DRAFT
ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PLAN

FOR

PATEL NAGAR CHINA CLAY AND FIRE CLAY MINES

(ML AREA – 7.22 HA.)

AT

At: J.L. No. 145, Plot No. 4412 to 4418, 4420 to 4427, 5056 to 5064, 5066, 5067, 5071, 5072, 5074 to 5081, 5083 to 5092, 5095, 5096, 5098 to 5106, 5109 to 5118, 5122 to 5136 Patel Nagar, Mouza- Kharia, P.O. & P.S.- Md. Bazar, Dist.- Birbhum, West Bengal.

Category – 'B', Sector and Schedule – Mining of Minerals 1(a)

STUDY PERIOD – 1st October, 2021 TO 31st December, 2021

APPLICANT

M/s. N. P. MINERALS

MARCH 2022

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0	29th March, 2022	For Draft Submission	Draft EIA Report

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Abbreviation List

AAQM	Ambient Air Quality Monitoring
NQ/SQ	Noise Quality/Soil Quality
SW/GW	Surface Water/Ground Water
MoEF&CC	Ministry of Environment, Forest and Climate Change
CPCB	Central Pollution Control Board
SEIAA	State Level Environment Impact Assessment Authority
SEAC	State Level Expert Appraisal Committee
WBPCB	West Bengal Pollution Control Board
CGWB	Central Ground Water Board
QCI	Quality Council of India
IMD	India Meteorological Department
DGMS	Directorate General of Mines Safety
CER	Corporate Environment Responsibility
MCR	Mineral Concession Rules
MMDR	Mines and Mineral (Development and Regulation)
ML	Mine Lease
AMSL	Above Mean Sea Level
ROM	Run of Mine
OB	Over Burden
TPA	Tonne Per Annum
RF/PF	Reserve Forest/Protected Forest
SH/NH	State Highway/National Highway
RET	Rare Endangered Threatened
DFO	Divisional Forest Officer
KLD	Kilolitre Per Day
MT	Metric Tonne
EIA	Environmental Impact Assessment
EC	Environmental Clearance
EHS	Environment Health & Safety
EMP	Environment Management Plan
EMS	Environment Management System
EMS	Environmental Management Cell
EPA	Environmental Protection Act
ETP	Effluent Treatment Plant
DMP	Disaster Management Plan
GLC	Ground Level Concentration
GOI	Government of India
OM	Office Memorandum
IS	Indian Standard
MSDS	Material Safety Data Sheets
NOC	No Objection Certificate
OSHA	Occupational Safety and Health Administration
PPEs	Personal Protective Equipment's
RA	Risk Assessment
TOR	Terms of Reference

PM	Particulate Matter
BDL	Below Detectable Limit
TSDF	Treatment, Storage and Disposal Facility
TDS	Total Dissolved Solid
TSS	Total Suspended Solid
DO	Dissolved Oxygen
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
CFU	Colony Forming Units

CHAPTER-1

INTRODUCTION

CHAPTER -1
INTRODUCTION

The Mining industry in India is a major economic activity which contributes significantly to the economy of India. Because mining is at the beginning of the value chain and has the capacity to kick start economic development that few other businesses offer. However, the extraction of mineral reserves has always resulted in varying degrees of environmental resource degradation and social impacts, including displacement. Furthermore, mining industry being 'location specific', the site cannot be shifted away from the mineral deposits. Hence, the mining companies have to take enough precautions and responsibility to minimize the environmental damage during mining operations and restoring those areas after mining activity is over.

While acknowledging that no mining can be entirely free from all negative impacts, there is sufficient ground to suggest that Environmental Impact Assessment (EIA) is a formal process to predict the environmental consequences (positive or negative) of a plan, policy, program or project prior to the implementation decision. It proposes measures to bring down impacts to acceptable levels or to investigate new technological solution. Although it can lead to difficult economic decisions, strong political and social commitments, but it protects environment with sounds basis for effective and sustainable development.

An Environmental Management Plan (EMP) is usually prepared as part of EIA report. It translates recommended mitigation and monitoring measures into specific actions that will be carried out by the proponent. Cost of measures for environmental safeguards should be treated as an integral component of the project cost and environmental aspects should be taken into account at various stages of the project. EMP is a site- specific plan developed to ensure that all necessary measures are identified and implemented in order to protect the environment and comply with environmental legislation. It provides the answers to the following important questions:

- What are the likely environmental issues for the site?
- What likely harm these issues can cause to the surrounding environment?
- How will these issues be managed to minimize harm to the environment?

1.0 PURPOSE OF REPORT:

Environmental Clearance is the permission from the Govt. for setting of certain projects like mining, which may impact environment considerably. Any new mining projects or existing mining projects going for enhancement in capacity require environmental clearance either from Ministry of Environment, Forest & Climate Change (MoEF&CC), Govt. of India for the matters falling under Category 'A' (as the schedule of notification number S.O. 1533 (E), date 14th September 2006) or at state level in the State Level Environment Impact Assessment Authority (SEIAA) for the matters falling under Category B.

This EIA /EMP report has been prepared by the QCI accredited Environment Consultant M/s Pacific Scientific Consultancy Pvt. Ltd., Kolkata according to the Environmental Guidelines contained in MoEF&CC notification 14th Sept 2006, amendment of 1st December 2009 and further guidelines dated 16th November 2010.

(i) Draft report for holding public hearing/public consultation.

At the 1st stage; the draft report along with its Executive Summary is submitted to the State Pollution Control Board, West Bengal for holding public hearing/public consultation.

(ii) EIA Report for consideration of Environmental/Clearance

Later, at the 2nd stage, the draft report is finalized with inclusion of public hearing proceedings comments of the people and compliances by the project proponent. The final report will be submitted to the MoEF&CC, Govt. of India for consideration of Environmental Clearance.

The present report is an Environmental Impact Assessment report prepared as per latest stipulations of Ministry of Environment, Forests and Climate Change (MoEF&CC), Government of India. This report focuses on following aspects;

- Protect the surrounding environment during /after mining operation with appropriate environmental safeguards.
- Provide protection to the native floral and faunal diversity of the area.
- Protect both surface and groundwater qualities of the area from contamination.
- Measures to prevent deterioration in air quality.
- Minimize risks relating to mining on public health and improve economic status.
- Ensure that ecological balance of the area is not adversely affected by dust.
- Minimization of noise and vibration impacts on surroundings.

1.1 IDENTIFICATION OF PROJECT & PROJECT PROPONENT:

Proposed China Clay Mine of 19349 TPA and Fire Clay Mine of 8687 TPA over an area of 7.22 ha. (17.84 acres) at J.L. No. 145, Plot No. 4412 to 4418, 4420 to 4427, 5056 to 5064, 5066, 5067, 5071, 5072, 5074 5081, 5083 to 5092, 5095, 5096, 5098 to 5106, 5109 to 5118, 5122 to 5136 Patel Nagar, Mouza- Kharia, P.O. & P.S.- Md. Bazar, Dist.- Birbhum, West Bengal. The relevant lease deed dated 04.06.1986 was valid for 20 years, has expired on 03.06.2006, in terms of Rule 24 A under MCR 1960, the renewal lease application in –"J" form has been submitted 1 year before the expiry of the lease (on 02 .06.2005). So as per Rule 24 of MCR 1960, the said lease deemed to granted for another 20 years i.e. Up-to 2026.

Also, In terms of Memorandum No:151-ICE/0/MIN/MJM-MNL/03/2017, Dated-30.03.2021, Govt of West Bengal, Department of Industry, Commerce and Enterprise, Mines Branch, the date of Expiry of Lease 23.06.2036 (since 31 nos. of minerals having re-clarified in the Notification dated 10.02.2015) as Minor Minerals, the lease already existed regarding the same when we are executed before introduction of the above mentioned notification may be deemed to be the lease for such Minor Minerals and may be extended up to 50 years vide section 8A of MMDR (Amendment) Act 2015 and the State Govt is very much competent to regulate the mineral concession of said Minor Mineral under provision of Section 15 of MMDR (Amendment Act 1957).

The lease area is located in Toposheet No. 73M9 and is bounded between Latitude 23°59'28.59"N – 23°59'9.46"N and Longitude 87°36'0.45"E – 87°36'0.54"E.

The area of Block-I is already explored, and Block-II proposed to be explored. Present mine development was proposed in Block-I, which is already proved. Location map of the N.P. Minerals China Clay and Fire Clay mining leasehold area is shown in Fig. No. 1.1.

Fig. No. -1.1: Location Map of the Lease Area

The N.P. Minerals plans to develop the mine based on the techno-economic feasibility of the mines and as per approved mining plan. The mining plan was approved by the Office of the Chief Mining Officer, Court Road, Asansol, Dist. Paschim Bardhman, West Bengal vide Memo. no. 677/CMO/XVI/91(153), dt 29th December, 2017. The approved mining plan of M/s N. P. Minerals China clay and Fire clay mine is prepared with an envisaged production of 19349 tonnes per year China Clay and 8,687 TPA Fire Clay.

1.1 NATURE, SIZE, LOCATION AND ACCESSIBILITY OF THE PROJECT:

The China Clay and Fire Clay mining lease over 7.22 ha. is in non-forest land; the entire lease area comes under waste land. This mine was under operation till 2017 by N.P. Minerals. The

lease area is in general has a flat topography with gently sloping towards south west. The elevation of the ML area ranges from 51m AMSL to 52m AMSL. There is no perennial/ seasonal nala flowing within the lease area. The total Geological Reserve of China Clay and Fire Clay comes about 4,05,098 MT. After deductions of the safety zone, batter losses & standard mining losses, it is envisaged that 85% of the Geological Resources will be converted into Mineable Reserves. As the confidence level of the resource is low with the present level of information, the standard deductions of 15% have been made to convert extractable reserves from the mineable reserve. The extractable reserve of China Clay and Fire Clay are estimated to be 96,745 Ton and 43,435 Ton respectively during the mining plan period. With the maximum production of ROM to be 28,036 TPA, the life of the mines is expected to be 17 years.

The proposed Mining Project is situated about 16 km North-East of Suri, the dist. headquarter of Birbhum dist. via Mohammad Bazar through National Highway – 14; which is at a distance of 3.5 km in the West direction of the lease area. All weather road connects the mines with through State Highway (SH)- 11 and finally connect to the NH-14. The nearest railway station is at Sainthia towards the South of the project site.

1.2 DETAILS OF REGULATORY SCOPING (AS PER TOR):

This particular project is considered to be of 'B' category as the ML area is less than 100 ha. and the interstate boundary between West Bengal & Jharkhand as well as the nearest Sanctuary, National Park, Reserve, etc is above 5km of the project site. So, pre-environmental clearance application (Form–I, Proposed Terms of Reference & Pre- feasibility Report) was submitted online to SEIAA/SEAC West Bengal. Subsequently the project was considered during the 185th meeting of the State Level Expert Appraisal Committee, West Bengal held on 27th December, 2019 and SEIAA meeting held on 08.07.2021. After detailed discussion, Terms of Reference (ToR) was issued by the SEIAA vide Letter No: 1211/EN/T-II-1/078/2019 on 12th July, 2021 for carrying out EIA Studies and prepare EMP report for obtaining Environmental Clearance. The compliance to the prescribed ToR is presented it the table below;

Table No. 1.1: Compliances to prescribed ToR

ToR No.	Prescribed Terms of Reference	Compliances to Terms of Reference (ToR)
1.	Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification, 1994 coming into force w.r.t. the highest production achieved prior to 1994.	The lease deed dated 04.06.1986 was valid for 20 years, and has expired on 03.06.2006, in terms of Rule 24 A under MCR 1960, the renewal lease application in –"J" form has been submitted 1 year before the expiry of the lease (on 02 .06.2005). So as per Rule 24 of MCR 1960, the said lease deemed to granted for another 20 years i.e. Up-to 2026. Also, In terms of Memorandum No:151-ICE/0/MIN/MJM-MNL/03/2017, Dated-30.03.2021, Govt of West Bengal, Department of Industry, Commerce and Enterprise, Mines Branch, and also as per amended MMDR Act 2015 the date of Expiry of Lease is 23.06.2036
2.	A copy of document in support of the fact that the proponent is the rightful lessee of the mine should be given.	Mining Lease documents for N.P. Minerals China Clay and Fire Clay mines over an area of 7.22 ha. has been attached as **Annexure II** in support of the fact that N. P. Minerals is the rightful lessee of the mine.
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.	The EIA /EMP report has been prepared & public hearing will be conducted in compliance with the mining plan in terms of the production target, waste generation and management & mining technology.

4.	All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery /toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	All corner coordinates of the mine lease area superimposed on google earth map is attached as **Annexure III.**
5.	Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.	The 10km study area map of the proposed site is provided in Survey of India Toposheet No. 73M9 and is given as figure 1 in Chapter 1.
6.	Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.	The total lease area of 7.22 ha. come under waste land. No forest land is involved in the lease area. Earlier mining was carried out within this lease area till 2017 by N.P. Minerals.
7.	It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/ procedures to bring into focus any infringement/ deviation/ violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances/ violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.	Yes, the company has a well laid down Environment Policy. This policy has fixed roles and responsibilities of each personnel. The company has a system of reporting of non-compliances/ violations of environmental norms to the Board of Directors of the company. The details are discussed in Chapter-6, Section 6.5, 6.6 & 6.7.
8.	Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should	Clay of this area is usually bedded in nature which is also interbedded with sandy clay. So, no drilling and blasting will be carried out in the process of mining. The likely causes

	also be provided.	and preventive measures relating to mines safety is depicted in section 7.1 of Chapter -7.
9.	The study area will comprise of 10 Km zone around the mining lease area from the lease periphery and the data contained in the EIA such as waste generation, etc. should be for the life of the mine / lease period.	The EIA study has been prepared by taking into consideration the 10km area around the mining lease. The data in the report is for the 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 indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.	Land use of the study area delineating forest area, agricultural land, grazing land, water bodies, human settlements and other ecological features is Section 3.4 of Chapter – 3.
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.	There is no proposal of dumping outside the leasehold and also the mine is lease free from any households
12.	A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.	The lease hold involves no forest land.
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 Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.	Not applicable
15.	The vegetation in the RF /PF areas in the study area, with necessary details, should be given.	The detail of the forest within the study area is given in Chapter-3. There is no RF/PF present in the 10 Km study area.
16.	A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.	There is no endangered or rare animal in the study area; so, no protected area is there for conservation. However, dust pollution, noise pollution, increase in human interference may impact the existing wildlife. But a no. of similar mines are operating in the study area due to which the wildlife have become habituated to prevailing conditions. The details are discussed in Section 4.1.5 & 4.1.6 of Chapter 4 and Section 10.7 & 10.8 of Chapter 9.
17.	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/Elephant Reserves/ (existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.	There is no National Parks /Sanctuaries, Biosphere Reserves, Wildlife Corridors, Tiger Reserves within 10 Km radius of the mining lease area in West Bengal. A map to this effect is in process of authentication by Chief Wildlife Warden and will be submitted at the time of Final EIA submission.
18.	A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the	A detailed biological study for the study area covering both core & buffer zone was carried out including field survey, local people interaction as well as comparison of information available from various govt. agencies. The detailed is

	Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.	discussed in Section 3.9 of Chapter-3. There is no endangered, endemic & RET Species of flora and fauna observed during the study. The list of available flora and fauna is in the process of authentication by DFO, Birbhum and will be submitted with the Final EIA.
19.	Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Dept. Should be secured and furnished to the effect that the proposed mining activities could be considered.	There is no such area within the study area of 10km.
20.	Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL. HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).	Not applicable
21.	R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need-based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and	The project does not involve any Displacement & Rehabilitation.

	socio-economic aspects should be discussed in the Report.	
22.	One season (non-monsoon) [i.e., March - May (Summer Season); October -December (post monsoon season); December - February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.	Baseline data on Ambient Air Quality, Noise Level, Water Quality, Soil, Flora & Fauna has been collected during winter season starting from 1st October, 2021 to 31st December, 2021. The detailed results are given in Section 3.5, 3.6, 3.7, 3.8 & 3.9 of Chapter 3. Micro-meteorological data has also been collected from the site and compared with the information available from the secondary sources. The monitoring stations were fixed taking into account some of the important aspects like pre-dominant wind direction, topographical features, human habitat, sensitive areas, water sources etc.
23.	Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre- dominant wind direction may also be indicated on the map.	The air quality modeling details is discussed in Section 4.1.1 of Chapter- 4 and the Isopleths maps is attached as Fig. No. 4.1. The map has been prepared by taking into account the impact of mining and movement of vehicles for transportation of mineral under controlled conditions.
24.	The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.	The water requirement for the project will be 1.5 KLD; 0.8 KLD will be used for dust suppression, plantation will consume 0.5 KLD whereas drinking water need along with cleaning & washing at work place is 0.2 KLD. The details

		been discussed in and a water balance is provided in Section 4.1.2.4 of Chapter- 4.
25.	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	The water required for sprinkling & plantation shall be collected from the settling tank whereas drinking water shall be from mines office, which is inside the ML area & has water facility with due permission.
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.	The water conservation measures proposed to be adopted in the project are collection of surface runoff, minimizing wastage of water in office and adaptation of rainwater harvesting scheme.
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.	The mining activities shall be carried out upto a maximum depth of 21m from surface level i.e. 30m AMSL by the end of the life of the mines, whereas the ground water table of the region varies from 6m to 8m with maximum at 30m AMSL (during post monsoon period). Maximum depth of the quarry is 21.0 m. pumping will be required for water drainage. However, the accumulated water during rainy season may be pump out. If required 2 no. of 10 HP. Diesel pump will be deployed. Moreover. no workings are proposed to carried out during rainy season, hence regular pumping of quarry water shall not be required.
28.	Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report	The mining activities shall be carried out up to a maximum depth of 21m from surface level i.e. 30m AMSL by the end of life of the mines (which is 17 years), whereas the ground water table of the region

	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.	varies from 6m to 8m with maximum at 30m AMSL (during post monsoon period).
29.	Details of any stream, seasonal or otherwise, passing through the lease area and modification /diversion proposed, if any, and the impact of the same on the hydrology should be brought out.	There are no perennial streams crossing the mining lease area. Surface run-off water of the lease area flows through the natural slope which is towards south and discharges water to Mayurakshi River flowing at a distance of about 3 km from the leasehold area.
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.	The mining activities shall be carried out upto a depth of 21m from surface level by the end of the lease period, whereas the ground water table of the region varies from 6m to 8m with maximum at 30m AMSL (during post monsoon period). The schematic diagram is given in the Mine Plan which is attached as **Annexure IV.**
31.	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.	Time bound Progressive Greenbelt Development Plan in tabular form is given in Chapter 10, Table No. 10.1. The details of plant species to be planted in specific part of the lease hold are given.

32.	Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.	The study on traffic density is given in Section 3.10 of Chapter – 3. The exiting road network is sufficient to handle the increase in truck density. However, the village road connecting the ML area to the NH needs to be regularly maintained.
33.	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	The details of onsite shelter and facilities for the mines workers are discussed in Section 8.5, of Chapter 8.
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.	With the proposed rate of production, the extractable clay upto a depth of 21m will be mined out in 17 years. At the end of the conceptual period, the generated lateritic OB of 3,12,000 Ton shall be used in backfilling of 3.90 ha. of the mined-out area, which is the northern part of the quarry. After the completion of quarrying operation, remaining of the quarry area i.e. 0.92 ha. will be converted into pond; which will be utilized for irrigation and pisciculture purpose will be converted to water body.
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.	There is no instance of occupational health problems due to similar type of project in the surrounding. Regular Health camps shall be organized for proper health checkup of the mine's workers and the local villagers in the vicinity. The control measures adopted to prevent the occupational impact are discussed in Section 10.9 of Chapter- 10.

36.	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	The process of excavation /quarrying & sizing leads to some health hazards. Regular medical check-up camps shall also be arranged for detection of occupational diseases and minor disease in the nearby rural population. However, there is no instance of occupational health problems due to similar type of projects in the locality.
37.	Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	There will be positive impact on the socio-economic development of the local inhabitants due to the existing project. The details are discussed in Chapter 8.
38.	Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.	The Environmental Management Plan is discussed in Chapter- 10.
39.	Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.	Public Hearing points raised and time bound action plan with budget to implement will be incorporated after conducting public hearing.
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.	Not applicable
41.	The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.	The cost of the project is Rs 194.57 lakhs & that towards implementing EMP is Rs 15.50 lakhs. The details are described in Table No. 6.5 of Chapter-6.
42.	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	The Disaster management Plan is given in Chapter 7, Section 7.1.

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.	Benefits of the said Project are discussed in Chapter 8.
44. General Conditions		
a)	Executive Summary of the EIA/EMP Report.	Complied
b)	All documents to 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, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.	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 project as devised earlier by the Ministry shall also be filled and submitted.	Complied
g)	While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants Issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA. II(I) dated 4th August. 2009. which are available on the website of this Ministry. should be followed.	Complied
h)	Changes. If any made In the basic scope and project parameters (as submitted In Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reason 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 modification arising out of the P.H. process) will entail conducting the	Noted

	PH again with the revised documentation.	
i)	As per the circular no. J-11011/618/2010-IA. II(I) dated 30.5.2012 certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change as may be applicable.	Noted
j)	The EIA report should also Include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any. Clearly showing the land features of the adjoining area.	Complied

CHAPTER-2

PROJECT DESCRIPTION

CHAPTER -2
PROJECT DESCRIPTION

2.0 DETAILS OF PROJECT

Proposed China Clay Mine of 19349 TPA and Fire Clay Mine of 8687 TPA over an area of 7.22 ha. (17.84 acres) at J.L. No. 145, Plot No. 4412 to 4418, 4420 to 4427, 5056 to 5064, 5066, 5067, 5071, 5072, 5074 to 5081, 5083 to 5092, 5095, 5096, 5098 to 5106, 5109 to 5118, 5122 to 5136 Patel Nagar, Mouza- Kharia, P.O. & P.S.- Md. Bazar, Dist.- Birbhum, West Bengal.

The mining lease area is situated about 11 km North-East of Suri, the dist. headquarter of Birbhum dist. via Mohammad Bazar through National Highway – 14; which is at a distance of 3.5 km in the West direction of the lease area. All weather road connects the mines with through SH- 11 and finally connect to the NH-14. The nearest railway station is at Sainthia towards the South East of the project site. The entire lease area is in waste land; no forest land is involved in the lease area. The elevation of the ML area ranges from 51m AMSL to 52m AMSL. The lease area is in general has a flat topography with gently sloping towards south.

Based on the rated production of mine and mineable reserve, it is estimated that the life of the mine shall be 17 years. The extraction of clay is by opencast semi-mechanized method by excavation, without drilling & blasting, followed by stacked and spread over the mineral stack yard area for drying.

2.1 NEED FOR THE PROJECT

Clay in the region is popular for its salability in the ready market. Occurrence of both China Clay and Fire Clay has developed mining and allied industry in the region and acts as one of the major livelihoods for the local people. Starting from the medium sized mines to cottage industry by means of generating “Khari Mati”, a major chuck of people depends upon the clay mines. Besides, clay beneficiation plants also run to beneficiate and upgrade the ROM products. Depending upon the brightness, colour and plasticity, demand of the different clay products varies. China clay is used mainly in sanitary ware industry, tiles production industry, pottery works and dinner production process as a raw material. China clay and fire clay also used in refractory production; in paper industry and in rubber industry as filler.

The market has a steady demand of the supplied ROM in both ROM form as well as beneficiated products. Usually, the mines production is based on the demands. The Clay (Both China Clay & Fire Clay) produced from the mine will be entirely sold in domestic market. It is also being a very common material to be procured from local market, export possibility is not yet considered. The local market has good demand of the material.

To cater growing need of clay for use in the refractory and other industries, N.P. Minerals has decided to start clay mining in Patel Nagar Mouza Kharia. The clay of Birbhum District, popularly known as "Khari Mati" is being used in most of the refractory and other industries within and outside the state of West Bengal. The areas around Patel Nagar are important centre for production of clay in order to cater to the need of various consumers.

2.2 PHYSIOGRAPHY AND GEOLOGY OF THE LEASEHOLD AREA

2.2.1 Physiography:

The area is characterised by the flood plain deposit of Mayurakshi River, which is flowing west to east in the southern part of the study area at a distance of 3Km. Flow of Mayurakshi River is controlled by the nearby barrage at Tilpara Mihirlal Barrage. It is situated at distance of around 9 Km from the project site in WSW direction. One canal is running from the water reservoir is passing around 1 Km from the project site near Patel Nagar. The climate of the area is very hot in summer and cool in winter with temperature ranges between 8^0C to 42^0C and average annual rainfall of 1564mm.

2.2.2 Regional Geology:

Rock type of Birbhum district comprises with the archeans exposed in the South-West and North-West consists of granites, granite gneisses, biotite-schists and calc granulites. Gneisses are predominant and probably intruded in the pre existing schsists. In the northern part, Rajmahal series is overlying the Gondwana formation mostly consists of basalts of fine to coarse grains consists of pyroxenes and plagioclase feldspars with ophiolitic textures.

Occurrence of tertiary formations is found to be in patches and is exposed in Patel Nagar Mokdamnagar-Mohammad bazaar area, Chaknurai, Chaubatta etc. areas. The sequence comprises clays and sandstones which overlie the Rajmahal traps on the north, as at chaubatta while Archaeans forms the basement in the south as at Adda.

The study area falls under the fringe of the Archaens and Rajmahal series which even supported by the presence of fire clay in few instances. A generalized succession of the region is given in the table below after Karunakaran, Rao and Sinharoy (1969) in Table No. 2.1.

Table No. – 2.1: Stratigraphic Sequence of the area.

Formation	**Age**
Alluvium	Recent
Laterite and Lateritic gravel with silicified fossil wood	
Clay beds	Tertiary
Ferruginous and felspathic sandstones	
Rajmahal Traps	Middle Jurassic
Flaggy shale, clays and compact sandstones (Dubrajpur beds)	Lower Jurassic
Sandstones, shale with coal seams (Barakar Series)	Permian
…….Unconformity……..	
Granite, Granite Gneisses, biotite schist's, calc granulites with quartz and pegmatite veins	Achaean

2.2.3. Local Geology:

Geomorphologically the area forms a part of the dissected lateritic upland where majority of the southern and eastern parts are mostly dominated by the flood plains of Lower Ganga whereas immediate northern edge forms the Southern tip of the Rajmahal Plateau.

The study area is mostly covered by a lateritic and alluvium cover**.** Clay of this area is generally covered by alluvium, Laterite and or lateritic soil and occasionally sandstone and is possibly formed due to kaolinization of feldspar of granite gneiss. The clay belongs to the Tertiary sequence. Colour of crude clay varies from off-white to light cream and light buff with brown to purple tinge at places. Clay of this area is usually bedded in nature which is also interbedded with sandy clay. So far the observation made during site visit, it is understood that Clay beds near the surface are mostly ferruginous and are capped by Laterite to lateritic soil of various thicknesses that ranges from 50 cms to 4m or more. Clay of the area is compact in nature with moderate plasticity. Clay beds have a general trend of NE-SW with a low dip (about 10^{o} southeasterly).

2.3 UPTO DATE RESERVE ESTIMATION:

Initially the area has been worked by N.P. Minerals and a previous report was made available by the company. The report suggests that, the formation of clay is due to extensive Kaolinization of the tertiary rocks, compact in nature, moderately plastic with colour tint (brown-chocolate) and are highly ferruginous. Depth of Overburden varies from 5 meter to 6 meter whereas clay layer is being found to occur till 21-meter depth with variable thickness. The continuity was established by five numbers of bore holes in the area.

Besides the resources estimated in and around the existing quarry pits, about 5.20 Ha of land within the block is untouched. Quite likely, the clay beds are continuing in the area which needs to be proved by subsequent exploratory works. To ascertain the clay resources within this part of the block as well with lower level of confidence (50%) and is defined as prognosticated resources. Estimated resources comes about 4,05,098 MT of China and Fire Clay.

After deductions of the safety zone, batter losses and standard mining losses, it is envisaged that 85% of the Geological Resources will be converted into Mineable Reserves. As the confidence level of the resource is low with the present level of information, the standard deductions of 15% have been made to convert extractable reserves from the mineable reserve.

2.4 YEAR WISE PRODUCTION FOR THE FIRST FIVE YEARS

The year wise production of clay and waste from the Patel Nagar China Clay and Fire Clay mines is given below in **Table No. 2.2.**

Table No. 2.2: Year wise production for the first five years

Period/ Year	Block	Pit Size (m^3)	Over Burden (m^3)	Tonnage Factor / Conversion Factor	Mining Loss +Geological Loss	Gross Fire Clay in M.T.	Net mineable F.C. in M.T.	Gross China Clay in M.T.	Net mineable C.C. in M.T.	Net Ore (F.C + C.C.) in M.T.
1st	I	105 x15 x21	105x15x6=9450	1.3	15%	99x15 x4.5x1 .3=8687	8687x85 %=7384	94.5x15x10.5 x1.3= 19349	19349 x 85%= 16447	7384+16447= 23831
2nd	I	105 x15 x21	105x15x6=9450	1.3	15%	99x15 x4.5x1 .3=8687	8687x85 %=7384	94.5x15x10.5 x1.3= 19349	19349 x 85%= 16447	7384+16447= 23831
3rd	I	105 x15 x21	105x15x6=9450	1.3	15%	99x15 x4.5x1 .3=8687	8687x85 %=7384	94.5x15x10.5 x1.3= 19349	19349 x 85%= 16447	7384+16447= 23831
4th	I	105 x15 x21	105x15x6=9450	1.3	15%	99x15 x4.5x1 .3=8687	8687x85 %=7384	94.5x15x10.5 x1.3= 19349	19349 x 85%= 16447	7384+16447= 23831
5th	I	105 x15 x21	105x15x6=9450	1.3	15%	99x15 x4.5x1 .3=8687	8687x85 %=7384	94.5x15x10.5 x1.3= 19349	19349 x 85%= 16447	7384+16447= 23831
In Five Years			**47250**			**43435**	**36920**	**96745**	**82235**	**119155**

The extractable reserve of China Clay and Fire Clay are estimated to be 96,745 Tonnes and 43,435 Tonnes respectively. With the maximum production of ROM to be 28,036 TPA, during the plan validity and the life of the mines is expected to be 17 years. However, life of the mine may increase depending on the outcomes of proposed exploration of the ML area.

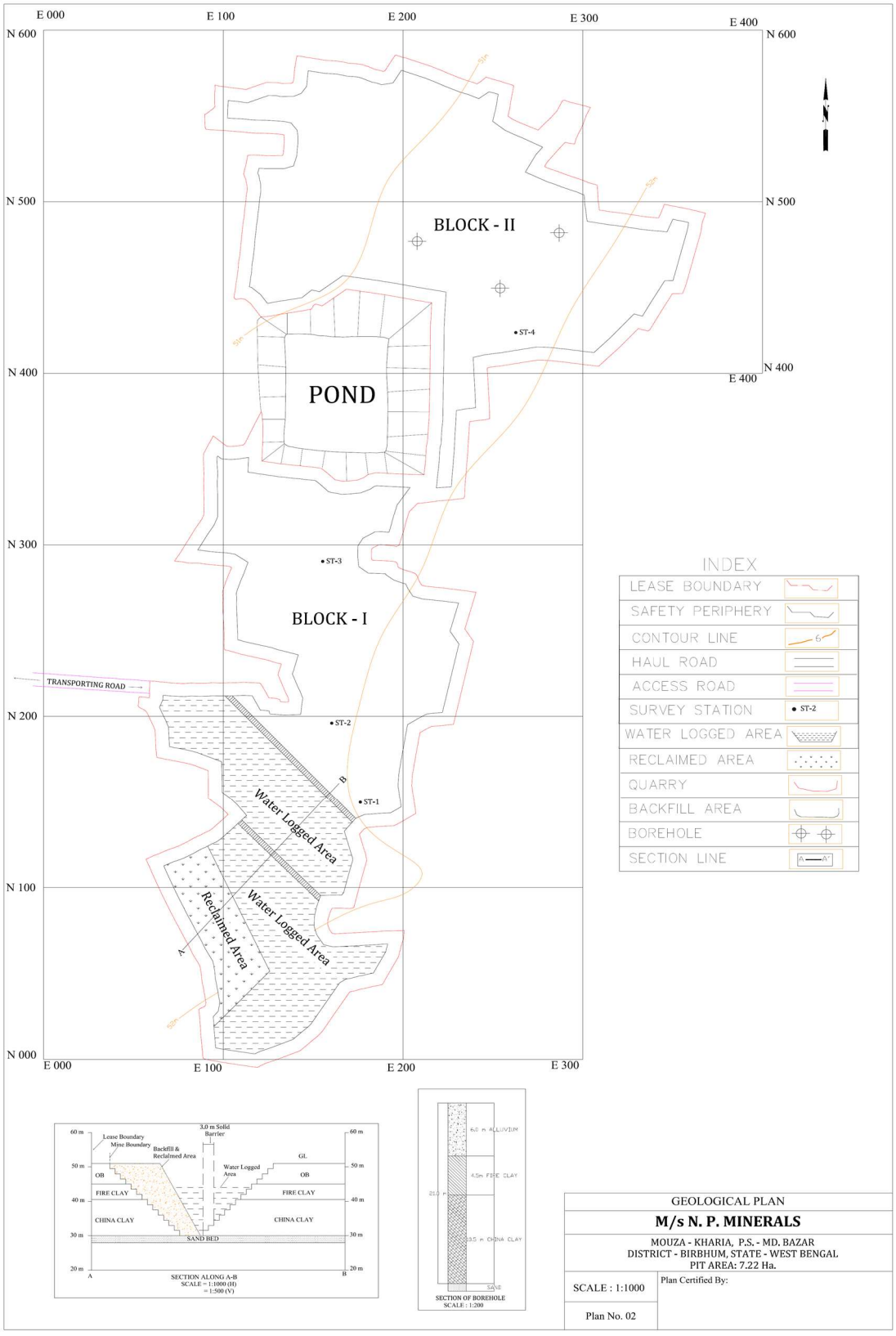
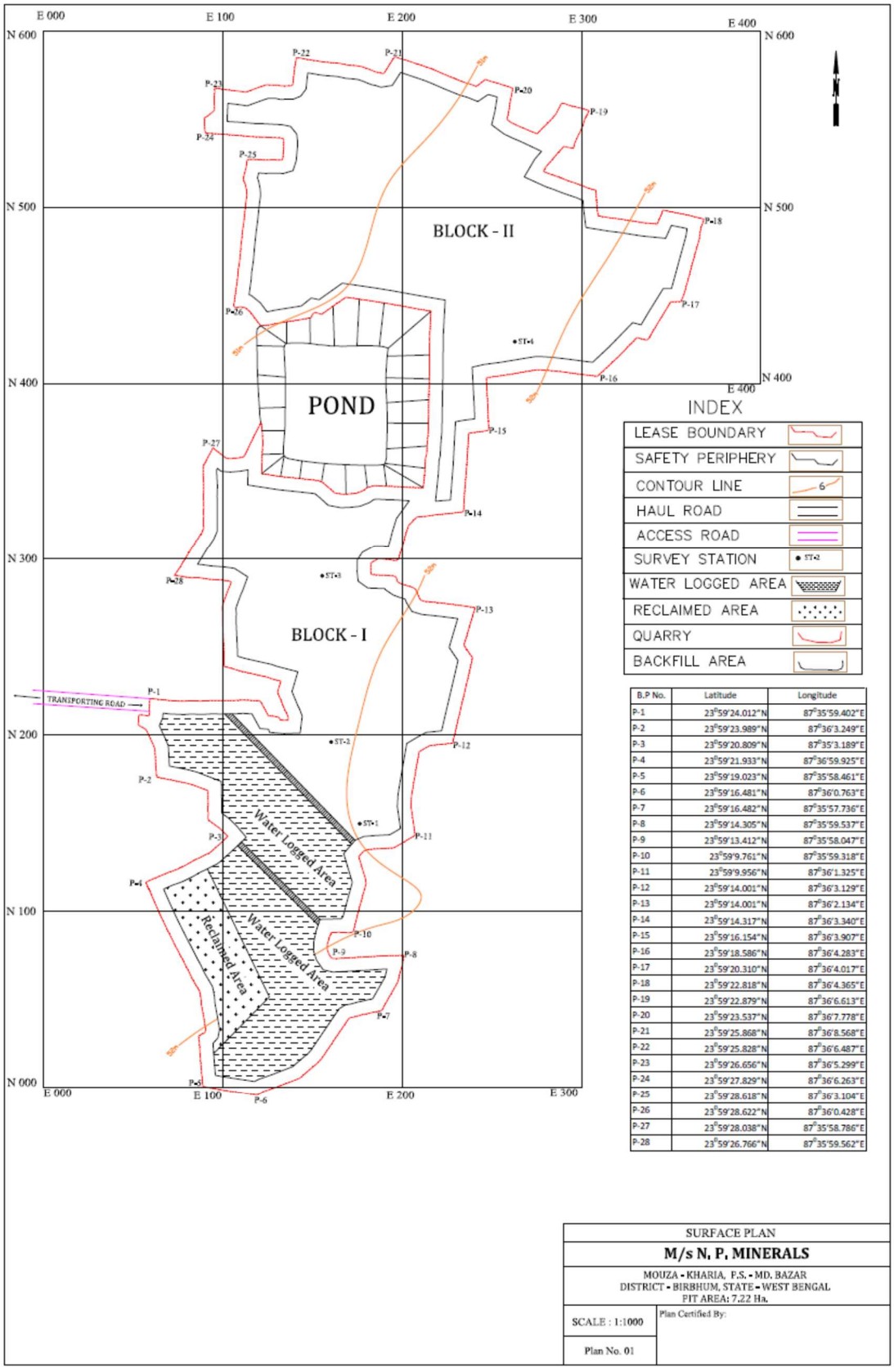


Fig. No. 2.1: Geological Plan cum Section Plan



B.P No.	Latitude	Longitude
P-1	23°59'24.012"N	87°35'59.402"E
P-2	23°59'23.989"N	87°36'3.249"E
P-3	23°59'20.809"N	87°35'3.189"E
P-4	23°59'21.933"N	87°36'59.925"E
P-5	23°59'19.023"N	87°35'58.461"E
P-6	23°59'16.481"N	87°36'0.763"E
P-7	23°59'16.482"N	87°35'57.736"E
P-8	23°59'14.305"N	87°35'59.537"E
P-9	23°59'13.412"N	87°35'58.047"E
P-10	23°59'9.761"N	87°35'59.318"E
P-11	23°59'9.956"N	87°36'1.325"E
P-12	23°59'14.001"N	87°36'3.129"E
P-13	23°59'14.001"N	87°36'2.134"E
P-14	23°59'14.317"N	87°36'3.340"E
P-15	23°59'16.154"N	87°36'3.907"E
P-16	23°59'18.586"N	87°36'4.283"E
P-17	23°59'20.310"N	87°36'4.017"E
P-18	23°59'22.818"N	87°36'4.365"E
P-19	23°59'22.879"N	87°36'6.613"E
P-20	23°59'23.537"N	87°36'7.778"E
P-21	23°59'25.868"N	87°36'8.568"E
P-22	23°59'25.828"N	87°36'6.487"E
P-23	23°59'26.656"N	87°36'5.299"E
P-24	23°59'27.829"N	87°36'6.263"E
P-25	23°59'28.618"N	87°36'3.104"E
P-26	23°59'28.622"N	87°36'0.428"E
P-27	23°59'28.038"N	87°35'58.786"E
P-28	23°59'26.766"N	87°35'59.562"E

SURFACE PLAN

M/s N. P. MINERALS

MOUZA - KHARIA, P.S. - MD. BAZAR
DISTRICT - BIRBHUM, STATE - WEST BENGAL
PIT AREA: 7.22 Ha.

