
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REPORT NO:

TEST REPORT

The Ramco Cement Limited,
 Periyanganal Limestone Mines,
 Ariyalur District.

Report Number	ABC71/2021/DR/0016-0014		
Sample Drawn by	ABC Techno Labs India Private Limited		
Sample Description	Ground Water Quality (Bore Well, BW) - (In compliance with IS 4725)		
Date of Sampling	19.08.2021	Date of Completion	04.09.2021
Date of Receipt	19.08.2021	Report Date	12.09.2021
Date of Analysis	23.08.2021	Page No.	2 of 2

Sl.No.	Parameters	IS 4725 Part	Unit	Result, PPM	Result, PPM	Result, PPM	Result, PPM	Result, PPM	IS 4725 Part
20	Calcium (as Ca)	27	mg/l	100.0	100.0	100.0	100.0	100.0	200
21	Magnesium (as Mg)	43	mg/l	10.0	10.0	10.0	10.0	10.0	100.0
22	Manganese (as Mn)	59	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.1/0.2
23	Chloride (as Cl)	57	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	255
24	Copper (as Cu)	42	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.05/0.1
25	Selenium (as Se)	56	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
26	Aluminium (as Al)	55	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.01/0.2
27	Calcium (as Ca)	41	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.001
28	Arsenic (as As)	37	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.01/0.05
29	Barium (as Ba)	57	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.1/1.0
30	Mercury (as Hg)	40	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
31	Lead (as Pb)	47	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
32	Zinc (as Zn)	49	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.1/1
33	Total coliforms	IS 4725	NPN/100 ml	<2	<2	<2	<2	<2	None
34	Fecal coliforms	IS 4725	NPN/100 ml	<2	<2	<2	<2	<2	None
35	E. coli	IS 4725	NPN/100 ml	<1	<1	<1	<1	<1	None

* IS 4725:2012 Drinking Water Specifications - Requirements/Threshold Limit for the detection of various metals
 Unit: $1 \mu\text{g/l}$ for 100 ml of water

---End of Report---

S. Dharam
 Quality Manager



Dr. M. Krishna Murthy
 Head - Microbiology

A. Robson Chinnadurai
 Technical Manager - Lab

Initiated by

Submitted Signature

ABC Techno Labs India Private Limited is a ISO 9001:2015 Certified Company & ISO 17025 Certified Laboratory. Accredited by NABL (No. 10703) under ISO/IEC 17025:2005 for Chemical Analysis. The laboratory is established and operated in compliance with the requirements of ISO 9001:2015 and ISO 17025:2005. The laboratory is committed to providing accurate and reliable test results to our customers. For more information, please contact us at lab@abcindia.com or www.abcindia.com.

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Accredited by NABL with TC-2770, NABL / QC, Approved by TSMU, Recognized by IAF/ISO/IEC 17025, APSCA, IOPEPC, Test Report India

ISSUED TO: **TEST REPORT**

The Ramco Cement Limited,
Periyannagalur Limestone Mines,
Ariyalur District.

Customer Provided Details					
Sample Name:	Mine Pit Water/Discharge	Customer Ref:	As per PO		
Seal if Any:	Nil	Marks on Sample:	Nil		
Lab Provided Details					
Report Number:	ABCTL/2310/0137/909	Date of Receipt:	16.10.2023	Analysis Commenced:	17.10.2023
Analysis Completed:	21.10.2023	Sample Condition:	Good	Sample Qty:	2 Liters
Report Date:	06.11.2023	Sample Drawn by:	Laboratory	Date of Sampling:	14.10.2023
Location of Sampling:	ETP	Sampling Method:	IS:3025 - Part 1 & ABCTL/SOP/MS/001		

Sl. No.	Test Parameters	Test Procedure	Unit	Results	TNPCR Norms*
1	pH at 25°C	IS:3025 Part 12-1983 (Reaff:2017)	-	7.58	5.5-9
2	Total Suspended Solids	IS:3025 Part 17-1984 (Reaff:2021)	mg/l	28	90
3	Total Dissolved Solids	IS:3025 Part 16-1984 (Reaff:2017)	mg/l	510	1000
4	Chlorides (as Cl)	IS:3025 Part 32-1988 (Reaff:2019)	mg/l	170	1800
5	Sulphates (as SO ₄)	IS:3025 Part 24-1986 (Reaff:2019)	mg/l	49	1000
6	BOD: 3 days @ 27°C	IS:3025 Part 44-1993 (Reaff:2019)	mg/l	BDL(+2)	30
7	COD	IS:3025 Part 56-2006 (Reaff:2017)	mg/l	14	200
8	Oil & Grease	IS:3025 Part 79-1991 (Reaff:2007)	mg/l	BDL(+4)	10
9	Iron (as Fe)	IS:3025 Part 53-2003 (Reaff:2009)	mg/l	0.33	0.3-1.0
10	Fluorides (as F)	IS:3025 Part 60-2008 (Reaff:2013)	mg/l	0.23	2.0

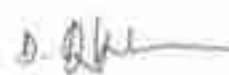
* : TNPCR Norms/Tamil Nadu Pollution Control Board Norms stipulated for discharge of treated effluent into natural water bodies. BDL- Below Detection Limit, DL- Detection Limit.

—End of Report—



K. Dharmu
Quality Manager





A. Robson Chinnadurai
Technical Manager - Lab

Verified by: _____

Authorized Signatory: _____

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ISI - 6708

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REPORT NO: ABC/11/2021/08/09613-20264

The Ramco Cements Limited,
Periyaragalur Limestone Mines,
Ariyalur District.

Report Number	ABC/11/2021/08/09613-20264		
Sample Drawn by	ABC Techno Labs India Private Limited		
Sample Description	Soil (Quality) - Quarter No. 0013 - On land/for use with ISIR Contract No. J/92		
Date of Sampling	18.08.2021	Date of Completion	24.09.2021
Date of Receipt	19.08.2021	Report Date	27.09.2021
Date of Analysis	21.08.2021	Page No.	1 of 1

Sl. No.	Parameters	Method (IS)	Unit	Grav. Wet, 100g Office	HR Range	Sample Range*
1	pH @25°C	2720-Part 24	-	7.60	7.00	5.0-10.0
2	Electrical Conductivity	14767	µmhos/cm	1.20	1.74	0.2-6.2
3	Natural Moisture Content	2720-Part 2	%	21.6	9.1	-
4	Organic Carbon	2720-Part 4.2	%	0.90	0.05	0-1.0
5	Nitrogen	1480a	%	0.011	0.011	0.004-0.02
6	Phosphorus	682 Chapter 2	%	0.009	0.000	0.001-0.009
7	Potassium (as K)	682 Chapter 2	%	0.012	0.000	0-0.01
8	Sulfur (as S)	242 Chapter 2	ppm	40	0	-
9	Cadmium (as Cd)	242 Chapter 2	ppm	05	100	-
10	Mercury (as Hg)	242 Chapter 2	ppm	00	00	-
11	Chloride (as Cl)	242 Chapter 2 (as per IS 1470)	ppm	100	200	-
12	Zinc (as Zn)	2720-Part 4.7	ppm	100	100	-
13	Cation Exchange Capacity	2720-Part 24	meq-100g	11.1	20.6	0-30
14	Bulk Density	682 Chapter 3	g/cm ³	1.20	1.23	-
15	Available Water Storage Capacity	242 Chapter 2 (as per IS 1470)	%	0.00	22.4	-
16	Soil Moisture Holding Capacity	242 Chapter 2 (as per IS 1470)	%	1.15	1.01	0.5

* Desirable Range for High Productive Soil.

End of Report

S. Dharmas

S. Dharmas
Quality Manager

Verified by



A. Robben Chinnadurai

A. Robben Chinnadurai
Technical Manager - Lab

Authorised Signatory

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ISSUED TO:

TEST REPORT

The Ramco Cement Limited,
Periyannagalur West Limestone Mines,
Ariyalur District.

Report Number	ABC/TL/2023/05/10388
Sample Drawn by	ABC Techno Labs India Private Limited
Sample Description	Wetland Air Quality Status during First Half Yearly - April-September 2023
Sampling Method	IS 5182 Part 1 & 14

S	Parameter	Unit	Measured Values during 2000 hrs. (2000 hrs.)					
			PM10 (SP)	PM10 (SI)	SO ₂	NO ₂	O ₃	Temp. (°C)
Wetland			340.00	111.00	0.190	0.030	0.100	31.500
Range			17.71	30.37	0.9	0.17	0.01	0.01
Mean			22.7	44.3	0.6	1.3	0.01	0.01
Wetland			27.41	37.70	7.41	9.14	0.01	0.01
Range			38.8	62.9	0.8	1.1	0.01	0.01
Mean			35.37	60.07	11.13	15.47	0.01	0.01
Wetland			25.8	37.2	11.7	14.0	0.01	0.01
Range			35.37	60.71	9.16	11.13	0.01	0.01
Mean			29.4	39.0	0.8	1.1	0.01	0.01
Wetland			19.20	27.41	6.8	7.11	0.01	0.01
Range			17.8	34.7	7.2	9.3	0.01	0.01
Mean			11.43	33.47	7.0	7.31	0.01	0.01
Wetland			15.8	26.7	7.2	9.3	0.01	0.01
Range			19.30	61.30	6.11	11.13	0.01	0.01
Mean			22.9	60.0	6.5	11.3	0.01	0.01
Wetland			17.74	30.61	9.12	11.15	0.01	0.01
Range			16.0	34.0	11.0	11.0	0.01	0.01
Mean			20.24	37.49	9.0	10.47	0.01	0.01
Wetland			20.7	41.0	8.0	10.0	0.01	0.01
Range			15.25	31.44	7.0	7.11	0.01	0.01
Mean			18.0	30.7	7.0	9.1	0.01	0.01
Wetland			13.4	27.09	6.11	7.47	0.01	0.01
Range			24.8	40.2	6.5	11.0	0.01	0.01
Mean			60	100	80	80	2000	1.0

Legend: PM10 Particulate Matter size less than 2.5 mic, PM10 Suspended Particulate Matter size less than 10 mic, SO₂ Sulphur Dioxide, NO₂ Nitrogen Dioxide, O₃ Ozone, Temp. (°C) Temperature, RH Relative Humidity, PM Particulate (Total), PM Particulate (Respirable), CO Carbon Monoxide, CH₄ Methane, H₂ Hydrogen, NH₃ Ammonia, (a) present in particulate phase where mentioned below, (b) present in dissolved phase. * as per IS 5182 Part 1 & 14. ** as per IS 5182 Part 14. *** as per IS 5182 Part 14. **** as per IS 5182 Part 14. ***** as per IS 5182 Part 14.

Verified by: S. Bharathi
Quality Manager

Authorized Signatory: A. Ruben Chinnadurai
Technical Manager - Lab

Terms and conditions: This report is valid only for the purpose stated. The responsibility of the test results is solely that of the client. The accuracy of the test results is dependent on the quality of the sample provided. The client is responsible for the accuracy of the sample information provided. The client is responsible for the accuracy of the sample information provided. The client is responsible for the accuracy of the sample information provided.



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Recognized by MINISTRY OF STEEL, MINERAL & FUEL DEVELOPMENT, GOVERNMENT OF INDIA, NEW DELHI, INDIA

ISSUED TO: TEST REPORT

**The Ramco Cements Limited,
 Periyannagalur West Limestone Mines,
 Ariyalur District.**

Report Number	ABC/TL/2022/04/09000
Sample Drawn by	ABC Techno Labs India Private Limited
Sample Description	Noise Levels - Quarter III, 2023
Date of Sampling	16.08.2023 to 17.08.2023
Date of Receipt	18.08.2023
Report Date	22.08.2023

Page 1 of 1

Sl. No.	Location	Noise Levels (dB(A))					
		Day Time (06:00-22:00 hrs.)			Night Time (22:00-06:00 hrs.)		
		Limit	Leas	Log	Limit	Emax	Log
1	Quarry Edge	75.0	87.4	87.2	55.0	60.0	60.0
2	Loading Area	69.7	80.8	80.2	53.0	59.7	60.0
3	Crash Road	70.2	80.8	81.4	50.0	55.0	60.0
4	TRM Crusher	70.0	84.0	89.7	52.0	61.0	60.0
Statutory Limit* for 8 hrs. Exposure				75			65
Duller Zone:							
5	Periyannagalur	70.0	83.0	80.0	55.0	60.0	60.0
6	V Kallakudi	74.1	80.7	80.7	55.0	60.0	60.0
7	Ariyalur/Aranganthi	70.0	80.0	80.0	50.0	55.0	60.0
Max. Value**				89.7			65

Sampling & Test Method: IS 9905-1:2011 (Reaff 2014)

* 1) Maximum Noise Measure of the equipment, the test & climate change conditions shall be used (Log for fractional noise)
 Day time is included between 06:00 and 22:00 hrs. and Night time is included between 22:00 and 06:00 hrs.
 * 2) A Leas value of 85 dB(A) may be set as the level below which any little risk is considered out of hearing impairment even if it is night time exposure.

---End of Report---



S. Dharam
Quality Manager





A. Subram Chinnadurai
Technical Manager - Lab

Verified by: _____ Authorized Signatory

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Tamil Nadu Pollution Control Board
Ambient Air Quality Survey Report

Report No:07/AAQS/2023-2024 Dated: 11.05.2023

1. Name and Address of the Industry : M/s. The Ramco Cements Ltd.,
Periyangalur Limestone Mine
Periyangalur Village,
Ariyalur Taluk,
Ariyalur District
2. Date of Survey : 22.04.2023
3. Duration of Survey : Eight Hours
4. Category : Red/Medium

Ambient Temperature (°C)	Min	Max	Relative Humidity (%)	Min	Max
	27	36		32	68
Weather Condition	Clear		Rain Fall (mm)	Nil	
Predominant Wind Direction	NE to SW		Mean Wind Speed (Km/hr)	4.2 km/hr	

Sl. No.	Location of Sampling Stations	From Source			Pollutants in µg/m ³		
		Dir.	Dst. (m)	Ht. from gl (m)	PM ₁₀	SO ₂	NO ₂
1.	On the top of scaffolding near View Point	NE	325	2.0	69	12.0	14.4
2.	On the top of scaffolding near SE boundary of Mines	SE	350	2.0	72	13.9	13.3
3.	On top of scaffolding near Main Office	SW	400	2.0	79	17.7	18.6
4.	On top of scaffolding near Mines Office	NW	260	2.0	75	13.8	17.1


Environmental Scientist


Auditor Director,
AFL, TNPCB, Trichy-15.



Tamil Nadu Pollution Control Board

Ambient Noise Level Survey Report of Analysis

Report No: 07/AAQS/NL/2023-2024 Dated: 11.05.2024

1	Name of the Industry	M/s.The Ramco Cements Ltd.
2	Address of the Industry	Periyannagalur Limestone Mine, Periyannagalur Village, Ariyalur - 1 K, Ariyalur District.
3	Date of Survey	27.04.2023
4	Category	Red Medium
Type of Survey		Ambient
Time of Survey		Day
Meteorological Conditions		Calm

Logging Parameters

Instrument Used	Casella	Serial No.	0499485
Logging Interval	10 Minutes in each Point	Measuring Range	50-110dB(A)
Weighting	"A"	Time Weighting	Fast
Sound Incidence	Random	Time of Survey in Hrs.	10.00 to 11.30hrs

Sl No	Location	Duration (m)	Distance (m)	Direction	Sound Level -dB(A)		
					L _{eq}	L _{max}	L _{min}
1	Near View Point	10	325	NE	46.2	42.5	51.8
2	Near SE Boundary	10	350	SE	51.9	49.8	56.7
3	Near Security Office	10	350	S	46.7	43.6	57.8
4	Near Mine Office	10	400	SW	46.8	43.2	54.3
5	Near Mines Office	10	200	SW	54.6	49.9	59.6


 Environmental Scientist,


 Assistant Director,
 AEL, TNPCB, Trichy-15.

7.0 Additional Studies

7.1 Hazards Identification & Risk Assessment

Hazards Identification & Risk Assessment (**HIRA**) is the Tool to identify the potential Hazards due to the proposed activities and assessment of the Risks to propose the Emergency Preparedness Plan (EPP). There is no storage of Hazardous Chemicals in the Quarry and thus, no Modelling is warranted. The Potential Hazards that could have impacts during Operation Phase are given in **Table 7.1**.

Table : 7.1 Potential Hazards due to Proposal

Potential Hazard	Probable Impact
Manmade :-	
Accident due to Mining Activities	Can occur at any time during the Mining.
Natural :-	
Natural Calamities	Can occur at any time.
Others :-	
Medical Emergency	Can occur at any time during the Operational Phase.

7.2 Emergency Preparedness Plan

The hazard scenarios were risk ranked using the Risk Matrix (R) are shown in **Table 7.2**.

Table : 7.2 Risk Matrix (R)

Potential Severity	Risk			
	Low (1)	Medium (2)	High (3)	Continuous (4)
Major (4)	2.5	3.0	3.5	4.0
Moderate (3)	2.0	2.5	3.0	3.5
Minor (2)	1.5	2.0	2.5	3.0
Negligible (1)	1.0	1.5	2.0	2.5

The Mining operations are ranked in Low-Major Risks with Score of 1-4. It shall be ensured that engaged Personnel are aware of the Hazards involved and are trained in responding to the Disasters. **First Aid Kits and Medical Supplies** should be maintained at the Lease. All personnel shall use **Personal Protective Equipment (PPEs)** like Safety Shoes, Helmets, Safety glasses, etc. They should be trained in Safety Procedures to ensure that accidents and injuries are minimised. Government Hospitals in the vicinity will be used for any Medical Emergencies.

7.3 Disaster Management Plan

The proposed Disaster Management Plan (DMP) for the Risks involved in the Mining Operations are listed in **Table 7.3**.

Table : 7.3 DMP Measures

Sl. No.	Factors	Causes of risks	Control measures
1	Removal of Top Soil & O.B	a) Top soil bench may slide due to its unconsolidated nature. b) Vibration due to movement of vehicles in the O.B benches	Bench height is 8 m and Width is also maintained at 8 m or more. Adequate Bench Slope will be maintained. OB Dump Slope will be maintained <math><28^\circ</math> without disturbing its own angle of repose.
2	Drilling	a)Due to high pressure of compressed air hoses may burst b)Drill rod may broken due to improper maintenance of the rod	Preventive & Periodical maintenance as well as replacement of worn-out accessories are being carried out in the Compressor and Drill Equipment. The rods & bits are being replaced as per manufacturers recommendation.
3	Blasting	a) Fly rock, ground vibration and noise etc., b) Improper charging of explosives	Optimum Burden and Spacing are being kept. Explosive Charge per delay is being kept optimum.
4	Excavation of Ore	a)Hauling and loading equipment are in such proximity while excavation b)Swinging of bucket over the body of tipper c) Driving of un authorized person	Operator will not operate the machine when person & vehicles are in close proximity Will not swing the bucket over the cabin and operator leaves the machine after ensuring the bucket is placed on ground Will not allow any unauthorized person to operate the machine by effective/strict supervision
5	Transportation of Ore	a)Operating the vehicle "nose to tail" b) Overloading of material c) While reversal & overtaking of vehicle d) Operator of Tipper leaving his cabin when it is loaded	It is ensured that all these causes will be nullified by giving training to the operators No over loading is entertained. Audio visual reverse horn is provided.
6	Fire due to electricity and Oil	a)Due to the short circuit of cables & other electrical parts b) Due to the leakage of inflammable liquid like diesel, oil etc,	All electrical parts are being cleaned frequently with the help of dry air blower All fastening parts and places will be tightening.
7	Natural calamities: Water Inundation	a) Inrush of storm water due to heavy rain. b) Unprecedented opening of dam in the upstream of the River. c) Unusual seepage of water from River side. d) Sudden collapse of peripheral bund due to torrential pour.	Adequate pumping will be provided to handle the situation. Emergency Preparedness Plan is in force. Guard is kept for continuous watch on water level and it touches danger mark, warning siren will be there. Mine workers will be withdrawn from the Mine via the shortest route.

			Work will be resumed only after all working places are thoroughly examined by a competent person and with prior permission of Mines Manager.
7	Natural calamities	Unexpected happenings	The mine management is capable to deal with the situation

RCL management is able to deal with the situation efficiently to reduce confusion keeping in view of the likely sources of danger in the mine. In case of eventuality and sudden occurrence of abnormalities during mining activity leads to any danger for persons and machinery in the mines, the following person will be coordinating to restore the normalcy of the situation.

Mr. Madhusudhan Kulkarni
 Sr. Vice President (Mfg.)
 The Ramco Cements Limited,
 Govidapuram Works,
 Sendurai Road, Ariyalur District
 Ph.No. : 04329-294400.

Outline of Disaster Management Plan : The purpose of disaster management plan is to restore the normalcy for early resumption of mining operation due to an unexpected, sudden occurrence resulting to abnormalities in the course of mining activity leading to a serious danger to workers or any machinery or the environment

System of communication: RCL has an internal communication system for the department head and to their line of command with telephone. And also we are having the telephone Nos. and addresses of adjoining mines, rescue station, police station, Fire service station, local hospital, electricity supply agency and standing consultative committee members.

Consultative Committee: A standing consultative committee is formed under the head of Mines Manager. The members consists of safety officer / medical officer / Asst. manager/ public relation officer/ Foreman/ and environmental engineer.

Facilities & Accommodation: Accommodation and facilities for medical centre, rescue room and for various working groups will be provided.

First Aid & Medical facilities: The mine management is having first aid / medical centre for use in emergency situation. All casualties would be registered and will be given first aid. The centre will have facilities for first aid & minor treatment, resuscitation, ambulance and transport. It has proper telephone / wireless set for quick communication with hospitals where the complicated cases are to be sent.

Stores and equipment : A detailed list of equipment is available with its type & capacity and items reserved for emergency.

Transport services : A well defined transport control system is provided to deal with the situation.

Functions of public relations group: To make a cordial relation with government officials and other social service organization and working groups. To liaise with representatives of the mine to ameliorate the situation of panic , tension, sentiments , grievances and misgivings created by any disaster. To ameliorate the injured, survivors and family members of affected persons by providing material, moral support and establishing contact with relatives of victims.

Security :- Manning of security posts.

Catering & Refreshment:- Arrangement to be made for the victims, rescue teams and others.

Care and maintenance during temporary discontinuance: If the mine will be discontinued temporarily for more than 90 days, notice will be given 105 days before the date of such discontinuance to the concerned authorities. During discontinuance period safety arrangement and fencing will be provided to avoid the entry of unauthorized persons. The accessibility to the mine from the surface will be prevented by providing fencing arrangement.

Emergency Plan:

- ❖ On realizing anything serious will be happened anywhere in the mine, immediately inform the nearest mining official
- ❖ On being informed about the emergency, it will be verified for the correctness of information and telephone in particular to the Manager and other part of the mine and managers of adjoining mine so that persons may be withdrawn.
- ❖ On receiving information of emergency, intimation will be sent to the consultative committee which is already formed. Shift in-charge will ensure that all the materials and transport system to deal with emergency situation.
- ❖ First aid facilities to be ready to receive the cases.

Emergency Response Organization : Following Officers of the mines will be responsible for co ordination in case of emergency situated in any section of the mine.

<u>Person</u>	<u>Responsibility</u>
Head of the department/Mine Agent	Site Controller
Shift In charge/Section In charge	Accident Controller/ Communication officer
Employee who gives the first information about the accident	Primary Controller
P & A Dept. (HOD)	Liaison officer

Capability of Lessee: Following facilities are available at RCL Mine :

Public addressing system
Telephones/ Mobile handsets
Runners/messenger
Emergency alarm
Fire fighting equipments & accessories with trained manpower
Full fledged dispensary at RCL Plant
Training centre
Fire tender, Ambulance.

Facilities available outside RCL : Government Hospital at Ariyalur.

The possibility of 'Offsite Emergency' situation are ruled out as RCL mine is not likely to pose any offsite emergency and hence does not call for any preparation of an off-site emergency plan.

8.0 Project Benefits

Environmental Benefits : The proposal ensures the continuous limestone supply to the Cement Plant. Effective utilization of the Mineral for Cement manufacturing is a Mineral Conservation Measure.

Financial Benefits : The Project Cost is **Rs.9.00 Crores**. As per MMDR Act 2015, 30% of Royalty Amount of **Rs.38.04 Crores will be earmarked for District Mineral Foundation (DMF)** and the amount will be spent for benefit of local villages in the Lease Area.

Social Benefits : Project employs about 33 persons directly and 50 persons indirectly. About **Rs.21.00 Lakhs** has been allotted as **Corporate Environmental Responsibility (CER) Budget** in compliance with MoEF&CC OM dated 01.05.2018. Also, DMF amount of Rs.38.04 Crores will be contributed.

The direct and indirect employment, CSR/CER activities, etc., will have a positive impact on the Socioeconomic Structure of the area. The Proposal will be beneficial and important to the Society and the Country by way of :

- ❖ Royalty to the Exchequer.
- ❖ Improved local and regional economy.
- ❖ Direct and indirect employments.
- ❖ Improvement in direct and indirect means of livelihoods of local population.

9.0 Environmental Cost Benefit Analysis

Cost Benefit Analysis is not applicable for the Proposal as there is no forest land is envisaged for the Project. Also, it was not awarded during the Scoping Process.

10.0 Environmental Management Plan

Environmental Management Plan (EMP) is suggested to mitigate the possible negative impacts that may be caused to the various attributes of environment due to the proposed mining operations.

10.1 EMP for Construction Phase

Being Existing Mine, there will be **no Construction Phase** for the Project.

10.2 EMP for Operation Phase

Mining operations will be carried out scientifically as per approved Mining Plan, stipulated EC & CTO Conditions, IBM Approvals, DGMS Norms, etc. EMP Measures for Operation Phase are proposed below :

10.2.1 Land Use

- ❖ No Blastings shall be carried out during night times and overcast conditions.
- ❖ Vibration Studies/Monitoring has to be carried out whenever Blastings are carried out.
- ❖ Vibration Parameters viz. Peak Particle Velocity (PPV) and Noise Levels during Blastings shall comply with DGMS Norms for Residential Areas.
- ❖ There will be no Solid Wastes Dump in the Lease at Conceptual Stage.
- ❖ OB in dumps may be gainfully utilized for reclaiming the mined out voids.
- ❖ Backfilled Mine Voids are to be Afforested with local Tree species and Reclaimed early.
- ❖ Maintenance of garland drains around the Lease boundaries has to be carried out periodically.

10.2.2 Traffic Impact

- ❖ Regular wetting of haul roads has to be undertaken to arrest the fugitive emissions.
 - ❖ Tippers are to be fully covered with Tarpaulin to avoid any spillage on transportation.
 - ❖ No overloading of Tippers is allowed strictly.
 - ❖ A strict Speed Limit of 30 km/hr. has to be enforced and monitored continuously.
 - ❖ Compliance to 'Pollution under Control' Certification has to be ensured for the Tippers which has to be checked periodically.
 - ❖ Restriction of Truck parking in the Public Road has to be implemented.
 - ❖ Regular and preventive maintenance of transport vehicles has to be ensured.
 - ❖ Effective Green Belt with thick foliage has to be developed and maintained.
 - ❖ Security Guards are to be placed at the Public Road-Mine Haulage Road Junction to handle the inward and outward vehicles.
-

10.2.3 Air Environment

- ❖ Controlled Blasting has to be carried out and during day times only.
- ❖ No Blasting is carried out during overcast conditions.
- ❖ Water sprinkling on the Mining areas, loading point, haul roads, etc. has to be carried out.
- ❖ Covering of Trucks/Tippers with tarpaulin shall be ensured during Mineral transportation.
- ❖ Over loading of Tippers has to be avoided to control the spillages during transportation.
- ❖ Periodical maintenance and replacement of worn out accessories in the mine equipments.
- ❖ Tippers are to be maintained periodically.
- ❖ Periodical check up of vehicles for 'Emission Under Control' Certificate is to be ensured.
- ❖ Effective Green Belt with thick foliage has to be developed along boundaries and haul roads.
- ❖ Periodical Air Quality Monitoring shall be carried out and Reports submitted to the Authorities.

10.2.4 Noise Levels

- ❖ The noise and vibration generated due to the blasting operations shall be kept well within the limits by using milli-second delay electric detonators and by using Non-electric initiation system of blasting which completely eliminates air-blasts and thus reduces noise due to blasting.
- ❖ Deploying mining equipments shall be with in-built mechanism for reducing noise.
- ❖ Provision of silencers to modulate the noise generated by the machines.
- ❖ Providing sound proof operator's cabin of equipments.
- ❖ Provision of ear muffs/ear plugs to the workers in higher noise zones.
- ❖ Green Belt with thick foliage along roads and around lease boundary will act as acoustic barriers.
- ❖ Periodical Noise Monitoring shall be carried out and Reports submitted to the Authorities.

10.2.5 Water Environment

- ❖ The increased Mine Pit Water has to be utilized gainfully by increasing the supply to nearby Villages for Domestic Consumption as well as to agricultural activities nearby as in the current practice.
 - ❖ Mine Pit Water shall not be directly discharged without ensuring its quality.
 - ❖ Ground Water NOC for Dewatering has to be obtained/renewed from SGWA/CGWA Authority.
 - ❖ Periodical Monitoring of Water Level Data from existing Piezometer and nearby Wells in the vicinity has to be carried out along with the water quality.
 - ❖ Effective Afforestation in Backfilled Areas, with native species, is to be done.
 - ❖ Garland Drains and Settling Tanks are to be maintained and desilted periodically. The de-silted quantity from the Garland Drains has to be used for Green Belt/Afforestation.
 - ❖ Ground Water Levels and Water Quality are to be periodically monitored at the identified Borewells & Dugwells in the Mine vicinity.
-

- ❖ The monitored Water Quality data are to be periodically submitted to the IBM and with half-yearly Compliance Reports to SEIAA-TN & Regional Office, MoEF&CC, Chennai.

10.2.6 Biological Environment

- ❖ Effective Green Belt has to be developed and maintained, **with the guidance of DFO**, with about **90% Survival Rate**.
- ❖ Native species shall be preferred for Green Belt development.
- ❖ Fruit bearing trees may also be preferred.
- ❖ Afforestation in backfilled & reclaimed areas shall be undertaken.
- ❖ Through the process of photosynthesis, plants assimilate carbon and return some of it to the atmosphere through respiration. The carbon that remains as plant tissue is then consumed by animals or added to the soil as litter when plants die and decompose. The primary way that carbon is stored in the soil is as **soil organic matter (SOM)**. SOM is a complex mixture of carbon compounds, consisting of decomposing plant and animal tissue, microbes (protozoa, nematodes, fungi, and bacteria), and carbon associated with soil minerals. Carbon can remain stored in soils for millennia, or be quickly released back into the atmosphere. Climatic conditions, natural vegetation, soil texture, and drainage all affect the amount and length of time carbon is stored.

10.2.7 Social Measures

CSR activities shall be carried out by providing social and welfare measures for the local residents and nearby villages around the mine area. The prime focus will be on the creating and maintaining of drinking water facilities for the students at the nearby Government Schools, establishing toilets especially for girl students at the schools, setting up of computer centres, maintenance of village roads & ponds, providing solar street lights, conducting free medical camps, etc.

- ❖ Joining Hands with District Administration in implementing Govt. Schemes.
- ❖ Development of Infrastructure Facilities in the Region.
- ❖ Medical Camps and extending medical facilities.
- ❖ Contribution to Education.
- ❖ Drinking Water Supply.
- ❖ Budget for covering Public Hearing issues will be included in EMP Budget.
- ❖ As per MMDR Act 2015, 30% of Royalty Amount of **Rs.38.04 Crores will be earmarked for District Mineral Foundation (DMF)** and the amount will be spent for benefit of local villages.

10.2.8 Occupational Health Measures

- ❖ All employees are to undergo Medical Check-up on recruitment and periodically during employment. Maintenance of Pre, during & Post Employment Records are to be kept for periodical review.
- ❖ Standard operating procedures for all operations with respect to occupational safety and health are to be in place.
- ❖ Required Personal Protective Equipments for the Mine employees are to be provided.
- ❖ Provision of ergonomically designed seats for drivers/operators has to be ensured.
- ❖ Provision of illumination facilities are to be made at proper places of mines for ease of working during night times.
- ❖ Work comfort and its periodic review by a Committee is to be ensured.
- ❖ Provision of Rest Shelters at Mines has to be made.
- ❖ Provision of cool drinking water to employees has to be made.

10.3 Plastic Waste Management

There will be **ban on one-time use and throw away Plastic** usage in the Lease. Encourage the use of eco friendly alternatives such as banana leaf, areca nut palm plate, stainless steel glass, porcelain plates / cups, cloth bag, jute bag etc.

10.4 EMP Budget

The Project Cost is **Rs.9.00 Crores**. Proposed **EMP Capital Budget will be Rs.20,50,000/-** (excluding Budget for addressing PH issues) and **EMP Operating Cost will be Rs.11,27,750/- per Annum (Table 10.1)**. As per SEAC Guidelines, Capital EMP Budget arrived is **Rs.6.70 Lakhs** and **Rs.11.27 Lakhs per Annum as EMP Operating Cost (Table 10.2)**. Galvanium sheet fencing will be erected for distance of 150 m with a height of 3 m along SH-139 at a cost of **Rs.13.80 Lakhs**. Also, an amount of Rs. 3.00 Lakhs per Annum has been earmarked for Occupational Health & Safety Measures.

Table : 10.1 Proposed EMP Budget

Cost for	Capital Cost, Rs.	Recurring Cost, Rs.
EMP Budget as per SEAC Guidelines	6,70,000	11,27,750
Galvanium sheet fencing along SH-139	13,80,000	-
Total	20,50,000*	11,27,750

* - Budget for addressing PH Issues will also be included in the EMP

Table : 10.2 EMP Budget

Mitigation Measure	Provision for Implementation	Capital Cost, Rs.	Recurring Cost, Rs.	Total for Quarrying Area in a Year	
				Capital Cost, Rs.	Recurring Cost, Rs.
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	10,000	10,000	22,500	22,500
Fixed Water Sprinkling Arrangements + Water sprinkling by own water tankers	Fixed Sprinkler Installation and New Water Tanker Cost for Capital; and Water Sprinkling (thrice a day) Cost for recurring	8,00,000	50,000	Own Tanker available	50,000
Air Quality will be regularly monitored as per norms within ML area & Ambient Area	Yearly Compliance as per CPCB norms	0	50,000	0	2,00,000
No overloading of trucks/tippers/tractors	Manual Monitoring through Security guard	0	5,000	0	60,000
Stone carrying trucks will be covered by tarpaulin	Monitoring if trucks will be covered by tarpaulin	0	10,000	0	1,20,000
Enforcing speed limits of 20 km/hr within ML area	Installation of Speed Governors @ Rs. 5000/- per Tipper/Dumper deployed	5,000	0	5,000	0
Regular monitoring of exhaust fumes as per RTO norms	Monitoring of Exhaust Fumes by Manual Labour	0	5,000	0	5,000
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	20,000	0	0
Installing wheel wash system near gate of quarry	Installation + Maintenance + Supervision	50,000	20,000	0	0
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	0	0
Oiling & greasing of Transport vehicles and HEMM at regular interval will be done	Provision made in Operating Cost	0	0	0	0
Adequate silencers will be provided in all the diesel engines of vehicles.	Provision made in Operating Cost	0	0	0	0

Mitigation Measure	Provision for Implementation	Capital Cost, Rs.	Recurring Cost, Rs.	Total for Quarrying Area in a Year	
				Capital Cost, Rs.	Recurring Cost, Rs.
It will be ensured that all transportation vehicles carry a fitness certificate.	Provision made in Operating Cost	0	0	0	0
Safety tools and implements that are required will be kept adequately near blasting site at the time of charging.	Provision made in OHS part	0	0	0	0
Water management	Provision for garland drain @ Rs. 10,000/- per Hectare with maintenance of Rs. 5,000/- per annum	10,000	5,000	22,500	11,250
Waste management (Spent Oil, Grease etc.,)	Provision for domestic waste collection and disposal through authorized agency	25,000	20,000	25,000	20,000
	Installation of dust bins	5,000	2,000	5,000	2,000
Bio toilets will be made available outside mine lease on the land of owner itself	Provision made in Operating Cost	10,000	1,000	0	0
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	10,000	1,000	10,000	1,000
Workers will be provided with Personal Protective Equipment's	Provision of PPE @ Rs. 4000/- per employee with recurring based on wear and tear (say, @ Rs. 1000/- per employee)	40,000	10,000	4,00,000	1,00,000
Health check up for workers will be provisioned	IME & PME Health check up @ Rs. 1000/- per employee	0	10,000	0	1,00,000
First aid facility will be provided	Provision of 2 Kits per Hectare @ Rs. 2000/-	5,000	4,000	0	0
Mine will have safety precaution signages, boards.	Provision for signages and boards made	10,000	2,000	10,000	2,000
Barbed Wire Fencing to quarry area will be provisioned.	Per Hectare fencing Cost @ Rs. 2,00,000/- with Maintenance of Rs 10,000/- per annum	2,00,000	10,000	Fully fenced already	10,000
No parking will be provided on the transport routes. Separate provision on the south side of the hill will be made for vehicles /HEMMs.	Parking area with shelter and flags @ Rs. 50,000/- per hectare project and Rs.10,000/- as maintenance cost	50,000	10,000	50,000	10,000

Mitigation Measure	Provision for Implementation	Capital Cost, Rs.	Recurring Cost, Rs.	Total for Quarrying Area in a Year	
				Capital Cost, Rs.	Recurring Cost, Rs.
Flaggers will be deployed for traffic management					
Installation of CCTV cameras in the mines and mine entrance	Camera 4 Nos, DVR, Monitor with internet facility	30,000	5,000	30,000	5,000
Implementation as per Mining Plan and ensure safe quarry working	Mines Manager (1 st Class / 2 nd Class / Mine Foreman) under regulation 34 / 34 (6) of MMR, 1961 and Mining Mate under regulation 116 of MMR, 1961 @ 40,000/- for Manager & @ 25,000/- for Foreman / Mate	0	7,80,000	0	4,00,000
Green belt development - 500 trees per one hectare (200 Inside Lease Area & 300 Outside Lease Area)	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant (capital) for plantation inside the lease area and @ 30 per plant maintenance (recurring)	40,000	6,000	0	0
	Avenue Plantation @ 300 per plant (capital) for plantation outside the lease area and @ 30 per plant maintenance (recurring)	90,000	9,000	90,000	9,000
Total				6,70,000	11,27,750

Also, about **Rs.21.00 Lakhs** has been allotted as **Corporate Environmental Responsibility (CER) Budget** in compliance with MoEF&CC OM dated 01.05.2018 for execution (Table 10.3).

Table : 10.3 CER Budget

Name of the Village	Particulars	CER Amount
Periyanganal Village	(i) Upliftment of surrounding Government schools - Rs. 10.00 Lakhs (ii) Construction of individual smart toilets - Rs. 9.00 Lakhs. (iii) Skill development, Training of village women for self employment - Rs. 2.00 lakhs	Rs.21.00 Lakhs

11.0 Summary Environmental Impact Assessment Report

The Ramco Cements Limited
Amalgamated Periyagalur Limestone Mine
Extent - 53.32 Ha & Plan Production - 15 Million Tonnes @ 3.00 MTPA Limestone
S.F. Nos. 51/2, 51/3, 51/4, 229/1, 267, 268/1, 269, 271, etc.,
Periyagalur Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu

1.0 Introduction

1.1 Project Proponent

Ramco Group is one of the leading, highly reputed and Second Largest Industrial Group in South India. It is well diversified in the fields of Cement, Ready Mix Concrete, Cement Fiber Products, Cotton and Synthetic Yarn, Software Systems, Wind Farms, Research & Development, Dry Mortar Plants, Cotton Textiles and Surgical. The total employees are about 15,700 and the Turnover of the Group is Rs.8,000 Crores. The main companies of RAMCO Group are:

- ❖ **M/s. The Ramco Cements Limited** (formerly M/s. Madras Cements Limited).
- ❖ M/s. Rajapalayam Mills Limited.
- ❖ M/s. Ramco Industries Limited.
- ❖ M/s. Ramco Systems Limited.

The Ramco Cements Limited (RCL) is one of the reputed Cement Companies in India. The Company is the Second Largest cement producer in South India and sixth largest manufacturer of cement in the Country. The cement production of RCL is about 17.70 million tons per annum (MTPA) from their **Cement Plants** in India.

- ❖ Ramasamy Raja Nagar near Virudhunagar, Tamil Nadu (established in 1961) with 3 Lines - 2.7 MTPA Cement.
- ❖ Kumarasamy Raja Nagar, near Jaggayyapeta, Andhra Pradesh (1986)-3.65 MTPA (3 Lines).
- ❖ Alathiyur near Vriddhachalam, Tamil Nadu (1997): 3.0 MTPA (2 Lines).
- ❖ Method near Chithradurga, Karnataka : 0.3 MTPA (2000; not in operation now).
- ❖ Govindapuram near Ariyalur, Tamil Nadu-5.5 MTPA (2009) (2 Lines).
- ❖ Kolimigundla, Andhra Pradesh (Cement 2.0 MTPA).

RCL is operating **Cement Grinding Units** at:

- ❖ Kolaghat (2.0 MTPA) in West Bengal.
- ❖ Kattuputtur (0.75 MTPA) near Chennai, Tamil Nadu.
- ❖ Valapadi (2.0 MTPA) near Salem, Tamil Nadu.
- ❖ Vizag (2.0 MTPA) near Anakapalli, Andhra Pradesh.
- ❖ Haridaspur (0.9 MTPA), Jajpur District, Odisha.

It is also operating a **Packing Plant** at Nagercoil.

RCL is producing Ordinary Portland Cement (**OPC**), Portland Pozzolana Cement (**PPC**), Slag Cement (PSC), Composite Cement (CC), etc. The cement produced by RCL is marketed in the brand name of 'RAMCO'. The market centers are mainly in Tamil Nadu, Andhra Pradesh, Telangana, Kerala, Karnataka, Odisha and West Bengal States.

The **Contact information of RCL Corporate Office** is :

Shri.M.Srinivasan,
Executive Director (Operations),
The Ramco Cements Limited,
5th Floor, Auras Corporate Centre,
No. 98A, Dr.Radhakrishnan Road,
Mylapore, Chennai-600 004.
Tel. No. : 044-28478666/28478661/28478656
Fax No. : 044-28478676
e-Mail : ramcoenv@ramcocements.co.in

1.2 Project Profile

RC) is operating its Govindapuram Cement Plant near Ariyalur for 3.62 MTPA Clinker & 5.50 MTPA Cement production. The Plant requires about 6.5-7.0 MTPA of different grade Limestone and Kankar depending on the production. The existing Captive Mines viz. Periyagalur, Periyagalur-West, Kattupirangium, Reddipalayam, Pudupalayam-North & Usenabad-South Limestone Mines and Illupaiyur & Ottakovil Kankar Quarries in the Ariyalur Region supply the Raw Materials Limestone & Kankar to the Plant.

Periyagalur Mine (Lease-I; PNR) over an extent of 36.29.5 Ha in Periyagalur Village was granted to RCL (MCL-Madras Cements Limited at that time) vide GO (3D) No. 2 dated 13.01.2003 for a period of 20 years. Lease Deed was executed for actual worked out Lease Area of **35.960 Ha** on 02.06.2003 with validity from 20.08.2003 to 19.08.2023. Subsequently, extension of mining lease validity upto 50 years has been granted vide GO (Ms) No. 77 dated 26.07.2018 over an extent of 35.96 Ha and is **valid till 19.08.2053**. The supplementary lease deed has been executed and registered on 03.07.2019. First EC dated 26.11.1999 was for 0.105 MTPA Limestone production. The mine was operated for 0.105 MTPA quantity from 2005-06 to 2007-08. Expansion EC dated 10.10.2007 is for 0.90 MTPA (Clean Limestone) production and the mine is operating for this quantity from 2008-09 to till date. Crusher established over an extent of 4.22 Ha in the non-lease area was shifted to RCL Govindapuram Cement Plant. Both Opencast Conventional Mining with controlled Blasting & Non-Conventional Mining Method with X-Centric Rippers are adopted.

Periyagalur-West Mine (Lease-II; PNR-W) over an extent of **17.360 Ha** in Periyagalur Village was granted for Limestone & Marl vide GO (Ms) No. 153 dated 23.12.2016 for a period of **50 years**. EC for the production of **0.3 MTPA Limestone & Marl** over an extent of 17.36 Ha was

awarded by SEIAA-TN vide Letter No. SEIAA-TN/F.No.-462/2012/EC-45/1(a)/ARY/2016 dated 14.11.2016. Lease Deed is executed on 10.01.2017 with validity from 10.01.2017 to 09.01.2067. Both Opencast Conventional Mining with controlled Drilling & Blasting and Non-Conventional Mining Method with X-Centric Rippers are adopted. Existence of Mineral Marl is not proved.

Need for Amalgamation : The two existing Captive Mines in Ariyalur Region are in Conceptual Stage and will be completely exhausted in another 2 years period. Thus, other Limestone sources are being explored for sustained supply of Limestone to Govindapuram Cement Plant. PNR & PNR-W Leases are located adjacent to each other and are in compact & contiguous nature. With long barriers (550 m long & 35 m depth) between the two leases, about 1.50 Million Tonnes of Limestone reserves would be un-exploited. By amalgamation of both the leases, the Mineable Reserves will be enhanced. Also, **‘Common Boundary Workings’ with Dalmia PNR Mine** is now proposed. Thus, it is proposed to amalgamate both these mining leases.

Amalgamated Periyagalur Mining Lease over an extent of **53.32 Ha** is falling in SF Nos. 51/2, 51/3, 51/4, 51/5A, 51/5 B, 51/5C, 51/5D, 51/5E, 51/5F, 51/5G, 51/5H, 224/1, 224/2, 226/1A, 226/1B, 226/2, 226/3, 226/4, 226/5, 226/6A, 226/6B, 226/6C, 226/6D, 226/6E, 226/7, 226/8A, 226/8B, 226/8C, 226/9A, 226/9B, 226/9C, 226/10A, 226/10B, 226/10C, 226/11A, 226/11B, 226/12, 226/13A, 226/13B, 226/13C, 226/14, 226/15A, 226/15B, 226/16, 228/1, 228/2, 228/3A, 228/3B, 228/3C, 228/3D, 228/5, 229/1, 229/2, 229/3, 229/4, 229/7, 229/8, 229/9, 229/11, 230/1A, 230/1B, 230/2A, 230/2B, 230/3, 230/4A, 230/4B, 230/5A, 230/5B, 230/5C, 230/5D, 230/6A, 230/6B, 230/6C, 230/6D, 230/6E, 230/6F, 230/6G, 230/6H, 230/6I, 230/7A, 230/7B, 230/7C, 230/8, 230/9, 230/10, 230/11A, 230/11B, 230/11C, 230/12, 230/13, 230/14, 230/15A, 230/15B, 230/15C, 230/15D, 230/16, 230/17, 230/18, 230/19, 230/20, 231/1A, 231/1B, 231/1C, 231/1D, 231/1E, 231/1F, 231/1G, 231/1H, 231/1I, 231/1J, 231/1K, 231/1L, 231/1M, 231/1N, 231/2A, 231/2B, 231/2C, 231/2D, 231/2E, 231/2F, 231/2G, 231/2H, 231/2I, 231/2J, 231/2K, 231/2L, 231/2M, 231/2N, 231/2O, 231/2P, 231/2Q, 231/2R, 231/2S, 231/2T, 231/2U, 231/2V, 231/2W, 231/2X, 231/3A, 231/3B, 231/3C, 231/4, 231/5A, 231/5B, 231/5C, 231/6A, 231/6B, 231/6C, 231/6D, 231/6E, 231/6F, 231/6G, 231/6H, 231/6I, 231/6J, 231/6K, 231/6L, 231/6M, 231/6N, 231/6O, 231/6P, 231/6Q, 231/6R, 231/7, 231/8, 231/9, 231/10A, 231/10B, 231/10C, 231/11A, 231/11B, 231/11C, 231/11D, 231/12A, 231/12B, 231/12C, 231/12D, 231/12E, 231/12F, 231/12G, 231/12H, 231/12I, 231/12J, 231/12K, 231/12L, 232/1A, 232/1B, 232/1C, 232/1D, 232/1E, 232/1F, 232/2, 232/3, 232/4, 232/5A, 232/5B, 232/5C, 232/5D, 232/5E, 232/5F, 232/5G, 232/5H, 232/6A, 232/6B, 232/6C, 232/6D, 232/7A, 232/7B, 232/8, 232/9A, 232/9B, 232/10A, 232/10B, 232/11, 232/12A, 232/12B, 232/12C, 232/13, 232/14, 232/15A, 232/15B, 232/16, 232/17A, 232/17B, 232/18, 232/19A, 232/19B, 232/19C, 232/19D, 232/20, 233/1, 233/2, 233/3, 233/4, 233/5, 233/6, 233/7A, 233/7B, 233/7C, 233/8A, 233/8B, 233/9, 233/10, 233/11A, 233/11B, 233/11C, 233/11D, 233/11E, 233/11F, 233/11G, 233/11H, 233/12A, 233/12B, 233/12C, 233/12D, 233/12E, 233/12F, 233/12G, 233/12H, 233/12I, 234, 234 Part, 235/1, 235/2, 235/3, 237/1, 267, 268/1, 268/2, 269 & 271 of Periyagalur Village, Ariyalur Taluk & District of Tamil Nadu State (**Fig. 1.1**).

Out of 53.32 Ha, **Patta Land is 33.28 Ha and Govt. Poramboke Land is 20.04 Ha**. There is **no Forest Land** involved. There is **no Rehabilitation & Resettlement** issue. **There is no litigation/pending case against the Proposal.**

The State Government has granted **permission vide GO (Ms.) No. 126 dated 26.02.2021** for amalgamating the two Periyagalur mining leases totalling over an extent of **53.320 hectares** into a single lease for mining Limestone only, duly co-terminus with the Lease Period ending on 19.08.2053. IBM, Chennai has approved the Mining Plan for amalgamated Lease vide its Letter TN/ALR/LST/MP-2079.MDS dated 23.07.2021 for the Period 2020-21 to 2024-25 with its validity till 31.03.2025. With '**Common Boundary Workings**' with **Dalmia PNR Mine** proposed now, the Review of Mining Plan (ROMP) for Plan Period of **2025-26 to 2029-30 is being submitted with updated data** to IBM for its approval. **Surface & Geological Plan along with Geological Sections** is given as **Fig. 2.1**.

There was no production of 3.00 MTPA in the Amalgamated Lease as scheduled in the approved Mining Plan for want of prior EC. The **existing mining operations are continued** in the Leases (PNR & PNR-W) for respective **consented production quantities**. Subsequently, the **Mineable Reserves** has been reassessed as **15.85 Million Tonnes**, as on 01.04.2024. The Review of Mining Plan (ROMP) for Plan Period of **2025-26 to 2029-30** has been prepared and **submitted with updated data** to IBM for its approval.

The mining operation will be carried out by both Opencast Conventional Mining with controlled Drilling & Blasting and Non-Conventional Mining Method with X-Centric Rippers @ **3.00 MTPA**. Limestone production during ROMP period will be **15 Million Tonnes**. Balance Reserves will be mined out in subsequent Plan Period. **The Life of the Mine is 10 years** based on established Reserves now. **Ultimate Pit Depth** on proposed Plan Period will be **92 m BGL** from 71 m arrived in the earlier Mining Plan. Mining will intersect the Ground water-table. Fragmented limestone will be loaded by Hydraulic Excavators into Tippers. The Tippers transport limestone to Govindapuram Cement Plant. Limestone transportation will be **in all 3-Shifts** as District Administration restricted Limestone transportation during peak hours of the day in Ariyalur. The proposed Production Schedule is given in **Table 1.1**.

After exhaustion of all limestone, part of the pit on the northern, eastern & southern sides will be **reclaimed and rehabilitated** and the remaining exhausted pit will be used as water Reservoir for harvesting the rain water.

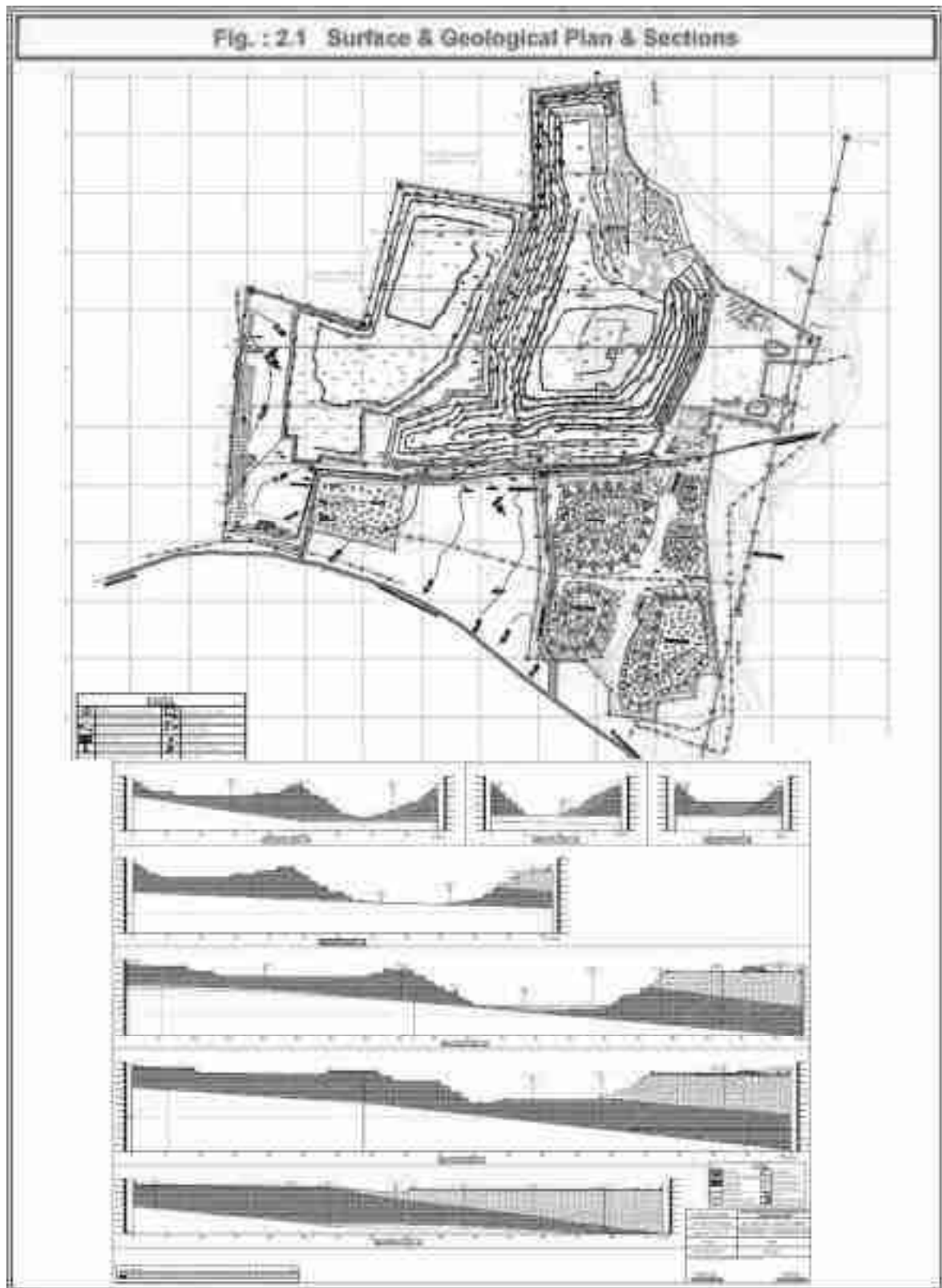


Table : 1.1 Yearwise Development & Production

Sl. No.	Plan Period & Year	Top Soil, Tons	OB/SB/IB, Tons	Total Waste, Tons	ROM Limestone, Tonnes	Mineral Reject, Tonnes	Ore:OB Ratio
I	2020-21 to 2024-25 (Non operative period)	3,83,560	12,34,120	16,17,680	92,11,880	0	1:0.18
II	ROMP Period (Commencement of operation)						
1	2025-26	1,42,960	9,24,336	10,67,296	30,00,000	0	1:0.36
2	2026-27	49,760	2,42,288	2,92,048	30,00,000	0	1:0.10
3	2027-28	0	0	0	30,00,000	0	1:0
4	2028-29	1,00,480	13,96,512	14,96,992	30,00,000	0	1:0.50
5	2029-30	31,578	9,71,693	10,03,271	30,00,000	0	1:0.33
Total		3,24,778	35,34,829	38,59,607	1,50,00,000	0	1:0.26

Out of 53.32 Ha, Area of excavation at the end of the life of the mine will be 39.17 Ha, out of which about 14.00 Ha will be Backfilled & Reclaimed and balance 25.17 Ha will be left out as water reservoir.

The Limestone to be mined out from this Amalgamated Lease is a Major Mineral over an extent of <250 Ha and falls in **Category 'B'** of Sl. No. 1(a) of EIA Notification 2006, as amended vide Notification SO 1886(E) dated 20.04.2022, for prior Environmental Clearance (EC) from the State Level Environmental Impact Assessment Authority, Tamil Nadu (SEIAA-TN). Accordingly, RCL has applied for prior EC to SEIAA-TN vide Online Proposal No. **SIA/TN/MIN/76439/2022 on 02.05.2022**. The Proposal under Sl. No. 1(a), Category B1 was deliberated in State Level Expert Appraisal Committee-Tamil Nadu (SEAC-TN) in its 287th Meeting held on 22.06.2022 and in 532nd SEIAA-TN Meeting held on 14.07.2022. Terms of Reference (TOR) for carrying out Environmental Impact Assessment (EIA) Study has been awarded vide **Letter SEIAA-TN/F.No.9220/TOR-1215/2022 dated 14.07.2022 with Public Hearing**.

EIA Consultant, M/s. ABC Techno Labs India Private Limited, Chennai has been accredited for various Sectors including **Sector-1 (Mining Projects) for Category 'A'** by the National Accreditation Board for Education & Training (NABET) vide Certificate NABET/EIA/2225/RA0290 dated 11.06.2023 with validity till 16.11.2025 (Sl. No. 4 of List dated 15.07.2024). ABC Laboratory is accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) vide Certificate No. TC-5770 dated 03.04.2022. EIA Report has been **prepared in compliance with awarded TORs** and submitted. Summary EIA Reports (both in **English and Tamil versions**) along with Draft EIA Report are submitted for Public Consultation & Public Hearing.

2.0 Description of the Environment

2.1 Environmental Setting

PNR-A Mining Lease Area falls in the Survey of India Topo Sheet No. 58 M/4 (Fig. 1.2). The ML is located inbetween the following geographical co-ordinates :

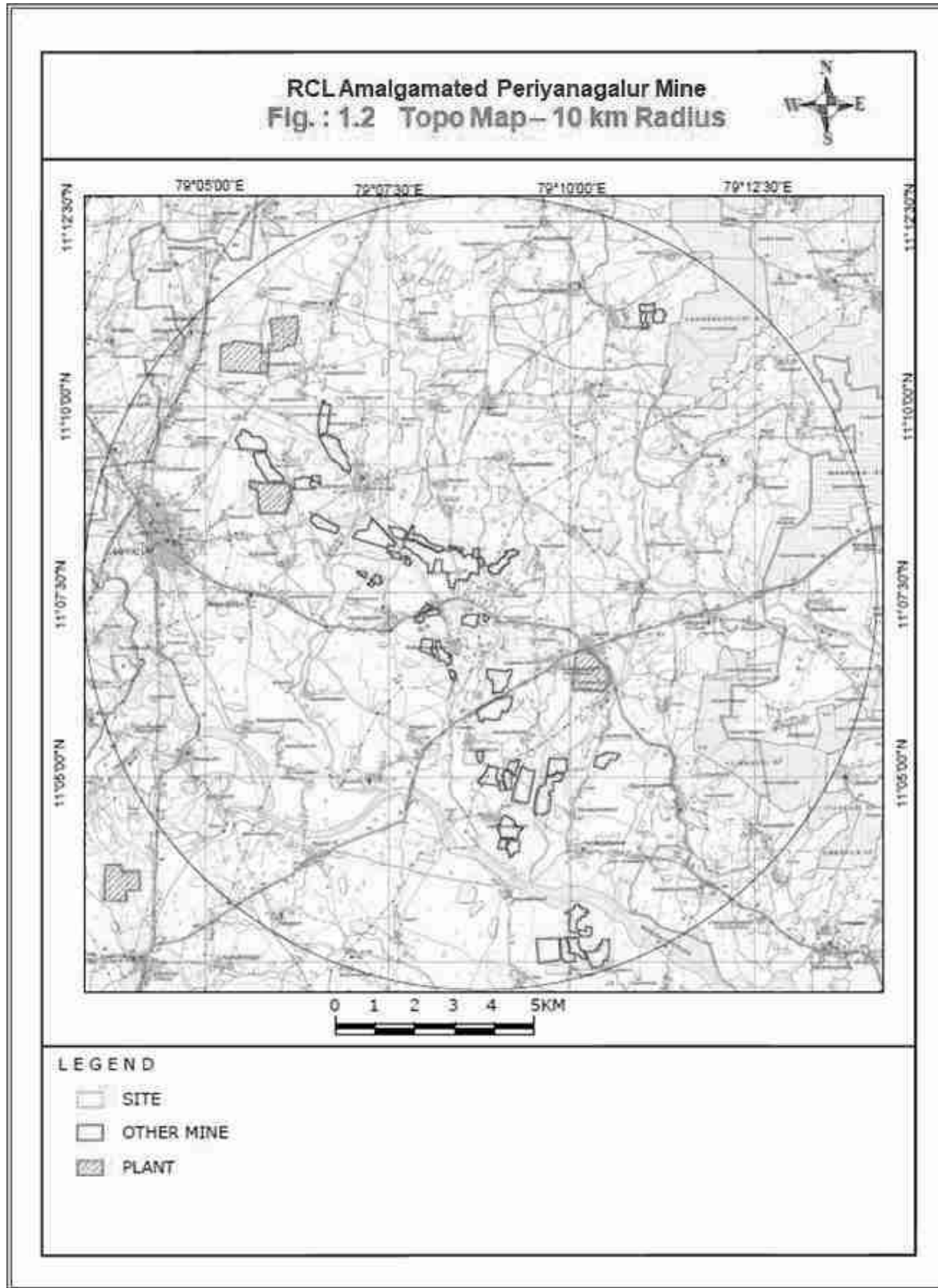
North Latitude	:	11° 07' 15.8'' - 11° 07' 51.4''
East Longitude	:	79° 08' 26.9'' - 79° 09' 01.0''

There is **no Forest Land involved and no Reserved Forest (RF) exists within 1 km** of the Mine. **No grazing land** exist in the study area. The area is having almost a gentle slope topography with an elevation of about 65-73 m above mean sea level (aMSL). The site is free from seismic effects (Seismic Zone-III). There are **no eco sensitive areas like National Parks, Wildlife Sanctuaries, Biosphere Reserves, Elephant Corridor, Mangroves, Archaeological/Historical Monuments, Heritage sites, etc. within 10 km from the Lease boundary**. Parts of **Managethi RF** (6.6 km in east), **Vannankurichi RF** (7.0 km in NE), **Kallankuthu RF** (10.0 km ENE), **Vilangudi Extn. RF** (8.0 km in ESE), **Vilangudi RF** (8.2 km in ESE), **Sundaresapuram RF** (9.5 km in SE) and **Ulliyakudi RF** (10.0 km in SE) fall in the Study Area.

Seasonal **River Marudaiyar** drains the region (flows at 4.9 km in the south). Seasonal Nallah Kallar River flows at 2.9 km in northwest. A seasonal nalla flows in the eastern boundary of the Lease from north to south. High Flood Level recorded in the seasonal nalla is 63.9 m in the north to 62.2 m in the south. The Lease is located in an elevation of 66.8 m to 65.7 m and thus, **no flood hazard due to the nearby seasonal nalla**.

State Highway (SH)-139 (Ariyalur-V.Kaikatti-Jayamkondam Section) is passing in east-west direction in southern boundary of the Lease-II and a **Safety Distance of 50 m has been provided as per GO, approved Mining Plan, Tamil Nadu Mineral Concession Rules 1959 & Anna University Recommendations** and will be maintained till end of the mining.

National Highway (NH)- 81 connecting Trichy-Kilapaluvur-Chidambaram runs at @ 2.5 km (in SE), NH-136 connecting Tanjore-Ariyalur-Perambalur runs at 6.2 km (W). Southern Railway BG Line runs through Ariyalur at a distance of 8.5 km in the west. The nearest Airport Trichy is at 60 km in southwest. The nearest Ports are at Chennai (300 km) and Cuddalore (95 km). ML Area is about 1.0 km from nearby Kattupirangium village. Periyagalur village is at 1.0-1.5 km in the east. RCL Govindapuram Cement Plant is located at a distance of 6.8 km aerial distance (14 km by road) in northwest. From the Lease, Ultratech Cement Plant-Reddipalayam is at 3.2 km (SE), TANCEM Cement Plant-Kallankurichi at 4.7 km (WNW), Dalmia Ariyalur Plant at 7.2 km (NW) and Chettinad Kilapaluvur Cement Plant at 10.6 km (SW). Captive Limestone Mines of these Cement Plants as well as others are located within 10 km radius area.