SCALE : 1:1000

Plan Certified By:

Plan No. 01

Fig. No. 2.2: Surface Plan

2.5 MINING PROCESS

2.5.1 Mining Method:

The mining lease is spread over an area of 7.22 Ha. During the ensuing five year, the mine shall achieve its targeted production of 1,40,180 TPA ROM. The average number of working days in the year would be 300 (excluding the rainy season). Till the end of the lease period, a total of 0.7875 ha of land shall be degraded out of 7.22 ha.

The lease area has a flat topography with gently sloping towards south west. The elevation of the ML area ranges from 51m AMSL to 52m AMSL. The quarry may deepen up to 21m from the surface level as the reserve is observed to be available up to that limit. Mining shall commence from the southern part of the leasehold and completed up to the reserve level of about 30m AMSL. Initially the existing quarry area towards the south of the lease area will be expanded towards north to meet the desired production level. All five years planned production from the southern patch of the lease only. Plan for the remaining area will be done once exploration is completed within this planned period. The rain water stored in the existing quarry i.e. the pit towards south of the lease area shall be used in water sprinkling and plantation purpose with the start of mining activity.

Opencast semi-mechanised method of mining will be adopted without drilling & blasting, on single shift basis with the deployment of 1.5m^3 excavator, 5m^3 capacity tippers and 21 employees. The ultimate pit slope will be around 45^0 with the horizontal. ROM produced from the mine will be stacked and spread over the mineral stack yard area for drying. Products will be broken onto lump sizes before it's dried up. Fines are used locally for different derived products; however lumps are used in industrial purposes. In this project, there is no plan of washing of materials, but to produce only ROM product of variable grades.

The mine shall be developed in next five years up to a depth of 21m including 6m of Alluvium soil over burden. Direct excavation method will be followed as the strata conditions are soft in nature. The top OB is alluvium in nature while clay is exposed below the alluvium surface. During the first five years of production, drilling will be carried out once for further exploration purpose. Production of clay includes China clay and Fire clay. The height & width of the quarry benches will be kept at 1.5m, each respectively at the time of abandonment of the mining

activity, in order to ensure the ultimate pit slope will be around 45^0 with the horizontal. The loss of mineral during transportation will be negligible.

Mining will be carried out through direct excavation method by excavators and loading onto tippers /dump trucks. Surface transport involves carrying of ROM products from mine pit to Stack Yards. This will be done through $5m^3$ dump trucks.

2.5.2 Mineral Processing:

In Clay mining, usually there is washing as part of mineral processing to upgrade the market value. However, this project doesn't envisage any washing of materials, but to produce only ROM product of variable grades.

The excavated clays will be stacked and spread over the mineral stack yard area for drying. Stacked Clay will require more areas for breaking of big size products into lump sizes and spreading of the same for drying up. This process will be done manually and it will be a labour intensive job. Fines will be used locally for different derived products; however, lumps will be used in industrial purposes.

2.5.3 Drilling and Blasting:

No drilling and blasting will be required in this semi-mechanised open cast mining process to extract China Clay and Fire Clay. Direct excavation of different types of clays will be stacked and spread over the mineral stack yard area for drying. Products will be broken onto lump sizes before it's dried up.

2.6 CONCEPTUAL MINING PLAN

2.6.1. Life of the Mine:

The extractable mineable reserves in the leasehold are estimated to be 2,74,818 MT for China Clay and 1,30,280 MT for Fire Clay. Considering a steady production 28,036 TPA (ROM) and the extractable reserves (85% of Gross Geological reserves) of 16,447 MT for China Clay and 7,384 MT for fire clay, the life of the mine shall be 17 years, i.e. covering the full tenure of the lease period. However, change in the reserve figures will be there with further exploration and exploitation, by which the life of mines shall be increased by some more years.

2.6.2. Ultimate Extend and Size of the Quarry:

At present there are no mining activities at site. During the initial planned five years of mining operation, the depth of mining will be limited to 21 meters from the surface level with spreading over 0.7875 ha., while in the end of five year, the depth will be limiting in the same and quarry area will be 0.7875 ha. At the end of the mine plan period, the generated OB of 47,250 MT shall be used in backfilling of 0.7875 ha. of the mined-out area.

The mine was operating till 2017. Hence, electricity, drinking water, first aid facilities are available at mine site office. The project is having a complete set up of office infrastructure just outside the lease boundary owned by N.P. Minerals, but not within the ML boundary. The same will be extended for the mining project.

2.6.3. Ultimate Capacity of Dumps:

The solid waste comprises of alluvium top soil & overburden. Alluvium soil mixed with weathered mantles is the type wastes. Small quantity of Top soil (since the top portion of the lease area is alluvium soil) if any generated, shall be stacked over an earmarked area of 0.08 ha. and shall be used in annual plantation. The alluvium overburden of 6m thickness (47,250 cum in Five Years) shall be dumped over an identified area covering 0.7875 ha. by the end of the plan period. At the end of the period, the generated OB of 47,250 cum shall be used in backfilling of 0.7875 ha. of the mined-out area.

Since life of the mines is 17 years, this OB dump will be made inactive and reclamation will be done by means of technical and biological means. To prevent water pollution OB dump shall be provided with boulder wall and garland drain.

Table No. 2.3: Waste Generation and Storage

	Quantity		**Area of dumping /stacking**	
	After 5year	**Conceptual**	**After 5year**	**Conceptual**
Top Alluvium OB (6m from surface level)	47,250 cum	3,12,000 cum	0.08 ha.	3.90 ha. (Reclaimed by Backfilling)
Mineral (Clay) stacking	----	-----	0.7875 ha.	Nil (At conceptual stage, there will not be any mineral storage yard as everything is conceptualized to be sold)

2.6.4. Reclamation:

The whole area is found to mineralized with a 5 to 6m depth of overburden within the lease area. As per the approved mining plan, clay material in the area continued till an average depth of about 21m from the surface level. During the lease period, 4 benches will be worked with the top OB bench where bench height will not exceed 1.5m in any case.

It has been found that with the proposed rate of production, the life of the mines will be 17 years. At the end of the conceptual period, the generated alluvium soil OB of 3,12,000 m^3 shall be used in backfilling of 3.90 ha. of the mined-out area, which is the northern part of the quarry. After the completion of quarrying operation, remaining of the quarry area i.e. 0.92 ha. will be converted into pond; which will be utilized for irrigation and pisciculture purpose.

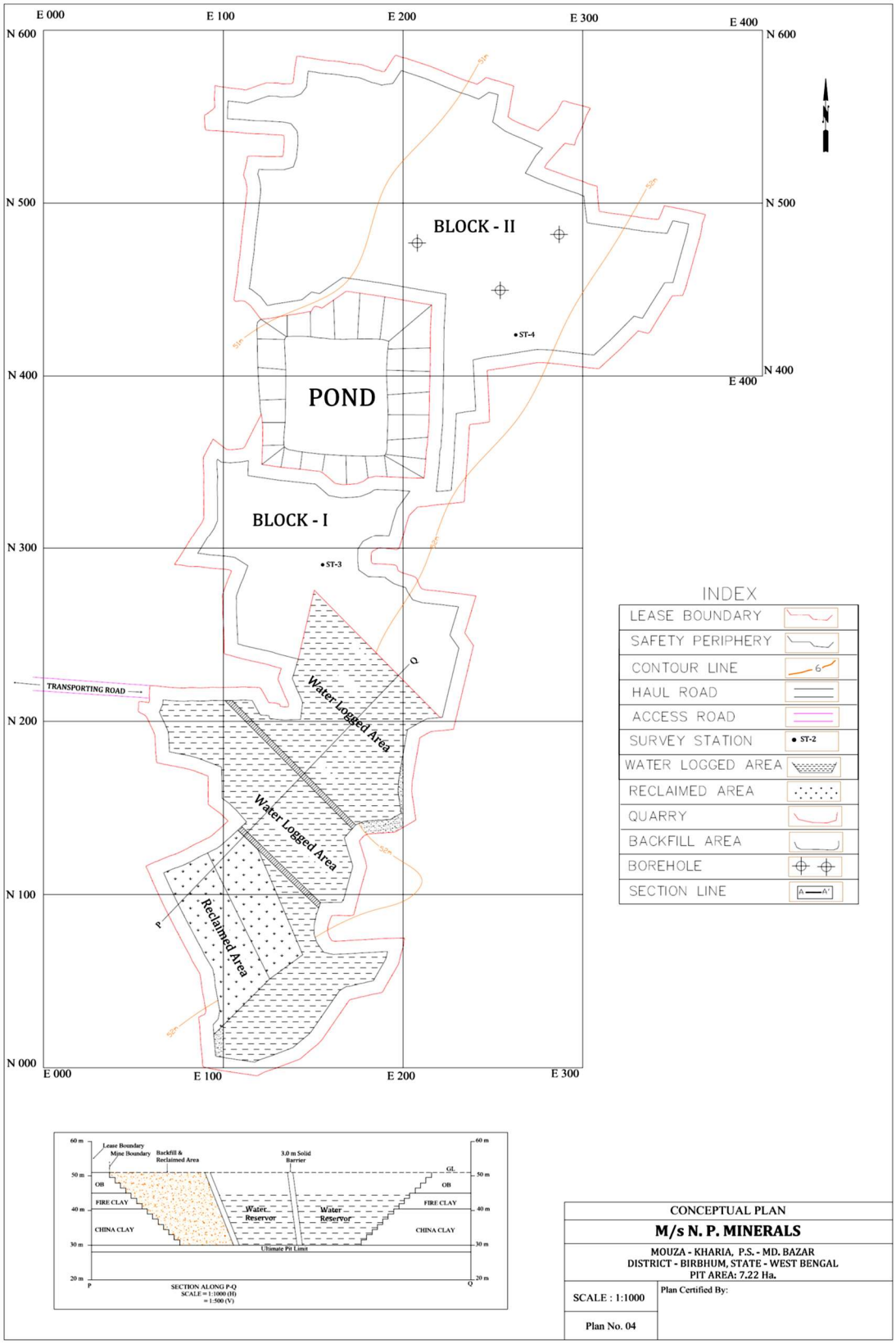


Fig. No. 2.3: Conceptual Plan

2.7 LAND USE

The clay deposit spread over an area of 17.84 acres (7.22 ha.) in Patel Nagar. The mining activity shall bring changes to the existing land form within the lease area. Land use pattern within the leasehold after the plan period & at the end of the Lease period is given below;

Table No. 2.4: Land use within the ML Area

Sl. No.	Type of Land use	Area at present (ha)
1	Old Pit	0.68
2	Reclaimed Area	0.31
3	Dumps	0.08
4	Present Quarry	0.79
5	Water Reservoir	Nil
6	Virgin Area	5.20
7	Road	0.15
8	Site Services	0.01
G. Total		**7.22**

2.8 USE OF MINERALS

China Clays have been used in the ceramic industry since a long period. China Clay, a soft white clay that is an essential ingredient in the manufacture of China and porcelain. The properties that this clay possesses like easy molding, fine texture, etc. make it easier to use. In making paper, this clay is also used as filler. This clay is used for providing the adequate gloss on the grades of coated paper. Approximately 40 percent of the China Clay produced is used in the filling and coating of paper. Apart from the paper, it is also used in the production of rubber, paint, ceramics, cement & tiles, cosmetics & soap, dyes and many other products as well.

One of the best uses of this clay is removing the impurities from the skin. At the time of winters, this clay is useful enough to treat the problems of the dry skin. It is rich in mineral and its healing properties do the wonders for the skin. One rare quality in China Clay mud masks is to remove oil, dirt and toxins without leaving areas of the face, mainly the nose, shinny. These are essentially the same qualities that make China Clay useful in soap, although it is considered the least absorbent of the clays commonly used in soap. Therefore, it is used most often in

soaps for less oily, dryer skin. China Clay is also used in deodorants, tooth paste, anti-inflammatory creams (poultices) and scrubs.

Fire Clay is a normal mud, but a mud with higher Alumina (AL) content. Has usually whiter-lighter color i.e., whitish to yellowish, pinkish, light brownish. Commonly Alumina content of Fire Clay ranges between 24% – 34% and Silica from 50% to 60%. this clay is mainly used in the production of heat resistant clay items because of very high fusion and melting point, Once it is worked and fired, it will hold up to extremely high temperatures such as those found in kilns, furnaces, and retorts, Fire Clay can also be used to create fire resistant chimney and flue liners, and fire resistant pads for safety. The principal uses of Fire Clay are in the manufacture of firebrick and of various accessory utensils, such as crucibles, saggers, retorts, and glass pots, used in the metal working industries.

2.9 MANPOWER

The manpower requirement in the proposed China Clay and Fire Clay mine shall include those of managerial & supervisory personnel, highly skilled workers and labours (skill, semi-skill & un-skilled type) for mining, top soil /OB removal, transportation, etc. No colony is planned as most of the workers will be from local villages. Local people will be given priority in case of employment depending upon their experience and qualification. With the development of this mining activity there will be lot of scope for more ancillary development, which in turn will benefit the local population. Total man power to be employed in the mines are estimated to be 21 nos.

Table No. 2.5: Manpower Requirement

S. No.	Items	Total
1.	Manager (Permit Manager or Foreman or Diploma Holder)	01
2.	Attendant cum Clerk	01
3.	Night Guard	01
4.	Miners	11
5.	Supervisor	01
6.	Store/ Godown keeper	01
7.	Dumper Operator	03
8.	Helper	01
9.	Electrician	01
	Total	**21**

2.10 EXTENT OF MECHANIZATION

The mining shall be semi-mechanized through direct excavation method by excavators and loading onto tippers /dump trucks. Surface transport involves carrying of ROM products from mine pit to Stack Yards. This will be done through 5m^3 tippers and dump trucks. The machinery, which shall be deployed in the mines for is given in the following table;

Table No. 2.6: List of Machineries

Sl. No.	HEMM with Capacity	Nos.
1.	Excavators – 1.5 Cum	02
2.	Diesel Pump 5 H.P.	01
3.	Dumper/Trucks – 5m^3	03
4.	Water Sprinkler	01
5.	Mine Inspection Car	01
6.	Safety Equipment's (Safety Belt, Safety Helmet, Safety Shoe etc.)	Adequate Nos.

2.11 SOURCE OF WATER

This is a Clay mining project through mechanized machine; no other industrial water is required. Total water requirement at the mine shall be about 1.5 KLD for domestic, sprinkling and green belt development. Water will be sourced through tankers.

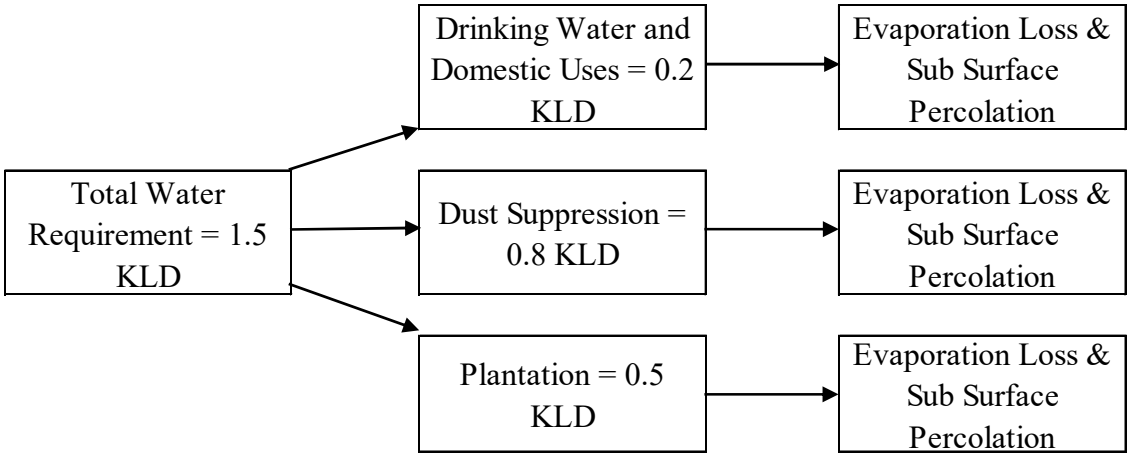


Fig. No. 2.4: Water Balance Diagram

2.12 POWER

There will be no power requirement for the project as the hired machinery will be used for mining of minerals which will be diesel operated.

2.13 PROJECT COST

The cost of the project and means of finance is proposed to be as follows:

Table No. 2.7: Cost of Project

Item		Cost (in Lakh)
1.	Land & Shed	Rs. 55.23
2.	Heavy Earth moving machine (like JCB) 1 No.	Rs. 29.50
3.	2 No. Heavy Dumper (16 M^3) (31.56x2)	Rs. 63.12
4.	2 No. 5 M^3 Capacity Dumper (16.40x2)	Rs. 32.80
5.	Water tanker & sprinkler	Rs. 13.25
6.	Safety Equipment (Like belt, helmet Shoes)	Rs. 00.25
7.	Diesel water pump 2No.	Rs. 00.42
Project Cost		**Rs. 194.57**

Means of Finance

Item		Cost (in Lakh)
1.	Investment of Capital by Partner	Rs. 50.57
2.	Unsecured Loan from Partner & their relatives	Rs. 44.00
3.	Term Loan from Bank	Rs. 100.00
Project Cost		**Rs. 194.57**

There is budgetary provision of Rs 15.50 lakhs toward environmental protection measures.

CHAPTER-3

DESCRIPTION OF ENVIRONMENT

CHAPTER -3
DESCRIPTION OF ENVIRONMENT

3.0 INTRODUCTION

In order to evaluate various environmental impacts likely to be caused due to opencast mining activities for excavation of China Clay & Fire Clay over an ML area of 7.22 ha. (17.84 acres) at J.L. No. 145, Plot No. 4412 to 4418, 4420 to 4427, 5056 to 5064, 5066, 5067, 5071, 5072, 5074 to 5081, 5083 to 5092, 5095, 5096, 5098 to 5106, 5109 to 5118, 5122 to 5136 Patel Nagar, Mouza- Kharia, P.O. & P.S.- Md. Bazar, Dist.- Birbhum, West Bengal by M/s N.P. Minerals., an attempt has been made to assess the existing environmental scenario through generation of different baseline data on various environmental attributes. In order to depict the present environmental scenario, data on environment factors like Meteorology, Air, Water, Soil, Flora, Fauna and Socio-economic status have been collected during the Post Monsoon starting from 1st October to 31st December 2021 and analyzed. Hence, this Chapter outlines the present environmental setting of the project site and its surroundings.

For the purpose of environmental impact assessment, the study area has been divided in two zones, namely,

- The core zone covers the mining lease area, where the mining activities shall be carried out i.e. the area of 7.22 ha. and
- The buffer zone, covers an aerial coverage of around 10km from the core zone periphery.

It has been presumed that any potential impact on the environment, if at all occur due

to the proposed mining activities would be within the buffer zone. It is also expected that there would not be any potential impact on the biotic and abiotic environment beyond this buffer zone. The vicinity map of the core as well as buffer zone i.e. study area is presented in Fig. No. 3.1. For the characterization of the present status of air, noise, soil, water (both surface & ground) and biotic components, land use pattern, socio-economic and heritage site, visits were made in winter season i.e., from 1st October to 31st December 2021 covering core as well as buffer zone. Samples were collected during the field visits & tested in the MoEF&CC

accredited laboratory of M/s Envirocheck, Kolkata. Data generated during the investigation period were compiled and presented in this report in tabular form.

3.1 COMPONENTS OF STUDY

In general, the important environmental parameters associated with and considered for impact assessment of this mining project are as follows;

- Air quality
- Water quality (both Surface & Ground water quality)
- Noise level
- Soil quality
- Land use
- Forests & Vegetation
- Wildlife
- Public health & safety
- Socio-economics

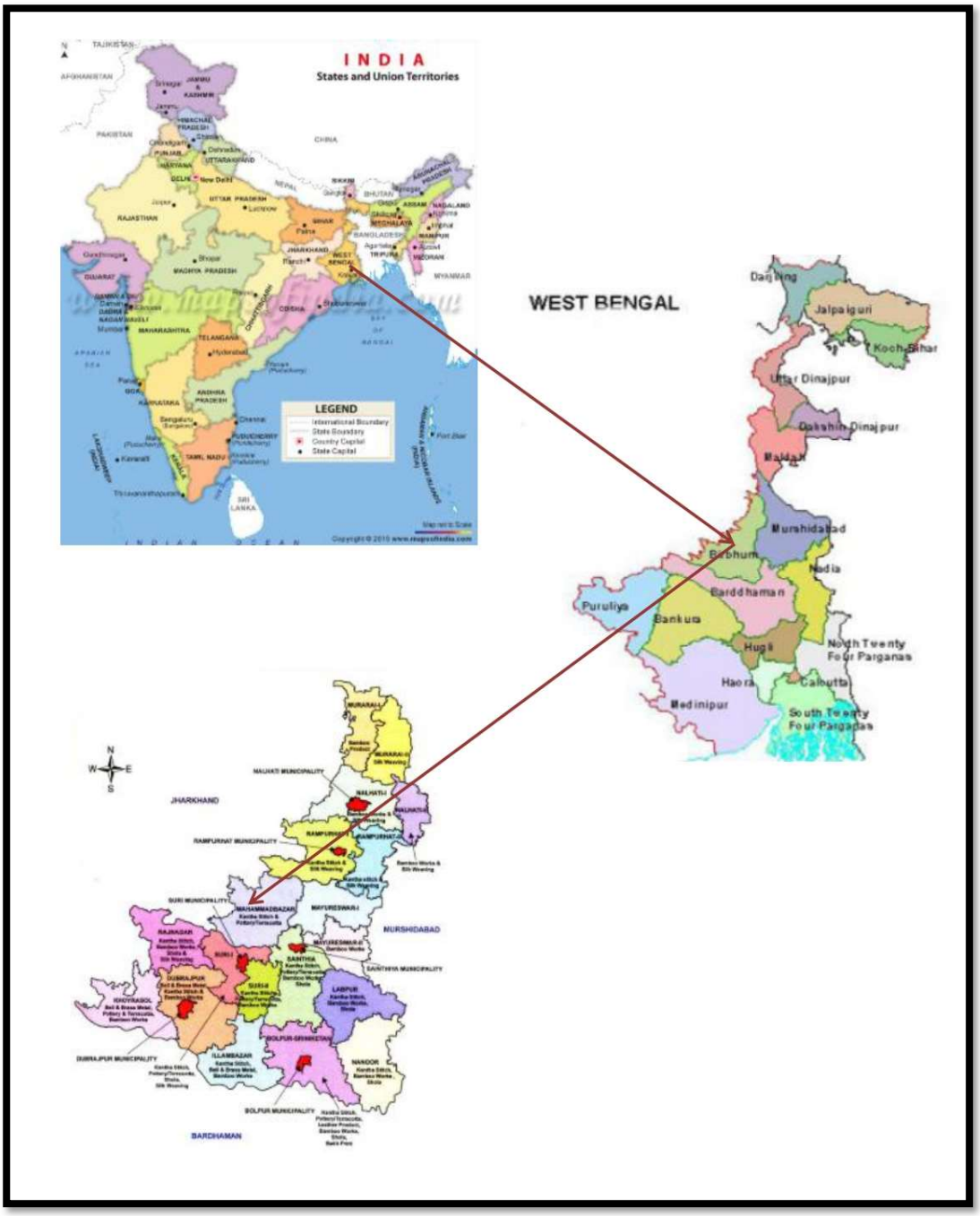


Fig. No. 3.1: Vicinity Map of the Lease Area

3.2 METHODOLGY

The following methods have been adopted to present the environmental scenario of the study area.

A. Baseline Data Generation

- *Air Quality, Water Quality, Noise Levels, Soil Quality & Meteorological Parameters*

To monitor the ambient air quality and noise levels, one station in core zone and seven stations in buffer zone on priority basis have been fixed. For meteorological study regular data have been collected from the study area throughout the season and previous data from the nearest meteorology center has been taken for better assessment. Surface & Ground water samples have been collected for analysis. Soil samples from the study area have been collected during the monitoring period & analysed for quality check.

Anemometer, wind vane, hygrometer, thermometer, rain gauge and noise meter have used to collect wind speed, wind direction, relative humidity, maximum-minimum temperature, rain fall and noise level on regular basis throughout the winter season.

- *Ecological Studies*

Quadrate method with Random Sampling Technique was adopted to know distribution pattern of the plant species and faunal characteristics both in core and buffer zone. All the plant species in a quadrate of 10m x 10m size at an interval of 700m from the core of the mine in all four directions were recorded. A line transect was laid for entire area of 10km to divide 700m segments. Thus, randomly distributed quadrates were laid for ecological assessment.

- *Socio-economic & Demographic profile*

For the analysis of socio-economic status and demographic profile, survey has been conducted in the main villages within core and buffer zones. Census data of 2011 is being used to arrive at a conclusion on demography.

B. Sample Collection & Analysis Methods

a. Ambient air samples

Fine Particulate Samplers and Respirable Dust Samplers have been used to collect 24 hourly samples twice a week at each of the eight monitoring stations. Samples have been collected throughout the season i.e. post monsoon season from 1st October to 31st December 2021. Analysis has been done to know the concentration of $PM_{2.5}$, PM_{10}, SO_2, NOx & CO.

b. Meteorological studies

Meteorological data such as Rainfall, Max. & Min. Temperature, Relative humidity, Wind speed & Wind direction were collected throughout the monitoring period covering the post-monsoon season on regular basis at fixed station. Data of previous year have collected from the meteorological center at Shanti Niketan town for comparison, which is 35 km to the SSE of the lease area.

c. Noise levels

Noise levels at eight stations covering core zone and buffer zone have been collected on regular basis throughout the season. Readings have been recorded at one-hour interval for 24 hours. The data collected have been compared with the prescribed CPCB standards.

d. Water quality

Water samples from Buffer Zone & Core Zone have been collected at eight locations in all total. All sampling locations which have been selected, includes eight surface water points and eight ground water points. Samples were collected once during the season and analysed following the guidelines of IS: 10500 & 2296.

e. Soil quality

Representative soil samples have been collected from three locations. Both physical & chemical parameters have been analysed following the standard analysis methods.

f. Land use pattern

Latest survey report has been made with the base map, which was designed from Survey of India toposheet & IRS imageries. The final map has been prepared by using GIS software.

g. Ecology of the area

Detailed floral and faunal studies were carried out both in the core and buffer of the lease hold area and identification of existing species was made as per the Wildlife (Protection) Act, 1972.

i. Socio-economic status

Socio-economic condition of the study area was analyzed based on the secondary data for various socio-economic attributes like demography, SC/ST population and classification of workers, etc.

C. Preparation of Report

Considering the generated baseline data of the winter season, the Environmental Impact Assessment and Environmental Management Plan for Patel Nagar China Clay and Fire Clay by M/s N.P. Minerals mines has been prepared.

3.3 CLIMATE AND METEOROLOGICAL PARAMETERS

Study of meteorological conditions is an integral part of environmental impact assessment studies. The meteorological data recorded during the study period is very useful for proper interpretation of the baseline information regarding Patel Nagar China Clay and Fire Clay by M/s N.P. Minerals mining project and surrounding area for air dispersion. Accordingly, a meteorological station was set up within the leasehold area. Monitoring of meteorological parameters was carried out from 1st October to 31st December 2021.

The area experiences tropical climate. A dry and hot summer with temperatures often rises above normal. During summers, the mercury rises well above 40^0 C. The direction of the wind in summer is from the south-east. The summers start from middle of March and lasts till the middle of June. The region boasts of a high average rainfall even higher as compared to the eastern region of the dist. Winters in the region marks the mercury dropping to below 10^0 C. While the day time is pleasingly cool, with the fall of even in temperature lowers further, making the nights chilly and cold. During winters, wind usually blows from the north-west direction. The winter starts from December and last till the month of February.

The district falls under Eastern ghat zone. The climate of the area is hot & sub-humid and is characterized by a hot and dry summer between the period of March to May, winter between December to February and well-distributed rainfall between mid of June to mid of September. The rainfall in the area is because of the south western monsoon. The meteorological data were collected from nearest IMD station.

3.3.1 Methodology

The methodology adopted for monitoring surface observation is as per the standard norms laid down by Bureau of Indian Standards (IS: 8829) and India Meteorological Department (IMD). On-site monitoring was undertaken for various meteorological variables in order to generate the site-specific data. Data was collected every hour continuously from 1st October to 31st December 2021 covering post monsoon period. The following parameters were continuously recorded at hourly intervals during monitoring season:

- Cloud Cover
- Temperature
- Rainfall
- Relative Humidity
- Atmospheric Pressure
- Wind speed
- Wind Direction

The Central Monitoring Station (CMS) equipped with continuous monitoring equipment was installed at a height of 10m above ground level to record wind speed, direction, relative humidity and temperature. The meteorological monitoring station was located in such a way that it is free from any obstructions and as per the guidelines specified under IS: 8829. Cloud cover was recorded by visual observation. Rainfall was monitored by rain gauge.

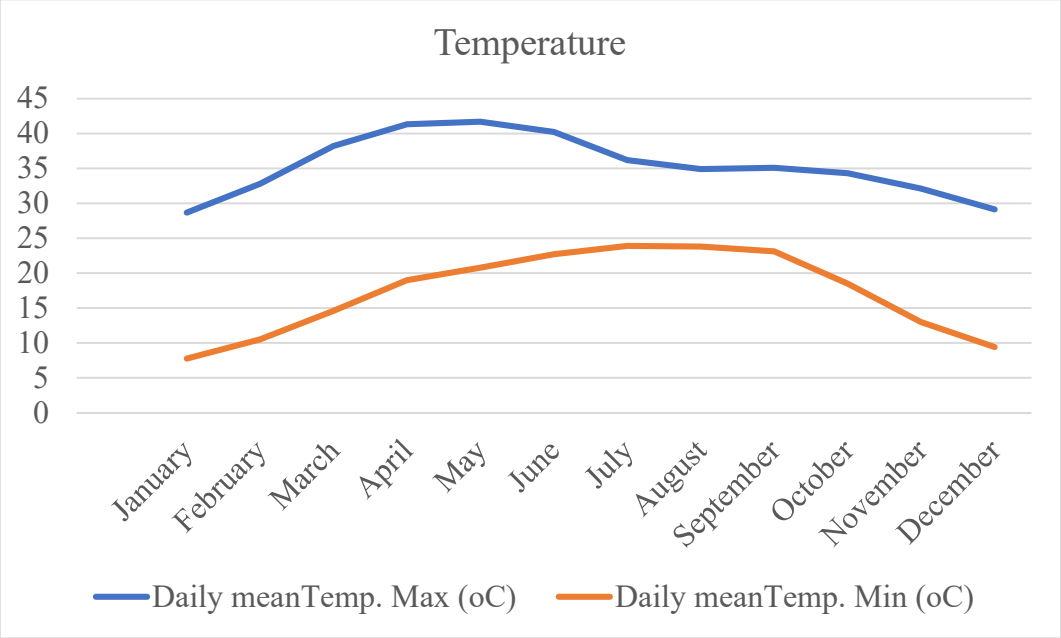
Secondary information on meteorological conditions was collected from the nearest IMD station at Shanti Niketan, district Birbhum dist., located about 35 km from the mine site in SSE direction.

A. CLOUD COVER

The area remains cloudy between June-September, which is the active period of the monsoon season. The average cloud cover for the study area for the summer season is 1 oktas.

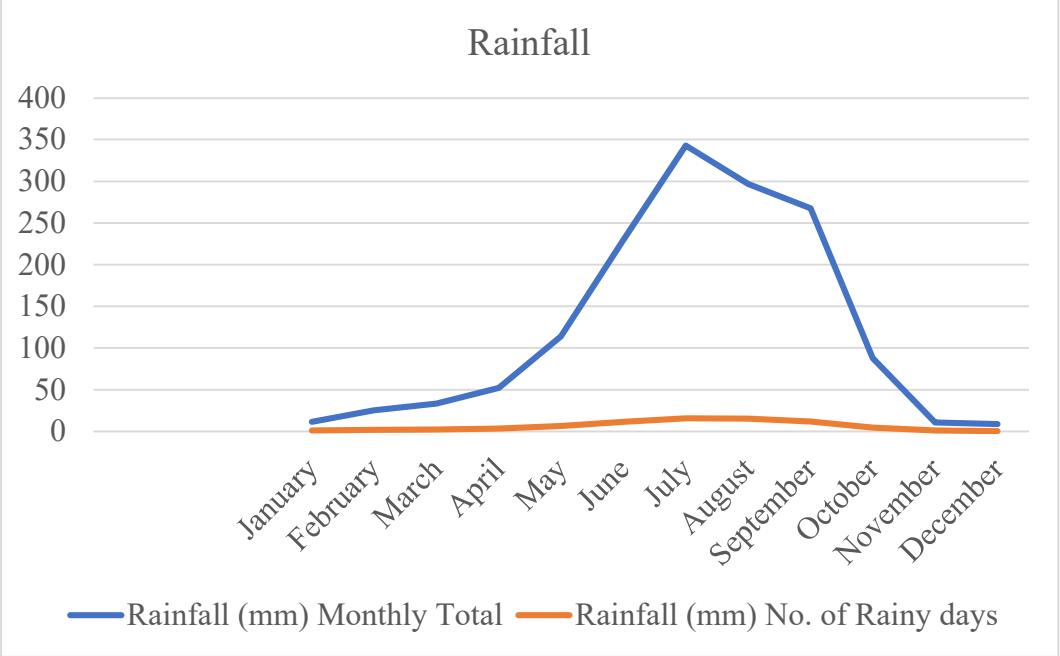
B. TEMPERATURE

The temperatures at Shanti Niketan IMD shows that May is the hottest month, the mean daily maximum temperature in that month being 41.7°C and January is the coldest month with mean temperature recorded 7.8°C.



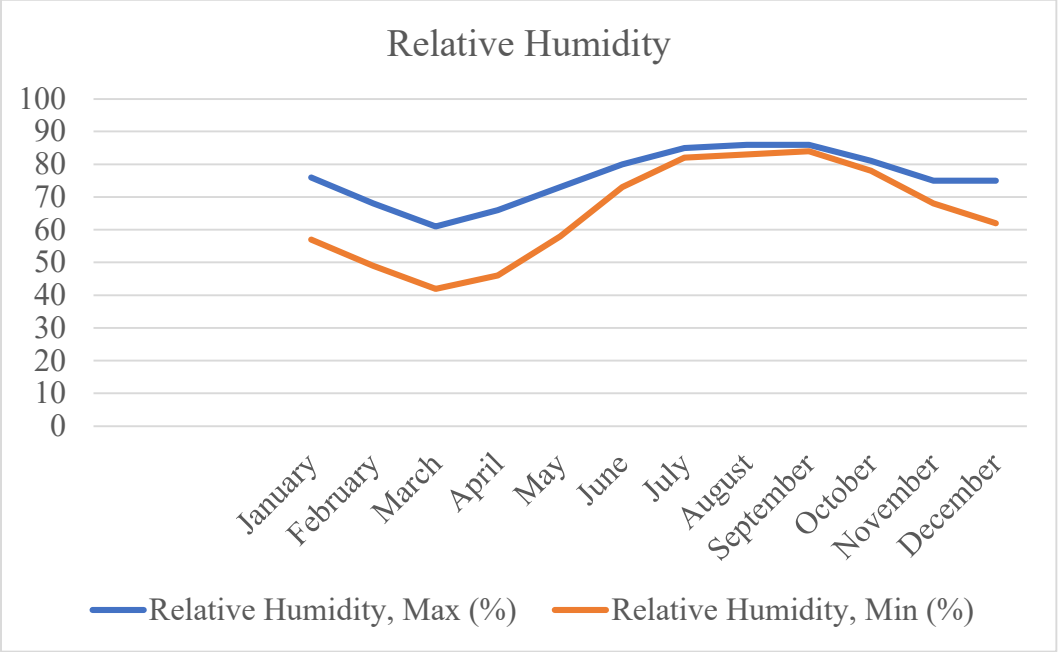
C. RAINFALL

Rainfall data at Shanti Niketan IMD station shows highest during July (343.2 mm) and lowest during December (9.0 mm). Total mean annual rainfall recorded about 1564 mm with 77.6 total rainy days.



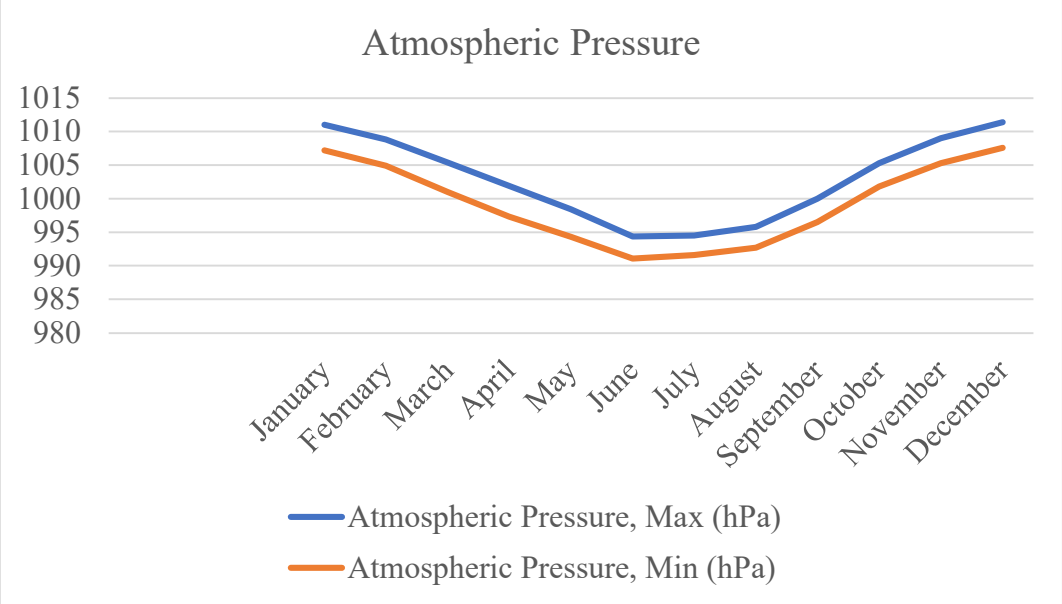
D. RELATIVE HUMIDITY

The relative humidity (RH) data at Shanti Niketan IMD Station shows highest during September month (86% 3 at 8:30 hr) and lowest during March month (42% at 17.30 hr).



E. ATMOSPHERIC PRESSURE

The atmospheric pressure data at Shanti Niketan IMD Station shows highest during December month (1011.4 hPa at 8:30 hr) and lowest during June month (991.1 hPa at 17.30 hr).



3.3.2 Historical Meteorological Data

Both the night and day temperature decrease gradually during the winter period. The maximum temperature of Birbhum dist. during the summer month of April to June is around 41.7^{0}C and minimum during January is around 7.8^{0}C. Temperature recorded from the Meteorological station fixed in the study area during the study period indicates that the minimum and maximum temperature during the study period ranged from 9.4^{0}C to 34.3^{0}C.

The monthly average maximum & minimum temperature as per Climatological Normal 1981-2010 IMD Pune has been furnished in Table. No. 3.1: and graphical representations of the same have been given in the figure below.

Table No.3.1: Historical Meteorological Data IMD Shanti Niketan (1981-2010)

Month	Daily mean Temp. (0C)		Relative Humidity (%)		Rainfall (mm)		Cloud cover (in Okta)	Mean Wind Speed (Kmph)
	Max	Min	Max	Min	Monthly Total	No. of Rainy days		
January	28.7	7.8	76	57	11.6	1.2	1.5	4.1
February	32.8	10.5	68	49	25.1	1.9	1.7	4.5
March	38.2	14.6	61	42	33.2	2.4	2.2	5.4

April	41.3	19	66	46	52.0	3.5	3.0	6.6
May	41.7	20.8	73	58	113.8	6.3	4.0	7.2
June	40.2	22.7	80	73	229.7	11.6	5.9	7.2
July	36.2	23.9	85	82	343.2	15.7	6.6	6.6
August	34.9	23.8	86	83	296.7	15.1	6.3	6.0
September	35.1	23.1	86	84	267.5	11.9	6.0	5.1
October	34.3	18.5	81	78	87.7	4.7	3.2	3.5
November	32.1	13	75	68	10.5	0.9	1.8	3.7
December	29.1	9.4	75	62	9.0	0.5	1.3	3.9
Annual or Mean	**42.3**	**7.7**	**76**	**65**	**1563.9**	**77.6**	**3.6**	**5.3**

(Source: IMD Station, Shanti Niketan)

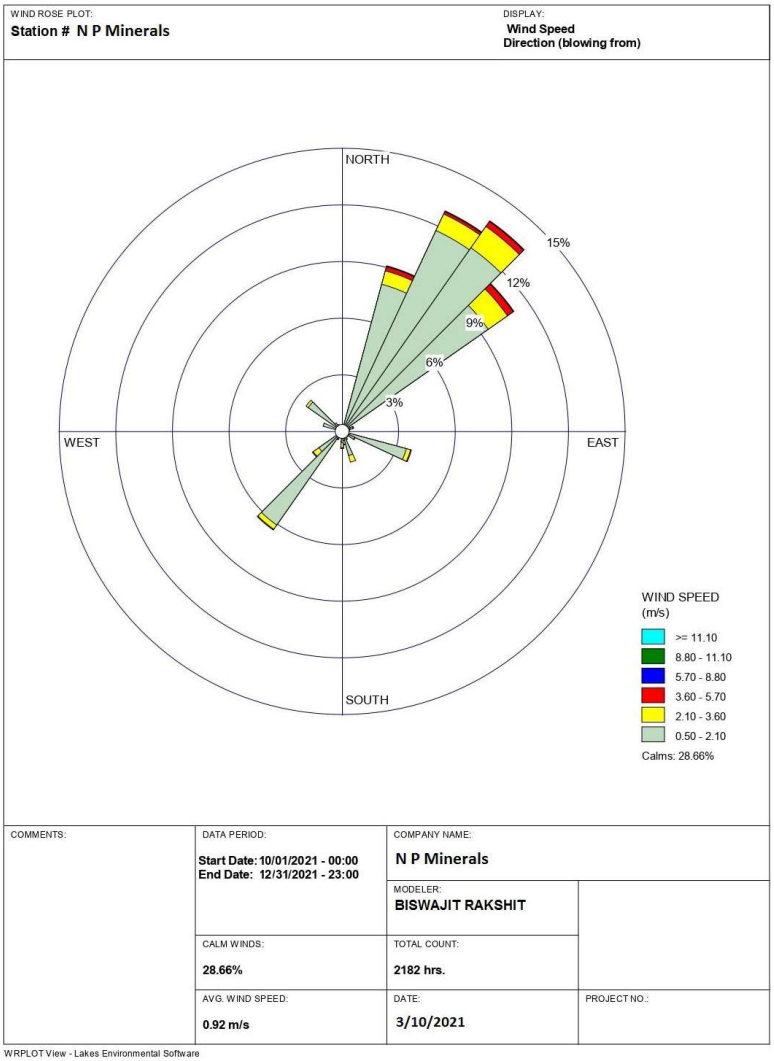


Fig. No. 3.2: Overall Wind Rose Diagram (1st October to 31st December, 2021)

3.4 LAND USE / LAND COVER PATTERN

The opencast mining has potentials to cause impact on the environment depending upon the pollution potential of mines and the sensitivity of the receiving environment especially for a opencast mining activity where separate land area are needed for extraction, over burden storage and establishment of colony area etc. Therefore, it is necessary to study the present land use of the project site and its immediate receiving environment i.e. 10 km buffer zone around the site. The process of land use mapping from satellite imagery is well established. Several parameters like terrain, climatic conditions, socio economic trends & environmental influences etc. play a vital role in the existence of various land use categories.

Land use refers to "man's activity and the various uses which are carried on land". Land cover refers to "natural vegetation, water bodies, rock/soil, artificial cover and others resulting due to land transformation." The Land use/ Land cover map of the study area is prepared based on the recent satellite imagery as well as available secondary information. Detailed satellite imagery interpretation was carried out and thematic maps of the study area were prepared by visual interpretation using tone texture variation from IRS-IC LISS- False Color Composite geo coded images. Digital image processing techniques were used to classify land use, geology, geomorphology, drainage pattern/ watersheds and vegetation cover of the study area.

3.4.1. Land use pattern in Buffer Zone:

About 71.5% of land is under agriculture whereas the forest area which includes the reserve forest, deciduous forest & scrub forest is about 5.37% of the total buffer zone area. The various land use/ land cover classes identified and mapped in the study are discussed below:

- **Human Settlement:** It is defined as an area of human habitation developed due to non-agricultural use and that which has a cover of buildings, transport, communication, utilities in association with water, vegetation and vacant lands.
- **Agriculture Land:** Agriculture Land generally refers to an area mainly used for cultivation purpose in some part of the year.
- **Dense Forest:** It is an area pre-dominantly covered with trees along with some other plant forms like shrubs, herbs and climbers capable of producing timber and other forest produce with more than 40% canopy cover.

- **Open Forest:** Forests where crown density of upper storey vegetation is within 10 to 40% of the canopy cover are classified under this category.
- **Degraded /Scrub Forest:** Forests where the crown density of upper storey vegetation is less than 10% of the canopy cover are classified under this category. It is the result of both natural and anthropogenic activities.
- **Land with Scrub:** These lands occupy (relatively) higher topography like uplands or high grounds with scrub like vegetation.
- **Barren Rocky /Stony Waste Land:** It is defined as the rock exposure of varying lithology; often barren and devoid of any soil & vegetation cover.
- **Water Bodies:** it may be free flowing like river /nala or stagnant water bodies like pond. River is a natural course of water flowing on land along definite channel; it can be seasonal or perennial.

The land use pattern of the area around 10km radius of core zone is presented in Table No. 3.2 and Fig. No. 3.3.

Table No. 3.2: Land use pattern of the buffer zone

S. No.	Type of Landuse	Category	Area (Sq.km)	Percentage
1	Agriculture	Crop land	227.11	71.50
2	Agriculture	Fallow	0.17	0.05
3	Wetland/Waterbodies	River/Stream/Canals	18.01	5.67
4	Built-up	Rural	36.09	11.36
5	Built-up	Mining	5.19	1.63
6	Built-up	Urban	2.46	0.77
7	Wetland/Water Bodies	Water Bodies	4.44	1.40
8	Forest	Forest Plantation	1.87	0.59
9	Forest	Deciduous	12.47	3.93
10	Forest	Scrub Forest	2.73	0.86
11	Barren/Unculturable Wastelands	Scrub land	6.76	2.13
12	Grass/Grazing land	Grass/Grazing land	0.35	0.11
Total area			**317.65**	**100.00**

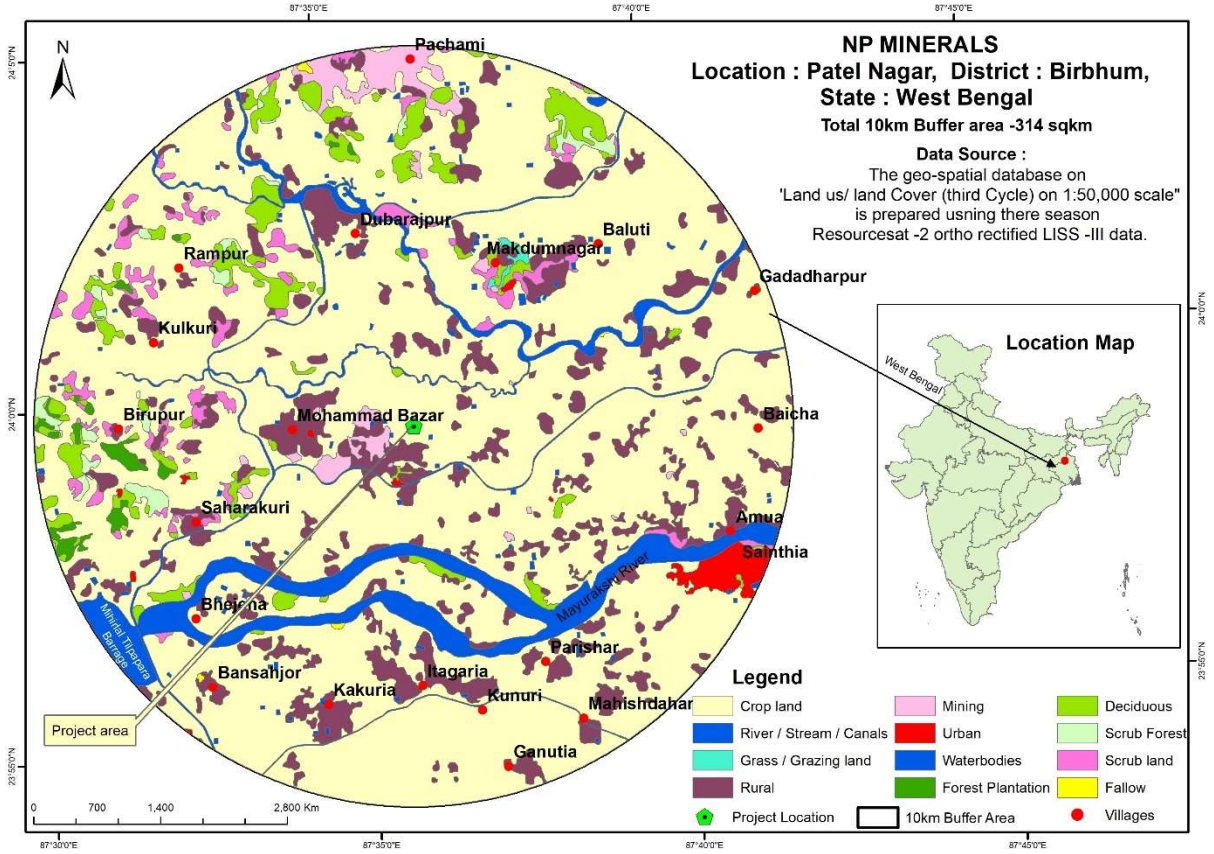


Fig. No. 3.3: Land use/ Land cover map of the study area

3.4.2. Land use pattern in Core Zone:

The mining lease area comprises of 7.22 ha. of waste land in Village Patel Nagar P.S. Md Bazar, Dist. Birbhum of West Bengal. It is a fresh mining lease; earlier mine was operative till be 2017 by M/s N. P. Minerals. No forest and is involved in the ML area. The existing land use pattern of the core area is given below:

Table No. 3.3: Existing land use pattern of the ML area

Sl. No.	Type of Land use	Area at present (ha)
1	Old Pit	0.68
2	Reclaimed Area	0.31
3	Dumps	0.08
4	Present Quarry	0.79
5	Water Reservoir	Nil
6	Virgin Area	5.20
7	Road	0.15

8	Site Services	0.01
G. Total		**7.22**

3.5 AIR QUALITY

To quantify the impact of the Patel Nagar China Clay and Fire Clay mining project on the ambient air quality (AAQ), it is necessary to evaluate the existing ambient air quality. The existing ambient air quality, in terms of Particulate Matter- PM10 (size less than 10µm), Particulate Matter- PM2.5 (size less than 2.5 µm), Sulphur Dioxide (SO_2), Oxides of Nitrogen (NO_X), etc. have been measured through a planned field monitoring and analysed. The sources of air pollution in the area other than mining units are like vehicular traffic, dust arising from unpaved village roads and domestic fuel burning.

3.5.1 Frequency & Duration of Sampling

Ambient air quality monitoring was carried out at a frequency of two days per week at each location representing the study period. The duration of sampling of Particulate Matter (PM2.5 & PM10), SO2, and NOx was carried out continuous for twenty-four hourly (8am to 8am of next day) per day. This is to allow a comparison with the present revised standards mentioned in the latest Gazette Notification of the Central Pollution Control Board (CPCB) (Nov. 18, 2009).

3.5.2 Method of Sampling

Respirable Dust Samplers have been used for monitoring PM10 (<10 microns) and for gaseous pollutants like SO_2, NOx, NH_3 & O_3 whereas Fine Particulate Air Sampler is used to measure PM2.5 (<2.5 microns). CO analyzer (NDIR) was used to monitor CO, and as per ToR point no. 22 at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given for which Benzene sampler was used for sampling Benzene. To monitor Ar, Pb, Ni & Benzo(a) Pyrene RDS was used with EMP 2000 filter paper.

3.5.3 Location of Monitoring Stations

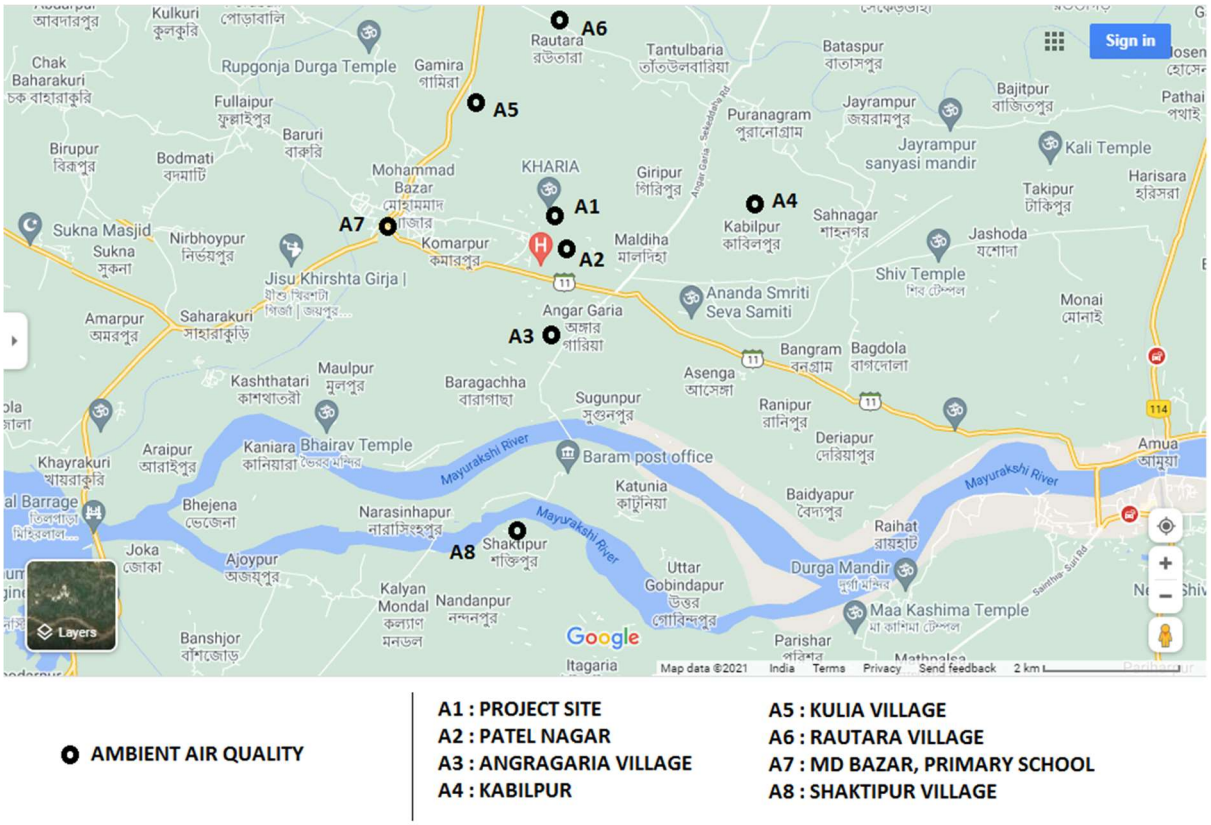
The baseline status of the ambient air quality has been established through a scientifically designed ambient air quality monitoring network and was based on following considerations:

- Meteorological condition on synoptic scale.
- Topography of the study area.
- Representatives of regional background air quality for obtaining baseline status
- Location of residential areas representing different activities
- In absence of any stack, the ambient air quality is expected to be affected in and around the mining areas up to a limited distance (within 10km). Keeping this in view, air quality of core and nearby buffer zone has been monitored.

Sampling was done in all the sampling locations at a height of 3 meter above the ground on a platform erected with outcrops at the base. The station represents approximately the highest ground level of the area and practically having no obstruction. 8 (Eight) monitoring stations were set up in the study area and their details is represented in Table. No.3.4. The stations are shown in Fig. No. 3.4.

Table No. 3.4: Ambient Air Quality (AAQ) Monitoring Stations

Sl. No.	Station Code	Location	Type of Area	Distance from ML area	Direction from ML area
1.	A1	ML area	Industrial	**0**	**-**
2.	A2	BDO Office Near Patel Nagar	Silence	1.5 Km	SW
3.	A3	Angar Garia	Residential	1.4 Km	South
4.	A4	Kabilpur	Residential	2.0 Km	East
5.	A5	Kulia	Residential	2.3 Km	WNW
6.	A6	Rautara	Residential	1.8 Km	North
7.	A7	Primary School Md. Bazar	Silence	3.0 Km	West
8.	A8	Shaktipur	Residential	5.0 Km	SSW



AMBIENT AIR QUALITY

A1 : PROJECT SITE
A2 : PATEL NAGAR
A3 : ANGRAGARIA VILLAGE
A4 : KABILPUR
A5 : KULIA VILLAGE
A6 : RAUTARA VILLAGE
A7 : MD BAZAR, PRIMARY SCHOOL
A8 : SHAKTIPUR VILLAGE

Fig. No. 3.4: AAQ Sampling Locations of the Study Area

Table No. 3.5: National Ambient Air Quality Standard (as per CPCB Notification of 18 Nov., 2009)

Sl. No.	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, residential, Rural and Other Area	Ecologically Sensitive Area	Methods of Measurement
1	Sulphur Dioxide (SO_2), µg/m3	Annual * 24 hours **	50 80	20 80	- Improved West and Gaeke - Ultraviolet fluorescence
2	Nitrogen Dioxide (NO_2), µg/m3	Annual * 24 hours **	40 80	30 80	- Modified Jacob & Hochheiser (Na-Arsenite) - Chemiluminescence
3	Particulate Matter (size < 10µm or PM_{10}), µg/m3	Annual * 24 hours **	60 100	60 100	- Gravimetric - TOEM - Beta attenuation
4	Particulate Matter (size < 2.5µm) or $PM_{2.5}$ µg/m3	Annual * 24 hours **	40 60	40 60	- Gravimetric - TOEM - Beta attenuation

5	Ozone (O_3), µg/m3	8 hours ** 1 hour **	100 180	100 180	- UV photometric - Chemilminescence - Chemical Method
6	Lead (Pb), µg/m3	Annual * 24 hours **	0.50 1.0	0.50 1.0	- AAS/ICP methodafter sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon filter
7	Carbon Monoxide (CO), mg/m3	8 hours ** 1 hour **	02 04	02 04	- Non dispersive Infra-Red - (NDIR) spectroscopy
8	Ammonia (NH_3), µg/m3	Annual * 24 hours **	100 400	100 400	- Chemiluminescence - Indophenol blue method
9	Benzene (C_6H_6), µg/m3	Annual *	05	05	Gas chromatography based continuous analyzer Adsorption followed by GC analysis
10	Benzo(a) Pyrene (BaP)–particulate phase only, ng/m3	Annual *	01	01	- Solvent extraction followed by HPLC/GC analysis
11	Arsenic (As), ng/m3	Annual *	06	06	- AAS/ ICP methodafter sampling on EMP 2000 or equivalent filter paper
12	Nickel (Ni), ng/m3	Annual *	20	20	- AAS/ ICP method after sampling on EMP 2000 or equivalent filter paper

* Site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 08 hourly or 01 hourly mentioned values, as applicable, shall be complied with 98% of the time in a year, 2% of the time; they may exceed the limits but not on two consecutive days of monitoring.

The values of air quality pollutants of concern as mentioned below are presented in the following table. The range of maximum concentrations reflects that the pollution level is low in all of the places as these are rural area and surrounded mostly by agricultural lands. An analysis of the data of the site with respect to downward side in particular and other monitoring sites in general represent the background levels.

Spatial and temporal variations in the air quality occur as a result of the air basin and the prevailing meteorological conditions of the study area. To assess the existing sub regional air status during the winter, the above factors govern the status at all the AAQ sampling stations.

Various statistical parameters like maximum; minimum and different percentile have been computed from the observed raw data for all sampling stations.

3.5.4 Data Analysis of AAQ Levels

The existing concentrations of the critical pollutants in the study area are represented in the following table. The range of maximum and minimum concentrations reflect that the pollution levels are varying depending on the prevailing activity i.e. either industrial, or domestic fuel burning or vehicular traffic etc. Background concentrations of the critical pollutants are established by comparing the concentrations at the site and that of the downwind locations with the pollutant concentrations at other locations.

Table No. 3.6: Summarized Ambient Air Quality Monitoring Results (Concentration in µg/m³)

STATIONS		PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_X (µg/m³)	CO (mg/m³)
Project Site [A1]	Min	52.80	23.60	<4.0	8.50	<0.1
	Max	80.10	42.10	<4.0	16.50	<0.1
	Mean	68.21	32.26	<4.0	12.30	<0.1
	P98	79.23	40.26	<4.0	16.50	<0.1
Patel Nagar [A2]	Min	53.20	24.50	<4.0	9.00	<0.1
	Max	81.20	46.20	<4.0	20.00	<0.1
	Mean	69.71	32.97	<4.0	13.75	<0.1
	P98	80.74	44.64	<4.0	19.31	<0.1
Angar Garia [A3]	Min	52.80	21.50	<4.0	9.50	<0.1
	Max	80.10	41.80	<4.0	18.20	<0.1
	Mean	65.81	28.02	<4.0	12.73	<0.1
	P98	78.44	39.50	<4.0	17.42	<0.1
Kabilpur [A4]	Min	59.10	26.50	<4.0	8.50	<0.1
	Max	81.20	41.50	<4.0	16.50	<0.1
	Mean	67.85	33.27	<4.0	11.88	<0.1
	P98	80.42	40.58	<4.0	16.50	<0.1
Kulia [A5]	Min	51.80	23.80	<4.0	8.50	<0.1
	Max	76.20	41.80	<4.0	15.00	<0.1
	Mean	62.35	30.78	<4.0	10.68	<0.1
	P98	75.56	40.28	<4.0	13.85	<0.1
Rautara [A6]	Min	48.60	21.80	<4.0	8.50	<0.1
	Max	76.20	36.50	<4.0	12.50	<0.1

	Mean	63.44	28.90	<4.0	10.30	<0.1
	P98	74.82	36.36	<4.0	12.50	<0.1
Md Bazar [A7]	Min	56.20	26.50	<4.0	9.50	<0.1
	Max	76.50	39.20	<4.0	16.50	<0.1
	Mean	68.30	33.01	<4.0	12.40	<0.1
	P98	75.49	38.88	<4.0	15.81	<0.1
Shaktipur [A8]	Min	60.10	25.80	<4.0	10.00	<0.1
	Max	78.50	39.20	<4.0	16.80	<0.1
	Mean	70.09	32.47	<4.0	12.69	<0.1
	P98	78.36	39.20	<4.0	16.66	<0.1

PM_{10} levels varied from 48.60 μg/m^3 and 81.20 μg/m^3 minimum at A6 and maximum at A2 & A4, $PM_{2.5}$ levels varied between 21.50 μg/m^3 to 46.20 μg/m^3 at A3 and A2. The project site is surrounded by few mining industries.

SO_2 and NO_2 levels of study area is well within the prescribed CPCB limit of 80 μg/m^3. The minimum and maximum concentrations of SO_2 were found to be <4.0 μg/m^3 (BDL). The minimum and maximum concentrations of NO_x were found to be 8.50 μg/m^3 to 20.0 μg/m^3. CO at all locations were found to be less than 0.1 mg/m^3.

3.6 NOISE ENVIRONMENT

3.6.1 General

The physical description of sound concerns its loudness as a function of frequency. Noise in general is an unwanted sound, which is composed of many frequency components of various types of loudness level distributed over the audible frequency range. Sound Pressure Levels (SPL's) are measured in decibels on the A-weighted scale, dB (A), where the A-weighting scheme accounts for the sensitivities of the human ear over the audio spectrum.

3.6.2 Reconnaissance Survey

A preliminary reconnaissance survey was undertaken to identify the major noise generating sources in the area. The noise at different noise generating sources, based on the industrial activities, commercial activities, traffic, noise at sensitive areas like hospitals and schools have

been identified. The noise monitoring has been conducted at all the identified location in the study area once in every season during the study period.

3.6.3 Sources of Noise

Various activities such as vehicular movements, sizing etc. would contribute to noise in the core zone. Environmental noise assessment can be divided into two separate categories, one related to noise sources and other related to potential receivers. Two quantities are needed to describe completely the strength of the source i.e. i) Sound Power Levels and ii) Directivity.

Sound Power levels measure the total sound power radiated by the source in all directions and directivity is a measure of the difference in radiation with direction. The concept of sound power level and directivity index makes it possible to calculate the sound pressure level (SPL) created by source.

The impact of noise sources on surrounding community depends on:

- Characteristics of noise sources (instantaneous, intermittent or continuous in nature). It can be observed that steady noise is not as annoying as one which is continuously varying in loudness.
- The time of day at which noise occurs, for example high noise levels at night in residential areas are not acceptable because of sleep disturbance.
- The location of the noise sources, with respect to noise sensitive land use, which determines the loudness and period of exposure.

The environmental impact of noise can have several effects varying from Noise Induced Hearing Loss (NIHL) to annoyance depending on loudness of noise levels. The Environmental Impacts of noise from the plant activities is carried out by taking into consideration the various factors:

- Potential damage to hearing
- Potential physiological responses
- Annoyance
- General community responses

3.6.4 Noise Levels in the Study Area

Baseline noise levels were monitored at different points within the study area using a Digital Sound Level Meter. 8 (Eight) noise monitoring stations were identified keeping in view the nature of the monitoring locations i.e. residential areas in villages, schools, roads, etc. for the assessment of the existing noise levels in four directions. These are also the stations where air monitoring was undertaken in core & buffer zone. The noise monitoring locations with reference to the project site is given in the Table. No. 3.7.

Table No. 3.7: Details of Noise Level Monitoring Locations

Sl. No.	Station Code	Location	Type of Area	Distance from ML area	Direction from ML area
1.	NQ1	Project site, Kharia Village	Industrial	-	-
2.	NQ2	Md. Bazar Market	Commercial	3.0 Km	West
3.	NQ3	Angar Garia Village	Residential	1.4 Km	South
4.	NQ4	Rautara Village	Residential	1.8 Km	North
5.	NQ5	Patel Nagar Hospital	Silence	1.1 Km	SW
6.	NQ6	Sekedda High Secondary School	Silence	5.2 Km	NE
7.	NQ7	Sekkedda Up Sastha Kendra	Silence	5.6 Km	NE
8.	NQ8	Kedarpur B N High School	Silence	1.0 km	SSE

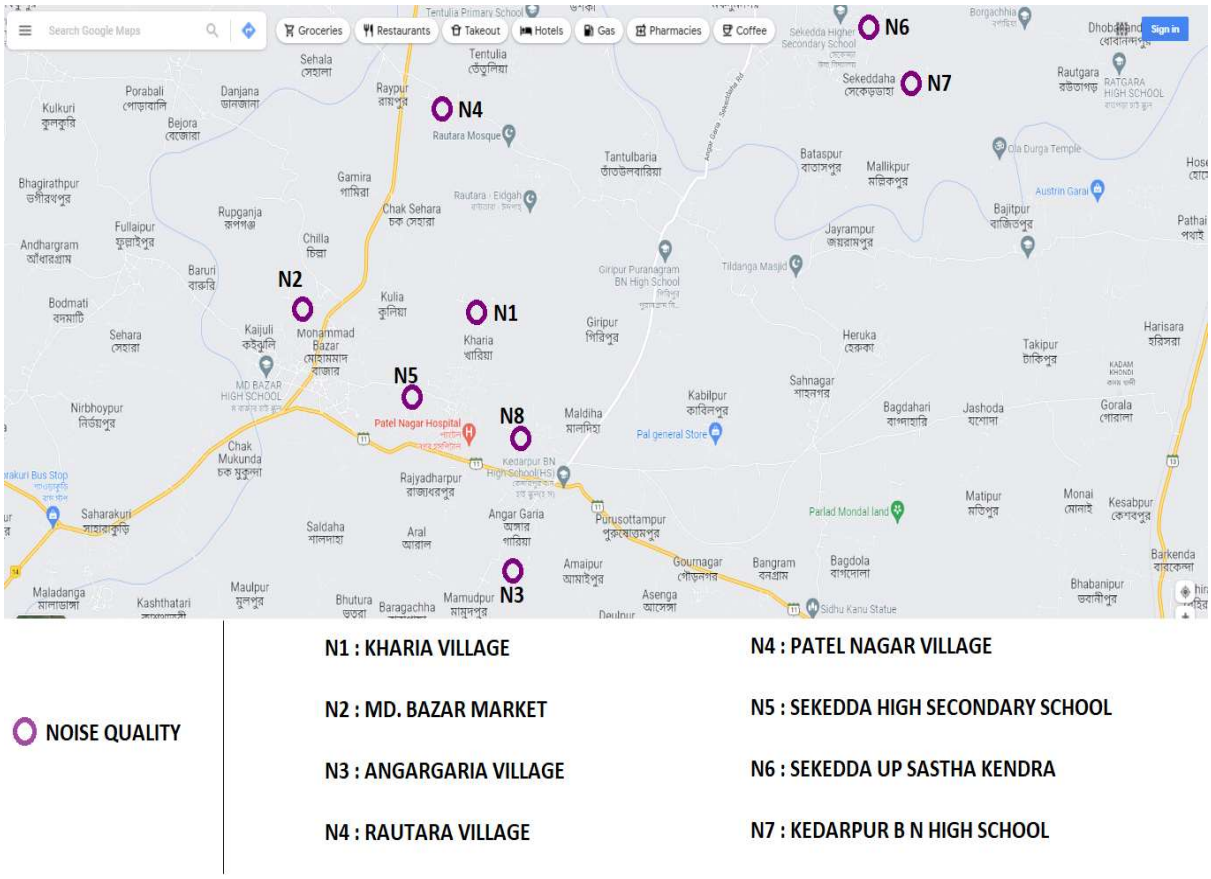


Fig. No. 3.5: Noise Sampling Locations of the Study Area

The day levels have been monitored between 6.00 A.M. and 10.00 P.M. and the night levels have been monitored between 10.00 P.M. and 6.00 A.M. From these values, day and night time as well as 24-hour Leq values were also calculated. The Leq is the equivalent continuous sound level, which is equivalent to the same sound energy as the fluctuating sound measured in the same period. The Indian Standard for Noise Limit are presented below in Table No. 3.8:

Table No.3.8: Indian Standard for Noise Limit

Category	Noise Limit in dB(A) Leq	
	Day Time (6A.M. to 10P.M.)	Night Time (10P.M. to 6A.M.)
Industrial Area	75 dB(A)	70 dB(A)
Commercial Area	65 dB(A)	55 dB(A)
Residential Area	55 dB(A)	45 dB(A)
Silence Zone	50 dB(A)	40 dB(A)

(Source: Environmental Standards for Ambient Air, Automobiles, Fuel, Industries, & Noise; Pollution Control Law Series – CPCB)

Note:

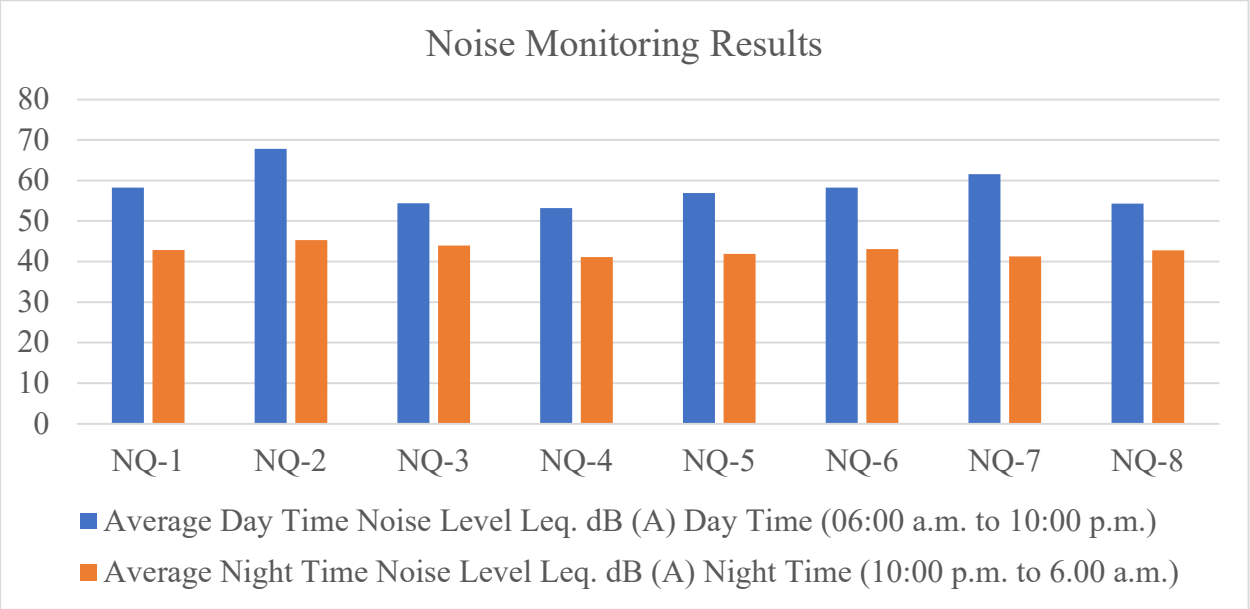
Silence zone: Hospital, Educational Institution, Wild Life Sanctuary, Courts & Sanitarium (within 100 meter around these locations)

The baseline noise levels have been monitored at different locations as indicated in the Table 3.9 and graphical representation is given in Figure below.