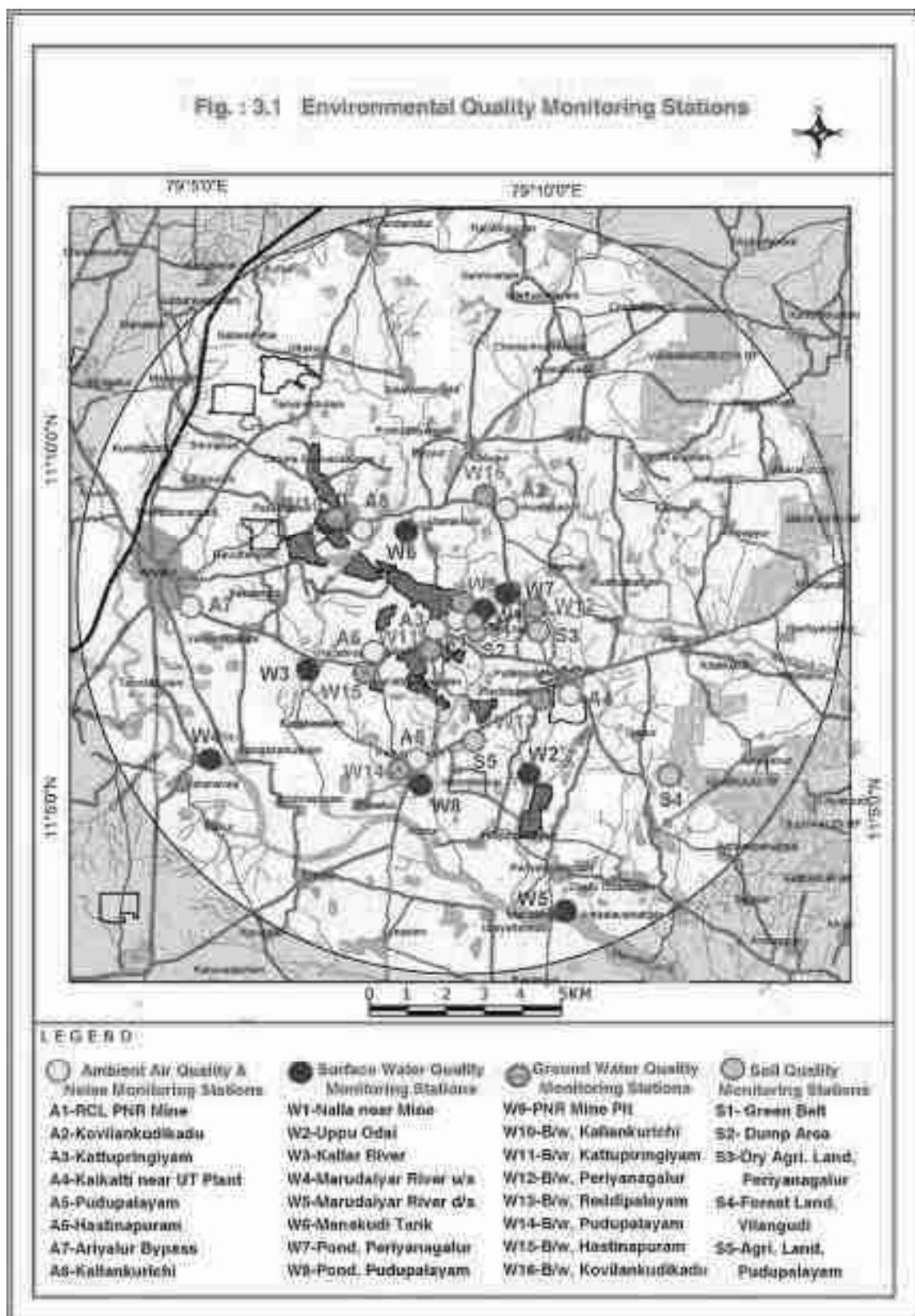


2.2 Baseline Environmental Status

The study area of 10 km radius (from boundary) (Fig. 3.1) has been considered for assessing the baseline environmental status. **Project area does not fall in Critically Polluted Industrial Clusters** listed by CPCB. As Bay of Bengal is at 100 km from the Lease, Coastal Regulation Zone (CRZ) **applicability is not there**. The nearest IMD Station is Trichy Airport. The monitoring stations were selected in such a way that the baseline environmental data reflects the **Cumulative Impact of existing Mines and Industries** in the Study area. The Environmental Attributes covered for the EIA Study is given in Table 2.1.

Table : 2.1 Baseline Data Collection – Monitoring Locations

Attributes		Sampling		Remarks
		No. of Locations	Frequency	
Air	Meteorological Parameters	1	For a Season	Wind speed, wind direction (wind rose), temperature, humidity, cloud cover, atmospheric pressure, rainfall, etc.
	AAQ Parameters	8	24-hourly basis, continuously for 2 days in a week for 4 weeks in a month for a season	For the parameters as per Revised NAAQ Norms
Noise		8	Once in the season	For Leq, Lday and L night values
Water	Surface Water Quality Parameters	8	Once in the Season	As per CPCB Norms (including existing Plant Raw Water)
	Ground Water Quality Parameters	8		As per IS:10500 Norms
Land	Soil Quality	8	Once in the Season	Season for Textural & Physical Parameters & Nutrients.
	Land Use	Study Area	Once during the Study Period	Based on recent available Satellite Imagery
Biological	Aquatic	Study Area	Once during the Study Period	Flora & Fauna in Core & Buffer Zones
	Terrestrial			
Socio economic Parameters		Study Area	Once during the Study Period	Based on 2011-Census and Need Based Assessment, once in the study period.



The summary of baseline status is given in **Table 2.2**.

Table : 2.2 Environmental Baseline Status

Envl. Component	Main Parameters	Minimum	Maximum	Mean	Desirable Norms
Ambient Air Quality, ug/m ³	PM2.5	10	46	25.1	60
	PM10	20	74	44.6	100
	SO ₂	6	22	10.9	80
	NO _x	6	26	13.3	80
Ambient Noise, dB(A)	Leq-Day	40.4	49.3	45.1	55
	Leq-Night	36.2	46.8	42.1	45
Surface Waters	TDS, mg/l	320	500	-	500/2100
Ground Waters	TDS, mg/l	360	550	-	500-2000
Soil Status	EC, mmhos/cm	1.50	1.79	-	0.2-0.5
	SAR	1.96	2.79	-	<5

Legend : PM2.5-Particulate Matter size less than 2.5 um; PM10- Particulate Matter size less than 10 um; SO₂-Sulphur dioxide; NO_x-Oxides of Nitrogen; Leq-Day & Leq-Night - Equivalent Noise Levels during Day & Night Times; TDS-Total Dissolved Solids; EC-Electrical Conductivity & SAR-Sodium Absorption Ratio.

The findings of baseline environmental status of the study area are summarized below :

- ❖ The collected meteorological data during this season represented the local weather phenomena.
- ❖ The monitored ambient air quality in the study area was found to be in compliance with the Revised National Ambient Air Quality (NAAQ) 24-hourly Norms for Industrial, Residential, Rural and other areas.
- ❖ Ambient equivalent noise levels (Leq) during day and night times were found to be well within the MoEF&CC Norms.
- ❖ The water quality of surface waters was found to be in compliance with CPCB Norms.
- ❖ The ground water quality was found to be in compliance with the IS:10500-2012 Norms.
- ❖ The soil in the study area would very well support vegetation after amending it suitably.
- ❖ There is no eco sensitive area exists in the study area and only domesticated animals exist.
- ❖ The area is thinly populated and basic amenities are available almost in all villages.

Thus, there is **adequate buffer** for the proposed Project in the physical, biological and edaphic environments of the study area.

3.0 Anticipated Environmental Impacts

Being an existing Mine, it **does not involve any major establishment or construction**. Thus, Construction Phase Impacts are not there for Impact Assessment and Environmental Management Plan (EMP). The impacts during Operation Phase have been divided into two categories, viz. **Localised and Cumulative**. There are Cement Plants and Limestone Mines in the Study Area. Following industrial activities are considered for **Cumulative Impact Assessment** for assessing their contribution (**Table 3.1**). Cumulative Impact has been assessed for the identified Industries and assumed that the **pollution due to other existing Industrial & Mining activities have already been covered under baseline environmental status** and continue to remain same till the operation of the project.

Table : 3.1 Industrial Activities considered for Cumulative Impact

Sl. No.	Industry / Mine	Extent & Consented Production	Bearing & Contribution during Study Period
1	Ramco Amalgamated Mining Lease	53.320 Ha (3.00 MTPA)	Study Lease
2	UltraTech Periyagalur Limestone Mine (ML5)	4.985 Ha (0.15 MTPA)	Adjacent Lease in Upwind side & not in operation.
3	Dalmia Periyagalur & AK Limestone Mines	167.605 Ha (1.9 MTPA)	Adjacent Lease in operation. Downwind side & not contributing other than Traffic Volume
4	TANCEM Periyagalur & Khairulabad, Mines	194.165 Ha 66.110 Ha	Adjacent Lease; Not in operation. Downwind side & not contributing
5	TANCEM Kallankurichi Mine	240.610 Ha (expansion 0.2 to 0.7 MTPA)	Downwind side & not contributing
6	Ultratech Cement Plant, Reddipalayam	1.6 MTPA	Plant located near the Lease & not contributing other than Traffic Volume

Safeguard to State Highway Traffic : State Highway (SH)-139 (Ariyalur-V.Kaikatti-Jayamkondam Section) is passing in east-west direction in southern boundary of the PNR-West Mine (Lease-II) and a **Safety Distance of 50 m has already been provided as per GO, approved Mining Plan & Tamil Nadu Mineral Concession Rules 1959**. The following Safety/Preventive measures will also be implemented :

- ✓ In addition to 50 m Green Belt developed in the safety barrier, a Galvanium sheet fencing will be erected for 150 m length & 3 m height along SH-139 at a cost of **Rs.13.80 Lakhs**.
- ✓ With the help of State Highway department, safety measures like cautionary signals, speed brakers, sign boards, etc. will be installed and monitored.

- ✓ The existing OB Dumps are being handled for backfilling and the tail end of Lease-II western parts will be backfilled upto 150 m and reclaimed at the end.

Safeguard to nearby Habitations due to Mining : There are houses existing in nearby Kattupringiyam Ayyanagar and Chinna Nagalur Villages at a minimum distance of about 175 m from the Mine. RCL had engaged **NITK, Surathkal, a Govt. of India Institute**, for Study out the scientific investigation on "Blasting Parameters & Design of Safe Bench Geometry and Evaluation of Slope Stability. The findings are : Studies with given blast configurations having 10 to 25 holes of 5 m to 10 m average depth and each blasthole charged with 16.02 kg – 40.03 kg of explosive, indicated that there is no effect of ground vibrations and fly rock caused due to blasting operations carried out in the Mine, on the stability of village structures vis-à-vis the present distances. The following Safety measures are be implemented :

- ✓ There is a level difference of 6-25 m between the Mine and the Habitations. All these houses may be assigned with a PPV of 2 mm/s due to their condition as per DGMS Standards. The public road passing through the Lease and other village structures may be assigned a PPV of 25 mm/s during Blastings.
- ✓ Blasting operations in the Periyagalur Limestone Mine should, therefore, be carried out in such a way that the ground vibrations at different structures are always maintained below the assigned permissible PPV values. Fly rock should be controlled to within mine limits, without causing any problems to the structures around and the villagers.

Scientific Study on Slope Stability : This is an existing Mines of RCL in operation since 2005 onwards with proper benches in compliance with approved Mining Plans/Schemes. The stability analysis and determination of 'Factor of Safety (FOS)' in the present investigation was carried out using Limit Equilibrium Method which is more than 1.3 and is the minimum recommended value required for stability of rock slopes. The following Safety measures will be implemented :

- ✓ The pit should be provided with garland drain/ bund / barrier on the upper surface of pit to divert the run-off of rainwater away. It should be kept effective during the monsoon.
- ✓ The open tension cracks should be filled with permeable material. This filled material should be consolidated by dozer. At the top, any impermeable material has to be spread.

Land Environment : Industrial/Mining activities are being carried out in an extent of **766.965 Ha** in the Impact Zone. **There is no additional Land requirement for the Proposal.** There is **Drilling & Blasting** proposed and thus, vibration impact due to mining will be there. Also, as the entire Top Soil & OB Dumps will be rehandled for Backfilling & Reclamation of mined out voids, there will be no Dump in the Lease. Area of excavation at the end of the life of the mine will be 39.17 Ha, out of which about 14.00 Ha will be Backfilled & Reclaimed and balance 25.17 Ha will be left out as water reservoir for recharging the ground water table in the vicinity.

Traffic Impact : Limestone Transportation of Ramco Mines, TANCEM Mines and partly Dalmia Mines (meant for Ariyalur Plant) is through SH-139 towards Ariyalur Bypass (in western part). The existing traffic volume in the Project vicinity was found to be **5,445.1 Passenger Car Units**

(PCUs)/day. In the Post-Project Scenario, there will be an addition of **468 Vehicle** (in 2 ways) due to the Project. Cumulatively, the traffic volume in the Project vicinity will be **6,410.7 PCU/day**. **The net increase (cumulative) will be 965.6 PCU/day.** The existing Roads/SH are adequate to handle the proposed traffic volume due to the Project. Adequate parking area is provided in the Mine Area. Facilities for **drivers (rest room, toilet, etc.)** are also provided.

Water - Scientific Study on Hydrogeology : On the monitoring day, the water level was observed in 6 Borewells in the PNR-A Mine vicinity (within 2 km). The levels were found to be 8.14 m BGL to 22.30 m BGL while it was 15.50 m BGL at PNR Mine. The monitored water levels in the Study Area are brought to Reduced Levels (RLs) for comparison and 'Water Level Contours' are plotted in Google Earth Imagery and appended. Ground Water-table in the District ranges from 23.0 m to 28.7 m with average level at 25.4 m BGL during Post-monsoon and 25.6 m to 31.7 m with average level at 29.2 m BGL during Premonsoon Period. Thus, no impact on the ground water levels of nearby Borewells due to mining on account of poor transmissivity.



There is no nalla crossing in the mine vicinity. Seasonal River Marudaiyar drains the region (flows at 4.9 km in the south). Seasonal Nallah Kallar River flows at 2.9 km in northwest. The entire mine pit water collected & pumped from Settling Tanks, after 20 KLD consumption for Mine use, is being utilised for Irrigation (Agricultural) activities in eastern side for about 46 Ha. There is no impact due to the Surface waters due to mining.

RCL has engaged the **Department of Remote Sensing, Bharathidasan University, Trichy** for '**Integrated Hydrological Investigations-A Geospatial Approach**' in and around their Mine Lease Areas in Ariyalur Region. Also, the EIA Coordinator and Officials of M/s. Thrust Geo-consultants Private Limited, an **Accredited Ground Water Professionals** for 'Hydrogeological Report for Mining Projects' by Central Ground Water Authority (CGWA) have carried out the Hydrogeological Survey including a Pumping Test during 18.12.2023 and submitted the Report. The Transmissivity 'T' value of the Limestone Aquifer is estimated as 2.39 m²/day. The limestone aquifer is observed to be very low in terms of transmissibility and hydraulic conductivity. **The radius of zone of influence is 317 m which falls within the mining lease area. The anticipated cone of depression in such aquifers with low T values will be highly localized, and does not spread beyond the Mine due to poor permeability of limestone aquifer.**

Mine Pits dewatering quantity was about 754 KLD during Apr. 2023-Mar. 2024 Period. The pumped out water from Settling Tanks, after 20 KLD consumption for Mine use, is being utilised for Irrigation (Agricultural) activities in eastern side for about **46 Ha. About 26 Families are the beneficiaries.** Thus, **Mine Pits water is gainfully utilized.** On Amalgamation of the Mine, about 1245 KLD mine pit seepage water realization will be there. It is about 65.12% increase to the existing discharge of 754 KLD. As in current practice, the pumped out water from Settling Tanks, after 20 KLD consumption for Mine use, will be utilised for Irrigation (Agricultural) activities in eastern side.

Ambient Air Quality : The Drilling & Blasting, Excavating, Loading, Unloading, Transporting and Rehandling activities would generate both fugitive dust emissions and smoke from Heavy Earth Moving (HEM) Machineries and Transporting Tippers. Fugitive emissions are predicted by using standard equations given in 'Indian Mine and Engineering Journal' and suggested by USEPA (Emission Factors as referred in AP-42) for Mining and Allied activities.

AERMOD View Software is used for Predicting the maximum Ground Level Concentrations (GLCs) including **Transportation Impact**. The predicted maximum GLC-PM10 for cumulative operation of Mining activities is 0.062 ug/m³ and found to be confined locally i.e. within 1.0 km radius from the boundaries. Also, **adequate Buffer Level available (55.34%)** in the Air Environment for the Proposal. Other pollutants SO₂ and NO_x emissions due to mining activities and their Predicted values are found to be low and are not reported.

Noise Levels : The mining operations are being carried out by fully mechanized method with the help of Excavators and Tipping Taurus combination. The blast induced ground vibration is controlled & maintained within permissible limits by using milli second delay detonators (MSDD) and NONEL shock tubes. In general, the work force is exposed to <85 dB(A) levels during the 8-hours Shift. Noise level at the nearest Lease boundary will be <55 dB(A) during day times and <45 dB(A) during night times and which will be within the MoEF&CC Norms for Residential and Rural Areas.

Biological Environment : There is no habitat fragmentation or blocking of migratory corridors due to Project activities since there is no wild life movement or migratory birds movement in the study area. Thus, there will not be any significant impact on the existing flora-fauna of the area. ML area is surrounded by Mines & Mineral bearing areas, barren lands and dry agricultural lands within 1.0 km area. As the baseline AAQ are in lower levels as well as Predicted GLC is very low/insignificant, there **will not be any impact on the surrounding dry agricultural lands** due to the Project.

Socioeconomics : Project employs about 33 persons directly and 50 persons indirectly. The Project Cost is **Rs.9.00 Crores**. Now, about **Rs.21.00 Lakhs** has been allotted as **Corporate Environmental Responsibility (CER) Budget** in compliance with MoEF&CC OM dated 01.05.2018 for execution within 2 years period. Also, as per MMDR Act 2015, 30% of Royalty Amount of **Rs.38.04 Crores will be earmarked for District Mineral Foundation (DMF)** and the amount will be spent for benefit of local villages.

RCL is undertaking various CSR activities, @ **Rs.1.00 Core per annum**, related to health, education, drinking water supply, sanitation, bio-toilets for individual household, infrastructure development activities, construction of bus shelters, road repair work, building class rooms, etc. for the nearby villages which will be continued.

Occupational Health : RCL is committed to provide a Safety & Healthy working conditions. RCL's objectives are : to achieve zero accident and safe work environment. The First Aid Box is made available for immediate treatment. First Aid Training is imparted to the selected employees regularly. Personal Protective Equipment (PPEs) are provided for all employees working in the Mines. Adequate training on safety and health aspect has been provided in RCL's Vocational Training Centre. RCL is also providing the ergonomic support in work comfortness with periodical review.

An Occupational Health Centre (OHC), headed by Occupational Health Physician, is run by the Company at Govindapuram Plant. Occupational Health Surveillance Programme is being conducted for the workers periodically and records are maintained. Adequate care is exercised to detect early incidences of Occupational diseases, if any, for prompt treatment and cure.

4.0 Environmental Monitoring Programme

RCL has **EMP Monitoring Cell**. The quality of air, noise, water, soil, etc. are being monitored at the identified locations as per MoEF&CC, IBM & TNPCB Norms by appointing an accredited external agency. For the Lease, periodical monitoring of Ambient Air Quality (3 locations), Fugitive emissions/Workzone Air Quality (4 locations), Ambient & Workzone Noise Levels (4 locations), Water (4 Surface & 4 Ground waters along with Mine Pit water) and Soil Quality (3 Locations) shall be undertaken and reported to Authorities.

5.0 Additional Studies

Detailed Risk Assessment and mitigative measures are delineated and an effective Disaster Management Plan, for natural and man-made disasters, is also submitted. RCL management is able to deal with the situation efficiently to reduce confusion keeping in view of the likely sources of danger in the mine. In case of eventuality and sudden occurrence of abnormalities during mining activity leads to any danger for persons and machinery in the mines, the following person will be coordinating to restore the normalcy of the situation.

Mr. Madhusudhan Kulkarni
Sr. Vice President (Mfg.)
The Ramco Cements Limited,
Govidapuram Works,
Sendurai Road, Ariyalur District
Ph.No. : 04329-294400.

The possibility of 'Offsite Emergency' situation are ruled out as RCL mine is not likely to pose any offsite emergency and hence does not call for any preparation of an off-site emergency plan.

6.0 Project Benefits

Environmental Benefits : The proposal ensures the continuous limestone supply to the Cement Plant. Effective utilization of the Mineral for Cement manufacturing is a Mineral Conservation Measure.

Financial Benefits : The Project Cost is **Rs.9.00 Crores**. As per MMDR Act 2015, 30% of Royalty Amount of **Rs.38.04 Crores** will be earmarked for **District Mineral Foundation (DMF)** and the amount will be spent for benefit of local villages in the Lease Area.

Social Benefits : Project employs about 33 persons directly and 50 persons indirectly. About **Rs.21.00 Lakhs** has been allotted as **Corporate Environmental Responsibility (CER) Budget** in compliance with MoEF&CC OM dated 01.05.2018. Also, DMF amount will be contributed.

7.0 Environmental Management Plan

Environmental Management Plan (EMP) is suggested to mitigate the possible negative impacts that may be caused to various attributes of environment due to the proposed mining operations.

7.1 EMP for Construction Phase

Being existing Mine, there will be **no Construction Phase** for the Project.

7.2 EMP for Operation Phase

Land Use :-

- ❖ No Blastings shall be carried out during night times and overcast conditions.
- ❖ Vibration Studies/Monitoring has to be carried out whenever Blastings are carried out.
- ❖ Vibration Parameters viz. Peak Particle Velocity (PPV) and Noise Levels during Blastings shall comply with DGMS Norms for Residential Areas.
- ❖ There will be no Solid Wastes Dump in the Lease at Conceptual Stage.
- ❖ OB in dumps may be gainfully utilized for reclaiming the mined out voids.
- ❖ Backfilled Mine Voids are to be Afforested with local Tree species and Reclaimed early.
- ❖ Maintenance of garland drains around the Lease boundaries has to be carried out periodically.

Traffic Impact :-

- ❖ Regular wetting of haul roads has to be undertaken to arrest the fugitive emissions.
- ❖ Tippers are to be fully covered with Tarpaulin to avoid any spillage on transportation.
- ❖ No overloading of Tippers is allowed strictly.
- ❖ A strict Speed Limit of 30 km/hr. has to be enforced and monitored continuously.
- ❖ Compliance to 'Pollution under Control' Certification has to be ensured for the Tippers which has to be checked periodically.
- ❖ Restriction of Truck parking in the Public Road has to be implemented.
- ❖ Regular and preventive maintenance of transport vehicles has to be ensured.
- ❖ Effective Green Belt with thick foliage has to be developed and maintained.
- ❖ Security Guards are to be placed at the Public Road-Mine Haulage Road Junction to handle the inward and outward vehicles.

Air Environment :-

- ❖ Controlled Blasting has to be carried out and during day times only.
 - ❖ No Blasting is carried out during overcast conditions.
-

- ❖ Water sprinkling on the Mining areas, loading point, haul roads, etc. has to be carried out.
- ❖ Covering of Trucks/Tippers with tarpaulin shall be ensured during Mineral transportation.
- ❖ Over loading of Tippers has to be avoided to control the spillages during transportation.
- ❖ Periodical maintenance and replacement of worn out accessories in the mine equipments.
- ❖ Tippers are to be maintained periodically.
- ❖ Periodical check up of vehicles for 'Emission Under Control' Certificate is to be ensured.
- ❖ Effective Green Belt with thick foliage has to be developed along boundaries and haul roads.
- ❖ Periodical Air Quality Monitoring shall be carried out and Reports submitted to the Authorities.

Noise Levels :-

- ❖ The noise and vibration generated due to the blasting operations shall be kept well within the limits by using milli-second delay electric detonators and by using Non-electric initiation system of blasting which completely eliminates air-blasts and thus reduces noise due to blasting.
- ❖ Deploying mining equipments shall be with in-built mechanism for reducing noise.
- ❖ Provision of silencers to modulate the noise generated by the machines.
- ❖ Providing sound proof operator's cabin of equipments.
- ❖ Provision of ear muffs/ear plugs to the workers in higher noise zones.
- ❖ Green Belt with thick foliage along roads and around lease boundary will act as acoustic barriers.
- ❖ Periodical Noise Monitoring shall be carried out and Reports submitted to the Authorities.

Water Environment :-

- ❖ The increased Mine Pit Water has to be utilized gainfully by increasing the supply to nearby Villages for Domestic Consumption as well as to agricultural activities nearby as in the current practice.
 - ❖ Mine Pit Water shall not be directly discharged without ensuring its quality.
 - ❖ Ground Water NOC for Dewatering has to be obtained/renewed from SGWA/CGWA Authority.
 - ❖ Periodical Monitoring of Water Level Data from existing Piezometer and nearby Wells in the vicinity has to be carried out along with the water quality.
 - ❖ Effective Afforestation in Backfilled Areas, with native species, is to be done.
 - ❖ Garland Drains and Settling Tanks are to be maintained and desilted periodically. The de-silted quantity from the Garland Drains has to be used for Green Belt/Afforestation.
 - ❖ Ground Water Levels and Water Quality are to be periodically monitored at the identified Borewells & Dugwells in the Mine vicinity.
 - ❖ The monitored Water Quality data are to be periodically submitted to the IBM and with half-yearly Compliance Reports to SEIAA-TN & Regional Office, MoEF&CC, Chennai.
-

Biological Environment :-

- ❖ Effective Green Belt has to be developed and maintained, **with the guidance of DFO**, with about **90% Survival Rate**.
- ❖ Native species shall be preferred for Green Belt development.
- ❖ Fruit bearing trees may also be preferred.
- ❖ Afforestation in backfilled & reclaimed areas shall be undertaken.
- ❖ Through the process of photosynthesis, plants assimilate carbon and return some of it to the atmosphere through respiration. The carbon that remains as plant tissue is then consumed by animals or added to the soil as litter when plants die and decompose. The primary way that carbon is stored in the soil is as **soil organic matter (SOM)**. SOM is a complex mixture of carbon compounds, consisting of decomposing plant and animal tissue, microbes (protozoa, nematodes, fungi, and bacteria), and carbon associated with soil minerals. Carbon can remain stored in soils for millennia, or be quickly released back into the atmosphere. Climatic conditions, natural vegetation, soil texture, and drainage all affect the amount and length of time carbon is stored.

Social Measures :-

CSR activities shall be carried out by providing social and welfare measures for the local residents and nearby villages around the mine area. The prime focus will be on the creating and maintaining of drinking water facilities for the students at the nearby Government Schools, establishing toilets especially for girl students at the schools, setting up of computer centres, maintenance of village roads & ponds, providing solar street lights, conducting free medical camps, etc.

Occupational Health Measures :-

- ❖ All employees are to undergo Medical Check-up on recruitment and periodically during employment. Maintenance of Pre, during & Post Employment Records are to be kept for periodical review.
 - ❖ Standard operating procedures for all operations with respect to occupational safety and health are to be in place.
 - ❖ Required Personal Protective Equipments for the Mine employees are to be provided.
 - ❖ Provision of ergonomically designed seats for drivers/operators has to be ensured.
 - ❖ Provision of illumination facilities are to be made at proper places of mines for ease of working during night times.
 - ❖ Work comfort and its periodic review by a Committee is to be ensured.
 - ❖ Provision of Rest Shelters at Mines has to be made.
 - ❖ Provision of cool drinking water to employees has to be made.
-

Plastic Waste Management : There will be **ban on one-time use and throw away Plastic** usage in the Lease. Encourage the use of eco friendly alternatives such as banana leaf, areca nut palm plate, stainless steel glass, porcelain plates / cups, cloth bag, jute bag etc.

EMP Budget :- The Project Cost is **Rs.9.00 Crores**. Proposed **EMP Capital Budget will be Rs.20,50,000/-** (excluding Budget for addressing PH issues) and **EMP Operating Cost will be Rs.11,27,750/- per Annum**. Also, about **Rs.21.00 Lakhs** has been allotted as **Corporate Environmental Responsibility (CER) Budget** in compliance with MoEF&CC OM dated 01.05.2018 for execution.

12.0 Disclosure of Consultants

EIA Consultant, M/s. ABC Techno Labs India Private Limited, Chennai has been accredited for various Sectors including **Sector-1 (Mining Projects) for Category 'A'** by the National Accreditation Board for Education & Training (**NABET**) vide Certificate NABET/EIA/2225/RA0290 dated 11.06.2023 with validity till 16.11.2025 (Sl. No. 4 of List dated 15.07.2024). ABC Laboratory is accredited by the National Accreditation Board for Testing and Calibration Laboratories (**NABL**) vide Certificate No. TC-5770 dated 03.04.2022. The Lab is also recognised by the Ministry of Environment, Forest and Climate Change (**MoEF&CC**) vide Letter F. No. Q-15018/04/2019-CPW dated 14.10.2019 with validity of 5 years. RCL has utilized the services of M/s.Ensyscon, Chennai for the coordination of the Study.

ABC comprises a team of highly talented professionals, who work in sync with clients ensuring that the defined assessment and survey or reporting is executed with high level of efficiency. The proficient team consists of Environmentalists, Policy makers, Geologists, Chemists, Engineers, Industrial hygienists, Technicians, Research Associates, Sociologists and others with expertise in various key areas.

ABC has a proven successful track record of working with industry & institutions and in executing multi faceted projects funded by organizations like World Bank, UNDP, MoEF&CC, amongst others. ABC Techno labs India Private Ltd has laid down new benchmarks in all its areas of strategic operations by the dedicated team of outstanding professionals and client-centric approach, clearly evident by the accomplishments/ clients list.

The **accredited Sectors and approved Experts** of ABC are appended.



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Certificate of Accreditation

ARC Techno Labs India Private Limited, Chennai
ARC Tower, 400, 13th Street, SIDCO Industrial Estate, North Phase, Ambattur, Chennai 600058

The organization is accredited in Category-A under the QC-NABET Scheme for Accreditation of EIA Consultant Organization, Version-3 for preparing EIA-EMP reports in the following Sector -

S. No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals including open-cast/ underground mining	1	1 (a) (i)	A
2	Offshore and onshore oil and gas exploration, development & production	2	1 (b)	A
3	River Valley projects	3	2 (c)	A
4	Thermal power plants	4	2 (d)	A
5	Mineral beneficiation including pelletisation	7	2 (b)	A
6	Metallurgical industries (ferrous & non-ferrous)	8	3 (a)	A
7	Cement Plants	8	3(b)	A
8	Petroleum refining industry	10	4 (a)	A
9	Leather/Skin/Hide processing industry	15	4 (f)	A
10	Chemical fertilizers	18	5 (a)	A
11	Petro-chemical complexes	19	5 (c)	A
12	Petrochemical based processing	20	5 (h)	A
13	Synthetic organic chemicals industry	21	5 (f)	A
14	Detergents	22	5 (g)	A
15	Integrated paint industry	23	5 (j)	B
16	Sugar industry	25	5 (i)	B
17	Oil & gas transportation pipeline, passing through national parks/ sanctuaries/toural hubs / ecologically sensitive areas including LNG terminal	27	6 (k)	A
18	Airports	29	7 (k)	A
19	Industrial estates/ parks/ complexes/ Areas, export processing zones (EPZs), special economic zones (SEZs), Biotech parks, leather complexes	31	7 (d)	A
20	Ports, harbours, break waters and dredging	33	7 (h)	A
21	Highways	34	7 (f)	A
22	Common Effluent Treatment Plants (CETPs)	36	7 (b)	B
23	Common Municipal Solid Waste Management Facility (CMSWMP)	37	7 (i)	B
24	Building and construction projects	38	8 (a)	B
25	Townships and area development projects	39	8 (c)	B

Note: Needs of approved EIA Consultants and Functional Area Experts are mentioned in BAAC minutes dated June 08, 2023 posted on QC-NABET website.

The Accreditation shall remain in force subject to continual compliance to the terms and conditions mentioned in QC-NABET's letter of accreditation bearing no QC/NABET/EN/ACC/25/2193 dated July 11, 2023. The accreditation needs to be renewed before the expiry date by ARC Techno Labs India Private Limited, Chennai following the process of assessment.


Sr. Director, NABET
Dated: July 11, 2023

Certificate No.
NABET/EN/2225/RA 0290

Valid up to
Nov 16, 2025

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

List of Experts




**SCHEME FOR ACCREDITATION OF EIA
CONSULTANT ORGANIZATIONS**

NATIONAL ACCREDITATION BOARD FOR EDUCATION AND TRAINING

(EIA - www.QCI.ac.in)

Manual for Scheme of Accreditation of EIA Consultant Organization || FAQ For Initial Accreditation

**ABC Techno Labs India Private Limited (formerly known
as ABC Environ Solutions Pvt. Ltd.)**

S No	Name	Type	Designation	Sector	FA
1	Ratnakumar V Mudhar	Empanelled	EC,FAE	2(A),21(A),22(A),27(B),29(B)	SHW(A),SC(A),V
2	Abhishek Saha	In House	EC,FAE	2(A),9(A),12(A),21(B),22(A)	WP(A),EB(A),AP
3	Dr. R. K Jayaseelan	In House	EC,FAE	1(B),31(B),39(B),21(A),27(B)	LU(A),WP(A),HG
4	Dr. R. Paramashivan	In House	EC,FAE	21(A),39(A)	WP(A),HG(A)
5	Dr. Mohit Kumar Ray	Empanelled	EC	10(A), 18(A), 4(a), 20(A), 27(A)	

S No	Name	Type	Designation	Sector	FA
6	Geetha S	In House	FAE		SE(B)
7	Hansraj Paniker	Empanelled	EC,FAE	34(B),36(B),37(B),38(B),39(B)	AP(B),WP(B),NV
8	K Sekar	Empanelled	EC	1(A),7(A),8(A),31(A),35(A)	
9	Kavitha Zog	Empanelled	EC,FAE	3(A),4(B),22(A),25(B),39(B)	SHW(B),WP(B),J
10	M.S Bhaskar	Empanelled	EC,FAE	1(A),2(A),7(B),21(A)	Geo(A),HQ(A),LI
11	Muthiah Marappan	Empanelled	EC,FAE	4(A),10(A),15(A),16(A),28(A)	SHW(A),AP(A),V
12	P Swaminaj	Empanelled	EC	34(A)	
13	R Rajendran	Empanelled	EC,FAE	8(B),36(B),38(B),39(A)	SHW(B),AP(B),J

S No	Name	Type	Designation	Sector	FA
14	Shankar N Gopthya	Empanelled	EC	27(A),30(A)	
15	Sushil Mahajan	In House	,FAE		SE(A)
16	Vishnavi Dhinakaran	In House	,FAA		SHW,WP
17	Vijayalakshmi K	Empanelled	EC,FAE	28(B),38(B),4(a),21(A)	NV(A),RM(A),AQ
18	Vinod Kumar Gautam	Empanelled	EC,FAE	28(A),38(B),28(D),21(A),34(A)	SHW(A),AQ(A),F
19	Vivick P Nayyar	Empanelled	EC,FAE	1(A)	NV(A)

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Best viewed in 1024x768 or higher resolution mode.

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F.No Q/1102/94/2019/CPW
 Government of India
 Ministry of Environment, Forest and Climate Change
 (CP Division)

Agn-211, Indira Parkway, Plot no.
 for High Road,
 New Delhi - 110019
 Dated: 16/ 12/ 2019

To

M/s ABC Techno Labs India Private Limited
 ABC Tower No. 406, 13th Street, SIDCO
 Industrial Estate North Phase, Ambattur
 Chennai, TamilNadu-600098

Subject: Recognition of M/s ABC Techno Labs India Private Limited, ABC Tower No-406, 13th Street, SIDCO, Industrial Estate North Phase, Ambattur, Chennai, TamilNadu-600098, as Environmental Laboratory under the Environment (Protection) Act, 1986 - regarding.

Re:

I am directed to refer to your application dated 04/10/2019 for approval of recognition of your laboratory under Environment (Protection) Act, 1986. Based on the recommendation of the Expert Committee for Recognition of Environmental Laboratories in its 10th meeting held on 30/08/2019 and your compliance of the revised terms and conditions of Sections III & IV of the Guidelines for Recognition of Environmental Laboratories, this Ministry approves the renewal of recognition of M/s ABC Techno Labs India Private Limited, ABC Tower No. 406, 13th Street, SIDCO, Industrial Estate North Phase, Ambattur, Chennai, TamilNadu-600098, for five years, to start be notified in the Gazette of India.

2. As sought in your aforementioned application, M/s ABC Techno Labs India Private Limited, Chennai may undertake the following tests:

- i. **Physical Tests:** Conductivity, Colour, pH, TSS & settleable solids, Total solids, Total dissolved solids, Total suspended solids, Turbidity, Temperature, Velocity & discharge measurement of industrial effluent stream, Flocculation test, Free Chlorine, Solids, settleable solids and Sludge volume index.
- ii. **Inorganic (General & Non-metallic):** Acidity, Ammoniacal nitrogen, Chloride, Chlorine residual, Dissolved oxygen, Fluoride, Total hardness, Total Kjeldahl nitrogen (TKN), Total nitrogen, Nitrite nitrogen, Phosphate, Sulphate, Sulfide, Carbon dioxide, Chlorine demand, Iodine, Sulfite, Sulfur, Cyanide and Sulphide.
- iii. **Inorganic (Trace metals):** Boron, Cadmium, Calcium, Chromium, Total Chromium, Hexavalent Chromium, Copper, Iron, Lead, Magnesium, Mercury, Nickel, Potassium, Sulfur, Sodium absorption 2400, Zinc, Arsenic, Aluminium, Beryllium, Barium, Lithium, Manganese, Selenium, Silver, Strontium, Tin, Antimony, Cobalt and Vanadium.
- iv. **Organics (General) and Trace Organics:** Bio-chemical oxygen demand (BOD), Chemical oxygen demand (COD), Oil & grease, Phenol, Pesticide (Organochlorine, Organonitrogen-phosphorus), Total organic carbon, Surfactant, Tannin & lignin, Poly-chlorinated biphenyl (PCB) and Poly-cyclic aromatic hydrocarbon (PAH), Organic carbon (as Solid) and Carbon-Nitrogen ratio.
- v. **Microbiological Tests:** Total Coliform, Faecal Coliform, Faecal streptococci, F. coli, Total Water count and Enterobacter.
- vi. **Toxicological Tests:** Drosophila method for mutation of bacteria using B6, Bioaccumulation, Bio-magnification and bio-transformation studies, Measurement of toxicity using Daphnia or other organisms.
- vii. **Biological Tests:** Synthetic organism identification and count, (Planktonic Microtox test), Measurement of various diversity index, Chlorophyll and primary productivity.
- viii. **Hazardous Waste:** Preparation of Leachate (TCLP extract) water extract, Conductivity, Acidity (Hach-Drift), Reactivity, Toxicity and Measurement of heavy metals/pesticides in the leachate leachate.
- ix. **Soil/Sludge/Sediment and Solid Waste:** Boron, Cation Exchange Capacity (CEC), Electrical Conductivity, Nitrogen available, Organic carbon water leachate methods, pH, Phosphate

(arsenite), Phosphate (arsite), Fluoride (arsite), Potassium, Sulfur, Sulfate, Sodium, Sodium nitrate, Iron, Calcium, Lead, Arsenic, Barium, Cadmium, Cobalt, Copper, Cyanide, Chloride, Fluoride, Exchangeable Sodium Percentage, Heavy metal, Magnesium, Nitrate, Nitrite, PAH, Pesticide, Polychlorinated Biphenyl, Sulphur, Sulfoxide, TDC / Total water soluble salt and Water binding capacity)

k. **Ambient Air: Fugitive Emissions:** Nitrogen dioxide (NO₂), Sulphur dioxide (SO₂), Suspended particulate matter, Respirable suspended particulate matter (RPM), Ammonia, Carbon monoxide, Ozone, Fluoride, Lead, Heavy, Benzene Toluene Xylene, Polycyclic aromatic hydrocarbon (PAH), Benzopyrene & others, Total Particulate Matter (PM) and Volatile Organic Compounds.

l. **Stack Gases/ Source Emission:** Particulate matter, Sulphur dioxide, Velocity & Disp. Carbon dioxide, Carbon Monoxide, Temperature, Oxygen, Oxides of nitrogen, Acid rain, Ammonia, Chlorine, Hydrochloric acid, Total Hydro Carbon, Hydrogen Sulphide.

m. **Noise Level:** Noise level measurement (24 hrs) at 100m, Ambient noise & Source (open) Noise.

n. **Meteorological:** Ambient temperature, Wind direction, Wind speed, Relative Humidity and Rainfall.

1. Further, the following analysts have been approved for recognition as Government Analysts:
 - (i) Mr. S. Raju
 - (ii) Mr. K.C. Sureshbabu
 - (iii) Mr. A. Babasaheb Chinnadani

2. The laboratory shall compulsorily participate in the Analytical Quality Control (AQC) exercise conducted by the Central Pollution Control Board (CPCB) at least once a year to ascertain the credibility of the laboratory and analyses carried out and shall submit quarterly progress reports to the Ministry.

3. Periodic surveillance of the recognized environmental laboratory will be undertaken by this Ministry/CPCB to assess its proper functioning, systematic operation and reliability of data generated at the laboratory.

4. It is also mandatory for the laboratory to have requisite accreditation of the NABL (ISO 9001) and ISO/IEC 17025 and its renewal as per accreditation rules. Permission in para 2 above is subject to such accreditations and renewal as applicable.

5. The laboratory should compulsorily follow the specified Terms & Conditions. In case of serious non-compliance of any of the Terms and Conditions, the laboratory may be black listed for a minimum period of one year and civil criminal proceedings, as applicable, may be initiated for performing functions on behalf of the Government in an unauthorized manner.

Yours faithfully,



(Sd/-) S. Manoj George, I.A.

Secretary, I.P.

Env. No. 511-2485327

Email: smanojg@nic.in

Copy to

1. Member Secretary, Central Pollution Control Board, Panchsheel Bhawan, Lodhi Arjan Nagar, New Delhi - 110032.
2. Member Secretary, Tamil Nadu Pollution Control Board (TNPCB), 78 Anna Salai, Chennai - 600012.
3. Additional Principal Conservator of Forests (C), Ministry of Environment, Forest and Climate Change, Regional Office (SEZ), 1st and 2nd Floor, Handloom Export Promotion Council, 34, Cathedral Garden Road, Nungambakkam, Chennai-34.
4. Director, II Division, MoEF&CC, New Delhi (110001) for spreading on MoEF&CC website.



भारतसरकार
GOVERNMENT OF INDIA
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE
Regional Office/ क्षेत्रीय कार्यालय,
1st Floor, Additional Office Block for GPOA, Shastri Bhawan, Haddows
Road, Nungambakkam, Chennai – 600006



EP/12.1/940/TN/SA2

18.04.2024

To

Shri Pankaj Varma
Member Secretary
IA-division, Non-Coal Mining
Indira Paryavaran Bhawan
Ministry of Environment, Forest & Climate Change
Aliganj, Jor Bagh Road, New Delhi-110001

Subject 1: Periyannagar opencast limestone mine (capacity 1.05 lakh tonnes per annum) of M/s. Madras Cements Ltd. (now M/s. The Ramco Cements Limited) at village Periyannagar, District Perambalur (now Ariyalur District), Tamil Nadu – Environmental Clearance reg.

Reference No 1. F. No. J-11015/10/99-IA. II(M) dated 26.11.1999

Subject 2: Expansion of Periyannagar Limestone Mining Project (Project area 40,515 ha (ML area 36,29.5 ha, 4.22 ha of crusher area and increase in limestone production from 0.105 MTPA to 0.9 MTPA) of M/s. The Ramco Cements Limited (formerly M/s. Madras Cements Ltd.) at village Periyannagar, Taluk Ariyalur in District Ariyalur (formerly Perambalur District), Tamil Nadu

Reference No 2. F. No. J-11015/556/2007-IA.II(M) dated 10.10.2007

Your letter dated: 01.02.2024

Sir,

With reference to the above-mentioned subject, please find enclosed herewith Certified Compliance Reports. This has the approval of the competent authority vide diary No. 236398 dated 18.04.2024.

Encl: As above.

Yours faithfully,

C. Palpandi
(Dr. C. Palpandi)
Scientist 'D'

Dr. C. Palpandi
Scientist 'D'
Government of India
Regional Office, MoEF&CC
Shastri Bhawan, Haddows Road,
Nungambakkam, Chennai-600 006

GOVERNMENT OF INDIA
Ministry of Environment, Forest & Climate Change
(Regional Office, Chennai)

MONITORING REPORT

PART - I

DATA SHEET

1	Project Type: River valley / Mining / Industry / Thermal / Nuclear / Other Specify	:	Mining
2	Name of the project	:	<p>1. Periyagalur opencast limestone mine (capacity 1.05 lakh tonnes per annum) of M/s. Madras Cements Ltd. (now M/s. The Ramco Cements Limited) at village Periyagalur, District Perumbalur (now Ariyalur District), Tamil Nadu - Environmental Clearance reg.</p> <p>2. Expansion of Periyagalur Limestone Mining Project (Project area 40.515 ha (ML area 36,29.5 ha, 4.22 ha of crusher area and increase in limestone production from 0.105 MTPA to 0.9 MTPA) of M/s. The Ramco Cements Limited (formerly M/s. Madras Cements Ltd.) at village Periyagalur, Taluk Ariyalur in District Ariyalur (formerly Perambalur District), Tamil Nadu</p>
3	Clearance letter(s) / OM No. and dated	:	<p>i. MoEF Letter F. No. J-11015/10/99-1A. II(M) dated 26.11.1999 for 0.105 MTPA.</p> <p>ii. MoEF&CC Letter F. No. J-11015/556/2007-1A.II(M) dated 10.10.2007 - Expansion from 0.105 MTPA to 0.9 MTPA</p>
	Consent order for Establishment (CFE) No. & date	:	CTE Orders 4223 (Air Act) & 4279 (Water Act) dated 25.01.2008 for the Expansion production quantity of 0.90 MTPA @ 3000 TPD.
	Consent Order for Operation (CFO) No., date and validity	:	CTO-Renew Orders: 2308150516922 (Water) & 2308250516922 (Air) dated 28.12.2023 with validity till 31.03.2024 for the Expansion production quantity of 0.90 MTPA @ 3000 TPD.

4	Locations:	
a.	Taluk(s) District	: Ariyalur Taluk, Ariyalur District
	State (s)	: Tamil Nadu
	Latitudes / Longitudes	: 11° 07' 27" - 11° 07' 44" N & 79° 08' 45" - 79° 08' 55" E
5	Address of correspondence:	
a.	Address of concerned project Chief Engineer (with Pin Code & telephone / telex / fax numbers	: Shri Madhusudhan Kulkarni Sr. Vice President (Manufacturing) M/s The Ramco Cements Limited Govindapuram, Ariyalur - 621713. Phone No.: (04329) 226001 - 04 Fax No.: (04329) 226005 Email: madbusudan.k@ramcocements.co.in
6.	Salient features:	
a.	of the project	: The Mine is being operated over an Extent 35.96 Ha now (against EC Stage extent of 36.295 Ha) with EC dated 26.11.1999 for 0.105 MTPA from 2005-06 to 2007-08 and with Expansion EC dated 10.10.2007 for 0.90 MTPA (Clean Limestone) from 2008-09 to till date. Crusher established over an extent of 4.22 Ha was shifted to RCL Govindapuram Cement Plant. Opencast Conventional Mining method with Drilling & Blasting is adopted. Mined out limestone is loaded in tippers and transported to Govindapuram Cement Factory. The Project Authority (PA) is planning to go for amalgamation of this Periyagalur Mine along with Periyagalur West Mine over an extent of 17.360 Ha which is located adjacent in the western side of this mine. <i>The PA obtained TOR from SELAA-Tamil Nadu.</i> For this purpose, the PA has requested Certified Compliance Report.
b.	of the environmental management plans.	: <u>Air Pollution:</u> <ul style="list-style-type: none"> • Development of shelter belt. • Development of avenue plantation. • Regular water sprinkling for dust suppression. • Regular maintenance of vehicles. <u>Noise pollution:</u> <ul style="list-style-type: none"> • Limiting time exposure of workers to excess noise.

			<ul style="list-style-type: none"> • The workers provided with protection equipment and earmuffs. • Speed of the trucks entering or leaving-with moderate speed. • Green belt developed act as noise buffer.
7	Breakup of the project area		
	a	Submergence area (forest & non-forests)	: Not Applicable. No forest land is involved.
	b	Others (Beneficiation Plant area)	: No Beneficiation Plant.
8		Break up of project affected population with enumeration of those losing houses / dwelling units only, agricultural land only, both dwelling units and agricultural land and landless labourers / artisans	: Not Applicable Own Patta land (32.835 Ha) & Government Poramboke land (3.125 Ha)
	a	SC,ST/Adivasis	: Not Applicable
	b	Others	: Not Applicable
9	Financial Details		
	a	Project cost as originally planned and subsequent revised estimates and the years of price reference	: Rs. 6.30 Crores
	b	Allocations made for environmental management plans, with item wise and year wise breakup	: Capital – Rs.64.00 Lakhs Recurring Rs.25.00 Lakhs per annum
	c	Benefit cost ratio / internal rate of return and the years of assessment	: Not Applicable; Captive Mine
	d	Whether (c) includes the cost of environmental management as shown in (b) above	: Yes
	e	Total expenditure on the Project so far	: Rs. 6.30 Crores
	f	Actual expenditure incurred on the environmental management plans so far	: Capital – Rs.64.00 Lakhs Recurring Rs.25.00 Lakhs per annum
10	Forest land requirement:		
	a	The status of approval for a diversion of forest land for non-forestry use	: Not Applicable
	b	The status of compensatory afforestation, if any	: Not Applicable
	c	The status of clear felling	: Not Applicable
	d	Comments on the viability and sustainability of compensatory afforestation programme in the light of actual field experience so far	: Not Applicable

11	The status of clear felling in non-forest area (such as submergence area of reservoir, approach road), if any, with quantitative information.	:	Not Applicable	
12	Status of construction:			
	a	Date of commencement	:	01.07.2005
	b	Date of completion (actual and / or planned)	:	Ongoing project
13	Reasons for the delay if the project is yet to start.	:	Not Applicable	
14				
	a	The dates on which the project was monitored by the Regional Office on previous occasions, if any	:	18.02.2022 & 19.02.2022
	b	Date of site visit for this monitoring report	:	22.02.2024

C. Palpandi
 (Dr. C. Palpandi)
 Scientist 'D'

PART-II

Subject: Expansion of Periyaganalur Limestone Mining Project (Project area 40.515 ha (ML area 36,29.5 ha, 4.22 ha of crusher area and increase in limestone production from 0.105 MTPA to 0.9 MTPA) of M/s. The Ramco Cements Limited (formerly M/s. Madras Cements Ltd.) at village Periyaganalur, Taluk Ariyalur in District Ariyalur (formerly Perambalur District), Tamil Nadu - reg.

Reference No: MoEF&CC Letter F. No. J-11015/556/2007-IA,II(M) dated 10.10.2007.

Monitoring Date: 22.02.2024

Present Status of the Project:

The Mine is being operated now over an extent of 35.96 Ha with validated GO (Ms) No. 77 dated 26.07.2018 under MMDR Amendment Act, 2015 and is valid till 19.08.2053 (attached as Document-1). Supplementary Lease Deed has been executed and registered on 03.07.2019.

First EC dated 26.11.1999 was for 0.105 MTPA Limestone production over an extent of 36.295 Ha. The mine was operated for 0.105 MTPA quantity from 2005-06 to 2007-08. Expansion EC dated 10.10.2007 is for 0.90 MTPA (Clean Limestone) production and the mine is operating for this quantity from 2008-09 to till date. Crusher established over an extent of 4.22 Ha in the non-lease area was shifted to RCL Govindapuram Cement Plant.

TNPCB has issued CTO-Renew Orders 2308150516922 (Water) & 2308250516922 (Air) dated 28.12.2023 with validity till 31.03.2024 for the Expansion production quantity of 0.90 MTPA @ 3000 TPD and are attached as Document-2.

Review of Mining Plan (ROMP) has been prepared and approved by IBM, Chennai for the Period 2023-24 to 2027-28 vide Letter No. TN/AIR/LST/ROMP-1704.MDS dated 14.12.2022 and is valid till 31.03.2028 which is attached as Document-3.

Proved/Mineable Reserves is 6,14,800 Tonnes Limestone as on 01.09.2022. Opencast Conventional Mining method with Drilling & Blasting is adopted. Mined out limestone is loaded in tippers and transported to Govindapuram Cement Factory.

The Project Authority (PA) is planning to go for amalgamation of this Periyaganalur Mine along with Periyaganalur West Mine over an extent of 17.360 Ha which is located adjacent in the western side of this mine. The PA obtained TOR from SEIAA-Tamil Nadu. For this purpose, the PA has requested the RO, MoEF&CC, Chennai for Certified Compliance Report. Accordingly, the Mine was inspected on 22.03.2024. The Mine is in operation on the day of monitoring.

Site visit Photographs are attached as Annexures I-II.

C. Narasimha

PART-IIISpecific Conditions:

S. No.	EC Conditions	Compliance status
i.	Top soil shall be stacked properly with proper slope with adequate safeguards and shall be backfilled for reclamation and rehabilitation of mined out area.	<p>Complied.</p> <p>Topsoil of 332,600 Tons was removed and stacked at the earmarked site and 3,01,022 Tons was used for green belt development. There are 5 Nos. OB Dumps with 25,47,843 Tons OB. Backfilling with OB materials is being carried out in northern side of the Pit and balance Topsoil is used for reclamation and rehabilitation of backfilled areas.</p>
ii.	<p>Garland drains shall be constructed to arrest silt and sediment flows from soil, and mineral dumps. The water so collected shall be utilized for watering the mine area roads green belt development etc. The drains shall be regularly de-silted particularly after monsoon and maintained properly.</p> <p>Garland drain with appropriate (size, gradient and length) shall be constructed for both mine pit and for waste dump and sump capacity shall designed keeping 50% safety margin over and above peak sudden rain fall (based on 50 years data) and maximum discharge in the area adjoining the mine site. Sump capacity shall also provide adequate retention period to allow proper settling of site material. Sedimentation pits shall be constructed at the corner of the garland drains and desilted at regular intervals.</p>	<p>Complied.</p> <p>Garland Drains are provided all along periphery of overburden dumps with dimension of 1500 (L) x 2 (W) x 2 m (D). Recharge cum Settling Pond of 100 (L) x 50 (W) x 2 m (D) is made in the eastern side of the Lease area to collect the surface runoffs through garland drains. Water collected in the settling pond is utilized for green belt and dust control measures. Excess water is drained to nearby irrigation pond for raising agricultural crops in nearby areas. Garland drains are also provided for working mine pit of size 700 (L) x 2 (W) x 2 (D). Garland drains are connected to the sedimentation tanks of 3 (L) x 3 (W) x 2 m (D) at the corners to settle the solids before final disposal. Periodical desilting of garland drains and sedimentation tanks is made.</p>
iii.	Conceptual mining plan for every 5 years for the mine shall be submitted to Ministry.	<p>Complied.</p> <p>Periodical Mining Plan for 5 years Block period with conceptual stage closure plan is prepared and obtained approval by IBM. Approved plan is submitted to the Authorities. Present ROMP for the Period 2023-24 to 2027-28 is approved by IBM vide Letter No.</p>

C. Panwar

		TN/ALR/LST/ROMP-1704.MDS dated 14.12.2022 and is valid till 31.03.2028.
iv.	The company shall monitor cumulative impacts of the nearby mines and cement plants located in the area with regard to ambient air quality and maintain proper authentic record.	Complied. Ambient air quality is periodically monitored at 3 locations in the Mine and 6 locations in the buffer zone for monitoring the cumulative impacts of the nearby mines and cement plant. Periodical reports (Document-4) are submitted to TNPCB on monthly basis, IBM on quarterly basis and RO on six monthly basis.
v.	Drilling and blasting shall be by using dust extractors / wet drilling.	Complied. Both Opencast Conventional Mining with controlled Drilling & Blasting and Non-Conventional Mining Method with X-Centric Ripper is adopted. Wet drilling is adopted.
vi.	Plantation shall be raised in an area of 21.21 ha including a green belt of adequate width by planting the native species around the ML area, OB dump sites etc., in consultation with the local DFO/Agriculture Department. The density of the trees shall be around 2500 plants per ha. Selection of plant species shall be as per CPCB guidelines. Herbs & shrubs shall also form a part of afforestation programme besides tree plantation.	Complied. Green belt is developed around the ML areas, all along haulage road, dumps and mine office. Green belt is developed in a phased manner. About 18.70 Ha is brought under green belt with 43,660 trees @ 2,335 plants per ha and survival rate is about 90%. Herbs and shrubs are also made besides tree plantation.
vii.	The project authority shall implement suitable conservation measures to augment ground water resources in the area in consultation with the Regional Director, Central Ground Water Board.	Complied. Recharge cum Settling Pond of 100 (L) x 50 (W) x 2 m (D) is made in the eastern side of the Lease area to collect the surface runoffs through garland drains. Water collected in the settling pond is utilized for green belt and dust control measures. Excess water is drained to nearby irrigation pond for raising agricultural crops in nearby areas. The PA is consulting SGWB for mine pit dewatering and its gainful utilisation.
viii.	Regular monitoring of ground water level and quality shall be carried out by establishing a network of existing wells and constructing new piezometers.	Complied. Periodical monitoring of ground water level is carried out 3 locations on

C. Narasimhan

	<p>during the mining operation. The monitoring shall be carried out four times in a year pre-monsoon (April-May), Monsoon (August), post-monsoon (November), winter (January) and the data thus collected may be sent regularly to MoEF, central Ground water Authority and Regional Director Central Ground Water Board.</p>	<p>quarterly basis in addition to the piezometer readings recorded in the Mine. Periodical water level data (Document-5) are submitted to IBM on quarterly basis and RO, MoEF&CC, Chennai on six monthly basis. Ground water quality monitoring data is attached as Document-6.</p>
ix.	<p>The existing water bodies and that to be created during the course of mining may utilized to develop pisciculture by organizing Fishermen cooperative society with the land losers if any and special the poorer section of the people as member of such society with initial financial assistance in the form of share money and managerial assistance so that the member themselves can run the affairs of the society in due course. The project proponent shall arrange marketing tie up so that the society gets fair price of their product and the profits are equitably shared by member of the society as regular source of income.</p>	<p>Refer below.</p> <p>There is no existing water bodies around the mine pit. At conceptual stage, balance mine pit voids, after backfilling, will be left out as water reservoir. Pisciculture activities will commence after that.</p>
x.	<p>Land use pattern of the nearby villages shall be studied and action plan for abatement and compensation for damage to agriculture land or common property land (if any) due to mining activity shall be submitted to ministry within six months.</p>	<p>Complied.</p> <p>Land Use pattern of the nearby villages are studies with Satellite imageries. The mine is surrounded by other leases in northern and western parts. OB dumps exist in eastern and southern parts. There is no agricultural activity near the mine. Hence, the PA has not prepared action plan.</p>
xi.	<p>Soil samples for contamination of mercury, chromium and other traces metals shall be studied when mine is in operation and records maintained.</p>	<p>Complied.</p> <p>Soil quality monitoring is carried out 2 locations and reports submitted to the Authorities on quarterly basis (Document-7). As per monitored data, there was no trace metals recorded in the Soil quality monitoring.</p>
xii.	<p>Erosion and silt control measures shall be prepared and ground vibration study shall be conducted.</p>	<p>Complied.</p> <p>Garland drains are provided around OB dumps to arrest the silt. Check dams are also made for this purpose. Vibration levels are monitored with Minimate instruments whenever blasting are done</p>

C. Narasimhan

		and records are maintained as per DGMS requirement.
xiii	Vehicular emissions shall be kept under control and regular monitored. Measures shall be taken for maintenance of vehicle used in mining operations and in transported of mineral. The vehicles shall be covered with a tarpaulin and shall not be overloaded.	Refer below. All the vehicles used in the mine are on contract basis and servicing is being done in their own places. 'Pollution Under Control' Certificates are checked periodically. The PA also informed that transport vehicles are covered with tarpaulin and are not overloaded.
xiv	A final Mine Closure Plan, along with details of Corpus Fund, shall be submitted to the Ministry of Environment & Forests 5 years in advance of final mine closure for approval.	Refer below. The PA is planning to go for amalgamation of this Periyannagalur Mine along with Periyannagalur West Mine located adjacent in the western side of this mine. Thus, mine decommissioning plan will be delayed and will be submitted well in advance.
xv	Company shall periodically (every 6 month) monitor river water quality and also shall undertake mitigation measures in case contamination due to mining activity is observed. Periodic test result of the river water quality shall be submitted to the state government and the ministry for record every 6 months.	Complied. The PA is monitoring the Surface water quality at 3 locations through a NABL Lab on quarterly basis and submitting the Reports to the Authorities as Six-monthly compliance. The monitored data (Document-8) reveals that there was no contamination of surface waters due to the mining activities.
xvi	Transportation of ore shall be done by covering the trucks with tarpaulin or other suitable mechanism so that no spillage of ore /dust take place. Transportation shall be done only during day time.	Complied. Ore is transported through Tippers covered with tarpaulin. Transportation is done during permitted times by the District Administration.
xvii	Occupational health surveillance program of the workers shall be undertaken periodically to observe any contractions due to exposure to dust and take corrective measures, if needed occupational health and safety measures for the workers including training on malaria eradication, HIV, and health effects on exposure to mineral dust etc., shall be carried out. The company shall engage a full time qualified doctor who is trained in occupational Health surveillance, health record of workers shall be maintained.	Complied. Occupational Health Surveillance Program is being conducted for the workers periodically. An Occupational Health Center is at the Cement Plant. A dedicated dispensary with qualified Doctor in OHS and pharmacy are provided for Occupational Health Surveillance and Monitoring. Personal Protective Equipment is provided for all employees working in the mines. Adequate training on Safety and health aspect has been provided. Review of

C. Prasad

	Impact of various health measures is being undertaken.
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General Conditions: -

S. No.	EC Conditions	Compliance status
i.	No change in mining technology and scope of working shall be made without prior approval of the Ministry of Environment & Forest.	Complied. There is no change in scope of working and technology. The PA is planning to go for amalgamation of this Periyagalur Mine along with Periyagalur West Mine located adjacent to this mine. The PA obtained TOR from SEIAA-Tamil Nadu. For this purpose, the PA has requested the IRO, MoEF&CC, Chennai for Copy of the Certified Compliance Report.
ii.	No change in the calendar plan including excavation, quantum of limestone and waste should be made.	Complied. The PA is following the calendar plan as approved by IBM.
iii.	Conservation measures for protection of flora and fauna in the core & Buffer zone shall be drawn up in consultation with the local forest and wildlife department.	Refer below. The ML area is private land, there is no forest land involved. No wildlife also was observed in this area. No conservation plan is required.
iv.	Four ambient air quality - monitoring stations should be established in the core zone as well as the buffer zone for RPM, SPM, SO ₂ , NO _x and CO monitoring. Location of the stations should be decided based on the meteorological data topographical features and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board	Complied. In consultation with TNPCCB, Ambient air quality is periodically monitored at 3 locations in the Mine and 6 locations in the buffer zone as per the Land Use pattern and environmentally sensitive targets. Periodical reports are submitted to TNPCCB on monthly basis, IBM on quarterly basis and RO, MoEF&CC on six monthly basis.
v.	Data on ambient quality should be controlled regularly submitted to the Ministry including its Regional office at Bangalore and the State Pollution Control Board/ Central Pollution Control Board once in six months.	Complied. AAQ monitored data is being submitted to the Ministry once in six months and on monthly basis to TNPCCB regularly.