Table No.3.9: Noise Level Monitoring Data of the Study Region

S. No.	Average Day Time Noise Level $L_{eq.}$ dB (A)	Average Night Time Noise Level $L_{eq.}$ dB (A)	Area Category Industrial/ Residential/ Silence Zone
	Day Time (06:00 a.m. to 10:00 p.m.)	Night Time (10:00 p.m. to 6.00 a.m.)	
NQ-1	58.21	42.81	Industrial
NQ-2	67.80	45.28	Commercial
NQ-3	54.38	43.98	Residential
NQ-4	53.18	41.10	Residential
NQ-5	56.91	41.92	Silence
NQ-6	58.26	43.12	Silence
NQ-7	61.58	41.23	Silence
NQ-8	54.28	42.78	Silence

(Source: Based on Field Monitoring Results between 1st October to 31st December 2021)



Observations

At all the eight stations, day and night time average values in dB(A) Leq were observed in the ranges from 53.18 dB(A) to 67.80 dB(A) and from 41.10 dB(A) to 45.28 dB(A), respectively. It is, therefore, concluded that the noise levels within the study area are well within the specified standards. However, the higher values of noise are observed in those villages, which are located adjacent to the road, primarily due to the vehicular traffic movement and other anthropogenic activities.

3.7 WATER SOURCES AND QUALITY

Water is available in the study area in the form of surface water & ground water. The lease area has no perennial /seasonal nala, flowing within the lease. Water quality parameters of 8 (Eight) Surface and 8 (Eight) Ground water resources within 10km radius of the study area have been studied to assess the water environment and evaluate anticipated impact of the project. The surface water samples were collected on 30th November, 2021 whereas the ground water samples were collected on 25th November, 2021 for analysis in the NABL and MoEF&CC accredited laboratory. Understanding the water quality is essential in preparation of Environmental Impact Assessment and to identify critical issues with a view to suggest appropriate mitigation measures for implementation.

The drainage pattern of the region is dendritic (Ref. Drainage Map as Fig. No. 3.6). The major sources of water in the buffer area are Dwarka river (flows in NE direction, 2,7km away), Mayurakshi river (flows in south direction, 3km away. Drinking water is available in most of the nearby villages in form of Borewells, Dug Wells and Tubewells. A barrage Tilpara Mihirlal (9km away in WSW direction) is constructed on Mayurakshi river to control the flow and develop canal system. A number of canal systems from Dwarka and Mayurakshi river is traversing the study area; the nearest one is passing around 1 Km in South direction from the project site near Angar Garia village.

Both surface and ground water samples were sampled through grab sampling & composite sampling methods. The grab samples were collected for analysis of BOD, DO, COD, nitrates and CO_2 and composite samples were collected for analysis of rest of the parameters. The ground water samples are compared with the standards for drinking water as per IS: 10500 and

surface water sources are compared with CPCB Surface water quality standard for IS 2296 : Class "C" type.

All the sample points of the project area from which water samples were collected are marked in Fig. No. 3.7.

Table No. 3.10: Location of water sampling station

Sl. No.	Code	Location	Distance	Direction
			From ML area	
Surface water				
1	SW 1	Tilpara Mihirlal Barrage (Dam)	9.0 Km	SW
2	SW 2	Canal near Kharyakuri (before Tilpara Dam)	9.0 Km	WSW
3	SW 3	Canal near MD. Bazar	3.8 Km	West
4	SW 4	Mining pond Near Kharia village	1.3 Km	West
5	SW 5	Pond Water - Near Project site	0.5 Km	West
6	SW 6	Mayurakhi river - Near Baram Village	4.5 Km	South
7	SW 7	Mayurakshi canal - Near Angar Garia village	1.2 Km	South
8	SW 8	Dwarka river - Near Purana gram	2.7 Km	NE
Ground water				
1	GW 1	Well Water – Angargaria Village	1.4 Km	South
2	GW 2	Well Water – Kulia Village	2.0 Km	East
3	GW 3	Tube well in Kabilpur Village	2.1 Km	ESE
4	GW 4	Tube well in Rautara Village	1.8 Km	North
5	GW 5	Well Water – Kumarpur Village	2.5 Km	WSW
6	GW 6	Well Water – Kharia Village	1.0 Km	West
7	GW 7	Tube well in Patel Nagar	1.3 Km	WSW
8	GW 8	Tube well in Md. Bazar	2.7 Km	West

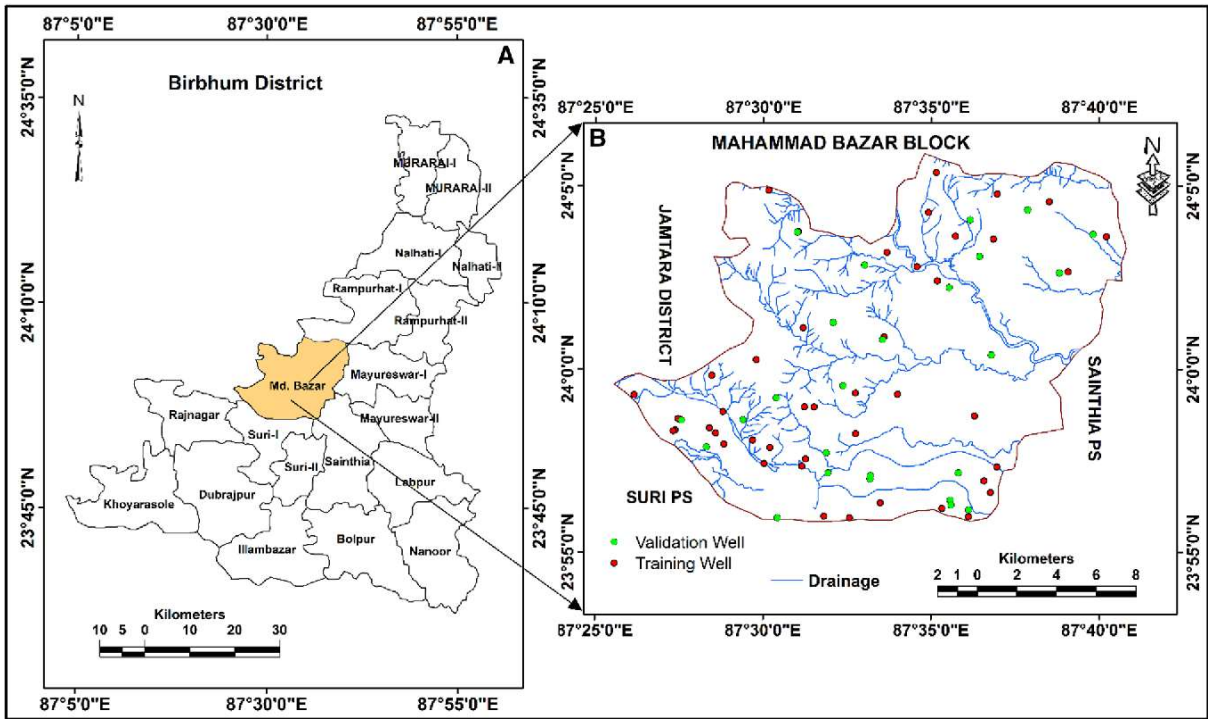


Fig. No. 3.6: Drainage Map of the study area

Fig. No. 3.7: Surface Water Sampling Locations of the study area

Table No. 3.11: Analysis results of Surface Water Quality of the study area

S. No.	Parameters	[SW1]	[SW2]	[SW3]	[SW4]	[SW5]	[SW6]	[SW7]	[SW8]
1	Temperature (^{0}C)	15.5	16	15	16	15	15.5	15	16.5
2	pH	7.2	7.23	7.36	7.36	7.2	7.23	7.12	7.32
3	TDS (mg./l)	280	350	380	230	230	210	310	410
4	TSS (mg./l)	35	30	35	20	15	12	28	35
5	Total Hardness (mg/l)	90.09	62.37	119.79	56.43	98.01	65.34	92.07	76.23
6	DO (mg/l)	6.6	7.4	5.2	6.2	7.4	7.8	5.8	5.2
7	BOD, 3 days at 27^{0}C (mg./l)	7	5	16	18	6	4	12	15
8	COD (mg./l)	42.84	33.32	57.12	38.08	28.56	23.8	42.84	47.6
9	Oil & Grease (mg./l)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
10	Total Kjeldahl Nitrogen (mg/l)	5.85	4.26	7.26	5.81	3.21	2.82	7.22	6.85
11	Chloride (mg/l)	85.26	119.82	86.64	65.44	23.5	21.66	32.72	52.54
12	Sulphates as SO4 (mg/l)	32.6	48	68	45.2	11.2	9.6	16.2	82.4
13	Nitrate (mg/l)	6.23	4.8	5.22	3.88	3.85	3.24	4.82	5.22
14	Alkalinity (mg/l)	38	67.5	64.6	30.4	21.9	18.1	37.1	53.2
15	Bi-Carbonate (mg/l)	46.36	82.29	78.81	37.09	26.66	22.02	45.2	64.9
16	Phosphate (mg/l)	1.21	1.23	0.92	0.85	0.93	0.65	0.96	1.2
17	Calcium (mg/l)	21.43	15.87	26.59	14.28	16.67	13.09	21.03	18.65
18	Magnesium (mg/l)	8.88	5.52	12.96	5.04	13.68	7.92	9.6	7.2
19	Sodium (mg/l)	28.53	30.61	32.51	28.52	16.51	12.53	23.52	48.55
20	Manganese (mg/l)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
21	Zinc (mg/l)	0.2	0.26	0.35	0.1	0.2	0.16	0.3	0.23
22	Iron (mg/l)	0.65	0.85	0.92	0.65	0.12	0.1	0.1	0.23
23	Chromium^{+6} (mg/l)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
24	Chromium (Total) (mg/l)	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
25	Total Coliform (CFU/100 ml.)	1.3 x 10^3	1.1 x 10^3	1.6 x 10^3	1.2 x 10^3	1.4 x 10^3	1.2 x 10^3	1.6 x 10^3	1.9 x 10^3
26	Faecal Coliform (CFU/100 ml.)	6.8 x 10^2	5.6 x 10^2	9.8 x 10^2	6.8 x 10^2	8.9 x 10^2	8.6 x 10^2	9.2 x 10^2	9.6 x 10^2

3.7.1 Observation on Surface Water Quality Analysis Results

On the basis of test results obtained it is interpreted those results of all sampling locations meet with the standard. For the observations, it seems that ground water of the study area is suitable for outdoor bathing purpose after conventional treatment

Analysis results of surface water reveal the following;

- pH varies from to 7.12 to 7.36
- Dissolved Oxygen varies from 5.2 to 7.8 mg/l.
- Total Dissolved Solids varies from 210 to 410 mg/l.
- Chloride varies from 21.66 mg/l to 119.82 mg/l

- Nitrate varies from 3.24 mg/l to 6.23 mg/l
- Sulphate varies from 9.60 mg/l to 82.40 mg/l
- Calcium varies from 13.09 mg/l to 26.59 mg/l
- Magnesium varies from 5.04 mg/l to 13.68 mg/l
- Iron varies from 0.10 mg/l to 0.92 mg/l
- Total Coliform varies from 1.1 x 10^3 CFU/100 ml to 1.9 x 10^3 CFU/100 ml

The detailed analysis result of surface water quality in the study area is given in Table No. 3.11. The surface water standard "IS 2296: Class C" is mentioned alongside the surface water analysis result for comparison. The analytical results of surface water samples at different location for various parameters reveal that all the parameters comply with "IS 2296 : Class C" standards indicating their suitability for drinking and other purposes after conventional treatment followed by disinfection.

Fig. No. 3.8: Ground Water Sampling Locations of the study area

Table No. 3.12: Analysis results of Ground Water Quality of the study area (as per IS: 10500, 2012)

S. No.	Parameters	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
1	Odour (TON)	Odour less	Odour less	Odour less	Odour less	Odour less	Odour less	Odour less	Odour less
2	Colour (Hazen)	1	1	1	1	1	1	1	1
3	Taste	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
4	Temperature (0C)	14.5	15	15	15.5	14.5	15	15.5	14.5
5	Turbidity (NTU)	2.5	2.8	1.2	1.25	3.2	2.6	1.6	1.5
6	Total Dissolved Solid (mg/l)	380	452.5	790	760	380	610	780	850
7	pH	6.92	6.80	6.82	6.78	6.92	6.80	6.76	6.72
8	Alkalinity (mg/l)	63.65	67.45	171	148.2	70.3	76	174.8	190
9	Total Hardness (mg/l)	72.27	102.96	126.72	120.78	76.23	116.82	109.89	136.62
10	Residual Chlorine (mg/l)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
11	Nitrate (mg/l)	12.5	11.51	12.92	9.55	21.51	11.81	8.56	8.22
12	Fluoride (mg/l)	0.44	0.41	0.15	0.13	0.12	0.69	<0.1	0.72
13	Phenol (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
14	Total Nitrogen (mg/l)	35.1	21.5	15.1	11.5	36.2	32.6	10.2	11.5
15	Boron (mg/l)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
16	Chloride (mg/l)	22.12	36.41	68.21	58.07	18.43	35.95	85.26	92.17
17	Sulphate (mg/l)	28.6	23.8	58	48.8	26.4	28.8	68.8	76
18	Bi-Carbonate (mg/l)	77.65	82.29	208.62	180.8	85.77	92.72	213.26	231.8
19	Cyanide (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
20	Calcium (mg/l)	19.84	25.39	31.74	23.41	16.67	32.54	23.8	30.16
21	Magnesium (mg/l)	5.46	9.5	11.4	14.97	5.94	8.55	12.12	15.68
22	Manganese (mg/l)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
23	Zinc (mg/l)	0.2	0.16	0.23	0.2	0.2	0.12	0.68	0.09
24	Aluminium (mg/l)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
25	Iron (mg/L)	0.43	0.68	0.82	0.9	0.38	0.46	0.82	0.92
26	Chromium (mg/l)	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
27	Copper (mg/l)	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
28	Mercury (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
29	Cadmium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
30	Sodium (mg/l)	26.5	56.2	52.8	36.5	36.5	82.5	80.0	96.2
31	Arsenic (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
32	Lead (mg/l)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
33	Total Coliform (CFU/100 ml)	8.2 x 10^2	8.6 x 10^2	<1,<10 <100	<1,<10 , <100	8.2 x 10^2	9.6 x 10^2	<1,<10 , <100	<1,<10 , <100
34	Fecal Coliform (CFU/100 ml)	2.6 x 10^2	3.5 x 10^2	<1,<10 , <100	<1,<10 , <100	2.5 x 10^2	4.1 x 10^2	<1,<10 , <100	<1,<10 , <100

3.7.2 Observation on Ground Water Quality Analysis Results

Analysis results of ground water reveal the following;

- pH varies from to 6.72 to 6.92.
- Total Hardness varies from 72.27 to 136.62 mg/l.
- Total Dissolved Solids varies from 380 to 850 mg/l.
- Fluoride varies from <0.1 mg/l to 0.72 mg/l
- Nitrate varies from 8.22 mg/l to 21.51 mg/l
- Sulphate varies from 23.8 mg/l to 76.0 mg/l
- Calcium varies from 16.67 mg/l to 32.54 mg/l
- Magnesium varies from 5.46 mg/l to 15.68 mg/l
- Iron varies from 0.38 mg/l to 0.92 mg/l
- Heavy metals is <2 mg/l
- Total Coliform is from absent to 9.6 x 10^2 (CFU/100 ml)

The physico-chemical characteristics ground water samples are presented in Table No. 3.12. The drinking water quality standard "ISO: 10500, 2012" is mentioned alongside the ground water analysis results for comparison. The analytical results of groundwater samples showed all the parameters are within the prescribed limits as per IS: 10500, 2012 standards for drinking water.

3.8 SOIL CHARACTERISTICS

Soil samples were collected on 25th November, 2021 from four different sampling locations and were analyzed for the soil structure, texture, moisture, content, nutrient level and other chemical parameters. The present study of the soil profile establishes the baseline characteristics and this will help in future in identifying the incremental changes if any, due to the operation of the proposed project. The sampling locations have been identified with the following objectives:

- To determine the baseline soil characteristics of the study area,
- To determine the impact of industrialization on soil characteristics, and
- To determine the impact on soils more importantly from agricultural productivity point of view.

In the buffer zone, soil in general is grayish to reddish in colour with some sandy percentage. The presence of organic carbon, N, P, K and good water holding capacity of the top soil

indicates that the soils will support plant growth. The organic matter and phosphorous content is high in top soil to support proper plant growth. The soil samples of nearby agricultural field are having good water holding capacity, organic matter and phosphorus percentage to support plant growth.

Table No. 3.13, enlists the soil sampling locations. These sampling locations are also marked in Fig. No. 3.9.

Table No. 3.13: List of Soil Sampling Locations

Sl. No.	Code	**Location**	**Distance from ML area**	**Direction**
1.	SQ1	Proposed Project Site	-	-
2.	SQ2	Ag. field in Kumarpur Village	2.5 Km	WSW
3.	SQ3	Road side near Seoarakuri	6.5 Km	WSW

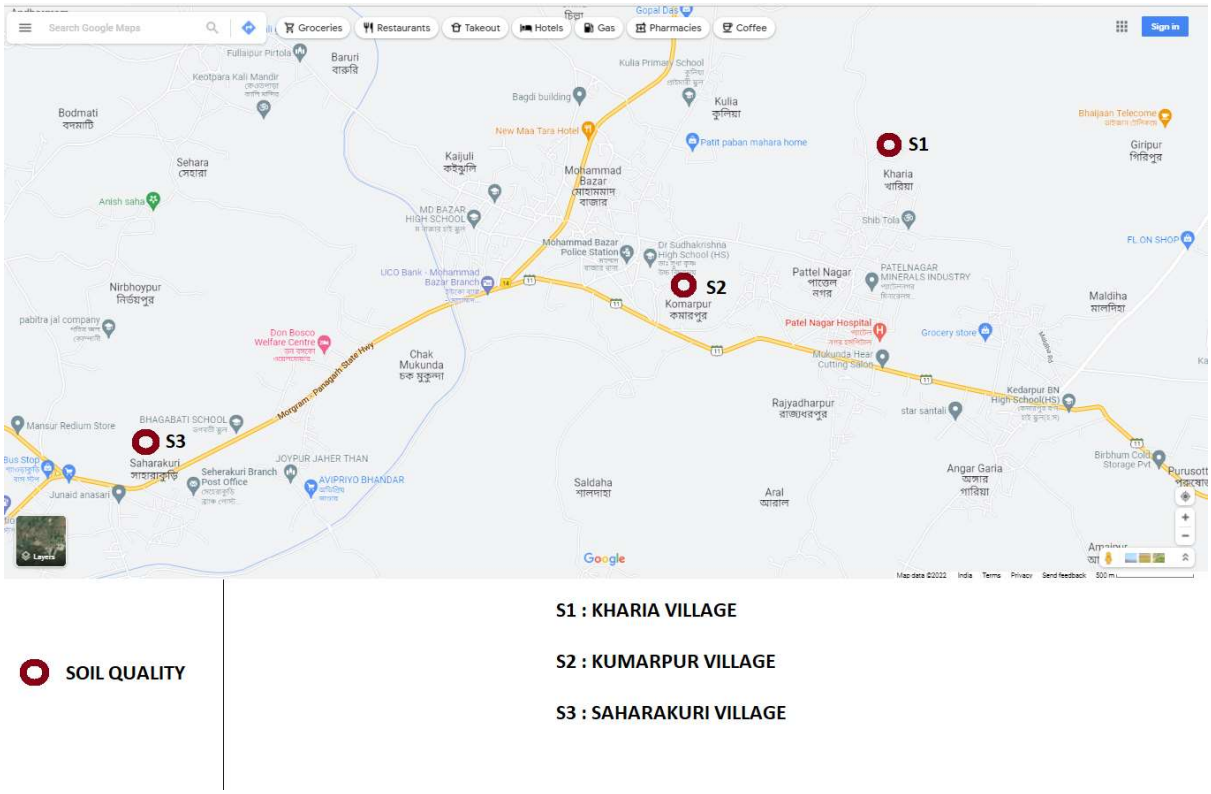


Fig. No. 3.9: Soil Sampling Locations of the study area

Table No. 3.14: Soil Analysis Results

Sl. No.	PARAMETER	SQ1	SQ2	SQ3
1	Description of Soil	Disturbed soil	Disturbed soil	Undisturbed soil
	PARAMETERS			
A	PHYSICAL			
2	Colour	Grayish	Grayish	Slightly Reddish
3	PH (1:2)	7.68	7.8	7.32
4	Soil Texture (upto 60 cm depth)	Sandy loam	Sandy loam	Loamy sand
5	Sand (%)	60	65	70
6	Silt (%)	30	25	15
7	Clay (%)	10	10	10
B	**CHEMICAL**			
8	Nitrogen (mg/Kg)	980	820	580
9	Potassium (mg/Kg)	1150	950	760
10	Phosphorous(mg/Kg)	480	720	520
11	Organic Carbon (mg/Kg)	7.8	7.2	5.6

3.8.1 Observation of the Soil Quality Scenario of Study Area

- **pH:** pH of soil mainly depends on the soil water ratio. The pH of soil samples in the study area indicated that in agriculture land, the soil pH was slightly alkaline in nature.
- **Textural Class:** Soil texture is an indicator parameter, through which other soil properties can be studied, but if used alone, it has limited predictive value; viz., ability of a soil to adsorb cations from solution depends on the mineralogy of the clay fraction as well as on the percentage of clay. It also depends on the amount and nature of organic matter, the soil holds. Clay soils retain more water against gravity and warm up more slowly in comparison to other soil textural forms. Soil textural form of the study area is sandy loam in nature.
    - **Water Holding Capacity (WHC):** Water holding capacity is the amount of water that can be retained by the soil when all the pores in the soil have been filled with water. WHC was more in the surface soil layer where accumulations of organic matter, litter and root mass, etc., existed.

- **Organic Carbon:** The organic substances are a major determinant of soil structure, moisture content, pH and the soil nutrient status of the topsoil. This differentiates among the fertile and non-fertile soils. The organic carbon content of the soil in terms of percentage collected from different sampling locations indicating variable organic matter content and decomposition rates. The requirement of optimum level of organic matter required by the plants slightly varies between species, as it is not a single nutrient source required for all the plants and for all the soils. The variation is also dependent on soil type, climate and existing plant species.

- **Total Phosphorus:** Phosphorus is the second most important macronutrient available in the soil of the biological systems. It is a major component of nucleic acids, phospholipids & many phosphorylated compounds. Similarly, it is also a second most limiting factor often affecting plant growth. Chemically, phosphorus exists in the soil in the form of both organic and inorganic forms. Generally, plants are dependent on inorganic phosphorus especially in the form of phosphate ions, whereas organic phosphates are also important sources of phosphorus in almost all types of soils.

- **Potassium:** This element is important in grain formation and is absolutely necessary for tuber development. All crops generally respond to application of potassium. Potassium increases crop resistance to certain diseases. It helps to prevent the undesirable growth of plants that is sometimes caused by excessive nitrogen. In general way, potassium exerts a balancing effect on the effects of both nitrogen and phosphorous; consequently, it is important as a multi-nutrient fertilizer. Soils with high clay content have a greater amount of mineral potassium than sandy soil.

- **Available Nitrogen:** Nitrogen is having a major role in maintaining the fertility status of the soil. Nitrogen content in almost all the soils is observed to be very low. Plants are more dependent upon nitrate nitrogen during aerobic conditions and ammonical nitrogen during anaerobic conditions. Nitrogen content is favourable for the luxuriant growth of nitrogen fixing bacteria and blue-green algae in soil which are ultimately responsible for increased nitrogen content.

Table No. 3.15: Rating Chart for Soil Test Values and their Nutrient Indices

Soil pH	**Acidic**	**Neutral**	**Alkaline**
Range	Below 6.0	6.0 – 8.0	Above 8.0
SRI (Soil Reaction Index)	I	II	III
Electrical Conductivity			
Range (µmhos/ cm)	Normal (<1000)	Critical (1000-2000)	Injurious (>2000)
Salt Index	I	II	III
Organic carbon			
Range (%)	Low (<0.5)	Medium (0.5-0.75)	High (>0.75)
Nutrient Index	I	II	III
Available Phosphate			
Range (Kg/ha)	Low (<22)	Medium (22-54)	High (>54)
Nutrient Index	I	II	III
Available Potassium			
Range (Kg/ha)	Low (<123)	Medium (123-296)	High (>296)
Nutrient Index	I	II	III
Available Nitrogen			
Range (Kg/ha)	Low (≤280)	Medium (>280-450)	High (>450)
Nutrient Index	I	II	III

Conclusion: The soils of the study area have been developed mostly from massive granitic rocks and meta sedimentary formations of Precambrian age. These soils are gray to red in colour, medium texture, containing gravels, quartz, sand and ferruginous concretions. Its physical and chemical characteristics markedly show a little variation in the area.

The presence of organic carbon, N, P, K and good water holding capacity of the top soil indicates that the soils will support plant growth. The soil samples of nearby agricultural field are having good water holding capacity, organic matter and phosphorus percentage to support plant growth.

3.9 BIODIVERSITY STUDY

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

- Primary field surveys to establish primary baseline data of the study area.
- Consultation with Divisional Forest Offices of the area, and
- Compilation of information available in published literatures and as obtained from Divisional Forest Offices, Botanical Survey of India (BSI) and Zoological Survey of India (ZSI).

The floral and faunal studies were carried out in different sites representing the entire study area of 10km radius around the leasehold area. Details regarding the assessment of flora and fauna of the study are presented below:

3.9.1 Flora /Vegetation Study

The study of vegetation was aimed at enumeration of the available plant resources and obtaining a broad representation of the existing floristic variations within the mine lease area and surrounding areas. Enumeration of the plant wealth was done by surveying the area through walking along the gradients of hillocks and valleys followed by collection and identification of plant specimens during the winter period. Phyto-sociological aspects of the study were carried out by sampling through quadrates method. Sample plots were selected in such a way to get maximum representation of different types of vegetation and plots were laid out in different parts of the areas within the mine lease area as well as the buffer zone of the ML area.

3.9.2 Forest Types and Composition

The leasehold of M/s N. P. Minerals' China Clay & Fire Clay mines involves no forest land. The study area has mostly dry deciduous forest towards northern & western part. Area of dense forest is very less. Southern part of the study area is almost denuded of any forest cover. Forest having low density of tree growth predominated by scanty shrubs and bushes are on the remaining area of the buffer zone. Most of the forest blocks are mainly dry tropical deciduous type with good growth of Sal forest. This is because of its gregarious habit, coppicing power, resistance to burning, regeneration even under burning & grazing and adaptability to varying

soil & site condition. The pre-dominant associated species are Babul, Siris, Am, Arjun, Sal, Neem, Bot, etc.

3.9.3 Assessment of Flora in Core Zone

10 quadrates of 10m X 10m size have been considered to access the floral composition of the core zone. It was found from the study that the project area is covered by trees having moderate density of growth with scanty shrubs and bushes. Most of vegetations are dry deciduous type. List of flora found in the study area is given in Table No. 3.16.

Table No. 3.16: **Floral Composition in the Core Zone**

Sl. No.	Local Name	Scientific Name	Family
TREES			
1.	Tal	*Borassus flabellifer*	Arecaceae
2.	Bot	*Ficus benghalensis*	Moraceae
3.	Aswatha	*Ficus regiosa*	Moraceae
4.	Khenjur	*Phoenix sylvestris*	Arecaceae
5.	Arjun	*Terminalia arjuna*	Combretaceae
6.	Kul	*Zizypus mauritiana*	Rhamnaceae
7.	Sal	*Shorea robusta*	Dipterocarpaceae
8.	Siris	*Albizzia lebbeck*	Fabaceae
9.	Babul	*Acacia arabica*	Fabaceae
SHRUBS			
1.	Arakha	*Calotropis gigantantia*	Asclepiadaceae
2.	Naga airi	*Lantana camara*	Verbenaceae
3.	Bhuin khajuri	*Phoenix acaulis*	Areaceae
HERBS			
1.	Apangu	*Achyranthes aspera*	Amaranthaceae
2.	Bhui amla	*Phyllanthus virgatus*	Euphorbiaceae
3.	Lajjabati	*Mimosa pudica*	Mimosaceae
4.	Uchunti	*Ageratum conyzoides*	Asteraceae
GRASSES			
1.	Guguchia	*Chrysopogon montanus*	Poaceae
2.	Durba	*Cynodon dactylon*	Poaceae

3.9.4 Assessment of Flora in Buffer Zone

52 quadrates of 10m X 10m size has been considered in all four directions of the leasehold in 10km radius to access the floral composition of the buffer zone. Vegetation of study area is mixed type, dominated by various tree species as Am, Siris, Sal, Bot, Tal, etc. The growth forms of the plant species are categorized as trees, herbs, shrubs and climbers etc. A full checklist of vascular plant species as recorded during the field survey is tabulated in Table No. 3.17.

Table No. 3.17: Floral Composition in the Buffer Zone

Sl. No.	Local Name	Scientific Name	Family
TREES			
1.	Neem	*Azadirrachta indica*	Meliaceae
2.	Simul	*Bombax ceiba*	Bombacaceae
3.	Tal	*Borassus flabellifer*	Arecaceae
4.	Palas	*Butea frondosa*	Fabaceae
5.	Krishnachura	*Caesalpinia pulcherima*	Fabaceae
6.	Coconut	*Cocos nucifera*	Arecaeae
7.	Gulmohar	*Delonix regia*	Fabaceae
8.	Chalta	*Dillenia indica*	Dilleniaceae
9.	Bot	*Ficus benghalensis*	Moraceae
10.	Aswatha	*Ficus regiosa*	Moraceae
11.	Aam, mango	*Mangifera indica*	Anacardiaceae
12.	Bakul	*Mimusops elengi*	Sapotaceae
13.	Khejur	*Phoenix sylvestris*	Arecaceae
14.	Guava	*Psidium guajava*	Myrtaceae
15.	Tamarind	*Tamarindicus indica*	Fabaceae
16.	Arjun	*Terminalia arjuna*	Combretaceae
17.	Jhao	*Thuja occidentalis*	Cupressaceae
18.	Kul	*Zizypus mauritiana*	Rhamnaceae
19.	Sal	*Shorea robusta*	Dipterocarpaceae
20.	Siris	*Albizzia lebbeck*	Fabaceae
21.	Babul	*Acacia arabica*	Fabaceae
SHRUBS			
1.	Shet – akanda	*Calotropis gigantea*	Asclepiadaceae
2.	Lal-bharenda	*Jatropha glandulifora*	Euphorbiaceae
3.	Verenda	*Jatropha gossypifolia*	Euphorbiaceae
4.	Rehri	*Ricinus communis*	Euphorbiaceae
5.	Petari	*Abutilon indicum*	Malvaceae
6.	Kapas	*Gossypium herbaceum*	Malvaceae
7.	Berela	*Sida cordifolia*	Malvaceae

8.	Lal Berela	*Sida rhombifolia*	Malvaceae
9.	Kambhoe	*Phyllanthus reticulates*	Euphorbiaceae
10.	Ayapana	*Eupatorium cannabinum*	Asteraceae
11.	Bon-nil	*Tephrosia purpurea*	Papilionaceae
HERBS			
1.	Muktajhurih	*Acalypha indica*	Euphorbiaceae
2.	Bon-tulusi	*Croton bonplandianum*	Euphorbiaceae
3.	Boro-karni	*Euphorbia hirta*	Euphorbiaceae
4.	Chotra	*Lantana camara*	Verbenaceae
5.	Bhui okra	*Lippia nodiflora*	Verbenaceae
6.	Kantanotey	*Amaranthus spinosus*	Amaranthaceae
7.	Apang	*Achyranthes aspera*	Amaranthaceae
8.	Haldi Basanto	*Lindenbergia indica*	Scnphulariaceae
9.	Punarnaba	*Boerhaavia diffusa*	Nyctaginaceae
10.	Dutura	*Datura metel*	Solanaceae
11.	Bhurangini	*Solanum xanthocarpum*	Solanaceae
12.	Kakmachi	*Solanum nigram*	Solanaceae
13.	Parthenium	*Parthenium hysterophorus*	Asteraceae
14.	Kantakalia	*Hygrophila longifolia*	Acanthaceae
GRASSES			
1.	Bharbusi	*Eragrostris tenella*	Poaceae
2.	Kush	*Eragrostris unioloides*	Poaceae
3.	Durba	*Cynodon dactylon*	Poaceae
4.	Chorkanta	*Chrysopogon aciculatus*	Poaceae
5.	Lal Kans	*Saccharum spontaneum*	Poaceae
6.	Motha	*Cyperus rotundus*	Cyperaceac
7.	Elephant grass	*Typha elephantine*	Typhaceac
CLIMBERS			
1.	Telakucha	*Coccinia grandis*	Cucurbitaceae
2.	Bilavi	*Mukia maderaspatana*	Cucurbitaceae
3.	Besharm	*Ipomoea carnea*	Convolvulaceae
4.	Satamulee	*Asparagus plumosus*	Liliaceae
5.	Matira	*Citrullus vulgaris*	Cucurbitaceae

During the survey of the core & buffer zone, no endangered or rare plant species were observed. As such from floristic stand point, the study area cannot be considered as unique site.

3.9.4.1 Phyto-sociological Analysis of Vegetation covers in Buffer area

Phyto-sociological aspects of the study were carried out by sampling through quadrates method. Sample plots were selected in such a way to get maximum representation of different types of vegetation and plots were laid out in different parts of the areas within the mine area as well as the surrounding mine area. Analysis of the vegetation will help in determining the relative importance of each species in the area & to reveal whether any economically valuable species is endangered in the process.

Methodology: The study was aimed at enumeration of the available plant resources and obtaining a broad representation of the existing floristic pattern surrounding mine lease areas. Enumeration of the plant wealth was done by surveying the area through walking along the gradients of hillocks and valleys followed by collection and identification of plant specimens during the winter season. Phyto-sociological aspects of the study were carried out by sampling through quadrates method. Sample plots were selected in such a way to get maximum representation of different types of vegetation and plots were laid out in different parts of the areas within the mine area as well as the surrounding mine area.

3.9.5 Assessment of Fauna

To assess the impacts due to mining activity and evolve suitable mitigation measures to protect and conserve wildlife biodiversity, the status of wildlife biodiversity within the lease area and in 10km radial area (Study Area) of Patel Nagar China Clay & Fire Clay Mine, the following components were studied:

a) Wildlife survey (diversity)

b) Habitat study (feeding, breeding, roosting areas)

c) Migratory paths of major wildlife species

d) Distribution of birds

e) Rare & Endangered species of fauna

Equipment's & materials are used during the survey are Global Positioning System (G.P.S.) with an accuracy of ± 10m, Binoculars (8×40 capacity) for good viewing, a compass to guide

the route & direction, maps, etc. Both direct and indirect observation methods were used to survey the fauna in the study area. Visual encounter (search)

method was employed to record vertebrate species. Since birds may be considered as

indicators for monitoring and understanding human impacts on ecological systems (Lawton 1996), an attempt was made to gather data by:

a. Point Survey Method: Observations were made in each site for 15 min duration.

b. Road Side Counts: The observer traveled by motor vehicles from site to site and all sightings were recorded.

c. Pellet and track Counts: All possible animal tracks and pellets were identified and recorded (South Wood, 1978).

Based on the Wildlife Protection Act, 1973 (WPA, 1972); Anonymous, 1991; Upadhyay, 1995; Chaturvedi and Chaturvedi, 1996) species were short-listed and arranged as per Schedule defined in Wildlife Act, 1972 and subsequent amendments. Species listed in Ghosh (1994) are considered as Indian Red List species. The details of fauna found in the study area (both core and buffer zone) are given in below. No Schedule –I species is observed in the study area. The Flora & Fauna list authenticated by the DFO, Birbhum dist. Is under process of authentication.

The buffer zone of this lease area does not form part of any National Park, Wildlife Sanctuary, Biosphere Reserve, Tiger Reserve and Elephant Corridor.

Table No. 3.18: Faunal composition in the Core Zone

Local Name	English Name	Zoological Name	Schedule as per WP Act 1972
Mammals			
Kathbirali	Squirrel	*Funambulus pennati*	IV
Indur	Indian bush Rat	*Golunda ellioti*	IV
Neul	Mongoose	*Herpestes eduardsii*	II
Birds			
Paira	Pigeon	*Columba livia*	IV
Moyna	Indian Myna	*Acridotheres tristis*	IV
Bulbul	Red Vented Bul Bul	*Pycnonatus cafer*	IV
Kak	Common Crow	*Corvus splendens*	IV

Reptiles			
Bali borha	Common Boa	*Boa constricta*	IV
Girgiti	Common lizard	*Calotes versicolor*	IV

Table No. 3.19: Faunal composition in the Buffer Zone

Local Name	English Name	Zoological Name	Schedule as per WP Act 1972
Mammals			
Neula	Mongoose	*Herpestes eduardsii*	II
Kathbirali	Squirrel	*Funambulus pennati*	IV
Bandor	Common langur	*Presbytes intellus*	II
Khargosh	Indian Hare	*Lepus nigricollis*	IV
Indur	Indian bush Rat	*Golunda ellioti*	IV
Harin	Barking deer	*Muntiacus muntjack*	IV
Goose	Domestic Goose	*Anser anser domesticus*	-
Cow	Cow	*Bos indicus*	-
Dog	Dog	*Canis familiaris*	-
Goat	Goat	*Capra hircus*	-
Cat	Cat	*Felis domesticus*	-
Birds			
Ghughu	Spotted Dove	*Streptopelia chinensis*	IV
Ban Murgi	Red Jungle fowl	*Gallus gallus*	IV
Bak/Saras	Egret	*Egretta garzetta*	IV
Paira	Pigeon	*Columba livia*	IV
Moyna	Indian Myna	*Acridotheres tristis*	IV
Chil	Common kite	*Milirusa migrans*	IV
Kak	Common Crow	*Corvus splendens*	IV
Chorai	Sparrow	Passer domesticus	IV
Bulbul	Red Vented Bul Bul	*Pycnonatus cafer*	IV
Machhranga	Kingfisher	Ceryle rudis	IV
Tia	Parakeet	*Pesittacula cyanoceph*	IV
Kokil	Cuckoo	*Eudynamis scolopaceus*	IV
Konch Bak	Pond Heron	*Ardeola grayil*	IV
Titira	Grey Partridge	*Perdix perdix*	IV
Reptiles			
Dhamna	Rat snake	*Ptyas mucosus*	II
Bali Borha	Common Boa	*Boa constricta*	IV
Chiti	Common Indian Krait	*Bangarus caruleus*	IV
Mala Chiti	Banded krait	*Bungarus fasciatus*	II

Girgiti	Common lizard	*Calotes versicolor*	IV
Dhanda	Dhanda	*Xenochrophis piscator*	II
Common cobra	Common cobra	*Naja naja*	II
Amphibian			
Bang	Indian toad	*Bufo melanostictus*	IV
Brahmuni bang	Indian Bullfrog	*Rana tigrina*	IV
Gach Bang	Tree frog	*Rhacophorus leucomystax*	IV
Kuno Bang	Paddy field Frog	*Paddy field Frog*	IV
Bang	Common frog	*Euphlyctis hexadactyla*	IV

The fresh water fish varieties observed in the perennial streams /rivers of the study zone are Seul *(Ophiocephaius striatus)*, Rohu (*Labeo rohita)*, Bata (*Labeo bata*), Mirikali (*Cirrhinay mrigala*), Katla (Catla catla), Sala (*Ophiocephalus marulius*), Balia (*Wallagoattu*) etc.

PHYTOPLANKTON OF POND AND DITCHES

1. *Oscillatoria* sp
2. *Nostoc.*sp
3. *Spirogyra* sp.
4. *Pediastrum*.sp
5. *Oedogonium* sp.
6. *Hydrodictyon* sp.

ZOO PLANKTON OF POND AND DITCHES

I Cladocera
- 1 *Daphnia* sp.
- 2 *Moina.*sp

II Copepoda
- 3 *Cyclops* sp.

III Ciliata
- 4 *Paramoecium* sp.

3.10 TRAFFIC DENSITY

Major traffic in the road near the mines will be trucks & tippers of 20T capacity, which would be used in transporting the China Clay & Fire Clay to the consumer sites. The waste material shall be transported within the ML area whereas the mineral shall be transported through lease road & 3.5km all weather village road connecting to the NH 14. In all, the heavy vehicles like

20 MT capacity truck /tippers plying on the road will be maximum 4 per day (in case of 300 working days), if used ones daily to transport the mineral to the consumer site.

3.10.1 Methodology

Traffic density measurements were made continuously for 24 hours at near project site by visual observation and counting of vehicles under four categories, viz. heavy motor vehicles, light motor vehicles, two/three wheelers and cycles. Looking at the traffic density on the road, two skilled persons were deployed simultaneously during each shift – one person on each of the two directions for counting the traffic. At the end of each hour, fresh counting and recording was undertaken. Thus, the total number of vehicles per hour under the three categories was determined.

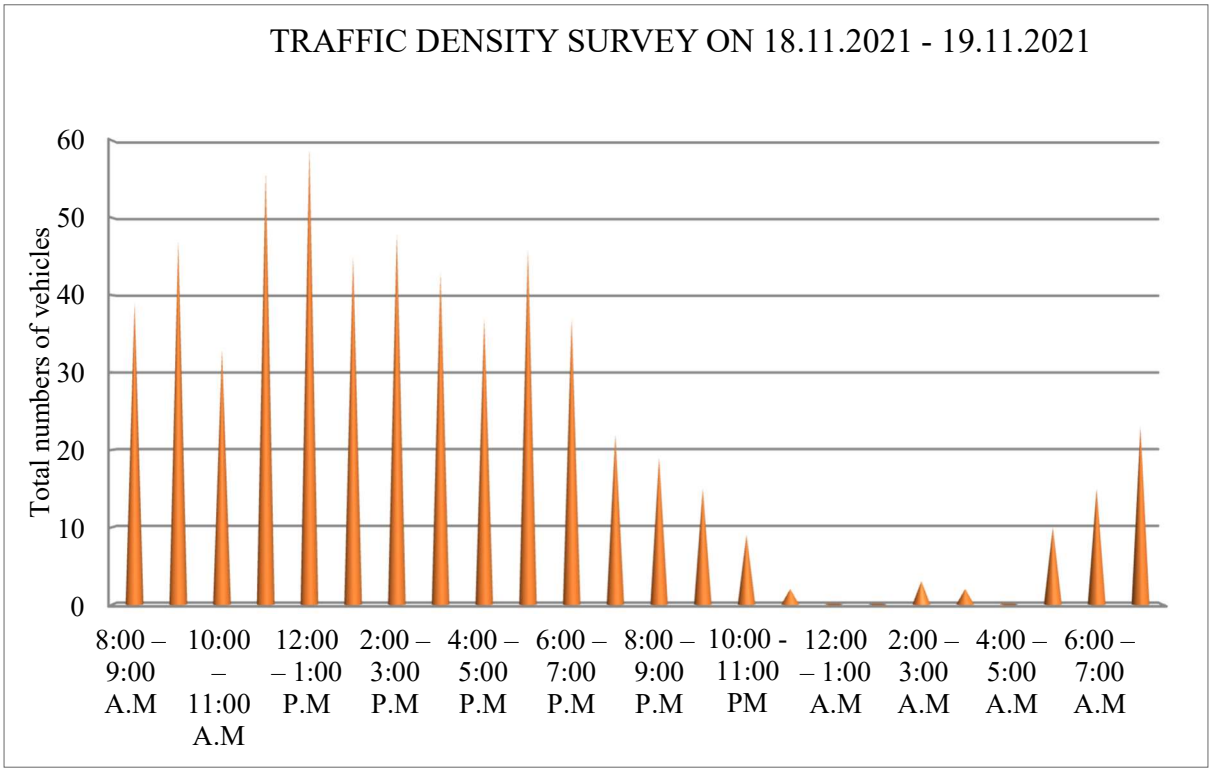
Table No. 3.20: Traffic Data

Time	Car & Jeep	Bus	Truck	Two Wheeler	Total
8:00 – 9:00 A.M	6	2	8	23	39
9:00 – 10:00 A.M	12	3	12	20	47
10:00 – 11:00 A.M	10	3	8	12	33
11:00 – 12:00 P.M	8	2	20	26	56
12:00 – 1:00 P.M	9	2	18	30	59
1:00 – 2:00 P.M	5	3	12	25	45
2:00 – 3:00 P.M	8	1	11	28	48
3:00 – 4:00 P.M	3	0	8	32	43
4:00 – 5:00 P.M	5	0	6	26	37
5:00 – 6:00 P.M	8	0	8	30	46
6:00 – 7:00 P.M	6	0	6	25	37
7:00 – 8:00 P.M	5	0	5	12	22
8:00 – 9:00 P.M	6	0	3	10	19
9:00 – 10:00 P.M	4	0	3	8	15
10:00 - 11:00 PM	3	0	0	6	9
11:00 – 12:00 A.M	2	0	0	0	2
12:00 – 1:00 A.M	0	0	0	0	0
1:00 – 2:00 A.M	0	0	0	0	0
2:00 – 3:00 A.M	0	0	0	3	3
3:00 – 4:00 A.M	0	0	0	2	2
4:00 – 5:00 A.M	0	0	0	0	0

5:00 – 6:00 A.M	0	0	0	10	10
6:00 – 7:00 A.M	3	0	0	12	15
7:00 – 8:00 A.M	5	0	0	18	23

Table No. 3.21: Traffic Density

Traffic Vehicle	No. of Vehicles /day (Before project implementation)	No. of Vehicles /day (After project implementation)
Heavy Motor Vehicle	144	148
Light Motor Vehicle	108	111
Two /Three wheelers	358	370
Grand Total	**610**	**629**



3.11 SOCIO-ECONOMIC STUDY:

Socio-economic study of a particular study area indicates the level of socio-economic status already exist and what could be the possible achievements during subsequent years to come after opening up of the mining site. The socio-economic development is a value-added concept and there should not be a consensus as to its meaning and should have the option of application and its implementation in multiple way to achieve the ultimate goal.

The socio-economic development has multiple dimensions such as economic status, social placement, availability and utilization of basic amenities, working pattern and work category etc. and the development could be conceptualized as a set or vector of desirable social objectives or a development index.

The socio-economic data comprising of information on economic condition and social structure was made around 10km radius, centering China Clay & Fire Clay mining lease area. The study area covers 152 villages in Birbhum district of West Bengal which are within the 10km radius of the ML area. Social Impact Assessment study was conducted in nearby villages of Patel Nagar.

This study includes the aspects of demographic profile with respect to urban and rural base, classification of male, female, S.C., S.T and working class pattern, literacy level, health and drinking water facility in the study area.

The people mainly depend on agriculture as their main activity. Due to poor soil fertility, the yield is not encouraging. Consequently, most of the people have to supplement agriculture with horticulture, farming and other forms of occupation. Other than these few are engaged in mining /industry related activities & other traditional occupations.

Industrialization and the consequent urbanization have brought some changes in the settlement patterns as well as the social make-up of the people of this area. A number of villages have increased in size, primarily those nearer to industrial areas or on road sides. This increase in the population size of the villages was more due to the immigrants who came searching for the economic succor. This has changed the character of the villages from homogeneity of a single tribe or caste to heterogeneity.

Table No. 3.21: Population Statistics of Study Area (As Per Census Data 2011)

Total number of villages /towns	:152
Number of Households	:75,186
Total Population	:3,34,654
Total number of Males	:1,70,474
Total number of Females	:1,64,180

Male/ Female ratio :963.0 female per 1000 male

Percentage of S.C population :27.79%

Percentage of S.T Population :14.96%

Percentage of Literates :57.21%

3.11.1 Demography:

The status of demographic profile in the study area has been a reflection of Census 2011 The demographic profile study of a particular area gives a picture to visualize the status of population i.e., male population, female population, no. of households and their occupation. The sex ratio of male and female are also the part of the study which represents a futuristic assessment for balancing the ratio for a biological sustainability. There are 152 no. of village present in the buffer zone. Total house hold of the area is 75,186 nos. with total population of 3,34,654. Total male population is 1,70,474 and female population is 1,64,180. As per Census 2011 the sex ratio of the area is 963 females per 1000 of male population. Total SC population of the area is 93,017 (27.79%) with 48,229 male and 44,788 female. Total ST Population of the area is 50,077 (14.96%) with 25,965 male and 24,112 female. Population below 6 years is 46,452 with male of 23,393 and female of 23059. The Demographic profile of the study area is given in Table No. 3.22.

The socio-economic profile of the study area is presented based on site visits, discussions with the villagers and the secondary data available from various agencies and District Census Hand Books, 2011.

3.11.2 Literacy & Education Facility:

Out of the total population within the study area, 1,91,448 persons are literate which contribute about 57.21% of total population within the buffer zone. Out of the total literate, male literacy is contributed by 1,07596 (63.12%) and female literacy is contributed by 83,852 (51.07%) and remaining 1,43,206 (42.79%) of the total population of the project villages are illiterates. The total data are figured in the Table No. 3.22.

During the field survey it has been found that many of the villages of the study area having the primary education facility in terms of Primary schools and Anganwadi centers. There is good

awareness among the people regarding the education. As per the census data there are 56 Primary School & 35 M.E Schools present within the study area. The High schools are in Deucha, Mohammadad bazaar, Ghaga, Ganpur, etc. College facility is in Ganpur only.

3.11.3 Medical and Health Services:

The villages are very poorly served in terms of medical facilities. Md Bazar Rural Hospital in Patelnagar area has 30 beds. There are Primary Health Centres at Bharkata (10 beds), Sakeddah (PO Dighalgram) (6 beds) and Rampur (10 beds). Sainthia Rural Hospital at Sainthia has a facility of 60 beds.

Block Livestock development office and Block Animal Health Centre is at Md Bazaar; Additional Block Animal Health Centre is at Deucha to assist villagers in the issues relating to their livestock.

3.11.4 Drinking Water & Other Infrastructures:

Hand pumps & Dug wells are the main source of drinking water in the study area. Almost all the villages have drinking water facility. Telecommunication and Electricity is available in the almost all the villages of the study area.,

3.11.5 Occupational Pattern:

The work force classification in the study area helps in formulating strategies in any development programme. It also helps in identifying the potential workforce, their aptitude, skill etc. in any targeted population. Keeping this in view, in the present study an attempt was made by the study team to collect information on the occupational profile of the people within the sample villages during primary survey and also verified the field data with census data of 2011.

3.11.6. Communication Facilities:

Nearest national highway NH-14 is at the distance of 3.0 km in the West direction. An all weather 3.0km long road connects the mines with Patel Nagar which is on NH- 14.

The nearest railway station is at Sainthia (to the South East of the project sire) Eastern Railway is 9.5 km from the project site. Nearest airport is Dumka Airport at 43km in NW and Kazi Nazrul Islam Airport, Durgapur, 55km in SW direction from the project site.

3.11.7. Other Facilities:

Md Bazar has a delivery sub post office, with PIN 731127, under Suri head office. Village post offices are in Patel Nagar, Kharia, Kabilpur etc. Police station at block head quarter Md Bazar is providing all necessary police assistance in the study area. Weekly market takes place at Patel Nagar, Kharia, Kabilpur and all facilities are available in Mohammad Bazar.

Table No. 3.22: Demographic Pattern of the Study Area:

Sl No	Location Name	House hold	Popula tion	Male Popula tion	Female Popula tion	SC Popula tion	ST Popula tion	P_Lit	M_Lit	F_Lit	P_06	M_06	F_06
1	Giripur	72	307	157	150	75	82	231	139	92	29	9	20
2	Maldiha	193	844	438	406	615	1	526	319	207	77	45	32
3	Kharia	427	1837	921	916	959	12	1206	655	551	212	105	107
4	Kulia	212	922	473	449	696	0	500	277	223	114	59	55
5	Chak Sehara	0	0	0	0	0	0	0	0	0	0	0	0
6	Rautara	677	3278	1653	1625	66	141	1792	985	807	553	262	291
7	Tantulbaria	598	2594	1330	1264	486	78	1579	875	704	359	173	186
8	Kabilpur	514	2131	1056	1075	1172	383	1154	644	510	252	114	138
9	Angar Garia	1067	4232	2155	2077	1860	641	2631	1476	1155	487	239	248
10	Rajyadharpur	413	1643	824	819	523	472	965	537	428	180	95	85
11	Komarpur	720	2919	1492	1427	1069	441	1904	1048	856	326	159	167
12	Purusottampur	65	273	141	132	8	0	194	110	84	24	13	11
13	Puranagram	462	1924	984	940	711	365	1030	558	472	249	136	113
14	Jayrampur	219	848	443	405	347	219	418	251	167	103	53	50
15	Heruka	510	2139	1061	1078	211	42	1417	747	670	232	104	128
16	Sahnagar	388	1747	889	858	103	0	1147	637	510	222	105	117
17	Bataspur	204	916	461	455	594	126	613	331	282	135	69	66
18	Mallikpur	0	0	0	0	0	0	0	0	0	0	0	0
19	Makdumnagar	326	1593	828	765	615	0	1074	612	462	215	117	98
20	Ushka	248	1068	544	524	271	443	560	325	235	163	81	82
21	Raghunathpur	173	720	380	340	464	0	442	260	182	100	56	44
22	Tentulia	194	901	448	453	245	0	435	256	179	136	66	70
23	Raypur	252	1038	514	524	399	7	801	420	381	96	48	48
24	Gamira	161	681	349	332	253	0	529	293	236	47	24	23
25	Bagalpur	239	1069	525	544	390	308	594	329	265	147	65	82
26	Danjana	83	361	189	172	49	67	241	136	105	31	19	12
27	Rupganja	59	235	130	105	94	0	155	90	65	30	18	12
28	Chilla	89	376	187	189	212	2	217	122	95	55	23	32
29	Kaijuli	365	1686	869	817	728	0	1015	566	449	221	106	115
30	Mohammad Bazar	36344	164570	83590	80980	43814	31152	92045	51892	40153	23346	11775	11571
31	Baruri	9	35	17	18	28	0	18	10	8	4	2	2
32	Chak Mukunda	1	3	1	2	0	0	1	1	0	1	0	1

33	Saldaha	114	495	274	221	377	0	338	210	128	64	31	33
34	Aral	0	0	0	0	0	0	0	0	0	0	0	0
35	Baragachha	1	2	0	2	0	2	1	0	1	1	0	1
36	Bhutura	101	416	211	205	346	3	136	80	56	55	29	26
37	Maulpur	329	1372	686	686	591	229	795	447	348	192	93	99
38	Chat Rama	47	176	88	88	39	91	78	43	35	24	14	10
39	Mamudpur	35	126	62	64	55	19	69	38	31	17	7	10
40	Nadighasbera	0	0	0	0	0	0	0	0	0	0	0	0
41	Simulia	16	51	20	31	0	51	23	14	9	7	0	7
42	Baram	115	453	230	223	176	87	314	176	138	39	22	17
43	Katunia	46	173	94	79	97	0	109	67	42	20	11	9
44	Deulpur	0	0	0	0	0	0	0	0	0	0	0	0
45	Sugunpur	167	622	323	299	176	70	360	211	149	84	43	41
46	Amaipur	59	252	121	131	0	252	81	51	30	44	20	24
47	Asenga	87	369	191	178	306	0	178	97	81	40	22	18
48	Gournagar	122	519	263	256	195	0	364	196	168	69	32	37
49	Ranipur	37	132	69	63	42	0	95	54	41	7	5	2
50	Bangram	176	823	397	426	10	793	269	172	97	72	30	42
51	Bagdola	165	721	389	332	215	264	474	273	201	76	42	34
52	Bagdahari	95	375	183	192	227	0	210	108	102	56	30	26
53	Sekeddaha	631	3016	1557	1459	492	159	1604	896	708	535	272	263
54	Baluti	903	4304	2254	2050	979	15	2409	1347	1062	716	354	362
55	Darkata	466	2198	1111	1087	663	149	1066	606	460	378	186	192
56	Dighalgram	1360	6284	3194	3090	447	247	3442	1864	1578	949	479	470
57	Bara Bataspur	402	1737	870	867	374	89	1033	560	473	228	112	116
58	Chandpur	0	0	0	0	0	0	0	0	0	0	0	0
59	Gopalpur	130	554	294	260	326	2	333	202	131	64	32	32
60	Alinagar	347	1748	890	858	269	0	1105	584	521	283	138	145
61	Sonthsal	900	4687	2426	2261	0	11	2887	1571	1316	747	401	346
62	Kapasdanga	548	2426	1250	1176	477	122	1456	763	693	321	174	147
63	Maharajganja	0	0	0	0	0	0	0	0	0	0	0	0
64	Chanda	383	1920	963	957	238	1374	756	429	327	341	181	160
65	Pachmi	55	280	138	142	21	248	98	66	32	42	26	16
66	Bahadurganja	316	1392	694	698	240	196	1013	535	478	136	71	65
67	Dubrajpur	225	887	454	433	305	358	447	256	191	117	69	48
68	Deucha	377	1772	894	878	644	0	1066	582	484	266	129	137
69	Tajpur	226	953	482	471	217	295	487	286	201	127	65	62
70	Nischintapur	681	3186	1642	1544	1035	329	1509	893	616	562	312	250
71	Saluka	150	694	357	337	78	0	506	273	233	88	46	42
72	Rampur	220	930	487	443	669	0	505	307	198	122	56	66
73	Srikantapur	206	954	489	465	299	250	529	307	222	122	60	62
74	Bherapathar	122	602	284	318	154	443	260	147	113	97	40	57
75	Debagram	286	1411	688	723	158	1107	556	317	239	224	114	110
76	Kuldihi	4	19	10	9	0	0	15	9	6	2	1	1
77	Korapukur	123	591	292	299	5	104	235	139	96	97	39	58

78	Sarenda	237	1057	519	538	409	0	666	355	311	124	64	60
79	Langalbhanga	200	1236	639	597	0	181	708	404	304	254	118	136
80	Porabali	73	306	148	158	269	0	175	99	76	44	18	26
81	Kulkuri	290	1231	628	603	747	0	730	419	311	146	71	75
82	Abdarpur	111	494	269	225	246	12	302	171	131	68	51	17
83	Bishnupur	328	1507	757	750	908	20	872	488	384	212	106	106
84	Bhagirathpur	0	0	0	0	0	0	0	0	0	0	0	0
85	Fullaipur	240	951	476	475	405	0	426	234	192	131	62	69
86	Bodmati	153	625	321	304	414	0	516	277	239	63	31	32
87	Birupur	273	1500	784	716	135	245	783	470	313	243	131	112
88	Andhargram	72	258	131	127	61	55	162	81	81	26	14	12
89	Sehara	29	117	63	54	45	0	83	47	36	15	9	6
90	Chak Baharakuri	63	314	152	162	215	1	181	107	74	50	19	31
91	Nirbhoypur	139	614	305	309	86	509	202	119	83	108	46	62
92	Sukna	302	1534	781	753	75	513	727	460	267	299	137	162
93	Amarpur	23	116	56	60	0	116	61	34	27	13	8	5
94	Saharakuri	479	2260	1159	1101	173	132	1203	694	509	311	161	150
95	Maladanga	452	2058	1057	1001	915	449	1191	695	496	285	137	148
96	Shankarpur	70	314	177	137	148	15	215	128	87	38	21	17
97	Kashthatari	145	635	314	321	493	120	230	139	91	104	50	54
98	Araipur	0	0	0	0	0	0	0	0	0	0	0	0
99	Amjola	217	1048	536	512	529	21	703	395	308	125	64	61
100	Kaniara	5	25	13	12	0	25	7	7	0	5	2	3
101	Bhejena	171	721	383	338	269	154	380	234	146	95	55	40
102	Joka	45	168	81	87	15	145	96	57	39	17	8	9
103	Kamalpur	403	1783	910	873	896	148	1156	642	514	221	119	102
104	Ajoypur	216	903	463	440	678	0	650	352	298	102	56	46
105	Narasinghpur	25	117	59	58	0	0	88	47	41	17	9	8
106	Durgapur	209	928	479	449	260	214	514	280	234	127	64	63
107	Banshjor	943	4568	2371	2197	532	5	2700	1486	1214	607	316	291
108	Parsimulia	126	475	240	235	133	107	342	197	145	47	21	26
109	Shaktipur	192	778	415	363	334	231	477	294	183	93	49	44
110	Nandanpur	119	488	244	244	261	5	316	175	141	56	25	31
111	Maheshpur	78	328	158	170	71	0	180	95	85	49	24	25
112	Junidpur	608	2598	1353	1245	360	0	1400	806	594	376	208	168
113	Bandiha	121	520	274	246	0	0	261	143	118	82	47	35
114	Karimpur	166	765	386	379	32	0	441	229	212	104	58	46
115	Kukhurdihi	533	2224	1123	1101	116	0	1454	807	647	309	147	162
116	Dhulla	462	2075	1048	1027	963	0	1167	658	509	297	152	145
117	Kakuria	480	2104	1087	1017	164	1	1352	744	608	291	141	150
118	Bara Alunda	292	1101	582	519	671	0	720	415	305	104	57	47
119	Itagaria	503	2049	1037	1012	129	286	1303	719	584	257	126	131
120	Chhota Alunda	606	2511	1283	1228	389	1	1612	894	718	380	182	198
121	Kunuri	934	3217	1645	1572	1341	5	1889	1057	832	347	171	176

122	Parishar	204	840	432	408	537	0	517	280	237	92	53	39
123	Ganutia	64	288	138	150	115	0	196	106	90	38	17	21
124	Bijuri	152	677	342	335	285	272	349	203	146	84	48	36
125	Uttar Gobindapur	229	954	488	466	281	173	465	255	210	110	54	56
126	Baidyapur	253	1000	517	483	360	418	503	293	210	138	73	65
127	Kultor	45	171	86	85	99	0	80	48	32	26	10	16
128	Raihat	156	676	341	335	50	625	287	172	115	115	57	58
129	Mahishdahari	528	2320	1214	1106	175	0	1524	869	655	313	145	168
130	Matpalsha	899	3756	1940	1816	167	0	2499	1368	1131	564	282	282
131	Bhalian	541	2300	1162	1138	605	62	1469	788	681	323	149	174
132	Chhautara	159	663	333	330	394	96	336	195	141	88	36	52
133	Harishkopa	282	1099	587	512	613	117	733	424	309	132	71	61
134	Bideshini	0	0	0	0	0	0	0	0	0	0	0	0
135	Saoldihi	65	293	147	146	234	0	184	101	83	33	15	18
136	Daikota	105	434	212	222	123	195	245	141	104	47	17	30
137	Laliapur	200	736	380	356	548	0	393	237	156	96	55	41
138	Amua	958	4398	2253	2145	689	402	2478	1391	1087	604	315	289
139	Bhabanipur	260	965	484	481	257	206	774	405	369	85	44	41
140	Behira	101	472	235	237	132	129	223	134	89	75	32	43
141	Gumta	209	828	426	402	320	5	526	290	236	84	44	40
142	Itahata	120	523	276	247	134	128	371	214	157	58	31	27
143	Monai	231	954	480	474	426	263	483	281	202	115	59	56
144	Matipur	194	851	456	395	593	0	546	319	227	94	49	45
145	Kesabpur	41	188	93	95	105	82	94	53	41	23	11	12
146	Nandura	381	1583	823	760	524	0	1130	620	510	162	83	79
147	Bajitpur	639	2611	1340	1271	1328	445	1249	720	529	337	168	169
148	Pathai	326	1348	707	641	714	0	929	535	394	115	61	54
149	Hosenganj	73	263	127	136	44	27	156	90	66	37	17	20
150	Gadadharpur	212	893	465	428	782	20	526	319	207	88	42	46
151	Rautgara	257	1052	520	532	141	355	680	381	299	106	50	56
152	Dhobanandapur	112	385	194	191	356	0	217	133	84	51	22	29
	Total	75186	334654	170474	164180	93017	50077	191448	107596	83852	46452	23393	23059

Summary

The population of the study area (10 km area around the proposed project site) is 3,44,654 (2011 census), the male-female ratio is 963, density is 1050 persons/km2. The study area is densely populated with 151 villages and 1 large town. 27.79% of the population is Scheduled Caste. Only 14.96% of the population is Scheduled Tribe. 57.21% of the population are literate. The study area is moderately industrialized. Many mining are present in the area. The infrastructure facilities of the settlements within study area is satisfactory. All villages are

connected by asphalted roads, all panchayat village have Primary Health Centre with basic facilities, primary school is present in all panchayat villages. Secondary schools and higher secondary schools are also present in the large semi-urban localities. All villages have electricity. College and Good Hospitals are available in Md. Bazar. All main educational and health care facilities are available in neighboring Md. Bazar and Suri town.

3.12 LIST OF INDUSTRIES:

Many industries are located in the 10 km buffer zone of the project site as well. The list of industries within 10 km of the proposed site is given below.

Table 3.23: List of Industries

S No.	Industries Name	Distance	Direction
1	Patel Nagar Mineral Industry	0.70	SW
2	Jai Bharat Oil Industry, Sainthia	8.30	SE
3	Sainthia Rice and Oil Mills	9.50	ESE
4	Chandra Rice Mill, Sainthia	8.20	SE
5	Arihant Oil Mill, Sainthia	8.30	SE
6	Joy Gopal Oil Industries	8.00	SE
7	KGN Stone Crusher	9.30	NNW
8	New Panchami Stone Crusher	9.50	NNW
9	Old Khori Mills, Makdumnagar	4.20	NNE
10	Makdumnagar Tentulberia China Clay and Fire Clay Mines	4.50	NNE

CHAPTER-4

ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

CHAPTER - 4
ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

4.0 GENERAL:

An essential step in Environmental Impact Assessment (EIA) is to identify all potential environmental impacts and then examine critically to find out the major impacts (both beneficial and adverse), which are then analyzed in detail. Based on description of present environment as described in Chapter-3, a scientific evaluation on various impacts that are likely to influence the present environment is furnished in this chapter. To overcome the various environmental problems, possible mitigation measures have been suggested in the Environmental Management Plan.

In the present study, likely impact and its extent on various environmental parameters viz. topography and drainage, land, water, noise, air, ecological and socio-economic conditions were studied by assessing the baseline environmental status of the area and estimations were made as how this will change with commencement of project activity. The mitigation measures have been worked out with a view to bring down the levels of impacts within limits. In each of the areas of impact, measures have to be taken to mitigate adverse impacts and where these are beneficial in nature such impacts are to be enhanced /augmented so that the overall adverse impacts are reduced to substantial extent.

4.1 ENVIRONMENTAL IMPACTS:

The identification of potential environmental impact is first step in the Environmental Impact Assessment (EIA). There are various techniques available for impact identification. These include checklists, matrix, networks cause effect diagrams etc. In the present study, matrix method has been used. Impact assessment of the proposed project would help in implementing the project in an eco-friendly manner. The environmental attributes that are influenced due to the mining activities can be identified by observing the Impact on:

- Air Quality
- Water Quality & Drainage system
- Noise Quality

- Topography and Land use
- Vegetation
- Wild life
- Socio-economic Environment

4.1.1 IMPACT ON AIR QUALITY:

The major cause of air pollution in the open cast mining is mainly caused due to generation of dust arising from mining activities. In case of this opencast mining operations, mining extraction, loading and unloading, movement of vehicles on haul roads and external dumping etc. are expected to generate airborne fugitive dusts.

There is very less scope of spreading of dust particles to the nearby residential areas; since these operations are carried out at about 200m away from the habitation but in the opposite direction as of the predominant wind direction. Hence human population does not directly feel the dust pollution. It is found that the dust nuisance is localized only.

The predominant wind directions are from North East. The data on wind speed and direction in the study area were collected simultaneously during AAQ monitoring period. During the monitoring period the average wind speed was 0.92m/s. Existing level of SO2 and NOx in the proposed core zone area is below 4 $\mu g/m^3$ & 20 $\mu g/m^3$ respectively. Comparatively higher level of PM10 and PM2.5 are expected due to fine particles emissions during mining operation and movement of vehicles in haul roads.

The Fugitive dispersion model (FDM) AERMOD is generally based on the well-known Gaussian Plume formulation for computing concentrations. The model has been specifically adapted to incorporate an improved gradient-transfer deposition algorithm. Emissions for each source are apportioned by the user into series of particle size classes. A gravitation setting velocity and a deposition velocity are calculated by FDM for each class. This model is designed to work on hourly meteorological data.

The following source/ emission inputs have been considered for air pollution prediction modeling:

1. Pollution Sources in multiple combinations of active mining areas and haul roads (as line source) have been considered. Emission from top of the road surface of

reclamation area shall be insignificant because of high moisture content in unconsolidated soil, thus not contributing to fugitive dust level.

2. Fugitive dust level at any particular time is, by a large extent, function of the available active mining area and haul road length under a given set of meteorological conditions.

3. In this particular case, the scenario during the proposed mining period has been considered. During this period maximum mineral & overburden shall be handled in the mines.

4. Emissions from mines, stack yard and loading arrangement have been considered.

Fig. No. 4.1 show that pollution contribution of PM_{10} is mostly towards the South direction which is the downwind direction.

Wind velocity and direction plays a major role in predicting the locations where maximum concentration will occur. Hence, the wind velocity data was consulted for this purpose. As mentioned earlier, the most predominant wind direction at the project area during post monsoon is from NE. Therefore, maximum concentration was predicted in directions opposite to this direction, which is also supported by the data presented in the Table 4.1 below. Finally, the predicted value was added with monitored existing PM_{10} value and maximum PM_{10} concentrations in predominant wind directions were calculated.

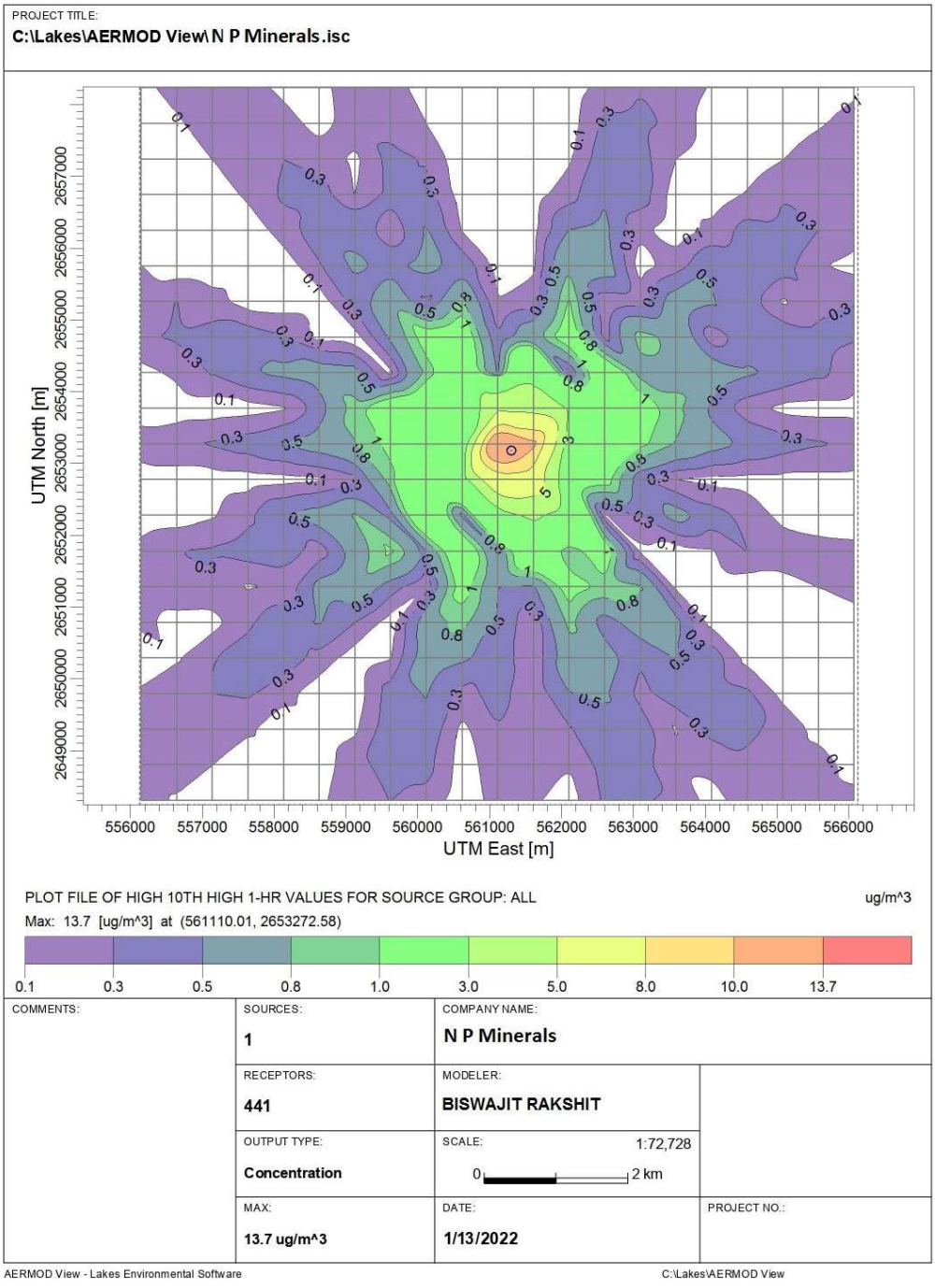


Fig. No.4.1: Isopleths of PM10

Table No. 4.1: Predicted Maximum Ground Level Concentration of PM10

Sampling Stations	PM_{10} ($\mu g/m^3$)		
	Existing Concentration	Predicted increase in Concentration	Concentration after the increment
A1 (ML Area)	81.20	13.70	94.90

It is observed during air quality monitoring that, the dust generations are short term and settle quickly within close ranges. There is very less scope of spreading of dust particles to the nearby residential areas. Above all, these operations are carried out in the same direction as the predominant wind direction; hence human population does not directly feel the dust pollution. It is found that, the dust nuisance is localized only.

4.1.2 IMPACT ON WATER QUALITY & DRAINAGE SYSTEM:

4.1.2.1. DRAINAGE SYSTEM:

In the core zone, which has a flat topography with gently sloping towards south west, has no perennial /seasonal nala, flowing within the lease area. The major sources of water in the buffer area is Mayurakshi River (flows in S direction, 3km away) and Dwarka River (flows in NE direction, 2.7km away).

The storm water discharge coming out of quarries and dump through a network of garland drains is expected to contain solid particles. These solid particles shall be removed by settling in the settling pond before being used for dust suppression and plantation. Hence, there shall be no change in drainage system due to this mining project in buffer zone.