S. Prasad

vi.	Fugitive dust emissions from all the sources should be controlled regularly monitored and data recorded properly. Water spraying arrangement on haul roads, wagon loading, dump, trucks (loading & unloading) should be provided and properly maintained.	Complied. Fugitive dust emission is controlled on mine haul road, internal roads by spraying water and maintained well.
vii.	Measures shall be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in operations of HEMM, etc., shall be provided with ear plug / muffs.	Complied. The PA is monitoring both Ambient & Work zone Noise levels periodically through a NABL Lab and submitting the status reports to the Authorities. The monitored data (Document-9) reveals that Leq Noise Levels were within the MoEF&CC Norms for Residential Area and within 85 dB(A) in working areas for 8-hours duration.
viii.	Industrial waste water (workshop and waste from the mine) should be properly collected, treated so as to conform to the standards prescribed under GSR 422 (E) dated 19 th May, 1993 and 31 st December, 1993 or as amended from time to time. Oil and grease trap shall be installed before discharge of workshop effluents.	Refer below. There is no trade effluent generation from the mine.
ix.	Personnel working in dusty areas should wear protective respiratory devices and they should also be provided with adequate training and information on safety and health aspects.	Complied. Personnel Protective Equipment (PPE) including earplugs are provided to the workers and they are using them. Training on safety also are being given to them regularly.
x.	A separate environmental management cell with suitable qualified personnel should be set-up under the control of a Senior Executive, who will report directly to the Head of the Organization.	Complied. Environment Management Cell (EMC) is made with qualified person including Horticulturist. The EMC person is directly reporting to the Head of the Unit.
xi.	The project authorities shall inform to the Regional Office located at Bangalore regarding date of Financial closures and final approval of the project by the concerned authorities and the date of start of land development work.	Refer below. It is an existing captive mine and thus, the financial closure was not required.
xii.	The funds earmarked for environmental protection measures shall be kept in separate account and should not be	Complied.

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	diverted for other purpose. Year wise expenditure should be reported to the Ministry and its Regional office located at Bangalore.	The PA has allocated adequate amount for environment management and informed that it is not diverted for any other purpose. The amount is kept in a separate budget.
xiii	The Regional Office of this Ministry located at Bangalore shall monitor compliance of the stipulated conditions. The project authorities extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data /information/monitoring reports.	Complied. The PA has extended full co-operation to the officers of RO, MoEF&CC, Chennai during the visit and provided requisite data / information.
xiv	A copy of clearance letter will be earmarked to concern Panchayat / local NGO, if any from whom suggestion / representation has been received while processing the proposal.	Not complied. No document of submission of Environmental Clearance letter to the local panchayat has been provided.
xv	State Pollution Control Board should display a copy of the clearance letter at the Regional office, District Industry center and Collectors office/ Tahsildars Office for 30 days.	Refer below. This condition pertains to TNPCB.
xvi	The project authorities should advertise at least in two local newspapers widely circulated around the project, one of which shall be in the vernacular language of the locality concerned, within 7 days of the issue of the clearance letter informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the State Pollution Control Board and may also be seen at web site of the Ministry of Environment & Forests at http://envfor.nic.in and a copy of the same shall be forwarded to the Regional Office of the Ministry located at Bangalore.	Complied. Advertisements were given in two local Newspapers namely, Indian Express (English) dated 15.10.2007 and Dinathanthi (Tamil) dated 15.10.2007. (Document-10).

Summary note:

(i) Implementation of Conditions

The PA has not complied following EC conditions:

- No document of submission of Environmental Clearance letter to the local panchayat has been provided.

C. Narasimha

(ii) General observations:

During the site visit, it was observed that the PA has complied most of the EC conditions which are satisfied.

(iii) Court cases and show cause/closure notices

At present there are no court cases and show cause / closure notices issued by the Competent Authority.


(Dr. C. Palpandi)
Scientist 'D'

Dr. C. Palpandi
Scientist 'D'
Government of India
Regional Office, M&EF&CC
Shastri Bhawan, Haddows Road,
Nungambakam, Chennai - 600 008

J-11015/556/2007- IA.II(M)
 Government of India
 Ministry of Environment & Forests

Tel no. 24363973

E mail: plahujanai@yahoo.com
 Paryavaran Bhavan, C.G.O. Complex,
 Lodi Road, New Delhi-110003

Dated the October 10, 2007

To

M/s Madras Cements Ltd
 Auras Corporate Centre, V Floor,
 98-A, Dr. Radhakrishnan Road
 Mylapore Chennai 600004

Sub: Expansion of Periyagalur Limestone Mining Project (Project area 40.515 ha (ML area 36.29.5 ha, 4.22 ha of crusher area and increase in limestone production from 0.105 MTPA to 0.9 MTPA) of M/s Madras Cements Ltd. at village Periyagalur, Taluk Ariyalur in District Perambalur, Tamil Nadu - regarding Environmental Clearance.

Sir,

The undersigned is directed to refer to your letter no. MCL-CO/PNR/MOEF-2007/1 dated 11.06.2007 on the subject mentioned above. The Ministry of Environment and Forests has examined the application

2. It has been noted that proposal is for environmental clearance for expansion of production capacity of mine from 0.105 million TPA to 0.90 Million TPA to supply limestone to the cement plant. The mine is located in district Perambalur in Tamilnadu. Total project area is 40.515 ha of which ML area is 36.29.5 ha and 4.22 ha of crusher area. The lease area of the mine comprises of 32.95 ha of agricultural land and 3.345 ha of Govt. revenue land. Out of 40.515 ha of area at the post mining stage, 10.23 ha will be left as void, 7.81 ha will be backfilled, 0.95 ha is for waste dump, 4.42 ha of built up area, 13.40 ha for green belt and 3.7015 ha of undisturbed area. Water body will be used as fish pond. Topography of the area is flat. Marudaiyar river which is seasonal is located at a distance of 4.0 Kms from the mine boundary. No ecologically sensitive area, such as National park/ Wildlife Sanctuary /Biosphere reserve etc is located within 10 Km radius of the core zone. Project does not involve forest land and displacement of the people. Life of the mine is 8.3 years. Method of mining will be opencast and mechanized. Drilling and blasting is involved, water requirement of 45 m³/a will be met from the ground water source and mine pit water. The ultimate working depth will be 40m bgl and ground water table is 16 m bgl. Mine workings will intersect the ground water table. Hydrogeological study of the area has been carried. As per the study, total recharge is 43.19 million m³ and net ground water draft is 16.15 million m³, whereas ground water availability is 27.04 million m³. Net annual ground water availability is 59.73 %. Total quantity of OB generated will be 0.86 Million m³, which will be backfilled and stabilized with vegetation. It is noted that public hearing of the project was held on 22.08.06. Approval of Modifications in the approved mining plan including progressive mine closure plan from the IBM has obtained on 01.09.2006. Cost of the project is Rs.6.30 crores.

-2-

3. The Ministry of Environment and Forests has examined the application in accordance with Section 12 of the Environmental Impact Assessment Notification, 2006, read with para (2.2.1(i) (a)) of interim operational guidelines vide Circular no. J-11013/41/2006-IA.II(i) dated 13th October, 2006 and hereby accords environmental clearance under the provisions thereof to the Perianagalur Limestone Mine of M/s Madras Cements Ltd for expansion of annual production capacity from 0.105 million TPA to 0.9 Million TPA of Limestone involving total project area of 40.515 ha of which 36.2950 ha of ML area and 4.22 ha of crusher area subject to implementation of following conditions and safeguards:

A. Specific conditions

- (i) Top soil shall be stacked properly with proper slope with adequate safeguards and shall be backfilled for reclamation and rehabilitation of mined out area.
- (ii) Garland drains shall be constructed to arrest silt and sediment flows from soil and mineral dumps. The water so collected shall be utilized for watering the mine area, roads, green belt development etc. The drains shall be regularly desilted particularly after monsoon and maintained properly.

Garland drain with appropriate (size, gradient and length) shall be constructed for both mine pit and for waste dump and sump capacity shall be designed keeping 50% safety margin over and above peak sudden rainfall (based on 50 years data) and maximum discharge in the area adjoining the mine site. Sump capacity shall also provide adequate retention period to allow proper settling of silt material. Sedimentation pits shall be constructed at the corners of the garland drains and desilted at regular intervals.
- (iii) Conceptual Mining Plan for every 5 years for the life of the mine shall be submitted to the Ministry.
- (iv) The company shall monitor cumulative impacts of the nearby mines and cement plants located in the area with regard to ambient air quality and maintain proper authentic records.
- (v) Drilling and blasting shall be by using dust extractors/wet drilling.
- (vi) Plantation shall be raised in an area of 21.21 ha including a green belt of adequate width by planting the native species around the ML area, roads, OB dump sites etc. in consultation with the local DFO / Agriculture Department. The density of the trees shall be around 2500 plants per ha. Selection of plant species shall be as per CPCB guidelines. Herbs and shrubs shall also form a part of afforestation programme besides tree plantation.
- (vii) The project authority shall implement suitable conservation measures to augment ground water resources in the area in consultation with the Regional Director, Central Ground Water Board

-3-

- (viii) Regular monitoring of ground water level and quality shall be carried out by establishing a network of existing wells and constructing new piezometers during the mining operation. The monitoring shall be carried out four times in a year – pre-monsoon (April-May), monsoon (August), post-monsoon (November) and winter (January) and the data thus collected may be sent regularly to MOEF, Central Ground Water Authority and Regional Director, Central Ground Water Board
- (ix) Prior permission from the competent authority shall be obtained for drawl of ground water, if any
- (x) The existing water bodies and that to be created during the course of mining may be utilized to develop pisciculture by organizing fishermen cooperative society with the land losers, if any and specially the poorer section of the people as members of such society with initial financial assistance in the form of share money and managerial assistance so that the members themselves can run the affairs of the society in due course. The project proponent shall arrange marketing tie up so that the society gets fair price of their product and the profits are equitably shared by the members of the society as regular source of income
- (xi) Land-use pattern of the nearby villages shall be studied and action plan for abatement and compensation for damage to agricultural land or common property land (if any) due to mining activity shall be submitted to the Ministry within six months.
- (xii) Soil samples for contamination of mercury, chromium and other trace metals shall be studied when mine is in operation and records maintained.
- (xiii) Erosion and silt control measures shall be prepared and ground vibration study shall be conducted
- (xiv) Vehicular emissions shall be kept under control and regularly monitored. Measures shall be taken for maintenance of vehicles used in mining operations and in transportation of mineral. The vehicles shall be covered with a tarpaulin and shall not be overloaded.
- (xv) A Final Mine Closure Plan, along with details of Corpus Fund, shall be submitted to the Ministry of Environment & Forests 5 years in advance of final mine closure for approval.
- (xvi) Company shall periodically (every 6 months) monitor river water quality and also shall undertake mitigation measures in case contamination due to mining activity is observed. Periodic test results of the river water quality shall be submitted to the State Government and the Ministry for records every 6 months.
- (xvii) Transportation of ore shall be done by covering the trucks with tarpaulin or other suitable mechanism so that no spillage of ore / dust take place. Transportation shall be done only during day time.

-4-

- (xviii) Occupational health surveillance program of the workers shall be undertaken periodically to observe any contractions due to exposure to dust and take corrective measures, if needed. Occupational health and safety measures for the workers including training on malaria eradication, HIV, and health effects on exposure to mineral dust etc. shall be carried out. The company shall engage a full time qualified doctor who is trained in occupational health surveillance. Health records of the workers shall be maintained.

B. General conditions

- i. No change in mining technology and scope of working shall be made without prior approval of the Ministry of Environment & Forests.
- ii. No change in the calendar plan including excavation, quantum of mineral, limestone ore and waste shall be made.
- iii. Conservation measures for protection of flora and fauna in the core & buffer zone shall be drawn up in consultation with the local forest and wildlife department.
- iv. Four ambient air quality-monitoring stations shall be established in the core zone as well as in the buffer zone for RPM, SPM, SO₂, NO_x monitoring. Location of the stations should be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets and frequency of monitoring should be undertaken in consultation with the State Pollution Control Board.
- v. Data on ambient air quality (RPM, SPM, SO₂, NO_x) should be regularly submitted to the Ministry including its Regional office located at Bangalore and the State Pollution Control Board / Central Pollution Control Board once in six months.
- vi. Fugitive dust emissions from all the sources shall be controlled regularly. Water spraying arrangement on haul roads, loading and unloading and at transfer points shall be provided and properly maintained.
- vii. Measures shall be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in operations of HEMM, etc. shall be provided with ear plugs / muffs.
- viii. Industrial waste water (workshop and waste water from the mine) should be properly collected, treated so as to conform to the standards prescribed under GSR 422 (E) dated 19th May, 1993 and 31st December, 1993 or as amended from time to time. Oil and grease trap shall be installed before discharge of workshop effluents.
- ix. Personnel working in dusty areas shall wear protective respiratory devices and they shall also be provided with adequate training and information on safety and health aspects.

-5-


- x. A separate environmental management cell with suitable qualified personnel shall be set-up under the control of a Senior Executive, who will report directly to the Head of the Organization.
- xi. The project authorities shall inform to the Regional Office located at Bangalore regarding date of financial closures and final approval of the project by the concerned authorities and the date of start of land development work.
- xii. The funds earmarked for environmental protection measures shall be kept in separate account and should not be diverted for other purpose. Year wise expenditure shall be reported to the Ministry and its Regional Office located at Bangalore.
- xiii. The project authorities shall inform to the Regional Office located at Bangalore regarding date of financial closures and final approval of the project by the concerned authorities and the date of start of land development work.
- xiv. The Regional Office of this Ministry located at Bangalore shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data / information / monitoring reports.
- xv. A copy of clearance letter will be marked to concerned Panchayat / local NGO, if any, from whom suggestion / representation has been received while processing the proposal
- xvi. State Pollution Control Board should display a copy of the clearance letter at the Regional office, District Industry Centre and Collector's office/ Tehsildar's Office for 30 days.
- xvii. The project authorities should advertise at least in two local newspapers widely circulated, one of which shall be in the vernacular language of the locality concerned, within 7 days of the issue of the clearance letter informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the State Pollution Control Board and also at web site of the Ministry of Environment and Forests at <http://envfor.nic.in> and a copy of the same shall be forwarded to the Regional Office of this Ministry located Bangalore.

4. The Ministry or any other competent authority may alter/modify the above conditions or stipulate any further condition in the interest of environment protection

5. Failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attract action under the provisions of Environment (Protection) Act, 1986.

-6-

6. The above conditions will be enforced inter-alia, under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986 and the Public Liability Insurance Act, 1991 along with their amendments and rules.

Yours faithfully,

 (Dr. P.L. Ahujara)
 Director

Copy to:

1. Secretary, Ministry of Mines, Government of India Shastri Bhawan, New Delhi.
2. Secretary, Department of Environment, Government of Tamilnadu, Chennai.
3. Secretary, Department of Mines and Geology, Government of Tamilnadu, Chennai.
4. Secretary, Department of Forests, Government of Tamilnadu, Chennai
5. The Secretary (Environment) Govt. of Tamil Nadu, Fort. St. George, Chennai-600009.
6. The Chairman, Central Pollution Control Board, Parivesh Bhavan, CBD-cum-Office Complex, East Arjun Nagar, Delhi-110032.
7. The Chairman, Tamil Nadu Pollution Control Board, 76, Mount Road, Gundy, Chennai-600032.
8. The Chief Conservator of Forests (Central), Regional Office (SZ), Kendriya Sadan, IVth Floor, E&F Wings, 7th Main Road, 11th Block, Karamangala, Bangalore-560034.
9. Member Secretary, Central Ground Water Authority, A2, W3 Curzon Road Barracks, K.G. Marg, New Delhi-110001.
10. Controller General, Indian Bureau of Mines, Indira Bhavan, Civil Lines, Nagpur-440 001
11. District Collector, District Perambalur, Tamilnadu.
12. Monitoring File.
13. Guard File
14. Record File.

(Dr. P.L. Ahujara)
 Director

Category of the Industry :

RED



CONSENT ORDER NO. 2308150516922 DATED: 28/12/2023.

PROCEEDINGS NO.T1/TNPCB/F.0144ARY/RM/ARY/W/2023 DATED: 28/12/2023

SUB: Tamil Nadu Pollution Control Board - RENEWAL OF CONSENT – M/s. THE RAMCO CEMENTS LIMITED, PERIYANAGALUR LIMESTONE MINES , S.F.No. 51/2,3,4 etc. 224/1 and 2, 226/1A, 1B etc, 226/12, 13A etc, 228/1,2 etc, 229/2,3 etc, 230/1A,1B etc, 231/1A, 1B etc,232/1A,1B etc, 233/3, 4 etc, 234, 235/1,2 etc, 236/1,237/1 and 2, 267, 268/1 and 2, 269, 271, 226/16,228/2,234 Part,228/5, PERIYANAGALUR village, Ariyalur Taluk and Ariyalur District - Renewal of Consent for the operation of the plant and discharge of sewage and/or trade effluent under Section 25 of the Water (Prevention and Control of Pollution) Act, 1974 as amended in 1988 (Central Act 6 of 1974) – Issued- Reg.

REF: 1. PROCEEDINGS NO.T2/TNPCB/F.0144ARY/RM/ARY/W&A/2021 DATED: 17/05/2021
2. IR.No : F.0144ARY/RM/DEE/ARY/2023 dated 05/12/2023

RENEWAL OF CONSENT is hereby granted under Section 25 of the Water (Prevention and Control of Pollution) Act, 1974 as amended in 1988 (Central Act, 6 of 1974) (hereinafter referred to as “The Act”) and the rules and orders made there under to

The Managing Director

M/s . THE RAMCO CEMENTS LIMITED, PERIYANAGALUR LIMESTONE MINES

S.F No. 51/2,3,4 etc. 224/1 and 2, 226/1A, 1B etc, 226/12, 13A etc, 228/1,2 etc, 229/2,3 etc, 230/1A,1B etc, 231/1A, 1B etc,232/1A,1B etc, 233/3, 4 etc, 234, 235/1,2 etc, 236/1,237/1 and 2, 267, 268/1 and 2, 269, 271, 226/16,228/2,234 Part,228/5

PERIYANAGALUR Village

Ariyalur Taluk

Ariyalur District.

Authorising the occupier to make discharge of sewage and /or trade effluent.

This is subject to the provisions of the Act, the rules and the orders made there under and the terms and conditions incorporated under the Special and General conditions stipulated in the Consent Order issued earlier and subject to the special conditions annexed.

This RENEWAL OF CONSENT is valid for the period ending **March 31, 2024**

**For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai**

SPECIAL CONDITIONS

1. This renewal of consent is valid for operating the facility for the manufacture of products/byproducts (Col. 2) at the rate (Col 3) mentioned below. Any change in the product/byproduct and its quantity has to be brought to the notice of the Board and fresh consent has to be obtained.

Sl. No.	Description	Quantity	Unit
Product Details			
1.	Mining of Limestone over an Extent of 36.295 Hectares	0.9	Million Tonnes Per Annum
By-Product Details			
1.	No by product	0	
Intermediate Product Details			
1.	No Intermediate product	0	

2. This renewal of consent is valid for operating the facility with the below mentioned outlets for the discharge of sewage/trade effluent. Any change in the outlets and the quantity has to be brought to the notice of the Board and fresh consent has to be obtained.

Outlet No.	Description of Outlet	Maximum daily discharge in KLD	Point of disposal
Effluent Type : Sewage			
1.	Sewage	1.7	On Industrys own land
Effluent Type : Trade Effluent			
1.	Trade effluent	0.9	On land for gardening

Special Additional Conditions:

The unit shall obtain No Objection Certificate (NOC) from the Tamil Nadu Bio Diversity Board /National Bio Diversity Authority if the unit is using any Biological resources or knowledge associated thereto as per the provisions of Biological Diversity Act 2002.

The industries shall take all efforts to use and popularize “Mission LiFE” logo and mascot which is available in TNPCB & MoEFCC website. They shall also request their employees to adopt “Mission LiFE” action points and document the same and furnish half yearly report to Board.

Additional Conditions:

1. The unit shall treat and dispose the sewage in septic tank and Dispersion trench arrangements.
2. The unit shall operate and maintain the Effluent Treatment Plant and ensure that the treated effluent shall be utilized for gardening after satisfying the standards prescribed by the Board.
3. The unit shall comply with all conditions mentioned in the EC issued by MoEF , New Delhi vide Lr. No, J11015/556/2007-IA.II(M) dt:10.10.2007.
4. The unit shall adhere to the depth of mining mentioned in the Environmental Clearance issued.
5. The unit shall adhere to the depth of mining mentioned in the Environmental Clearance issued.
6. The unit shall strictly adhere to the approved mine closure plan.
7. The unit shall comply with Mines and Minerals (Development and Regulation) Amendment Act 2015.
8. Safety precautionary measures for all the employees who are working in the mines should be practiced and strictly to be followed.
9. Medical check up of the all the employees shall be carried out periodically, specifically with respect to dust exposure levels and the possible control measures shall be taken for minimizing the dust exposure level on the worker and improving their health conditions to be furnished to the competent authority
10. The proponent shall provide more green-belt in the periphery of the mining area.
11. The mined out pits should be backfilled wherever warranted and area should be suitably landscaped to prevent environmental degradation. The mine closure plan as furnished in the proposal shall be strictly followed.
12. The mining lease holder shall, after ceasing mining operations, undertake re-grassing the mining area and any other area which may have been disturbed due to their mining activities and restore the land to a condition which is fit for growth of fodder, flora, fauna etc.
13. The unit shall not use “use and throwaway plastics’ such as plastic sheets used for food wrapping , spreading on dining table etc., plastic plates , plastic coated tea cups, plastic tumbler , water pouches and packets, plastic straw, plastic carry bags and plastic flags irrespective of thickness, within the industry premises. Instead unit shall encourage use of eco friendly alternative such as banana leaf, arecanut palm, stainless steel, glass, porcelain plates/cups/cloth bag, jute bag etc.,
14. The unit shall liable to pay the consent fee and shall remit the difference in amount in case of any revision of consent fee by the Government.
15. The unit shall submit Environmental Statement for every financial year ending the 31st March in Form -V as per the Rule 14 of the Environment (Protection) Rules, 1986.
16. This consent order does not absolve from obtaining necessary permission / clearance from other Authority or under other Statute as applicable.

**For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai**

To
The Managing Director,
M/s.THE RAMCO CEMENTS LIMITED, PERIYANAGALUR LIMESTONE MINES,
RAMAMANDIRAM,
RAJAPALAYAM,
VIRUDHUNAGAR DISTRICT.
Pin: 626117

Copy to:

- 1.The Commissioner, ARIYALUR-Panchayat Union, Ariyalur Taluk, Ariyalur District .
 2. The District Environmental Engineer, Tamil Nadu Pollution Control Board, ARIYALUR.
 3. The JCEE-Monitoring, Tamil Nadu Pollution Control Board, Triuchirappalli.
 4. File
-

Category of the Industry :

RED



CONSENT ORDER NO. 2308250516922 DATED: 28/12/2023.

PROCEEDINGS NO.T1/TNPCB/F.0144ARY/RM/ARY/A/2023 DATED: 28/12/2023

SUB: Tamil Nadu Pollution Control Board - RENEWAL OF CONSENT –M/s. THE RAMCO CEMENTS LIMITED, PERIYANAGALUR LIMESTONE MINES , S.F.No. 51/2,3,4 etc. 224/1 and 2, 226/1A, 1B etc, 226/12, 13A etc, 228/1,2 etc, 229/2,3 etc, 230/1A,1B etc, 231/1A, 1B etc,232/1A,1B etc, 233/3, 4 etc, 234, 235/1,2 etc, 236/1,237/1 and 2, 267, 268/1 and 2, 269, 271, 226/16,228/2,234 Part,228/5, PERIYANAGALUR village, Ariyalur Taluk and Ariyalur District - Renewal of Consent for the operation of the plant and discharge of emissions under Section 21 of the Air (Prevention and Control of Pollution) Act, 1981 as amended in 1987 (Central Act 14 of 1981) –Issued- Reg.

REF: 1. PROCEEDINGS NO.T2/TNPCB/F.0144ARY/RM/ARY/W&A/2021 DATED: 17/05/2021
2. IR.No : F.0144ARY/RM/DEE/ARY/2023 dated 05/12/2023

RENEWAL OF CONSENT is hereby granted under Section 21 of the Air (Prevention and Control of Pollution) Act, 1981 as amended in 1987 (Central Act 14 of 1981) (hereinafter referred to as “The Act”) and the rules and orders made there under to

The Managing Director

M/s . THE RAMCO CEMENTS LIMITED, PERIYANAGALUR LIMESTONE MINES

S.F No. 51/2,3,4 etc. 224/1 and 2, 226/1A, 1B etc, 226/12, 13A etc, 228/1,2 etc, 229/2,3 etc, 230/1A,1B etc, 231/1A, 1B etc,232/1A,1B etc, 233/3, 4 etc, 234, 235/1,2 etc, 236/1,237/1 and 2, 267, 268/1 and 2, 269, 271, 226/16,228/2,234 Part,228/5

PERIYANAGALUR Village

Ariyalur Taluk

Ariyalur District.

Authorizing the occupier to operate the industrial plant in the Air Pollution Control Area as notified by the Government and to make discharge of emission from the stacks/chimneys.

This is subject to the provisions of the Act, the rules and the orders made there under and the terms and conditions incorporated under the Special and General conditions stipulated in the Consent Order issued earlier and subject to the special conditions annexed.

This RENEWAL OF CONSENT is valid for the period ending **March 31, 2024**

**For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai**

SPECIAL CONDITIONS

1. This renewal of consent is valid for operating the facility for the manufacture of products (Col. 2) at the rate (Col. 3) mentioned below. Any change in the products and its quantity has to be brought to the notice of the Board and fresh consent has to be obtained.

Sl. No.	Description	Quantity	Unit
Product Details			
1.	Mining of Limestone over an Extent of 36.295 Hectares	0.9	Million Tonnes Per Annum
By-Product Details			
1.	No by product	0	
Intermediate Product Details			
1.	No Intermediate product	0	

2. This renewal of consent is valid for operating the facility with the below mentioned emission/noise sources along with the control measures and/or stack. Any change in the emission source/control measures/change in stack height has to be brought to the notice of the Board and fresh consent/Amendment has to be obtained.

I Point source emission with stack :				
Stack No.	Point Emission Source	Air pollution Control measures	Stack height from Ground Level in m	Gaseous Discharge in Nm ³ /hr
0	Drilling	Dust extraction system	0	
II Fugitive/Noise emission :				
Sl. No.	Fugitive or Noise Emission sources	Type of emission	Control measures	
1.	Mining area and haulage road	Fugitive	Water spraying through tanker	

Special Additional Conditions:

The unit shall obtain No Objection Certificate (NOC) from the Tamil Nadu Bio Diversity Board /National Bio Diversity Authority if the unit is using any Biological resources or knowledge associated thereto as per the provisions of Biological Diversity Act 2002.

The industries shall take all efforts to use and popularize “Mission LiFE” logo and mascot which is available in TNPCB & MoEFCC website. They shall also request their employees to adopt “Mission LiFE” action points and document the same and furnish half yearly report to Board.

Additional Conditions:

1. The unit shall operate and maintain the Air Pollution Control measures efficiently and continuously so as to achieve the Ambient Air Quality / Emission standards prescribed by the Board.
2. The unit shall adhere to the AAQ/ambient Noise level standards prescribed by the Board.
3. The unit shall carry out ROA of AAQ/ANL survey once in a year through TNPCB and submit report to the Board.
4. The unit shall operate the water sprinklers effectively to suppress the dust emission during mining and vehicle movements.
5. The haul roads in the mines shall be adequately water sprayed using water tankers at regular intervals.
6. The unit shall continue to develop more green belt in and around the premises.
7. The unit shall comply with Mines and Minerals (Development and Regulation) Amendment Act 2015.
8. The unit shall ensure that transport vehicle shall be leak proof and properly covered with tarpaulin so as to prevent dust from being air borne.
9. The unit shall comply with all conditions mentioned in the EC issued by MoEF , New Delhi vide Lr. No, J11015/556/2007-IA.II(M) dt:10.10.2007.
10. The unit shall adhere to the depth of mining mentioned in the Environmental Clearance issued.
11. The unit shall liable to pay the consent fee and shall remit the difference in amount in case of any revision of consent fee by the Government.
12. The unit shall submit Environmental Statement for every financial year ending the 31st March in Form -V as per the Rule 14 of the Environment (Protection) Rules, 1986.
13. This consent order does not absolve from obtaining necessary permission / clearance from other Authority or under other Statute as applicable.

**For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai**

To
The Managing Director,
M/s.THE RAMCO CEMENTS LIMITED, PERIYANAGALUR LIMESTONE MINES,
RAMAMANDIRAM,
RAJAPALAYAM,
VIRUDHUNAGAR DISTRICT.
Pin: 626117

Copy to:

- 1.The Commissioner, ARIYALUR-Panchayat Union, Ariyalur Taluk, Ariyalur District .
 2. The District Environmental Engineer, Tamil Nadu Pollution Control Board, ARIYALUR.
 3. The JCEE-Monitoring, Tamil Nadu Pollution Control Board, Triuchirappalli.
 4. File
-



भारतसरकार
GOVERNMENT OF INDIA
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE
Regional Office/ क्षेत्रीय कार्यालय,
1st Floor, Additional Office Block for GPOA, Shastri Bhawan, Haddows
Road, Nungambakkam, Chennai - 600006



EP/12.U/SEIAA/2016-17/30/TN /1057

15.07.2024

To:

Shri Pankaj Varma
Member Secretary
IA-division, Mining Sector
Indira Paryayaran Bhawan
Ministry of Environment, Forest & Climate Change
Aliganj, Jor Bagh Road, New Delhi-110001

Subject: SEIAA, TN - Environmental Clearance for Periyannagalur West limestone Mines - over an extent of 17.36 Ha situated in S.F Nos. 267, 268/1, 269, 271, etc., Periyannagalur village, Ariyalur Taluk, Ariyalur District for limestone and Marl Production of 0.3 MTPA by M/s. The Ramco Cements Limited - Issued - Regarding.

Reference No. Lr. No. SEIAA-TN/F. No-462/2012/EC-45/1 (a)/ARY/ 2016 dated 14.11.2016
CCR Request letter dated: 01.02.2024

Sir:

With reference to the above-mentioned subject, please find enclosed herewith Certified Compliance Report.

This issues with the approval of the Competent Authority.

Yours faithfully,

(Dr. C. Palpandi)
Scientist 'D'

Encl: As above.

Copy to:

1. Dr. Shruti Rai Bhardwaj, Scientist 'F' Monitoring Cell, IA Division, Indira Paryayaran Bhawan, MoEF&CC, Jorbagh Road, Aliganj, New Delhi - 110 003. Email: shruti.raibhardwaj@moefcc.gov.in
2. The Member Secretary, Tamil Nadu Pollution Control Board, 76, Mount Salai, Guindy, Chennai - 600 032. Email: membersecretary@tnpcb.org.in

Dr. C. Palpandi
Scientist 'D'
Government of India
Regional Office, MoEF&CC
Shastri Bhawan, Haddows Road,
Nungambakkam, Chennai - 600 006

- 3. **The District Collector, District Collectorate, Jayankondam Road, Ariyalur - 621704. E-mail: col@ariyalur.tn**
- 4. **Shri Madhusudhan Kulkarni, Sr. Vice President (Manufacturing), M/s The Ramco Cements Limited, Govindapuram, Ariyalur - 621713. Email: madhusodhan.k@ramcocements.co.in**

(Dr. C. Palpandi)
Scientist 'D'
C. Palpandi
Dr. C. Palpandi
Scientist 'D'
 Government of India
 Regional Office, MEFACC
 Shastri Bhawan, Madhav Road,
 Nungambakkam, Chennai - 600 006

Dr. C. Palpandi
 Scientist 'D'
 Regional Office, MEFACC
 Shastri Bhawan, Madhav Road,
 Nungambakkam, Chennai - 600 006

Part-II

Certified Compliance Report

Subject: SEIAA, TN - Environmental Clearance for PeriyanaGalur West limestone Mines - over an extent of 17.36 Ha situated in S.F Nos. 267,2 68/1, 269, 271, etc., PeriyanaGalur village, Ariyalur Taluk, Ariyalur District for limestone and Marl Production of 0.3 MTPA by M/s. The Ramco Cements Limited - Issued - Regarding.

Reference No.: Lr. No. SEIAA-TN/F. No-462/2012/EC-45/1 (a)/ARY/ 2016 dated 14.11.2016.

Monitoring Date: 22.02.2024

Present Status of the Project: The PA got the grant of PeriyanaGalur West Mining Lease over an extent of 17.360 Ha in PeriyanaGalur Village for mining Limestone & Marl vide G.O (Ms) No. 153 dated 23.12.2016 for a period of 50 years (Document-1). The Lease Deed was executed on 10.01.2017 and the Lease is valid from 10.01.2017 to 09.01.2067.

EC for the production of 0.3 MTPA Limestone & Marl over an extent of 17.36 Ha was awarded by SEIAA-TN vide Letter No. SEIAA-TN/F.No-462/2012/EC-45/1(a)/ARY/2016 dated 14.11.2016 under EIA Notification 2006 with validity till Lease Period.

With awarded EC, the PA applied and obtained CTEs from TNPCB vide Orders 170128064428 (Air Act) and 170118064428 (Water Act) dated 23.07.2017 (Document-2). TNPCB has issued CTO-Renew Orders 2409157816355 (Water Act) & 2409257816355 (Air Act) dated 29.02.2024 with validity till 31.03.2026 for the production quantity of 0.3 MTPA ROM and are attached as Document-3.

Review of Mining Plan (ROMP) has been approved by IBM, Chennai vide Letter TN/ALR/LST/ROMP-1642 MDS, & 23.02.2021 for Plan Period 2021-22 to 2025-26 with validity till 31.03.2026 which is attached as Document-4.

Production is being carried out since 2018-19. Mineable reserves established upto a depth of 40 m BGL is 5.65 million tonnes ROM, as on 01.04.2024. Both Opencast Conventional Mining with controlled Drilling & Blasting and Non-Conventional Mining Method with X-Centric Rippers are adopted. Mined out limestone is loaded in tippers and transported to Govindapuram Cement Factory. Existing pit configuration is 490 (L) x 280 (W) x 15 m (D). The production achieved during last plan period is given below:

Year	ROM Quantity Dispatched, Tonnes
2019-20	2,99,888.700
2020-21	2,99,538.070
2021-22	2,99,289.650
2022-23	2,99,937.320
2023-24	2,99,888.660

The Project Authority is planning to go for amalgamation of this Periyaragalur-West Mine with Periyaragalur Mine (35.96 Ha) which is located adjacent in the eastern side. The PA obtained TOR from SEIAA-Tamil Nadu. For this purpose, the PA has requested CCR from RO, MoEF&CC, Chennai. Accordingly, the Mine was inspected on 22.02.2024. The Mine was in operation on the day of monitoring.

Site visit Photographs are attached as Annexures I-VI.

Part-III

A. For Pre - Construction Phase:

S. No.	EC Conditions	Compliance status												
i.	Consent for Establishment shall be obtained from the Tamil Nadu Pollution Control Board and a copy shall be submitted to the SEIAA, Tamil Nadu before taking up any construction activity at the site.	<p>Complied.</p> <p>The PA obtained the Consents for Establishment from TNPCB vide Orders 170128064428 (Air) and 170118064428 (Water) dated 23.07.2017. The PA submitted the copies to SEIAA also.</p>												
ii.	In the case of any change(s) in the scope of the project, a fresh appraisal by the SEAC/SEIAA shall be obtained. No change in mining technology and scope of working should be made without prior approval of the State Environmental Impact Assessment Authority. No change in the calendar plan including excavation, quantum of mineral limestone and waste should be made.	<p>Complied.</p> <p>There is no change in the mining methodology and scope of working. Both Opencast Conventional Mining with controlled Drilling & Blasting and Non-Conventional Mining Method with X-Centric Rippers are adopted. The annual production scheduled specified in the approved mining plans are complied and there was no deviation.</p> <table border="1"> <thead> <tr> <th>Year</th> <th>ROM Quantity Dispatched, Tonnes</th> </tr> </thead> <tbody> <tr> <td>2019-20</td> <td>2,99,888.700</td> </tr> <tr> <td>2020-21</td> <td>2,99,538.070</td> </tr> <tr> <td>2021-22</td> <td>2,99,289.650</td> </tr> <tr> <td>2022-23</td> <td>2,99,937.320</td> </tr> <tr> <td>2023-24</td> <td>2,99,888.660</td> </tr> </tbody> </table> <p>Entire Top Soil of 62,912 Tons generated was utilized for green belt development.</p> <p>The PA is planning to go for</p>	Year	ROM Quantity Dispatched, Tonnes	2019-20	2,99,888.700	2020-21	2,99,538.070	2021-22	2,99,289.650	2022-23	2,99,937.320	2023-24	2,99,888.660
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2023-24	2,99,888.660													

S. No.	EC Conditions	Compliance status
		amalgamation of this Periyagalur-West Mine with Periyagalur Mine (35.96 Ha) which is located adjacent in the eastern side. The PA obtained TOR from SEIAA-Tamil Nadu.
iii.	Project proponent shall comply with all the guidelines and notifications issued by MoEF&CC, New Delhi regarding Mining of Minerals and comply with orders of Hon'ble National Green Tribunal from time to time regarding Mining of Minerals, under 1 (a).	Agreed to comply. The PA informed that the guidelines and notifications issued by MoEF&CC, for Mining of major minerals will be complied.
iv	A copy of the clearance letter shall be sent by the proponent to the Local Body, Ariyalur Taluk, Ariyalur District and the Local NGO, if any from whom suggestions/ representations, if any, have been received while processing the proposal. The clearance letter shall also be put on the website of the Proponent.	Complied. The PA sent the copy of EC letter to the Local body. The EC letter is also uploaded on the company's website www.ramcocements.co.in .
v	All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire and Rescue Services Department, Civil Aviation Department, Forest Conservation Act, 1980 and Wild Life (Protection) Act, 1972, State/Central Ground Water Authority, Coastal Regulatory Zone Authority, other statutory and other authorities as applicable to the project shall be obtained by project proponent from the concerned competent authorities.	Complied. The PA has obtained all applicable clearances. The CTOs are valid up to 31.03.2026. Other NOCs or approvals are not applicable to the mine project.
vi	The Construction of the structures should be undertaken as per the plans approved by the concerned local authorities / local administration.	Complied. This is a mining project being operated with approved mining plan by IBM. Current ROMP approved is valid till 31.03.2026.
vii	Any appeal against this environmental clearance shall lie with the Hon'ble National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.	Refer below. The PA informed that no appeal was made against the EC awarded.

S. No.	EC Conditions	Compliance status
viii	All required sanitary and hygienic measures should be in place before starting construction activities and they have to be maintained throughout the construction phase.	Complied. The PA provided all the required infrastructures at the Mine viz. Mines Office, First Aid Room, Rest Shelters, Drivers Rest Room, Toilet, potable water and other amenities.
ix	The company shall stress upon the preventive aspects of occupational health.	Complied. Occupational Health Surveillance Program is being conducted for the workers periodically. An Occupational Health Center is at the Cement Plant. A dedicated dispensary with qualified Doctor in OHS and pharmacy are provided.
x	Provision shall be made for the housing of construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, Safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.	Complied. This is a limestone mine with no major construction activities involved. The mine employees are staying in the colony at the Plant.
xi	The project authorities should advertise with basic details at least in two widely circulated local newspapers, one of which shall be in the vernacular language of the locality concerned. Within 7 days of the issue of clearance and a copy of the clearance letter is available with the State Pollution Control Board and also at website of SEIAA, TN and a copy of the same should be forwarded to the Regional Office of the Ministry of Environment and Forests located at Chennai.	Complied. The intimation on awarded EC for the Mine was informed to the Public by the PA vide advertisement in 'Dinamani' Tamil newspaper & 'The Indian Express' English newspaper dated 22.11.2016. The Notice copies were also submitted to IRO.
xii	A separate environment and safety management cell with qualified staff shall be set up before commissioning of construction activities and shall be retained throughout the lifetime of the industry, for implementation of the stipulated environmental safeguards.	Complied. The Environmental Management Cell (EMC) is functioning under the Unit Head. There is a Hierarchical System in the company to deal with the environmental issues and for ensuring compliance with the environmental

S. No.	EC Conditions	Compliance status
		clearance conditions. Any non-compliance/violations of environmental norms and corrective actions taken is reported by the Unit Head to EDO & CEO.
xiii	The State Pollution Control Board should display a copy of the Environmental Clearance issued to the project at the Regional office, District Industry Centre and the Collector's office/Tahsildar's office for 30 days.	Reportedly Complied. SEIAA-TN/SPCB had displayed the EC in their Website.

B. Conditions for Construction/Mining Phase

S.No.	EC Conditions	Compliance status
a.	Fully mechanized Opencast Conventional method of Mining method shall be adopted as reported for the mining of limestone.	Complied. Fully mechanized, both Opencast Conventional Mining with controlled Drilling & Blasting and Non-Conventional Mining Method with X-Centric Rippers are adopted.
b.	To furnish to the SEIAA for one year period:- <ul style="list-style-type: none"> Report on quality and quantity of ground water to be generated during mining operations and from adjoining areas. Comparative statement on normal ground water and mined out water with respect to qualities & suitability for agriculture etc., for one year period. 	Refer below. Ground water-table level in the mine vicinity is at 40m BGL. Mining is not yet intersected the ground water-table.
c.	Monitoring of well water levels and water quality of the wells in the locations furnished in the EIA report shall be done during pre-monsoon and post monsoon period and results submitted to the Regional Office of MoEF, Chennai and SEIAA.	Complied. Periodical monitoring of ground water level is carried out 3 locations on quarterly basis in addition to the piezometer readings recorded in the Mine. Periodical water level data (Document-5) are submitted to IBM on quarterly basis and IRO, SGWB & SEIAA on six monthly basis.

S. No.	EC Conditions	Compliance status
D.	Monitoring of water quality and air quality in and around the project site in the selected monitoring points as mentioned in the EIA report shall be continued regularly involving Academic institutions.	<p>Complied.</p> <p>Ground water quality monitored at 4 locations and monitoring data is attached as Document-6. The PA is monitoring the Surface water quality at 3 locations through a NABL Lab on quarterly basis and submitting the Reports to the Authorities (Document-7).</p> <p>Ambient air quality is periodically monitored at 3 locations in the Mine and 6 locations in the buffer zone on monthly basis. The periodical AAQM reports (Document-8) are submitted to TNPCB on monthly basis, IBM on quarterly basis and IRO on six monthly basis.</p>
e.	Regular monitoring of ground water level and quality shall be carried out in and around the mine lease by establishing a network of existing wells and constructing new piezometers during the mining operation. The periodic monitoring at least four times in a year pre-monsoon (April-May), Monsoon (August), Post-monsoon (November) and winter (January); once in each season)) shall be carried out in consultation with the State Ground Water Board/Central Ground Water Authority and the data thus collected may be sent regularly to the Ministry of Environment and Forests and its Regional Office, Chennai, the Central Ground Water Authority and the Regional Director, Central Ground Water Board. If at any stage, it is observed that the ground water table is getting depleted due to the mining activity; necessary corrective measures shall be carried out.	<p>Complied.</p> <p>Ground water-table level in the mine vicinity is at 40 m BGL. Mining is not yet intersected the ground water-table. Periodical monitoring of ground water level is carried out 3 locations on quarterly basis in addition to the piezometer readings recorded in the Mine. Periodical water level data are submitted to IBM on quarterly basis and IRO, SGWB & SEIAA on six monthly basis.</p>
f.	Hydro-Geological study including infiltration test shall be conducted by any reputed agency to estimate leachate quantity.	<p>Complied.</p> <p>Hydro-Geology study was conducted by Bharathidasan University, Trichy and submitted to RO, MoEF&CC. As per the report there is no leachate observed due to mining activity.</p>

S. No.	EC Conditions	Compliance status
g.	The excess Over Burden (OB) shall not be disposed for any commercial purpose and shall be disposed within the mine lease area only.	<p>Refer below.</p> <p>There is no OB generation in the Mine.</p>
h.	The proponent shall conduct AAQ Monitoring survey once in 6 months in the locations furnished in the EIA report and furnish report to the Regional Office of MoEF, Chennai. It shall be ensured that one AAQ station shall be located in the nearby habitation of Periyagalur village.	<p>Complied.</p> <p>Ambient air quality is periodically monitored at 3 locations in the Mine and 6 locations in the buffer zone on monthly basis. One AAQ station is located in the nearby Periyagalur village. The periodical reports are submitted to TNPCB on monthly basis, IBM on quarterly basis and RO, MoEF&CC on six monthly basis. The monitored data are found to be well within the prescribed limits.</p>
i.	The critical parameters such as RSPM ($PM_{2.5}$, PM_{10}) and NO_x in the ambient air within the impact zone, peak particle velocity at 300 m distance or within the nearest habitation, whichever is closer shall be monitored periodically. Further, quality of discharged water shall also be monitored [(TDS, DO, PH and Total Suspended Solids (TSS)]. The monitored data shall be uploaded on the website of the company as well as displayed on a display board at the project site at a suitable location near the main gate of the company in public domain.	<p>Complied.</p> <p>The PA established 9 AAQ Monitoring Stations, based on meteorological data, topographical features and environmentally and ecologically sensitive considerations in consultation with SPCB, in Core & Buffer Zones. Periodical AAQ Monitoring is being carried out at these locations in compliance with new NAAQ Norms and status reports are being submitted to RO, MoEF&CC once in six months.</p> <p>Vibration levels are monitored with Minimate instruments whenever blastings are done and records are maintained as per DGMS requirement. Vibration Parameters viz. Peak Particle Velocity (PPV) at 300 m distance and Noise Levels during Blastings were in compliance with DGMS Norms for Residential Areas (Document-9).</p> <p>There is no discharge of pit water from this mine.</p> <p>The monitored data as six-monthly compliance report is uploaded on the company website www.ramcocements.co.in for public view.</p>

S. No.	EC Conditions	Compliance status
j.	Data on ambient air quality [RSPM and NO _x] shall be regularly submitted to the Regional office of MoEF at Chennai and the SEIAA/SPCB/CPCB once in six months.	Complied. The PA is regularly submitting the AAQM reports to RO, MoEF&CC on six monthly basis.
k.	Fugitive dust emissions from all the sources should be controlled regularly. Water spraying arrangement on haul roads, loading and unloading and at transfer points should be provided and properly maintained.	Complied. Fugitive emissions at mining-cum-loading & hauling areas were controlled by periodical water sprinkling with high pressurized water tankers. The PA developed avenue plantations on both the sides of the haul roads to control the fugitive dust emissions.
l.	Pre-placement medical examination and periodical medical examination of the workers engaged in the project shall be carried out and records maintained. For the purpose, schedule of health examination of the workers should be drawn and followed accordingly.	Complied. Occupational Health Surveillance Program is being conducted for the workers periodically. An Occupational Health Center is at the Cement Plant. A dedicated dispensary with qualified Doctor in OHS and pharmacy are provided for Occupational Health Surveillance and Monitoring. Adequate training on Safety and health aspect has been provided. Review of Impact of various health measures is being undertaken.
m.	Regular medical check-up for mine workers and nearby residents around the project site involving community medical centre/NIMH shall be conducted.	Complied. In addition to regular medical check-up for mine workers and nearby residents around the mine are being conducted by involving community medical center/NIMH during mining operations.
n.	As per norms, health study should be conducted through competent / approved Health organizations and report submitted for one year.	Complied. A dedicated dispensary with qualified Doctor in OHS and pharmacy are provided for Occupational Health Surveillance and Monitoring. Review of Impact of various health measures is being undertaken. Yearly reports are submitted as per DGMS requirement/norm.
o.	To address noise level issues vibration tests shall be conducted and submitted to SEIAA.	Complied. Vibration levels are monitored with

S. No.	EC Conditions	Compliance status
		<p>Minimate instruments: whenever blastings are done and records are maintained as per DGMS requirement. Vibration Parameters viz. Peak Particle Velocity (PPV) and Noise Levels during Blastings were in compliance with DGMS Norms for Residential Areas. Biannual status reports are reports are submitted to DGMS & SEIAA.</p>
p.	<p>Corpus fund created should be prioritization and utilized for health issues.</p>	<p>Complied.</p> <p>The CSR amount allocated is utilized towards health issues on priority basis.</p>
q.	<p>Mineral handling area shall be provided with adequate number of high efficiency dust extraction system. Loading and unloading areas including all transfer points shall also have efficient dust control arrangements. These should be properly maintained and operated.</p>	<p>Complied.</p> <p>There is mineral beneficiation involved and the Crusher is at the Cement Plant. Fugitive emissions at mining-cum-loading & hauling areas were controlled by periodical water sprinkling with high pressurized water tankers.</p>
r.	<p>Vehicular emissions shall be kept under control and regularly monitored. Measures shall be taken for maintenance of vehicles used in mining operations and in transportation of mineral within the lease area. The mineral transportation shall be carried out through the covered trucks only and the vehicles carrying the mineral shall not be overloaded.</p>	<p>Complied.</p> <p>All the vehicles used in the mine are on contract basis and servicing is being done in their own places. 'Pollution Under Control' Certificates are checked periodically. The PA also informed that transport vehicles are covered with tarpaulin and are not overloaded.</p>
s.	<p>The effective safe guard measures shall be provided to control particulate dust level in critical areas, transfer points and haul road within the mine area.</p>	<p>Complied.</p> <p>Fugitive emissions at mining-cum-loading & hauling areas were controlled by periodical water sprinkling with high pressurized water tankers.</p>
t.	<p>At least four ambient air quality-monitoring stations should be established in the core zone as well as in the buffer zone for monitoring of RSPM (PM_{2.5}, PM₁₀) and NOx. Location of the stations should be decided in consultation with Tamil Nadu Pollution Control Board based on the meteorological data, topographical features and</p>	<p>Complied.</p> <p>The PA established 9 AAQ Monitoring Stations, based on meteorological data, topographical features and environmentally and ecologically sensitive considerations in consultation with SPCB, in Core & Buffer Zones. Periodical AAQ Monitoring is being carried out at these locations in</p>

S. No.	EC Conditions	Compliance status
	environmentally and ecologically sensitive targets and frequency of monitoring etc.	compliance with new NAAQ Norms and status reports are being submitted to SPCB once in a month, IRO, MoEF&CC once in six months and IBM once in a quarter.
u.	Mine working shall be restricted up to 40 BGL ultimate pit depth as per the present mine plan period. NOC from the State GWA for drawing ground water shall be furnished.	Complied. Ground water-table level in the mine vicinity is at 40 m BGL. Mining is not yet intersected the ground water-table. NOC will be obtained once ground water-table is intersected.
v.	Garland drains and siltation ponds of appropriate size shall be constructed around the mine working, soil and mineral dumps to prevent run off of water and flow of sediments. The water so collected shall be utilized for watering the mine area, roads, green belt development etc. The drains shall be regularly desilted, particularly after the monsoon, and maintained properly.	Complied. Garland drains with 2 check dams are provided around the working pit. There is no OB dump and subgrade mineral dump. The collected water, after settling of silt materials within the retention period, is being utilized for dust suppression and green belt development. The PA is carrying out periodical desilting of garland drains and ponds before the onset of monsoon.
w.	The rain water accumulation in the mine during rainy seasons shall be treated by providing settling tanks in the periphery of the mining lease area and the overflow clean water from the settling tanks shall be allowed to discharge through the first order streams to join nearby natural drains. The settling tanks shall be cleaned periodically for removal of sediments and such records of cleaning shall be maintained properly.	Complied. Recharge cum Settling Pond of 100 (L) x 50 (W) x 2 m (D) is made in the eastern side of PNR Lease area to collect the surface runoffs through garland drains. Water collected in the settling pond is utilized for green belt and dust control measures. Excess water is drained to nearby irrigation pond for raising agricultural crops in nearby areas. The PA is carrying out periodical de-silting of garland drains and ponds before the onset of monsoon.
x.	Garland drains proposed on the non-moving sides of the Dump yards shall be connected to settling tanks to arrest any wash off sediments from the dumps and only overflowing clean water shall be allowed to discharge through the first order streams. The settling tanks shall be of sufficient dimensions to hold the wash offs in one rainy season and has to be cleaned before every rainy season.	Refer below. There is no OB generation in the mine, thus, no OB Dump.

S. No.	EC Conditions	Compliance status
y.	Conservation plan furnished to protect the scheduled flora and fauna in the core and buffer zone of the project site shall be implemented. Scheduled species of fauna found in the study area shall be monitored closely.	<p>Refer below.</p> <p>The entire ML area is private land and there is no forest land involved. The Lease is surrounded by other Mining Leases upto Ariyalur. There is no Schedule-I fauna noticed and thus, no Conservation plan is required.</p>
z.	Bio-diversity Management Plan for mine and buffer area shall be prepared in consultation with Local DFO and submitted to SEIAA.	<p>Refer below.</p> <p>Green belt is developed around the ML area, along haulage road and mine office. The PA developed green belt in a phased manner in consultation of DFO, Ariyalur. About 2.65 Ha is brought under green belt with 4,640 trees @ 1750 Trees per Ha and survival rate of 85-90%. Herbs and shrubs are also made besides tree plantation. The Bio-diversity of the mine area will be enhanced due to the green belt maintained.</p>
aa.	Greenbelt shall be raised including a 7.5m wide statutory barrier all around the mining lease, reclaimed and rehabilitated areas, around water body, roads etc., by planting the native species in consultation with the local DFO/Agriculture Department. The ultimate area to be planted/ afforested shall not be less than 0.4 ha. Greenbelt shall be developed all along the mine lease area in a phased manner as per the approved mining plan.	<p>Complied.</p> <p>The PA developed green belt in a phased manner in consultation of DFO, Ariyalur. About 2.65 Ha is brought under green belt with 4,640 trees @ 1750 Trees per Ha and survival rate of 85-90%. Herbs and shrubs are also made besides tree plantation. Green belt is developed around the ML area, along haulage road and mine office.</p>
bb.	Green belt shall be provided as per norms of MoEF&CC & GOI in consultation with local DFO.	<p>Complied.</p> <p>The PA developed green belt in a phased manner @ 1750 Trees per Ha as per MoEF&CC norms (>1600 Trees/Ha) in consultation of DFO, Ariyalur.</p>
cc.	The project authority shall implement suitable water conservation measures including rain water harvesting system to augment ground water resources in the area in consultation with the Regional Director, State Ground Water Board.	<p>Complied.</p> <p>Recharge cum Settling Pond of 100 (L) x 50 (W) x 2 m (D) is made in the eastern side of PNR Lease area to collect the surface runoffs through garland drains. Water collected in the settling pond is utilized for green belt and dust control measures. Excess water is drained to nearby irrigation pond for raising</p>

S. No.	EC Conditions	Compliance status
		agricultural crops in nearby areas.
dd.	The Company shall submit within 3 months their policy towards Corporate Environment Responsibility which should inter-alia address (i) Standard operating process/procedure to bring into focus any infringement/deviation/violation of environment or forest norms/conditions, Hierarchical system or Administrative order of the company to deal with environmental issues and ensuring compliance of EC conditions and (ii) System of reporting of non-compliance/ violation of environmental norms to the Board of Directors of the company and/or stakeholders or shareholders.	<p>Complied.</p> <p>The Unit is having an Integrated Management System (IMS) Policy. The Environmental Management Cell (EMC) is functioning under the Unit Head. There is a Hierarchical System in the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions. Any non-compliance/violations of environmental norms and corrective actions taken is reported by the Unit Head to EDO & CEO of the Company. CEO is reporting to the Board of Directors and shareholders.</p>
ee.	CSR: Audited details pertaining to the mining shall be submitted to SELAA along with compliance report then and there.	<p>Refer below.</p> <p>Need based assessment study for the nearby village is carried out. Under CSR Scheme, lot of welfare measures are carried out in the nearby villager based on the villagers' request. Audited details pertaining to CSR spent are submitted to SELAA as well as published in the company website www.ramcoements.co.in under CSR Head.</p>
ff.	For CSR activities as per Ministry of corporate affairs notification dated 27.02.2014, amount shall be earmarked.	<p>Complied.</p> <p>As per the Companies Act 2013, Companies should spend at least 2% of the Profit after Tax of the previous year for CSR activities but not lower than 2% of average of previous three years Profit after Tax. The PA is carrying out various social measures for the local as well as regional populations as per CSR Norms.</p>
gg.	A Final Mine Closure Plan along with details of Corpus Fund shall be submitted to the Ministry of Environment & Forests, Government of India, New Delhi in advance of one year prior to the final mine closure for approval. Mine closure procedure shall be followed as per the approved	<p>Agreed to comply.</p> <p>The PA informed that final closure plan will be prepared one year prior to the final closure with suitable financial provisions for mine closure, obtain the approval from IBM and the same will be informed to MoEF&CC.</p>

S. No.	EC Conditions	Compliance status
	mining plan.	
hh.	Depth of water table of the wells located inside the mining area and wells located around the monitoring area shall be monitored regularly.	Complied. Periodical monitoring of ground water level is carried out 3 locations on quarterly basis in addition to the piezometer readings recorded in the Mine.
ii.	CSR activity shall include providing social & welfare measures for the local residents & nearby villages around the mine area. It shall focus on providing water supply and sanitation facility to the nearby government schools around the mine area and maintenance of village roads, ponds, providing solar street lights etc. Funds earmarked for CSR activity shall be used for that purpose only and separate account shall be maintained and report on implementation shall be furnished regularly.	Complied. The PA is undertaking various CSR activities related to health, education, drinking water supply, sanitation, bio-toilets for individual household, infrastructure development activities, construction of bus shelters, road repair work, building class rooms, etc. for the nearby villages. The PA submitted the CSR measures carried out to IRO in the status report. Allotted funds are not diverted for any other purpose.
jj.	The points raised in Public hearing and concerns shall be addressed without fail. As per action plan submitted to SEIAA.	Complied. Public Hearing (PH) for the Mine was held on 21.09.2016. PH issues in compliance with MoEF&CC OM F No 22-6512017-1A.III dated 30.09.2020 & 20.10.2020 are carried out. A budget of Rs.10.00 Lakhs was spent in addressing the PH issues. Also, an amount of Rs.2,00,000/- was remitted to the Executive Director, Kalakad-Mundanthurai Tiger Conservation Fund (KMTCF) under CSR Budget for the Mine.

C. Conditions for Post Construction / Operation Phase & Entire life of the project:

S. No.	EC Conditions	Compliance status
i.	It is mandatory for the project proponent to furnish to the SEIAA, Half yearly compliance report in hard and soft copies on 1 st June and 1 st December of each clearance, and also	Complied. The PA is submitting the half yearly compliance status report to RO, MoEF&CC Chennai and a copy to

	before commencement of production.	SEIAA-TN.
ii.	No expansion or modernization in the project shall be carried out without prior approval of the SEIAA-TN. In case of any deviations or alterations in the project proposal from those submitted to this Authority for clearance, a fresh reference shall be made to the SEIAA-TN to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any.	Complied. No expansion or modernization is carried out in the mine. The PA is planning to go for amalgamation of this Periyagalur-West Mine with Periyagalur Mine (35.96 Ha) which is located adjacent in the eastern side. The PA obtained TOR from SEIAA-Tamil Nadu.
iii.	All the environmental protection measures and safeguards as recommended in the EIA report shall be complied with.	Complied. Pollution control measures with regard to environmental quality prescribed in the EIA-EMP Report are implemented by the PA.
iv.	The implementation of the project vis-a-vis environmental action plans shall be monitored by the Regional office of MoEF at Chennai/TNPCB/CPCB. A six-monthly compliance report shall be submitted to monitoring agencies regularly.	Complied. The PA extended the full cooperation during the site visit and the six-monthly compliance reports submitted by the PA periodically.
v.	Data on ambient air, stack and fugitive emissions shall be regularly submitted online to the Regional office of MoEF at Chennai, TNPCB and Central Pollution Control Board as well as hard copy once in six months and display data on RSPM, SO ₂ and NO _x outside the premises at the appropriate place for the general public.	Complied. The PA is submitting the data on ambient air, fugitive emissions, noise levels, water quality & soil quality by email to RO, MoEF&CC as well as uploading in Parivesh Portal.
vi.	Occupational health surveillance of the workers shall be done on a regular basis and records maintained as per the Mines Act.	Complied. An Occupational Health Center is at the Cement Plant. Occupational Health Surveillance Program is being conducted for the workers periodically and the medical records are maintained as verified during the inspection.
vii.	Proper house-keeping and cleanliness must be maintained within and outside the plant.	Complied. The PA maintained a good housekeeping in the Mine Office.

viii	The first aid facilities in the occupational health center shall be strengthened and the medical records of each employee should be maintained separately.	<p>Complied.</p> <p>First Aid Center is maintained in the mine pit and OHS is established with supporting staff and facilities at the Cement Plant. The medical records are maintained at the OHC.</p>
ix	The overall noise levels in and the mining area shall be kept well within the standards prescribed for by providing noise control measures on all sources of noise generation. The ambient noise levels should conform to the standards prescribed under EPA Rules, 1989 viz. 55 dBA (day time) and 45 dBA (night time).	<p>Complied.</p> <p>The PA is monitoring both Ambient & Work zone Noise levels periodically through a NABL Lab and submitting the status reports to the Authorities. The monitored data (Document-10) reveals that Leq Noise Levels were within the MoEF&CC Norms for Residential Area of <55 dBA (day time) & <45 dBA (night time) and also within 85 dB(A) in working areas for 8-hours duration.</p>
x	The project proponent shall regenerate/ preserve water body located at about 5.0 km from the propose site at its own expenses. The project proponent shall also develop village ponds in addition and shall ensure that the existing ponds in and around 5.0 Km radius are well maintained.	<p>Complied.</p> <p>The PA is carrying out periodical desilting of water bodies, village ponds and irrigation tanks like Kattupiringiyam, Periya Eri near Reddipalayam, Periyagalur, etc. within 5 km radius from the mine and maintain them.</p>
xi	Hydro geological study of the area shall be reviewed annually and report submitted to the Authority. No water bodies including natural drainage system in the area shall be disturbed due to activities associated with the operation of the Mining activity.	<p>Complied.</p> <p>The PA engaged the Department of Remote Sensing, Bharathidasan University, Trichy for 'Integrated Hydrological Investigations-A Geospatial Approach' in and around their Mine Lease Areas in Ariyalur Region (Project 'Hydrotime') since May 2017 and submitted the Report to the Authorities. Natural drainage system in the mine vicinity is maintained as such.</p>
xii	CSR activity shall be implemented as committed by drawing a scheme for social up lifemen in the surrounding villages with reference to contribution in road construction, providing sanitation facilities, drinking water supply in the government schools nearby, community awareness, establishment of health centers, water	<p>Complied.</p> <p>The PA developed the basic infrastructures for better living conditions of the villages.</p> <p>The PA is undertaking various CSR activities related to health, education, drinking water supply, sanitation, bio-</p>

	supply to nearby villages and employment to local people whenever and wherever possible both for technical and non-technical jobs and protection of water sources around the project site etc. Funds earmarked for CSR activity shall be used for that purpose only and separate account shall be maintained and report on implementation shall be furnished regularly.	toilets for individual household, infrastructure development activities, construction of bus shelters, road repair work, building class rooms, etc. for the nearby villages. The PA submitted the CSR measures carried out to RO in the status report. Allotted funds are not diverted for any other purpose.
xiii.	The requisite amount earmarked towards capital cost and recurring cost/annum for implementing pollution control measures shall be used judiciously to implement the Environment Management as furnished in the EIA report. The funds so provided shall not be diverted for any other purpose.	Complied. The funds earmarked for environmental protection measures is kept in a separate account book and is not diverted for other purpose. Year wise expenditure are reported to IRO in Six monthly Compliance Report.
xiv.	The project proponent shall upload the status of compliance of the stipulated environmental clearance conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of the MoEF at Chennai. The respective Zonal Office of CPCB and the SPCB. The criteria pollutant levels namely; RSPM, SO ₂ , NO _x (Ambient levels as well as stack emissions) or critical sector parameters, indicated for the projects shall be monitored and displayed at a convenient location near the main gate of the company in the public domain.	Complied. The PA uploading the compliance report along with the monitored data on the company website www.ramcocements.co.in for public view. Six monthly Compliance Report is also mailed to IRO and uploaded in Parivesh Portal. IRO is monitoring the Data and environmental parameter levels periodically.
xv.	The project proponent shall also submit six monthly reports on the status of the compliance of the stipulated environmental conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB. The Regional Office of this Ministry at Bangalore/CPCB/SPCB shall monitor the stipulated conditions.	Complied. Six monthly Compliance Report is also mailed to RO, MoEF&CC, Chennai and uploaded in Parivesh Portal.
xvi.	The environmental statement for each financial year ending 31 st March in Form-V as is mandated to be submitted	Complied. Form - V is being submitted to TNPCB

	by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986 as amended subsequently, shall also be put on the website of the company along with the status of compliance of environmental conditions and shall also be sent to the respective Regional Offices of the MoEF by e-mail.	and RO, MoEF&CC, Chennai in hard copy and by e-mail.
xvii.	Environmental Clearance is being issued without prejudice to the action initiated under Environment (Protection) Act, 1986 or any court case pending or any other court order shall prevail.	Agreed to comply. It was submitted that this condition is noted and assured to abide by this condition.
xviii.	The SEIAA, TN may alter/modify the above conditions or stipulate any further condition in the interest of environment protection.	Agreed to comply. It was submitted that this condition is noted and assured to abide by this condition.
xix.	The SEIAA/SEAC reserves the right to add any further condition(s) on receiving reports from the project authority. The above condition shall be monitored by the Regional Office of MoEF located at Chennai.	Agreed to comply. It was submitted that this condition is noted and assured to abide by this condition.
xx.	The SEIAA, TN may revoke or suspend the Environmental Clearance, if implementation of any of the above conditions is not satisfactory.	Agreed to comply. It was submitted that this condition is noted and assured to abide by this condition.
xxi.	The SEIAA, TN may cancel the environmental clearance granted to this project under the provisions of EIA Notification, 2006, if at any stage of the validity of this environmental clearance, if it is found or if it comes to the knowledge of this SEIAA, TN that the project proponent has deliberately concealed and/or submitted false or misleading information or inadequate data for obtaining the environmental clearance.	Agreed to comply. It was submitted that this condition is noted and assured to abide by this condition.
xxii.	Failure to Comply with any one of the conditions mentioned above may result in withdrawal of this clearance and attract action under the provisions of the Environment (Protection) Act, 1986.	Agreed to comply. It was submitted that this condition is noted and assured to abide by this condition.

xxiii.	The above conditions will be enforced inter-alia, under the provisions of the Water (Prevention & Control of pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, the Public Liability Insurance Act, 1991, along with their amendments, MMDR amendment Act 2015, National Commission for protection of Child Right Rules, 2006 and rules made there under and also any other orders passed by the Hon'ble Supreme Court of India/Hon'ble High Court of Madras and any other Courts of Law relating to the subject matter.	Complied. CTO-Renew Orders 2409157816355 (Water Act) & 2409257816355 (Air Act) dated 29.02.2024 with validity till 31.03.2026. As no hazardous material handling in the mines, PLI is not applicable.
xxiv.	This clearance is issued with respect to only Environmental conditions and it does not imply that SEIAA approved the way by which lease is granted to the project. While granting lease, the concerned authority shall ensure compliance of relevant Rules, Regulations, Notifications, Government Resolutions, Circulars, Judgments/Orders of Hon'ble Courts and NGT, etc.	Agreed to comply. It was submitted that this condition is noted and assured to abide by this condition.
xxv.	Any appeal against this Environmental Clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.	Agreed to comply. There was no appeal lying with National Green Tribunal (NGT) against this EC as on date.

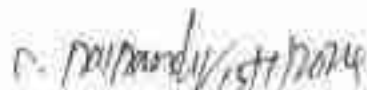
Summary Note:

(i) Implementation of Conditions:

During the site visit, it was observed that the PA has complied most of the EC conditions which are satisfied.

(ii) Court Cases and Show Cause/Closure Notices:

As informed, there are no court cases and show cause / closure notices issued by the Competent Authority.


(Dr. C. Palpandi)
 Scientist 'D'
Dr. C. Palpandi
 Scientist 'D'
 Government of India
 Regional Office, MoEF&CC
 Shastri Bhawan, Haddows Road,
 Nungambakkam, Chennai - 600 008



STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY
ENVIRONMENTAL CLEARANCE

From: Dr. S. Kalyanasundaram, I.F.S.(Retd.) Chairman 3rd Floor, Panagal Maaligal, No.1, Jeerla Road, Saldaper, Chennai-600 015.	To: The President(Mfg) The Ramco Cement Ltd., Auras Corporate Centre, 5 th floor, 98A, Dr. Radhakrishnan Road, Mylapore, Chennai - 600 004.
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LT.No.SEIAA.TN / F.No.462/2012 / EC-45 / (Ia) / ARY/2016 dated 14.11.2016.

Sir,

Sub: SEIAA, TN – Environmental Clearance for Periyannagalur West limestone Mines - over an extent of 17.36 Ha situated in S.F.No.267,268/1,269,271 etc Periyannagalur village, Ariyalur Taluk, Ariyalur District for limestone and Marl Production of 0.3 MTPA by M/s The Ramco Cement Limited - Issued - Regarding.

1. This has reference to your application for Environmental Clearance to MoEF, GOI dated 14.05.2012 and along with subsequent documents & EIA report submitted for the aforesaid project to the State Level Environment Impact Assessment Authority, Tamil Nadu seeking Environmental Clearance under the Environment Impact Assessment Notification, 2006.
2. It is noted, interalia that the project proposal is for the Production capacity of 0.3 MTPA (ROM) (Limestone & Marl) in applied mine lease area of 17.36.0 Ha (0.44.50 company owned Patta lands & 16.91.50 ha Government Poramboke Land) at - S.F.No. 267,268/1,269 & 271 of Periyannagalur village, Ariyalur Taluk, Ariyalur District, so as to meet the captive need of the Cement Plant at Ariyalur Unit in Tamil Nadu. The co-ordinates of the mining lease area is furnished as Latitude (N) 11° 07' 12" - 11° 07' 25" ; Longitude (E) 79° 08' 28" - 79° 08' 51" as per Topo sheet No. 58M/4. The entire Mine Lease area is reported to be wasteland

S. Kalyanasundaram
 CHAIRMAN
 SEIAA-TN



STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY
ENVIRONMENTAL CLEARANCE

and there is no forest land is involved. There is no R&R. There is no water course crossing the lease area. It is reported that there is no litigation pending against this proposal.

3. The lime stone mining is a New Lease proposed one (<50 ha) over an area of 17.36 Ha . Mining operations is fully mechanized Opencast Conventional method of Mining by utilizing Heavy Earth Moving Equipment (HEME). Pneumatically operated wagon drills (Atlas Copco make) of 110mm diameter holes are engaged for carrying out drilling operations. The drills will be operated using diesel operated screw compressors. For the targeted production of 0.3MTPA ROM, it requires 3333 Holes of spacing X burden X depth (3X3X8m) which will yield roughly 90 Tonnes / Hole. For blasting 83 mm diameter holes will be drilled with spacing and burden of 3 m x 3 m to a depth of 8 m. A powder factor of around 5 is assumed for limestone. It is proposed to blast 70 Nos. of Holes in a week. PNR -West Mine block is located at a distance of 0.5km in the south. Ramco Cements Ltd. Govindapuram Cement Plant is located at a distance of 6 km aerial distance (14km by road) in north west. Pndia area issued vide Ln.No.3505/MMA/2/2011-2 dated 1.3.2011. The approval from IBM was vide Ln.No.TN/ALR/MP/LST-1974-MDS/dated 23.05.2016.

- No processing or beneficiation of the ore or mineral mined is planned. The ultimate pit limit in Plan period is 20m bgl and Ultimate pit limit in conceptual stage will be 40m bgl. Ground water table in the mining lease area generally fluctuates between 15m bgl to 20m bgl. Ground water Intersection is there in Mine working during the scheme period.
- The proposal was awarded TOR in reference SEAC/F.No.9/M-XXVI/TOR.92 / 2012/dated 01.10.2012.TOR was extended vide Letter No. SEIAA /TNV.462/TOR-EXT/2012-199 dated 28.11.2014, and again extended vide Letter No.

CHAIRMAN
SEIAA-TN



STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY
ENVIRONMENTAL CLEARANCE

SEIAA/TN/F.462/TOR-EXT/2012/2015 dated 05.11.2015. Public Hearing was conducted on 21.09.2016. The proposal was considered as per the EIA Notification, 2006, by the State Level Expert Appraisal Committee, Tamilnadu in its 82nd meeting held on 21.10.2016 and 83rd SEAC meeting held on 11.11.2016 and recommended to SEIAA-TN to consider issue of EC.

6. The proposal was placed in its 200th SEIAA TN meeting held on 14.11.2016 and SEIAA after careful consideration decided to issue Environmental Clearance in its meeting and vide Item No. 200 - 29, it was decided by SEIAA to issue prior EC based on the information submitted by you which are extracted below:-

F. No. 462/2012		Date of receipt at SEIAA - 14.05.2012
S. No.	Description	Detail
1	Name of the Project	M/s. The Ramco Cements Limited, Periyasattur West Limestone Mine, Extent - 17.36 Ha & Production - 0.3 MTPA (ROM) (New Lease for Captive Use)
2	Location Co-ordinates	S.F. No. 267, 268, 269, 271, etc., Parts of Periyasattur Village, Ariyalur Taluk, Ariyalur District. Latitude (N) 11° 07' 24" - 11° 07' 46" Longitude (E) 79° 06' 27" - 79° 06' 59"
3	Type of Project	Mining of Major Minerals Schedule I (a) < 50 ha. of Mining lease area in respect of non-coal mine lease.
4	Life of mine	25 Years @ rate of 0.3MTPA production.
5	Ground level Water table	15 m BGL (Post monsoon) 20 m (pre monsoon)
6	Mineral reserve	7.46 Million Tonnes (MT) of Limestone/ROM having average quality of CaO: 46.49% SiO ₂ : 6.97%


CHAIRMAN
SEIAA-TN



STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY
ENVIRONMENTAL CLEARANCE

7	Total Area (in hectares)	17.36 Ha.																									
		<table border="1"> <thead> <tr> <th>Activities</th> <th>Existing Land Use, Ha</th> <th>At the End of Plan Period, Ha</th> </tr> </thead> <tbody> <tr> <td>Mined out area</td> <td>0</td> <td>5.710</td> </tr> <tr> <td>storage for top soil</td> <td>0</td> <td>0</td> </tr> <tr> <td>Overburden Dump</td> <td>0</td> <td>0</td> </tr> <tr> <td>Infrastructures (Buildings, roads, etc.)</td> <td>0</td> <td>0.200</td> </tr> <tr> <td>Roads</td> <td>0</td> <td>0.500</td> </tr> <tr> <td>Green Belt</td> <td>0</td> <td>1.000</td> </tr> <tr> <td>Others to specify (undisturbed)</td> <td>17.360</td> <td>9.950</td> </tr> <tr> <td>Total</td> <td>17.360</td> <td>17.360</td> </tr> </tbody> </table>	Activities	Existing Land Use, Ha	At the End of Plan Period, Ha	Mined out area	0	5.710	storage for top soil	0	0	Overburden Dump	0	0	Infrastructures (Buildings, roads, etc.)	0	0.200	Roads	0	0.500	Green Belt	0	1.000	Others to specify (undisturbed)	17.360	9.950	Total
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Others to specify (undisturbed)	17.360	9.950																									
Total	17.360	17.360																									
8	Cost of Project	Rs.1.54 Crores																									
9	Brief description of the project	Mining operations will be carried out by Fully Mechanized Open cast, Conventional Method, by utilizing Heavy Earth Moving Equipment (HEME). Pneumatically operated wagon drills of 110 mm diameter holes will be engaged for carrying out the drilling operations. The drills will be operated with the help of diesel operated screw compressors. The blasted ROM will be extracted with the hydraulic excavators and transported to the Cement Plant by Tipers.																									
10	Documents enclosed	1. Final EIA Report as per TOR 2. Minutes of Public Hearing 3. Copy of Public Area Notification 4. Modified Mining plan along with Progressive mine closure plan approved by IBM.																									
11	Production capacity	Lime stone & Marl - 0.3 Million Tons Per Annum (MTPA) ROM																									
12	a) Water requirement b) Source	Total : 20 KLD. Domestic Usage : 5 KLD. Green Belt : 10 KLD. Dust Suppression: 5 KLD. Own Bore well and Mine Pit seepage Water (NOC awaited from SCWA).																									
13	Quantity of Domestic sewage KLD	4.5 KLD																									

Rajiv Gandhi
CHAIRMAN
SEMA-TN



STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY
ENVIRONMENTAL CLEARANCE

14	Details of STP	Septic Tank (2 x 12 x 0.5 m) followed by a Dispersion Trench (1 x 1 x 1.5 m)
15	Mode of Disposal of treated sewage with quantity	4.5 KLD. On land dispersion
16	Quantity of Solid Waste generated per day (in Kgs)	50947 Tonnes (31842 cu.m)
17	Mode of Disposal of excavated earth/construction debris (cum)	Topsoil of 0.32 Lakh M ³ (50,647 Tonnes) to be removed and dumped all along the periphery of the Mining Lease boundary for the afforestation programme. Thus, there is no Dump in the Project. No Reclamation.
18	Details of D.O. set with Capacity in KVA	No DG Set proposed.
19	Air Pollution Control Measures	<ol style="list-style-type: none"> 1. Prevention of fine dust getting air borne by spraying water on the dust generation points 2. Wetting of haul roads periodically. 3. Avoiding overloading of trailers / tippers. 4. Covering of trailer/tippers with tarpaulin during transportation. 5. Periodical maintenance of trucks/trailers. 6. Periodic check - up of vehicles for Emissions. 7. Avoiding blasting during high wind periods. 8. Development of green belt along the periphery, haul roads, waste dumps, etc.
20	Details of green belt (including lawn) area hectares)	It is proposed to plant 1,250 saplings of local tree species in an area of 1.00 Ha. At the Conceptual mining stage, - 3.17 Ha area will be covered by green belt/ afforestation area (18.26% coverage) with about 4,000 trees.
21	Provision for rain water	The rainwater realization in the mine pit area of 13.49 Ha will be 1,47,850 cu.m/year.


CHAIRMAN
SEIAA-TN



STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY
ENVIRONMENTAL CLEARANCE

	harvesting	The rainwater utilization in the mine pit during Monsoon Season will be 1.211 cu.m/day and during Non-monsoon Season will be 242 cu.m/day.				
22	Availability of approach road & linkages	Available - 54-139				
23	Containment of Noise	<p>Deploying mining equipments shall be with in-built mechanism for reducing noise.</p> <ol style="list-style-type: none"> 1. Provision of silencers to modulate the noise generated by the machines. 2. Providing sound proof operator's cabin of equipments. 3. Provision of ear muffs/ear plugs to the Workers in higher noise zones. 4. Blasting shall be carried out using optimum burden, charge and millisecond delay detonators. 5. Ground vibrations shall be continuously monitored during Blasting using a minimate. 6. Green belts with thick foliage along roads and around lease boundary to act as acoustic barriers. 				
24	EIA Study Baseline studies Period	Jan 2015 to March 2016.				
25	Public Hearing & site	21.09.2015; Peralangalur Crusher site.				
26	CSR Activities	Sl. No	Socio-Economic Works	2013-14 (Rs)	2014-15 (Rs)	2015-16 (Rs)
		1.	Education	450157	3120489	1114826
		2.	Infrastructure Development	24382600	2540922	4364193
		3.	Medical	90000	244860	762099
		4.	Sports	10000	-	70620
		5.	Temple	287500	495733	292501
			Total	2,54,20,259	64,02,004	64,83,839



STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY
ENVIRONMENTAL CLEARANCE

27	EIMP Budget	Capital cost - Rs.9.75 Lakhs Social measures - Rs.3.50 Lakhs per Annum
28	Wild life Act	There are no eco sensitive areas like National Parks, Wildlife Sanctuaries, Biosphere Reserves, Elephant Corridor, Mangroves, Archaeological/Historical Monuments, Heritage sites, etc. within 10 km from the proposed site boundary. Ports of Managethi RF is a distance of 8.5 km in northeast and Sundaresapuram RF at 9.5 km in southeast falls within the Study Area.

VALIDITY:-

The SEIAA-TN hereby accords Environmental Clearance to this project under the provisions of the EIA Notification 2006 as amended, with Validity Co-Terminal with the mining lease period subject to the following conditions as below.

A. Conditions for Pre - Construction Phase:

- Consent for Establishment shall be obtained from the Tamil Nadu Pollution Control Board and a copy shall be submitted to the SEIAA, Tamil Nadu before taking up any construction activity at the site.
- In the case of any change(s) in the scope of the project, a fresh appraisal by the SEAC/SEIAA shall be obtained. No change in mining technology and scope of working should be made without prior approval of the State Environmental Impact Assessment Authority. No change in the calendar plan including

[Signature]
CHAIRMAN
SEIAA-TN



STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY
ENVIRONMENTAL CLEARANCE

- excavation, quantum of mineral limestone and waste should be made.
- iii) Project Proponent shall comply with all the guidelines and notifications issued by MoEF & CC, New Delhi regarding Mining of Minerals and comply with orders of Hon'ble National Green Tribunal from time to time regarding Mining of Minerals, under 1(a).
 - iv) A copy of the clearance letter shall be sent by the proponent to the Local Body, Ariyalur Taluk, Ariyalur District, and the Local NCC, if any, from whom suggestions / representations, if any, have been received while processing the proposal. The clearance letter shall also be put on the website of the Proponent.
 - v) All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire and Rescue Services Department, Civil Aviation Department, Forest Conservation Act, 1980 and Wild Life (Protection) Act, 1972; State / Central Ground Water Authority, Coastal Regulatory Zone Authority, other statutory and other authorities as applicable to the project shall be obtained by project proponent from the concerned competent authorities.
 - vi) The Construction of the structure should be undertaken as per the plans approved by the concerned local authorities/local administration.
 - vii) Any appeal against this environmental clearance shall lie with the Hon'ble National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.
 - viii) All required sanitary and hygienic measures should be in place before starting construction activities and they have to be maintained throughout the construction phase.
 - ix) The company shall stress upon the preventive aspects of occupational health.
 - x) Provision shall be made for the housing of construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, canteen etc. The housing may


CHAIRMAN
SEIAA-TN



STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY
ENVIRONMENTAL CLEARANCE

be in the form of temporary structures to be removed after the completion of the project.

- vi) The project authorities should advertise with basic details at least in two widely circulated local newspapers, one of which shall be in the vernacular language of the locality concerned, within 7 days of the issue of clearance and a copy of the clearance letter is available with the State Pollution Control Board and also at website of SEIAA, TN and a copy of the same should be forwarded to the Regional Office of the Ministry of Environment and Forests located at Chennai.
- vii) A separate environment and safety management cell with qualified staff shall be set up before commissioning of construction activities and shall be retained throughout the lifetime of the industry, for implementation of the stipulated environmental safeguards.
- viii) The State Pollution Control Board should display a copy of the Environmental Clearance issued to the project at the Regional office, District Industry Centre and the Collector's office/Tahsildar's office for 30 days.

B. Conditions for Construction/Mining Phase

- a) Fully mechanized Opencast Conventional method of Mining method shall be adopted as reported for the mining of lime stone.
- b) To furnish to the SEIAA for one year period :-
 - (i). Report on quality and quantity of ground water to be generated during mining operations and from adjoining areas.
 - (ii). Comparative statement on normal ground water and mined out water with respect to quality & suitability for agriculture etc for one year period.

K. Srinivasan
CHAIRMAN
SEIAA-TN



STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY
ENVIRONMENTAL CLEARANCE

- d) Monitoring of well water level and water quality of the wells in the locations furnished in the EA report shall be done during pre-monsoon and post monsoon period and results submitted to the Regional Office of MoEF, Chennai and SEIAA.
- d) Monitoring of water quality and air quality in and around the project site in the selected monitoring points as mentioned in the EA report shall be continued regularly involving Academic institutions.
- e) Regular monitoring of ground water level and quality shall be carried out in and around the mine lease by establishing a network of existing wells and constructing new piezometers during the mining operation. The periodic monitoring [(at least four times in a year: pre-monsoon (April-May), monsoon (August), post-monsoon (November) and winter (January), once in each season)] shall be carried out in consultation with the State Ground Water Board/Central Ground Water Authority and the data thus collected may be sent regularly to the Ministry of Environment and Forests and its Regional Office, Chennai, the Central Ground Water Authority and the Regional Director, Central Ground Water Board. If at any stage, it is observed that the groundwater table is getting depleted due to the mining activity, necessary corrective measures shall be carried out.
- f) Hydro-Geological study including Infiltration test shall be conducted by any reputed agency to estimate leachate quantity.
- g) The excess over burden shall not be shipped for any commercial purposes and shall be disposed within the mine lease area only.
- h) The proponent shall conduct AAQ Monitoring Survey once in 6 months in the locations furnished in the EA report and furnish report to the Regional Office of MoEF, Chennai. It shall be ensured that one AAQ station shall be located in the nearby habitation of Periyasagalur village.


CHAIRMAN
SEIAA TN



STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY
ENVIRONMENTAL CLEARANCE

- i) The critical parameters such as RSPM (PM_{10} , $PM_{2.5}$) and NOX in the ambient air within the impact zone, peak particle velocity at 300m distance or within the nearest habitation, whichever is closer shall be monitored periodically. Further, quality of discharged water shall also be monitored (TDS, DO, PH and Total Suspended Solids (TSS)). The monitored data shall be uploaded on the website of the company as well as displayed on a display board at the project site at a suitable location near the main gate of the company in public domain.
- j) Data on ambient air quality [(RSPM and NOX] shall be regularly submitted to the Regional office of MoEF at Chennai and the SEIAA/SPCB/CPCB once in six months.
- k) Fugitive dust emissions from all the sources should be controlled regularly. Water spraying arrangement on haul roads, loading and unloading and at transfer points should be provided and properly maintained.
- l) Pre-placement medical examination and periodical medical examination of the workers engaged in the project shall be carried out and records maintained. For the purpose, schedule of health examination of the workers should be drawn and followed accordingly.
- m) Regular medical check-up for mine workers and nearby residents around the project site involving community medical centre/NMHI shall be conducted.
- n) As per norms, health study should be conducted through competent/approved Health organisations and report submitted for one year.
- o) To address noise level issues vibration tests shall be conducted and submitted to SEIAA.
- p) Corpus fund created should be prioritized and utilized for health issues.
- q) Mineral handling area shall be provided with adequate number of high efficiency dust extraction system. Loading and unloading areas including all transfer points shall


CHAIRMAN
SEIAA-TN



STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY,
ENVIRONMENTAL CLEARANCE

- also have efficient dust control arrangements. These should be properly maintained and operated.
- r) Vehicular emissions shall be kept under control and regularly monitored. Measures shall be taken for maintenance of vehicles used in mining operations and in transportation of mineral within the lease area. The mineral transportation shall be carried out through the covered trucks only and the vehicles carrying the mineral shall not be overloaded.
 - s) The effective safe guard measures shall be provided to control particulate dust level in critical areas, transfer points and haul roads within the mine area.
 - t) At least four ambient air quality monitoring stations should be established in the core zone as well as in the buffer zone for monitoring of RSPM (PM_{10} , $PM_{2.5}$) and NO_x . Location of the stations should be decided in consultation with Tamil Nadu Pollution Control Board based on the meteorological data, topographical features and environmentally and ecologically sensitive targets and frequency of monitoring etc.
 - u) Mine working shall be restricted upto 100 feet ultimate pit depth as per the present mine plan period. NOC from the State GWA for drawing ground water shall be furnished.
 - v) Geland drains and siltation ponds of appropriate size shall be constructed around the mine working, soil and mineral dumps to prevent run off of water and flow of sediments. The water so collected shall be utilized for watering the mine area, roads, green belt development etc. The drains shall be regularly desilted, particularly after the monsoon, and maintained properly.
 - w) The surface water accumulation in the mine during rainy seasons shall be treated by providing settling tanks in the periphery of the mining lease area and the overflow

Tn.No-064-20150973

Page 22 of 29

email: chairmanseiaa@yahoo.com


CHAIRMAN
SEIAA, TN



STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY
ENVIRONMENTAL CLEARANCE

clean water from the settling tanks shall be allowed to discharge through the first order streams to join nearby natural drains. The settling tanks shall be cleaned periodically for removal of sediments and such records of cleaning shall be maintained properly.

- x) Gulland drains proposed on the non-moving sides of the Dump yards shall be connected to settling tanks to arrest any wash off sediments from the dumps and only overflowing clean water shall be allowed to discharge through the first order streams. The settling tanks shall be of sufficient dimensions to hold the wash offs in one rainy season and has to be cleaned before every rainy season.
- y) Conservation plan furnished to protect the scheduled flora and fauna in the core and buffer zone of the project site shall be implemented. Scheduled species of fauna found in the study area shall be monitored closely.
- z) Bio-diversity Management Plan for mine and buffer area shall be prepared in consultation with local DFO and submitted to SEIAA.
- aa) Greenbelt shall be raised including a 7.5m wide statutory barrier all around the mining lease, reclaimed and rehabilitated areas around water body, roads etc. by planting the native species in consultation with the local DFO/Agriculture Department. The ultimate area to be planted/afforested shall not be less than 0.4 ha. Greenbelt shall be developed all along the mine lease area in a phased manner as per the approved mining plan.
- bb) Green belt shall be provided as per norms of MoEF & CC & GoI, in consultation with local DFO.
- cc) The project authority shall implement suitable water conservation measures including rain water harvesting systems to augment ground water resources in the area in consultation with the Regional Director, State Ground Water Board.


CHAIRMAN
SEIAA-TN



STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY
ENVIRONMENTAL CLEARANCE

- dd) The Company shall submit within 3 months their policy towards Corporate Environment Responsibility which should inter-alia address (i) Standard operating process/ procedure to bring into focus any infringement/deviation/violation of environmental or forest norms/conditions, (ii) Hierarchical system or Administrative order of the company to deal with environmental issues and ensuring compliance of EC conditions and (iii) System of reporting of non-compliance /violation of environmental norms to the Board of Directors of the company and/or stakeholders or shareholders.
- ee) CSR: Annual details pertaining to the mining shall be submitted to SEIAA along with compliance report then and there.
- ff) For CSR activities as per Ministry of corporate affair notification dated 27.02.2014, amount shall be earmarked
- gg) A Final Mine Closure Plan along with details of Corpus Fund shall be submitted to the Ministry of Environment & Forests, Government of India, New Delhi in advance of one year prior to the final mine closure for approval. Mine closure procedure shall be followed as per the approved mining plan.
- hh) Depth of water table of the wells located inside the mining area and wells located around the monitoring area shall be monitored regularly.
- ii) CSR activity shall include providing social & welfare measures for the local residents & nearby villages around the mine area. It shall focus on providing water supply and sanitation facility to the nearby government schools around the mine area and maintenance of village roads, ponds, providing solar street light etc. Funds earmarked for CSR activity shall be used for that purpose only and separate account shall be maintained and report on implementation shall be furnished regularly.


CHAIRMAN
SEIAA-TN



STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY
ENVIRONMENTAL CLEARANCE

- ii) The points raised in Public hearing and concerns shall be addressed without fail, as per action plan submitted to SEIAA.

Conditions for Post Construction / Operation Phase & Entire life of the project:

- i. It is mandatory for the project proponent to furnish to the SEIAA, Half yearly compliance report in hard and soft copies on 1st June and 1st December of each calendar year in respect of the conditions stipulated in the prior Environmental clearance, and also before commencement of production.
- ii. No expansion or modernization in the project shall be carried out without prior approval of the SEIAA-TN. In case of any deviations or alterations in the project proposal from those submitted to this Authority for clearance, a fresh reference shall be made to the SEIAA-TN to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any.
- iii. All the environmental protection measures and safeguards as recommended in the EIA report shall be complied with.
- iv. The implementation of the project vis-à-vis environmental action plans shall be monitored by the Regional office of MoEF at Chennai/TNPCB/CPCB. A six monthly compliance status report shall be submitted to monitoring agencies regularly.
- v. Data on ambient air, stack and fugitive emissions shall be regularly submitted online to the Regional office of MoEF at Chennai, TNPCB and Central Pollution Control Board as well as hard copy once in six months and display data on RSPM, SO₂ and NO_x outside the premises at the appropriate place for the general public.
- vi. Occupational health surveillance of the workers shall be done on a regular basis and records maintained as per the Mines Act.


CHAIRMAN
SEIAA-TN



STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY
ENVIRONMENTAL CLEARANCE

- vi. Proper house-keeping and cleanliness must be maintained within and outside the plant.
- vii. The first aid facilities in the occupational health centre shall be strengthened and the medical records of each employee should be maintained separately.
- viii. The overall noise levels in and around the mining area shall be kept well within the standards prescribed for by providing noise control measures on all sources of noise generation. The ambient noise levels should conform to the standards prescribed under EPA Rules, 1989 viz. 55 dBA (day time) and 45 dBA (night time).
- ix. The project proponent shall regenerate / preserve water body located at about 5.0 km from the propose site at its own expenses. The project proponent shall also develop village ponds in addition and shall ensure that the existing ponds in and around 5.0 Km radius are well maintained.
- x. Hydro geological study of the area shall be reviewed annually and report submitted to the Authority. No water bodies including natural drainage system in the area shall be disturbed due to activities associated with the operation of the Mining activity.
- xi. CSR activity shall be implemented as committed by drawing a scheme for social upliftment in the surrounding villages with reference to contribution in road construction, providing sanitation facilities, drinking water supply in the government schools nearby, community awareness, establishment of health centres, water supply to nearby villages and employment to local people whenever and wherever possible both for technical and non-technical jobs and protection of water sources around the project site etc. Funds earmarked for CSR activity shall be used for that purpose only and separate account shall be maintained and report on implementation shall be furnished regularly.
- xii. The requisite amount earmarked towards capital cost and recurring cost/annum for implementing pollution control measures shall be used judiciously to



STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY
ENVIRONMENTAL CLEARANCE

implement the Environment Management Plan as furnished in the EIA report. The funds so provided shall not be diverted for any other purposes.

- xiv. The project proponent shall upload the status of compliance of the stipulated environmental clearance conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of the MOEF at Chennai, the respective Zonal Office of CPCB and the SPCB. The criteria pollutant levels namely: RSPM, SO₂, NO_x (Ambient levels as well as stack emissions) or critical sector parameters, indicated for the projects shall be monitored and displayed at a convenient location near the main gate of the company in the public domain.
- xv. The project proponent shall also submit its monthly reports on the status of the compliance of the stipulated environmental conditions including results of monitored data (both in hard copies as well as by email) to the respective Regional Office of MOEF, the respective Zonal Office of CPCB and the SPCB. The Regional Office of this Ministry at Bangalore/CPCB/SPCB shall monitor the stipulated conditions.
- xvi. The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board in prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of environmental conditions and shall also be sent to the respective Regional Office of the MOEF by e-mail.
- xvii. Environmental Clearance is being issued without prejudice to the action initiated under Environment (Protection) Act, 1986 or any court case pending or any other court order shall prevail.
- xviii. The SEIAA, TN may alter/modify the above conditions or stipulate any further condition in the interest of environment protection.



STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY
ENVIRONMENTAL CLEARANCE

- xv. The SEIAA/SEAC reserves the right to add any further condition(s) on receiving reports from the project authority. The above conditions shall be monitored by the Regional Office of MoEF located at Chennai.
- xvi. The SEIAA, TN may revoke or suspend the Environmental clearance, if implementation of any of the above conditions is not satisfactory.
- xvii. The SEIAA, TN may cancel the environmental clearance granted to this project under the provisions of EIA Notification, 2006, if, at any stage of the validity of this environmental clearance, if it is found or if it comes to the knowledge of this SEIAA, TN that the project assessment has deliberately concealed and/or submitted false or misleading information or inadequate data for obtaining the environmental clearance.
- xviii. Failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and allied action under the provisions of the Environment (Protection) Act, 1986.
- xix. The above conditions will be enforced inter-alia, under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, the Public Liability Insurance Act, 1991, along with their amendments, MMDR amendment Act 2015, National Commission for protection of Child Right Rules - 2006 and rules made there under and also any other orders passed by the Hon'ble Supreme Court of India / Hon'ble High Court of Madras and any other Courts of Law relating to the subject matter.
- xx. This clearance is issued with respect to only Environmental considerations and it does not imply that SEIAA approved the way by which lease is granted to the project. While granting lease, the concerned authority shall ensure compliance of relevant Rules, Regulations, Notifications, Government Resolutions, Circulars, Judgments/Orders of Hon'ble Courts and NGT, etc.


CHAIRMAN
SEIAA-TN



STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY
ENVIRONMENTAL CLEARANCE

- xxi. Any appeal against this Environmental Clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.

K. Jayaraman
Chairman
SEIAA-TN

Copy to:-

1. The Principal Secretary to Government, Environment & Forests Department,
Govt. of Tamil Nadu, Fort St. George, Chennai - 600 009.
2. The Chairman, Central Pollution Control Board, Parvath Bhavan,
CBD Cum-Office Complex, East Arjun Nagar, New Delhi 110032.
3. The Member Secretary, Tamil Nadu Pollution Control Board,
76, Mount Salai, Guindy, Chennai - 600 032.
4. The ACCF(C), Regional Office of MoEF,
34, Hept Building, 1 & 2 nd Floors, Cathedral Garden Road,
Nungambakkam, Chennai - 600 034.
5. Monitoring Cell, I A Division, Ministry of Environment & Forests,
Paryavaran Bhavan, CGO Complex, New Delhi 110003.
6. The District Collector, Ariyalur district.
7. Stock File.



TAMILNADU POLLUTION CONTROL BOARD

RENEWAL OF CONSENT ORDER NO:2409157816355

DATE:29/02/2024



PROCEEDINGS NO.F.0387ARY/RS/DEE/TNPCB/ARY/W/2024 DATED:
29/02/2024

Sub :	Tamil Nadu Pollution Control Board – AUTO RENEWAL OF CONSENT – M/s. PERIYANAGALUR WEST LIMESTONE MINES-THE RAMCO CEMENTS LIMITED S.F No. 229/1,267,268/1,269,271, PERIYANAGALUR Village, Ariyalur Taluk, Ariyalur District- Renewal of Consent for the operation of the plant and discharge of sewage and/or trade effluent under Section 25 of the Water (Prevention and Control of Pollution) Act, 1974 as amended in 1988 (Central Act 6 of 1974) – Issued- Reg.
Ref :	1.CTO. Procs. No. T2/TNPCB/F.0387ARY/RS/ARY/W/2018 dated 19/02/2018. 2.RCO Procs.No.F.0387ARY/RS/DEE/TNPCB/ARY/W/2023 Dated: 19/06/2023 3.Unit's application for Auto renewal of consent through online no.57816355 Dated: 24.02.2024. 4.Board Circular Memo No. TNPCB/OCMMS/06517/2019 Dated 08-06-2022

Renewal Of Consent is hereby granted under Section 25 of the Water (Prevention and Control of Pollution) Act, 1974 as amended in 1988 (Central Act, 6 of 1974) (hereinafter referred to as "The Act") and the rules and orders made there under to

CHAIRMAN & MANAGING DIRECTOR,
M/s . PERIYANAGALUR WEST LIMESTONE MINES-THE RAMCO CEMENTS LIMITED
S.F No. 229/1,267,268/1,269,271,
PERIYANAGALUR Village,
Ariyalur Taluk,
Ariyalur District.

Authorising the occupier to make discharge of sewage and /or trade effluent.

This is subject to the provisions of the Act, the rules and the orders made there under and the terms and conditions incorporated under the Special and General conditions stipulated in the Consent Order issued earlier and subject to the special conditions annexed.

This RENEWAL OF CONSENT is valid for the period ending - March 31, 2026

M SENTHILKUMAR

District Environmental Engineer,
Tamil Nadu Pollution Control Board,
ARIYALUR

Digitally signed by M SENTHILKUMAR
DN: cn=M SENTHILKUMAR, o=TAMILNADU POLLUTION CONTROL BOARD, email=M SENTHILKUMAR@TNPCCB.TN.GOV.IN, c=IN, postalCode=605002, st=Tamil Nadu,
c=IN, postalCode=605002, st=Tamil Nadu, email=M SENTHILKUMAR@TNPCCB.TN.GOV.IN, o=TAMILNADU POLLUTION CONTROL BOARD, ou=ARIYALUR, cn=M SENTHILKUMAR
Date: 2024.02.29 14:27:36 +0530


SPECIAL CONDITIONS

1. This renewal of consent is valid for operating the facility for the manufacture of products (Col. 2) at the rate (Col. 3) mentioned below. Any change in the products and its quantity has to be brought to the notice of the Board and fresh consent has to be obtained.

Sl.No.	Description	Quantity	Unit
a. Product Details :-			
1.	Mining of Limestone over an Extent of 17.36.0 Hectares	0.3	Million Tonnes/Annum
b. By-Product Details :-			
1.	No By-Product	0	-
c. Intermediate Product Details :-			
1.	No Intermediate Product	0	-

2. This renewal of consent is valid for operating the facility with the below mentioned permitted outlets for the discharge of sewage/trade effluent. Any change in the outlets and the quantity has to be brought to the notice of the Board and fresh consent has to be obtained.

Outlet No.	Description of Outlet	Maximum daily discharge in KLD	Point of disposal
EFFLUENT TYPE :- Effluent Type : Sewage			
1.	Sewage	4.5	On Industrys own land
EFFLUENT TYPE :- Effluent Type : Trade Effluent			
OUTLET NUMBER DESCRIPTION OF OUTLET MAXIMUM DAILY DISCHARGE (IN KLD) POINT OF DISPOSAL			
1.	Nil	0.0	-

Special Additional Conditions-

The unit shall obtain No Objection Certificate (NOC) from the Tamil Nadu Bio Diversity Board /National Bio Diversity Authority if the unit is using any Biological resources or knowledge associated thereto as per the provisions of Biological Diversity Act 2002.

The industries shall take all efforts to use and popularize "Mission LIFE" logo and mascot which is available in TNPCB & MoEFCC website. They shall also request their employees to adopt "Mission LIFE" action points and document the same and furnish half yearly report to Board.

Additional Conditions-

- The unit shall treat and dispose the sewage in septic tank and Dispersion trench arrangements.
- The unit shall comply with all conditions mentioned in the EC issued by SELAA vide Lr.Dated:14.11.2016.
- The unit shall adhere to the depth of mining mentioned in the EC.
- The unit shall comply with Mines and Minerals (Development and Regulation) Amendment Act 2015.
- The mining lease holder shall, after ceasing mining operations, undertake regrassing the mining area and any other area which may have been disturbed due to their mining activities and restore the land to a condition which is fit for growth of fodder, flora, fauna etc.
- The unit shall not use 'use and throwaway plastics' such as plastic sheets used for food wrapping, spreading on dining table etc., plastic plates, plastic coated tea cups, plastic tumbler, water pouches and packets, plastic straw, plastic carry bag and plastic flags irrespective of thickness, within the industry premises. Instead it shall encourage use of eco friendly alternative such as banana leaf,arecanut palm plate, stainless steel, glass, porcelain plates/ cups, cloth bag, jute bag etc.
- The unit shall comply with the E waste Management Rules 2016, E waste as listed in Schedule- I generated by them shall be channelized through collection centre or dealer of authorized producer or dismantlers or recycler or through the designated take back service provider of the producer to authorized dismantler or recycler. The unit shall maintain records of E- waste generated by them in Form- 2 and make such records available for scrutiny by the TNPCB. The unit shall file annual returns in Form -3, to the TNPCB on or before the 30 th day of June following the financial year.
- The unit shall not go for expansion activity without obtaining Environmental Clearance for expansion.
- This consent order does not absolve from obtaining necessary permission /clearance from other Authority or under other Statute as applicable.

M

SENTHILKUMAR
POLLUTION PREVENTION PAYS

Digitally signed by M SENTHILKUMAR
 DN: c=IN, o=TAMIL NADU POLLUTION CONTROL BOARD,
 ou=CHENNAI
 2.5.4.20.3086f12954111284f98649496284090274957d
 8a018b192b163ee19, postalCode=600052, st=Tamil Nadu,
 serialNumber=372307974510610061410387ED0EE28E9F
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District Environmental Engineer,
Tamil Nadu Pollution Control Board,
TAMILNADU POLLUTION CONTROL BOARD

To
CHAIRMAN & MANAGING DIRECTOR,
M/s.PERIYANAGALUR WEST LIMESTONE MINES-THE RAMCO CEMENTS LIMITED,
RAMAMANDIRAM,
RAJAPALAYAM,
VIRUDHUNAGAR DISTRICT
Pin: 626117

Copy to:

- 1.The Commissioner, ARIYALUR-Panchayat Union, Ariyalur Taluk, Ariyalur District .
2. Copy submitted to the Member Secretary, Tamil Nadu Pollution Control Board, Chennai for favour of kind information.
3. Copy submitted to the JCEE-Monitoring, Tamil Nadu Pollution Control Board, Triuchirappalli for favour of kind information.
4. File

This is computer generated, Signature is not required.



TAMILNADU POLLUTION CONTROL BOARD

RENEWAL OF CONSENT ORDER NO:2409257816355
DATE:29/02/2024



PROCEEDINGS NO.F.0387ARY/RS/DEE/TNPCB/ARY/A/2024 DATED: 29/02/2024

Sub :	Tamil Nadu Pollution Control Board – AUTO RENEWAL OF CONSENT –M/s. PERIYANAGALUR WEST LIMESTONE MINES-THE RAMCO CEMENTS LIMITED , S.F. No. 229/1,267,268/1,269,271, PERIYANAGALUR village, Ariyalur Taluk and Ariyalur District- Renewal of Consent for operation of the plant and discharge of emissions under Section 21 of the Air (Prevention and Control of Pollution) Act, 1981 as amended in 1987 (Central Act 14 of 1981) – Issued – Reg.
Ref :	1.CTO. Procs. No. T2/TNPCB/F.0387ARY/RS/ARY/A/2018 dated 19/02/2018. 2.RCO.Procs.No.F.0387ARY/RS/DEE/TNPCB/ARY/A/2023 Dated: 19/06/2023 3.Unit's application for Auto renewal of consent through online no.57816355 Dated: 24.02.2024. 4.Board Circular Memo No: TNPCB/OCMMS/06517/2019 Dated 08-06-2022

Renewal of Consent is hereby granted under Section 21 of the Air (Prevention and Control of Pollution) Act, 1981 as amended in 1987 (Central Act 14 of 1981) (hereinafter referred to as "The Act") and the rules and orders made there under to

CHAIRMAN & MANAGING DIRECTOR,
M/s . PERIYANAGALUR WEST LIMESTONE MINES-THE RAMCO CEMENTS LIMITED
S.F No. 229/1,267,268/1,269,271,
PERIYANAGALUR Village,
Ariyalur Taluk,
Ariyalur District.

Authorizing the occupier to operate the industrial plant in the Air Pollution Control Area as notified by the Government and to make discharge of emission from the stacks/chimneys.

This is subject to the provisions of the Act, the rules and the orders made there under and the terms and conditions incorporated under the Special and General conditions stipulated in the Consent Order issued earlier and subject to the special conditions annexed.

This RENEWAL OF CONSENT is valid for the period ending - March 31, 2026

M
SENTHILKUMAR

District Environmental Engineer,
Tamil Nadu Pollution Control Board,
ARIYALUR

Digitally signed by M.SENTHILKUMAR
DN: cn=M.SENTHILKUMAR, o=TAMILNADU POLLUTION CONTROL BOARD,
ou=ARIYALUR,
c=IN, email=Senthilkumar@tnpcb.gov.in, postalCode=605002, st=Tamil Nadu,
serialNumber=97280900031396760051D387EED5EE9E4F,
AD1C1D00802845847016525EEF714-M.SENTHILKUMAR
Date: 2024.03.01 16:28:31 +05'30'

SPECIAL CONDITIONS



1. This renewal of consent is valid for operating the facility for the manufacture of products (Col. 2) at the rate (Col. 3) mentioned below. Any change in the products and its quantity has to be brought to the notice of the Board and fresh consent has to be obtained.

Sl.No.	Description	Quantity	Unit
Product Details :-			
1.	Mining of Limestone over an Extent of 17.36.0 Hectares	0.3	Million Tonnes/Annum
By-Product Details :-			
1.	No By-Product	0	-
Intermediate Product Details :-			
1.	No Intermediate Product	0	-

2. This renewal of consent is valid for operating the facility with the below mentioned emission/noise sources along with the control measures and/or stack. Any change in the emission source/control measures/change in stack height has to be brought to the notice of the Board and fresh consent/Amendment has to be obtained

I Point source emission with stack :				
Stack No	Point Emission sources	Air pollution Control measures provided	Stack height from Ground Level in m	Gaseous Discharge in Nm ³ /hr
Nil	Nil	Not Applicable	0	-
II Fugitive/Noise emission :				
Sl.No.	Fugitive or Noise Emission sources	Type of Emission	Control measures provided	Quantity
1.	Drilling operation	Fugitive	Dust Controlled Using Wet Gunny Bags	
2.	Mining Activity	Fugitive	Water Spraying Arrangement using Water Tankers	
3.	Haulage Road	Fugitive	Water Spraying Arrangement using Water Tankers	

Special Additional Conditions-

The unit shall obtain No Objection Certificate (NOC) from the Tamil Nadu Bio Diversity Board /National Bio Diversity Authority if the unit is using any Biological resources or knowledge associated thereto as per the provisions of Biological Diversity Act 2002.

The industries shall take all efforts to use and popularize "Mission LIFE" logo and mascot which is available in TNPCB & MoEFCC website. They shall also request their employees to adopt "Mission LIFE" action points and document the same and furnish half yearly report to Board.

Additional Conditions-

- The unit shall operate and maintain the Air Pollution Control measures efficiently and continuously so as to achieve the Ambient Air Quality / Emission standards prescribed by the Board.
- The unit shall adhere to the ambient Noise level standards prescribed by the Board.
- The unit shall operate the water sprinklers effectively to suppress the dust emission during mining and vehicle movements.
- The haul roads in the mines shall be adequately water sprayed using water tankers at regular intervals.
- The unit shall continue to develop more green belt in and around the premises.
- The unit shall comply with Mines and Minerals (Development and Regulation) Amendment Act 2015.
- The unit shall ensure that transport vehicle shall be leak proof and properly covered with tarpaulin so as to prevent dust from being air borne.
- The unit shall comply with all conditions mentioned in the EC issued by SEIAA vide Lr.Dated:14.11.2016.

POLLUTION PREVENTION PAYS

9.The unit shall not go for expansion activity without obtaining Environmental Clearance for expansion.

M. SURESH KUMAR

District Environmental Engineer,

TAMILNADU POLLUTION CONTROL BOARD,
ARIYALUR

Digitally signed by M SURESH KUMAR
DN: cn=M SURESH KUMAR, o=TAMILNADU POLLUTION CONTROL BOARD, ou=ARIYALUR, email=M.SURESHKUMAR@TAMILNADUPCB.ORG, c=IN
Date: 2018.08.16 10:29:00 +05'30'

To
CHAIRMAN & MANAGING DIRECTOR,
M/s.PERIYANAGALUR WEST LIMESTONE MINES-THE RAMCO CEMENTS LIMITED,
RAMAMANDIRAM,
RAJAPALAYAM,
VIRUDHUNAGAR DISTRICT
Pin: 626117

Copy to:

- 1.The Commissioner, ARIYALUR-Panchayat Union, Ariyalur Taluk, Ariyalur District .
- 2. Copy submitted to the Member Secretary, Tamil Nadu Pollution Control Board, Chennai for favour of kind information.
- 3. Copy submitted to the JCEE-Monitoring, Tamil Nadu Pollution Control Board, Trichirappalli for favour of kind information.
- 4. File

This is computer generated, Signature is not required.



ABSTRACT

Industries - Mines and Minerals - Major Mineral - Mining leases granted to The Ramco Cements Limited (formerly Madras Cements Limited) for Limestone - Over an extent of 35.96.0 hectares of Patta & Government lands in S.F.Nos.51/2, 51/3, 51/4 etc., and over an extent of 17.36.0 hectares of Patta & Government lands in S.F.Nos.267, 268/1 etc., - Periyanaḡalur Village - Ariyalur Taluk & District - Amalgamation of two mining leases under Rule 56 of the Minerals (other than Atomic and Hydrocarbons Energy Minerals) Concession Rules, 2016 - Orders - Issued.

Industries (MMA.2) Department

G.O.(Ms) No. 126

Dated 26.02.2021

சார்வரி வந்தும், மார்சி 14

திருவள்ளூர் ஆண்டு-2052

Read:

1. G.O.(3D)No.2, Industries (MMA.2) Department, dated 13.01.2003.
2. G.O.(Ms)No.153, Industries (MMA.2) Department, dated 23.12.2016.
3. G.O.(Ms) No.77, Industries (MMA.2) Department, dated 26.07.2018.
4. From the District Collector, Ariyalur Letter Rc.No.381/G&M/2017, dated 22.06.2020 and 20.12.2020.
5. From The Ramco Cements Limited, Ariyalur, Letter dated 02.02.2021.
6. From the Director of Geology and Mining, Letter.Ref.2920/MM9/2020 dated 09.02.2021.

ORDER:

In the G.O. 1st read above, orders were issued granting a mining lease to Tvl.Madras Cements Limited over an extent of 36.29.5 hectares of patta and poramboke lands in S.F.Nos.51 etc., of Periyanaḡalur village, Ariyalur Taluk, Perambalur District for a period of 20 years by relaxing of Section 6(1)(c) of Mines and Minerals (Development and Regulation) Act, 1957. However the lease deed had been executed for an reduced actual extent of 35.96.0 Hectares only.

2. In the G.O. 2nd read above, orders were issued granting a mining lease in favour of The Ramco Cements Limited for mining limestone and marl over an extent of 17.36.0 hectares comprising of patta (0.44.5 hectares) lands in S.F.No.229/1 and Government land (16.91.5 hectares) in S.F.Nos.267, 268/1, 269, 271 of Periyanaḡalur village, Ariyalur Taluk and District for a period of 50 years under 8A(2) of the Mines and Minerals (Development & Regulation) Amendment Act, 2015.

3. In the G.O. 3rd read above, the said mining lease had been extended for a period of 50 years as per Section 8A(3) of the Mines and Minerals (Development and Regulation) Act, 2015 and the lease period is valid upto 19.08.2053. The supplementary mining lease deed was executed and registered on 03.07.2019.

4. The Ramco Cements Limited have requested for amalgamation of two mining leases granted to them vide G.O.Ms.No.77, Industries (MMA2) Department, dated 26.07.2018 and G.O.(Ms) No.153 Industries (MMA.2) Department, dated 23.12.2016 in Perlyanagalur Village, Ariyalur Taluk and District for the following reasons:-

- i. Both the above mentioned mining leases are situated adjoining to each other and also forms compact & contiguous in nature.
- ii. Mining Operation is being carried out as per the conditions stipulated in the Mining Lease grant Order and also Mining Lease deed document of Form-K.
- iii. The open cast fully mechanised method of mining is being practiced in the existing mining lease granted area of 36.29.5 Hectares.
- iv. As per the approved mining plan, lease wise mining operation has to be carried out by observing the mining parameters as stipulated in the approved mining plan. Thereby, safety barrier and mining bench parameters to be kept all along the lease boundaries of both the leases to the approximate length of 550 metres. Thereby, substantial quantity of limestone reserves would be unexploited and it would result the formation of long barriers for a length of 550 metres with a depth of 35 metres between the two leases.
- v. In order to carry out systematic and scientific mining operation and also in the mineral conservation point of view, it is proposed to amalgamate both the mining leases. .
- vi. By amalgamation of both the leases, they would get additional reserves of about 1.50 Million tonnes of limestone and resultant exchequer to the State Government by means of royalty, DMF and NMET is about Rs.15.84 Crores.
- vii. They have given an hereby undertaking to accept the terms and conditions of amalgamated leases shall be co-terminus with the lease whose period will expire first, considering the extension of lease period for G.O. (3D)No.2, Industries (MMA.2) Department, dated 13.01.2003 over an extent of 36.29.5 Hectares which is eligible to be extended upto a period ending 19.08.2053.

5. In the letters 4th read above, the District Collector, Ariyalur has recommended and forwarded the proposal to the Government for amalgamating the two mining leases held by The Ramco Cements Limited, totalling over an extent of 53.32.0 hectares as per Rule 56 of the Minerals (Other than Atomic and Hydrocarbons Energy Minerals)

Concession Rules, 2016 subject to the provisions of Acts & Rules and that the lease period of amalgamation of two mining leases shall expire on 19.08.2053.

6. In the letter 6th read above, the Commissioner of Geology and Mining has stated that the representation of The Ramco Cements Limited and the recommendations of the District Collector, Ariyalur along with the connected documents have been examined in accordance with the connected Act and Rules and observed that,

- i. The two mining leases to be amalgamated had been granted by the Government in G.O.Ms.No.77, Industries (MMA2) Department, dated 26.07.2018 and G.O.(Ms)No.153, Industries (MMA.2) Department, dated 23.12.2016.
- ii. The period of the mining lease granted in G.O.Ms.No.77, Industries (MMA2) Department, dated 26.07.2018 is valid upto 19.08.2053 and the period of mining lease granted in G.O.(Ms) No.153, Industries (MMA.2) Department, dated 23.12.2016 is valid upto 09.01.2067.
- iii. Rule 56 of the Minerals (Other than Atomic and Hydrocarbons Energy Minerals) Concession Rules, 2016 stipulates that,

"The State Government may, in the interest of mineral development and with reasons to be recorded in writing, permit amalgamation of two or more adjoining leases held by a lessee:

Provided that the period of amalgamated leases shall be co-terminus with the lease whose period will expire first".
- iv. As per the sketch enclosed by the lessee company, mining operations have been carried out in both the mining leases. The pit and the dump site have been earmarked in the sketches.
- v. The Deputy Director (G&M), Ariyalur has inspected the area on 21.03.2020 and stated that the lessee company is operating the mine as per the approved mining plan for both the leases and a safety barrier have been maintained all along the lease boundaries. Further, the Deputy Director has reported that substantial quantity of limestone reserves remains unexploited between the two leases due to the safety distance being maintained for a length of 550 metres and width of 15 metres. By way of amalgamating the two leases the lessee company could get additional reserves of about 1.5 million tonnes of limestone (for a depth of 35 metres) resulting payment of royalty, DMF and NMET to the State Government.
- vi. The lessee company is carrying out mining operations as per the approved mining plan and necessary safety barrier have been maintained in the two mining leases.
- vii. The District Collector, Ariyalur has reported that, as stated by the Revenue Divisional Officer, both the mining leases granted vide G.O.Ms.No.77, Industries (MMA2) Department, dated 26.07.2018 and G.O.(Ms) No. 153, Industries (MMA.2) Department, dated 23.12.2016 are contiguous to each other and as the surface rights

vests with the lessee company, the said mining leases covering an total extent of 53.32.0 hectares of patta and poromboke lands may be amalgamated.

- viii. The District Collector, Ariyalur in the letter Rc.No.381/G&M/2017, dated 20.12.2020 has further stated that the Assistant Geologist (G&M), Ariyalur inspected the above said mining lease hold areas and submitted an inspection report stating that the lessee company have complied with all the terms and conditions granted in the mining lease in G.O.(3D)No.2, Industries (MMA.2) Department, dated 13.01.2003 and G.O.(Ms)No.153, Industries (MMA.2) Department, dated 23.12.2016.
- ix. As envisaged in the proviso clause of Rule 56 of the Minerals (Other than Atomic and Hydro Carbons Energy Minerals) Concession Rules, 2016, the period of amalgamated leases shall be co-terminus with the lease whose period will expire first and accordingly, the period of one of the mining leases granted vide G.O.(Ms).No.77, Industries (MMA2) Department, dated 26.07.2018 which is expiring first i.e., on 19.08.2053, which shall be taken into consideration for the amalgamation of mining leases.
- x. The lessee company is having valid approved mining plan/scheme of mining for the two mining leases.
- xi. The lessee company is having valid Consent to Operate for both the mining leases obtained from the Tamil Nadu Pollution Control Board.
- xii. The lessee company has remitted the Annual compensation for the two mining leases upto 2020-2021.
- xiii. The lessee company has furnished the Mining Due clearance certificate which is valid upto the year 31.03.2020 for the limestone mining leases held by them in the State.
- xiv. The lessee company has given an undertaking for accepting the terms and conditions of the amalgamated cases that the period of lease shall be co-terminus with the leases whose lease shall expire first.
- xv. The lessee company has obtained Environmental clearance for both the mining leases.
- xvi. The lessee company has obtained permission from the Director of Mines Safety as per Regulation 111(3) of the Metalliferous Mines Regulations, 1961, for carrying out mining operations within the safety distance maintained between the two proposed amalgamation of leases.
- xvii. In order to carry out systematic and scientific mining operation and also in the mineral conservation point and the lessee company would get additional reserves of about 1.50 million tonnes, if the mining leases get amalgamated.
- xviii. The District Collector, Ariyalur has recommended for amalgamation of two mining leases as single lease totalling an extent of 53.32.0 hectares (17.36.0 hectares + 35.96.0 hectares) and the lease period shall expire on 19.08.2053.

- xix. **The Ramco Cements Limited has stated that they have got a mining lease for mining limestone over an extent of 35.96.0 hectares vide G.O.(3D)No.2, Industries (MMA.2) Department, dated 13.01.2003 and another mining lease over an extent of 17.36.0 hectares for mining limestone and Marl vide G.O.(Ms).No. 153, Industries(MMA.2) Department, dated 23.12.2016. Further, they have stated that the existence of mineral marl has not been proved in the detailed exploration conducted by the Department of Geology and Mining. Since both the said mining leases are situated adjacent to each other and form a compact and contiguous block, requested to consider the application for grant of amalgamation of both the mining leases for mining limestone only.**
- xx. **Therefore, as per the request of The Ramco Cements Limited, the amalgamation of both mining leases may be considered restricting for mining the mineral limestone only.**
- xxi. **The amalgamation of leases can be considered as per Rule 56 of the Minerals (Other than Atomic and Hydrocarbons Energy Minerals) Concession Rules, 2016 as it enables the utilization of the additional reserve which is being unexploited between the two leases due to safety distance of 7.5 metres each being maintained between the two leases.**
- xxii. **The additional reserves of 1.5 million tonnes of limestone are to be considered for excavation due to amalgamation of leases. Therefore, the lessee company has to obtain approved modified mining plan for amalgamated leases including the additional reserves and indicating the revised safety distances, to be maintained for the amalgamated lease from IBM.**
- xxiii. **Further, based on the modified mining plan for the amalgamated mining leases, the lessee company has to obtain revised Environment Clearance for amalgamated lease.**

The Director of Geology and Mining has, therefore, recommended for amalgamation of the two mining leases, granted for mining limestone, over an extent of 35.96.0 hectares of Patta and Poromboke lands in S.F.Nos.51/2, 51/3 etc. of Periyangalur Village, Ariyalur Taluk and District vide G.O.Ms.No.77, Industries (MMA2) Department, dated 26.07.2018; and another mining lease granted for mining Limestone and Marl, over an extent of 17.36.0 hectares of Patta and Poromboke lands in S.F.Nos.267, 268/1 etc. of Periyangalur Village, Ariyalur Taluk and District vide G.O.(Ms)No.153, Industries (MMA.2) Department, dated 23.12.2016 totalling over an extent of 53.32.0 hectares (35.96.0 hectares + 17.36.0 hectares) as per Rule 56 of the Minerals (Other than Atomic and Hydrocarbons Energy Minerals) Concession Rules, 2016 for mining Limestone only with the period of such lease expire on 19.08.2053, subject to the following conditions:-

- i. **The lessee company has to execute supplementary lease deed for the amalgamated mining lease with the District Collector, Ariyalur.**

- ii. The lessee company has to submit the approved modified mining plan/scheme from the IBM before executing Supplementary lease deed for amalgamation of the mining leases including additional reserves and indicating the safety distances to be maintained.
- iii. The lessee company has to get Environmental Clearance for the amalgamated mining lease totalling over an extent of 53.32.0 hectares from the competent authority before executing Supplementary lease deed for amalgamation of the mining leases.
- iv. Lessee company has to comply the conditions imposed in G.O.(3D)No.2, Industries (MMA2) Department, dated 13.01.2003, G.O.Ms.No.77, Industries (MMA2) Department, dated 26.07.2018 and G.O.(Ms).No.153, Industries (MMA.2) Department, dated 23.12.2016.
- v. As per Hon'ble Supreme Court order dated 08.01.2020 in W.P.(C) No.144/2014 and subsequent instructions received from Ministry of Mines order dated 14.01.2020 and State Government letter No. 1666/MMD.1/2020-1, dated 03.03.2020 "the mining lease holders shall, after mining operations undertake re-grassing the mining area and any other area which may have been disturbed due to their mining activities and restore the land to a condition which is fit for growth of fodder, flora, fauna, etc.,"

7. The Government have examined the proposal of District Collector, Ariyalur as recommended by Director of Geology and Mining carefully. Accordingly, the Government hereby grant permission under Rule 56 of the Minerals (Other than Atomic and Hydrocarbons Energy Minerals) Concession Rules, 2016, for amalgamating the two mining leases granted to The Ramco Cements Limited, viz., (i) for mining limestone over an extent of 35.96.0 hectares of Patta and Poromboke lands in S.F.Nos.51/2, 51/3 etc. of Periyaganalur Village, Ariyalur Taluk and District, originally granted in G.O.(3D)No.2, Industries (MMA.2) Department, dated 13.01.2003 and subsequently validity extended in G.O.Ms.No.77, Industries (MMA2) Department, dated 26.07.2018, and (ii) another mining lease granted for mining Limestone and Marl, over an extent of 17.36.0 hectares of Patta and Poromboke lands in S.F.Nos.267, 268/1 etc. of Periyaganalur Village, Ariyalur Taluk and District, in G.O.(Ms).No.153, Industries (MMA.2) Department, dated 23.12.2016, totalling over an extent of 53.32.0 hectares (35.96.0 hectares + 17.36.0 hectares) into a single lease for mining limestone only, duly coterminous with the lease period ending on 19.08.2053 subject to the following conditions and the conditions mentioned in the lease deed executed and other general / special conditions if any to be imposed by the competent authority and orders accordingly:-

- i. The lessee company has to execute supplementary lease deed for the amalgamated mining lease with the District Collector, Ariyalur.

- ii. The lessee company has to submit the approved modified mining plan/scheme from the IBM before executing supplementary lease deed for amalgamation of the mining leases including additional reserves and indicating the safety distances to be maintained.
- iii. The lessee company has to get Environmental Clearance for the amalgamated mining lease totalling over an extent of 53.32.0 hectares from the competent authority before executing supplementary lease deed.
- iv. Lessee company has to comply the conditions imposed in G.O.(3D)No.2, Industries (MMA2) Department, dated 13.01.2003, G.O.Ms.No.77, Industries (MMA2) Department, dated 26.07.2018 and G.O.(Ms)No.153, Industries (MMA.2) Department, dated 23.12.2016.

8. The District Collector, Ariyalur is directed to pursue necessary further action.

(BY ORDER OF THE GOVERNOR)

**N. MURUGANANDAM
PRINCIPAL SECRETARY TO GOVERNMENT**

To
The Ramco Cements Limited,
Auras Corporate Centre,
V-Floor, No.98 A,
Dr.Radhakrishnan Road,
Mylapore, Chennai - 600 004.

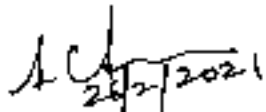
The Commissioner of Geology and Mining,
Guindy, Chennai - 600 032.

The District Collector, Ariyalur,

Regional Controller of Mines,
Indian Bureau of Mines,
Chennai - 600 090.

Copy to
PA to Hon'ble Minister(Law, Courts and Prisons),
Industries (OP.II) Department,
Sf/Sc.

// FORWARDED / BY ORDER //


26/2/2021
SECTION OFFICER
DG
26/2/2021

GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES
OFFICE OF THE REGIONAL CONTROLLER OF MINES

Telephone No.044-24914451/1570
Fax No.044-24911295
Email ID: ro.chennai@ibm.gov.in

C-4-A, Rajaji Bhavan
CGO comple, Besant Nagar
Chennai - 600 050.

No.TN/ALR/LST/MP-2079.MDS

Dated : 23/07/2021

To :

✓ The Ramco Cements Limited
V Floor, Auras Corporate Centre
98-A Dr. Radhakrishnan Road
Mylapore
Chennai - 600 004.

Sub. : Approval of Mining Plan with Progressive Mine Closure Plan for Amalgamated Periyanaagarur Limestone Mine over 53.32.0 hectares in Periyanaagarur Village, Ariyalur Taluk & District of M/s. The Ramco Cements Limited submitted under Rule 15 of MCR, 2016.

Ref. : Your letter no. nil dated 12.07.2021.

Sir,

In exercise of the powers conferred by under Rule 16 of Minerals (Other than Atomic & Hydro Carbon Energy Minerals) Concession Rules, 2016 vide Gazette Notification No. S.O. 1857(E) dated 18.5.2016 issued by the Controller General, Indian Bureau of Mines under F.No. T-43004/CGBM/MM(DR)/2015, I hereby approve the above said Mining Plan for Limestone mineral. This approval is subject to the following conditions:

- 1) That the Mining Plan with Progressive Mine Closure Plan is approved without prejudice to any other law applicable to the mine/area from time to time whether made by the Central Government, State Government or any other authority.
- 2) That this approval of the Mining Plan with Progressive Mine Closure Plan does not in any way imply the approval of the Government in terms of any other provision of the Mines & Mineral (Development & Regulation) Act, 2015 or the Mineral Concession Rules, 2016 or any other law including Forest (Conservation) Act, 1980, Environment Protection Act, 1986 and the rules made there under.
- 3) That this approved Mining Plan with Progressive Mine Closure Plan is approved without prejudice to any other order or direction from any court of competent jurisdiction.
- 4) Provisions of the Mines Act, 1952 and Rules & Regulations made thereunder including submission of notice of opening, appointment of manager and other statutory officials as required by the Mines Act, 1952 shall be complied with.
- 5) The Provisions made under MM(D&R) Act, 2015 (Amended) and Rules made thereunder shall be complied with.
- 6) The contents of circular No. 2/2010 issued by the Chief Controller of Mines, IBM, Nagpur vide his letter No. 11013/3/MP/90-CCOM Vol. VII dated 06.04.2010 shall be complied with.
- 7) The execution of Mining Plan / Modifications to the Approved Mining Plan shall be subjected to vacation of prohibitory orders / notices, if any.
- 8) This approval of Mining operations and associated activities is restricted to the Mining lease area only. The Mining lease area is as shown on the statutory plans under rule 32 of Mineral Conservation and Development Rules, 2017, by the lessee. Indian Bureau of Mines does not take any responsibility regarding correctness of the boundaries of the lease shown on the ground with reference to the lease map and other plans furnished by the lessee.
- 9) The Environmental Monitoring Cell of the Company shall continue monitoring ambient air quality, dust fall rate, water quality, soil sample analysis and noise level measurements on various stations established for the purpose both in the core zone and buffer zone, as per Department of Environment guidelines and keeping in view IBM's Circular No.3/92, season-wise every year or by engaging preferably the services of an Environmental laboratory approved by MOEF/CPCB. The data so generated shall be maintained in a bound paged register kept for the purpose and the same shall be made available to the inspecting officer on demand.