4.1.2.2 GROUND WATER:

The mining activities shall be carried out upto a maximum depth of 21m from surface level i.e. 51m - 52m AMSL by the end of the lease period as well as the life of the mine (which is 17 years), whereas the ground water table of the region varies from 6m to 8m with maximum at 30m AMSL (during post monsoon period) and thus, mining is expected to have no impact on ground water. Also quality of ground water indicates (when compared with Desirable limits as per IS: 10500) the water quality is very suitable to use as drinking water.

4.1.2.3 GROUND WATER RECHARGE FOR MINE LEASE AREA:

The rainfall infiltration method is one of the best methods suggested in ground water assessment methodology of CGWB 1997 for first approximation of ground water resources of an area, which receives good amount of rainfall. The lease area consisting of 7.22 Ha

receives an average of 1564 mm rainfall annually. The rainwater harvesting is not proposed in our project as the water table in the nearby area is very shallow.

4.1.2.4. SURFACE WATER:

Quality of surface water indicates (when compared with IS: 2296, Class C) all values are within the safety limit. Mining and allied activities shall have no impact or bearing on these. During mining substantial quantities of particulates are anticipated to be generated which may result in increase in silt content in adjoining water bodies if allowed to go outside. In order to prevent siltation, storm water will be collected through garland drains and reused after settling in settling pond.

Total daily Water requirement in the Patel Nagar China clay and Fire clay mining is estimated to be 1.5 KLD. For dust suppression peak water demand shall be 0.8 KLD, plantation will consume 0.5 KLD whereas drinking water need along with cleaning & washing at work place is 0.2 KLD. The total required water will be sourced from through tankers.

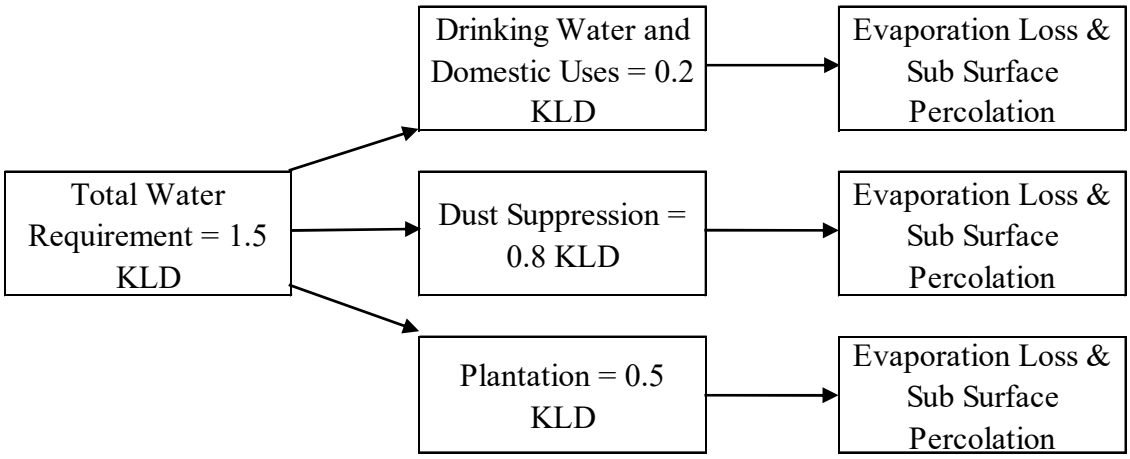


Fig. No. 4.2: Water Balance of the Mine

4.1.3. IMPACT ON NOISE QUALITY:

In this semi-mechanised open-cast mining operation, activities such as excavation, loading and unloading, movement of dumpers, etc. are expected to generate noise. In this particular mine, the operation will be limited to one shift of eight hours duration in a day. The various sources of noise mentioned above shall only be periodical and are limited to a fixed period of operation only. In addition to this, the transportation of ores might cause a little effect on the noise level.

Noise levels in the work zone shall vary from about 65 to 90 dB (A), it will not increase further as no drilling and blasting will take place in this clay mining. Personal exposure shall less than 80 dB (A) because operators only remain very close to the machines and they sit in closed cabins. Noise level in work zone is expected to increase marginally in the open-cast mining area due to excavation, handling and transportation of overburden and ore. Measures suggested in Chapter-10, shall reduce the noise level. Impact of noise level on the nearby villages has been predicted not to increase significantly.

4.1.4 IMPACT ON TOPOGRAPHY & LAND USE:

The lease area is gently sloping towards south west. The elevation of the ML area ranges from 51m AMSL to 52m AMSL. It is an existing mining lease granted to M/s N. P. Minerals. By the end of the life of the mines, i.e. after 17 years, an area of 3.90 ha. shall be utilized for mining related activities.

The solid waste comprises of alluvium top soil & overburden. Alluvium soil mixed with weathered mantles is the type wastes. Small quantity of Top soil (since the top portion of the lease area is alluvium) if any generated, shall be stacked over an earmarked area of 0.08 ha. and shall be used in annual plantation. The alluvium overburden of 6m thickness (47,250 m^3 by volume) shall be dumped over an identified area covering 0.08 ha. by the end of the plan period. At the end of the conceptual period, the generated OB of 3,12,000 m^3 shall be used in backfilling of 3.90 ha. of the mined out area.

The massive afforestation on abandoned mining benches, overburden dumps & other areas shall match well with the forests in the study area to the maximum possible extent, to provide a uniform land use befitting to the location. Afforestation has been planned in a manner, which will increase the bio-diversity of the local ecosystem. Positive impacts on land use due to subsequent artificial forest land generation shall come in view from 2025 when initial green belt attains height. The planned tree density of 2500 trees per ha. is comparable to the forests in the study area.

Some of the civil construction shall remain after cessation of active mining. These infrastructure facilities like the roads will form a much better communication link with the outside compared to the existing unpaved roads. The office buildings etc. may be used by the State government or Central government agencies or can be developed as primary health centre in the region.

4.1.4.1 IMPACT ON TOP SOIL:

The solid waste comprises of alluvium top soil & overburden. Small quantity of Top soil (since the top portion of the lease area is alluvium) if any generated, shall be stacked over an earmarked area of 0.08 ha. and shall be used in annual plantation in the subsequent years. Top soil Stack will be frustum pyramid in shape with dump slope to be maintained at 37^0.

Although minimum storage time shall be attempted to avoid nutrient loss, but loss of some nutrients due to temporary storage and even after direct placement of soil to the reclaimed areas of the external waste dump, cannot be ruled out.

4.1.4.2 IMPACT ON AGRICULTURE:

The mining lease area of 7.22 ha. comprises entirely of waste land only. Though it is a fresh mining lease but till 2017 mining was in operation by N. P. Minerals.

Though the agricultural production of the villages Patel Nagar has reduced due to diversion of agricultural land to mining but it will benefit the people by providing alternate source of earning, facility of transportation, etc. As such soil is not very fertile in the region due to alluvial and lateritic nature & lack of irrigation facility.

4.1.5 IMPACT ON VEGETATION:

The said mining project is coming under non-forest land category. The proposed area has thin vegetation cover; few trees, herbs & shrubs. Due to dusts from vehicle moments, the surrounding area are likely to be affected but water sprinkling and increase in vegetation cover are proposed to minimize the impact. The flora in the Buffer Zone is not likely to be affected much because of the limited mining activity and moment of transportation vehicles only during day time. Sal, Am, Tal, Jamun are the most dominant species in the forest of this region. Few patches of Eucalyptus plantations are even observed in the study area.

4.1.6 IMPACT ON WILDLIFE:

Though the mining area lies outside the forest area, and also free from Reserve & Protected Forests within 10km may not results in interference of the human activities with the wild habitats. The mining activity and other ancillary activities such as dumping of over burden, movement of vehicles, etc. shall not threaten the wild animals and interfere in their life cycle. The most possible impacts on wild life are being illustrated below:

- Dust pollution due to mining activities and moment of vehicles.
- Noise pollution due to movement of vehicles and mining machineries.
- Increase in human interference in to the forest in the buffer zone shall result in alterations in breeding and nesting of animals.
- Dumping of garbage and resulting water & air pollution due to mining and allied activities shall interfere with their living.

However, the forests in the buffer zone support faunal species which have become habituated to prevailing conditions. Similarly, the fauna in the core zone in the vicinity of the mine is restricted to few common small species. But after the mine is closed and the plantations developed on the abandoned mine area will attract back at least some of the animals displaced /scared away by the project.

4.1.7 IMPACT ON SOCIO-ECONOMIC ENVIRONMENT:

Analysis of various aspects of the study reveals that the Patel Nagar China clay and Fire clay mining project shall have major beneficial and more or less negligible adverse impacts on the following domains;

- The proposed project is not going to cause any damage to the existing rural economy of the study area, instead it may help agriculture by way of providing supplementary income which may result in increase investment in agriculture and consequently, agricultural production.
- The project has strong positive employment and income effects, both direct as well as indirect.
- The project is likely to speed up the positive view on importance of education among the people of the study area.
- With the mining activity due to increase in vehicles & transportation activity, the communication facility is likely to improve.

4.1.8 IMPACTS DUE TO TRANSPORTATION OF MINERAL

The transportation shall be done on the road to the proposed specific site by tippers of 20T capacity. The waste material shall be transported within the ML area whereas the mineral shall be transported through lease road & 3.0km all weather village road connecting to the National Highway- 14 at Md. Bazar.

Saleable Clay (Maximum quantity) – 23,831 MT/annum or 80 MT /day (by taking into consideration of 300 working days in 10 months of a year)

Overburden/Top soil – 47,250 m^3 during the 5years or 157.5 m^3/day

To transport the mineral and waste generated daily, 4 dumpers/tippers will be required within the lease area. The anticipated impacts on existing environment shall be as follows;

- Dust Pollution
- Noise Pollution
- Increase in Gaseous Pollutants like SO2, NOx

Following control measures shall be implemented to minimize the impacts of transportation;

- Installation & maintenance of automatic water sprinklers.
- Sprinkling of water by tanker, two times- a -day.
- Thick vegetation should be maintained around the mining pit to absorb dust and minimize noise.
- Regular checking to discourage overloading of Transportation vehicle.
- During transportation materials shall be covered to prevent any fall down or blown away.
- Proper maintenance of Transportation vehicles.
- No horn shall be blown up in morning & evening hours during the plying of vehicles to allow easy moments of wild animals.
- No mineral transportation shall be done during night time.
- Regular Air Quality Monitoring to check increment of pollutants.
- Lighting of the mine pit and by the official vehicles should be kept at the minimum, the head lights should be shaded black and dipper should be used.

To arrest dust pollution, water will be sprinkled on the transportation road by a 1.0 KLD capacity tanker and by installing automatic sprinklers daily two times. While transporting clay, trucks have to travel a maximum of 3.0 km on self-maintained village road to reach the SH-11 and finally to NH- 14. Looking at the size of the mines, amount of ore transported, road conditions and habitations in the buffer zone, the mine will have no significant impact.

4.2. EVALUATION OF ENVIRONMENTAL IMPACT:

The environmental impact evaluation follows the identification and quantification of the impacts. The significant impacts, which have been identified and quantified in the previous chapter, are based on the baseline data generated in the field during Oct., 2021 to Dec. 2021. Secondary data were collected from Govt. organizations on different aspects and utilized. Significance of Impacts has two distinct inter-related operations. Firstly, it refers to the need to determine the importance of an impact. Secondly the relative importance of impacts in comparison with other impacts of a different nature sometimes is considered as part of the impact interpretation.

4.2.1 ENVIRONMENTAL IMPACT ASSESSMENT METHOD:

The goal of this chapter is to achieve an impact score which can be used for decision making. Of the various techniques available for impact identification like checklists, matrices, networks, cause-effect diagram, computer simulation models etc., the matrix method has been chosen for the Patel Nagar China Clay and Fire Clay mining project. The advantage of matrix method is that it is possible to identify the most severe cause-effect relationship. The matrix method employs a list of project activities in addition to a checklist of potentially affected environmental characteristics. These two lists are related in a matrix, which identify cause-effect relationship between specific activities and impacts. Combining these lists as horizontal and vertical axes for a matrix allows the identification of cause effect relationships between specific activities and impacts. The entries in the cell of the matrix can be either qualitative estimates or quantitative estimates of the cause effect relationship. Here, the latter i.e. quantitative estimates have been adapted to the impact score. A Parameter Importance Value (PIV) of each cause effect impact area has been estimated. These values have been determined by taking into consideration the degree of stress that these activities are likely to impose cumulatively and each impact area has been ranked on a scale of 1 to 6 to arrive at the parameter importance value (PIV).

The environmental impact matrix has been setup with the 12 activities as columns and 14 environmental attributes as rows. The PIV for each row has been placed as the first column. An impact value has been assigned to each activity impact area combination as per the index scale given as follows:

Slight impact	-	0.5	- ve value for negative / adverse impact
Appreciable impact	-	1	+ ve value for positive / beneficial impact
Significant impact	-	2	
Major impact	-	3	
High impact	-	4	
Permanent impact	-	5	

The total score obtained has been evaluated against an assessment value index scale which is given as follows:

Below (-) 1000	: No appreciable.
(-) 1000 to (-) 2000	: Appreciable impact but not injurious in general. Mitigation measures required.
(-) 2000 to (-) 3000	: Significant impact.Major environmental control measures required.
(-) 3000 to (-) 4000	: Major injurious impact. Site selection is to be considered. (-)
4000 to (-) 5000	: Alternative site to be considered.

4.2.2 Delineation of Project Activities and Environmental Parameters

The following activities, which are likely to cause potential impacts on environment identified, are as follows:

1. **Site preparation** - It includes removal of overburden, preparation of benches, haul roads & garland drain around overburden dump.
2. **Quarrying** - It includes excavation, running of diesel pumps and movement of dumpers & vehicles.
3. **Loading & unloading** - Loading and unloading of ores and overburden.
4. **Transportation** - This includes transportation of clay from the mines to the destination.

5. **Disposal of over burden /mineral rejects** - The activity includes disposal of overburden solid wastes associated with mineral rejects.

6. **Processing -** It includes spreading and stacking of clay.

7. **Civil works** - Construction of garland drain, rest shelter, etc. The project is having a complete set up of office infrastructure within the lease boundary owned by N.P. Minerals

8. **Provision of civic amenities** - Civic amenities such as water, medical facilities, communication, etc. will be provided to the mines workers.

9. **Reclamation through social measures** - It includes afforestation or green belt development, provision of pucca roads for long term use, awareness programme, recreational programme, creation of employment opportunity for the local people, etc.

10. **Water Sprinkling** - Regular sprinkling on haul roads & on over burden dumps.

11. **Reclamation through improved mines management**- It includes construction of garland drain around quarry & waste dumps, provision of check dams, periodical clearing of drains, provision of small stone /rock barriers across the drains, plantation of grasses & bushes along the drains, avoiding loose sediments/ OB in the working benches during monsoon, provision of pucca roads for long term use, discharge of mines water effluent to garland drains followed by necessary treatments before discharge to outside, on time maintenance of vehicles and machineries, provision of medical facilities for the workers, training to the employees for safety & first aid, cultural & recreational activities, drinking water facilities and environmental awareness.

12. **Reclamation through soil conservation & biological measures** - Reclamation of waste dumps by plantation of suitable species & green belt development along the periphery of lease area, employee residence area and avenue plantation along the road sides.

4.2.3 Environmental Attributes:

Some of the impacts identified in various phases are insignificant and do not warrant much attention whereas some other are very important especially with respect to the present project. The objective is to identify those impacts which are significant and require a detailed analysis

for decision making or formulating adequate management measures. The following 14 nos. of environmental parameters have been taken into considerations which are likely to be affected due to various activities of the project:

1. Air quality
2. Surface water resource
3. Ground water resource
4. Water quality
5. Noise level
6. Health
7. Employment / trade/ commerce
8. Land use & Soil Characteristics
9. Geological resource
10. Aesthetic beauty
11. Human settlement
12. Economic aspect
13. Forest & Ecology
14. Public utility / Literacy / Awareness

4.2.4 Parameter Importance Value:

The impact areas considered along with their ranking are tabulated. The weightage for each impact area is calculated by dividing the ranking integer by sum of rankings. The total parameter importance value is assumed to be 1000 as per the standard practice. The value of total PIV is distributed among each impact area according to its weightage. The final values computed by this procedure are also tabulated in Table No. 4.2.

Table No. 4.2: Determination of Parameter Importance Value with Mitigation Measure

Sl. No.	Impact Area	RANKING						Total	Weightage	PIV
		1	2	3	4	5	6			
1.	Air quality	-	-	-	✦	-	-	4	4/40	100
2.	Surface water	-	-	✦	-	-	-	3	3/40	75
3.	Ground water	-	✦	-	-	-	-	2	2/40	50
4.	Water quality	-	-	✦	-	-	-	3	3/40	75
5.	Noise level	-	-	✦	-	-	-	3	3/40	75
6.	Land use & Soil quality	-	✦	-	-	-	-	2	2/40	50
7.	Health	-	✦	-	-	-	-	2	2/40	50
8.	Public utilities	-	-	✦	-	-	-	3	3/40	75

9.	Human settlement	-	✦	-	-	-	-	3	3/40	75
10.	Aesthetic beauty	-	✦	-	-	-	-	2	2/40	50
11.	Employment	-	-	✦	-	-	-	3	3/40	75
12.	Economic aspect	-	-	-	✦	-	-	4	4/40	100
13.	Wild life	-	✦	-	-	-	-	2	2/40	50
14.	Forest /Vegetation	-	✦	-	-	-	-	2	2/40	50
15.	Geological resource	-	✦	-	-	-	-	2	2/40	50
Total								40	1	1000

4.2.5 Environmental Impact Matrix:

The environment impact matrix incorporating all the environmental components and project activities (with in-built control measures) is presented in Table No. 4.3. The impact score is calculated by multiplying the sum of all proposed activities against each environmental component by its corresponding PIV.

4.2.6 Summary of Impacts:

The total impact score is – 230, which fall under category below (-) 1000. It indicates that the impacts are not very significant if the benefits are accounted for. But it is clear that negative impacts are there. Hence mitigation measures are required side by side to carry out the project activities eco-friendly. Major affected environmental attributes are air quality, noise level, land use, trade & commerce, economic aspect and public utility which are due to the project activities. Thus, due to the matrix, we identify the environmental attributes likely to be affected by the project activities. The impacts may be beneficial or adverse. These will be analyzed in detail during assessment of the impacts.

Table No. 4.3: IMPACT ON PRESENT STATE ENVIRONMENT DUE TO MINING WITH MITIGATION MEASURES

SL. No.	Environmental Attributes	Parameter importancevalue	Site Preparation	Quarrying includingexcavation	Loading & unloading	Transportation	Disposal of over burden/ rejects	Civil works	Processing like spreading &	Social measures	Water sprinkling	Improved mines management	Reclamation throughsoil conservation &	Impact Score
1.	Air quality	100	-0.4	-0.8	-0.8	-1.6	-0.8		-0.2		0.8	0.8	1.2	- 200
2.	Surface water resource	75	-0.2			-0.4	-0.2	-0.2	-0.2		-0.4		0.4	- 90
3.	Ground water resource	50		-0.2			-0.6	-0.2				0.2	0.4	- 20
4.	Water quality	75		-0.2			-0.4	-0.6				0.2		- 75
5.	Noise level	75	-0.2	-0.4	-0.6	-1.2						0.4		- 150
6.	Land use & soil characteristics	50	-0.2	-0.4		-0.2	-0.4	-0.4				0.2	0.4	- 50
7.	Health	50	-0.4	-0.8	-0.4	-0.4			-0.2	0.6	0.4	0.2	0.4	- 30
8.	Public utility/ Literacy/ Social awareness	75				0.6		0.4		0.4	0.2		0.4	150
9.	Human settlement	75	-0.2			-0.4	-0.2					0.2	0.4	-15
10.	Aesthetic beauty	50	-0.8	-0.8			-0.4			0.8		0.6	0.8	10
11.	Employment	75	0.2	0.6	0.4	0.4		0.6	0.2	0.2			0.2	210
12.	Wild life	50	-0.4	-0.6	-0.2	-0.4			-0.2			0.2	0.6	- 50
13.	Forest /Vegetation	50	-0.2	-0.4		-0.4		-0.4				0.4	0.6	- 20
14.	Geological resource	50		-1.6										- 80
15.	Economic aspect /trade /commerce	100		0.2		0.6		0.4				0.2	0.4	180
														- 230

CHAPTER-5

ANALYSIS OF ALTERNATIVES

CHAPTER - 5
ANALYSIS OF ALTERNATIVES

5.0 INTRODUCTION:

Proposed China Clay & Fire Clay mine will be operating on Clay beds near the surface, which formed primarily due to alteration of granite gneisses and their subsequent deposition as stratified layer as sedimentary deposit. The weathering effect of feldspar with gneisses gave rise to formation of Kaoline/China Clay. The lease area is over 7.22 ha. (17.84 acres) in Patel Nagar, Mouza- Kharia, P.O. & P.S.- Md. Bazar, Dist.- Birbhum, West Bengal. The relevant lease deed dated 04.06.1986 was valid for 20 years, has expired on 03.06.2006, in terms of Rule 24 A under MCR 1960, the renewal lease application in –"J" form has been submitted 1 year before the expiry of the lease (on 02 .06.2005). So as per Rule 24 of MCR 1960, the said lease deemed to granted for another 20 years i.e. Up-to 2026.

Also, In terms of Memorandum No:151-ICE/0/MIN/MJM-MNL/03/2017, Dated-30.03.2021, Govt of West Bengal, Department of Industry, Commerce and Enterprise, Mines Branch, the date of Expiry of Lease 23.06.2036 (since 31 no of minerals having re-clarified in the Notification dated 10.02.2015) as Minor Minerals, the lease already existed regarding the same when we are executed before introduction of the above mentioned notification may be deemed to be the lease for such Minor Minerals and may be extended up to 50 years vide section 8A of MMDR (Amendment) Act 2015 and the State Govt is very much competent to regulate the mineral concession of said Minor Mineral under provision of Section 15 of MMDR (Amendment Act 1957).

As the proposed production targets of total 28,036 TPA China Clay and Fire Clay is to be produced from this mine, this is a site specific project and no other alternative site is taken into consideration. Looking at the production level it was also decided to continue with open cast manual method of mining on single shift basis.

CHAPTER-6

ENVIRONMENTAL MONITORING PROGRAMME

CHAPTER -6
ENVIRONMENTAL MONITORING PROGRAMME

6.0 INTRODUCTION:

Regular monitoring of various environmental parameters is necessary to evaluate the efficiency of the management programme so that necessary corrective measures can be taken in case there are some drawbacks. A large part of the sampling and measurement activities will be concerned with long term monitoring aimed at providing an early warning of any undesirable changes or trends in the natural environment that could be associated with mining and allied activities. This is essential to determine whether the changes are a response to a cycle of climatic conditions or are due to the mining and allied activities.

In particular, a monitoring strategy is required to ensure that all environmental resources, which may be subjected to contamination, are kept under review. Monitoring of the individual elements of the environment is necessary.

To meet the above objective an "Environmental Management Wing" (EMW) shall be formed at Patel Nagar China Clay and Fire Clay Mining Project and will be responsible for implementation of Environmental Management Plan (EMP) and post operation monitoring. The officials of the EMW will meet frequently to assess the progress and analyze the data collected during the preceding month. The following items will be considered under the monitoring schedule.

6.1 ACTIVITIES TO BE MONITORED /INSPECTED BY EMW:

6.1.1 Slope Failure:

Regular examination will be carried out to look for slope failure on open cast mine faces & benches, waste dump & benches etc. Any abnormal condition, if observed will be brought to the notice of concerned department. Mine face will be also monitored by survey team with precision level instruments.

6.1.2 Land Erosion:

Regular observation for checking land erosion will be made in dump slopes and backfilled areas.

6.1.3 Drainage Pattern:

The effectiveness of drainage system depends upon proper cleaning of all drains and sumps. Any blockage due to silting or accumulation of loose material will be checked on a regular basis. Stone pitching, brick mounds etc., on drains shall also be monitored.

6.1.4 Re-vegetation and Green Belt Development:

Schedule planned for greenbelt development shall be checked after every year and any alteration required shall be implemented. Post plantation status shall be regularly checked in every season. Phase wise development in the areas of plantation including rate of growth, survival rate etc., shall be recorded systematically. The format is given in Table. No. 6.1 shall be filled every year for revising the schedule for the following year.

Table No. 6.1: Format to Record /Monitor Plantation

Sl. No.	Description
1.	Area(s) under plantation /vegetation
2.	Post plantation work involved
3.	Period of plantation
4.	Type of plantation a) Tree Species b) Grass
5.	Type of plant saplings/ seedlings/ grass species/ shrub species planted
6.	Distance between plant species/ between row of plant
7.	Type and amount of fertilizer (organic) used
8.	Interval of watering
9.	Method and period of post plantation care
10.	Survival rate of plant species
11.	Response of species to a) Time of seedling (season) b) Interval of watering c) Type and quantity of fertilizer (Organic) based
12.	Density of afforested area a) Pre-mining condition b) Post mining condition

6.1.5 Water Quality Monitoring

Facilities for monitoring both surface run-off water and ground infiltration shall be provided periodically. Ground water, surface water bodies shall be monitored and analyzed for the parameters specified by State Pollution Control Board, West Bengal.

6.1.6 Emissions and Air Quality

Dust prevention and control actions are to be taken at work zone. To monitor the effectiveness of dust control, it will be necessary to compare background levels of airborne dust with conditions downwind, and back this up with an adequate meteorological measurement.

Monitoring of fugitive dust and ambient air quality shall be carried out by the environmental wing of the user agency as per the standard and frequency fixed by State Pollution Control Board, West Bengal and MoEF&CC. Frequency of the monitoring shall be maintained as per the statutory requirements. Monitoring shall be carried for all 12 parameters including Particulate Matter, Sulphur Dioxide, Oxides of Nitrogen, etc.

6.1.7 Meteorological parameters:

Meteorological station installed at project site will fulfill the requirement of the lease. The following parameters are to be recorded regularly:

- Wind speed and direction (on a suitable tower, 10 m above ground)
- Rainfall
- Temperature
- Relative humidity
- Cloud Cover

Regular generation of Meteorological data in future shall be done by the Environmental Management Cell (EMC).

6.1.8 Occupational Health:

The process of excavation may leads to some health hazards. The most significant occupational health impacts are Noise Induced Hearing Loss (NIHL) and Occupational Lung Disease (OLD) due to inhalation of dust. As per Mines Rules, 1955, medical examination of employees at the

initial stage and periodically, shall be done by a qualified medical officers provided by the project proponent.

Facilities for checking levels of dust in the workplace will be provided. Each group of mine workers will be monitored at regular intervals.

6.1.9 Socio-economic Development:

The environmental cell shall be in regular touch with surrounding villages to monitor the implementation of various developmental schemes made by the mine authorities. They shall also consider any immediate requirement which can be taken care of.

6.2 DUTIES OF ENVIRONMENT MANAGEMENT CELL

In order to carry out the above monitoring /inspection in a systematic manner EMC shall practice the following:

- EMC shall chalk out a site-based strategy to control pollution. The strategy should include formulation of code of actions for controlling air, water, noise, soil pollution, phase wise afforestation scheme and also actions to be taken in respect of socio economic development. Frequency of monitoring/ sampling and inspection of various parameters / factors will also be planned.
- EMC shall oversee that environmental control measures are implemented as per approved action plan.
- Water and Energy conservation programme shall be formulated.
- Identify and record the constraints in respect of environmental planning and implementation.
- Systematic documentation of all the field monitoring and laboratory analysis results.
- Analyze the monitoring results and inspection findings. The results can be compared with various Standards/ Norms. EMC will prepare periodic progress reports which will include the analysis and inspection results. Environmental audit results and actions taken should also be systematically documented.
- Plan the management responsibilities defined for various environmental matters. This should be displayed in the notice board in the office of EMC.
- Interact and liaison with H.Q. officials and also with State/ Central Government departments.

Important records to be maintained by EMC are given in **Table No. 6.2**

Table No. 6.2: Important Records to be maintained by EMC

Sl. No.	Particulars
1.	Field monitoring results for air, water, meteorology
2.	Inspection records of slope failure, land erosion, drainage, socioeconomic development
3.	Format to record /monitor plantation measures
4.	Nursery records
5.	Environmental and related standards/ norms
6.	Records pertaining to statutory consents & approvals
7.	Code of actions for pollution control in defined areas
8.	Periodic Medical Examination (PME) records
9.	Records pertaining to laboratory equipment maintenance and calibration
10.	Complain register (Environmental Pollution)
11.	Records on water and electricity consumption
12.	Periodic progress records
13.	Environmental audit records
14.	Records of annual budgetary requirement and allocation for pollution control

6.3 UPDATING OF EMP:

The action plan of EMP shall be updated every year with respect to the results achieved and proposed activities for next year. Any new regulations considered by WBSPCB /CPCB shall be taken care of. Budget sanctions shall be made while updating EMP.

6.4 ORGANISATION MANPOWER AND TRAINING:

The environmental monitoring practice is being maintained by deploying the registered environmental monitoring agencies as per present practice. However, for the plantation as well as environmental monitoring purpose an environmental cell shall be created and designated as "Patel Nagar Mine of M/s N.P. Minerals Environmental Management Cell".

The important functions performed by this EMC are:

- Supervise the environmental control measures to be implemented as per approved action plan.
- Carry out meteorological observations.

- Keep watch on flow pattern of streams/ nala/ rivers in the buffer zone and keep vigil on the efficiency of water management system.
- Look for possible erosion, silting, dump and bench failure and to review sampling and analysis of air, water, soil and noise level survey.
- Follow the effects of project activities on the standing floristic pattern in the vicinity.
- Prepare and execute afforestation schemes.
- Keep log of all observation in a systematic manner.
- Keep analysis/ results received from laboratory in proper sequential manner.
- Prepare progress reports, schedules and interact with other agencies like the State Forest and Mining Departments.

6.4.1 Manpower:

To carry out the above-mentioned jobs properly, adequate staff shall be appointed. The consultation of forest officials shall be taken for effective implementation of plantation schemes. For development and maintenance of facilities like drainage, ditches, settling tanks etc. assistance from the projects civil engineering department will be taken. The entire monitoring programme shall be carried out effectively through a recognized agency on regular basis. However, casual laborers shall be employed for plantation, drain cleaning, assisting in monitoring activities, etc. as and when required. Manpower requirement is given in following table;

Table No. 6.3*:* Manpower Requirement for Proposed Environmental Monitoring Cell

Qualification	**Description**	**Specialization**	**No.**
P. G./ B. Tech	Environmental Officer	Environmental Science	1
M. Tech	Mining Engineer	Mining Engineering	1
	Gardener	Skill & Experience	1
	Gardener's Helper		1
	Total		**4**

6.4.2 Training Facilities:

To achieve the objective of Environmental Pollution Control, it is essential not only to provide latest pollution control and monitoring measures but also to provide trained manpower resources to operate the same. In Project, training facilities will be developed for environmental

control and also specialized courses by various environmental institutes will be organised. The training will cover the following fields.

1. Awareness of pollution control and environmental protection.
2. Operation and maintenance of pollution control equipment.
3. Afforestation and post plantation care of plants.
4. Field monitoring maintenance and calibration of monitoring instruments.
5. Knowledge of norms, regulation and procedures.
6. Occupational health and safety.
7. Disaster Management.

Plantation work, drains and sump cleaning etc. shall be done through departmentally or by engaging contractor and machinery operators shall be taken from mine operation section as and when required by the environmental section.

6.5 APPROVED ENVIRONMENTAL POLICY:

Corporate Environmental Policy forms the foundation of environmental improvements made for the business, as defined by senior management. M/s N.P. Minerals has a declared Environment Policy approved by the Board of Directors which outlines a business' aims and principles in relation to managing the environmental effects and aspects of its operations. It is strictly monitored that no infringement/ deviation/ violation of the environmental or forest norms/ conditions take place. Policy towards Corporate Environment Responsibility (CER) are as follows;

- Social /Environmental Sustainability Reporting.
- Corporate Accountability.
- Communication via responsibility reporting and its effect on firm value.
- Conservation of natural resources.
- Maintaining a safe working environment.
- Regular training and refresher courses so as to achieve continuous improvement.
- CER strategies aligned with organizational goals.
- Drive CER throughout the organization.
- Developing a culture of sustainability.
- CER impacting current and future regulatory practices.

- Providing high environmental expertise and know-how.

They will make every effort to:

- Operate their mining facilities as per standard prescribed procedures so as to comply to various environmental norms.
- Adopt the highest environmental standards in all areas of mining operation, meeting and exceeding all relevant legislative requirements.
- Assess our organizational activities and identify areas where to minimize impacts.
- Publicize their environmental position.
- Train employees in good environmental practice and encourage employee involvement in environmental action.
- Reduce risks from environmental, health or safety hazards for employees and others in the vicinity of our operations.
- Adopt an environmentally sound transport strategy.
- Aim to include environmental and ethical considerations in investment decisions where appropriate.
- Assist in developing solutions to environmental problems.
- Continually assess the environmental impact of all our operations.

6.5.1 Health and Safety Policy:

The company identifies safety and health of the personnel as integral part of work aspect at every level. Hence, the following step shall be taken;

- Provide adequate and continuous training to all personnel especially those who will be engaged in operation of heavy machinery;
- Prepare an over-all safety & health manual giving general requirements of leadership, planned inspections, job analysis & procedures, emergency preparedness, organisational rules, necessity and use of protective equipment, health control, etc.;
- Systematic evaluation & measurement of system performance at all operational levels and continuously update the over-all safety & health manual;
- Carrying out regular publicity campaigns to effective personnel safety and health consciousness and

- To employ a person as in-charge for planning, training & safety and make him responsible for implementation of safety and health policy.

6.6 SYSTEM OF REPORTING OF NON-COMPLIANCES:

A separate department "Environmental Management Cell (EMC)" shall be there at Patel Nagar China Clay & Fire Clay Mines to look after the monitoring, requirements and Reporting of Non-Compliances. The Wing shall be under the overall supervision of the M/s N. P. Minerals and responsible for monitoring of the implementation of the various actions which are to be executed by the agencies specified in the EMP. The Cell shall report on a regular basis to the Director of the company.; who then inform the important matters to the Board of Directors. The Cell shall be headed by the Mines Manager and the other members of the cell that will include the Environmental Officer, and the Mining Engineer. The roles and responsibilities of each member is discussed below;

- **Mines Manager:** He shall be responsible for planning and implementation of the control and protective measures. He shall supervise for the environment related activities within the project area on daily basis. He shall co-ordinate with the other team members for proper allocation and functioning of the pollution control and monitoring equipment including the land reclamation and water sprinkling trucks. He shall co-ordinate with the outside agencies including contractors for monitoring and controlling the tasks related to green belt development, afforestation and other social and biological reclamation. He will be responsible for monitoring of the progress of implementation of environmental control measures and will be reporting directly to the Mines Owner.
- **Environmental Officer:** He shall be responsible for coordinating with the recognized monitoring agency for collecting water and air samples and analysing water and air samples as well as collecting statistics of health of workers and population of surrounding villages. He will be responsible for maintaining the schedule, duration and parameters to be monitored. He shall also supervise the implementation of environmental protection measures viz, water sprinkling/spraying creation of storm water drains, garland drains, culverts and other protective measures/ arrangements. He will be the overall in-charge of biological reclamation and plantation scheme to be carried out in and around the mine lease area and maintenance of green belt and the ecologically sensitive areas.

- **Mining Engineer:** He will be responsible for providing technical inputs necessary from the mining operation's point of view, in managing the environment. He will work in close association with the geologist. He will also be responsible for preparing the Mining Plan and Scheme of Mining with the geologist of the company and also be responsible for all Government statutory non compliance. His role will also be to supervise and guide environmental team on geological aspects in the pollution control management, such as groundwater, etc.

6.7 HIERARCHICAL SYSTEMS OF REPORTING

The Hierarchical Systems of the Company to deal with various environmental norms are given below;

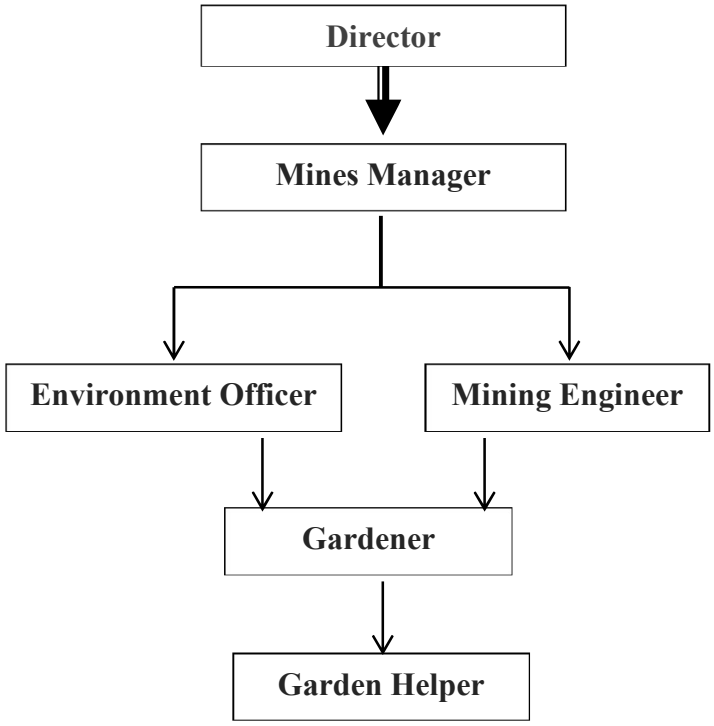


Fig No. 6.1: Hierarchical Systems of the EMC

6.8 MONITORING SCHEDULE:

To evaluate the effectiveness of environmental management programme, regular monitoring of the important environmental parameters will be taken up. The environmental monitoring followed by analysis and generation of report shall be carried out effectively through a recognized laboratory on regular basis. The frequency ofmonitoring of different parameters is given in the table below;

Table No. 6.4: Environmental Monitoring Schedule

Parameter	Frequency	To be Conducted by	Location
Ambient Air Quality			
PM 10	Twice in a week for 1 Month in a Quarter	Recognized Monitoring Agency	At Three locations
PM 2.5	Twice in a week for 1 Month in a Quarter	Recognized Monitoring Agency	At Three locations
SO2	Twice in a week for 1 Month in a Quarter	Recognized Monitoring Agency	At Three locations
NOx	Twice in a week for 1 Month in a Quarter	Recognized Monitoring Agency	At Three locations
Noise levels			
Noise level	Twice in month	Recognized Monitoring Agency	At Three locations
Surface Water Quality			
Parameters as per IS: 2296 – Class C	Once in a quarter	Recognized Monitoring Agency	At Two locations
Ground Water Quality			
Parameters as per IS: 10500	Once in a quarter	Recognized Monitoring Agency	At Two locations
Soil Quality			
Soil Quality	Once in a quarter	Recognized Monitoring Agency	At Two locations

6.9 COST OF ENVIRONMENTAL CONTROL MEASURES

The costs regarding implementation of EMP are presented under various headings in the Tables below. The updated capital cost and recurring cost per annum for the environmental management facilities of the mining project works out to be Rs. 15.50 lakhs (Rupees Fifteen Lakhs and Fifty Thousand) and Rs. 8.50 lakhs (Rupees Eight Lakhs Fifty Thousand/Year) respectively, based on price prevailing during first quarter of 2022.