- 10) If anything is found to be concealed as required by the Mines Act in the contents of approved Mining Plan and proposal for rectification has not been made, the approval shall be deemed to have been withdrawn with immediate effect.
- 11) Yearly report as required under Rule 26(2) of MCDR, 2017 setting for the extent of protection and rehabilitation works carried out as envisaged in the approved progressive mine closure plan and if there is any deviations, reasons thereof shall be submitted before 1st July of every year to the regional office, IBM, Chennai.
- 12) The Mining Plan is approved for the proposals contained therein and as applicable from 1.4.2021 for the mining activities to be carried out within the mining leasehold. The earlier instances of irregular mining/illegal mining, if any, shall not be regularized through the approval of this document.
- 13) The financial assurance submitted should be renewed before expiry of the same.
- 14) In case Mining lease falls within a radius of 10 kms. of National Park/Sanctuary, recommendations of NBWL have to be obtained as per the orders of the Hon'ble Supreme Court in I.A. No. 460/2004.
- 15) This approval is subject to the mining operations as per the proposals shall be carried out only after obtaining necessary clearances from MOEF, Pollution Control Board, Forest Department, etc.
- 16) This approval is subject to the conditions as per the directions given in WP(c) No. 114/2014 given by the Hon'ble Supreme Court of India should be taken care while implementing the proposals given in the PMCP part of the document.
- 17) This approval is subject to submission of DGPS Plan duly authenticated by the State Government and submission of Mining Plan if, consequent to the authentication of DGPS Survey Plan, any change in mining lease area is accepted by the State Government.

Encl : Copy of approved Mining Plan with Progressive Mine Closure Plan

Yours faithfully,

(Signature)
23.07.2021
(G.C. Sethi)

Regional Controller of Mines

Copy for information to:-

1. Shri V. Mohan, Qualified Person, The Ramco Cements Ltd., Govindapuram (PO), Sendurai Road, Ariyalur Taluk & District, PIN 621 713.
2. The Commissioner of Geology & Mining, Government of Tamilnadu, Guindy, Chennai - 600 032 along with copy of the approved Mining Plan.

Encl : As above.

(Signature)
(G.C. Sethi)

Regional Controller of Mines

Chapter 1 : General Information

1.1 : Lease Details

IBM Registration Number :	IBM/638/2011
Lease Code :	63646308
Mine Code :	38TMN610002
Name of Lessee :	THE RAMCO CEMENTS LIMITED
Address of Lessee :	5th Floor, Auras Corporate Centre 98A, Dr Radhakrishanan Salai , Mylapore Chennai
Type of Lessee :	Private
Name of Mining Lease :	Amalgamated Periyagalur Limestone Mine 53dot32 Ha
State :	TAMIL NADU
District :	Ariyalur
Tehsil/ Taluk/ Mandal :	Ariyalur
Village :	Periyagalur
Lease Area (Ha) :	53.32
Forest Area (Ha) :	0.0000
Name of Minerals :	LIMESTONE
Name of associated minerals :	

Type :	Existing Lease
Period of the proposal (FY) from :	2025 - 26
Period of the proposal (FY) to :	2029 - 30
Type of working :	Opencast
Nature of Use :	Captive
Category of Mine :	Category A

1.1.1 : Initial/subsequent Lease grant details

Grant	From	To	Lease deed execution date	Lease registration date
Initial Grant	20/08/2023	19/08/2053	03/07/2019	20/08/2023

1.1.2 : Mining Plan Submission Criteria Details

Type of Document :	Review Of Mining Plan Under Rule 17(2) Of MCR, 2016
Reason/s For Modification :	Existing Plan Is Due To Expire On 31.03.2025, Hence Review Of Mining Plan Is Submitted For The Period 2025-26 To 2029-30.
Period for which modification is proposed :	2025-2026 to 2029-2030

1.2 : Land Ownership Details

View Land Ownership Details Excel	Land_Ownership_Details.xlsx
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1.3 : Existing Lease

Date of Execution :	Nil
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ISSUED TO:

TEST REPORT

The Ramco Cement Limited,
Periyannagalur Limestone Mines,
Ariyalur District.

Report Number	: ABCTL/2312/0201/041-049		
Sample Drawn by	: ABC Techno Labs India Private Limited		
Sample Description	: Ambient Air Quality Monitoring - December 2023; Fortnight-2		
Date of Sampling	: 19.12.2023 to 21.12.2023	Date of Completion	: 28.12.2023
Date of Receipt	: 23.12.2023	Report Date	: 07.01.2024
Date of Analysis	: 25.12.2023	Page No	: 1 of 1
Sampling Method	: IS 5102 Part 5 & 14		

Predominant Wind Direction : NNE/NE Weather : Partly Cloudy		Monitored Values during 10:00 hrs - 10:00 hrs:						
Location		Unit	PM2.5	PM10	SO ₂	NO _x	CO	Part. Pb
Protocol			40CFR, Appendix L (Part 50)	IS 5102 Part 22	IS 5102 Part 2	IS 5102 Part 5	IS 5102 Part 19	IS 5102 Part 22
Core Zone :-								
1	Mines Office	ug/m ³	19	34	8	9	BDL*	BDL**
2	Hail Road	ug/m ³	21	41	9	11	BDL*	BDL**
3	Loading Area	ug/m ³	16	28	7	7	BDL*	BDL**
Buffer Zone :-								
1	Kapilankudikkadu	ug/m ³	12	26	8	7	BDL*	BDL**
2	Periyannagalur	ug/m ³	15	32	7	8	BDL*	BDL**
3	Koodipalayam	ug/m ³	21	44	9	11	BDL*	BDL**
4	Puduppalayam	ug/m ³	23	48	10	13	BDL*	BDL**
5	Valajanagaram	ug/m ³	17	38	8	9	BDL*	BDL**
6	Kallankurichi	ug/m ³	14	30	7	9	BDL*	BDL**
1	Ambient Air Quality Status in the Vicinity	ug/m ³	17.6	35.6	7.9	9.3	BDL*	BDL**
II	NAAQ Norms* (8/24-hly)	ug/m ³	60	100	80	80	2000	1.0

Legend : PM2.5-Particulate Matter (dust less than 2.5 µm); PM10- Particulate Matter (dust less than 10 µm); SO₂-Sulphur dioxide (as SO₂); NO_x-Oxides of Nitrogen (as NO₂); CO-Carbon monoxide (as CO) and Part. Pb-Particulate Lead (as Pb); other Parameter values were found to be in Below Detectable Limits and not Reported. * - DL: 1.0mg/m³; ** - DL: 0.1mg/m³ BDL- Below Detection Limit, DL- Detection Limit.

* : NAAQ Norms-National Ambient Air Quality Norms-Revised as per GSR 926(J) dated 16.11.2009 for Industrial, Residential, Rural and other Areas.

-End of Report-

S. Dharani
Quality Manager



A. Robson Chinnadurai
Technical Manager - Lab

Verified by

Authorised Signatory

Terms and conditions:

* The test results are valid to the terms stated. * The test report and test results are valid only if accompanied in full and without the written approval of ABC Techno Labs. * The test report will not be returned for more than 15 days from the date of issue of test report to Non-Perishable samples and in the case of Perishable samples test reports will be retained for 7 days after date of issue of report or as per customer requirement. * The laboratory's responsibility under this report is limited to the test results only and will not include test results for the reasons stated. * The test report is issued for the purpose of identifying the

ISSUED TO:

TEST REPORT

The Ramco Cement Limited,
Periyannagalur Limestone Mines,
Ariyalur District.

Report Number	: ABCTL/Z401/0171/001-009		
Sample Drawn by	: ABC Techno Labs India Private Limited		
Sample Description	: Ambient Air Quality Monitoring - January 2024; Fortnight-2		
Date of Sampling	: 15.01.2024 to 17.01.2024	Date of Completion	: 23.01.2024
Date of Receipt	: 19.01.2024	Report Date	: 05.02.2024
Date of Analysis	: 20.01.2024	Page No	: 1 of 1
Sampling Method	: IS 5182 Part 5 & 14		

Pre-dominant Wind Direction : NNE/E Weather : Clear		Monitored Values during 10:00 hrs-10:00 hrs						
	Location	Unit	PM2.5 40CFR Appendix L (Part 50)	PM10 IS:5182 Part 23	SO ₂ IS:5182 Part 2	NO _x IS:5182 Part 6	CO IS:5182 Part 19	Part. Pb IS:5182 Part 22
Core Zone :-								
1	Mines Office	ug/m ³	25	47	9	11	BDL*	BDL**
2	Haul Road	ug/m ³	29	56	11	14	BDL*	BDL**
3	Loading Area	ug/m ³	31	64	9	11	BDL*	BDL**
Buffer Zone :-								
1	Kopilankudkkada	ug/m ³	15	34	7	8	BDL*	BDL**
2	Periyannagalur	ug/m ³	21	41	8	10	BDL*	BDL**
3	Reddipalayam	ug/m ³	25	48	10	13	BDL*	BDL**
4	Puduppalayam	ug/m ³	28	52	12	15	BDL*	BDL**
5	Valajannagar	ug/m ³	17	37	7	9	BDL*	BDL**
6	Kallankurichi	ug/m ³	23	44	8	9	BDL*	BDL**
I	Ambient Air Quality Status in the Vicinity:	ug/m ³	23.8	47.0	9.0	11.1	BDL*	BDL**
II	NAAQ Norms* (8/24-hly.)	ug/m ³	60	100	80	80	2000	1.0

Legend : PM2.5-Particulate Matter (size less than 2.5 um); PM10- Particulate Matter (size less than 10 um); SO₂- Sulphur dioxide (as SO₂); NO_x-Oxide of Nitrogen (as NO₂); CO-Carbon monoxide (as CO) and Part. Pb-Particulate Lead (as Pb); other Parameter values were found to be in Below Detectable Limits and not Reported. * - DL:1.0mg/m³; ** - DL:0.1mg/m³ BDL-Below Detection Limit, DL- Detection Limit.

* : NAAQ Norms-National Ambient Air Quality Norms-Revised as per GSR 826(E) dated 16.11.2009 for Industrial, Residential, Rural and other Areas.

-End of Report-


S. Dharani
Quality Manager




A. Robson Chinnadurai
Technical Manager - Lab

Verified by:

Authorised Signatory

Terms and conditions :

* The test results are solely for the purpose of the test. The accuracy shall not be guaranteed in full or part without the written approval of ABCTL. * The test results will not be released for more than 10 days from the date of test report for Non-Particulate parameters and in the case of Particulate samples test results will be released for 7 days after date of report month or as per customer requirement. * The laboratory's responsibility ceases if the report is issued to a client with a negative test result and the client is not satisfied with the result. * The test report is issued for the purpose of identifying the parameters and not for legal proceedings. * For more details visit our website: www.abctechnolab.com

ISSUED TO:

TEST REPORT

The Ramco Cement Limited,
Periyannagalur Limestone Mines,
Ariyalur District.

Report Number	: ABC/TL/2402/0206/001-009		
Sample Drawn by	: ABC Techno Labs India Private Limited		
Sample Description	: Ambient Air Quality Monitoring - February 2024; Fortnight-2		
Date of Sampling	: 17.02.2024 to 19.02.2024	Date of Completion	: 24.02.2024
Date of Receipt	: 21.02.2024	Report Date	: 08.03.2024
Date of Analysis	: 22.02.2024	Page No	: 1 of 1
Sampling Method	: IS 5182 Part 5 & 14		

Predominant Wind Direction : NNE/NE Weather : Clear		Monitored Values during 10:00 hrs-10:00 hrs						
	Location	Unit	PM2.5	PM10	SO ₂	NO _x	CO	Part. Pb
i	Protocol	-	49CFR Appendix L (Part 50)	IS:5182 Part 22	IS:5182 Part 2	IS:5182 Part 6	IS:5182 Part 16	IS:5182 Part 22
Core Zone :-								
1	Mines Office	ug/m ³	21	44	8	11	BDL*	BDL**
2	Haul Road	ug/m ³	26	49	10	13	BDL*	BDL**
3	Loading Area	ug/m ³	34	67	9	13	BDL*	BDL**
Buffer Zone :-								
1	Kopilaroondicadu	ug/m ³	15	31	7	7	BDL*	BDL**
2	Periyannagalur	ug/m ³	19	41	8	9	BDL*	BDL**
3	Reddippalayam	ug/m ³	27	54	10	13	BDL*	BDL**
4	Puduppalayam	ug/m ³	29	59	12	16	BDL*	BDL**
5	Valajanagaram	ug/m ³	22	46	8	11	BDL*	BDL**
6	Kallankurichi	ug/m ³	21	44	8	9	BDL*	BDL**
i	Ambient Air Quality Status in the Vicinity	ug/m ³	23.8	47.7	8.9	11.3	BDL*	BDL**
ii	NAAQ Norms* (8/24-hly.)	ug/m ³	60	100	80	80	2000	1.0

Legend : PM2.5-Particulate Matter (size less than 2.5 um); PM10- Particulate Matter (size less than 10 um); SO₂-Sulphur dioxide (as SO₂); NO_x-Oxides of Nitrogen (as NO₂); CO-Carbon monoxide (as CO) and Part. Pb-Particulate Lead (as Pb); other Parameter values were found to be in Below Detectable Limits and not Reported. * - DL: 1.0ug/m³; ** - DL: 0.1ug/m³ BDL- Below Detection Limit, DL- Detection Limit.

* : NAAQ Norms-National Ambient Air Quality Norms Revised as per GSR 825(E) dated 16.11.2009 for Industrial, Residential, Rural and other Areas.

-End of Report-


S. Dharani
Quality Manager




A. Robson Chinnadurai
Technical Manager - Lab

Verified by

Authorised Signatory

Terms and conditions :

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ABC Techno Labs India Private Limited

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ABC TOWER - #400, 13th Street, SIDCO Industrial Estate - North Phase,

Ambattur, Chennai - 600 098, Tamilnadu, INDIA.

Ph : +91-44-2625 7788 / 99, +91 94442 60000 / 99661 87777

Email: lab@abctechnolab.com / Web: www.abctechnolab.com

TEST REPORT

The Ramco Cement Limited,
Periyagalur Limestone Mines,
Ariyalur District.

Report Number	: ABCTL/2401/0227/001		
Sample Drawn by	: ABC Techno Labs India Private Limited		
Sample Description	: Dustfall Rate - Quarter I, 2024		
Date of Sampling	: 01.01.2024 to 30.01.2024	Date of Completion	: 03.02.2024
Date of Receipt	: 31.01.2024	Report Date	: 05.02.2024
Date of Analysis	: 01.02.2024	Page No	: 1 of 1
Sampling Method	: IS 5182 Part 1		

Sl. No.	Parameter	Mines Manager Office
1	Retained Water, l	42
2	Regulated Water, l	Nil
3	pH	7.56
4	Total Undissolved Matter, mg	407
5	Total Dissolved Matter, mg	74
6	Total Solids, mg	481
7	Ash, mg	91
8	Lead (as Pb), ppm	<0.005
9	Mercury (as Hg), ppm	<0.005
10	Cadmium (as Cd), ppm	<0.005
11	Dustfall Rate, g/m ² /day	0.2124
12	Dustfall Rate, MT/km ² /month	6.37

-End of Report-

S. A. S. 15/02/24
S. Dharani
Quality Manager



A. Robson Chinnadurai
Technical Manager - Lab

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ISSUED TO:

TEST REPORT

The Ramco Cement Limited,
Periyannagar Limestone Mines,
Ariyalur District.

Report Number	: ABCTL/2401/0167/012
Sample Drawn by	: ABC Techno Labs India Private Limited
Sample Description	: Noise Levels - Quarter 1, 2024
Date of Sampling	: 16.01.2024 to 17.01.2024
Date of Receipt	: 18.01.2024
Report Date	: 05.02.2024

Page 1 of 1

Sl. No.	Location	Noise Levels, dB(A)					
		Day Time (06:00-22:00 hrs.)			Night Time (22:00-06:00 hrs.)		
		Lmin.	Lmax.	Leq	Lmin.	Lmax.	Leq
1	Quarry Edge	32.5	85.9	45.9	32.8	83.5	42.1
2	Loading Area	35.2	88.7	51.6	33.2	82.4	40.9
3	Haul Road	38.8	88.2	48.9	32.5	82.9	42.6
4	PNR Crusher	32.5	83.6	45.2	31.3	80.4	38.8
Statutory Norm* for 8 hrs. Exposure				85			85
Buffer Zone :							
5	Periyannagar	32.7	85.1	43.1	30.8	77.9	36.9
6	V Kalkatti	34.4	89.2	49.3	33.7	84.8	42.4
7	Kuttapinacchiyam	32.3	83.1	42.8	30.4	76.7	36.2
MoEF Norms**				55			45

Sampling & Test Method: IS: 9989-1981(Reaff: 2014)

* - MoEF&CC Norms Ministry of Environment, Forests & Climate Change Ambient Noise Norms (Leq) for Residential Areas.

Day time is reckoned in between 6 a.m and 10 p.m. and Night time is reckoned in between 10 p.m. and 6 a.m.

** - A warning limit value of 85 dB(A) may be set as the level below which very little risk to unprotected ear of hearing impairment exists for an eight hour exposure.

.....End of Report.....

S. A. S. 12/24

S. Dharani
Quality Manager



A. Robson Chinnadural

A. Robson Chinnadural
Technical Manager - Lab

Verified by

Authorised Signatory

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ABC Techno Labs India Private Limited

ISSUED TO:

TEST REPORT

The Ramco Cement Limited,
Periyanaalur Limestone Mines,
Ariyalur District.

Report Number	: ABCTL/2401/0044/001-003		
Sample Drawn by	: ABC Techno Labs India Private Limited		
Sample Description	: Surface Water Quality -Quarter 1, 2024 (In compliance with IBM Circular No. 3/92)		
Date of Sampling	: 09.01.2024	Date of Completion	: 24.01.2024
Date of Receipt	: 10.01.2024	Report Date	: 05.02.2024
Date of Analysis	: 11.01.2024	Page No	: 1 of 2

Sl. No.	Parameters	IS:3825 Parts	Unit	Uppu Oifas	Kallar River	Mandaiyar River	CPCB Norms*
1	pH	11	-	7.47	7.43	7.61	6.5-8.5
2	Colour	4	Hazen Units	BDL(DL:1.0)	BDL(DL:5.0)	BDL(DL:5.0)	10-30
3	Temperature	9	°C	26.8	26.6	27.1	-
4	Turbidity	10	NTU	1.2	1.5	1.8	-
5	Residual Chlorine	26	mg/l	BDL(DL:1.0)	BDL(DL:1.0)	BDL(DL:1.0)	-
6	Dissolved Oxygen	38	mg/l	5.3	5.8	5.4	4.0-6.0
7	Total Suspended Solids	17	mg/l	24	29	36	-
8	Electrical Conductivity	14	umhos/cm	588	638	700	-
9	Total Dissolved Solids	16	mg/l	378	400	440	500-2100
10	Total Hardness (as CaCO ₃)	21	mg/l	166	178	198	-
11	Calcium Hardness (as CaCO ₃)	21	mg/l	90	90	100	-
12	Magnesium Hardness (as CaCO ₃)	21	mg/l	70	88	90	-
13	Calcium (as Ca)	40	mg/l	36	36	40	-
14	Magnesium (as Mg)	46	mg/l	17	19	22	-
15	Sodium (as Na)	45	mg/l	39	45	49	-
16	Potassium (as K)	45	mg/l	3	3	6	-
17	Chlorides (as Cl)	32	mg/l	110	119	123	250-600
18	Sulphates (as SO ₄)	24	mg/l	23	27	32	400-1000
19	Total Alkalinity (as CaCO ₃)	23	mg/l	78	80	100	-
20	BOD-3 days @ 27 °C	44	mg/l	BDL(DL:2.0)	BDL(DL:2.0)	BDL(DL:2.0)	<3
21	COD	58	mg/l	8	11	13	-
22	Iron (as Fe)	53	mg/l	0.09	0.11	0.09	0.3-5.0
23	Fluorides (as F)	60	mg/l	0.16	0.21	0.18	1.5
24	Nitrates (as NO ₃)	34	mg/l	0.12	0.16	0.15	20-50
25	Phosphates (as PO ₄)	31	mg/l	<0.01	<0.01	<0.01	-

Contd..

S. A. S. 12/24
S. Dharani
Quality Manager



J. A. S.
A. Robsen Chinnadurai
Technical Manager - Lab

Verified by

Authorized Signatory

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TEST REPORT

The Ramco Cement Limited,
Periyannagar Limestone Mines,
Ariyalur District.

Report Number	: ABCTL/2401/0044/001-003		
Sample Drawn by	: ABC Techno Labs India Private Limited		
Sample Description	: Surface Water Quality - Quarter 1, 2024. (In compliance with IBM Circular No. 2/92)		
Date of Sampling	: 09.01.2024	Date of Completion	: 24.01.2024
Date of Receipt	: 10.01.2024	Report Date	: 05.02.2024
Date of Analysis	: 11.01.2024	Page No.	: 1 of 1

Sl. No.	Parameters	IS:3025 Parts	Unit	Uppu Odai	Kallar River	Marudaiyar River	CPCB Norms*
1	Oil & Grease	39	mg/l	BDL(DL:1.0)	BDL(DL:1.0)	BDL(DL:1.0)	-
2	Pesticides (as Malathion)	ABCTL/INS/ SOP-019	mg/l	<0.01	<0.01	<0.01	-
3	Percent Sodium	IS:2488:PS	%	34.1	35.7	35.0	-

* : CPCB Norms-Central Pollution Control Board Norms for Surface Waters/IS 3025:1982 Tolerance Limits for Inland Surface Waters
- : different units - : Not included/Not available

-----End of Report-----


S. Dharani
Quality Manager




A. Robson Chinnadurai
Technical Manager - Lab

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ABC Techno Labs India Private Limited

ABC TOWER #400, 131th Street, SIDCO Industrial Estate - North Phase,
Ambattur, Chennai - 600 098, Tamilnadu, INDIA.
Ph: +91-44-2625 7788 / 99, +91 94442 60000 / 95651 87777
Email: lab@abctechnolab.com / Web: www.abctechnolab.com



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ISSUED TO:

TEST REPORT

The Ramco Cement Limited,
Periyangalur Limestone Mines,
Ariyalur District.

Report Number	ABCTL/2401/0044/004-007		
Sample Drawn by	ABC Techno Labs India Private Limited		
Sample Description	Ground Water Quality - Quarter 1, 2024 - (In compliance with IBM Circular No. 3/92)		
Date of Sampling	09.01.2024	Date of Completion	24.01.2024
Date of Receipt	10.01.2024	Report Date	05.02.2024
Date of Analysis	11.01.2024	Page No	2 of 2

Sl. No.	Parameters	IS:3025 Parts	Unit	Borewell, PNR Mines	Borewell, Periyangalur	Borewell, Roudipalayam	Borewell, Kallanurichi	IS:10500* Norms
26	Cyanides (as CN)	27	mg/l	NDL(0L/0.02)	NDL(0L/0.02)	NDL(0L/0.02)	NDL(0L/0.02)	0.05
27	Phenols (as C ₆ H ₅ OH)	43	mg/l	NDL(0L/0.00)	NDL(0L/0.00)	NDL(0L/0.00)	NDL(0L/0.00)	0.01/0.002
28	Manganese (as Mn)	59	mg/l	<0.01	<0.01	<0.01	<0.01	0.1/0.3
29	Chromium (as Cr)	52	mg/l	<0.01	<0.01	<0.01	<0.01	0.05
30	Copper (as Cu)	42	mg/l	<0.01	<0.01	<0.01	<0.01	0.05/1.5
31	Selenium (as Se)	56	mg/l	<0.01	<0.01	<0.01	<0.01	0.01
32	Aluminium (as Al)	55	mg/l	<0.01	<0.01	<0.01	<0.01	0.03/0.2
33	Cadmium (as Cd)	41	mg/l	<0.01	<0.01	<0.01	<0.01	0.003
34	Arsenic (as As)	37	mg/l	<0.01	<0.01	<0.01	<0.01	0.01/0.05
35	Boron (as B)	57	mg/l	<0.01	<0.01	<0.01	<0.01	0.5/1.0
36	Mercury (as Hg)	48	mg/l	<0.001	<0.001	<0.001	<0.001	0.001
37	Lead (as Pb)	47	mg/l	<0.01	<0.01	<0.01	<0.01	0.01
38	Zinc (as Zn)	49	mg/l	<0.01	<0.01	<0.01	<0.01	5/15
39	Total coliforms	IS:1622	MPN/100 ml	<2	<2	<2	<2	Absent
40	Faecal coliforms	IS:1622	MPN/100 ml	<2	<2	<2	<2	Absent
41	E. coli	IS:1622	MPN/100 ml	<2	<2	<2	<2	Absent

* IS:10500:2012 Drinking Water Standards, # : Requirement/Permissible Limit in the absence of alternate source.
Note: <2 can be taken as Absent

.....End of Report.....

S. Dharani
Quality Manager



Dr. M Krishna Moorthy
Head - Microbiology

A. Robson Chinnadurai
Technical Manager - Lab

Verified by

Authorized Signatory

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ABC Techno Labs India Private Limited

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TEST REPORT

The Ramco Cement Limited,
Periyanaalur Limestone Mines,
Ariyalur District.

Report Number	: ABCTL/2401/0044/004-007		
Sample Drawn by	: ABC Techno Labs India Private Limited		
Sample Description	: Ground Water Quality - Quarries, 2024 - (In compliance with IBM Circular No. 3/92)		
Date of Sampling	: 09.01.2024	Date of Completion	: 24.01.2024
Date of Receipt	: 10.01.2024	Report Date	: 05.02.2024
Date of Analysis	: 11.01.2024	Page No	: 1 of 1

Sl. No.	Parameters	IS:3025 Parts	Unit	Borewell, PNE Mines	Borewell, Periyanaalur	Borewell, Reddy-palayam	Borewell, Kallan-kuruchi	IS:10500* Norms
1	Oil & Grease	39	mg/l	RDL(DL:1.0)	RDL(DL:1.0)	RDL(DL:1.0)	RDL(DL:1.0)	-
2	Pesticides (as Malathion)	ABCTL/INS /SOP-019	mg/l	<0.01	<0.01	<0.01	<0.01	Abs./0.001
3	Percent Sodium	IS:2488-P5	%	28.1	27.6	27.6	24.9	-

* IS 10500:2012 Drinking Water Standard; # - Requirement/Permissible Limit in the absence of alternate source.

Note: <2 can be taken as Absent.

.....End of Report.....

S. Dharani
Quality Manager



A. Robson Chinnadurai
Technical Manager - Lab

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TEST REPORT

The Ramco Cement Limited,
Periyanaalur Limestone Mines,
Ariyalur District.

Report Number	: ABCTL/2401/0044/008
Sample Drawn by	: ABC Techno Labs India Private Limited
Sample Description	: Ground Water Levels - Quarter I, 2024
Date of Sampling	: 09.01.2024
Date of Receipt	: 10.01.2024
Report Date	: 05.02.2024

Page 1 of 1

Sl. No.	Description	Water Level Monitored at (bgl*)		
		Borewell, Periyanaalur	Borewell, PNI Mine Area	Borewell, Kattupirangiyam
i.	Monitoring Well Code	GW1	GW2	GW3
ii.	Well Depth, m	65	90	70
1.	Quarter I/2023 (08.02.2023)	9.3	14.8	7.9
2.	Quarter II/2023 (09.06.2023)	10.7	16.3	9.2
3.	Quarter III/2023 (18.08.2023)	11.9	17.4	9.8
4.	Quarter IV/2023 (06.11.2023)	9.4	15.3	7.7
5.	Quarter I/2024 (09.01.2024)	7.9	12.8	6.4

* bgl : below ground level.

.....End of Report.....

S. A. S. P.
S. Dharani
Quality Manager



A. Robson Chinnadurai
Technical Manager - Lab

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TEST REPORT

The Ramco Cement Limited,
Periyamagalur Limestone Mines,
Ariyalur District.

Report Number	ABCTL/2401/0044/009-010		
Sample Drawn by	ABC Techno Labs India Private Limited.		
Sample Description	Soil Quality - Quarter 1, 2024 - (In compliance with ISM Circular No. 3/92)		
Date of Sampling	09.01.2024	Date of Completion	24.01.2024
Date of Receipt	10.01.2024	Report Date	05.02.2024
Date of Analysis	11.01.2024	Page No	1 of 1

Sr. No.	Parameters	Protocol (IS)	Unit	Green Belt, PNR Office	OR Dump	Desirable Range*
1	Grain Size Distribution : I. Sand	2720-Part-4	%	32.7	31.9	-
2	Silt	2720-Part-4	%	60.9	63.4	-
3	Clay	2720-Part-4	%	3.4	4.7	-
4	Textural Class	2720-Part-4	-	Silty loam	Silty loam	Loam
5	Field Capacity	14765	%	21.7	20.3	-
6	Wilting Coefficient	14765	%	0.4	0.0	>0.4

* - Desirable Range for High Production Soil.

.....End of Report.....

S. A. S. 2/24
S. Dharani
Quality Manager



A. Robson Chinnadurai
Technical Manager - Lab

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Design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited for an extent of Amalgamated Periyagalur Limestone Mine over an extent of 53.32.0 Hectares In Periyagalur Village, Ariyalur Taluk & District, Tamilnadu

Overview of Amalgamated Periyagalur Mine



Measurement of SH-139 road width of 7m in the south side



REPORT SUBMITTED

By

Dr. T. Subramani, Professor and Head
Mr. D. Edwin David Raj, Assistant Professor
Dr. E. Kumar, Teaching Fellow



DEPARTMENT OF MINING ENGINEERING
COLLEGE OF ENGINEERING, GUINDY
ANNA UNIVERSITY, CHENNAI 600025

October 2023

**Design of safety barrier at Amalgamated Periyagalur Limestone Mines of
M/s. Ramco Cements Limited for an extent of Amalgamated Periyagalur
Limestone Mine over an extent of 53.32.0 Hectares In Periyagalur Village,
Ariyalur Taluk & District, Tamilnadu**

To



REPORT SUBMITTED

By

**Dr. T. Subramani, Professor and Head
Mr. D. Edwin David Raj, Assistant Professor
Dr. E. Kumar, Teaching Fellow**



**DEPARTMENT OF MINING ENGINEERING
COLLEGE OF ENGINEERING, GUINDY
ANNA UNIVERSITY, CHENNAI 600025**

October 2023

CERTIFICATION

Certified that this project report titled "**Design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited for an extent of Amalgamated Periyagalur Limestone Mine over an extent of 53.32.0 Hectares In Periyagalur Village, Ariyalur Taluk & District, Tamilnadu**" is the bonafide work of Department of Mining Engineering, Anna University carried out under my supervision. I hereby affirm, to the best of knowledge and belief, based on the inspections, observations, field testing and upon the model developed, that this **Design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited for an extent of Amalgamated Periyagalur Limestone Mine over an extent of 53.32.0 Hectares In Periyagalur Village, Ariyalur Taluk & District, Tamilnadu** is completed and operable. The project was completed in accordance with the statutory requirements of act, regulations made thereunder and other provisions as recommended by the regulatory body (DGMS).

(E. Kumar)

Co-Consultant

(T. Subramani)

Co-Consultant

(D. Edwin David Raj)

Consultant

Sl. NO	NAME OF THE CONTENT	PAGE NO
1.0	INTRODUCTION	1
2.0	SCOPE AND OBJECTIVES	2
3.0	COMPANY DETAILS	3
3.1	Mine Location	4
3.2	General Geology	10
3.3	Local Geology	13
	3.3.1 Climatic Conditions	13
	3.3.2 Rainfall	14
3.4	Method of Mining	14
3.5	Deployed Mining Equipment	15
4.0	STATUTORY PROVISIONS FOR SAFETY BARRIER	15
	4.1 General restrictions in respect of quarrying operations	15
5.0	ROADWAYS AND HABITANTS	18
6.0	CONCLUSIONS	18

LIST OF FIGURES

FIGURE NO	NAME OF THE FIGURE	PAGE NO
1	Lease boundary of Amalgamated Periyagalur Mine	4
2	Overview of Amalgamated Periyagalur Mine	5
3	Measurement of SH-139 road width of 7m in the south side	5
4	Measurement of road width including shoulder and drainage of SH 139 road	5
5	Safety distance of 7.5m is maintained in the Northwest side of the proposed mine with adjacent working mine	6
6	Safety distance of 7.5m is maintained in the North side of the proposed mine in common boundary with adjacent working mine	6
7	Boundary pillar No. 49 is established in the common boundary with adjacent working mine	6
8	Safety bund of 2.5m height is maintained in the South side of the proposed mine from the SH-139 road in the lease boundary area	7
9	Measurement of boundary pillar at the distance of 7m in the Southeast side of the proposed mine from the SH-139 roadway	7
10	Trench is established in the South and East side of the proposed mine which could damp the dynamic wave propagation from the mining operations	8

11	Demarcation of safety barrier distance at 50m in the East side of the proposed mine from the SH-139 roadway	8
12	Measurement of safety barrier distance in the West side of the proposed mine	9
13	Wire fencing is established in the South side of the proposed mine from the SH-139 roadway at the distance of 5m from the lease boundary pillar (No.33)	9
14	Electrical sub-station is installed in the West side of the proposed mine	10
15	Measurement of wire fencing distance from the lease boundary pillar	10
16	Surface plan of Amalgamated Periyagalur Limestone Mines	11
17	Method of working	14

LIST OF TABLES

TABLE NO	NAME OF THE TABLE	PAGE NO
1.0	The stratigraphic succession for the cretaceous basin of Tiruchirapalli	12
2.0	Average Thickness of the lithounits	13
3.0.	List of earth-moving equipment in Periyagalur Limestone mine	15

1.0 INTRODUCTION

The mining industry has long been recognized as an essential contributor to economic growth and development, providing valuable resources critical to various sectors. Amidst its undeniable importance, it is equally essential to acknowledge the inherent risks and safety concerns that accompany mining operations. Ensuring the safety of both mining personnel and the surrounding community is paramount, and it necessitates meticulous planning, design, and implementation of safety measures. Amalgamated Periyagalur Limestone Mines, situated in proximity to State Highway 139 and village roads, is emblematic of the industry's safety challenges.

Safety barriers are a fundamental component of mitigating hazards associated with mining activities. They serve as a protective shield, demarcating the boundaries of mining operations and restricting unauthorized access. Beyond merely delineating areas of potential danger, safety barriers are essential for safeguarding against accidents, falls, and unintended entry into high-risk zones. In the context of Amalgamated Periyagalur Limestone Mines, where Heavy Earth Moving Machinery (HEMM) operates alongside critical transportation routes, a meticulously designed safety barrier holds the key to averting catastrophic incidents and ensuring the well-being of all stakeholders. The determination of a suitable safety distance from the mining site to the adjacent State Highway 139 is equally pivotal. This distance encompasses a zone of safety that acts as a buffer, shielding the highway from potential hazards emanating from mining operations. It is not merely a numerical value but rather a critical parameter that encompasses geological considerations, safety measures, and regulatory compliance. An accurate assessment of this safety distance is imperative to prevent accidents, road damage, and disruptions to traffic flow.

The management of **M/s. Ramco Cements, Ariyalur** has requested the Department of Mining Engineering, Anna University, Chennai to carryout scientific study on Design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited, Ariyalur District, Tamil Nadu.

The scope of this work is multifaceted and comprehensive, encompassing a range of critical aspects related to the design of safety measures for Amalgamated Periyagalur Limestone Mines,

Design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited for an extent of Amalgamated Periyagalur Limestone Mine over an extent of 53.32.0 Hectares In Periyagalur Village, Ariyalur Taluk & District, Tamilnadu

specifically concerning its proximity to State Highway 139. The primary objectives include conducting site investigations to assess geological conditions, analyzing the mining methodology and proposed production rates, and evaluating the level of mechanization, including the types of Heavy Earth Moving Machinery (HEMM) employed. Furthermore, this study will scrutinize the condition of village roads and State Highway 139 in the vicinity of the mining site. It aims to determine the appropriate safety measures and design parameters for a safety barrier that will ensure the protection of both roadways and the environment. An integral part of the scope involves calculating the requisite safety barrier distance from State Highway 139, employing a method that takes into account geological factors and safety measures.

2.0 SCOPE AND OBJECTIVES

Based on the guidelines of regulations of MMR, DGMS technical procedure, the following scope and objectives for the proposed scientific study adopted in order to design the safety barrier. The main focuses of the study are:

- To enhance safety for mining personnel, nearby habitants, and commuters on State Highway 139.
- To prevent unauthorized access to hazardous mining areas and reduce the risk of accidents, falls, and entry into high-risk zones.
- To ensure regulatory compliance with all relevant safety and environmental standards and statutory provisions.
- To safeguard the integrity of nearby village roads and State Highway 139 from potential mining-related hazards.
- To design a structurally stable safety barrier that can withstand various geological conditions.
- To calculate the optimal safety barrier distance, considering geological factors, safety measures, and regulatory requirements.

Design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited for an extent of Amalgamated Periyagalur Limestone Mine over an extent of 53.32.0 Hectares In Periyagalur Village, Ariyalur Taluk & District, Tamilnadu

- To provide cost estimates for the implementation of the safety barrier and associated safety enhancements.
- To present recommendations for the safe and efficient operation of Amalgamated Periyagalur Limestone Mines while prioritizing the welfare of all stakeholders.

3.0 COMPANY DETAILS

The Ramco Cements Limited (formerly Madras Cements Ltd) is the flagship company of the Ramco Group, a business group based in Chennai, South India. M/s. The Ramco Cements Limited (RCL) is one of the reputed Cement Companies in India. The cement production of RCL is about 16.50 million tons per annum (MTPA) from their cement plants in South India

The Ramco Cements Limited (RCL) is producing Ordinary Portland Cement (OPC), Portland Pozzolana Cement (PPC) and Slag Cement (PSC). The cement produced by RCL is marketed in the brand name of 'RAMCO'. The brand name RAMCO SUPER GRADE is very popular PPC and RAMCO SUPER STEEL is the slag cement brand. The market centres are mainly in Tamil Nadu, Andhra Pradesh, Kerala, Karnataka, Odisha and West Bengal States. RCL, which has always been striving for Total Quality, possesses International Certificate ISO:9001, ISO:14001, ISO:18001 and IS/ISO:50001. The company has achieved various awards for 'Best Performance' in the Cement Industry and also Green Rating Project Awards 4 Leaves from Centre for Science and Environment for the year 2005.

The Ramco Cements Limited is managed by a Board of Directors comprising of eminent personalities as its members. Under the dynamic leadership of Late Shri. P. R. Ramasubrahmaneya Rajha, the company has grown into a massive organization. Shri. P. R. Venketrama Raja is the Chairman & Managing Director of the Board. Shri. A. V. Dharmakrishnan, Chief Executive Officer (CEO) is heading the Cement Division. RCL has the well laid down Safety, Health and Environmental Policy approved by its Board of Directors. Each Unit of RCL is having the Unit Head under whom the Environmental Management Plan (EMP) Cell and Corporate Social Responsibility (CSR) Committee are functioning. The Units are having their Integrated Management System (IMS) Policy.

Design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited for an extent of Amalgamated Periyagalur Limestone Mine over an extent of 53.32.0 Hectares In Periyagalur Village, Ariyalur Taluk & District, Tamilnadu

3.1 MINE LOCATION

Amalgamated Periyagalur Mine of M/s. The Ramco Cements Limited is located in Periyagalur Village, Ariyalur Taluk & District, Tamilnadu for an extent of 35.96.0Ha under the G.O.(3D)No2. & 13.1.03 & G.O (Ms) No.77 & 26.07.2018 and 17.36.0.0Ha under the G.O.(Ms) No. 153 & 23.12.2016. The latitude and longitude of the mine are lying between 11°07'30.3" N and 79°08'46.1" E to 11°07'29.4" N to 79°08'44.9" E. A state Highway No.139 running Ariyalur - Muttuvancheri situated on the southern side of the mining lease Area. Amalgamated Periyagalur limestone mine is located 9 km from District Head Quarter Ariyalur by road and the mine falls in Survey of India (Restricted) Topo sheet No 58 M/4. Figure 1 and 2 shows the lease boundary and overview of Periyagalur Limestone Mine. Figure 3-15 shows the field investigations of the proposed mine.



Figure 1. Lease boundary of Amalgamated Periyagalur Mine

Design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited for an extent of Amalgamated Periyagalur Limestone Mine over an extent of 53.32.0 Hectares In Periyagalur Village, Ariyalur Taluk & District, Tamilnadu

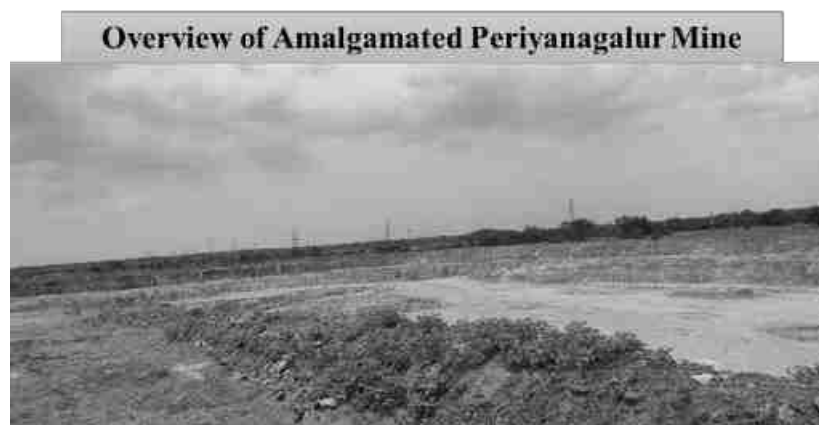


Figure 2. Overview of Amalgamated Periyagalur Mine



Figure 3. Measurement of SH-139 road width of 7m in the south side



Figure 4. Measurement of road width including shoulder and drainage of SH 139 road

Design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited for an extent of Amalgamated Periyagalur Limestone Mine over an extent of 53.32.0 Hectares In Periyagalur Village, Ariyalur Taluk & District, Tamilnadu

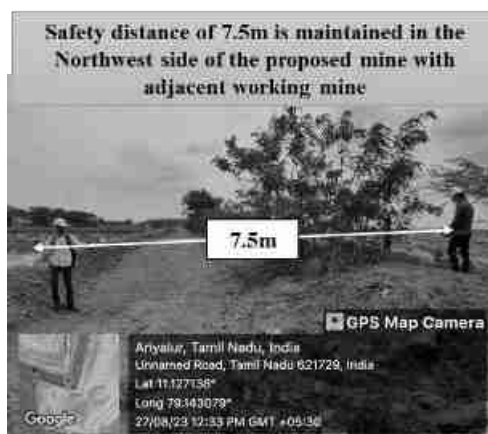


Figure 5. Safety distance of 7.5m is maintained in the Northwest side of the proposed mine with adjacent working mine

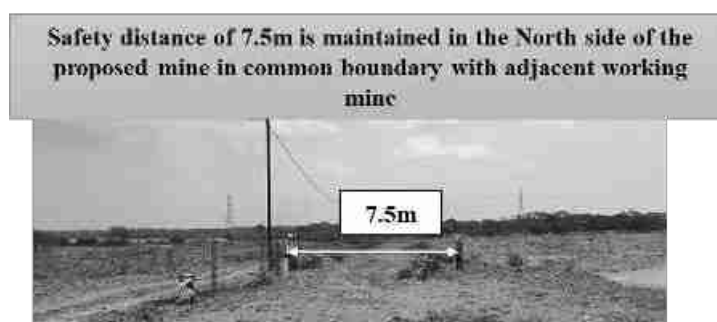


Figure 6. Safety distance of 7.5m is maintained in the North side of the proposed mine in common boundary with adjacent working mine

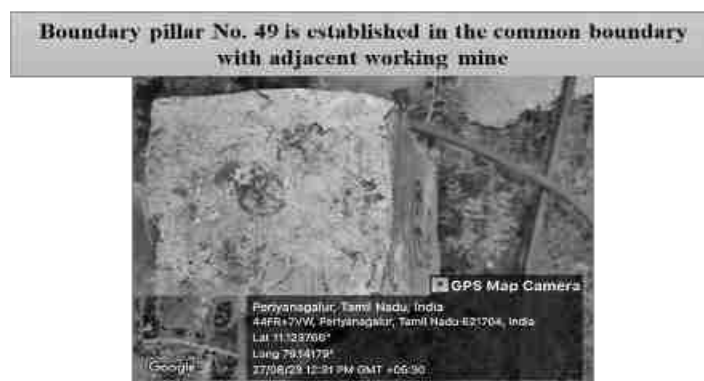


Figure 7. Boundary pillar No. 49 is established in the common boundary with adjacent working mine

Design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited for an extent of Amalgamated Periyagalur Limestone Mine over an extent of 53.32.0 Hectares In Periyagalur Village, Ariyalur Taluk & District, Tamilnadu



Figure 8. Safety bund of 2.5m height is maintained in the South side of the proposed mine from the SH-139 road in the lease boundary area

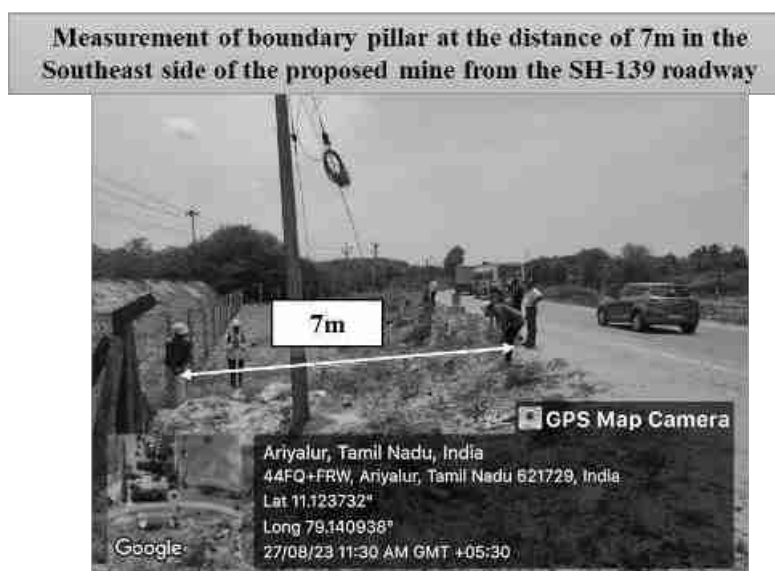


Figure 9. Measurement of boundary pillar at the distance of 7m in the Southeast side of the proposed mine from the SH-139 roadway

Design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited for an extent of Amalgamated Periyagalur Limestone Mine over an extent of 53.32.0 Hectares In Periyagalur Village, Ariyalur Taluk & District, Tamilnadu

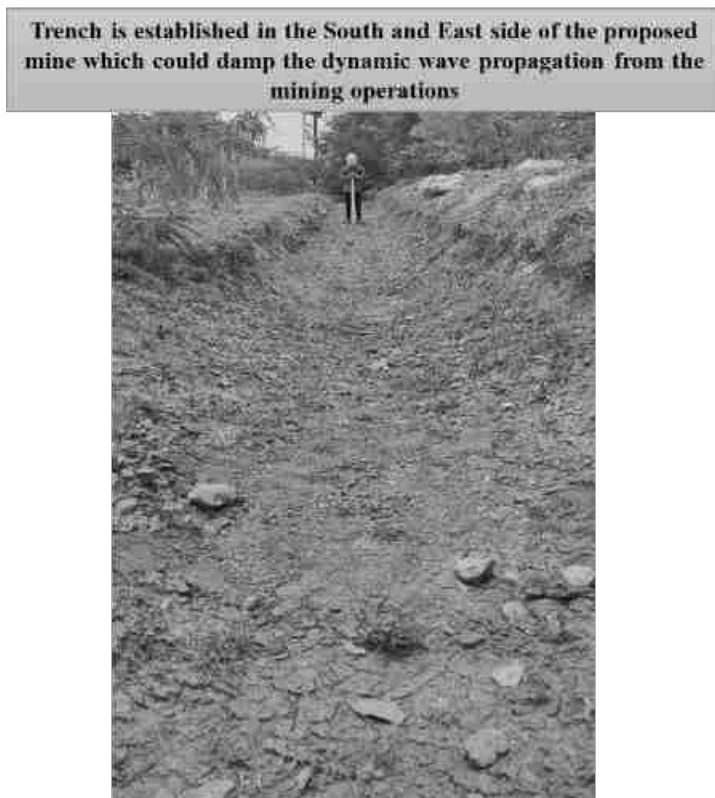


Figure 10. Trench is established in the South and East side of the proposed mine which could damp the dynamic wave propagation from the mining operations

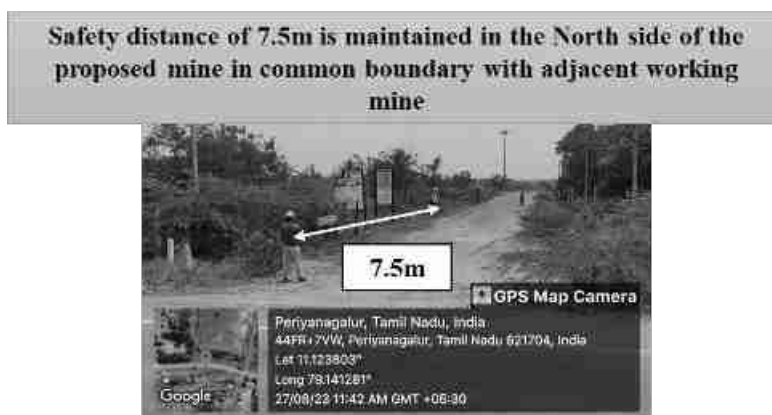


Figure 11. Demarcation of safety barrier distance at 50m in the East side of the proposed mine from the SH-139 roadway

Design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited for an extent of Amalgamated Periyagalur Limestone Mine over an extent of 53.32.0 Hectares In Periyagalur Village, Ariyalur Taluk & District, Tamilnadu

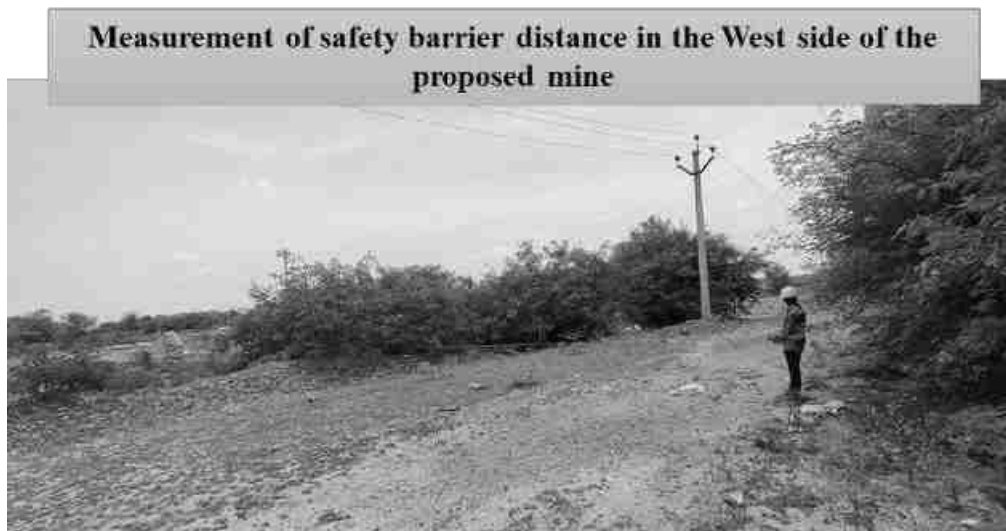


Figure 12. Measurement of safety barrier distance in the West side of the proposed mine

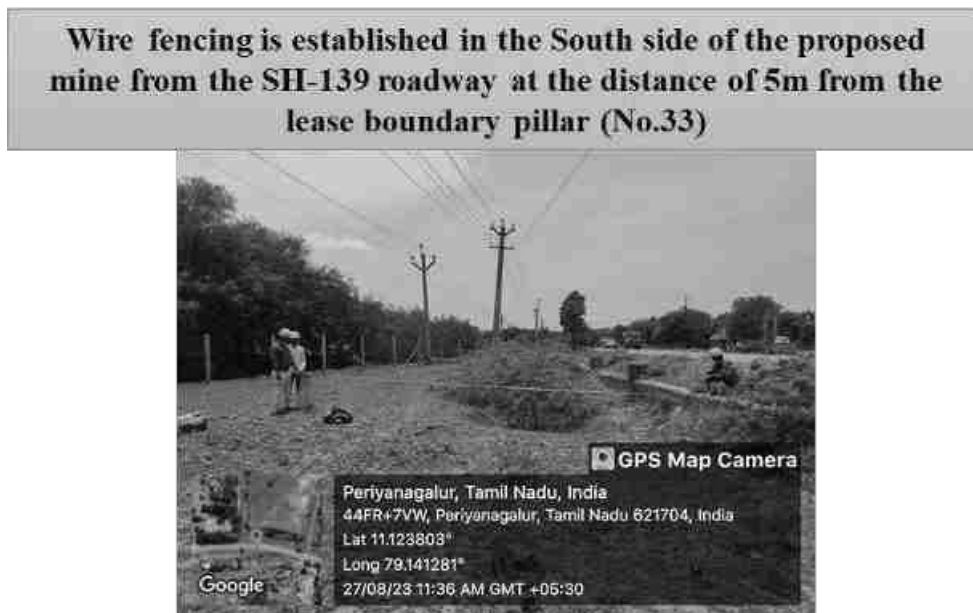


Figure 13. Wire fencing is established in the South side of the proposed mine from the SH-139 roadway at the distance of 5m from the lease boundary pillar (No.33)

Design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited for an extent of Amalgamated Periyagalur Limestone Mine over an extent of 53.32.0 Hectares In Periyagalur Village, Ariyalur Taluk & District, Tamilnadu

Electrical sub-station is installed in the West side of the proposed mine



Figure 14. Electrical sub-station is installed in the West side of the proposed mine

Measurement of wire fencing distance from the lease boundary pillar



Figure 15. Measurement of wire fencing distance from the lease boundary pillar

3.2 GENERAL GEOLOGY

The limestone deposit of the study area forms a part of Kallankurichi limestone formations of Middle Ariyalur stage of Cretaceous beds in South India. In the Cauvery basin carbonate rock form a sizable part of the stratigraphic column from the Lower Cretaceous to Recent. These deposits are geologically called the Maestrichian Limestones. This limestone bed is sandwiched between two sandstone/Marl beds. It can be traced continuously for more than 9km in the North

Design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited for an extent of Amalgamated Periyagalur Limestone Mine over an extent of 53.32.0 Hectares In Periyagalur Village, Ariyalur Taluk & District, Tamilnadu

- South direction starting from Srinivasapuram in the north through Kairulabad , Ameenabad , Periyagalur , Hasthinapuram , Kattupiringium Pudupaalyam, Nerunchikorai , Vilipiringium, and further South up to Idaiyathankudi on the banks of Marudaiyar river. Limestone of Cretaceous and early Tertiary are also exposed in the three principal outcrop areas viz. Trichirapalli, Virudhachalam, and Pondicherry along the western margin of the basin. The western margin of these sediments have NE- SW trend. The formation in the east trends NE-SW in the north and changes to NW-SE in the Southern part. The dip direction also changes accordingly. Limestone is exposed on the surface in the nearby TANCEM mines of Kallankurichi and Dalmia Mines of Periyagalur. Limestone is yellowish brown in colour with prominent and well preserved shells. From the core drilling it is found that top red soil thickness ranges between 1.5 to 2 m, followed by alternate bands of Sandstone / Marl and limestone. Limestone thickness is 7 to 9 m with various grades. The strike direction of the formation is limestone deposit is NNE-SSW & NNW- SSE and dips towards south east with dip angle varying from 3 to 5°. Local variation in dip amount and direction. Figure 16 shows Surface plan of Amalgamated Periyagalur Limestone Mines.



Figure 16. Surface plan of Amalgamated Periyagalur Limestone Mines

Design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited for an extent of Amalgamated Periyagalur Limestone Mine over an extent of 53.32.0 Hectares In Periyagalur Village, Ariyalur Taluk & District, Tamilnadu

The stratigraphic succession for the cretaceous basin of Tiruchirapalli is given below table.

Table 1. The stratigraphic succession for the cretaceous basin of Tiruchirapalli

Age	Group	Formation	Litho Stratigraphy
MioplIOCene		Cuddalore	Ferruginous sand stone laterite and clay
-----Unconformity-----			
Palaeocene	Ariyalur	Niniyur Kallamedu Kallankurichi	Predominantly limestone with sandstone and marl parting White sandstone and Fossiliferous Limestone calcareous shale marl and sandstone
Upper Cretaceous		Sillakudi	Uppermember-sandstone dominant Lower member - limestone / calc. Sandstone dominant
-----Unconformity-----			
Upper Cretaceous	Tiruchirapalli	Anaipadi	Upper-standstone Lower-Shale
		Kulakkantham	
-----Unconformity-----			
Upper Cretaceous	Uttattur	Karai Maruvattur	Coral limestone, Shaly limestone, sandstone & marl
-----Unconformity-----			
Upper Jurassic to Lower Cretaceous	Upper Gondwana	Thappai	Brownish, micaceous & silty ferruginous sandstone
-----Unconformity-----			
Archaean		Crystalline	Charnockite & Gneisses

3.3 LOCAL GEOLOGY

The general trend of the limestone deposit in this study area is N-S direction, with dipping Easterly with 3 to 5°. The deposit covers about 630 m in strike length and has a width of 560m. The limestone is Brown to Yellow, reddish brown medium grained and well preserved shells of Gryphea, Exogyra, Alectronia and shells of Ammonites and Echinoid group. The Average Thickness of the lithounits such as Topsoil, Micaceous Sandstone, Shell Limestone and Sandstone are detailed in Table 2.

Table 2. Average Thickness of the lithounits

Average Top soil Thickness	0.5 to 2.00 m
Average Micaceous Sandstone Thickness	2.00 to 36.00 m
Average Shell limestone Thickness	35.00 - 48.00 m
Average Bottom sandstone	4.00 - 6.00 m below

Topsoil with sandstone

Underlying the top red soil cover is the whitish weathered friable sandstone. This horizon has to be rejected as waste at the time of mining. The thickness varies between 0.5 to 2.0m.

Shell Limestone

Brown to Yellow, reddish brown medium grained and well preserved shells. They do not exhibit any other feature except bedding.

Sandstone

Calcareous in nature with quartz grains and this litho unit is considered as a marker horizon.

3.3.1 Climatic Conditions

The climate of this region is semi -arid with moderate rainfall averaging about 800mm per year. The mean monthly temperature ranges between 22.5°C and 41° C and it is maximum during the months of May and June. The relative humidity varies between 33 and 94% and it is highest during the months of December and January and is lowest during the month of June. There is only one rain gauge station in the Ariyalur town.

Design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited for an extent of Amalgamated Periyagalur Limestone Mine over an extent of 53.32.0 Hectares In Periyagalur Village, Ariyalur Taluk & District, Tamilnadu

3.3.2 Rainfall

The region receives rainfall from both the monsoons with annual rainfall spread over a period of 6 months. The South west monsoon precipitation occurring from June to September accounts for 30 % of the annual rainfall and the northeast monsoon rainfall occurring during October to December constitutes 70 % of the annual. The rainfall increases from west to east during the northeast monsoon period.

3.4 METHOD OF MINING

Limestone mining operations are being carried out through the development of a series of 6m high benches with the Excavator-Tipper combination. The minimum bench width is being maintained at 10m. Controlled Blasting adopted with combination of Slurry Explosive and Nonel for Overburden removal and Limestone production. Open cast mechanized mining is being done using drilling and blasting, which comprises of the following activities (Figure 16).

- Removal of top soil by excavator and preparing the face for Mining operation.
- Drilling and Blasting
- Loading by XCMG – XE230C– 1.1 m³ Capacity Excavator
- Hauling by using 25 T Tipper to the crusher hopper located at Govindapuram factory.

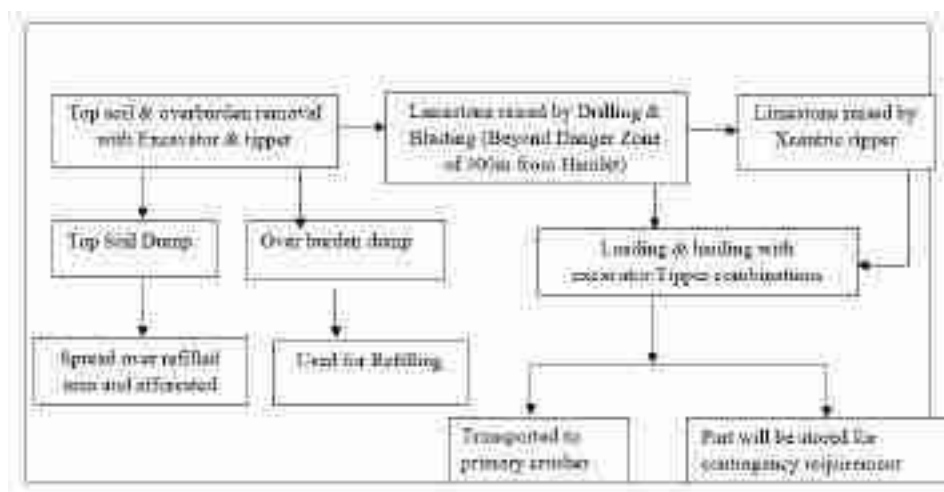


Figure 17. Method of working

3.5 DEPLOYED MINING EQUIPMENT

The detailed list mining equipment deployed at Amalgamated Periyagalur Limestone Mine in M/s. Ramco Cements Limited is depicted in Table 3.

Table 3. List of earth-moving equipment in Periyagalur Limestone mine

S. No	Type of Machinery	Number in use	H.P(Each)
1	Rock Drills		
	(i) Compressor – ELGI –XA 450 CFM Capacity	1	150
	(ii) Wagon Drill	1	
2	Heavy Earth Moving Machinery		
	(i) Excavator XCMG – XE230C– 1.1 M ³ Capacity	1	174.7
	(ii) Tippers – 10 M ³ Capacity	7	180
	(iii) Water Tanker-10000 litres	1	128

4.0 STATUTORY PROVISIONS FOR SAFETY BARRIER

4.1 General restrictions in respect of quarrying operations

- The quarrying permit holder or the lessee or their men shall not work or carry on or allow to be worked or carried on any mining operations at or to any point within a distance of 50 metres from any railway line except with the previous written permission of the Railway administration concerned or under or beneath any ropeway or any ropeway trestle or station except under and in accordance with the written permission of the authority owning the ropeway or from any reservoir, canal or other public works such as public roads and buildings except with the previous written permission of the Collector of the district or any other officer authorised by

Design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited for an extent of Amalgamated Periyagalur Limestone Mine over an extent of 53.32.0 Hectares In Periyagalur Village, Ariyalur Taluk & District, Tamilnadu

the State Government in this behalf and otherwise than in accordance with such instructions, restrictions and conditions, either general or special, which may be attached to such permission. The said distance of **50 metres** shall be measured in the case of railway, reservoir or canal horizontally from the outer toe of the bank or the outer edge of the cutting, as the case may be, and in case of building horizontally from the plinth thereof. In the case of village roads no working shall be carried out within a distance of 10 metres and except with the previous permission of the Collector of the District or any other officer duly authorised by the State Government in this behalf and otherwise than in accordance with such directions, restrictions and additions, either general or special, which may be attached to such permission.

- Provided that notwithstanding anything contained in any law for the time being in force or any provision in any lease deed or agreement already executed under these Rules, there shall be no quarrying of sand in any river bed or adjoining are or any other area which is located within **500 metres** radial distances from the location of any bridge, water supply system, infiltration well or pumping installation of any of the local bodies or Central or State Government Department or the Tamil Nadu Water Supply and Drainage Board head works or any area identified for locating water supply schemes by any of the above-mentioned Government Departments or other bodies.
- a) No lease shall be granted for quarrying stone within **300 metres (three hundred metres)** from any inhabited site: Provided that the exiting quarries which are subsisting under current leases shall be entitled for continuance till the expiry of the lease period. The lessees whose quarries lie within a radius of 300 metres from the inhabited site shall undertake blasting operations only after getting permission of the Director of Mines Safety, Gorgaum.
 - b) The permit to be granted under clause (a) shall be subject to the following conditions, namely:-
 - i) the permit holder shall intimate to the District Collector about the details of patta lands from which the earth for manufacture of brick is proposed to be quarried fifteen days before commencement of quarry of earth. Whenever there

Design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited for an extent of Amalgamated Periyagalur Limestone Mine over an extent of 53.32.0 Hectares In Periyagalur Village, Ariyalur Taluk & District, Tamilnadu

is a change of location (survey field) of quarrying it shall be intimated in the manner indicated above.

- ii) quarrying shall be done only for an optimum depth to be specified by the District Collector so that the land shall be restored to a state fit for cultivation.
- iii) quarrying shall be carried out without affecting the interest of the adjoining land owners.
- iv) a safety distance of **10m from the village road, cart track and stream courses** shall be left and maintained, and also a safety distance of 50 Mts. from the highways and railway lines should be left and maintained.

As per, the Tamil Nadu Minor Mineral Concession Rules, 1959 The permit holder shall not carryout quarrying operations within a distance of **50 metres from any public roads**, public building, temples, reservoirs, burial ground and railway track etc and cause any damage to any public or private properties.

Working near mine boundaries as per MMR

2[(1) The owner, agent or manager of every mine shall fixed boundaries of the mine. Notwithstanding anything contained in sub-regulation (2), the shall not be changed except with the permission of the Chief Inspector in writing and subject to such conditions as he may specify therein].

3[(2)] No working shall be made within a distance of **7.5 metres** of the boundary of any mine and, in case of a disputed boundary, no working shall be made within a distance of 7.5 metres of the boundary claimed by the owner of an adjacent mine until such time as a binding agreement has been reached as to the correct boundary or the question has been finally determined by a court of law:

1[Provided further that, where the workings of any 2[mine], for any reason, are extended or get extended within any shorter distance than what is laid down herein above, the Chief Inspector may, by an order in writing, require the owner to construct such protective works within such time as he may specify in the order].

Design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited for an extent of Amalgamated Periyagalur Limestone Mine over an extent of 53.32.0 Hectares In Periyagalur Village, Ariyalur Taluk & District, Tamilnadu

3[(3)] Notwithstanding anything contained in sub-regulation (1), the Chief Inspector may, by an order in writing and subject to such conditions as he may specify therein, permit the workings of any mine or part thereof to extend within any shorter distance than 7.5 metres aforesaid, or may require that the said working shall not extend further than a specified distance, not exceeding 60 metres, of such boundary.

5.0. ROADWAYS AND HABITANTS

- A **state Highway No.139** running Ariyalur - Muttuvancheri situated on the southern side of the mining lease Area. Amalgamated Periyagalur limestone mine is located 9 km from District Head Quarter Ariyalur by road and the mine falls in Survey of India (Restricted) Topo sheet No 58 M/4.
- A High Tension Power line located within the Mining Lease area on the Eastern Side passing North East - South West direction is proposed to be rerouted away from the Mining lease area. Five Low Tension power lines are proposed to be rerouted/shifted away from the Mining lease boundary.
- A road approaching to Chinnanagalur Village is located on the south western side of the Mining Lease Boundary is proposed to be rerouted in consultation with the District Authorities.

6.0 CONCLUSIONS

Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited requested the Department of Mining Engineering, Anna University, Chennai to carryout scientific study on design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited in Periyagalur Village, Ariyalur Taluk & District, Tamilnadu. The present scientific study in the proposed Amalgamated Periyagalur Limestone Mine for an area of over an extent of 35.96.0Ha under the G.0.(3D)No2. & 13.1.03 & G.0 (Ms) No.77 & 26.07.2018 and 17.36.0.0Ha under the G.0.(Ms) No. 153 & 23.12.2016for Amalgamated Periyagalur Limestone Mines, Periyagalur Village, Ariyalur Taluk & District, Tamilnadu to design the safety barrier. The study suggests the lessee to maintain the safety barrier as per MCR, MMDR, MMR norms.

Design of safety barrier at Amalgamated Periyagalur Limestone Mines of M/s. Ramco Cements Limited for an extent of Amalgamated Periyagalur Limestone Mine over an extent of 53.32.0 Hectares In Periyagalur Village, Ariyalur Taluk & District, Tamilnadu

Based on the field investigation of Anna University Research team, the following observations are made as follows,

- i. It is observed that in the northwestern and northern side, safety distance of 7.5m is maintained in the proposed amalgamated mine with adjacent working mine.
- ii. It is observed that the **State Highway road** exists in the southern side of the proposed mine. The road is measuring 15m including the trench and shoulder. From road, trench and shoulder, the distance of boundary pillar 31 and 34, at 7m in the southwest side and 6m in the southwest side of the proposed mine respectively. So, it is concluded that as per the MCR guidelines, 50m safety distance with including the trench and shoulder from the SH road is more than sufficient for the safe working condition.
- iii. It is observed that safety barrier distance at 50m in the East side of the proposed mine from the SH-139 roadway.
- iv. Wire fencing is established in the South side of the proposed mine from the SH-139 roadway at the distance of 5m from the lease boundary pillar (No.33).
- v. Electrical sub-station is installed in the west side of the proposed mine.
- vi. It is observed that, boundary 49 is at common boundary with adjacent M/s. Dalmia Mines (PNR).
- vii. It is observed that the safety bund of about 2.5m height is maintained in the southern side of the proposed mine from the SH-139 road in the lease boundary area.
- viii. It is observed that boundary pillar at the distance of 7m in the Southeast side of the proposed mine from the SH-139 roadway.
- ix. It is observed that trench is established in the South and East side of the proposed mine which could damp the dynamic wave propagation from the mining operations.

REPORT
(No.C/MN/67)

**Blasting Study Report for
Periyanalur Limestone Mines of
M/s. The Ramco Cements Ltd., Ariyalur**

INVESTIGATORS

Dr. M. Aruna and Dr. Harsha Vardhan
Faculty, Department of Mining Engineering



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Karnataka State**

Updated in November - 2023

ABSTRACT

M/S The Ramco Cements Limited is operating the Periyagalur Limestone Mines in Periyagalur Village of Ariyalur Taluk in Ariyalur District, Tamilnadu. Explosive energy is being used for fragmenting and displacing the limestone deposit from in-situ. The village structures of Kattupringiyam Ayyanagar are existing at a minimum distance of 175m from the limestone mine towards south side. Also there are structures of Chinna Nagalur Village at about 250m (minimum) from the limestone mine. Problems of concern in the present case are ground vibrations and fly rock that may have effect on nearby houses and other surrounding structures. It is proposed by the management of M/S The Ramco Cements Limited to get scientific study done on the effect of blasting operations on the surrounding village structures, by the Principal Investigator from NITK – Surathkal (Govt. of India).

In view of the above, a scientific study was taken up to assess the effect of blasting operations carried out in Periyagalur Limestone Mines on the surroundings, by studying 10 production scale blasts. Blastholes of 110 mm diameter with depth of blastholes varying from 5m to 10m were used for the studies. Number of blastholes per blast round varied from 10 to 25, covering different locations representing the entire mine. Slurry explosives available in the form of 83mm diameter cartridges were used as primer and column charges. Shock tube system of initiation was used for achieving delay in blast rounds. Explosive charge per hole was varying from 16.02kg to 40.03kg. Total explosive charge per blast round varied from 225.18kg to 800.64kg in the studies.

Ground vibration levels produced from different blast rounds were 25.90mm/s at 56m, 24.30mm/s at 80m, 16.80mm/s at 94m, 10.80mm/s at 107m, 9.40mm/s at 120m, 8mm/s at 122m, 7.49mm/s at 133m, 3.81mm/s at 140m, 7.24mm/s at 144m, 3.68mm/s at 150m, 4.44mm/s at 155m, 3.43mm/s at 160m, 2.67mm/s at 166m, 2.29mm/s at 177m, 1.65mm/s at 188m, 1.78mm/s at 250m, 1.78mm/s at 275m, 1.27mm/s at 285m, 2.29mm/s at 300m, 1.52mm/s at 325m, 0.762mm/s at 335m, 0.762mm/s at 350m, 1.14mm/s at 350m, 0.889mm/s at 360m, <0.51mm/s at 370m and 380m distances. PPV levels recorded at houses of Kattupringiyam Ayyanagar Village were 2.16mm/s at 175m, 2.54mm/s at 193m,

1.27mm/s at 216m, 1.52mm/s at 230m, 1.14mm/s at 235m, 2.16mm/s at 253m, 0.889mm/s at 254m, 0.762mm/s at 260m, 1.65mm/s at 304m, 0.762mm/s at 306m, 1.52mm/s at 310m, 0.51mm/s at 330m and <0.51mm/s at 335m from five (05) blasts studied near to the village structures. At Chinna Nagalur Village structures, the PPV was 1.52mm/s (from 10th blast) which is extremely safe. Studies have shown an insignificant effect of blasting operations carried out in Periyannagalur Limestone Mine on the village structures of Kattupringiyam Ayyanagar and Chinna Nagalur Villages. Ground vibrations were found to decay considerably from 100m distance from blast site. There is no effect of blasting operations on the stability of Kattupringiyam Ayyanagar and Chinna Nagalur Village Structures. Fly rock was observed to a maximum distance of 30m in all blasts studied, due to shock tube system of initiation.

ACKNOWLEDGEMENTS

The Principal Investigator is thankful to the Sri Madhusudhan Kulkarni, Sr. Vice President (Mfg.) and Unit Head, Periyagalur Limestone Mine, M/s The Ramco Cements Limited, for sanctioning the scientific study.

The Principal Investigator is grateful to the Director, National Institute of Technology Karnataka, Surathkal (Govt. of India) for permitting to take up the project.

Heartfelt thanks are due to Sri V.S. Samba Sivam, Deputy General Manager (Mines), Sri G.R. Magesh, Deputy General Manager (Mines), Sri K. Nagendran, Assistant General Manager (Mines), Sri K. Abraham, Manager (Mines), Sri R. Jayaker, Dy. Manager (Mines) and Blasting In-Charge, Sri M. Ramsankar, Surveyor, and the team members, for the excellent cooperation extended during the studies.

Help rendered by Mr. G. Raghu Chandra and Mr. K.V. Nagesha, Research Scholars, Mr. T. Murali Naik, PG Student, Department of Mining Engineering, NITK-Surathkal, in carrying out field studies and preparation of report is acknowledged.

INVESTIGATIONS

To assess the impact of blasting operations, 10 production scale blasts conducted at different locations in Periyagalur Limestone Mine were studied. Blastholes of 110mm diameter were drilled with wagon drills. Depth of blastholes was varying from 5m to 10m in different blast rounds.

Slurry explosives were used as Column Charge and Primer charge, with cartridges of 2.78kg each. Explosive charge per hole was varying between 16.02kg and 40.03kg. Exel Dueldet shock tube system of initiation was used, simultaneously providing the in-hole initiation and surface delay. Detonating cord along with shock tube was used for initiating decked charges in the blastholes, simultaneously. The pattern of explosive column and stemming in blasthole was changed from blast to blast. The blasthole charging pattern adopted in various blasts is shown in Fig. 9.

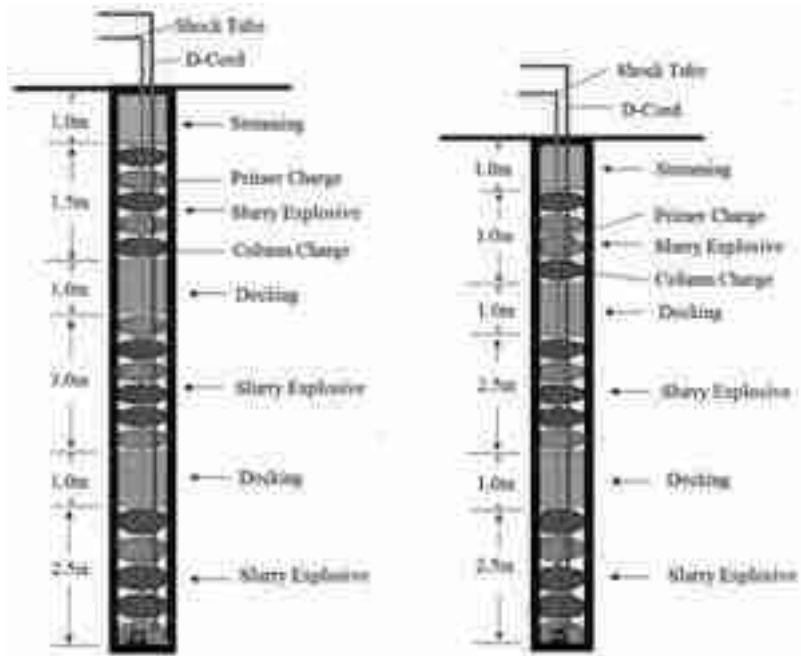


FIG. 9A Blast - 1

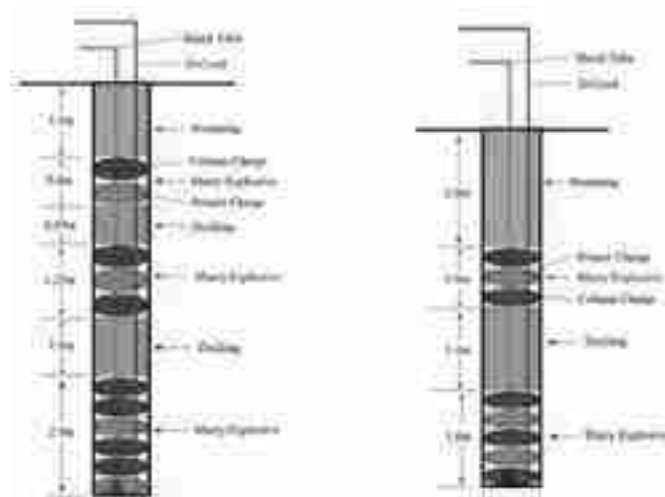


FIG. 9B Blast - 2

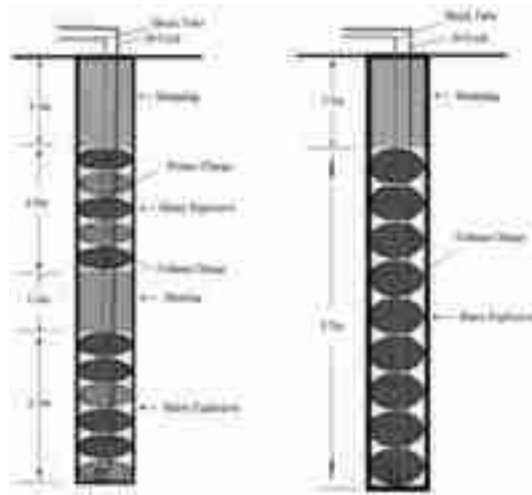


FIG. 9C Blast – 3

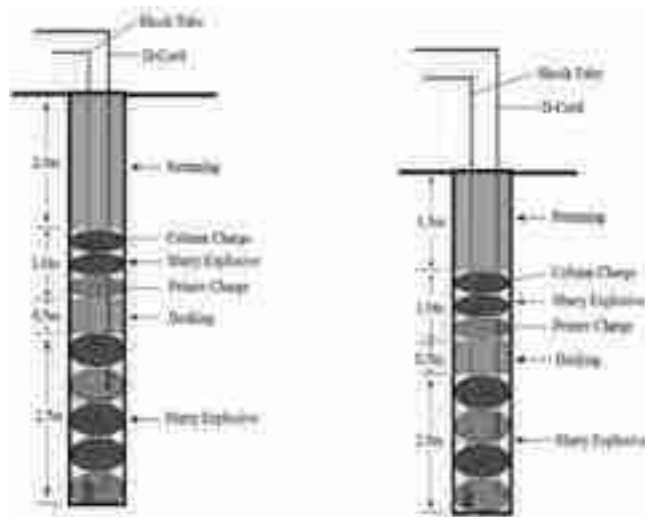


FIG. 9D Blast – 4

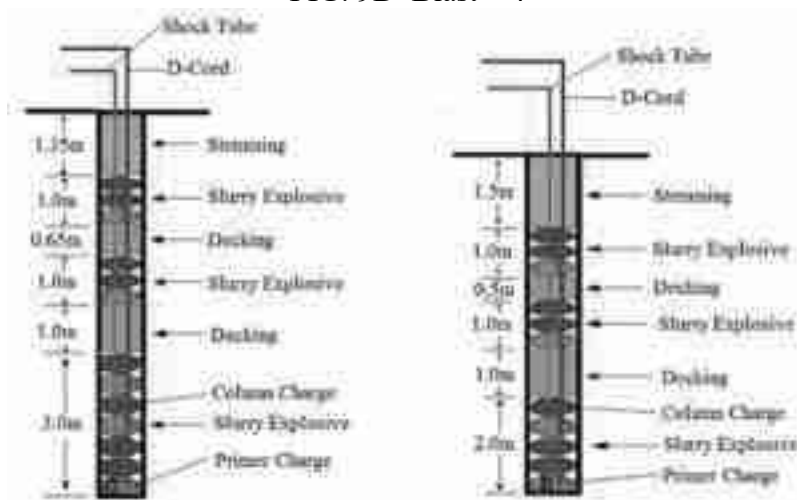


FIG. 9E Blast – 5

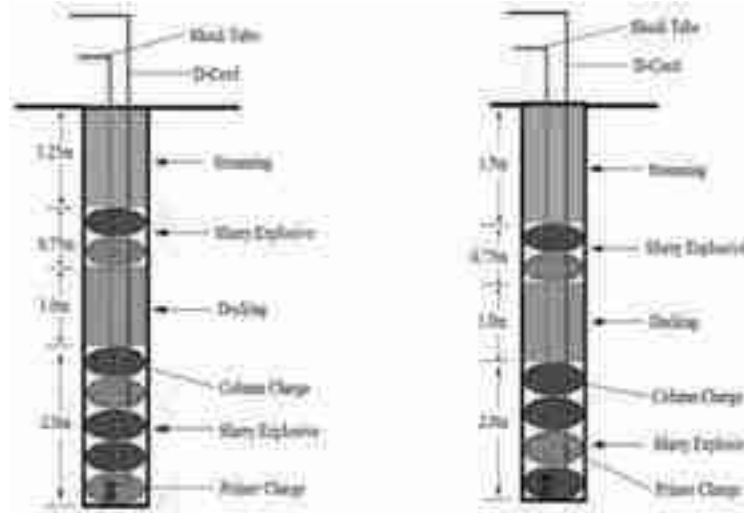


FIG. 9F Blast – 6

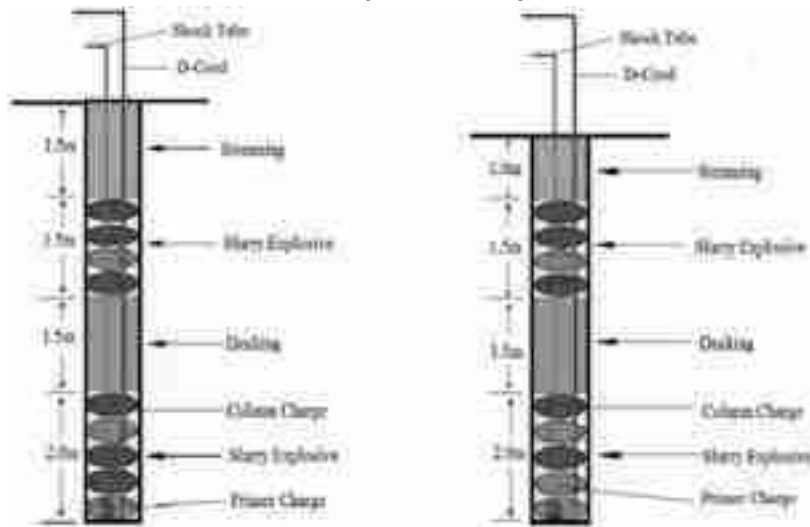


FIG. 9G Blast – 7

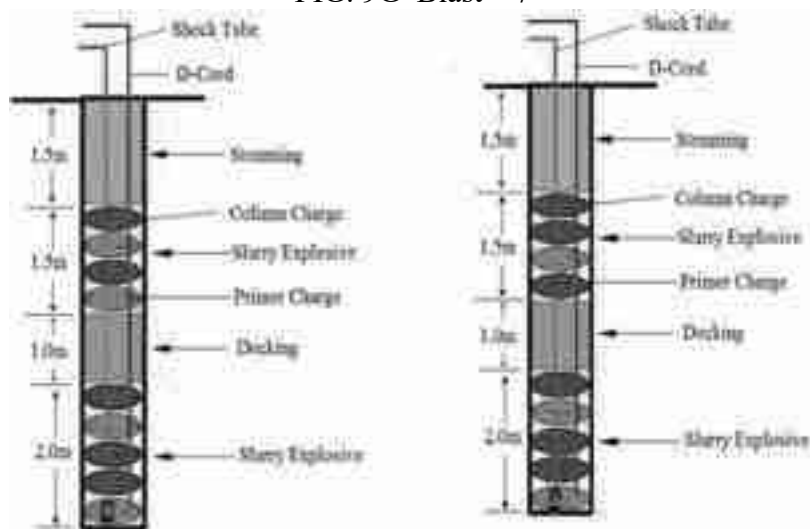


FIG. 9H Blast – 8

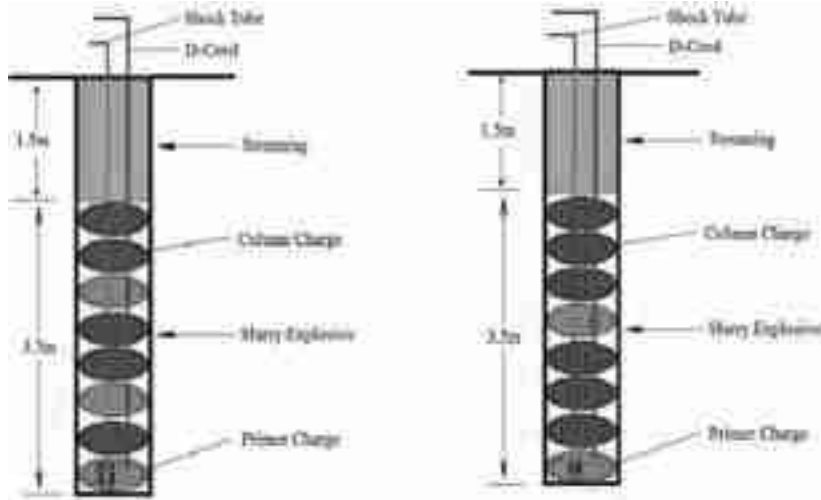


FIG. 9I Blast – 9

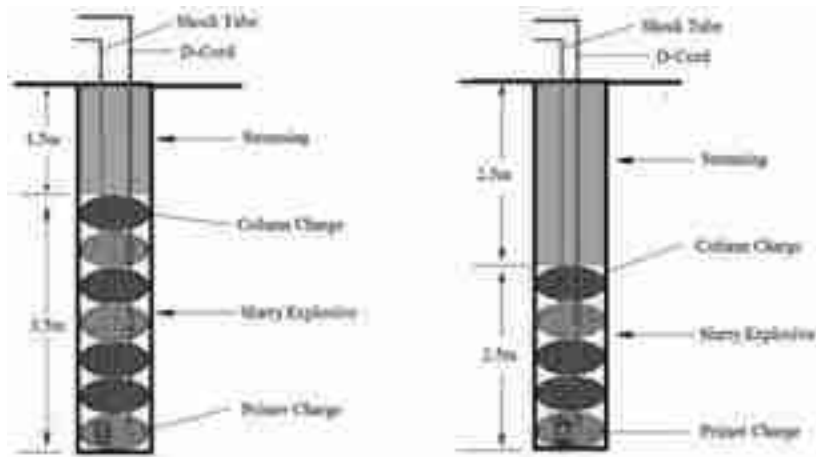


FIG. 9J Blast – 10

FIG. 9 TYPICAL CHARGING PATTERN OF BLASTHOLES

The muck piles generated from 10 different production scale blasts studied are shown in Fig. 10. Details of all 10 production blasts studied are given in Table-3.

BLAST - 1 (N11°07'42.7" E79°08'52.2")



BEFORE BLAST



AFTER BLAST

BLAST - 2 (N11°07'37.0" E79°08'49.1")



BEFORE BLAST



AFTER BLAST

BLAST – 3 (N11°07'34.1" E79°08'47.3")



BEFORE BLAST



AFTER BLAST

BLAST – 4 (N11°07'36.9" E79°08'40.6")



BEFORE BLAST



AFTER BLAST

BLAST – 5 (N11°07'34.0" E79°08'45.0")



BEFORE BLAST



AFTER BLAST

BLAST – 6 (N11°07'37.1" E79°08'49.9")



BEFORE BLAST



AFTER BLAST

BLAST – 7 (N11°07'34.1" E79°08'45.2")



BEFORE BLAST



AFTER BLAST

BLAST – 8 (N11°07'34.3" E79°08'46.0")

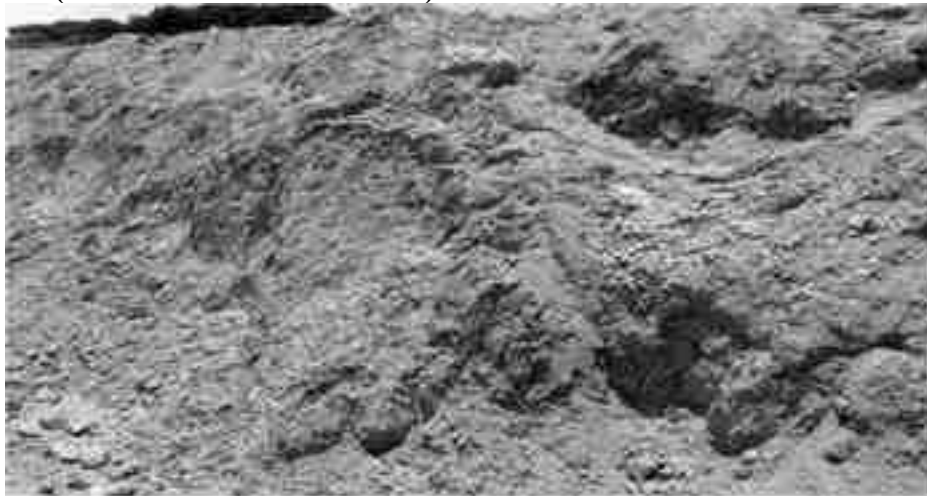


BEFORE BLAST



AFTER BLAST

BLAST – 9 (N11°07'34.8" E79°08'46.7")



BEFORE BLAST



AFTER BLAST

BLAST – 10 (N11°07'33.1" E79°08'49.8")**BEFORE BLAST****AFTER BLAST****FIG. 10 MUCKPILES GENERATED FROM DIFFERENT BLASTS**

Locations of different blasts studied in the Periyannagalur Limestone Mine are shown in Fig. 11. Layouts of all the blasts studied are given in Appendix-1.

TABLE – 3 DETAILS OF THE BLASTS STUDIED

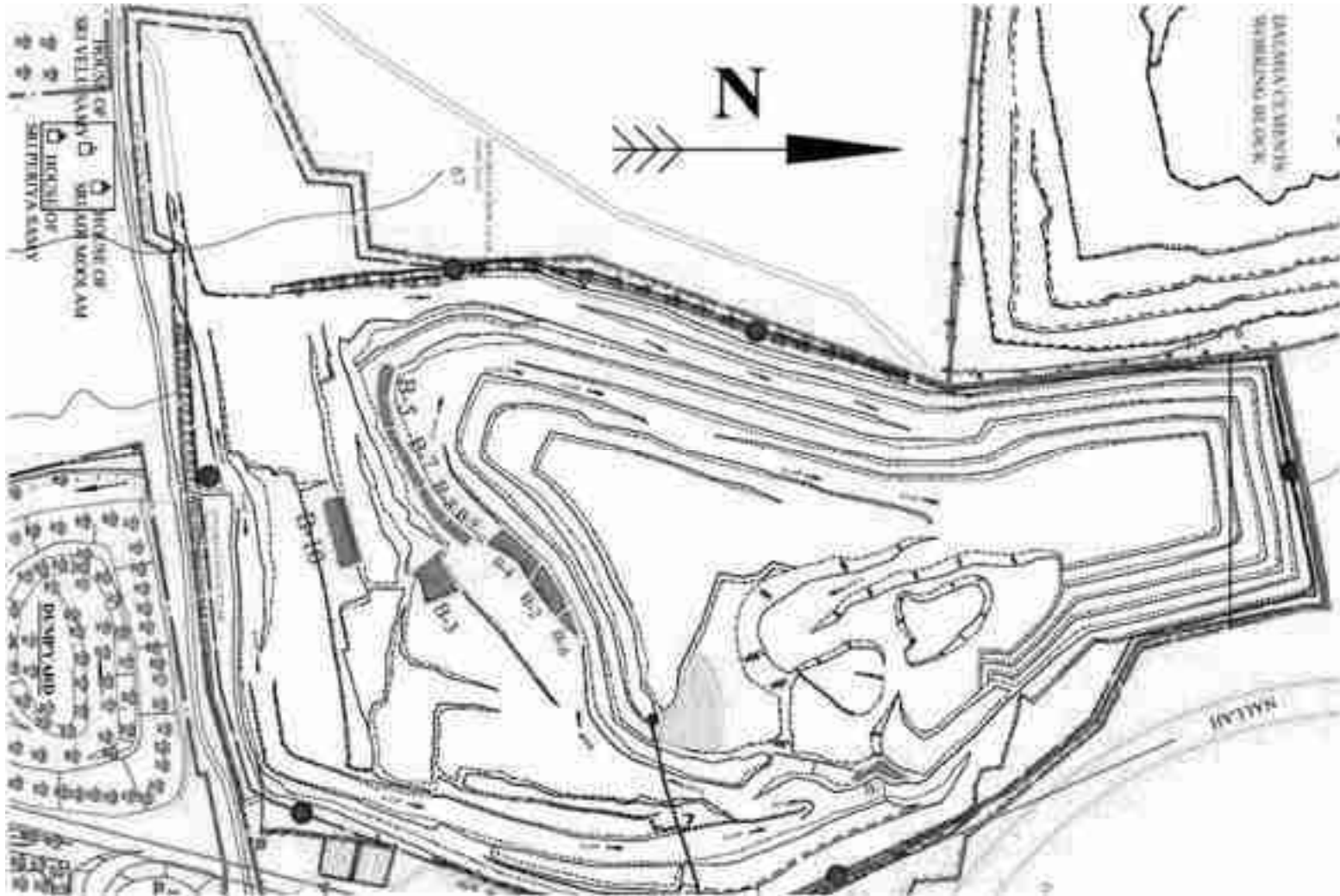
Sl. No.	Parameters	Blast No. 1	Blast No. 2
1	Date of Blast	28/09/2023	29/09/2023
2	Time of Blast (hrs)	15:33:44	15:25:59
3	Location of Blast	N11°07'42.7" E79°08'52.2"	N11°07'37.0" E79°08'49.1"
4	Diameter of Blasthole (mm)	100	100
5	Burden (m)	2.5	2.5
6	Spacing (m)	3.0	3.0
7	Drilling Pattern	Rectangular	Staggered
8	Depth of Blasthole (m)	10	6.5
9	Stemming (m)	1.0	1.5
10	No. of Rows	04	02
11	No. of Blastholes	20	21
12	Explosive Charge/Hole (kg)	40.03	27.40
13	Maximum Charge/Delay (kg)	44.48	30.58
14	Total Charge/Blast (kg)	800.64	575.46
15	Initiation System	Shocktube	Shocktube
16	Location of Instrument – 1	N11°07'40.1" E79°08'52.8"	N11°07'34.5" E79°08'44.7"
17	Distance (m) – 1	80	155
18	PPV (mm/s) – 1	24.3	4.44
19	Frequency (Hz) – 1	47	20
20	Elevation Difference (m) – 1	1	3
21	Location of Instrument – 2	N11°07'39.6" E79°08'52.8"	N11°07'34.6" E79°08'44.2"
22	Distance (m) – 2	94	166
23	PPV (mm/s) – 2	16.80	2.67
24	Frequency (Hz) – 2	43	9.70
25	Elevation Difference (m) – 2	0	3
26	Location of Instrument – 3	N11°07'39.5" E79°08'52.6"	N11°07'34.7" E79°08'44.4"
27	Distance (m) – 3	107	177
28	PPV (mm/s) – 3	10.80	2.29
29	Frequency (Hz) – 3	39	17
30	Elevation Difference (m) – 3	1	3
31	Location of Instrument – 4	N11°07'38.8" E79°08'52.4"	N11°07'35.1" E79°08'43.5"
32	Distance (m) – 4	120	188
33	PPV (mm/s) – 4	9.40	1.65
34	Frequency (Hz) – 4	43	14
35	Elevation Difference (m) – 4	2	4

Sl. No.	Parameters	Blast No. 3	Blast No. 4
1	Date of Blast	30/09/2023	03/10/2023
2	Time of Blast (hrs)	16:11:23	13:14:07
3	Location of Blast	N11°07'34.1" E79°08'47.3"	N11°07'36.9" E79°08'40.6"
4	Diameter of Blasthole (mm)	100	100
5	Burden (m)	2.5	2.5
6	Spacing (m)	3.0	3.0
7	Drilling Pattern	Rectangular	Rectangular
8	Depth of Blasthole (m)	7.0	5.5
9	Stemming (m)	1.5	1.7
10	No. of Rows	03	02
11	No. of Blastholes	23	20
12	Explosive Charge/Hole (kg)	29.37	22.52
13	Maximum Charge/Delay (kg)	30.58	66.72
14	Total Charge/Blast (kg)	675.54	450.36
15	Initiation System	Shocktube	Shocktube
16	Location of Instrument – 1	Mine Premises (N11°07'34.5"E79°08'44.1")	Mine Premises (N11°07'36.6"E79°08'42.7")
17	Distance (m) – 1	56	300
18	PPV (mm/s) – 1	25.90	2.29
19	Frequency (Hz) – 1	28	20
20	Elevation Difference (m) - 1	2	2
21	Location of Instrument – 2	Mine Premises (N11°07'32.9"E79°08'43.7")	Mine Premises (N11°07'36.6"E79°08'41.5")
22	Distance (m) – 2	122	325
23	PPV (mm/s) – 2	8.00	1.52
24	Frequency (Hz) – 2	32	24
25	Elevation Difference (m) - 2	6	5
26	Location of Instrument – 3	Mine Premises (N11°07'32.7"E79°08'43.7")	Mine Premises (N11°07'36.6"E79°08'39.5")
27	Distance (m) – 3	133	335
28	PPV (mm/s) – 3	7.49	0.762
29	Frequency (Hz) – 3	32	22
30	Elevation Difference (m) - 3	6	6
31	Location of Instrument – 4	Mine Premises (N11°07'32.5"E79°08'43.7")	Mine Premises (N11°07'36.6"E79°08'37.5")
32	Distance (m) – 4	144	350
33	PPV (mm/s) – 4	7.24	0.762
34	Frequency (Hz) – 4	30	21
35	Elevation Difference (m) – 4	8	7

Sl. No.	Parameters	Blast No. 5	Blast No. 6
1	Date of Blast	04/10/2023	05/10/2023
2	Time of Blast (hrs)	13:28:08	12:43:25
3	Location of Blast	N11°07'34.0" E79°08'45.0"	N11°07'37.1" E79°08'49.9"
4	Diameter of Blasthole (mm)	100	100
5	Burden (m)	2.5	2.5
6	Spacing (m)	3.0	3.0
7	Drilling Pattern	Staggered	Rectangular
8	Depth of Blasthole (m)	7.5	5.0
9	Stemming (m)	1.4	1.5
10	No. of Rows	02	02
11	No. of Blastholes	18	13
12	Explosive Charge/Hole (kg)	33.36	19.25
13	Maximum Charge/Delay (kg)	36.14	19.46
14	Total Charge/Blast (kg)	600.48	250.20
15	Initiation System	Shocktube	Shocktube
16	Location of Instrument – 1	Mine Premises (N11°07'36.6" E79°08'41.5")	Mine Premises (N11°07'30.4" E79°08'45.3")
17	Distance (m) – 1	350	250
18	PPV (mm/s) – 1	1.14	1.78
19	Frequency (Hz) – 1	34	28
20	Elevation Difference (m) – 1	6	25
21	Location of Instrument – 2	Mine Premises (N11°07'36.6" E79°08'40.5")	Mine Boundary (N11°07'30.1" E79°08'44.5")
22	Distance (m) – 2	360	275
23	PPV (mm/s) – 2	0.889	1.78
24	Frequency (Hz) – 2	22	26
25	Elevation Difference (m) – 2	6	26
26	Location of Instrument – 3	Mine Premises (N11°07'36.6" E79°08'39.6")	On Road, Kattupringiyam Ayyanagar (N11°07'30.1" E79°08'44.7")
27	Distance (m) – 3	370	285
28	PPV (mm/s) – 3	<0.51	1.27
29	Frequency (Hz) – 3	--	23
30	Elevation Difference (m) – 3	7	26
31	Location of Instrument – 4	Mine Premises (N11°07'36.6" E79°08'38.8")	House of Adi Moolam, Kattupringiyam Ayyanagar (N11°07'29.0" E79°08'42.6")
32	Distance (m) – 4	380	335
33	PPV (mm/s) – 4	<0.51	<0.51
34	Frequency (Hz) – 4	--	--
35	Elevation Difference (m) – 4	8	27

Sl. No.	Parameters	Blast No. 7	Blast No. 8
1	Date of Blast	06/10/2023	07/10/2023
2	Time of Blast (hrs)	13:07:17	13:17:23
3	Location of Blast	N11°07'34.1" E79°08'45.2"	N11°07'34.3" E79°08'46.0"
4	Diameter of Blasthole (mm)	100	100
5	Burden (m)	2.5	2.5
6	Spacing (m)	3.0	3.0
7	Drilling Pattern	Staggered	Staggered
8	Depth of Blasthole (m)	6.0	6.0
9	Stemming (m)	1.4	1.5
10	No. of Rows	03	02
11	No. of Blastholes	24	16
12	Explosive Charge/Hole (kg)	25.02	25.02
13	Maximum Charge/Delay (kg)	25.02	25.02
14	Total Charge/Blast (kg)	600.48	400.32
15	Initiation System	Shocktube	Shocktube
16	Location of Instrument – 1	On Road, Kattupringiyam Ayyanagar (N11°07'29.7" E79°08'44.6")	House of Adi Moolam, Kattupringiyam Ayyanagar (N11°07'29.6" E79°08'42.6")
17	Distance (m) – 1	140	193
18	PPV (mm/s) – 1	3.81	2.54
19	Frequency (Hz) – 1	32	26
20	Elevation Difference (m) – 1	23	22
21	Location of Instrument – 2	On Road, Kattupringiyam Ayyanagar (N11°07'29.7" E79°08'43.6")	Near House of Velu Samy, Kattupringiyam Ayyanagar (N11°07'28.9" E79°08'40.8")
22	Distance (m) – 2	150	230
23	PPV (mm/s) – 2	3.68	1.52
24	Frequency (Hz) – 2	23	27
25	Elevation Difference (m) – 2	24	18
26	Location of Instrument – 3	On Road, Kattupringiyam Ayyanagar (N11°07'29.6" E79°08'42.6")	House of Velu Samy, Kattupringiyam Ayyanagar (N11°07'29.4" E79°08'40.8")
27	Distance (m) – 3	160	235
28	PPV (mm/s) – 3	3.43	1.14
29	Frequency (Hz) – 3	20	47
30	Elevation Difference (m) – 3	24	18
31	Location of Instrument – 4	House of Adi Moolam, Kattupringiyam Ayyanagar (N11°07'29.0" E79°08'42.6")	House of Periya Samy, Kattupringiyam Ayyanagar (N11°07'28.8" E79°08'37.9")
32	Distance (m) – 4	175	306
33	PPV (mm/s) – 4	2.16	0.762
34	Frequency (Hz) – 4	28	32
35	Elevation Difference (m) – 4	25	23

Sl. No.	Parameters	Blast No. 9	Blast No. 10
1	Date of Blast	09/10/2023	10/10/2023
2	Time of Blast (hrs)	13:31:22	13:21:24
3	Location of Blast	N11°07'34.8" E79°08'46.7"	N11°07'33.1" E79°08'49.8"
4	Diameter of Blasthole (mm)	100	100
5	Burden (m)	2.5	4.0
6	Spacing (m)	3.0	4.0
7	Drilling Pattern	Staggered	Staggered
8	Depth of Blasthole (m)	5.0	5.0
9	Stemming (m)	1.50	2.25
10	No. of Rows	03	02
11	No. of Blastholes	10	25
12	Explosive Charge/Hole (kg)	22.52	16.02
13	Maximum Charge/Delay (kg)	25.02	19.46
14	Total Charge/Blast (kg)	225.18	400.32
15	Initiation System	Shocktube	Shocktube
16	Location of Instrument – 1	House of Adi Moolam, Kattupringiyam Ayyanagar (N11°07'29.6" E79°08'42.6")	House of Tanga Velu, Chinna Nagalur (N11°07'31.9" E79°08'58.1")
17	Distance (m) – 1	216	250
18	PPV (mm/s) – 1	1.27	1.52
19	Frequency (Hz) – 1	30	16
20	Elevation Difference (m) – 1	22	06
21	Location of Instrument – 2	Near House of Velu Samy, Kattupringiyam Ayyanagar (N11°07'28.9" E79°08'40.8")	House of Adi Moolam, Kattupringiyam Ayyanagar (N11°07'29.6" E79°08'42.6")
22	Distance (m) – 2	254	253
23	PPV (mm/s) – 2	0.889	2.16
24	Frequency (Hz) – 2	13	15
25	Elevation Difference (m) – 2	18	09
26	Location of Instrument – 3	House of Velu Samy, Kattupringiyam Ayyanagar (N11°07'28.9" E79°08'40.8")	Near House of Velu Samy, Kattupringiyam Ayyanagar (N11°07'28.9" E79°08'40.8")
27	Distance (m) – 3	260	304
28	PPV (mm/s) – 3	0.762	1.65
29	Frequency (Hz) – 3	23	12
30	Elevation Difference (m) – 3	18	07
31	Location of Instrument – 4	House of Periya Samy Kattupringiyam Ayyanagar (N11°07'28.8" E79°08'37.9")	House of Velu Samy, Kattupringiyam Ayyanagar (N11°07'28.9" E79°08'40.8")
32	Distance (m) – 4	330	310
33	PPV (mm/s) – 4	0.51	1.52
34	Frequency (Hz) – 4	39	27
35	Elevation Difference (m) – 4	23	08



B-1,2,3,.... indicates respective blast locations

FIG. 11 LOCATIONS OF BLAST ROUNDS STUDIED

Ground vibrations were monitored using four (4) units of Minimate Plus, Instantel, Canada, simultaneously at four different locations for all 10 production blasts. Geophones of these blast vibration monitors record the ground vibrations in three mutually orthogonal directions – Longitudinal, Transverse and Vertical. Geophone of the instrument was glued to the ground effectively, using Plaster of Paris, after digging 6 inches ground if it is soft. In hard ground like rocky area or RCC, the geophone was glued directly to the ground using Plaster of Paris. Trigger level of geophones was set to a minimum PPV of 0.51mm/s. Details of all blasts studied are given in Table–3. All the ground vibration event charts are given in Appendix–2. Ground vibrations monitoring at different locations is shown in Fig. 14.



FIG. 14A (Monitoring at the house of Sri Adi Moolya,
Kattupringiyam Ayyanagar Village)



FIG. 14B (Monitoring at the house of Sri Velu Sami,
Kattupringiyam Ayyanagar Village)



FIG. 14C (Monitoring at the house of Sri Tanga Velu,
Chinna Nagalur Village)



FIG. 14D (Monitoring at the house of Sri Periya Sami, Kattupringiyam Ayyanagar Village)



FIG. 14E (Monitoring on road existing between mine boundary and houses, Kattupringiyam Ayyanagar Village)



FIG. 14F (Monitoring at Mine Boundary)



FIG. 14G (Monitoring at Mine Premises)



FIG. 14H (Monitoring at Mine Premises)



FIG. 14I (Monitoring at Mine Premises)



FIG. 14J (Monitoring at Mine Premises)



FIG. 14K (Monitoring at Mine Premises)

FIG. 14 MONITORING OF GROUND VIBRATIONS AT DIFFERENT LOCATIONS

In summary, the intensity of ground vibrations recorded at different distances is given in Table-5.

TABLE – 5 SUMMARY OF VIBRATIONS AT DIFFERENT DISTANCES

Distance (m)	Peak Particle Velocity (mm/s)
56	25.90 (Blast No. 3)
80	24.30 (Blast No. 1)
94	16.80 (Blast No. 1)
107	10.80 (Blast No. 1)
120	9.40 (Blast No. 1)
122	8.00 (Blast No. 3)
133	7.49 (Blast No. 3)

140	3.81 (Blast No. 7)
144	7.24 (Blast No. 3)
150	3.68 (Blast No. 7)
155	4.44 (Blast No. 2)
160	3.43 (Blast No. 7)
166	2.67 (Blast No. 2)
175	2.16 (Blast No. 7)
177	2.29 (Blast No. 2)
188	1.65 (Blast No. 2)
193	2.54 (Blast No. 1)
216	1.27 (Blast No. 8)
230	1.52 (Blast No. 9)
235	1.14 (Blast No. 8)
250	1.78 (Blast No. 8)
250	1.52 (Blast No. 6)
253	2.16 (Blast No. 10)
254	0.89 (Blast No. 9)
260	0.76 (Blast No. 9)
275	1.78 (Blast No. 6)
285	1.27 (Blast No. 6)
300	2.29 (Blast No. 4)
304	1.65 (Blast No. 10)
306	0.76 (Blast No. 8)
310	1.52 (Blast No. 10)
325	1.52 (Blast No. 4)
330	0.51 (Blast No. 9)
335	0.76 (Blast No. 4)
335	<0.51 (Blast No. 6)
350	0.76 (Blast No. 4)
350	1.14 (Blast No. 5)
360	0.89 (Blast No. 5)
370	<0.51 (Blast No. 5)
380	<0.51 (Blast No. 5)

From the data generated, the Ground Vibrations Propagation equation for PeriyanaGalur Limestone Mining Project site has been established as (Fig. 15):

$$V = 1010.9 (D/\sqrt{W})^{-1.636}$$

where,

V = Peak particle velocity (mm/s)

D = Distance between blast site and location of instrument / structure (m)

W = Maximum explosive charge / Delay (kg)

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The scientific study carried out in the *Periyagalur Limestone Mine of M/S The Ramco Cements Limited operating in Periyagalur Village, Ariyalur Taluk, Ariyalur District, Tamilnadu*, led to draw the following conclusions:

- In total, 10 production scale blasts were studied.
- All the blasts were having 110mm diameter blastholes. Depth of blastholes in the study varied from 5m to 10m, as per the bench height.
- Number of blastholes in the study varied from 10 to 25.
- Slurry explosives of 83mm diameter cartridges were used as primer and column charges.
- Each blasthole was charged with 16.02kg to 40.03kg of explosive.
- Maximum explosive charge per delay varied as 19.46kg, 25.02kg, 30.58kg, 36.14kg, 44.48kg, and 66.78kg, in 10 different production blast rounds studied.
- Total Explosive charge per blast varied from 225kg to 800kg in various production blasts.
- Initiation was done by Exel Dueldet system, which includes both down-the-hole and surface initiations, along with D-Cord.
- Peak Particle Velocities of 2-5mm/s were assigned as threshold ground vibration limit to the houses located in Kattupringiyam Ayyanagar and Chinna Nagalur villages. The Public road existing in between mine boundary and village structures may be assigned a PPV of 25mm/s.
- Other village structures of Kattupringiyam Ayyanagar and Chinna Nagalur are 500m away from existing Periyagalur Limestone Mine. Mud houses with improper foundation may be assigned with safe ground vibration level of 2mm/s, as per DGMS

norms. Tiled houses with cement lining and proper foundation may be assigned with safe ground vibration level of 5mm/s and other RCC structures may be given a threshold PPV value of 10-25mm/s as per DGMS standards. Temples, Schools, Hospitals/Dispensaries, and other sensitive structures may be assigned with the least Threshold ground vibration limit (PPV) of 2mm/s as per DGMS norms.

- Ground vibrations levels were monitored simultaneously at different distances from blast site around the premises of Mine area, near mine boundary, on public existing between boundary and villages structures, houses located in Kattupringiyam Ayyanagar and Chinna Nagalur villages and other locations using four (4) Microprocessor based Blast Vibration Monitors, Minimate Plus, Instanetel, Canada.
- Summary of ground vibrations recorded from all the blasts studied are given below:

Blast No.	No. of Holes	Explosive Charge/Hole (kg)	Total Explosive/Blast (kg)	Distance (m)	PPV (mm/s)
1	20	40.03	800.64	80	24.30
				94	16.80
				107	10.80
				120	9.40
2	21	27.40	575.46	155	4.44
				166	2.67
				177	2.29
				188	1.65
3	23	29.37	675.54	56	25.90
				122	8.00
				133	7.49
				144	7.24
4	20	22.52	450.36	300	2.29
				325	1.52
				335	0.76
				350	0.76
5	18	33.36	600.48	350	1.14
				360	0.89
				370	<0.51
				380	<0.51
6	13	19.25	250.2	250	1.78
				275	1.78
				285	1.27
				335	<0.51

7	24	25.02	600.48	140	3.81
				150	3.68
				160	3.43
				175	2.16
8	16	25.02	400.32	193	2.54
				230	1.52
				235	1.14
				306	0.76
9	10	22.52	225.18	216	1.27
				254	0.89
				260	0.76
				330	0.51
10	25	16.02	400.32	250	1.52
				253	2.16
				304	1.65
				310	1.52

- In general, the PPV levels reduced considerably from 100m distance onwards from the blast site.
- The PPVs recorded from 5 blasts at structures of Kattupringiyam Ayyanagar and Chinna Nagalur villages are lesser than the suggested limits.
- Shock tube system of initiation was effective in containing the Fly Rock to a maximum distance of 30m from blast site.
- Studies with given blast configurations having 10 to 25 holes of 5m to 10m average depth and each blasthole charged with 16.02kg – 40.03kg of explosive, indicated that there is no effect of ground vibrations and fly rock caused due to blasting operations carried out in the Periyannagalur Limestone Mine, on the stability of Kattupringiyam Ayyanagar and Chinna Nagalur village structures vis-à-vis the present distances.
- However, when the mine benches approach the village structures to about 100m, the depth of blastholes should be restricted to 6m.

The blasthole should have two explosive decks, each being detonated separately, with different delays, i.e., implementation of down-the-hole delay system.

The explosive charge per delay should be a maximum of 11kg.

In case the MCD has to be increased beyond this, techniques like pre-splitting or line drilling are to be used. In this strata, pre-splitting may not work as the rock mass is weaker relatively. Line drilling will be more useful. Periphery of the mine closer to villages may be line drilled, to arrest the propagation of ground vibrations. Depth of hole should be 5m more than the depth of pit.

Recommendations

Following recommendations are made based on the studies carried out, in order to improve the blasting operations further:

- Number of rows in blast round may be restricted to a maximum of two (2), when the distance between the mine and the Kattupringiyam Ayyanagar and the Chinna Nagalur villages is $\leq 150\text{m}$.
- The maximum number of blastholes per round may be restricted to a maximum of 25.
- Burden x Spacing pattern of 3.5m x 5m may be used.
- Blastholes may be drilled vertically, as this would ensure equal burden along the entire bench and also will reduce unnecessary movement / throw of material, minimizing the fly rock.
- Sequential blasting with shock tube system should be continued.
- While blasting from distances of $\leq 100\text{m}$ from village structures, Depth of blastholes should be a maximum of 6m. Double Decking of explosive column should be done, with each deck detonated at different timings like 450ms and 500ms or similar as per availability of down-the-hole delays. A maximum of 11kg per delay should be used for protecting the structures from ground vibrations.

- The following Blast Pattern is suggested:

A. For normal conditions:

Blasthole Diameter	110 mm
Bench Height	5-8m
Depth of blastholes	5-8m (Maximum)
No. of Blastholes / Round	25 (Maximum)
No. of Rows	2 (Maximum)
Burden	3.5m
Spacing	5m
Pattern of Holes	Staggered
Initiation	Shock tube system
Explosive Charge / Hole	30kg (Maximum)
Type of Explosive	Slurry explosives
Maximum Charge / Delay	40kg (Maximum)
Total Charge / Blast	1000kg (Maximum)
Initiation Pattern	As per Layouts shown in Appendix-1

B. For blasting at $\leq 100\text{m}$ from village structures, especially mud houses:

Blasthole Diameter	110 mm
Bench Height	5m
Depth of blastholes	6m (Maximum)
No. of Blastholes / Round	20 (Maximum)
No. of Rows	2 (Maximum)
Burden	3.5m
Spacing	5m
Pattern of Holes	Staggered
Initiation	Shock tube system
Explosive Charge / Hole	22kg (Maximum)
Type of Explosive	Slurry explosives
Maximum Charge / Delay	11kg (Maximum)
Total Charge / Blast	440kg (Maximum)
Initiation Pattern	As per Layouts shown in Appendix-1

REFERENCES

- Anon, 1997.** DGMS (Tech) / S&T Circular No. 7, dated 29-08-1997.
- Dowding, C.H., 1985.** Blast Vibration Monitoring and Control, Prentice Hall. Inc., NJ, USA.
- Duvall, W.I. and Fogelson, D.E., 1962.** Review of criteria for estimating damage of residence from blasting operations, USBM: 5968.
- Holloway, R., Lundborg, N. and Runquist, G., 1983.** Ground vibrations and damage criteria, SWEDEFO Report R85:1981.
- Holmberg, R., Lundborg, N. and Runquist, G., 1981.** Ground vibrations and damage criteria, SWEDEFO Report R85:1981.
- Nicholls, H.R., Johnson, C.F. and Duvall, W.I., 1971.** Blasting vibrations and their effects on structures, USBM Bull: 656.
- Ricker, N.N., 1997.** Transient Waves in Visco-elastic Media, Elsevier, New York.
- Sastry, V.R., 1995.** Study into the effect of blasts in OCP-I Project on GDK 10-Incline U/G workings, Singareni Collieries Company Limited, An Unpublished Report.
- Sastry, V.R., 2001.** Study of the effect of ground vibrations and fly rock caused due to blasting operations in Kallakudi limestone mine, Dalmia Cements Limited, Tamilnadu (An Unpublished Technical Report submitted to Dalmia Cement (Bharat) Limited).
- Sastry, V.R., 2001a.** Control of ground vibrations and fly rock caused due to blasting operations at Vishnupuram Limestone Mine, India Cements Limited, An unpublished report.
- Sastry, V.R., 2001b.** Investigation into ground vibrations and fly rock problems caused due to blasting operations in Kallakudi Limestone Mine, Dalmia Cement (Bharat) Limited, An Unpublished Report.
- Sastry, V.R., 2002.** Design of controlled blasting methodology for controlling ground vibrations and fly rock problems, Grasim Industries Limited, Ariyalur, Tamilnadu (An Unpublished Technical Report submitted to Grasim Industries Ltd.).
- Sastry, V.R. 2006.** Design of blasting operations for the protection of existing CNG pipeline from ground vibrations generated due to lasting for trenching for laying a new CNG pipeline at 5m distance, Panvel-Dhabol Pipeline Project, GAIL (An Unpublished Technical Report).
- Sastry, 2008.** Design of underwater blasting operations for rock dredging and protection of marine structures, especially Berth No. 9 at 5m distance from blast site at Tuticorin Port (An unpublished Technical Report).

- Siskind, D.E., Stagg, M.S., Kopp, I.W. and Dowding, C.H.**, 1981. Structures response and damage produced by ground vibrations from surface mine blasting, USBMRI: 8507.
- Taquieddin, S.A.**, 1982. The role of borehole containment on surface ground vibration levels at closed scaled distances
- Wei Wu, 1984.** The effect of simulated detonator scatter on rock fragmentation and ground vibrations in single row bench blasting, MS Thesis, Univ. Missouri, Rolla.
- Wiss, J.F. and Linehan, P.W.**, 1978. Control of Vibration and blast noise from surface coal mining, USBM OPR: 103-79.
- Wiss, J.F. and Nicholls, H.R.**, 1974. A study of damage to residential structure from blast vibrations, Special Publication, American Society of Civil Engineers, NY,73.

REPORT
(No.C/MN/67)

**Study of the Stability of Slopes at
Periyaganalur Limestone Mine of
M/s. The Ramco Cements Ltd., Ariyalur**

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**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

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Dr. M. ARUNA

Dr. HARSHA VARDHAN

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

1.0 INTRODUCTION

The importance of safe and properly designed slope is well known in the surface mining industry. The surface mining industry gets benefit in its operation mainly on the use of steepest possible slopes. However, such slopes should not fail during the life of the mine. Therefore, a mining engineer is faced with the two opposing requirements, i.e., stability of the slopes as well as its steepness in designing deep surface mines. Maintaining steeper slopes can reduce the amount of material to be excavated. This can result in lots of saving to a mining firm. However, extra steep slopes may result in slope failure leading to loss of production, extra stripping costs to remove failed material, reforming of benches, rerouting of haul roads and production delays. Therefore, proper balance between economics and safety should be achieved in working of surface mines.

The stability of the slope primarily depends on the strength properties of the slope materials and groundwater condition within the slope. The orientation of the discontinuity planes with respect to slope face determines the types of failure possible within that slope. Generally plane, wedge and toppling types of failure occur in rock slopes (Fig. 1), while in soil slopes and highly weathered rock slopes, circular failure is possible.

1.1 Plane failure: Plane failure occurs when a discontinuity striking parallel or approximately parallel (within 20°) to the slope face and dipping at a lower angle intersects the slope face making it possible to slide the material above discontinuity.

1.2 Wedge failure: Wedge failure occurs along the line of intersection of the two discontinuity planes, dipping inside the excavation.

1.3 Toppling failure: Toppling failure occurs where blocks are formed by a closely spaced and steeply inclined discontinuity system dipping into the excavation face. The centre of gravity of each block must fall outside its outer lower corner for toppling to occur, which may then set the block falling freely. Hence toppling can be dangerous in high slopes at the locations below which working is going on. Soil slopes that are approximately homogeneous, usually fail along a surface approaching a circular arc of finite length.

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

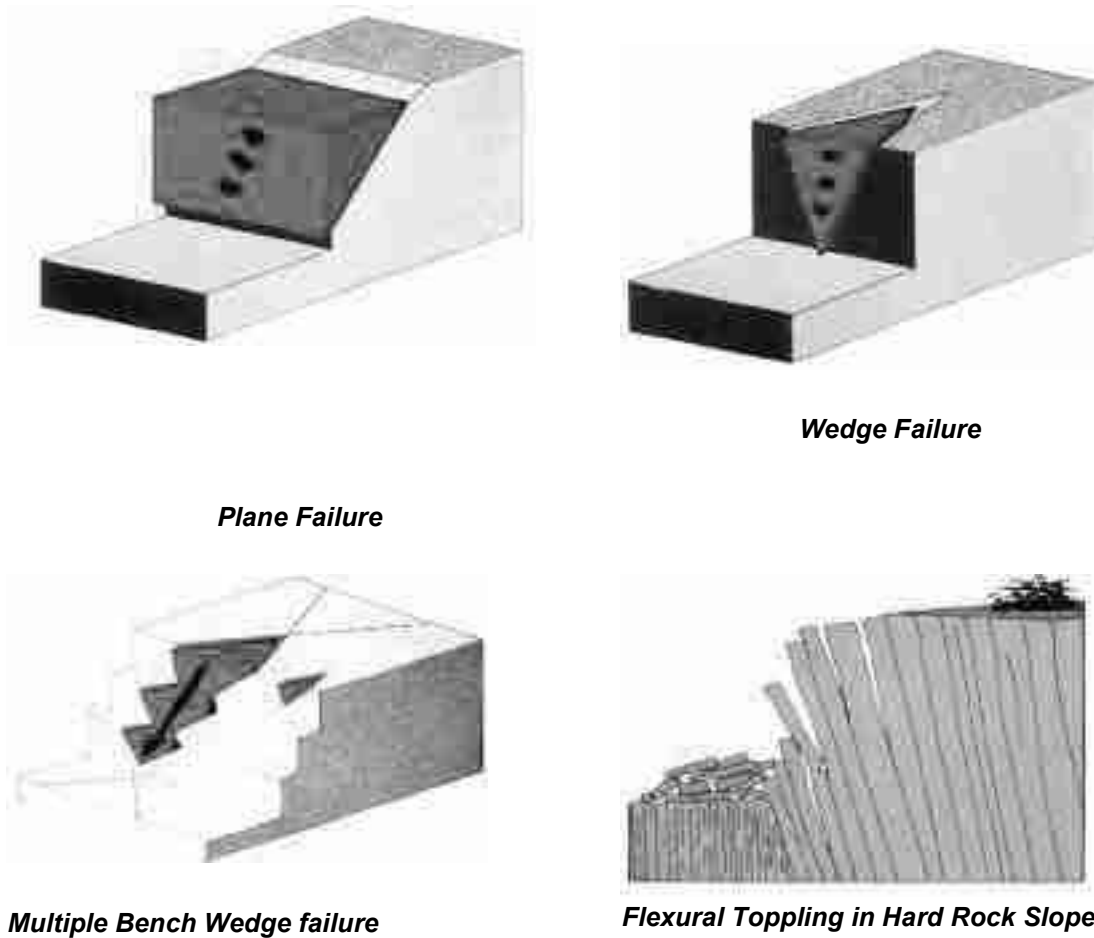


Fig. 1 Different types of failure of rock slopes

2.0 DETAILS OF THE MINE

2.1 Details of the Mine Lease Area

The Periyagalur Limestone Mines are located at Periyagalur village in Ariyalur Taluka, & District of Tamilnadu State. It extends over an area of 53.52 Ha. The topography of the area is almost a gentle slope with a maximum elevation of 65 m and minimum elevation of 61 m from MSL. All lands in the local supports only seasonal dry crops and there is no forest in the nearby area.

The mine lease is located at a distance of 8.0 km by road from Ariyalur on Chidambaram-Jayamkondam -Trichy road. Southern Railway line passes at a distance of 8.0 km from the west of the mining block.

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

2.2 Physiography (Topography and Drainage)

2.2.1 Regional Physiography

The area experiences semi-arid climate receiving rainfall of about 800 mm on average in a year. Seasonal Marudaiyar river flows during monsoon. The river is situated at about 4.0 km from the mining block. The limestone bearing areas stand out as fallow lands in an undulating terrain. At places fair amount of soil cover is found over limestone formation.

2.2.2 Local Physiography

The topography of the area is almost a gentle slope with a maximum elevation of 66 m and minimum elevation of 61 m from MSL. All lands in the local supports only seasonal dry crops and there is no forest in the nearby area

2.3 Geology

2.3.1 Regional Geology

In the Cauvery basin, carbonate rock form a sizable part of the stratigraphic column from the Lower Cretaceous to Recent. Limestone of Cretaceous and early Tertiary formations are exposed in three principal outcrop area viz. Trichirapalli, Virudhachalam and Pondicherry along the western margin of the basin. The western margin of the sediments have NE-SW trend. The limestone bed is sandwiched between two sandstone beds. It can be traced for more than 9 km in North-South direction. The strike of the deposit is NE-SW and dips towards east varying from 3° to 6°.

2.3.2 Local Geology

The area granted under M.L. comprises of the Ariyalur Groups of rocks. The dip of the Ariyalur formation is 3° to 6°. The strike of the limestone is NW-SE and dips towards east. The limestone is overlain by chert, marl, friable sandstone and underlain by sandstone beds. The order of succession of lithology of the mine lease area is given in Table 1.

2.4 Reserves & Quantity of Limestone

The limestone reserves of the Periyagalur Block (based on exploration) are estimated as 7.50 Million tones. The average grade of limestone in the mining lease area is around 86 % of CaCO₃.

Table 1: Order of succession

Sl. No.	Rock/ Soil	Average Depth from the Surface (m)

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

1	Top Soil (black in colour, occurs over micaceous sandstone layer)	0.00 – 1.00
2	Arenaceous Sandstone (wheathered and friable, has to be rejected as waste during mining)	1.00 -15.00
3	Shell Limestone Band No. 1 Ferruginous Limestone Limestone Band No. 2 (irregularly mixed in various proportions)	15.00 -55.00
4	Sandstone (Arenaceous in nature with more of quartz and considered a marker horizon)	Below 55.00 m

3.0 Method of Working

The mine is being operated with both Conventional & Non-conventional, Opencast Mechanized method of mining. The topsoil has been removed and dumped all around the periphery of the mining lease boundary. Overburden has also been removed. The present operating bench parameters are 6.0 m height and 6.0 m width with bench slope of 63°.