Table No. 6.5: Cost of Environmental Control Measures

Particulars	**Details of Capital Investment**		**Details of Recurring Cost**	
	Existing	**Proposed**	**Existing**	**Proposed**
Air Pollution Control	--	Rs 4.0 lakhs	--	Rs 4.0 lakhs
Water Pollution Control	--	Rs 1.0 lakh	--	Rs 1.0 lakh
Noise Pollution Control	--	Rs 0.5 lakh	--	Rs 0.5 lakh
Environment Monitoring and Management	--	Rs 4.0 lakhs	--	Rs 1.0 lakh
Occupational Health	--	Rs 2.0 lakh	--	Rs 1.0 lakh
Green Belt Development and Maintenance	--	Rs 4.0 lakhs	--	Rs 1.0 lakh
Total	**--**	**Rs 15.50 lakhs**	**--**	**Rs 8.50 lakhs**

CHAPTER-7

ADDITIONAL STUDIES

CHAPTER - 7
ADDITIONAL STUDIES

7.0 PUBLIC CONSULTATION:

Public Consultation is one of the important aspects of environmental impact assessment which is covered under MoEF&CC notification on environmental clearance issued on 14th September 2006. The aspect of public consultation is followed as per the said notification. In the present case the Draft EIA is being submitted to WBPCB to conduct Public Hearing. The minutes of the meeting and the action plan to execute the demands made by the public will be prepared and incorporated after successful public consultation.

7.1 DISASTER MANAGEMENT PLAN & RISK ASSESSMENT:

Natural hazards are mostly inevitable but not disasters. A disaster is the result of impact from hazards on society, on infrastructures, cities. Disasters lead to losses of lives or property, and effects of disaster depend on the vulnerability of the elements at risk and ability of the system to cope with disaster. For effective disaster management, it is necessary to evaluate risks at the mines in a careful manner, evaluate and then take steps for mitigating them. Whatever we may plan to do, 'Safety of the people' shall assume the paramount importance in the midst of all our planning. Hence stress must be given to carefully plan rescue & evacuation responses & training aspects of the Disaster Management Plan. Following procedures will be followed for effective management of any disaster in the mine.

Step – 1 : Identification of Disaster risk
Step – 2 : Identification of persons at risk
Step – 3 : Removal of hazardous material
Step – 4 : Evaluation of the risk
Step – 5 : Control measures to be taken
Step – 6 : Maintaining Assessment records
Step – 7 : Review

The mining activities involve certain types of hazards during operation and post operation period, which can disrupt normal activities abruptly and lead to disaster like fires, failure of machinery, to name a few. The impending dangers or risks which need to be investigated addressed, disaster management plan formulated with an aim to taking precautionary steps to

avert disaster and also to take such action after the disaster which limits the damage to the minimum. Nevertheless, the following natural/ manmade problems may be encountered during the operation of open cast mining of M/s N.P. Minerals China Clay & Fire Clay Mine.

- Failure of Slope in the query
- Failure of Slope of External dump
- Surface fire (Electrical and Oil)
- Accidents due to Machinery

Risk Assessment normally involves identification of hazards, risk associated with it and to work out strategy to reduce the significant consequences. Hence, there is a need to be aware that there is always a risk of an accident and steps can be taken to prevent it from happening. It is also necessary to understand the risks due to the mining operations and the purpose of Risk Assessment. In Risk Assessment, 'Hazard' and 'Risk' are often used.

Hazard: A 'Hazard' is defined as a source of potential harm to people, property or the environment. In mining sector, the use of explosives is a major source of potential hazard. During the use of explosives, a slightest negligence may cause premature initiation causing injury to persons or damage to equipment and due to sudden release of chemical energy can create havoc. In the proposed project the mining will be done in semi mechanized method where no drilling and blasting is proposed hence there will no chance of the above hazard.

Other hazards which can have serious impacts on the health of workmen include the following.

- Exposure to dust, chemicals and hazardous substances
- Hazards due to gravitational energies acting on unsafe stockpiles, structures, excavated pits etc.
- Hazards due to unsafe handling /driving or failure of mobile mechanical equipment.
- Hazards due to fixed mechanical equipment due to unsafe acts or conditions.
- Hazards posed due to unsafe work environment like higher noise level, slips /tripe, vibration etc.

Risk: The risk is defined as the "chances or possibility of accidental losses or undesired consequences". It can be defined in terms of either probability or frequency & the consequences. The risk arises from both a hazard and some uncertainty about its effects. Risk assessments to be conducted can be divided into the following three types;

a). Baseline Risk Assessments – A Baseline Risk Assessment would be conducted if no previous Risk Assessment has been conducted. This Risk Assessment report should reflect information on:

i. All workplaces;
ii. All activities or tasks performed; and
iii. All machinery or tools used.

The frequency at which these Risk Assessment reports should be reviewed is not prescribed. It is however common that annual reviews are required;

b). Issue Based Risk Assessments – These Risk Assessments are typically conducted:

i. After a new machine was purchased - The purpose of this assessment is to determine if the machine is safe and in compliance with legal and other requirements;

ii. After an incident - During the incident investigation process weaknesses with internal policies or procedures could have been identified. The incident investigation may also show additional precautionary measures are required as to prevent a re-occurrence; and or,

iii. When new legislation was promulgated - New legislation may prescribe requirements which are currently not being complied with. Assessing the contents of the legislation will show these non-conformances and will allow employers to ensure compliance;

c). Continuous Based Risk Assessments – Regular inspections conducted on equipment or machinery such as daily inspection of mobile plant could be regarded as continues based risk assessments. The purpose of conducting continuous Hazard Identification and Risk Analysis is to:

i. Identify Operational health and safety hazards with the purpose of immediately treating significant risks
ii. Gather information to feed back to issue-based Hazard Identification & Risk Analysis
iii. Gather information to feed back to baseline Hazard Identification & Risk Analysis.

7.1.1 DISASTERS IN THE MINES

7.1.1.1.Failure of Slope in the Pit:

In order to allay dangers due to open cast slope failure, slope stability estimations shall be made for the existing quarries after determining various physical parameters of the ground mass like uniaxial compressive strength, triaxial compressive strength, cohesion, angle of friction, specific gravity of the rock, water pressure etc. Besides, all the discontinuities have been plotted in stereo plots, which indicate that there is no chance of any planer failure, or wedge failure. Even then, factor of safety shall be determined against overall slope failure as well as against individual bench slope. Besides determining factor of safety the slopes are monitored at regular intervals to check for any possible failure. The well- developed drainage system over the lease area ensures that storm water does not accumulate in the lease area and therefore hydrostatic pressure remains at a low level.

7.1.1.2.Failure of Slope of External Dump:

The slopes of dumps shall be planned at an overall angle of 37^0. As the dumps attain final position, the slopes will be terraced and proper vegetation will be laid which will cause binding of the soil preventing any slope failure. Retaining walls will be built all-around the external dumps which will have weep holes for passage of storm water to join garland drains.

7.1.1.3.Surface Fire:

In case of any electrical fire, the personnel on duty shall inform the mines manager and Personnel trained in dealing with electrical fires will be informed. The fire area will be cordoned off till the fire is fully extinguished and remain so until all wreckage is cleared away. After affecting necessary repairs the power will be restored. The clearance for restoration of power shall be given only by the mines manager.

Spillage of HSD and resultant fire constitutes a potential risk. However, looking at the daily consumption, the quantity of the oil, which can spill shall not be much and the risks can be easily controlled. Sufficient nos. of portable fire extinguishers shall be provided at strategic locations to take care of any eventuality.

As soon as any fire is reported, the mines in-charge shall assume the function of disaster controller. In case of serious fire and depending on the gravity of the situation, the Mines

Manager may be summoned to assume charge. Personnel trained in dealing with fires will be summoned. Meanwhile the hospital will be informed to handle casualties. The fire area will be cordoned off till the fire is fully extinguished and remain so until all wreckage is cleared away.

7.1.1.4.Accidents due to Machinery (both Transport & Non-transport Machinery) Machineries engaged in both transport and non-transport activities can be a cause of accident if awareness is not created among the employees. Following are some likely causes and preventive measure;

- During reversal operation of vehicles, there is every possibility of accident. To avoid any mishaps the helper must be at the back of the vehicle to assist in reversing.
- Unauthorized driving of vehicles, mostly by helpers should be prohibited.
- Unauthorized riding of machinery & vehicles by persons not concerned with them should be prohibited.
- Awareness should be created to discourage any attempt to ride moving vehicles.
- Overloading a vehicle can be a cause of mishaps.
- Driving vehicles in an intoxicated stage should be prohibited.
- Use of sub-standard equipment's or machinery parts can result in accidents or break down. Standard machinery with authorised spare parts must be used.
- Never try to clean moving parts of any machinery without informing the concern person.
- Non-provision or removal of guards from moving parts of machinery at the time of operation may results in mishaps.

Since the mines is in almost flat area far away from any major drainage system, chances of inundation of mine does not exist.

7.1.1.5.Care & Maintenance during Temporary Discontinuance (Monsoon Season) The following measures would be taken up to deal with the unforeseen circumstances that may arise due to temporary discontinuance of the mine especially during monsoon season;

- All heavy machinery engaged in the mine & crushing would be withdrawn and brought to the safe place so that these do not get buried due to bench collapse, if any, and get damaged during the period of discontinuance.
- At the entrances and strategic points, sentries/watchmen will be posted to guard the mine areas. They will be provided with mobile phones /walky- talkies to contact the mine authorities/police for help during emergency.
- The mine area will be kept illuminated during night time, after State Electricity Board restores the electric power supply. Audible warning sirens will be established at the mine office to be used during emergency so that prompt help can be received from proper sources.
- Managerial, supervisory and competent persons of the mine would be engaged for supervising machinery, maintenance & housekeeping of the mine areas, as per needs.

7.1.1.6 Discontinue of Mining in the Rainy season

The mining activity shall be stopped for four months starting from June with the onset of rainy season. This is because due to rain the mines floor which comprises of clay becomes very slippery. In order to avoid any accident hazards to the workers due to slippery mining floor, the mining activity will discontinue from June to September of every year. From October onwards the mining activity will continue as usual. During this closure proper care and maintenance of machineries will be taken up.

7.2. OCCUPATIONAL HEALTH & SAFETY PLAN:

The mining process involves activities like excavation, drying, transportation which may result in accident like rock fall, fire, fall from height, mobile equipment accidents, entrapment and electrocution. All these activities involve operators who are susceptible to accidents if proper safety precautions are not taken and the equipment's are not maintained properly. The working personnel in the mine area are also exposed to occupational health hazard conditions which emanate due to dust emissions, ergonomic hazards, exposure to sun, stagnant water in mine pits, etc; whereas the safety hazards have immediate ramifications resulting in simple injuries like bruises to fatal injuries like disablement and death, the health hazards manifest after long years sometimes ranging from 10-15 years. The impact on human health and the mitigation measures are dealt in the following paragraphs.

7.2.1 Occupational Health Hazards and Mitigation Measures:

Project proponent has concern and will take full responsibility for the protection of the workers against sickness, disease and injury arising out of their employment and have adopted certain principles with regard to occupational health services, like establishing and maintaining a safe and healthy working environment which will facilitate optimal physical and mental health in relation to work. Project proponent will also adopt following occupational health measures;

(a) Identification and assessment of the risks from health hazards in the workplace;
(b) Surveillance of the factors in the working environment and working practices which may affect worker's health, including sanitary installations, canteens & housing; and
(c) Advice on planning and organization of work, including the design of workplaces, on the choice, maintenance & condition of machinery and other equipment and on substances used in work.

7.2.2. Safety Hazards and Mitigation Measures:

Occupational health and safety are very closely related to productivity and good employer-employee relationship. The main factors of occupational health in mines are fugitive dust, noise, vibration and ergonomic problem. Safety of employees and maintenance of mining equipment is to be taken care of as per the Mine Regulations, 1961 and Circulars of DGMS. To avoid any adverse effects on the health of workers due to dust, heat, noise and vibration, sufficient measures have been proposed in the EMP.

These include:

- Provision of rest shelters for mine workers with amenities like drinking water, toilets, etc.;
- Provision of personnel protection devices for the workers;
- Rotation of workers exposed to high noise areas;
- First-aid facilities.

Occupational Health Survey of the employees will be carried out at regular intervals as per the directives of Director General Mine Safety.

7.3. SOCIAL IMPACT ASSESSMENT:

The project proponent shall consider the following general measures for the socio-economic upliftment of the nearby villagers.

- Mining and mineral handling involve transportation activity is expected to generate employment. Project authorities shall engage the local people for material transportation or at least for loading and unloading.
- A section of local youth shall be trained in phases so that they can take up some jobs (mining contractor ship, building contractor ship, supply of mining materials, operation of heavy machinery and also small-scale rural business developments) of their own (self-employment) or in mines (on contract basis) or elsewhere.
- Purchase facilities and cultural improvement will also be developed due to mining.
- Medical, communication and educational facilities will be improved.
- The project shall provide regular grant to neighboring schools and constant encouragement for cultural activities in local villages.

7.4. CARE AND MAINTENANCE DURING DISCONTINUANCE OF MINING:

During the course of mining there may be temporary discontinuance due to unforeseen causes such as:

- Court order.
- Natural Calamities.
- Accident (Mine related).
- Slope failure.
- Failure in fulfillment of statutory requirement.
- Local issue or
- Any other unforeseen circumstances.

Therefore, an emergency plan is necessary to re-open the mine, which will include:

- Intimation to local mine and legal administrative authorities concerned (IBM, DGMS, Directorate of Mines, Circle Mining Office, etc.) regarding the temporary discontinuance.
- Explanation to the local community regarding the cause of temporary discontinuance and possibility of reopening of mine in future.

- Listing and proper storing of the machines, materials, assets and documents.
- Care and maintenance of machinery as per the machine operating manuals.
- Tightening of the security to keep the machine and materials safe & secured.
- Monitoring of status of unplanned discontinued mining operation in respect of bench height, width, individual bench slope angle, over hang, under cut, misfire or any other parameters whose levels either in form of higher side or lower side is dangerous for further mine working.
- Repair & maintenance of haul road.
- Regular monitoring of air, water, noise etc. in the permitted area.
- Preparation of plan & sections at the time of discontinuance.
- Projection of benches in plan and sections which is safe for future working.

7.5. R & R ACTION PLANS

This is to be noted that the proposed project is going to come up on an existing mine, where no human habitations are existing. Therefore, there is no chance of any displacement of persons from their land and hence Rehabilitation and Resettlement Policy is not applicable for the proposed project.

CHAPTER-8

PROJECT BENEFITS

CHAPTER -8
PROJECT BENEFITS

8.0 Major Benefit

With the commencement of mining activities, a new horizon shall emerge to the local people for their social upliftment. There will be no adverse effect of mining on the socio- economic status of the people rather the mining activities help in improvement of the standard of living of the people. The mining activity creates the employment opportunity for the local people and this definitely hike the economic status of the local people. Apart from overall beneficial impact of the project on the local people of the region, it is felt necessary to augment facilities in the fields of education, health and social awareness including concern for environment and eco-system.

8.1 Improvements in the Physical Infrastructure

The mining project in the locality helps in improvement of the physical infrastructure like roads, vehicles for public transportation, water and sanitation facility, house and rest shed for the mines worker, safety equipment's for the mines workers etc.

8.2 Improvement in the Social Infrastructure

With the commitment of the upcoming mine there will be substantial improvement of economy of the local people. Amenities such as education and healthcare will be developing in and around the lease area, which will be available to the local people also. Development in business activity shall lead to infrastructure development in and around the project site.

8.3 Employment Potential

With the commencement of the mining activity, there will be improvement of the income of the people through employment in the mining. The scope of direct and indirect employment opportunity for the local people will increase. The project creates direct employment opportunity for 21 people during the mining period. The majority of manpower belonging to supervisory category and skilled /semi-skilled /unskilled shall be recruited locally. Detailed employment at proposed China Clay and Fire Clay mines of M/s N.P. Minerals would be as below:

Table 8.1: Manpower Requirement

S. No.	Items	Total
1.	Manager (Permit Manager or Foreman or Diploma Holder)	01
2.	Attendant cum Clerk	01
3.	Night Guard	01
4.	Miners	11
5.	Supervisor	01
6.	Store/ Godown keeper	01
7.	Dumper Operator	03
8.	Helper	01
9.	Electrician	01
	Total	**21**

8.4 Other Tangible Benefits

Apart from overall beneficial impact of the project on the local people, the following measures will be taken up by the project proponent as periphery development project;

- Planting of economically important trees in the open spaces around the mining lease area which is accessible to the local people.
- Encouraging to use boiled /cleaned drinking water.
- Development of socio-economic status of the people of the project area through awareness programmes, loan, trainings, etc.
- Decrease in the rate of migration from the project villages as the employment opportunity will be created in the locality.
- During summer season, scarcity in drinking water will be addressed properly.

8.5 Details of Various Facilities to be Provided to Personnel Working in the Mines

21 numbers of persons are likely to be engaged in the mining project. There will be floating population in the project site due to `movement of trucks engaged in mineral transportation i.e. truck drivers and helpers etc. To meet the essential needs of the workers necessary welfare facilities as per the provisions of Factories Act, 1948 and amendment thereof will be provided by the company. The facilities will include the following:

1. Washing Facilities: Washing facilities shall be provided in conveniently accessible locations and will be maintained clean. There will be separate washing facilities for men and women.

2. Shelter, Rest Rooms and Lunch Rooms: Suitable shelter or rest rooms and lunch rooms will be provided. The rooms will be sufficiently lighted, ventilated and maintained in

cool and clean condition. There will be sitting provision inside the shelter room. The mobile population consisting of truck drivers, contractor employees etc. will be permitted to utilize the rooms.

3. First Aid Appliances: First aid boxes shall be provided in readily accessible points; the contents will be regularly examined & replenished. The first aid box will be kept in the charge of responsible person who holds a certificate in first aid treatment recognized by the State Government.

4. Parking Area for Trucks: Trucks will be utilised for Transporting Fire Clay and China Clay. About 4 nos. of 20T capacity trucks & tippers per day will be engaged for the purpose within the lease area. The trucks will be parked in the designated place outside the mines gate. They will be allowed to enter mines premises in batches through public address system. No truck will be retained in the mine's premises during night.

8.6 Corporate Environment Responsibility (CER)

The industry intends to undertake CER activities in and around their Plant. A total amount of Rs. 10,00,000/- (Rs. Ten lakhs only) would be utilized for CER program over a period of 5 years. The said amount is 1.0% of the total project cost. CER will be based on the requirements of the issues raised during public hearing and needs of the nearby villages as per MoEF&CC OM F. No. 22-65/2017-IA.III dated 30-09-2020.

Table 8.2: Year wise CER Plan

5 YEARS CER PLANNING							
	Project Cost	**Rs. 194,57,000.00**					
	Budget for CER (1%)	**Rs. 1,94,570.00 or Approx. 2.0 Lakhs**					
S. No.	**CER DETAILS**	**5 Year CER Planning (Rs.) in Lakhs**					**Total (Rs.) in Lakhs**
		1st Year	**2nd Year**	**3rd Year**	**4th Year**	**5th Year**	
1	Improvement and beautification of road and other infrastructure in vicinity	0.5	0.5	0.5	0.5	0.5	2.5
2	Donation to locality Schools for construction of Toilets, School Building and drinking water facility, gardening	0.5	0.5	0.5	0.5	0.5	2.5
3	Installation of solar street lights in local area	0.2	0.2	0.2	0.2	0.2	1.0
4	Health camp (Blood donation, eye check-up, child health etc.) for the local people	0.3	0.3	0.3	0.3	0.3	1.5
5	Slum community development	0.5	0.5	0.5	0.5	0.5	2.5
	TOTAL COMMITMENT (1.0 % OF TOTAL BUDGET)						**10.0**

CHAPTER-9

ENVIRONMENTAL COST BENEFIT ANALYSIS

CHAPTER - 9
ENVIRONMENTAL COST BENEFIT ANALYSIS

9.0 Environmental Cost Benefits

Not Applicable as it is not recommended at the Scoping Stage.

CHAPTER-10

ENVIRONMENTAL MANAGEMENT PLAN

CHAPTER -10
ENVIRONMENTAL MANAGEMENT PLAN

10.0 INTRODUCTION:

The sole objective of Environmental Management Plan (EMP) is to control the adverse impact of a developmental activity. The EMP consists of mitigation measures to be adopted, environmental monitoring & institutional measurers (financial estimates and organizational set-up). Looking at the size of the mines and quantity of production, it is evident that the proposed activities will have negligible adverse impact on different environmental components. To mitigate such adverse impacts, even though negligible, environmental management plan have been integrated into the process of mine planning so that appropriate remedial measures shall be implemented from the beginning. This chapter proposes Environmental Management Plan (EMP), which will be an integral part of the mining project for minimizing the adverse impacts and to ensure the sustainable development of the area.

Keeping in view the mitigation of the adverse environmental impacts due to mining, the EMP has been worked out with the following objectives:

- Reclamation of the mined out area wherever and whenever possible.
- Restoration of landscape as near to its original form as far as possible, consistent with the economy of mining operations, keeping in view the drainage pattern, geological stability, vegetation etc.
- Minimization, mitigation and where possible elimination of degradation of land and deterioration of quality of air as well as water.
- Making least disturbance to the water regime and water quality.
- Least disruption to the existing basic ecological status in the mining area during mining, which will be conserved and protected.
- Improvement of the overall flora scenario of the area.
- Establishment of an environment, in which the activities presently being carried out may change for the better without disruption or disturbance to the socio economic condition.

10.1 BACKGROUND OF ENVIRONMENTAL MANAGEMENT PLAN:

Keeping in view the impacts and mitigation measures, the formulation of Environmental Management Plan (EMP) is based on the following consideration:

a) Proposed project activities
b) Air and water pollution control
c) Work zone environment improvement
d) Solid waste management
e) Biological reclamation and landscaping
f) Occupational hazards and safety
g) Environmental monitoring facilities
h) Environment management costs

Many of the areas of environmental management planning require multidisciplinary approach. Therefore, the measures envisaged in the report are to be regarded as guidelines and depending upon the continuing advice to be taken from experts of relevant fields like forestry, soil chemistry, ground water etc. the suggested schemes are to be detailed and if necessary to be modified from time to time to meet statutory requirements. The changes warranted as per site specific conditions are to be accounted for, during actual implementation. Further, in the light of experience likely to be gained during the initial years of operation, proposed schemes may require periodic modification/ updating. In this chapter all technical, biological and socio-economic control measures have been envisaged and these pertain to:

- Air Pollution Control
- Water Management and Water Pollution Control
- Noise Control
- Solid Waste Management
- Re-vegetation / plantation
- Land use Planning
- Occupational safety and health
- Socio-economic measures

10.2 AIR POLLUTION CONTROL:

The mining activities involves various processes such as, loading & unloading, transportation, breaking, drying, etc. which are likely to contribute towards air pollution in the area. The effect is localized and is mostly due to fugitive emission of dust particles. Adequate control measures are therefore, proposed to be taken during mining operation, transportation and loading operations. A Green Belt of at least three rows of tall trees of suitable species to be planted within and along the boundary of the lease area, so that minimum 33% of the area is covered by plantation. However, the width of the green belt, leafiness and density of trees, etc. has to be taken into consideration while selecting the species apart from Peripheral plantation around ML area, Quarry and over burden dump.

The following preventive measures are suggested:-

i) Loading and Transportation:

To minimize the adverse impact on air quality due to loading/unloading and transportation the following measure are proposed:

- The unmetalled service roads are proposed to be metalled or adequately compacted before being put into use.
- Overloading of vehicles will be avoided as spillage generates dust.
- Trucks carrying ore /fines will be covered with tarpaulin sheets to prevent fugitive dust generation.
- Continuous cleaning of haul roads & pot holes is regularly filled.
- Water sprinkling during loading, unloading and transportation in the haul roads.
- All the fossil fuel consuming vehicles & equipment's shall be properly maintained as per the guideline of the manufacturer to keep the SO2 & NOx level within the limit.
- Vehicles having Pollution under Control (PUC) Certificate will be engaged in the mines.

ii) Dumping:

Once the overburden dump has reached its designed size, Coir matting will be adopted. Jute mat/ coir netting of about 25 mm X 25 mm mesh size shall be laid on slopes and anchored by pins on leveled surfaces to prevent displacement and to have intimate contact. The mat/ net

shall be covered with 80 mm thick good agricultural soil mixed with fertilizer, pesticides and saw dust/ hay as base for vegetation along with seeds of Grass-Legume mixture.

Grasses like Stilohamata and Doob with Baugenvillia are quick growing to provide biomass, have the ability to survive on toxic waste material and tolerant to adverse pH, extremely low nutrient conditions and toxic metals. Extensive root system of these species holds loose soil particles and prevents soil erosion while enhancing productivity to a sustainable level. On the other hand, legumes are drought tolerant, perennial, fast growing and enrich nitrogen in derelict sites. At the end of growing season, grasses eventually dry to form mulches which conserve moisture. Moreover dry mulch decomposes to form humus & organic matter which initiate nutrient cycling on the derelict sites. Legumes, being perennial, also conserve moisture, accrete organic matter & create a nitrogen rich substrate for the soil by decomposition of their subterranean parts. This not only stop erosion of soil by wind or rain and help to maintain uniform moisture content of the soil underneath but also helps in growth of shrubs & trees species.

iii) Haul Road:

Haul roads are major sources of fugitive dust in a mine. To reduce the problem of dust generation from haul roads, the following actions will be taken up:

- The prevailing practice of construction of haul roads with the layers of alluvium soil and subsequently compacted by road rollers in surrounding areas will be continued.
- These haul roads will be compact and water spraying will be done in a number of runs using only a small quantity of water each time just sufficient to wet the surface.
- Ensuring transport equipment to be leak proof.
- Over loading of the transport equipment will be prevented in order to avoid spillage.
- Regular water sprinkling especially before transportation.

iv) Ore Stack Yard:

Water sprinkling will be carried out daily in ore stackyard to bring down the air borne dust. Peripheral plantation around the stack yard will also be taken up to arrest the air borne dust, if any.

10.3 WATER MANAGEMENT AND WATER POLLUTION CONTROL:

10.3.1. Surface Water Pollution Control:

Water is available in the study area in the form of surface water & ground water. The objective is to regulate the surface water of the mining area in such a manner so as to cause minimum contamination and alteration of drainage system. The major sources of water in the buffer area Dwarka river (flows in NE direction, 2.7 km away), Mayurakshi river (flows in S direction, 3km away). The lease area has no perennial /seasonal nala, flowing within the lease. A barrage Tilpara Mihirlal (9km away in WSW direction) is constructed on Mayurakshi river to control the flow and develop canal system. A number of canal systems from Dwarka and Mayurakshi river is traversing the study area; the nearest one is passing around 1 Km in South direction from the project site near Angar Garia village.

Water management (including storm water drainage) scheme (by a network of garland drains/ diversion ditches and catch-pits) has been planned. No water from the ML area shall be allowed to drain out of the lease area without permission from CGWA. The salient features of the scheme are as follows:

- Retaining walls will be built all-around the external dumps which will have weep holes for passage of storm water to join garland drains.
- Garland drains shall be constructed as much as possible around quarries and external dumps (depending on contours). The garland drains shall be routed through settling pits and settling tanks to settle out suspended solids in the storm water.
- Settling pits & drains shall be cleaned periodically, especially before and after rainy season.
- Small grasses & bushes in garland drains will hold back solid particles from draining away.
- Small stone barriers across the drain will check water current and arrest solid particles.
- No overburden or loose sediments will be kept in the working benches particularly during monsoon months.
- No mine water will be discharged outside the lease area; rather these will be collected in settling ponds to use in sprinkling and plantation.
- Effluents from the rest areas will be diverted through drains for green belt development.

- Sanitary sewage generated in office area shall be treated in septic tanks and soak pit.
- Problems due to inundation and flood will not arise as the mine is in upland and at a higher altitude than the normal surface level.

10.3.2 Ground Water Pollution Control:

The ground water table of the region is at 30m AMSL (max.) whereas the pit limit by the end of the life of the mines will be at 21m AMSL i.e. 9m (min.) above the water table. Thus, the quarry configuration during the life period will not intersect the ground water table. Ground water recharge by using rain water shall be adopted for the office building and ML area excluding quarry pit. The pumped out water after the rainy seasons hall be drained into the settling tank and shall be used in sprinkling for dust suppression and plantation. Since the ground water table will not be intersected, the impact of mining ground water will be insignificant.

After rainy season the accumulated rain water in the quarry pit shall be pumped out and passed through the garland drain into the settling tank to arrest suspended solids, if any. The settled water shall be used in water sprinkling & Plantation.

Mining is a physical process where water is mainly used for dust suppression and washing of heavy earth moving machines. Since no chemical transformation takes place and the ore is naturally occurring, there is no possibility of any chemical contamination in this waste water except an increase in suspended solids comprising ore particles, clay, etc. in surface run off during monsoon. During oil changes in equipment & other machinery, there are chances of spillage of oil & generation of waste water containing oil & grease. However, maintenance related activities of all the vehicles shall be carried out in Mohammad Bazar or Suri.

The chance of generation of sanitary sewerage is negligible as there is no township in the leasehold area; since most of the workers will be local and from the nearby villages. Whatever little quantity of domestic waste water to be generated from the toilets /wash rooms, will be disposed off to Soak Pit via Septic Tank. Therefore, it can be concluded that no adverse effect will be expected in water quality.

The core zone, being at a higher elevation allows substantial quantity of precipitated water to flow down as run off to the streams/ nalas in close vicinity. In operational period the runoff is expected to carry substantial amounts of solids from mining core zone.

10.3.3 Rain Water Harvesting:

For the operation of the mining units the extraction of natural resources is unavoidable but effective steps shall be taken towards replenishing the natural resource conservation. In order to keep pace with the dwindling availability of the natural resources & resource utilization it has been proposed to take steps for organizing resource conservation initiatives.

Water is a scarce natural resource in most regions of India. Water from perennial sources /ground water sources is piped to utilization centers. Collection, storage & efficient use of rainwater can reduce the cost of water collection & supply. To cater to the needs of daily water requirement now-a-day mines are coming up with implementing the techniques of Rain Water Harvesting (RWH) over the roofs of offices, rest sheds and by making percolation tanks.

Broadly there are two ways of harvesting rain water:

1. Surface runoff harvesting
2. Roof top rainwater harvesting

In mining area rainwater flows away as surface runoff. This runoff could be caught and used for recharging aquifers by adopting appropriate methods. In the present context of open cast mining, rainwater flows away as surface runoff and hence, Rain Water Harvesting from land surface (paved and unpaved areas) may be proposed if required.

A) Rain Water Harvesting from Land Surface:

Rainwater harvesting using land surface is less complex way of collecting rainwater and can be done in the mining areas. It involves improving runoff capacity of the land surface through various techniques including collection of runoff with drain pipes and storage of collected water. Ground catchment techniques provide more opportunity for collecting water from a larger surface area. By retaining the flows of small creeks and streams in small storage reservoirs created by low cost earthen dams, this technology can meet water demands during dry periods. There is a possibility of high rates of water loss due to infiltration into the ground, and, because of the often marginal quality of the water collected, this technique is mainly suitable for storing water for plantation and other purpose.

B) Rain Water Harvesting through Contour Bund:

Contour Bunds are effective methods to conserve soil moisture in watershed for long duration. These are suitable in low rain fall areas where monsoon run off can be impounded by constructing bunds on the sloping ground all along the contour of equal elevation. Flowing water is intercepted before it attains the erosive velocity by keeping suitable spacing between bunds. Spacing between two contour bunds depends on the slope the area as the permeability of the soil. Lesser the permeability of soil, the close should be spacing of bunds. Contour bunding is suitable on lands with moderate slopes without involving terracing.

As the water table is very shallow in the mine area hence there is no requirement of Rain Water Harvesting.

10.4 NOISE POLLUTION CONTROL:

The sources of noise in this particular project are JCB, movement of vehicles, loading & unloading of materials. However, Noise level shall be maintained below 80 dB

(A) in work zone (for 8 hours exposure). The mitigation measures for noise pollution are of following types:

- Prevention at source
- Attenuation in transmission path and
- Protective measures on work environment.

The following measures will be taken to reduce noise levels.

- Diesel powered machineries which are major source of noise in open cast environment will be properly maintained as per maintenance schedule to prevent undesirable noise.
- Attention shall be paid towards rigorous maintenance of the silencers of diesel engines.
- Static diesel engines shall be housed as far as possible (not made of sheet metals or surrounded by baffles). If possible, they will be placed on vibration isolators.
- Excavators and dumper drivers will be issued earplugs and earmuffs. Duty hours of operators of noisy machinery will be regulated to keep their noise exposure levels within limits.
- Provision of sound proof cabins for the workers deployed on machines producing higher level of sound like dumpers, shovels etc.
- Green belt will be developed around office building and mine to reduce noise level.

10.5 SOLID WASTE MANAGEMENT:

The solid waste comprises of alluvium top soil & overburden. Small quantity of Top soil shall be stacked over an earmarked area of 0.08 ha. and shall be used in annual plantation. The overburden of 6m thickness (47250 m^3 by volume) shall be dumped over an identified area covering 0.08 ha. by the end of the plan period. At the end of the conceptual period, the generated lateritic OB of 3,12,000 m^3 shall be used in backfilling of 3.90 ha. of the mined out area.

Waste material will be compacted and stabilized by dumping the various sized material in a mixture form. Following steps shall be taken for the management of waste dump;

- Waste dumps location in the mine will be chosen according to topography, future aspects of mining and economy in transportation. Waste dump ground should be stable, strong and away from water reservoir.
- Dump site have no interference with primary drainage condition of the mine.
- The disposal sites have not been located in an area where future population growth or developments are likely to affect the ability of the site to meet performance objectives.
- Ring bund and drain all around the dump, at the toe shall be formed so that the rain water falling over the slopes and bringing down small quantities of silt will be arrested at the toe itself and prevented from going far away to agriculture land & into the nearby nalas etc. Settling tank along drain shall be provided at some intervals.
- Formation of masonry chutes at suitable intervals to bring down the rain water from the top of the dump to the ground levels. By this method, carrying away large quantities of silts & eroding the slopes year after year by water will be prevented.
- Garland drains (diversion ditches) shall be built to avoid water from outside entering into or becoming pounded against overburden dump.
- There shall be settling tanks connected to garland drains so that fine sands & heavy particles coming with water shall settle down and clear water is reused.
- Contour trenches shall be made on overburden dumps to control surface runoff & subsequent erosion.
- Grasses shall be planted over the dump slope followed by shrubs & trees. Height of the external dump will be up to 3m.

- The dump will have maximum slope of 37°.
- The external dumps will have stretches of retaining wall at suitable locations. The retaining walls will be made up of boulders. The walls will be of maximum 1m height and the top surface will be of 0.5m flat. Retaining walls will have weep holes to drain out water.
- The completed dumps and the back-filled areas shall be gradually afforested to increase the stability. Internal dumps & backfilled areas shall match with adjoining ground profile.

10.6 LAND USE PLANNING AND MINE CLOSURE:

At the end of the conceptual period, the generated alluvium OB of 3,12,000 m^3 shall be used in backfilling of 3.90 ha. of the mined out area, which is the northern part of the quarry. After the completion of quarrying operation, reaming of the quarry area i.e. 0.92 ha. will be converted into pond. Justifications of deciding pond as the post mining land use are as follows:

- The artificial pond developed on abandoned quarry areas in the lease shall fulfill the water need of the area for agriculture. The pond boundary shall be fences to avoid any mishaps.
- The pond will also be used for pisciculture.

Some of the civil construction shall remain after cessation of active mining. These infrastructure facilities shall benefit the site as the roads will form a much better communication link with the outside compared to the existing unpaved roads and the office buildings etc., which is just outside the lease area may be used by the State government or Central government agencies or can be developed as primary health centre etc. in the region. The areas of temporary use viz. stack yard, areas for site services etc. shall be afforested during closure. Electrical installations shall be dismantled following proper procedure.