4.0 SLOPE STABILITY ANALYSIS

4.1 Collection of Baseline Data

Slope stability studies were taken up at Periyagalur Limestone Mine belonging to M/s Ramco Cements Limited, upon their request to the Department of Mining Engineering of National Institute of Technology Karnataka, Surathkal. Investigation was carried out by the team from March, 2014 onwards till March 2023. During this investigation, the team met the mine officials, visited the mines and identified areas for rock sample collection in consultation with the mine officials. Further, some other baseline data were collected from the mine plan and survey section taking the help of the geologists and surveyors working in the mine. The rock samples identified during field visits were sent to the Department of Mining Engineering, NITK Surathkal for testing.

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

4.2 Objectives

This study was taken up with the following objectives.

- ❖ Assessment of stability of highwall
- ❖ To recommend effective steps to be taken to improve stability of slopes of highwall, in order to avoid slope failures for the safety of the men and the machinery.

4.3 Laboratory Investigations

Laboratory studies were carried out on the rock samples collected from the field to determine the Density, Cohesion, Angle of Internal Friction, Young's Modulus and Poisson's Ratio. All these tests were carried out in the Mining and Civil Engineering Departments of the Institute. The results of the laboratory investigations for different rock properties are given in Table 2.

Table 2: Results of laboratory investigations for rock properties

Sl. No.	Strength Parameters					
	Rock sample	Density (gm/cm ³)	Cohesion (Kpa)	Angle of internal friction (deg)	Young's modulus (Mpa)	Poisson's Ratio (μ)
1	Black cotton soil	1.59	31	22	12.5	0.24
2	Micaceous Sandstone	2.43	40	26	6200.0	0.24
3	Limestone	2.22	44	27	11323.0	0.23
4	Ferruginous Limestone	2.10	42	22	11408.0	0.21

4.4 Analysis of Slopes

There are several methods and techniques for the stability analysis of slopes. However, all these methods have their own limitations and short comings. The stability analysis and determination of Factor of Safety (FOS) in the present investigation was carried out using Limit Equilibrium Method. For this purpose, GALENA software available in the Department of Mining Engineering was used. To analyze the "Stress Distribution" within the rock mass, Finite Element Modeling was carried out using ANSYS software.

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

4.4.1 Limit Equilibrium Method

For the stability of a block in an inclined plane, the condition at which the force tend to induce sliding in the block is exactly balanced by those resisting sliding. This is called “Condition of Limiting Equilibrium”. In order to compare the stability of the slopes under the conditions other than those of “Limiting Equilibrium”, some form of index is required. The most commonly used index is the Factor of Safety (FOS). This can be defined as the ratio of the total force available to resist sliding to the total force tending to induce sliding. When the slope is on the point of failure, a condition of limiting equilibrium exists in which the resisting and disturbing forces are equal. When the slope is stable, the resisting forces are greater than the disturbing forces and the value of Factor of Safety is greater than unity.

Using GALENA slope stability software the analysis was carried out for the Sections ML -5 (East & West) and ML -4 (East & West)

Following input parameters were used in the model:

- Height of bench
- Width of bench
- Depth of tension crack (if applicable)
- Failure plane angle
- Face angle
- Angle of internal friction
- Cohesion of the rock mass
- Density of rock
- Depth of mining
- Width of the pit
- Depth of water table (if applicable)

The results of the laboratory studies, given in Table 2 , were used in the analysis. To suit the compatibility of the Galena software with the given sections, each section has been divided into two parts: left part of the planned pit configuration shows the Western part of the property and right part shows the Eastern part of the property. Thus, the left side of the planned pit configuration for a section is the West and right part is East. Readers are, thus, requested to refer sections while going through the report.

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

A) Analysis for Section ML-4

a) Analysis for Section ML-4 West for Planned Pit Configuration

The bench design parameters from top to bottom for the planned pit configurations for the Section ML-4 West are given in Table 3

The result of slope stability analysis of Section ML-4 West for the planned pit configuration is shown in Figure 2. In this section, the bench slope angle is kept at 62°. The width of benches are 6 m each and height of benches are also 6 m each, except the lowest one which is 1.05m. This has been designed keeping in mind that the ultimate pit slope angle is 35°. As per the section, the slope starts at 66.5 m RL and ends at 16 m RL. The ultimate pit slope indicated in the section is 35°. For this pit configuration the tension crack angle with horizontal is 33.2°. The analysis indicates a FOS of 2.34 which is above the safe limit. Hence this planned pit configuration is safe.

b) Analysis for Section ML-4 East for Planned Pit Configuration

In this section the bench slope angle is 65°. The height of each bench being 6 m except the lowest bench which is 3.46 m high. The width of the benches have been kept 6 m each. (Table 3). The result of analysis for this section is shown in Figure 3. The analysis indicates a FOS of 1.74 which is above the safe limit. As per the section, the slope starts at 63.86 m RL and ends at 12.40 m RL with ultimate pit slope angle of 36°. As per slope stability analysis the tension crack angle with horizontal is 19.8°.

Table 3: Bench design parameter from top to bottom for Section-ML-4 for planed pit configuration

Name of the mine	Sections under investigation	Height (m)	Width (m)	Slope angle (in deg)
Periyagalur Limestone Mine	Section: ML-4 West Planned	8.00	8.00	62
		8.00	8.00	62
		8.00	8.00	62
		8.00	8.00	62
		8.00	8.00	62
		8.00	8.00	62
		1.05	-	62
	Section- ML-4 East Planned	8.00	8.00	65
		8.00	8.00	65
		8.00	8.00	65
		8.00	8.00	65
		8.00	8.00	65
		8.00	8.00	65

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

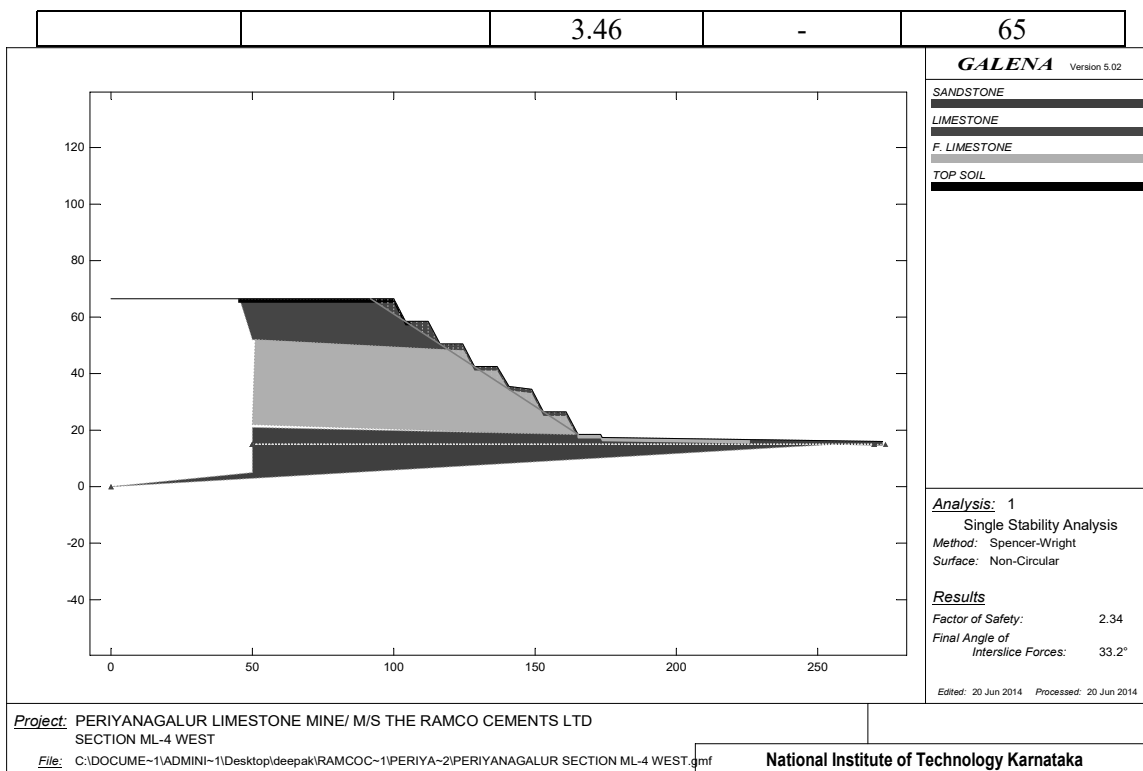


Fig. 2 Analysis of slope along Section: ML-4 West for planned pit configuration

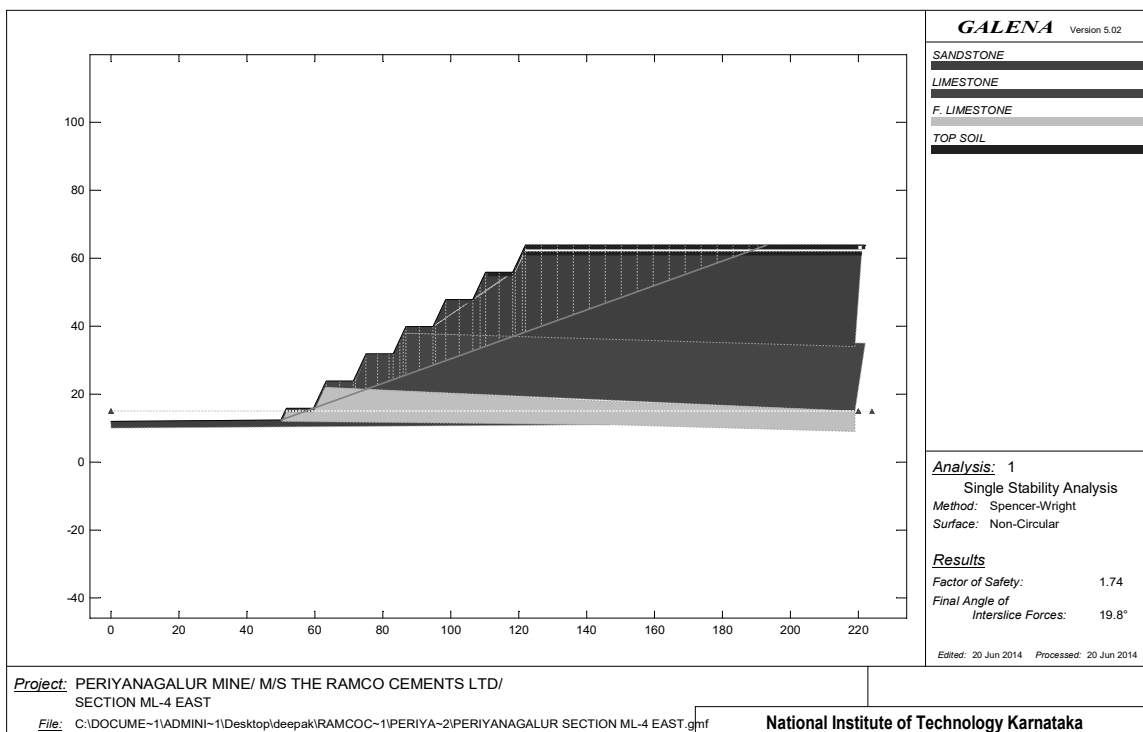


Fig. 3 Analysis of slope along Section: ML-4 East for planned pit configuration

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

B) Analysis for Section ML -5

a). Analysis for Section ML -5 West for Planned Pit Configuration

The bench design parameters from top to bottom for the planned pit configurations for Section ML-5 West are given in Table 4.

In this section, the bench slope angle is kept at 65°. The width of benches has been kept 8.0 m each. The height of benches has also been kept 6 m each except the lowest one which is 0.33 m (Table 3). The result of analysis for this section is shown in Figure 4. The analysis indicates a FOS of 2.19 which is above the safe limit. As per the section, the slope starts at 65.2 m RL and ends at 16.87 m RL with ultimate pit slope angle of 35°. As per slope stability analysis the tension crack angle with horizontal is 34.2°.

Table 4: Bench design parameters from top to bottom for Section : ML -5 for planned pit configurations

Name of the mine	Sections under investigation	Height (m)	Width (m)	Slope angle (in deg)
Periyagalur Limestone Mine	Section : ML-5 West Planned	8.00	8.00	65
		8.00	8.00	65
		8.00	8.00	65
		8.00	8.00	65
		8.00	8.00	65
		8.00	8.00	65
		0.33	-	65
	Section : ML-5 East Planned	8.00	8.00	65
		8.00	8.00	65
		8.00	8.00	65
		8.00	8.00	65
		8.00	8.00	65
		8.00	8.00	65
		4.56	-	65

**Report on the Stability of Slopes of Periyaganalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

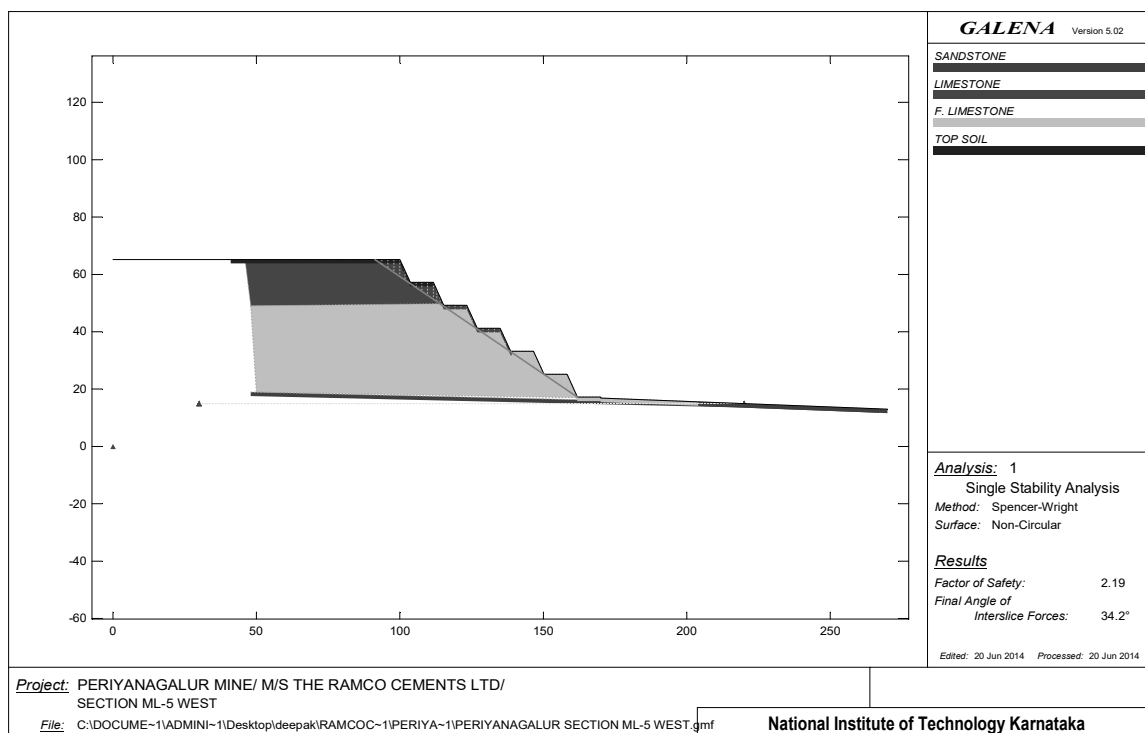


Fig. 4 Analysis of slope along Section : ML-5 West for planned pit configuration

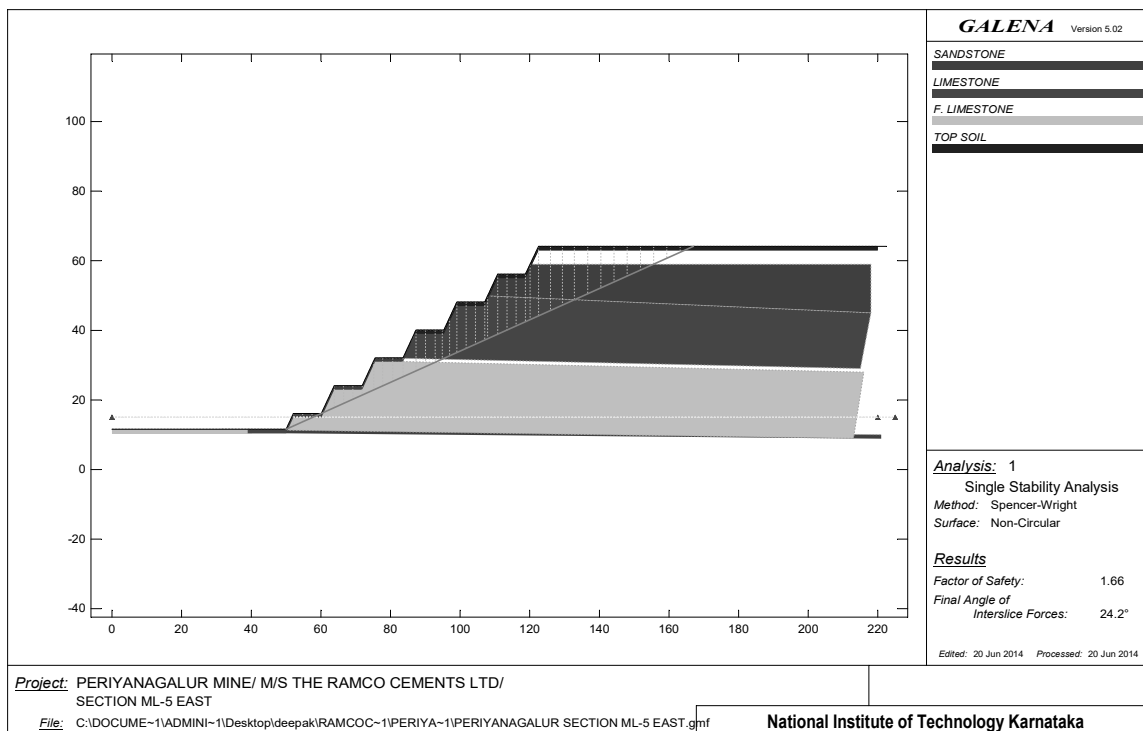


Fig. 5 Analysis of slope along Section: ML-5 East for planned pit configuration
b) Analysis for Section ML-5 East for Planned Pit Configuration

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

The bench design parameters from top to bottom for the planned pit configurations for Section - ML-5 East are given in Table 4.

In this Section the bench slope angle is 65° . The height of each bench being 6 m except the lowest one which is 4.56 m high. The width of the benches have been kept 6 m each (Table 4). The result of analysis for this section is shown in Figure 5. The analysis indicates a FOS of 1.66 which is above the safe limit. As per the mine section, the slope starts at 64.12 m RL and ends at 11.56 m RL with ultimate pit slope angle of 36° . As per slope stability analysis the tension crack angle with the horizontal is 24.2° .

The summary of ultimate pit slope angle and factor of safety for different sections under consideration are given in Table 5.

Table 5: Summary of ultimate pit slope angle and factor of safety for different sections (ideal condition) under consideration

Sl. No.	Sections	Factor of Safety	Ultimate Pit Slope (in deg)
1	Section: ML-4 West Planned	2.34	35
	Section: ML-4 East Planned	1.74	36
2	Section: ML-5 West Planned	2.19	35
	Section :ML-5 East Planned	1.66	36

4.4.2 Analysis of Pit Stability by- Finite Element Method - “ANSYS”

Finite Element Modeling (FEM) was carried out to know the stress distribution within the slopes. For this purpose ANSYS package available in the CAD Lab of the Department of Mechanical Engineering of the Institute was used. The whole block was modeled considering 2-D 6-Node Triangular Structural Solid (Plane 2) nodes for static plain strain conditions. The block will automatically take care of global inertia. Degree of freedom at each node is u_x and u_y . The element has quadratic displacement behavior, and it is well suited to model irregular mesh. Table 2 gives the input parameters for the FEM analysis.

A) Analysis of Section ML-4

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

(a) Analysis of Section ML-4 West for Planned pit configuration

Figure 6 and Figure 7 show the vertical displacement and stress distribution analysis respectively along Section ML-4 West for the planned pit configuration.

(i) Displacement profile:

Maximum vertical displacement – 5.059 mm

Minimum vertical displacement – nil

(ii) Vertical Stress Distribution Profile:

Maximum Stress – 0.996 N/mm² along lowest bench

Minimum Stress – 0.222N/mm² along most of the slopes

According to Figure 7, stress is in the range 0.001 to 0.222 N/mm² near the face. However, stress concentration of the order 0.222 to 0.444 N/mm² is observed near toe of all the benches and thus require regular monitoring.

(b) Analysis of Section ML-4 East for Planned pit configuration

Figure 8 and Figure 9 show the vertical displacement and stress distribution analysis respectively along Section ML-4 East for the planned pit configuration.

(i) Displacement profile:

Maximum vertical displacement – 4.01mm

Minimum vertical displacement – nil

(ii) Vertical Stress Distribution Profile:

Maximum Stress – 1.029N/mm² along lowest bench

Minimum Stress – 0.114N/mm² along most of the slopes

According to Figure 9, stress is in the range 0.25×10^{-3} to 0.114 N/mm² near the face. However, stress concentration of the order 0.114 to 0.457 N/mm² is observed near toe of all the benches and thus require regular monitoring.

B) Analysis of Section ML-5

(a) Analysis of Section ML-5 West for Planned Pit Configuration

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

Figure 10 and Figure 11 show the vertical displacement and stress distribution analysis respectively along Section ML-5 West for the planned pit configuration.

(i) Displacement profile:

Maximum vertical displacement – 3.8 mm

Minimum vertical displacement – nil

(ii) Vertical Stress Distribution Profile:

Maximum Stress – 1.12 N/mm² along lowest bench

Minimum Stress – 0.12-0.24 N/mm² along most of the slopes

According to Figure 11, stress is in the range 0.12×10^{-4} to 0.24 N/mm² near the face. However, stress concentration of the order 0.24 to 0.49 N/mm² is observed near toe of all the benches and thus require regular monitoring.

(b) Analysis of Section ML-5 East for Planned Pit Configuration

Figure 12 and Figure 13 show the vertical displacement and stress distribution analysis respectively along Section ML-5 East for the planned pit configuration.

(i) Displacement profile:

Maximum vertical displacement – 3.143 mm

Minimum vertical displacement – nil

(ii) Vertical Stress Distribution Profile:

Maximum Stress – 0.941 N/mm² along lowest bench

Minimum Stress – 0.104 N/mm² along most of the slopes

According to the Figure 13, stress is in the range 0.46×10^{-4} to 0.104 N/mm² near the face. However, stress concentration of the order 0.2 to 0.4 N/mm² is observed near toe of all the benches and thus require regular monitoring.

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

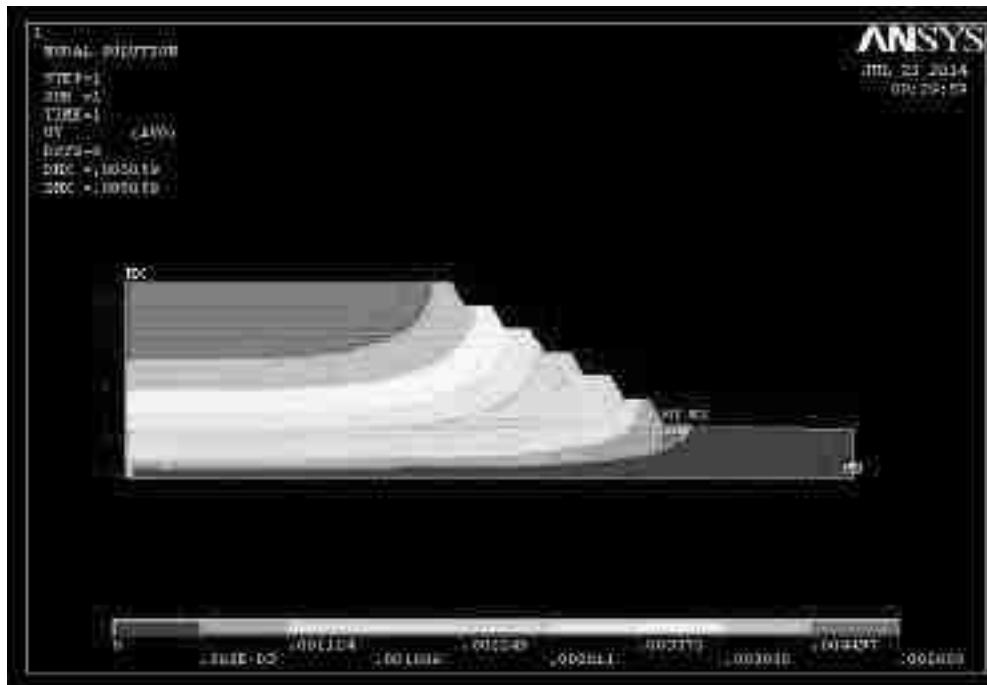


Fig.6 : The vertical displacement along Section : ML -4 West for the planned pit configuration

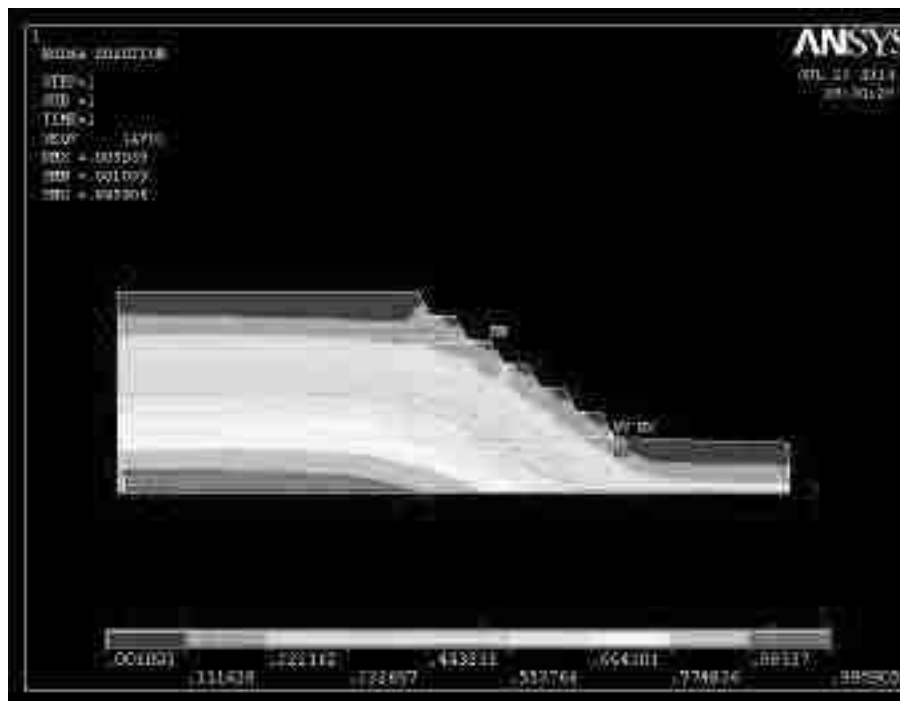


Fig. 7 : The stress distribution analysis along Section : ML-4 West for the planned pit configuration

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M/s. The Ramco Cements Ltd., Ariyalur**

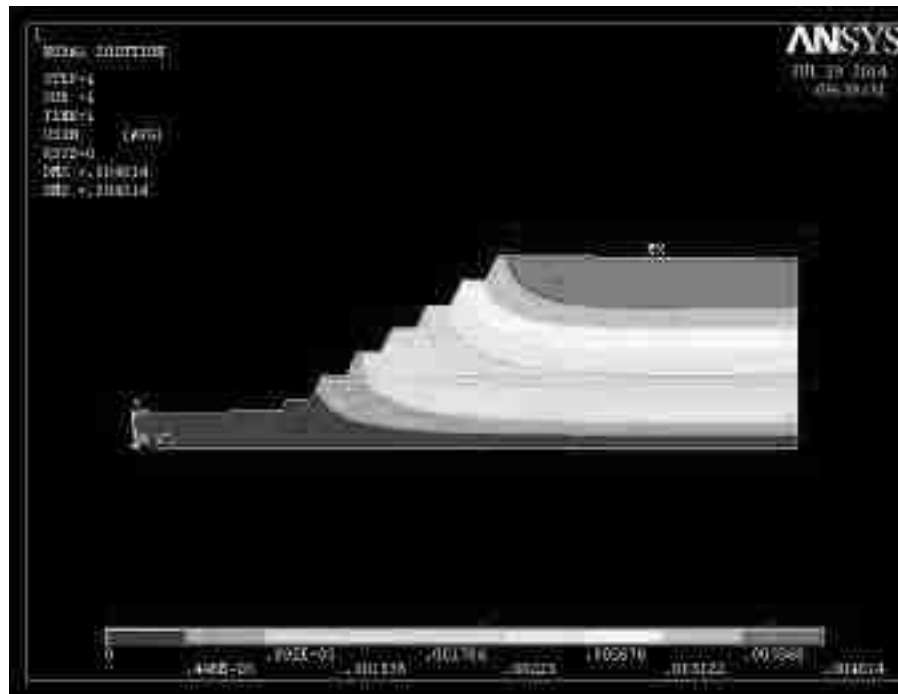


Fig. 8 : The vertical displacement along Section : ML -4 East for the planned pit configuration

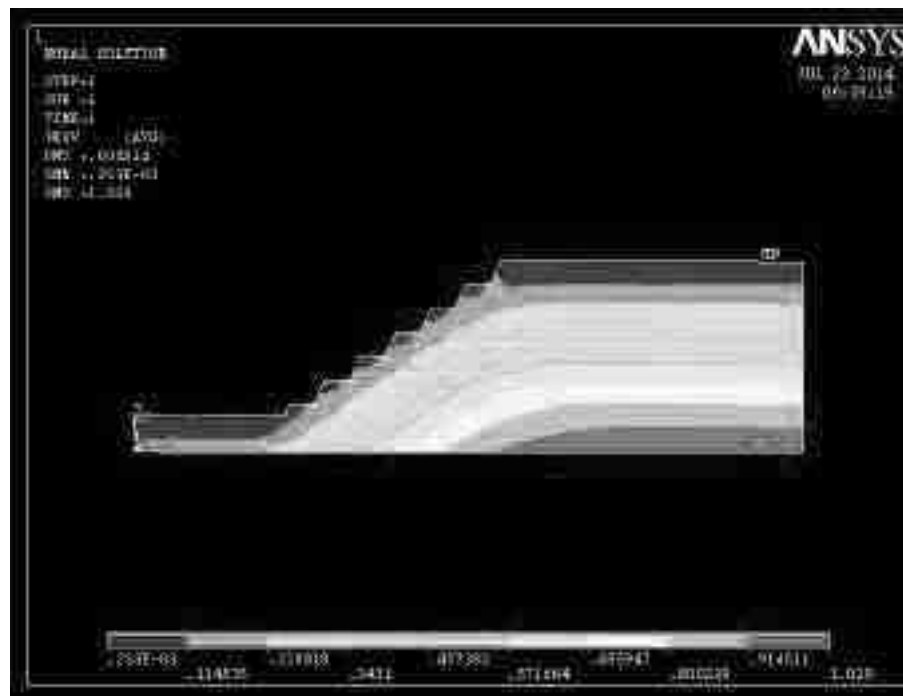


Fig. 9: The stress distribution analysis along Section : ML-4 East for the planned pit configuration

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

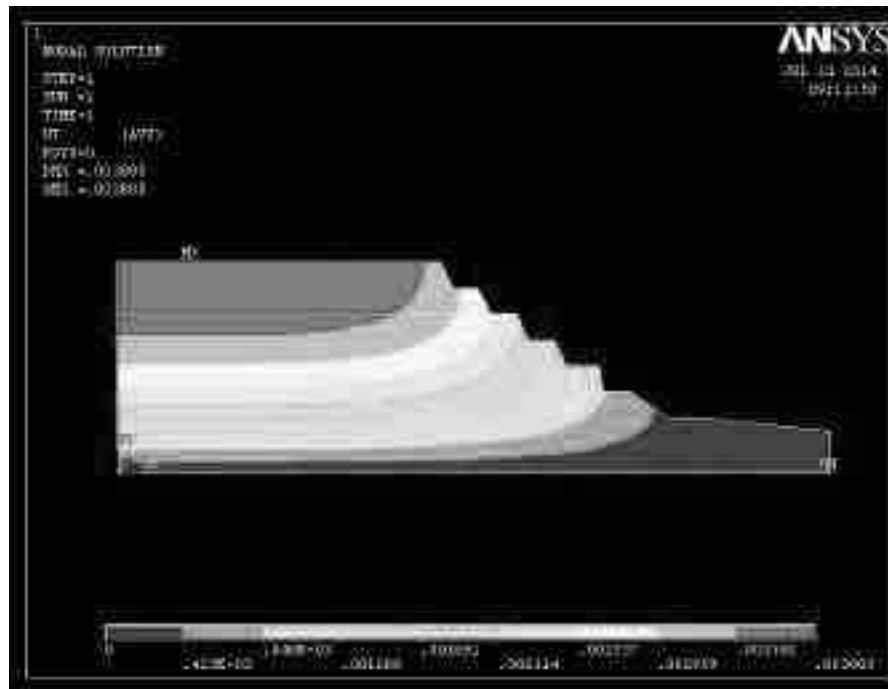


Fig.10 : The vertical displacement along Section : ML -5 West for the planned pit configuration

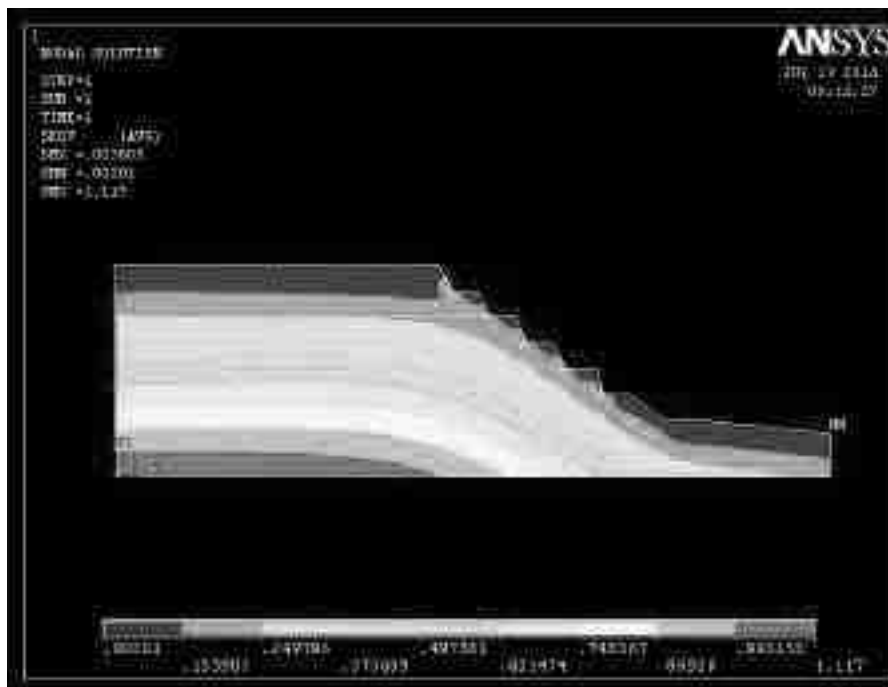


Fig. 11: The stress distribution analysis along Section : ML-5 West for the planned pit configuration

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

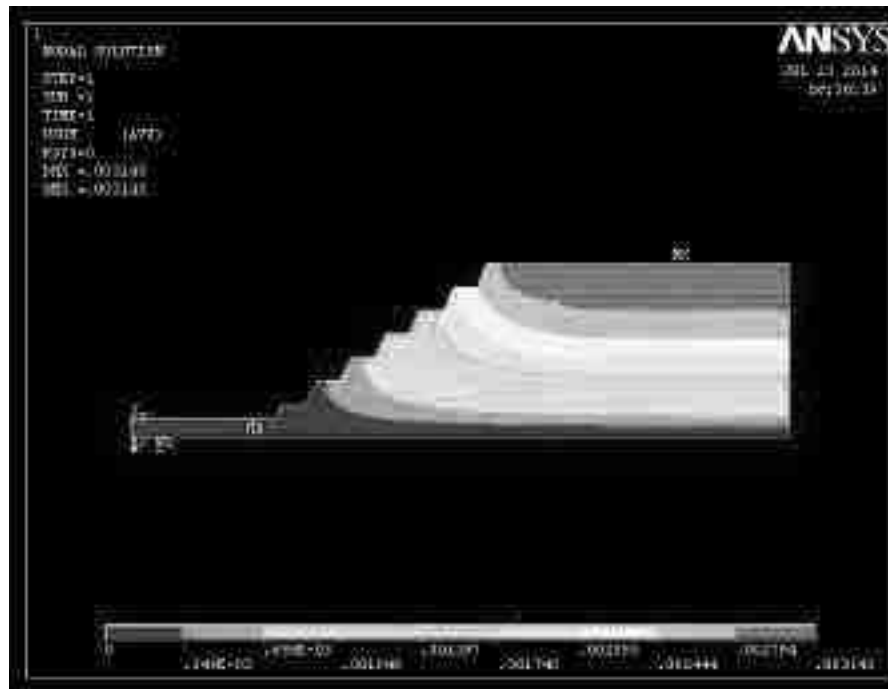


Fig. 12: The vertical displacement along Section : ML -5 East for the planned pit configuration

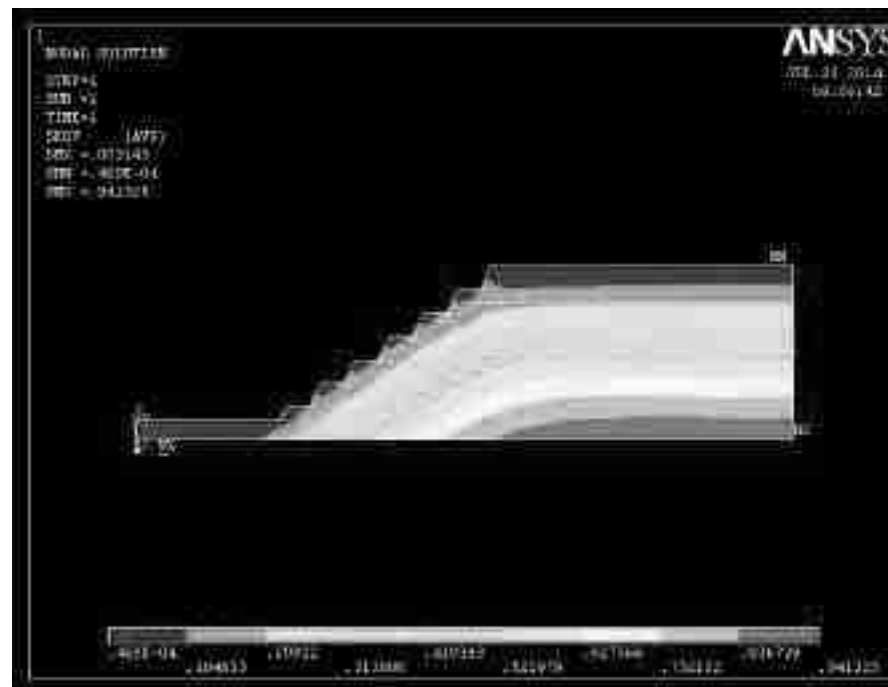


Fig. 13: The stress distribution analysis along Section : ML -5 East for the planned pit configuration

4.4.3 Analysis of Pit Stability for Some Special Cases By Limit Equilibrium Method”

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

CASE I (Height of bench 6 m, Width of Bench 3 m)

Note : The height of the lowest bench may not be as specified as can be seen from Table 6. It may be noted that the bench width and height is the same as per the Sections given by M/s Ramco Cements Ltd. They have not been modified/alterd.

A) Analysis for Section ML-4

a) Analysis for Section ML-4 East (3 m width) for Planned Pit Configuration

The bench design parameters from top to bottom for the planned pit configurations for the Section ML-4 for 3 m width and 6 m height are given in Table 6.

The result of slope stability analysis of Section ML-4 East (3 m width) for the planned pit configuration is shown in Figure 14. In this section, the bench slope angle is kept at 63.4° . The width of benches are 3 m each and height of benches are 6 m each, except the lowest one which is 4.0 m high. This has been designed keeping in mind that the ultimate pit slope angle is 50° . As per the section, the slope starts at 63.86 m RL and ends at 11.86 m RL. For this pit configuration the tension crack angle with horizontal is 38.2° . The analysis indicates a FOS of 1.10 which is below the safe limit. The factor of safety for individual bench slope lie between 2.1 – 2.8. Hence, this planned pit configuration is not safe as the overall FOS is below 1.3.

b) Analysis for Section ML-4 West (3 m width) for Planned Pit Configuration

The bench design parameters from top to bottom for the planned pit configurations for the Section ML-4 for 3 m width and 6 m height are given in Table 6.

The result of slope stability analysis of Section ML-4 West (3 m width) for the planned pit configuration is shown in Figure 15. In this section, the bench slope angle is kept at 63.4° . The width of benches are 3 m each and height of benches are 6 m each. This has been designed keeping in mind that the ultimate pit slope angle is 51° . As per the section, the slope starts at 66.50 m RL and ends at 18.50 m RL. For this pit configuration the tension crack angle with horizontal is 48.1° . The analysis indicates a FOS of 2.27 which is above the safe limit. The factor of safety for individual bench slope lie between 2.1 - 2.6. Hence, this planned pit configuration is safe.

B) Analysis for Section ML-5

a) Analysis for Section ML-5 East (3 m width) for Planned Pit Configuration

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

The bench design parameters from top to bottom for the planned pit configurations for the Section ML-5 for 3 m width and 6 m height are given in Table 6.

The result of slope stability analysis of Section ML-5 East (3 m width) for the planned pit configuration is shown in Figure 16. In this section, the bench slope angle is kept at 64° . The width of benches are 3 m each and height of benches are 6 m each, except the lowest one which is 3.1 m high. This has been designed keeping in mind that the ultimate pit slope angle is 50° . As per the section, the slope starts at 64.10 m RL and ends at 13.00 m RL. For this pit configuration, the tension crack angle with the horizontal is 38.1° . The analysis indicates a FOS of 1.2, which is below the safe limit. The factor of safety for individual bench slope lie between 1.8 -2.8. Hence, this planned pit configuration is not safe. However, this can be made safe if the height of the lowest two benches is adjusted to 6 m each.

b) Analysis for Section ML-5 West (3 m width) for Planned Pit Configuration

The bench design parameters from top to bottom for the planned pit configurations for the Section ML-5 for 3 m width and 6 m height are given in Table 6.

The result of slope stability analysis of Section ML-5 West (3 m width) for the planned pit configuration is shown in Figure 17. In this section, the bench slope angle is kept at 64° . The width of benches are 3 m each and height of benches are 6 m each. This has been designed keeping in mind that the ultimate pit slope angle is 51° . As per the section, the slope starts at 65.20 m RL and ends at 17.20 m RL. For this pit configuration the tension crack angle with horizontal is 44.4° . The analysis indicates a FOS of 2.20, which is above the safe limit. The factor of safety for individual bench slope lie between 1.8–2.6. Hence this planned pit configuration is safe.

Table 6: Bench design parameters from top to bottom for Section ML-4 and ML-5 for planned pit configurations with 3 m width and 6 m height

**Report on the Stability of Slopes of Periyaganalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

Name of the mine	Sections under investigation	Height (m)	Width (m)	Slope angle (in deg)
Periyaganalur Limestone Mine	Section : ML-4 (3 m) East Planned	8	3	64
		8	3	64
		8	3	64
		8	3	64
		8	3	64
		8	3	64
		4	-	64
	Section : ML-4 (3 m) West Planned	8	3	64
		8	3	64
		8	3	64
		8	3	64
		8	3	64
		8	-	64
	Section : ML-5 (3 m) West Planned	8	3	64
		8	3	64
		8	3	64
		8	3	64
		8	3	64
		8	3	64
		3.1	-	64
	Section : ML-5 (3 m) West Planned	8	3	64
		8	3	64
		8	3	64
		8	3	64
8		3	64	
8		-	64	

**Report on the Stability of Slopes of Periyangalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

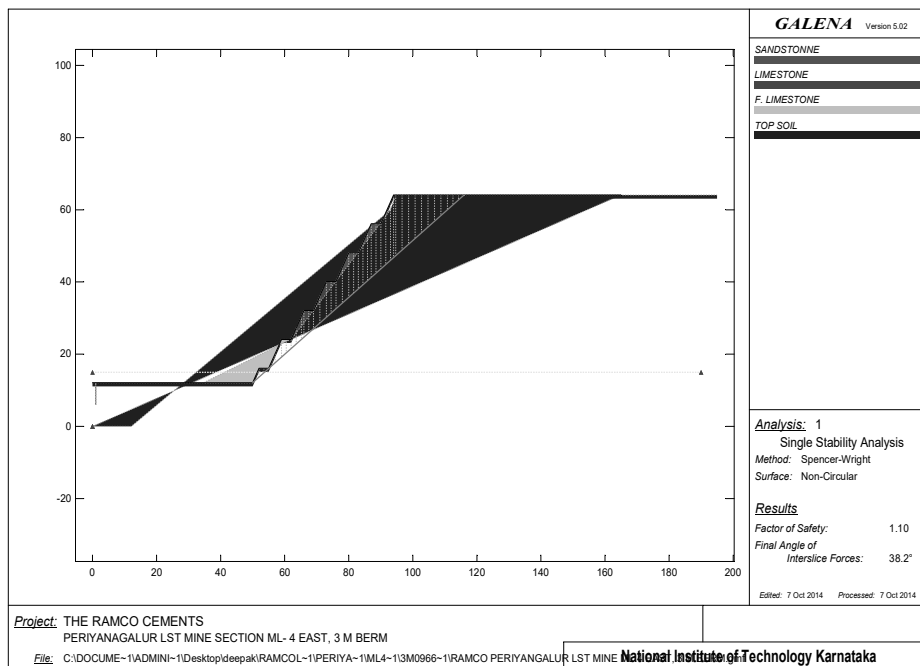


Fig. 14: Analysis of slope along Section –ML-4 East for planned pit configuration (3 m width)

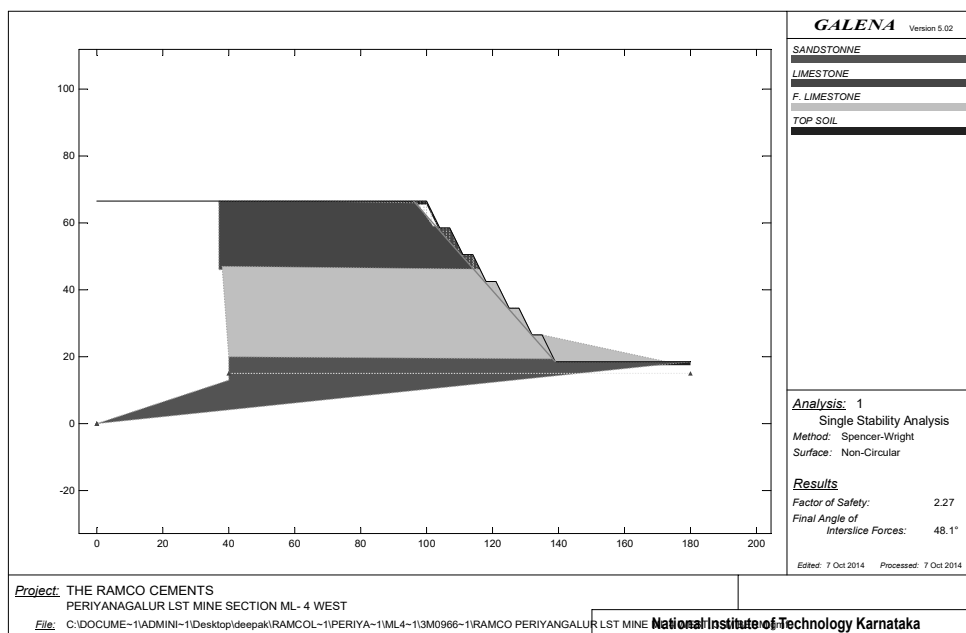


Fig. 15: Analysis of slope along Section –ML-4 West for planned pit configuration (3 m width)

**Report on the Stability of Slopes of Periyangalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

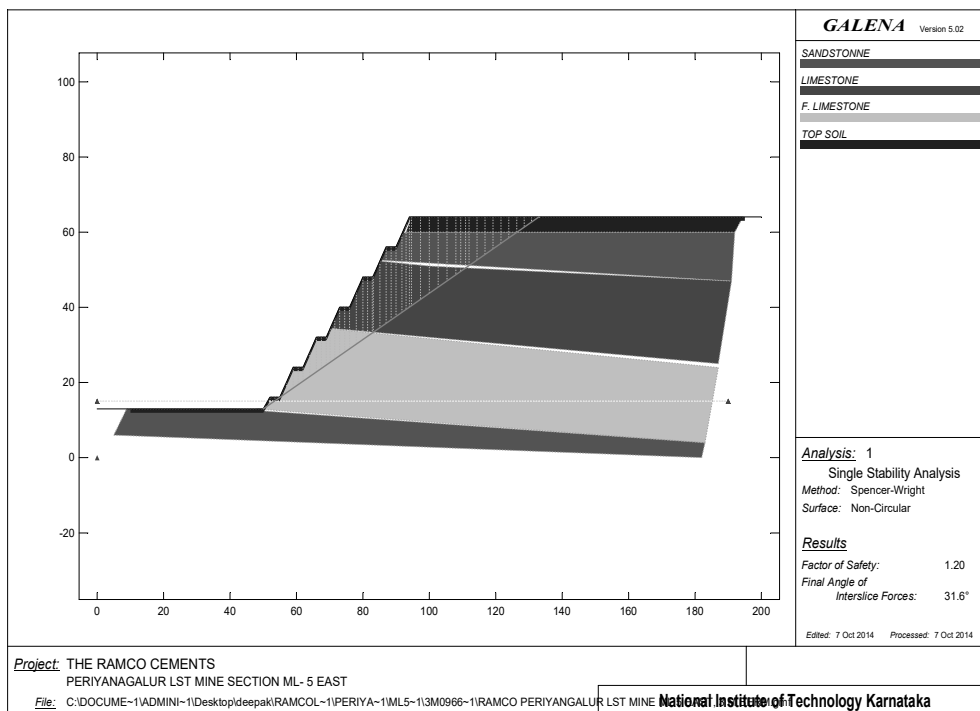


Fig. 16: Analysis of slope along Section –ML-5 East for planned pit configuration (3 m width)

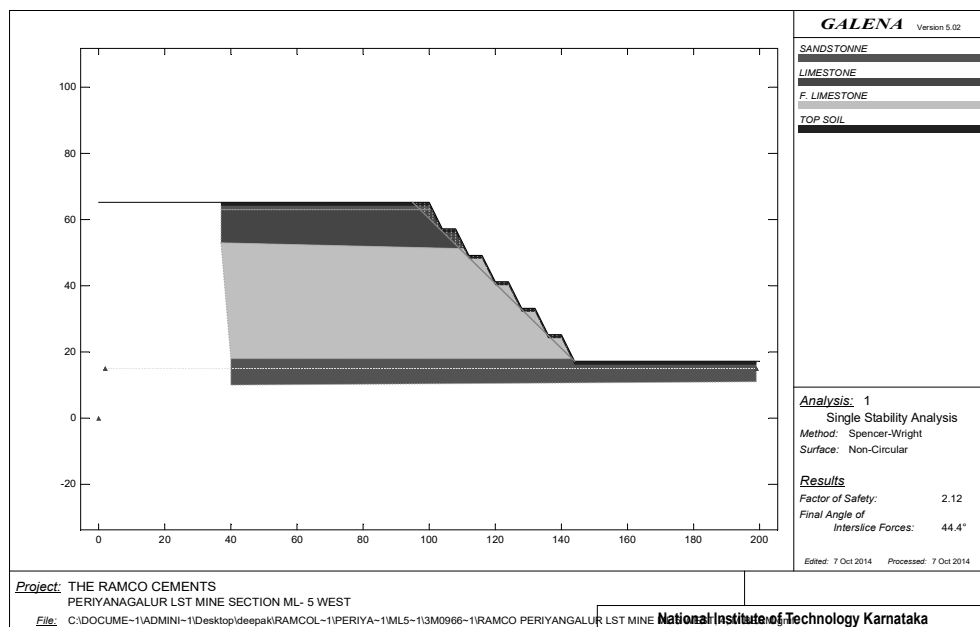


Fig. 17: Analysis of slope along Section –ML-5 West for planned pit configuration (3 m width)

CASE II: (Height of bench 6 m, Width of Bench 4 m)

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

Note : The height of the lowest bench may not be as specified as can be seen from Table 7. It may be noted that the bench width and height is the same as per the Sections given by M/s Ramco Cements Ltd. They have not been modified/altered.

A) Analysis for Section ML-4

a) Analysis for Section ML-4 East (4 m width) for Planned Pit Configuration

The bench design parameters from top to bottom for the planned pit configurations for the Section ML-4 for 4 m width and 6 m height are given in Table 7.

The result of slope stability analysis of Section ML-4 East (4 m width) for the planned pit configuration is shown in Figure 18. In this section, the bench slope angle is kept at 64° . The width of benches are 4 m each and height of benches are 6 m each, except the lower two benches which are 6.0 m high. This has been designed keeping in mind that the ultimate pit slope angle is 46° . As per the section, the slope starts at 63.86 m RL and ends at 11.86 m RL. For this pit configuration the tension crack angle with horizontal is 40.5° . The analysis indicates a FOS of 1.58 which is above the safe limit. The factor of safety for individual bench slope lie between 2.0 - 2.6. Hence this planned pit configuration is safe.

b) Analysis for Section ML-4 West (4 m) for Planned Pit Configuration

The bench design parameters from top to bottom for the planned pit configurations for the Section ML-4 for 4 m width and 6 m height are given in Table 7.

The result of slope stability analysis of Section ML-4 West (4 m width) for the planned pit configuration is shown in Figure 19. In this section, the bench slope angle is kept at 64° . The width of benches are 4 m each and height of benches are 6 m each, except the lower two benches which are 6.0 m and 2.0 m high. This has been designed keeping in mind that the ultimate pit slope angle is 45° . As per the section, the slope starts at 66.50 m RL and ends at 18.50 m RL. For this pit configuration the tension crack angle with horizontal is 21.8° . The analysis indicates a FOS of 1.7 which is above the safe limit. The factor of safety for individual bench slope lie between 2.0 – 2.6. Hence this planned pit configuration is safe.

B) Analysis for Section ML-5

a) Analysis for Section ML-5 East (4 m width) for Planned Pit Configuration

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

The bench design parameters from top to bottom for the planned pit configurations for the Section ML-5 for 4 m width and 6 m height are given in Table 7.

The result of slope stability analysis of Section ML-5 East (4 m width) for the planned pit configuration is shown in Figure 20. In this section, the bench slope angle is kept at 64°. The width of benches are 4 m each and height of benches are 6 m each, except the lowest one which is 3.1 m high. This has been designed keeping in mind that the ultimate pit slope angle is 46°. As per the section, the slope starts at 64.10 m RL and ends at 13.00 m RL. For this pit configuration the tension crack angle with horizontal is 23.7°. The analysis indicates a FOS of 1.53 which is above the safe limit. The factor of safety for individual bench slope lie between 2.1 -2.8 . Hence this planned pit configuration is safe.

b) Analysis for Section ML-5 West (4 m width) for Planned Pit Configuration

The bench design parameters from top to bottom for the planned pit configurations for the Section ML-5 for 4 m width and 6 m height are given in Table 7.

The result of slope stability analysis of Section ML-5 West (4 m width) for the planned pit configuration is shown in Figure 21. In this section, the bench slope angle is kept at 64°. The width of benches are 4 m each and height of benches are 6 m each, except the lower two benches which are 6.0 m and 2.0 high. This has been designed keeping in mind that the ultimate pit slope angle is 45°. As per the section, the slope starts at 65.20 m RL and ends at 17.20 m RL. For this pit configuration the tension crack angle with horizontal is 21.5°. The analysis indicates a FOS of 1.71 which is above the safe limit. The factor of safety for individual bench slope lie between 2.1 - 2.7. Hence this planned pit configuration is safe.

Table 7: Bench design parameters from top to bottom for Section : ML -4 and ML-5 for planned pit configurations with 4 m width and 6 m height

**Report on the Stability of Slopes of Periyaganalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

Name of the mine	Sections under investigation	Height (m)	Width (m)	Slope angle (in deg)
Periyaganalur Limestone Mine	Section: ML-4 (4 m) East Planned	8	4	64
		8	4	64
		8	4	64
		8	4	64
		8	4	64
		6	4	64
		6	-	64
	Section: ML-4 (4 m) West Planned	8	4	64
		8	4	64
		8	4	64
		8	4	64
		8	4	64
		6	4	64
		2	-	64
	Section: ML-5 (4 m) West Planned	8	4	64
		8	4	64
		8	4	64
		8	4	64
		8	4	64
		8	4	64
		3.1	-	64
	Section: ML-5 (4 m) West Planned	8	4	64
		8	4	64
		8	4	64
		8	4	64
		8	4	64
		6	4	64
		2	-	64

**Report on the Stability of Slopes of Periyangalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

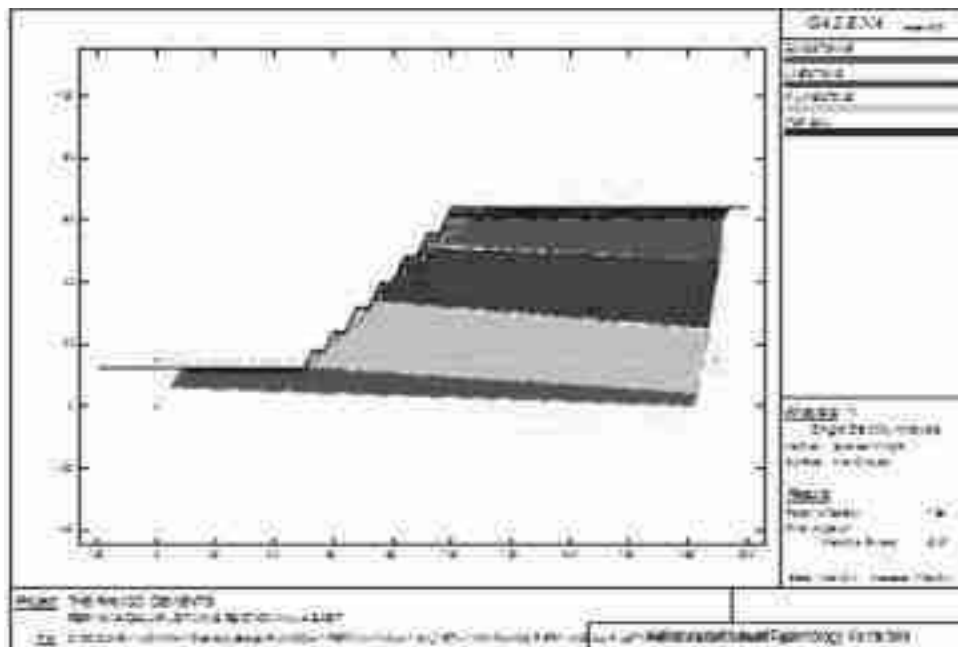


Fig. 18: Analysis of slope along Section –ML-4 East for planned pit configuration (4 m width)

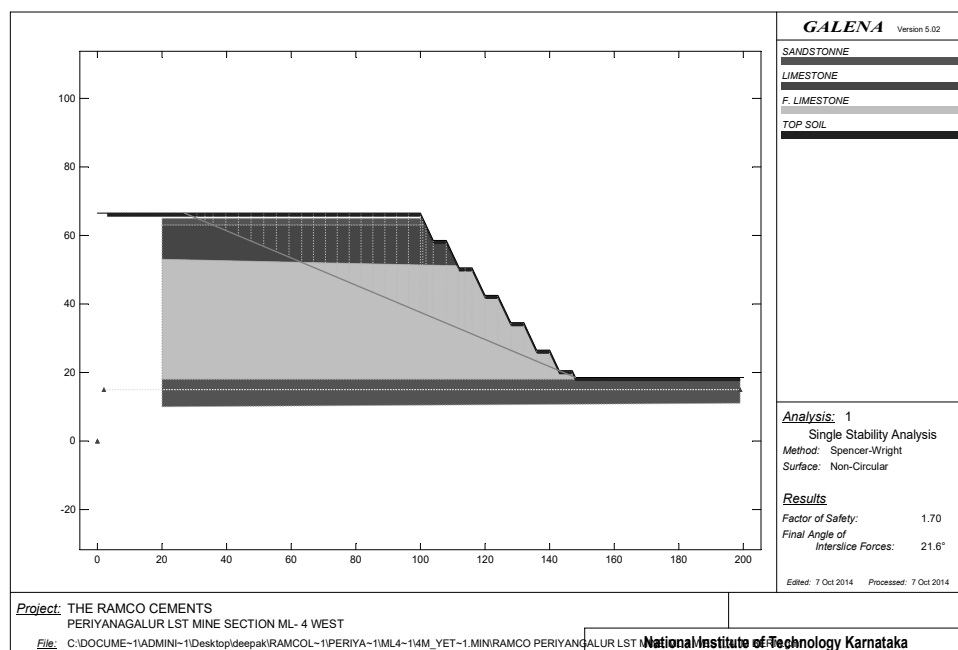


Fig. 19: Analysis of slope along Section –ML-4 West for planned pit configuration (4 m width)

Report on the Stability of Slopes of Periyangalur Limestone Mined of M/s. The Ramco Cements Ltd., Ariyalur

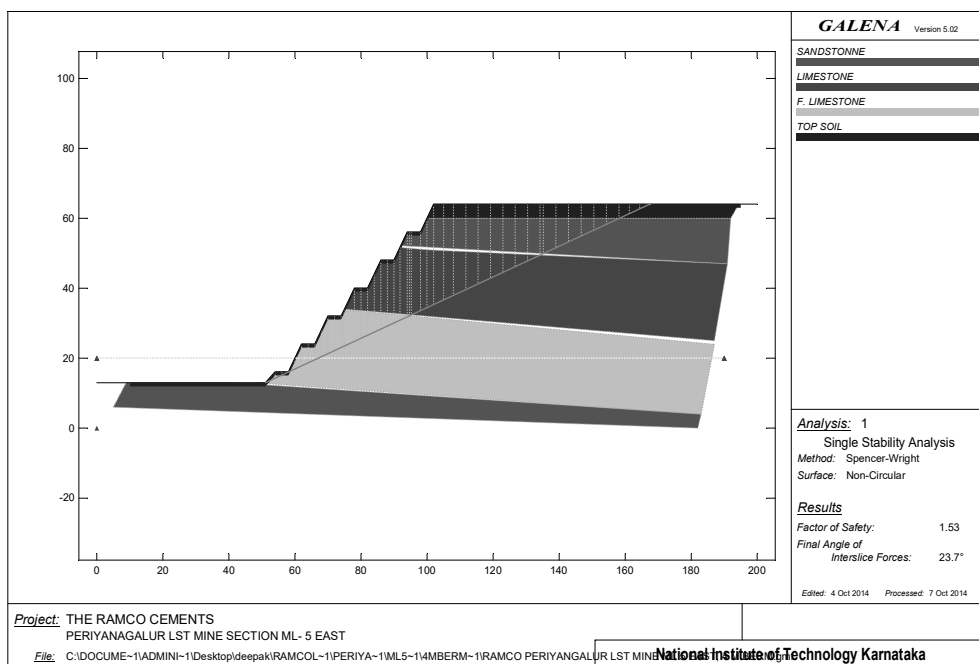


Fig. 20: Analysis of slope along Section –ML-5 East for planned pit configuration (4 m width)

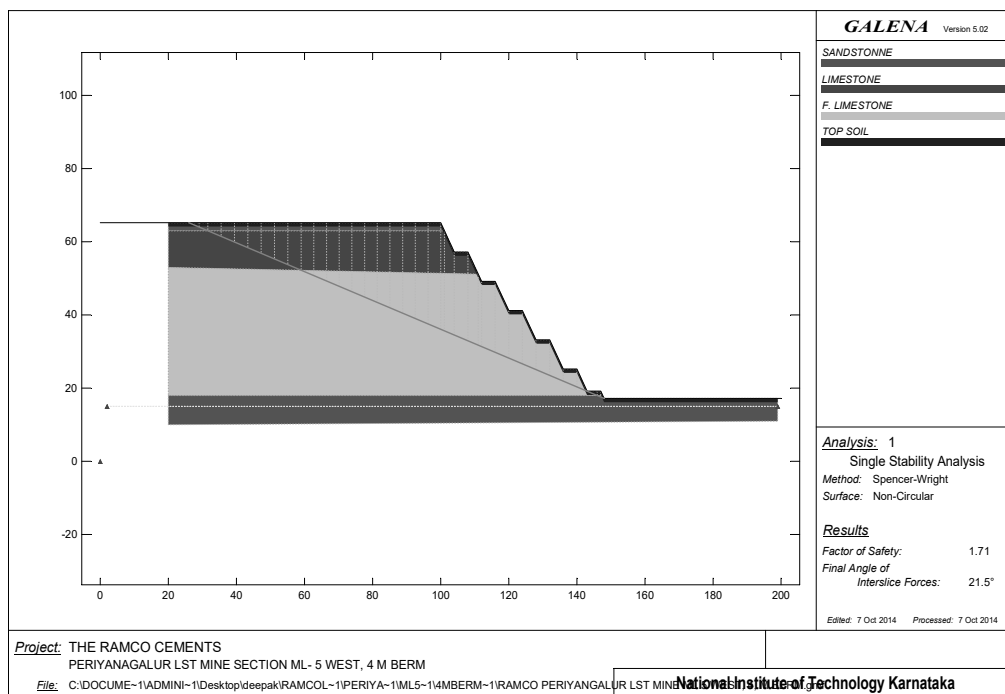


Fig. 21: Analysis of slope along Section –ML-5 West for planned pit configuration (4 m width)

CASE III: (Height of bench 6 m, Width of Bench 4 m, 6 m)

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

Note : The height of the lowest bench may not be as specified as can be seen from Table 8. It may be noted that the bench width and height is the same as per the Sections given by M/s Ramco Cements Ltd. They have not been modified/altered.

A) Analysis for Section ML-4

a) Analysis for Section ML-4 East (4 m, 6 m width) for Planned Pit Configuration

The bench design parameters from top to bottom for the planned pit configurations for the Section ML-4 for 4 m and 6 m width and 6 m height are given in Table 8.

The result of slope stability analysis of Section ML-4 East (4 m, 6 m width) for the planned pit configuration is shown in Figure 22. In this section, the bench slope angle is kept at 64° . The width of benches are 4 m and between every two benches of width 4.0 m, a bench of 8.0 has been designed. The height of benches are 6 m each, except the lowest bench which is 4.0 m high. As per the section, the slope starts at 63.86 m RL and ends at 11.86 m RL. The ultimate pit slope indicated in the section is 41° . For this pit configuration the tension crack angle with horizontal is 18.3° . The analysis indicates a FOS of 1.87 which is above the safe limit. The factor of safety for individual bench slope lie between 1.8-2.5. Hence this planned pit configuration is safe.

b) Analysis for Section ML-4 West (4 m, 6 m) for Planned Pit Configuration

The bench design parameters from top to bottom for the planned pit configurations for the Section ML-4 for 4 m, 6 m width and 6 m height are given in Table 8.

The result of slope stability analysis of Section ML-4 West (4 m, 6 m width) for the planned pit configuration is shown in Figure 23. In this section, the bench slope angle is kept at 64° . The width of benches are 4 m and between every two benches of width 4.0 m, a bench of 8.0 has been designed. The height of benches are 6 m each. This has been designed keeping in mind that the ultimate pit slope angle is 44° . As per the section, the slope starts at 66.50 m RL and ends at 18.50 m RL. For this pit configuration the tension crack angle with horizontal is 40.1° . The analysis indicates a FOS of 1.68, which is above the safe limit. The factor of safety for individual bench slope lie between 1.8 - 2.5. Hence this planned pit configuration is safe.

B) Analysis for Section ML-5

a) Analysis for Section ML-5 East (4 m, 6 m width) for Planned Pit Configuration

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

The bench design parameters from top to bottom for the planned pit configurations for the Section ML-5 for 4 m and 6 m width and 6 m height are given in Table 8.

The result of slope stability analysis of Section ML-5 East (4 m, 6 m width) for the planned pit configuration is shown in Figure 24. In this section, the bench slope angle is kept at 64°. The width of benches are 4 m and between every two benches of width 4.0 m, a bench of 8.0 has been designed. The height of benches are 6 m each, except the lowest one which is 3.1 m high. This has been designed keeping in mind that the ultimate pit slope angle is 41°. As per the section, the slope starts at 64.10 m RL and ends at 13.00 m RL. For this pit configuration the tension crack angle with the horizontal is 15.7°. The analysis indicates a FOS of 2.28, which is above the safe limit. The factor of safety for individual bench slope lie between 1.8 – 2.6. Hence this planned pit configuration is safe.

b) Analysis for Section ML-5 West (4 m, 6 m) for Planned Pit Configuration

The bench design parameters from top to bottom for the planned pit configurations for the Section ML-5 for 4 m and 6m width and 6 m height are given in Table 8.

The result of slope stability analysis of Section ML-5 West (4 m, 6 m width) for the planned pit configuration is shown in Figure 25. In this section, the bench slope angle is kept at 64°. The width of benches are 4 m and between every two benches of width 4.0 m, a bench of 8.0 m has been designed. The height of benches are 6 m each. This has been designed keeping in mind that the ultimate pit slope angle is 44°. As per the section, the slope starts at 65.20 m RL and ends at 17.20 m RL. For this pit configuration, the tension crack angle with horizontal is 40.6°. The analysis indicates a FOS of 1.73, which is above the safe limit. The factor of safety for individual bench slope lie between 1.8 -2.6. Hence this planned pit configuration is safe.

Table 8: Bench design parameters from top to bottom for Section - ML -4 and ML-5 for planned pit configurations with 4 m, 6 m width and 6 m height

Name of the mine	Sections under investigation	Height (m)	Width (m)	Slope angle (in deg)
	Section : ML-4	8	4	64
	(4 m, 6 m) East	8	4	64

**Report on the Stability of Slopes of Periyaganalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

Periyaganalur Limestone Mine	Planned	8	8	64
		8	4	64
		8	4	64
		8	8	64
		4	-	64
	Section : ML-4 (4 m, 6 m) West Planned	8	4	64
		8	4	64
		8	8	64
		8	4	64
		8	4	64
		8	-	64
	Section : ML-5 (4 m, 6 m) West Planned	8	4	64
		8	4	64
		8	8	64
		8	4	64
		8	4	64
		8	8	64
		3.1	-	64
	Section : ML-5 (4 m, 6 m) West Planned	8	4	64
		8	4	64
		8	8	64
		8	4	64
		8	4	64
		8	-	64

**Report on the Stability of Slopes of Periyangalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

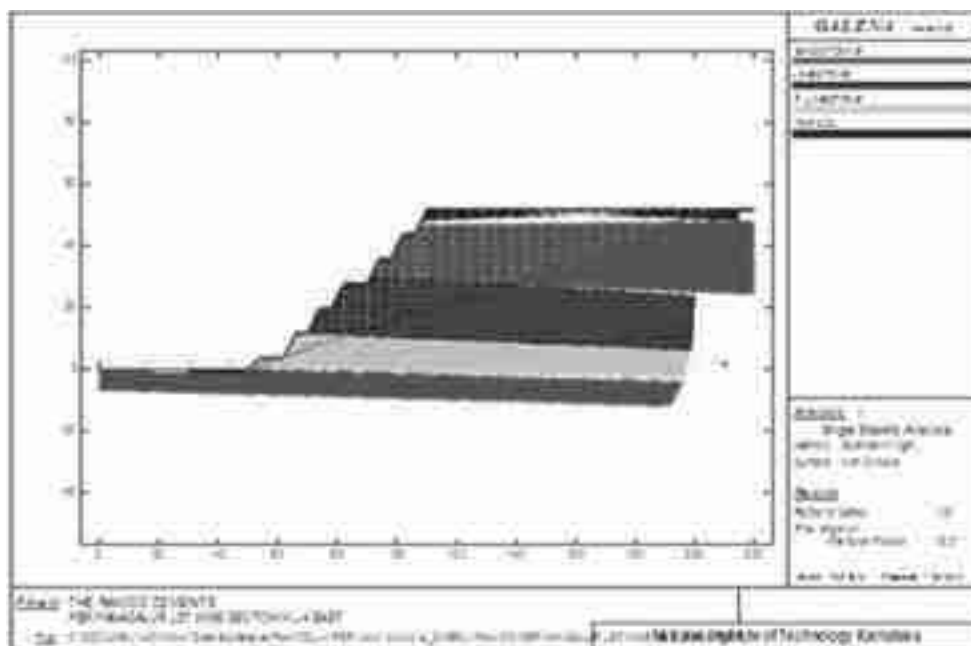


Fig. 22: Analysis of slope along Section:ML-4 East for planned pit configuration (4 m, 6 m width)

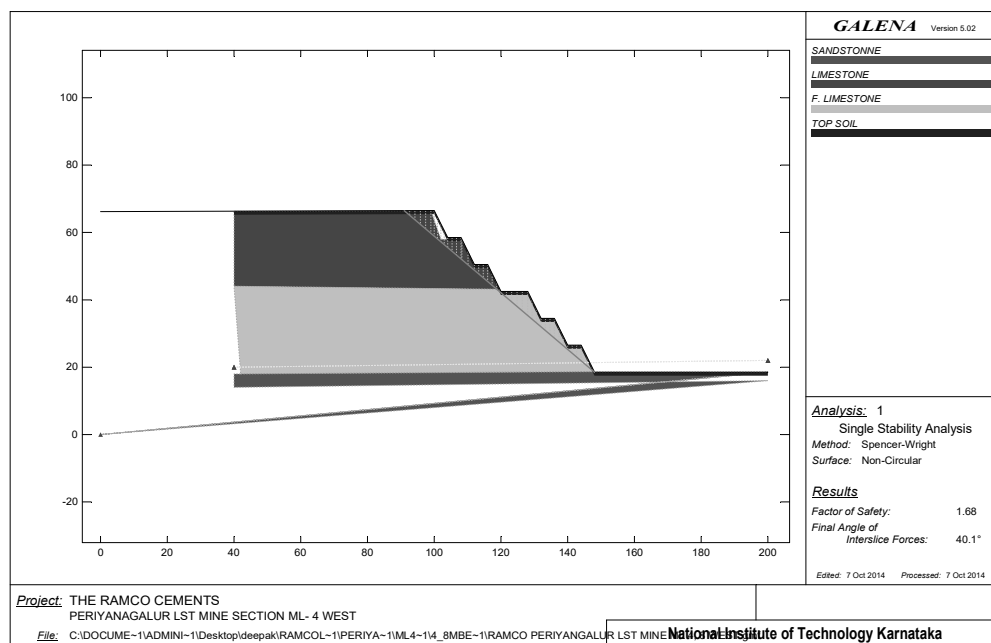


Fig. 23: Analysis of slope along Section :ML-4 West for planned pit configuration (4 m, 6 m width)

**Report on the Stability of Slopes of Periyangalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

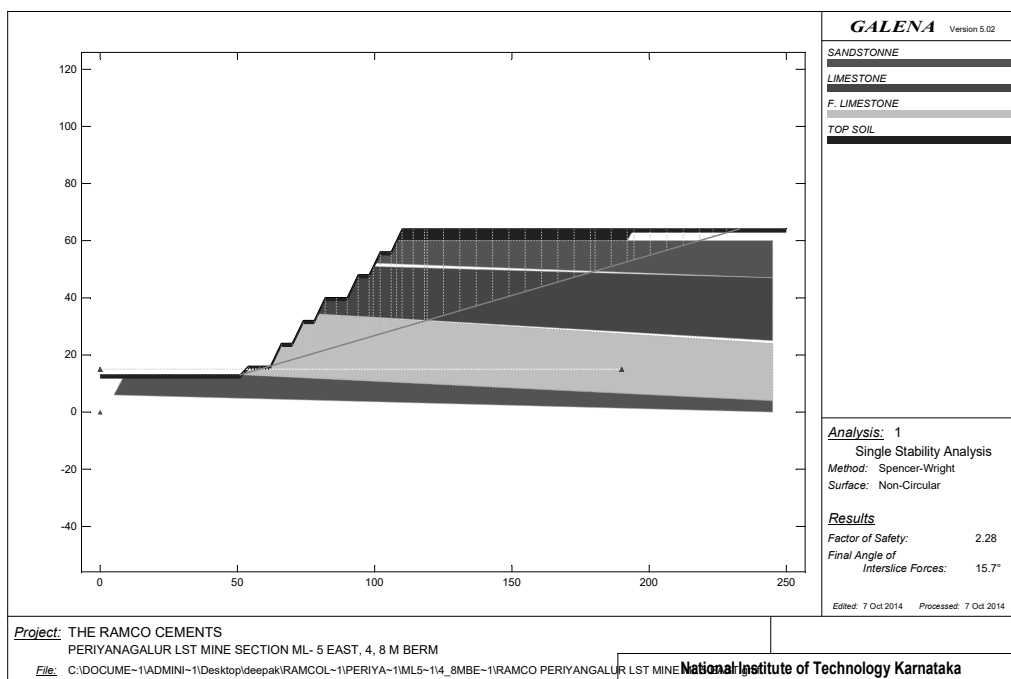


Fig. 24: Analysis of slope along Section :ML-5 East for planned pit configuration (4 m, 6 m width)

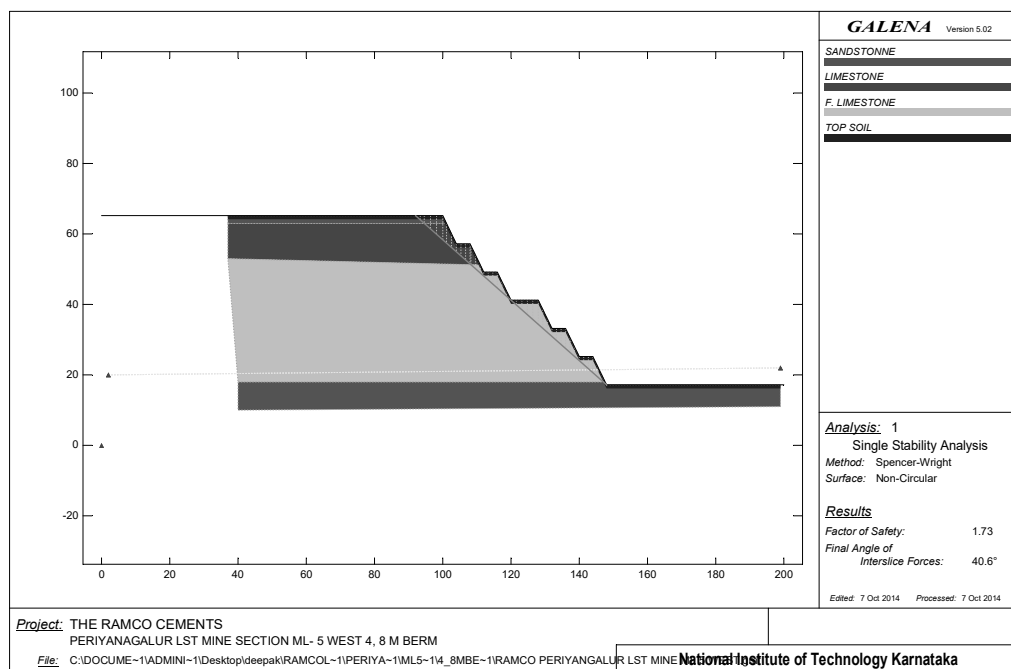


Fig. 25: Analysis of slope along Section –ML-5 West for planned pit configuration (4 m, 6 m Width)

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

Table 9: Summary of all special cases i.e., Case Study I, II & III

Case I : 3 m width and 6 m height				
Section	Overall FOS	Range of FOS for individual benches	FOS overall except lowest bench	Comments / Recommendations
ML- 4 EAST	1.10	2.1 – 2.8	NA	--
ML- 4 WEST	2.27	2.1 – 2.6	NA	--
ML - 5 EAST	1.20	1.8 – 2.8	1.87	Adjust lowest bench height with neighboring benches
ML –5 WEST	2.20	1.8 – 2.6	NA	--
Case II : 4 m width and 6 m height				
Section	Overall FOS	Range of FOS for individual benches	FOS overall except lowest bench	Comments / Recommendations
ML- 4 EAST	1.58	2.0 – 2.6	NA	--
ML- 4 WEST	1.70	2.0 – 2.6	1.52	--
ML - 5 EAST	1.53	2.1 – 2.8	2.23	Adjust lowest bench height with neighboring benches
ML –5 WEST	1.71	2.1 – 2.7	1.51	--
Case III : 4 m , 6 m width and 6 m height				
Section	Overall FOS	Range of FOS for individual benches	FOS overall except lowest bench	Comments / Recommendations
ML- 4 EAST	1.87	1.8 - 2.5	1.51	--
ML- 4 WEST	1.68	1.8 -2.5	NA	FOS less than compared to Case I, because sliding mass is more.
ML - 5 EAST	2.28	1.8 -2.5	1.70	--
ML –5 WEST	1.73	1.8 - 2.6	NA	--

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

The slope stability studies have been carried out along Section ML-4 (West & East) and ML-5 (West & East) for planned pit configurations using GALENA and ANSYS softwares. The factor of safety for planned pit configuration (ideal and special conditions) is determined using GALENA software whereas ANSYS results show the distribution of stress in the slopes. Factor

**Report on the Stability of Slopes of Periyagalur Limestone Mined of
M/s. The Ramco Cements Ltd., Ariyalur**

of safety higher than 1.3 shows the safe working conditions upto limestone horizon (92 mts) regarding stability of slopes. ANSYS results confirm that the distribution of stress in the slopes is not critical, but requires regular monitoring at the toes of benches. The following conclusions are drawn after analyzing the stability of slopes for their 'condition of limiting equilibrium' and 'stress distribution' respectively. The results of FOS along Section ML-4 (except for 3 m width and 6 m height) and Section ML-5 (except for 3 m width and 6 m height) of the pit for planned pit configurations are more than 1.3 which is the minimum recommended value required for stability of rock slopes. The FOS of slopes ignoring the lowest bench have been given for Cases I, II & III (Table 9). This indicates that if the height of the lowest bench can be increased by adjusting with second lowest bench, the FOS for overall slopes can be increased above 1.3. This is because of the smaller bench height of the lowest most bench which causes the tension crack angle for overall slope to decrease, thus increasing the sliding mass.

The results indicated in this report are based on the laboratory results of rock samples collected from the mine under study and is valid only with well developed drainage and slope monitoring systems.

5.2 RECOMMENDATIONS

As a precautionary measure, the pit should be provided with garland drain/ bund / barrier on the upper surface of pit to divert the run-off of rainwater away from the pit. It should be kept effective during the monsoon. The discontinuance of the pre-monsoon preparation at any location will jeopardize the whole effort of maintaining the designed slopes. The open tension cracks should be filled with permeable material. This filled material should be consolidated by dozer. At the top, any impermeable material may be spread to avoid entry of water to lower level.

Project “HYDROLIME”

**INTEGRATED HYDROGEOLOGICAL STUDY FOR
AMALGAMATED *PERIYANAGALUR LIMESTONE MINE* OF
M/s. THE RAMCO CEMENTS LIMITED, ARIYALUR
(A GEOSPATIAL APPROACH)**

Submitted to

THE RAMCO CEMENTS LIMITED



Submitted by



**Department of Remote Sensing
Bharathidasan University, Khajamalai Campus
Tiruchirappalli – 620 023, Tamil Nadu**

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**INTEGRATED HYDROGEOLOGICAL STUDY FOR AMALGAMATED
PERIYANAGALUR LIMESTONE MINE OF
M/s. THE RAMCO CEMENTS LIMITED, ARIYALUR**

1.0 INTRODUCTION

M/s. The Ramco Cements Ltd., - formerly known as Madras Cements Limited, is involved in the production of cement. One of its manufacturing plant is located at Govindapuram Ariyalur District of Tamil Nadu with an annual production capacity of 5.5 million tons. The major raw material “limestone” for this unit is sourced from the Ariyalur mines. The present study has been taken up to conduct hydrogeological studies in and around the mining area of PeriyanaGalur. In order to conduct the hydrogeological study, the company has entrusted the work to the Department of Remote Sensing, Bharathidasan University, Tiruchirappalli vide work order no TRCL –WO/ BU/ Hydrolime. Accordingly, the project team from the Department of Remote Sensing visited the mine area, conducted field surveys, pumping tests, collected water samples and other necessary secondary data from the authorities. This interim report presents the data and findings.

2.0 STUDY AREA

The PeriyanaGalur mines (PNR) is confined within 11° 07' 15.8'' - 11° 07' 51.4'' latitude and 79° 08' 26.9'' - 79° 09' 01.0'' E Longitude (Fig. 1). It is covered in the Survey of India (SoI) topographic sheet no. 58 M/4. It was agreed that all the thematic maps, groundwater quality, hydrogeology and other related investigations pertaining to the PNR Mines will be carried out for the area confined within this 10 km radius circle.

2.1 Climate and rainfall

The study area generally experiences tropical climate with hot summers and warm winters. April and May are the hottest months when the average daytime temperature exceeds above 35° C whereas November to January months are comparatively cooler with the average temperature being around 27° C. The wind speed in the study area can exceed above 25 km / hour during June - August and there after it gradually decreases and reaches the lowest value of 7.7 km/hour. The study area receives rainfall from both the northeast (September to December) and southwest (June to August) monsoon seasons. However, the amount of rainfall received during the northeast monsoon is higher (485 mm) than that of southwest monsoon (357 mm).

2.2 Slope

Slope can be expressed in two ways: it can be expressed either as degree or as percentage. Currently, several algorithms are developed in GIS that facilitate to prepare slope maps easily and accurately. One of the commonly used methods for slope map preparation in GIS is neighborhood method. The neighborhood method calculates the slope at one grid point by comparing the elevations of the grid points that surround it. In the present study, slope map (in percentage) was prepared using the 30 m resolution of Shuttle Radar Topographic Mission (SRTM) data which was processed in the ArcGIS software by utilizing neighborhood method. The prepared map has indicated that the study area has four different categories of slope (Fig. 2) and it was noticed that the gently sloping (2-5 %) is the dominant slope category in the study area. The slope direction is SE part of the study area.

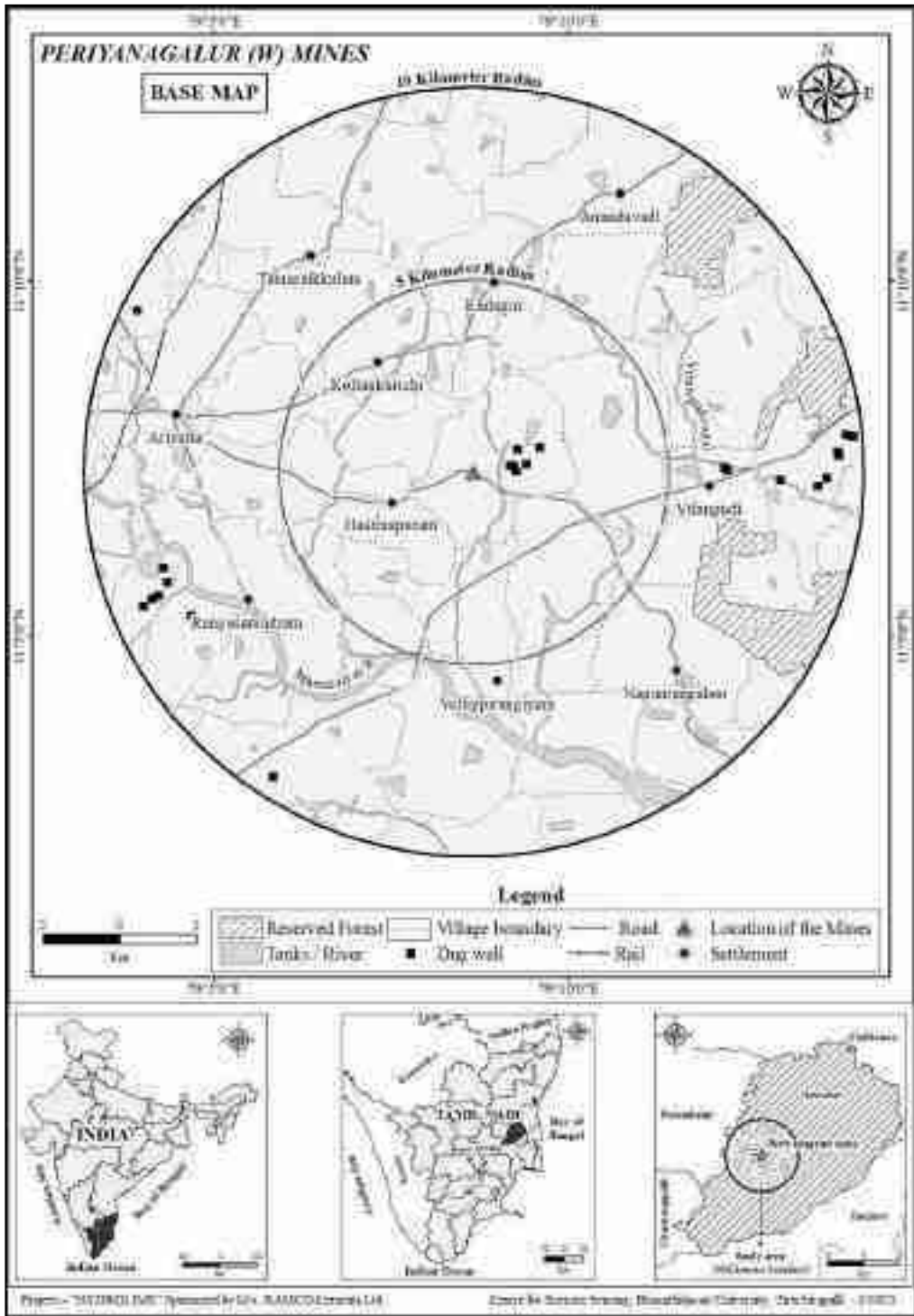


Fig.1 Study Area

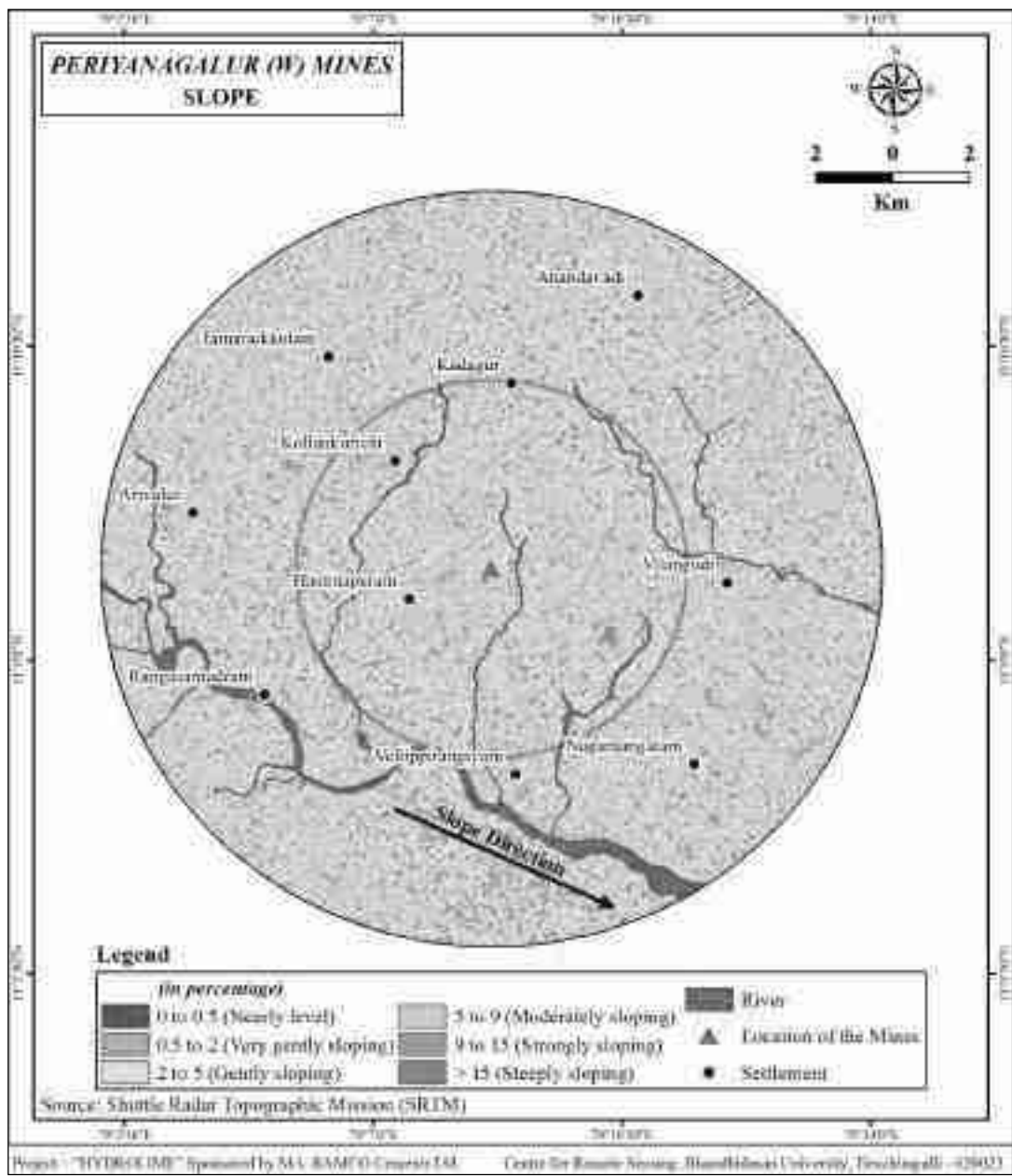


Fig.2 Slope

2.3 Relief

Relief is the difference between the highest and lowest elevations in an area. The study area does not display any drastic change in elevation along the northern and western parts where it ranges between 75- 150 m above msl. However, the elevation is increasing from south to north gradually due to the presence of uplands and the maximum elevation of the study area (150 m) is noticed in the North.

2.4 Geology

Geology generally describes the rocks present in an area. It plays a key role in any mining industry not just for finding out promising mineral deposits but it can also be tremendously useful for various hydrogeological investigations, environmental impact assessment etc. In addition, it can also help the mine managers / administrators in the reclamation part of the cycle when the mine is closing. The geology map has indicated that the study area consists of sediments belonging to Cretaceous to Quaternary periods that are represented by sandstone, limestone, clay etc. Most of the study area having Tertiary sediments trending towards SW direction. Sandstone with clay intercalation is dominant sediments deposited in the study area.

2.5 Soil

Soil is an important element of the ecosystem and acts as a medium that links air, water and life and plays a significant role in food production and environment conservation. It greatly influences the welfare of the humankind and acts as the base for economic development. In addition, for any mining industry knowledge about the soil types present in the area is critical as to adopt suitable soil conservation practices. The soil map of the study area was prepared using the National Bureau of Soil Survey and Land Use Planning report (NBSS & LUP, 1996). The prepared soil map has shown that the study area consists of four types of soils of which soil type “*Typic Chromusters*” (dark greyish brown to dark brown, very deep, fine, clayey, montmorillonitic- imperfectly drained, moderately to strongly alkaline, hyper thermic) cover major part of the study area.

2.6 Drainages

As the study area is made up of sedimentary rocks, it does not display the development of fine network of drainages owing to pervious nature of the sediments. There are several ephemeral streams flowing in the study area of which the Marudaiyar river flowing in the SE is the prominent one (Fig. 3). Though the streams in the study area are ephemeral, they act as an important source for irrigation and also happen to be a major source for groundwater recharge in the study area.

2.7 Drainage density

The drainage map of the study area (shape file) was used to prepare the drainage density map in GIS. The same has indicated that the study predominantly consists of drainage density classes “very low” and “low” as study area is made up of sedimentary rocks.

2.8 Lineaments / faults

Lineaments / faults help to identify the structural fabric of an area and also to infer the ongoing dynamic movements. In addition, lineaments / faults also act as conduits for groundwater recharge in an impervious terrain. In the present study, lineament / fault map was prepared through the visual interpretation of high resolution satellite images.

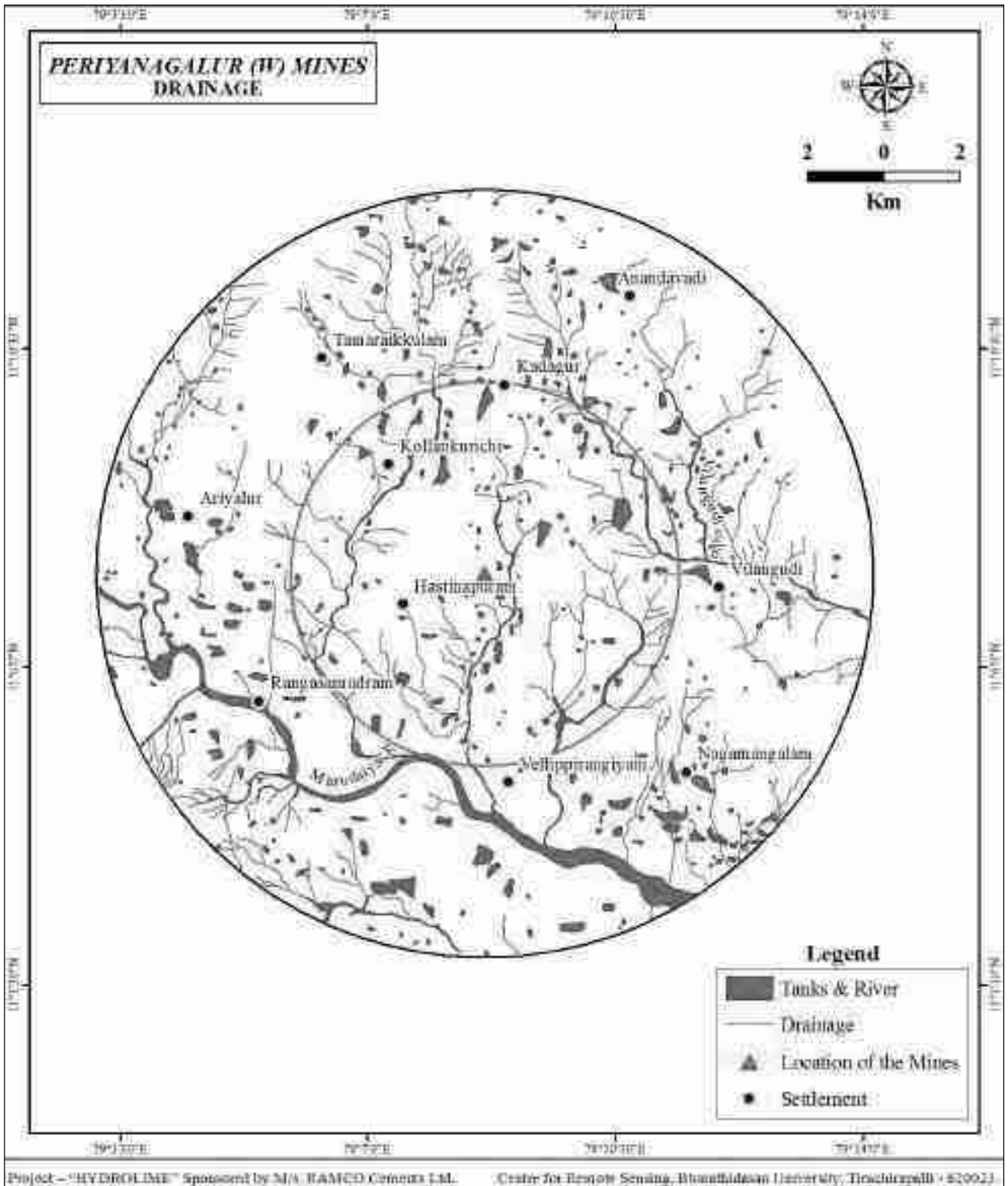


Fig. 3 Drainage

For identifying the lineaments / faults, the standard image interpretation keys like drainage pattern, tones etc. were used. Further, using the shaded relief map prepared for the study area, additional lineaments / faults were brought out. The prepared map has shown that the lineaments / faults in the study area generally trend in four azimuthal frequencies viz.

1. NE-SW, 2. NW-SE, 3. ENE-WSW and 4. NNE-SSW.

2.9 Lineament density

Lineament density map for the study area was prepared using the lineaments / faults map of the study area in GIS. The prepared map has indicated that the lineament density maxima zones are located close to Kadugur, Vilangudi, Ariyalur and Vellipiringam. The eastern half of the study area generally possesses low to moderate lineament density.

2.10 Geomorphology

Geomorphology or the study of landforms can provide vital information needed for assessing the resource potential, resource constraints and environmental vulnerability of an area. Hence, for a large number of studies, geomorphology acts as the foundation. In the present study, a detailed geomorphology map was prepared using high resolution satellite images which was subsequently verified and updated in the field (Table 1). The prepared map has indicated that the study area consists of different types of landforms (denudational, fluvial etc.) which stand as an evidence for the dynamic evolution of the area. The already mentioned Tertiary sandstone upland found to cover (38.86sq.km) in the eastern part of the study area. The upland is lateralized and noticed to be deeply eroded at places by the running water (Fig.10). Most of the study area covered by buried pediment geomorphic landform with deep, moderate and shallow conditions. Buried pediment shallow landform has covered major part of the study area around 103.76sq.km.

S.No	LANDFORM	AREA	
		(in sq.km)	%
1	Upland	38.86	12.37
2	Buried Pediment Shallow	103.76	33.03
3	Buried Pediment Moderate	90.45	28.79
4	Buried Pediment Deep	64.54	20.54
5	Tanks& River	16.55	5.27
Total		314.16	100.00

Table. 1 AREAL EXTENTS OF VARIOUS GEOMORPHOLOGICAL LANDFORMS

2.11 Land use / Land cover

Land use refers to the human induced changes / modifications on the land surface like agriculture, settlements, mining etc. whereas land cover refers to the land surface that is unmodified by human activities or human induced changes. The landuse / landcover features of the study area were interpreted from the high resolution (0.45 m) Geoeye satellite image. The land use / land cover types were identified through using visual interpretation techniques following the Level-II classification system of the National Remote Sensing Centre (NRSC) (Fig.4; Table no.2).

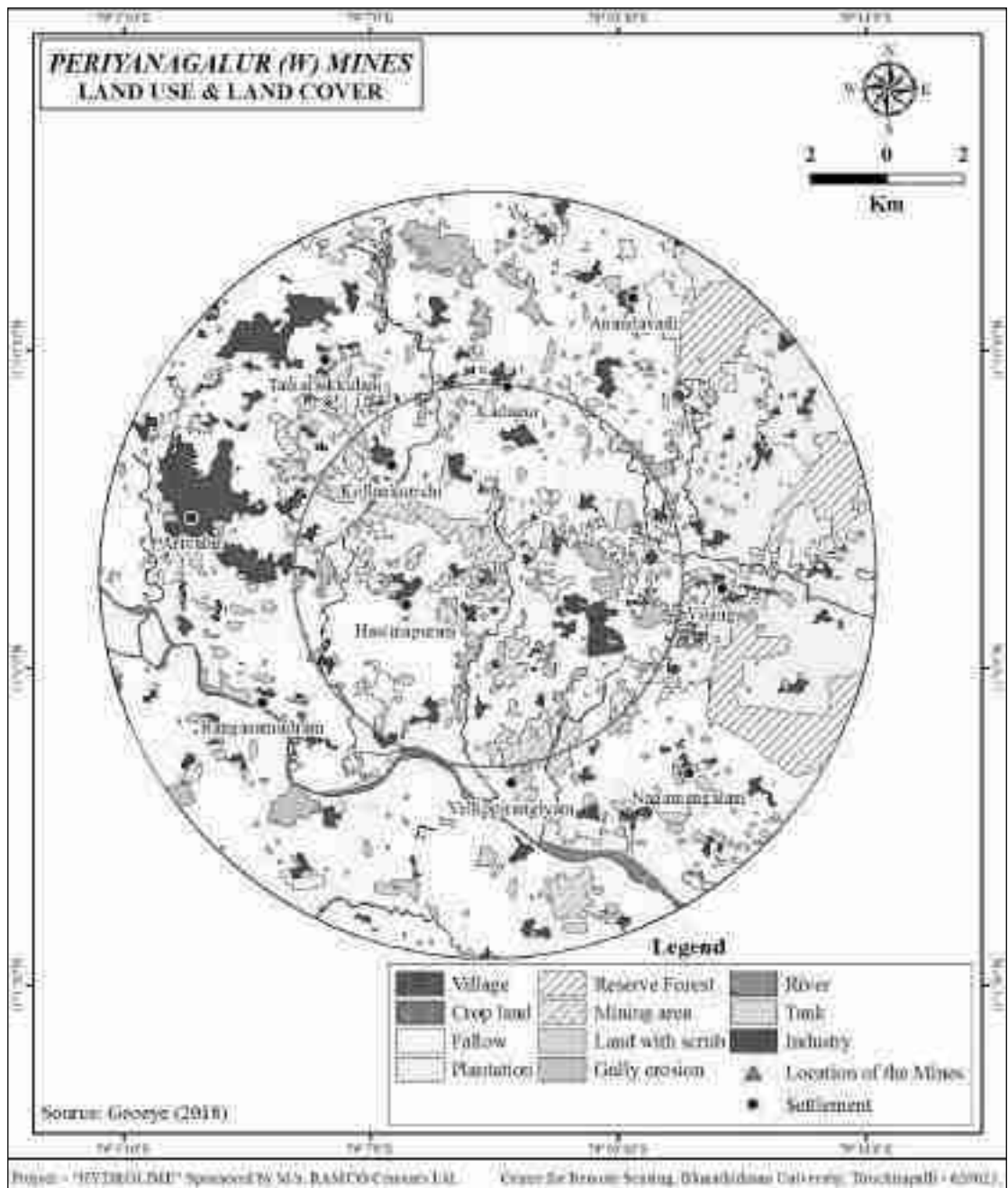


Fig.4 Land use / Land cover

Table.2 LAND USE AND LAND COVER

S.No	Land Use and Land cover	AREA	
		(in sq.km)	%
1	Villages	15.43	4.91
2	Fallow	198.83	63.29
3	Plantation	46.70	14.87
4	Reserve Forest	14.37	4.57
5	Land with Scrub	0.51	0.16
6	Mining / Industrial	11.13	3.54
7	Gully erosion	7.64	2.43
8	River	4.73	1.51
9	Tanks	11.83	3.77
10	Industry	2.99	0.95
Total		314.16	314.16

The prepared map has indicated that the study area is predominantly covered by fallow land (198.83sq.km) and followed by plantation. The reserve forest occupied around 14.37sq.km in the study area.

3.0 Groundwater level

The groundwater levels in the study area were measured in the bore wells and dug wells (Fig. 5) during the field survey using water level indicator equipment. The recorded values were used to generate a groundwater level contour map in GIS (Fig. 6). Accordingly, groundwater level contour maps were generated for two different periods.

3.1 Groundwater level (May 2023)

The groundwater level map prepared for April has indicated that the ground water level in the study area ranges from 10 - 50 m bgl (below ground level). It was noticed that the groundwater level near the mine ranges from 40-45 m bgl and the zones with deepest groundwater level were noticed along the NW margins of the study area. It was also observed that a shallow groundwater level zone occurs within the 5 km radius boundary drawn around the mine area and is located just 2 km from the mine

3.2 Groundwater level (January, 2024)

During the winter season due to the lack of less rain fall the water table is increase then the post monsoon period. The water level was ranged from 7-40 m bgl. It was observed the water level is increasing from NE and SW region of the study area. Hydrogeologically, the alluvial formation exhibits shallow water table, whereas the Limestone and Sandstone formations exhibit deeper water table.

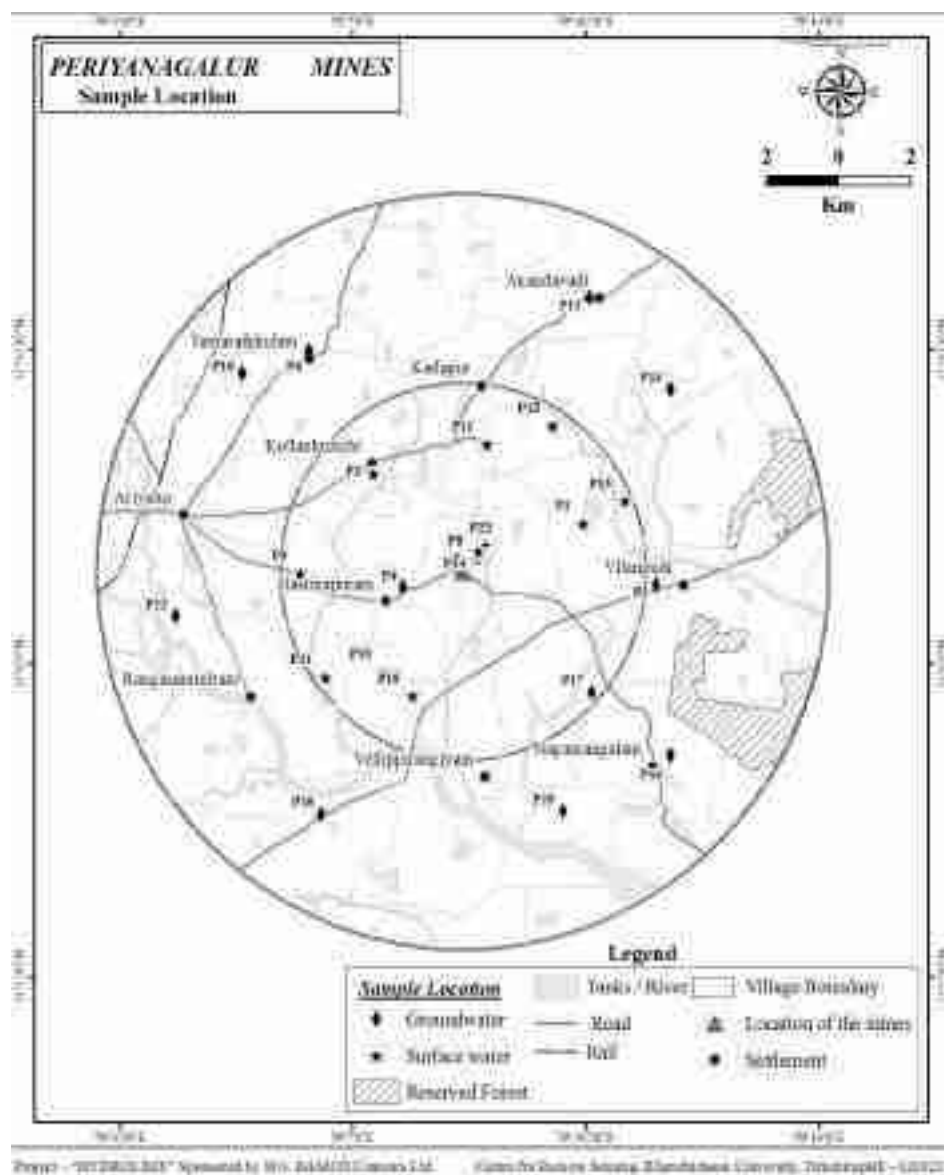


Fig. 5 Sample Location



Fig. 6 Water level with reference to RL

4.0 Pumping Test & Aquifer Characteristics

RCL has engaged the **Department of Remote Sensing, Bharathidasan University, Trichy** for ‘**Integrated Hydrological Investigations-A Geospatial Approach**’ in and around their Mine Lease Areas in Ariyalur Region (Project ‘Hydrolime’) since May 2017 and submitted the periodical Reports to the Authorities. Also, the EIA Coordinator and Officials of M/s. Thrust Geo-consultants Private Limited, an **Accredited Ground Water Professionals** for ‘Hydrogeological Report for Mining Projects’ by Central Ground Water Authority (CGWA) have carried out the Hydrogeological Survey including a Pumping Test during 09.01.2024 and submitted the Report.

In order to find the aquifer characteristics, **Pumping Test** has been conducted in the Borewell near the Mine. The depth of the borewell is 90 m and is pumped with a 5 HP submersible pump. The average discharge of the pump was set for 13.4 cu.m per hour. Pumping was done for a total duration of 66 minutes and the recovery was monitored for about 93 minutes. The water level in the pumping well was monitored at regular intervals along with discharge. The drawdown of water levels in the well was measured and given in the table. The static water level was at 11.54 m before the starting of the test and went down upto 60.47m. The plot of Drawdown Vs Time and the plot of Residual Drawdown Vs t/t’ was done using the pump test data and the draw down per log cycle was estimated in each plot. The transmissivity value is estimated using the formula :

$$T = \frac{2.30 \times Q}{4 \times \Pi * \Delta S}$$

Where T is Transmissivity in m²/day

Q is the pumping rate in m³/day

Π is a 3.14 & Δ S is drawdown per log cycle.

The drawdown per log cycle estimated from drawdown data ie., Δ S = 22m. the estimated transmissivity value is

$$T = \frac{2.30 \times 312}{4 \times 3.14 \times 22} = 2.59 \text{ m}^2/\text{day}$$

The drawdown per log cycle estimated from recovery data ie., Δ S = 26m. the estimated transmissivity value is

$$T = \frac{2.30 \times 312}{4 \times 3.14 \times 22} = 2.19 \text{ m}^2/\text{day}$$

Average “T” value of the Limestone aquifer is estimated to be 2.39 m²/ day

Table : 2 Pumping Test

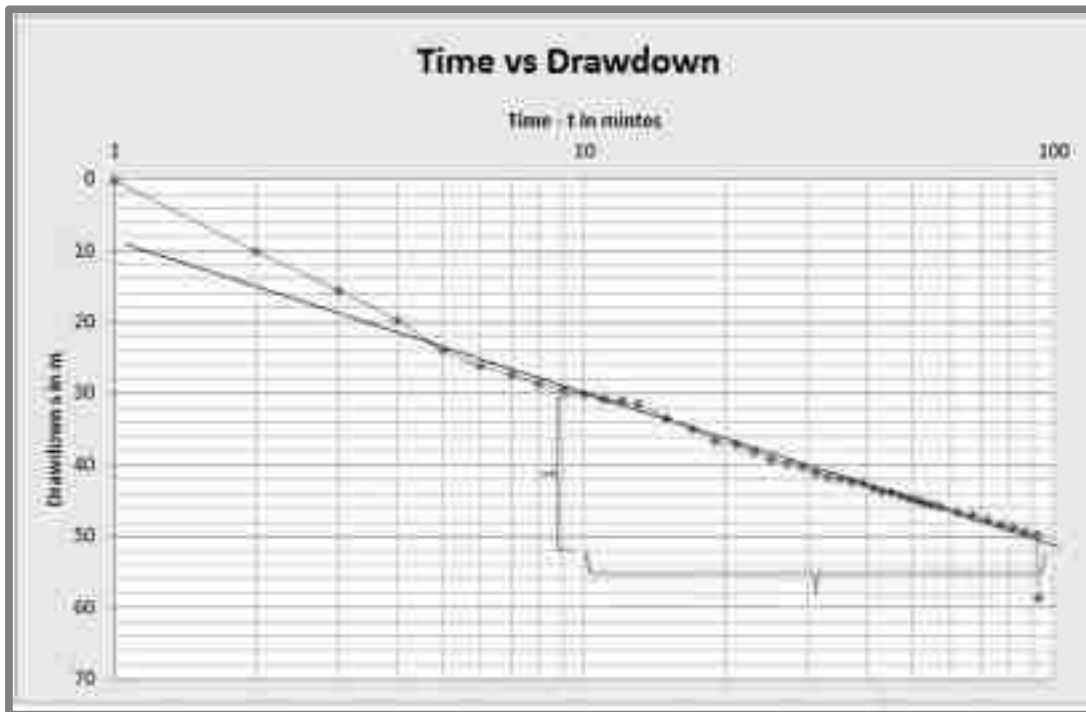
Pumping Test - RCL Borewell ID Location - Near Mine Office	S.W.L = 11.54 m Q= 20 cum/hr.
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Time since Pump Start, minutes	Pumping Water Level in meter	Drawdown in meter	Discharge / Remarks
0	11.54	0.00	SWL
1	11.67	0.13	Pump Started
2	21.59	10.05	
3	27.13	15.59	
4	31.24	19.70	Yield : 14000 LPH
5	35.50	23.96	
6	37.58	26.04	
7	38.97	27.43	
8	40.30	28.76	
9	41.02	29.48	
10	41.70	30.16	
11	42.29	30.75	
12	42.57	31.03	
13	42.94	31.40	
15	45.04	33.50	
17	46.52	34.98	
19	48.13	36.59	
21	48.65	37.11	
23	49.64	38.10	
25	50.67	39.13	
27	51.32	39.78	Yield : 13400 LPH
29	51.83	40.29	
31	52.63	41.09	
33	53.26	41.72	
35	53.47	41.93	
37	53.88	42.34	
39	54.19	42.65	
41	54.77	43.23	Yield : 13200 LPH
43	55.12	43.58	
45	55.47	43.93	
47	55.89	44.35	
49	56.18	44.64	

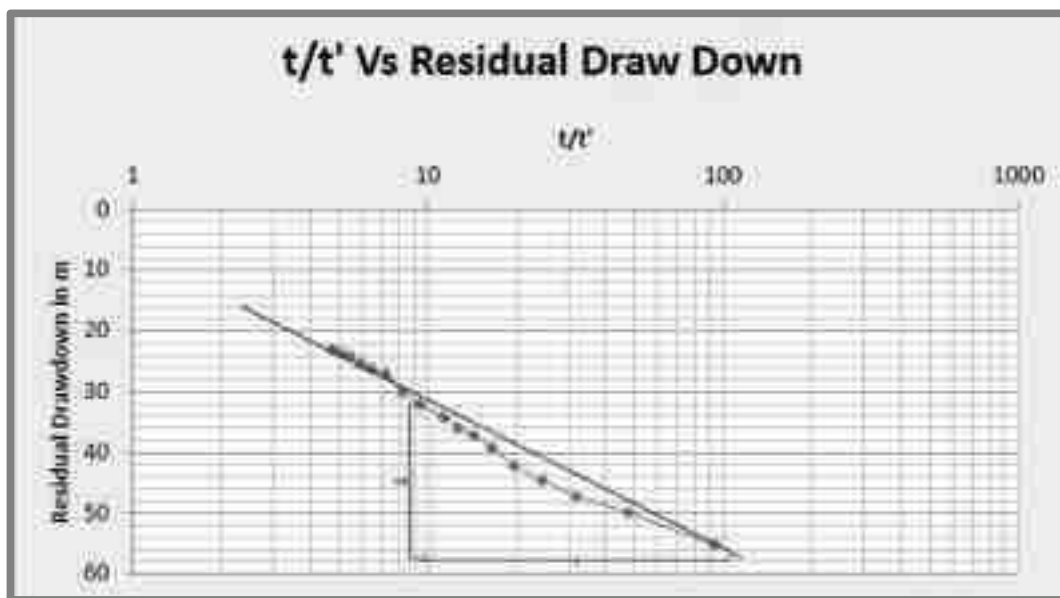
Time since Pump Start, minutes	Pumping Water Level in meter	Drawdown in meter	Discharge / Remarks
51	56.46	44.92	
53	56.78	45.24	
55	57.07	45.53	
57	57.39	45.85	
62	58.17	46.63	
67	58.65	47.11	
72	59.18	47.64	
77	59.86	48.32	Yield : 12980 LPH
82	60.34	48.80	
87	60.84	49.30	
92	61.31	49.77	
93	60.47	58.65	Pump Stopped

Recovery Test

Time Since Pumping Started (Minutes) 't'	Time Since Pumping Stopped (Minutes) 't'	t/t'	Depth To Water Level (M)	Residual Draw Down (M)	Remarks
94	1	94.0	56.91	55.09	
95	2	47.5	51.56	49.74	
96	3	32.0	49.02	47.20	
97	4	24.3	46.46	44.64	
98	5	19.6	44.00	42.18	
99	6	16.5	41.09	39.27	
100	7	14.3	39.00	37.18	
101	8	12.6	37.79	35.97	
102	9	11.3	36.07	34.25	
104	11	9.5	33.81	31.99	
106	13	8.2	31.79	29.97	
108	15	7.2	28.74	26.92	
110	17	6.5	28.00	26.18	
112	19	5.9	27.00	25.18	
114	21	5.4	26.03	24.21	
116	23	5.0	25.36	23.54	
118	25	4.7	24.67	22.85	
123	30	4.1	23.49	21.67	
128	35	3.7	22.10	20.28	
133	40	3.3	21.72	19.9	
138	45	3.1	20.86	19.04	
143	50	2.9	20.30	18.48	
148	55	2.7	19.75	17.93	
153	60	2.6	19.23	17.41	
246	153	1.6	15.85	14.03	



Drawdown Curve of the Aquifer



Recovery Curve of the Aquifer

The limestone aquifer is observed to be very low in terms of transmissibility and hydraulic conductivity.

The limestone mining area, which falls receives a mean annual rainfall of 1096 mm as recorded in the nearest rain gauge station at Ariyalur. Pre monsoon water level inside the mine is 45 m below ground level and post monsoon water level is at 40 m below ground level. The depth of Mine will be 92 m BGL at Conceptual Stage. However, as simultaneous Backfilling is being continued in the Pit, the actual mined out voids will be reduced. Accordingly, the Mine Pit seepage quantity is assessed as given in Table-3.

Working Bench RL, m	Void, sq.m	Backfilled Area, sq.m	Effective Void, sq.m	Working Level (BGL), m	Seepage Quantity, KLD
73 - 64	3,81,733	0	0	9	0
64 - 58	3,56,169	7,719	3,48,450	15	0
58 - 52	3,31,077	7,719	3,23,358	21	0
52 - 46	3,06,456	13,010	2,93,446	27	0
46 - 40	2,82,305	13,010	2,69,295	33	0
40 - 34	2,21,240	35,354	1,85,886	39	0
34 - 28	1,60,813	36,534	1,24,279	45	298.270
28 - 22	1,31,081	40,913	90,168	51	216.403
22 - 16	1,01,087	14,022	87,065	57	208.956
16 - 10	88,534	14,018	74,516	63	178.838
10 - 04	59,029	15,268	43,761	69	105.026
04 - (-2)	50,138	13,078	37,060	75	88.944
(-2) - (-8)	36,664	11,978	24,686	81	59.246
(-8) - (-14)	30,079	8,978	21,101	87	50.642
(-14)-(-19)	24,044	4,978	19,066	92	38.132
Total Seepage Realisation at 92 m BGL					1244.458

Table : 3 Mine Pit Seepage Quantity

The hydrogeological parameters arrived for the top water table limestone aquifer from pumping test is : Transmissivity ‘T’ - 2.39 m²/day. Permeability ‘K’ value has been derived from T value and thickness of Limestone Aquifer.

In order to estimate the mine Seepage quantity the Darcy’s flow equation is applied. As per Darcy Law Flow through a porous media is a product of Hydraulic gradient, Area of cross section and Hydraulic conductivity and is given by the equation :

$$Q = KIA$$

where K is the Hydraulic conductivity in m/day i.e., 0.04 m/day

I is the hydraulic gradient estimated at 0.01 from earlier studies

A is the area of cross section of the exposed aquifer i.e., the perimeter of the mine pit x saturated water column

Radius of Influence for PNR mine pumping

The estimated average seepages in the mine pit is around 1,245 KLD. The zone of influence will be of the shape of an ellipsoidal or cylindrical shape unlike a circular shape in isotropic and homogeneous condition. Accordingly, Hudak's method suggest the following formula:

- i) $V_C = Q (t) / \eta_e$
- ii) $A_C = V_C / b$
- iii) $R = (\sqrt{A_C / \pi}) + r_c$

Where,

Q = Rate of pumping from the mine in m³/day

t = time of continuous pumping in days

η_e = the effective fractured or secondary porosity,

b = saturated thickness of aquifer around the mine

r_c = the radius or equivalent radius of the mine pit in meters

V_c = Volume of the water pumped from the mine pit in m³

A_C = Area of zone influence in the aquifer in sq meters.

Based on these formulae the radius of influence for Periyagalur mines is estimated. In the case of Periyagalur mine pumping the quantity of mine dewatering Q at peak is 1,245 KLD for about 300 days, 't' the effective porosity is assumed to be around 4.0% or 0.04; the saturated thickness (b) of the aquifer is 52 m. The mine dimensions of Periyagalur of bottom bench with sump is 19066 sq.m. The equivalent radius of the mine, therefore,

$$r_c^2 = (19066) / \pi, \text{ or } r_c = 77.9 \text{ m}$$

$$V_C = (Q \times t) / \eta_e = (1245 \times 300) / 0.04 = 9337500 \text{ m}^3$$

$$A_C = V_C / b = 9337500 / 52 = 179567 \text{ sq.m}$$

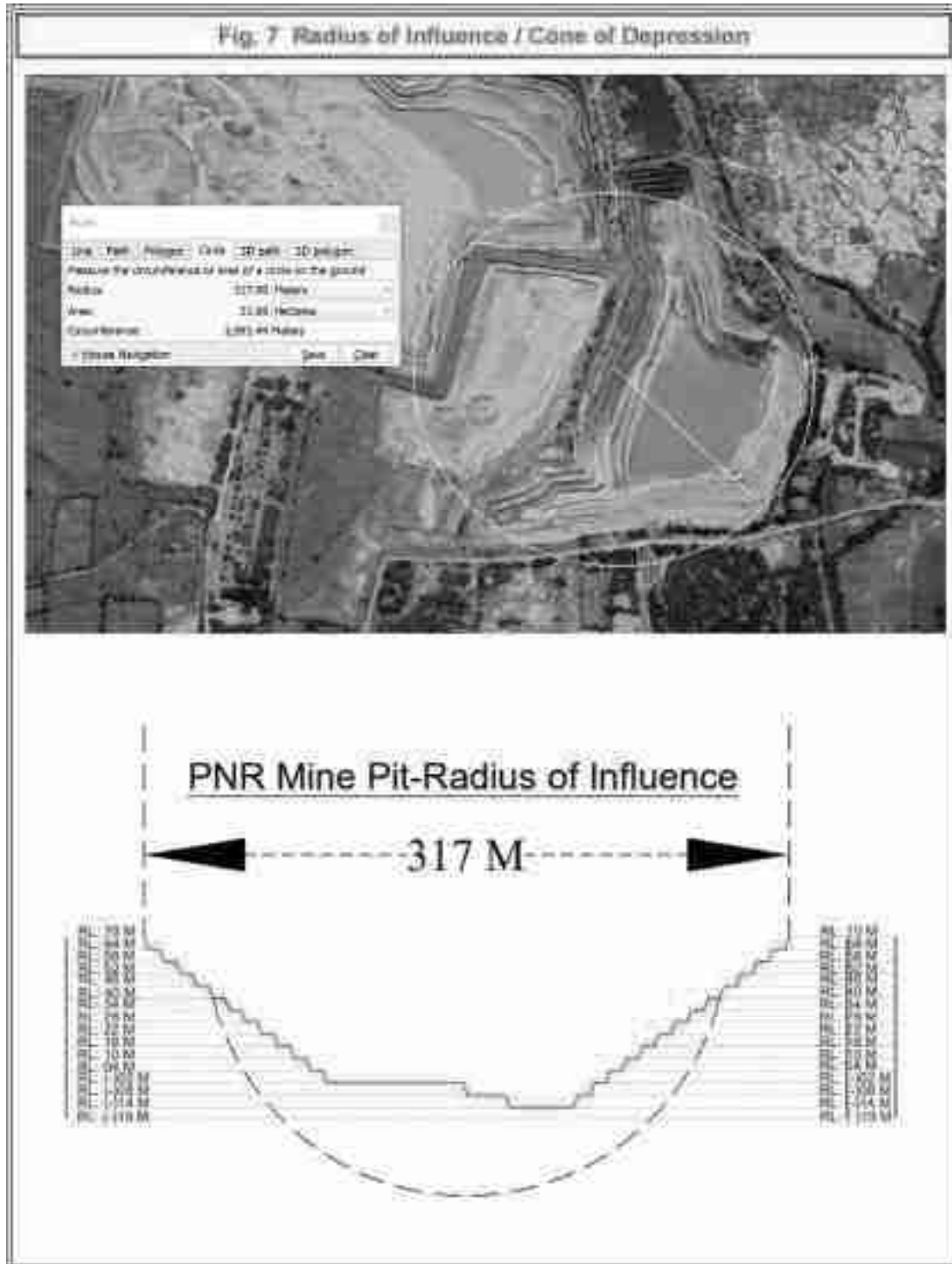
$$\text{And therefore } R = (\sqrt{A_C / \pi}) + r_c$$

$$= \sqrt{(179567 / 3.14)} + 77.9$$

$$= \sqrt{57187} + 77.9$$

$$= 239.1 + 77.9 = 317 \text{ m.}$$

Therefore, the radius of zone of influence is 317 m which falls within the mining lease area. When pumping is being done in mine pit, it is the actual quantity that is contributed from the aquifer surrounding the mine pit. Hence inflows into the mine equals the water pumped from the mine pit. As a result, the cone or zone of influence that is formed inside the pit within the saturated aquifer at the Conceptual Stage (Fig. 7). Thus, mining even at the depth of 92 m BGL, there will not be any influence on the nearby ground water structures in the vicinity. **The anticipated cone of depression in such aquifers with low T values will be highly localized, and does not spread beyond the Mine due to poor permeability of limestone aquifer.**



The seepage water is collected in the mine pit and allowed to settle down in the sump to remove the turbid solids and finally clear water is only pumped and utilised for gainful usage for agriculture activity in the surrounding village as in current practice.