10.7 AFFORESTATION/ PLANTATIONS PROGRAMME:

In order to mitigate and minimize the environmental impacts, arising due to mine project especially from air pollution, noise pollution, soil erosion etc. the Greenbelt Development around the project sites can provides the best mitigation option. The green canopy not only absorbs some of these pollutants but also improves the aesthetic environment. Therefore, a

"Green Belt Development Plan" has been proposed around the mine lease area and along the conveyor corridor. The green belt shall serve the following purposes:

- Compensate the damage to vegetation due to setting up and operation of the mine.
- Prevent the spread of fugitive dust generated due to mining and allied activities.
- Attenuate noise generated by the mine.
- Reduce soil erosion.
- Help stabilize the slope of over-burden dumps.
- Increases green cover and improve aesthetics.
- Attract animals to re-colonise the area when the mine is abandoned.

The green belt is proposed to be developed in a width of 7.5m in safety zone along the boundary of mine lease area covering 2.38ha and also along with the haul roads as transportation corridor. The strategy worked out for development of green belt consists of following:

- Broad leaf trees growing above 10m in height should be planted along the roads, offices and infrastructure facilities.
- Plantation of trees should be undertaken in appropriate encircling rows.
- Generally local/indigenous fast-growing trees & shrubs should be planted.
- The trees should be protected by plantation of non-palatable shrub species to avoid browsing by animals.
- Placement of tree guards to be provided to save the plants.

10.7.1 Identification of Sites for Plantation

The identified plantation sites should be free from over head telephone lines, electric poles and other industrial emergency installations so that there will be no obstacle in the plant growth. In the Proposed China Clay & Fire Clay mining project, plantation shall be developed in the following areas:

- Along the transportation roads inside and outside the ML area
- Along the ML area boundary
- Around office, rest shed & parking places
- Around waste dump areas as well as in the dump slope
- Over the vacant and non mineralized area within the lease area

- On backfill areas and on mining upper benches /slope (where overburden material is not available for back filling) of mine pits after closure of the mine pit.

10.7.2 Plantation along Mine Lease Boundary

The width of the belt around the proposed mining operations shall be of 7.5m width all around the ML boundary. Since most of the project area lies on the plain land, saplings of 0.3m high will be planted in pits at 2.0m intervals along contours so that the tree density is about 2500 trees per ha. The pits will be filled with a mixture of good quality soil and organic manure (cow dung, agricultural waste, kitchen waste) and insecticide. Since, tests have shown that availability of phosphorus, a limiting nutrient, is low, phosphoric fertilizers will also be added. The saplings will be planted just after the commencement of the monsoons to ensure maximum survival. The species selected for plantation must be locally growing varieties with fast growth rate and ability to flourish even in poor quality soils.

The row of plants facing mine should be smaller species and those facing outside should be taller species. The species suggested for plantation are:

Krushna chuda (*Delonix regia*)	Sal (*Shorea robusta*)
Babool (*Acacia nilotica*)	Siris (*Albizzia lebbeck*)
Palash (*Butea monosperma*)	Neem (*Azadirachta indica*)
Harida (*Terminalia chebula*)	Aam *(Mangifera indica*)

10.7.3 Plantation in Selected Areas within the Lease

In the proposed plan, green belt will be developed in vacant areas particularly around the dumping yards, mining pits, etc. Mixed plantation will be done to take care of different heights and rates of growth. Species suggested for such areas are:

Krushna chuda (*Delonix regia*)	Sal (*Shorea robusta*)
Babool (*Acacia nilotica*)	Siris (*Albizzia lebbeck*)
Palash (*Butea monosperma*)	Neem (*Azadirachta indica*)
Harida (*Terminalia chebula*)	Aam *(Mangifera indica*)

10.7.4 Plantation around Office Buildings, Stores, etc.

Plantation will be carried out around office buildings, stores and other buildings, along the side of connecting roads. Species suggested for plantation, mostly ornamental plants are as follows:

Krushna chuda (*Delonix regia*)	Sal (*Shorea robusta*)
Babool (*Acacia nilotica*)	Siris (*Albizzia lebbeck*)
Palash (*Butea monosperma*)	Neem (*Azadirachta indica*)
Harida (*Terminalia chebula*)	Aam *(Mangifera indica*)

10.7.5 Plantation along the transportation road:

Plantation along the transportation road will commence on the very first year of mining. Since this area is more prone to dust pollution, plant species tolerant to such pollution will be planted. The row of plants on the inside row should be smaller species and those facing outside should be taller species. The species suitable for this zone are as follows;

Krushna chuda (*Delonix regia*)	Sal (*Shorea robusta*)
Babool (*Acacia nilotica*)	Siris (*Albizzia lebbeck*)
Palash (*Butea monosperma*)	Neem (*Azadirachta indica*)
Harida (*Terminalia chebula*)	Aam *(Mangifera indica*)

10.7.6 Plantation on Waste Dump:

Plantation on the reject's dump cannot start till dumping activities cease at least in a dump and the site is prepared for plantation. Once dumping is complete in the dump, a path will be cleared to the designated area so that the basic inputs (water, manure and seedlings) can be carried up to the site. Next, a layer of topsoil shall be spread over the area and roughly leveled. Coir mats shall be spread over the surface followed by showing of grass seeds /plantations of seedlings on the soil layer to stabilize the dump slope.

Plants selected for plantation in and around the reject's dumps should have pollution tolerance nature, fast growth rate, glabrous/ pendulous leaves and large crown volume to surface area of fluttering leaves. The species selected will be from among Aswatha (*Ficus religiosa*), Acacia (*Acacia leucophloea*), Neem (*Azadirachta indica*), Kul/Barkoli (*Zizyphus mauritiana*), etc.

Plantation on Top of Dumps: Trenches of 45cm X 45cm will be dug on the flat top of the dumps and the excavated material will be used to form a bund on the dip side of the trenches to retain maximum water in the trenches during rains. Suitable benches will be made on the waste dumps and a size of 60cm X 60cm pits will be dug on the benches at 2m intervals and exposed for 10 – 15 days to sun. The pits will be filled with a mixture of topsoil, organic manure

and phosphoric fertilisers. Saplings will be planted in these pits once monsoon has commenced to ensure maximum survival of the saplings. Initially hardy pioneers species, *Acacia arabica, Azadirachta indica, Albizzia lebbeck, Zizyphus mauritiana,* etc will be planted to help build up the soil.

Plantation on Dump Slopes: Plantation on slope of the dumps will commence as soon as the first bench is ready. The terraces on the slopes will be sloped inward. 0.5 m to 0.75 m deep pits will be dug at an interval of 1 to 1.5 m and filled with a mixture of topsoil and organic manure. There will be open masonry drains on the terraces. These will receive water from the higher terraces and convey it to the next lower terrace. Before the commencement of the monsoon the slopes and terraces will be covered with a layer of soil (mixed with suitable mechanical soil binder) and sprinkled with water. Just before the commencement of the monsoon seeds of grasses and small shrubs will be sprinkled on the soil covering of the dump slopes or seedlings of such plants will be planted on the slopes.

10.7.7 Plantation on Backfill Areas and Mining Benches Slope (where back filling is not possible) of mine pits: Plantation on the mining benches cannot commence till all the mining activities from the pit ceases. Once the abandoned pit is backfilled & leveled, a layer of topsoil will be spread over the area. Grass seeds /seedlings will be planted on the soil layer to stabilise the soil.

Plants selected for plantation on the mining benches shall be draught hardy in nature, with fast growth rate, glabrous/ pendulous leaves and with large crown volume to surface area of fluttering leaves. The species selected for the purpose are Neem (*Azadirachta indica*), Babul (*Acacia arabica*), Gulmohar (*Delonix regia*), etc.

Stretches of open land in the lease area which will not be covered by any activity will be selected for developing forest. Plantation in such area will commence from the initial years of the mining and will be expanded in progressive stages. The trees will be watered using the treated discharges from mine pit. These plantations will be protected/maintained for 3years. Tree guards shall be provided around each new plantation.

Over the proposed area, fine dust particles collected from garland drains and settling tanks will be spread & suitable nutrients may have to be added for proper growth of plants. M/s N.P. Minerals shall purchase healthy seedlings of desired numbers from the nearby nursery during

the month of June. The company also wishes to give seedlings free of cost to the interested local peoples for plantation in their waste lands.

Plantation within the ML area will take place as per the following plan. In total 2.38 ha. of safety zone out of 7.22 ha. of the ML area will be covered under plantation by the end of the life by using 5950 saplings.

Table No. 10.1: Progressive Greenbelt Development Plan

Year	Area in ha.	No. of Plantation
1st year	1 ha. safety zone along lease boundary	2500 no.
2nd year	1 ha. safety zone along lease boundary	2500 no.
3rd year	0.38 ha. Lease Area	950 no.
4th year	Maintenance	--
5th year	Maintenance	--

Post plantation care includes replacement of casualties, weeding, soil working, manuring, watering, protection from grazing and fire. These post plantation care will continue for at least 3 years after plantation. This scheme and selection of plant species are mainly based on the utility to local people, local soil & climatic conditions.

10.8 MANAGEMENT MEASURES FOR REDUCING IMPACTS ON FAUNAL SPECIES: There is no wildlife sanctuary or corridor within 10km radius of the ML area. No doubt, certain irreversible changes will take place in the locality due to mining. However, to minimize such impacts as far as possible, wildlife present in and outside the zone of influence can survive without much interference as they become habituated to the mining process. Efforts shall be put forward to raise the awareness level of the people of the locality to conserve the wildlife & help them in surviving. Various short term as well as long term measures shall be taken in & around the mining area in order to improve habitat condition and security of wildlife.

(a) Massive Farm Forestry: Local people will be encouraged & supported to plant local species Neem, Babul, Mango, Ghambhar, etc. in their unused land and around village for fuel, fodder, timber, fruit, ornamental and medicinal use. This will reduce their dependency on the surrounding forests and help in improving their economic condition.

(b) Fire Protection: Fire occurrence may go up around the lease area due to rise in anthropogenic pressure created due to increase in population. Suitable fire protection measures like fire lines and fire watching shall be ensured in the forest patches in

cooperation with the forest dept. during dry seasons. They should be maintained throughout the plan period. Two local youth can be engaged for five months every year during fire season and equipped with simple fire fighting tools.

(c) Awareness Programme in Village: Improvement of rural economy for minimizing their dependence for on forest growth (Eco-development) can be done by educating and assisting people to choose the alternative livelihood such as poultry farm, growing vegetables and Mushroom, small scale business, raising nurseries for forest and horticulture species, cultivation of medicinal plants, small mechanical works like cycle repairs, electrical repairing and wiring, welding and fabrication work etc.

(d) Soil & Moisture Conservation: Wherever necessary staggered contour trenches of 5 m in length and 0.5 m in depth may provided around the ML area to check soil loss and to conserve water in order to improve sub-soil water. This will also help to reduce fire incidents. The contour trenches may be planted up with suitable indigenous species preferably those which have fodder value.

(e) Noise Pollution Control: Noise from mining activities like vehicle /machine moments, excavation, etc. are detrimental to the wild animals. The vehicles shall be checked at regular intervals and maintained properly besides using right types of muffling mechanism so that noise level remains within limit.

(f) Dust Pollution Control: The road surfaces and active benches shall be sprayed with water twice a day except on rainy days in order to prevent the fugitive dust emission from mining operation, movement of vehicles. The ore should be made free from dust by spraying water on it before transportation and the loaded trucks will be covered with tarpaulin during movement. Overloading of trucks /tipper shall be strictly prohibited. Thick vegetation will be maintained around the mining pit to absorb dust and to minimize noise.

10.9. OCCUPATIONAL HEALTH AND SAFETY:

Occupational health and safety is very closely related to productivity good employer- employee relationship. The factors of occupational health in China Clay & Fire Clay mining project are mainly dust and land degradation. Safety of employees during operation and maintenance etc. shall be as per mines rules and regulations. To avoid any adverse effects on the health of

workers due to various pollutants, sufficient measures have already been addressed in this chapter.

The process of excavation /quarrying & sizing leads to some health hazards. The most significant occupational health impacts are Noise Induced Hearing Loss (NIHL) and Occupational Lung Disease (OLD) due to inhalation of dust. As per Mines Rules, 1955, medical examination of employees at the initial stage and periodically, shall be done by a team of qualified medical officers provided by the project proponent. Regular medical check-up camps shall also be arranged for detection of occupational diseases and minor disease in the nearby rural population. Other measures mainly relating to health and safety include safety measures like;

- Provision of rest shelters for mine workers with amenities like drinking water etc.
- All safety measures like use of safety appliances, safety awards, posters, slogans related to safety etc.
- Training of employees for use of safety appliances and first aid.
- Regular maintenance and testing of all equipment as per manufacturer's guidelines.
- Periodical Medical Examination (PME) of all workers by a medical specialist so that any adverse effect may be detected in its early stage.
- First aid organisation in mines including training and retraining of First aiders.
- Close surveillance of the factors in working environment and work practices, which may affect environment and worker's health.
- Monitoring of the values of various factors, which may lead to occupational health hazards.
- Working of mine as per approved mining and environmental plans.

The mining activity shall be stopped for four months starting from June with the onset of rainy season. This is because due to rain the mines floor which comprises of clay becomes very slippery. In order to avoid any accident hazards to the workers due to slippery mining floor, the mining activity will discontinue from June to September of every year.

10.9.1 Expected Diseases:

Due to mining especially dust, the workers may suffer from diseases like dust allergy, cardiac congestion etc. Project proponent will take full responsibility for the protection of the workers

against sickness, disease and injury arising out of their employment and have adopted certain principles with regard to occupational health services, like establishing and maintaining a safe and healthy working environment which will facilitate optimal physical and mental health in relation to work.

The proposal is for a clay mine. Since clay beneficiation is not proposed within the lease area, the major cause of pollution and disease is removed.

10.9.2 Treatment Measures:

- A physician of the locality will be engaged for monthly check-up of the workers and villagers of Zone of Influence.
- Free medicine will be provided to the workers and nearby villagers.
- Provision of free traveling conveyance to patients to shift to District Head quarter Hospital at the time of emergencies.
- The six-monthly health checkup camp shall be held in the School of village Patel Nagar and periodical medical examination will be conducted.
- There will be regular health check-up of the mine workers and immediate attention will be paid for the patients with primary respiratory infections coughing, sore throat, Asthma, Breathlessness, expectoration, and chest pain.

Details of Pre-placement Medical Examination and periodical Medical Examination Schedule is described below;

Table No. 10.2: Medical Examination Schedule

Type of Medical Check up	Year	Percentage of total employment	No. of Person
Pre placement medical check up	1st year	100%	21
Periodical medical check up	Quarterly	50%	11

10.10. SOCIO-ECONOMIC MEASURES:

There will be no adverse effect of mining on the socio-economic status of the people as the inhabitants adjacent to the area as the workers will be mainly local. The employment avenues due to mining will definitely hike the socio-economic status of the local people. Apart from

overall beneficial impact of the project on the local people of the region, it is felt necessary to augment facilities in the fields of education, health and social awareness including concern for ecology. These are presented in a summarized form in the following statement;

Environmental Attributes	**Nature of Impact**
Employment	Beneficial
Service, trade/ commerce	Beneficial
Public utility/ education, social awareness	Augmentation
Healthcare facilities	Augmentation

CHAPTER-11

SUMMARY & CONCLUSION

CHAPTER -11
SUMMARY AND CONCLUSION

11.0 INTRODUCTION:

The proposed China Clay and Fire Clay mine covers an area of 7.22 ha (17.84 acres) at J.L. No. 145, Plot No. 4412 to 4418, 4420 to 4427, 5056 to 5064, 5066, 5067, 5071, 5072, 5074 to 5081, 5083 to 5092, 5095, 5096, 5098 to 5106, 5109 to 5118, 5122 to 5136 Patel Nagar, Mouza-Kharia, P.O. & P.S.- Md. Bazar, Dist.- Birbhum, West Bengal. This EIA/EMP report prepared on the basis of approved mining plan of M/s N.P. Minerals China Clay and Fire Clay mine. M/s N.P. Minerals is having good experience in mining of minerals and ores. In order to get the Environmental Clearance for the mine, ToR was approved by the State Level Expert Appraisal Committee, West Bengal vide letter No. 1211/EN/T-II-1/078/2019 on 19th July, 2021.

HIGHLIGHTS OF THE PROJECT

Project	:	Patel Nagar China Clay & Fire Clay mines
Proponent	:	M/s N.P. Minerals
Location	:	Village – Patel Nagar, Mouza- Kharia, P.O. & P.S.- Md. Bazar, Dist.- Birbhum, West Bengal
Latitude	:	23°59'28.59"N – 23°59'9.46"N
Longitude	:	87°36'0.45"E – 87°36'0.54"E
Topo sheet No.:		73M9
Production capacity:		28,036 TPA Clay (ROM) with Maximum Production of China Clay: 19,349 TPA and Fire Clay: 8,687 TPA
Type of mine	:	Semi-mechanised open cast mining in single shift
Water use	:	1.5 KLD is required for drinking /domestic, dust suppression & for plantation
Employment potential:		21 nos.
Project Cost:		194.57 Lakhs

11.1 PROJECT OUTLINE:

The study area is mostly covered by an alluvium cover. Clay of this area is generally covered by alluvium soil, occasionally and is possibly formed due to kaolinization of feldspar of granite gneiss. The clay belongs to the Tertiary sequence. Colour of crude clay varies from off-white to light cream and light buff with brown to purple tinge at places. Clay of this area is usually bedded in nature which is also interbedded with sandy clay and is compact in nature with moderate plasticity. The regional trend of Fire Clay and China Clay with gentle dipping with very low angle 3° to 5° towards north - east.

Thickness of the Fire Clay and China Clay horizons has been adopted from the previous trench reports as 3.5 - 4.5 meters and 8.5 – 10.5 meters respectively. As a conservative measure, resources are considered with lower level of confidence. Estimated resources comes about 4,05,098 MT of China and Fire Clay.

Besides the resources estimated in and around the existing quarry pits, about 5.20 Ha of land within the block is untouched. Quite likely, the clay beds are continuing in the area which needs to be proved by subsequent exploratory works. To ascertain the clay resources within this part of the block as well with lower level of confidence (50%) and is defined as prognosticated resources.

The extractable reserve of China Clay and Fire Clay are estimated to be 96,745 Tonnes and 43,435 Tonnes respectively. With the maximum production of ROM to be 28,036 TPA, the life of the mines is expected to be 17 years. However, life of the mine may increase depending on the outcomes of proposed exploration of the ML area.

The Proposed China Clay and Fire Clay mine shall adopt open cast semi-mechanised method of mining on a single shift basis. No drilling and blasting along with mineral processing will be required in this mining process to extract China Clay and Fire Clay. The present work is limited to field observation of the present site including the old quarry workings, survey of the boundary coordinates and topographical survey of the area. All total 3 qualified managerial, technical & supervisory personnel & 18 highly skilled machine operators, office management staff & labourers shall be engaged in the Proposed China Clay and Fire Clay mine to achieve a maximum production up to 28,036 TPA Clay (ROM).

During next 5years the level of production expected is given in Table.No.11.1.

Table No. 11.1: Production Level during ensuing Five Years

Year	Fire Clay in Tons	China Clay in Tons	Total Production in Tons
1st year	8687	19349	28036
2nd year	8687	19349	28036
3rd year	8687	19349	28036
4th year	8687	19349	28036
5th year	8687	19349	28036
Total	**43435**	**96745**	**140180**

The mine shall be developed in next five years up to a depth of 21m including 6m of over burden. Direct excavation method will be followed as the strata conditions are soft in nature. The top OB is alluvium in nature while clay is exposed below the alluvium surface. The solid waste comprises of alluvium top soil & overburden. Alluvium soil mixed with weathered mantles is the type wastes. Small quantity of Top soil if any generated, shall be stacked over an earmarked area of 0.08 ha. and shall be used in annual plantation. The overburden of 6m thickness (47,250 m^3 by volume) shall be dumped over an identified area covering 0.08 ha. by the end of the plan period. At the end of the conceptual period, the generated lateritic OB of 3,12,000 m^3 shall be used in backfilling of 3.90 ha. of the mined-out area.

The excavated clays will be stacked and spread over the mineral stack yard area for drying. Stacked Clay will require more areas for breaking of big size products into lump sizes and spreading of the same for drying up. This process will be done manually and it will be a labour-intensive job. Fines will be used locally for different derived products; however, lumps will be used in industrial purposes.

During the initial planned five years of mining operation, the depth of mining will be limited to 21 meters from the surface level with spreading over 0.7875 ha., while in the conceptual period, the depth will be limiting in the same, but the quarry extent will be increased to 3.90 ha. At the end of the conceptual period, the generated OB of 3,12,000 m^3 shall be used in backfilling of 3.90 ha. of the mined-out area.

11.2 PRESENT ENVIRONMENTAL SETTING:

For the purpose of having Environmental Impact Assessment of the proposed mining activity, a short-term field study in & around the ML area covering 10km radius was undertaken during the period of October to December, 2021 to ascertain the baseline status of the environment. The study area has a well-defined dendritic drainage pattern with a network of small nalas. The lease area has no perennial /seasonal nala, flowing within the lease. The major sources of water in the buffer area are Dwarka River (flows in NE direction, 2.7km away), Mayurakshi River (flows in S direction, 3km away), Kulia River (2km away from project site).

The core zone i.e., the mine lease over 7.22 hectares does not belongs to part of any national park, wild life sanctuary or natural / biosphere reserve. It also does not contain any features of archaeological /historical and cultural /aesthetic importance.

11.2.1. Climate & Meteorology:

The area experiences dry to moist subtropical climate with well-defined summer between April to June and monsoon from mid-June to September. The maximum temperature rises up to 42^0C in the month of May, which also falls down to the minimum average of 8^0C in the month of January. July and August are the rainiest months in the year. The average yearly rainfall of the district was 1564 mm. It is observed that, relative humidity is higher during the monsoon and lowest during summer. The wind direction is predominantly from North East during the monitoring period.

11.2.2. Sampling Stations:

The environment quality with respect to the study zone of 10-km radius around the mine site forms the baseline information. To access the environmental quality 8 sampling stations were selected basing on wind rose direction, availability of surface & ground water, sensitive receptors including habitation, etc.

Table No. 11.2: Location of Sampling Stations

Sl. No.	Location of Sampling Station	Direction	Distance	Monitoring Station for Parameters				
				Air	Surface Water	Ground Water	Soil	Noise
1	Mine Lease area	--	--	□			□	□

2	BDO Office Near Patel Nagar	1.5 Km	SW	□				
3	Angar Garia	1.4 Km	South	□				□
4	Kabilpur	2.0 Km	East	□				
5	Kulia	2.3 Km	WNW	□				
6	Rautara	1.8 Km	North	□				□
7	Primary School Md. Bazar	3.0 Km	West	□				
8	Shaktipur	5.0 Km	SSW	□				
9	Md. Bazar Market	3.0 Km	West					□
10	Patel Nagar Hospital	1.1 Km	SW					□
11	Sekedda High Secondary School	5.2 Km	NE					□
12	Sekkedda Up Sastha Kendra	5.6 Km	NE					□
13	Kedarpur B N High School	1.0 km	SSE					□
14	Tilpara Mihirlal Barrage (Dam)	9.0 Km	SW		□			
15	Canal near Kharyakuri (before Tilpara Dam)	9.0 Km	WSW		□			
16	Canal near MD. Bazar	3.8 Km	West		□			
17	Mining pond Near Kharia village	1.3 Km	West		□			
18	Pond Water - Near Project site	0.5 Km	West		□			
19	Mayurakhi river - Near Baram Village	4.5 Km	South		□			
20	Mayurakshi canal - Near Angar Garia village	1.2 Km	South		□			
21	Dwarka river - Near Purana gram	2.7 Km	NE		□			
22	Well Water – Angargaria Village	1.4 Km	South			□		
23	Well Water – Kulia Village	2.0 Km	East			□		
24	Tube well in Kabilpur Village	2.1 Km	ESE			□		

25	Tube well in Rautara Village	1.8 Km	North			□		
26	Well Water – Kumarpur Village	2.5 Km	WSW			□		
27	Well Water – Kharia Village	1.0 Km	West			□		
28	Tube well in Patel Nagar	1.3 Km	WSW			□		
29	Tube well in Md. Bazar	2.7 Km	West			□		
30	Ag. field in Kumarpur Village	2.5 Km	WSW				□	
31	Road side near Seoarakuri	6.5 Km	WSW				□	

N.B. – '□' represent the sites of Monitoring

11.2.3. Air Quality:

The ambient air quality as recorded was found to have particulate matter (particle size <10 µg) content PM_{10} levels varied from 48.60 µg/m^3 and 81.20 µg/m^3 against a standard 100 µg/m3 for residential /rural area and quantity of fine particulate matter (particle size <2.5 µg) is 21.50 µg/m^3 to 46.20 µg/m^3 against the standard 60 µg/m^3 for residential /rural area as per National Ambient Air Quality Standards (NAAQS). Sulphur dioxide level in the area is <4.0 µg/m^3 (BDL) as against acceptable level of 80 µg/m^3 and Oxides of Nitrogen is 8.50 µg/m^3 to 20.0 µg/m^3 against the permissible limit of 80 µg/m^3 as per NAAQS.

11.2.4. Noise Level:

The ambient noise levels were recorded at the study area revealed a maximum of 67.80 dB(A) at Md Bazar Market village and a minimum of 53.18 dB(A) at Rautara Village during daytime. A maximum of 45.28 dB(A) at Md Bazar Market and a minimum of 41.10 dB(A) at Rautara Village were recorded during night time.

11.2.5. Soil Quality:

In the buffer zone, soil in general is reddish brown in colour with some clay percentage. The presence of organic carbon, N, P, K and good water holding capacity of the top soil indicates that the soils will support plant growth. The soil samples of nearby agricultural field are having

good water holding capacity, organic matter and phosphorus percentage to support plant growth.

11.2.6. Water Quality:

The surface water quality as monitored during the study period reveals that, average river water quality at the locations conforms to the standard quality. It can also be seen from the data that, the ground water quality conforms to drinking water quality standard.

11.2.7. Socio-Economic Status:

All total 152 villages are there within the study area comprising of core and buffer zone. 75,186 households with 3,34,654 populations comprise this region. Male population has outnumbered that of female i.e., male population is 1,70,474 & that of female is 1,64,180. There are 963 females against every 1,000 males. Of the total population 27.79% are SC and 14.96% are ST. Literacy rate in the area is only 57.21%.

Large percentage of household's depends upon agricultural activities. Some households depend on business, trade and other occupation, small scale household industries and some even depend on cultivation as farm labour.

11.2.8. Biodiversity Status:

Forest areas are mostly dense in nature and belong to the various Reserve Forests. The area exposes dry deciduous forests and mixed deciduous forests. The study area is dominated by various tree species as Sal, Palas, Gulmohar, Bot, Siris, Babul, Mango, etc. and Shrubs like Verenda, Kapas, Rehri, etc. The area does not harbor any rare or endangered plant species.

The ML area is not habited with the wild animals. The field study has recorded only the presence of common birds, amphibians, insects and few mammals. Most of the fauna belongs to Schedule II, III and IV categories as per the schedule of Indian Wild Life Protection Act, 1972 and later amended in 1991. Neula, Common langur, Jungle cat, Barking Deer, Lizard, Rat snake, Indian Krait, etc., are noticed in the area along with birds like Pigeon, Crow, Dove, Egret, etc.

11.3 ENVIRONMENTAL IMPACT ASSESSMENT:

The present EIA is a rapid one covering evaluation of the process from environmental angle, review of pollution potential, impact scooping, extent of impact due to carrying out of proposed clay mining and allied activities in Patel Nagar village, under P.S. Mohammad Bazar, Dist. Birbhum of West Bengal.

11.3.1. Impact on Air Quality:

Dust pollution level is localized near the sources. The values reduce sharply with increase in distance from source as well as in the direction of non-predominant wind flow. Thus, maximum value noted at the plot has occurred at source.

The prediction of air quality due to proposed activities through simulation model shows that, the maximum incremental Ground Level Concentration (GLC) of PM10 under control situation will be increased by 13.70 $\mu g/m^3$ to settle around 94.90 $\mu g/m^3$ within the M.L. area. Then onwards the concentration of PM10 gradually decreases as we increase the distance.

Table No.-11.3: Predicted Maximum Ground Level Concentration Values

Sampling Stations	**PM10 ($\mu g/m^3$)**	
	Existing Max. Concentration	Predicted increase in Concentration
A1 (ML Area)	81.20	13.70

It is being observed from the predicted ambient air quality that, due to the proposed mining activities of Proposed China Clay & Fire Clay mines in Patel Nagar village, P.S. Md Bazar, Dist. Birbhum of West Bengal, there will be no appreciable impact on the ambient air quality.

11.3.2. Impact on Water Quality:

As the mining operation shall be done within the mining lease without any discharge of water & without any interference with the nearest water bodies, it will not alter the local drainage pattern and thus, is not expected to have any impact on the local hydrology. So, there will be no effect due to the said project on the surface water.

The mining activities shall be carried out up to a maximum depth of 21m from surface level i.e. 51m – 52m AMSL by the end of the lease period, whereas the ground water table of the

region varies from 6m with maximum at 30m AMSL (during post monsoon period) and thus, mining is expected to have no impact on ground water.

11.3.3. Impact on Noise Level:

In this open cast mining, the various sources of noise mainly attributed to excavation, loading & haulage and plying of transportation vehicles. The noise levels from all these sources are periodical and restricted to a particular operation. The noise measurement data indicate that present noise levels in the study area is within the permissible limits of National Ambient Air Quality Standards. Hence, it may be predicted that there will be a slight impact due to the proposed enhancement of production.

11.3.4. Impact on Land Use:

There might be some impact on the land in the core as well as buffer zone due to the proposed mining activities. However, the economic needs of the local people who are economically backwardness shall be met to a large extent by this mine. Considering the existing Agro-climatic conditions, in future there may be very little possibility for any change in the present land use pattern.

11.3.5. Impact on Biodiversity:

The proposed mining shall have little impact on the existing ecological conditions of the project area. The project area is not coming under any forest land category. However, the pattern of the vegetation in the mining lease is likely to change a bit because of the mining related activities. All preventive measures including plantations will be taken up to reduce the level of noise on the surrounding. After the mine is closed the plantations developed on the abandoned mine area will attract back at least some of the animals displaced/ scared away by the project.

11.3.6. Impact on Demography and Socio-Economics:

The impact on human environment would be beneficial due to project activity, sustenance of employment, additional direct employment opportunity, enhancement of local economy by indirect employment as contract laborers, transporters etc. During land development stage, there would be marginal adverse impact on air environment due to fugitive dust emissions but this would be of short duration and a localized one.

11.4 ENVIRONMENT MANAGEMENT PLAN (EMP):

EMP forms an integral part of the proposed mining activities to minimize the adverse impacts discussed earlier. Implementation of EMP and monitoring of the same at every stage will comply with the environment protection.

11.4.1 Air Quality Management:

The mining activities involve various processes such as extraction of ore, loading & unloading, transportation, etc. which are likely to contribute towards air pollution in the area. The effect is localized and this effect is mostly due to fugitive emission of dust ($PM_{2.5}$ & PM_{10}) particles. As the particles are heavy in nature, they settle easily in the immediate vicinity. SO_2, NOx and CO shall be contributed by the vehicular traffic, which is well below the prescribed limits. The following air pollution control measures are proposed for the mining site;

- The unmetalled hauls road shall be adequately compacted before being put into use.
- Regular water spraying on roads, especially before the start of transportation moment.
- Overloading of the transport equipment's will be prevented in order to stop spillage.
- Trucks carrying fines/ores shall be covered with tarpaulin sheets to prevent fugitive dust generation.
- Continuous cleaning of haul roads & pot holes are regularly filled.
- Dumping areas will be sprayed with water and grass will be immediately planted on the completed dumps to reduce fugitive dusts. To stabilize abandoned dumps, coir matting will be adopted.
- Plantation of wide leaf trees, creepers, tall grasses around lease area, roads and other surrounding barren zones.
- Backfilled areas will be spread with good quality soil and plantation will be made over them in no time.
- Gaseous pollutants in the exhaust fumes generated by the transportation machinery shall be minimized by ensuring vigorous maintenance & stringent overhaul schedule.

11.4.2. Water Quality Management:

Water management (including storm water drainage) scheme (by a network of garland drains/ diversion ditches and catch-pits) has been planned. Following are some measures proposed to be taken to prevent any contamination of nearby surface water;

- Garland drains shall be constructed as much as possible on all sides of quarries and external dumps (depending on contours). The garland drains shall be routed through catch pits and settling tanks to settle out suspended solids in the storm water.
- Retaining walls will be built all-around the external dumps which will have weep holes for passage of storm water to join garland drains.
- Settling pits & drains shall be cleaned periodically, especially before & after rainy season.
- Small grasses & bushes in garland drains will hold back solid particles from draining away.
- Small stone barriers across the drain will check water current and arrest solid particles.
- No overburden or loose sediments will be kept in the working benches particularly during monsoon months.
- Monitoring of nearby perennial nala shall be done at regular intervals & records maintained.
- Effluents from the areas will be diverted through drains for green belt development.
- Sanitary sewage generated in office area shall be treated in septic tanks and soak pit.

Since the ground water table will not be intersected in the course of mining, the impact of mining ground water will be insignificant. Ground water recharge by using rain water shall not be adopted. The pumped out water after the rainy seasons shall be drained into the settling tank and shall be used in sprinkling for dust suppression and plantation.

No wastewater is likely to be generated from the mines other than the surface run off only during rain. Retaining wall and garland drains are constructed around dump to collect rain water. Rain water is allowed to settle in the settling pond and reused within the leasehold for dust suppression & plantation.

11.4.3 Noise Level Management:

The sources for generation of noise in this particular project are movement of vehicles, loading & unloading of materials. The following measures will be taken to minimize the adverse impact of noise, even though negligible within the project area and its surrounding region.

- Diesel powered machineries, which are major source of noise in open cast mining will be properly maintained. Attention shall be paid towards rigorous maintenance of the silencer of the diesel engines.
- Green belt will be developed around the mine to reduce noise exposure level.
- Dumper drivers will be issued earplugs and earmuffs. Duty hours of operators of noisy machinery will be regulated to keep their noise exposure levels within limits.
- Provision of sound proof cabins for the workers deployed on machines producing higher level of sound like dumpers, shovels etc.

11.4.4 Biodiversity Management:

The floral population in the core zone is moderate. Plantation on safety zone, dumps, non-mineralised zone and backfilled area will enhance the greenery of the lease hold. Any loss of vegetation will be more than compensated by green belt development plan formulated for area. Plant species selected for land reclamation should not only be able to flourish in the area but must also have rapid growth rate, evergreen habit, large crown volume and small pendulous leaves with hairy surfaces. All these traits are difficult to get in a single species. Therefore, a combination of these is sought while selecting trees for land reclamation. It will enhance the green cover and vegetation diversity in and around the mine.

From the field study it was evident that there are no endangered animals within the core as well as buffer zone. The forests in the buffer zone support faunal species which have become habituated to prevailing conditions. After the mine is closed the plantations developed on the abandoned mine area will attract back at least some of the animals displaced/ scared away by the project.

11.4.5 Occupational Safety and Health:

To avoid any adverse effect on the health of workers due to dust, noise and vibration etc. extensive measures shall be adapted in relation to safety aspect. Periodical medical examination of all workers by medical specialists shall be conducted. The most significant occupational

health impacts are Noise Induced Hearing Loss (NIHL) and Occupational Lung Disease (OLD) due to inhalation of dust. As per Mines Rules, 1955, medical examination of employees at the initial stage and periodically, shall be done by a team of qualified medical officers provided by the project proponent.

All safety measures like provision of rest shelters for mine workers with amenities like drinking water, training on use of safety appliances, distribution of safety awards, posters and slogans related to safety, etc. shall be undertaken. Regular maintenance and testing of all equipment's shall be carried out as per manufacturer's guidelines to prevent any accident. Regular medical check-up camps shall also be arranged for detection of occupational diseases and other disease in the nearby rural population.

11.4.6 Risk Assessment & Disaster Management:

For effective disaster management, it is necessary to evaluate risks at the mines in a careful manner and then take steps for mitigating them. Whatever we may plan to do, 'Safety of the People' shall assume the paramount importance in the midst of all our planning. Following are some major disaster preventive steps;

- Machineries engaged in both transport and non-transport activities can be a cause of accident. It can only be avoided by creating awareness among the employees.
- As the dumps attain final position, the slopes will be terraced and proper vegetation will be laid which will cause binding of the soil preventing any slope failure. Retaining walls will be built all-around the external dumps which will have weep holes for passage of storm water to join garland drains.
- In case of any electrical fire, the personnel on duty shall shut down all the electrical equipment's and inform the mines manager. After fully extinguishing the fire and affecting necessary repairs the power supply will be restored.

11.4.7 Socio-Economic Measures:

There will be no adverse effect of mining on the socio-economic status of the people as the inhabitants adjacent to the area as the workers will be mainly local. The employment avenues due to mining will definitely hike the socio-economic status of the local people. Apart from overall beneficial impact of the project on the local people of the region, it is felt necessary to

augment facilities in the fields of education, health and social awareness including concern for ecology.

11.5 CONCLUSION:

Due to the other similar projects, the improvement in socio-economic status of the region has been noticed. The area is being represented mostly by the people of backward communities. The continuation of mining activity shall play a vital role in further improving the socio-economic status and life style of these local people of backward communities.

The project shall not have any such significant adverse impact on any of the environmental or socio-economic parameters. The project aims at carrying sustainable mining activity with a target to develop human and environment together with eco- friendly mine productivity. The implementation of EMP and continuous monitoring of implementation schedule as per set target shall ensure better environmental quality in the project area.

CHAPTER-12

DISCLOSURE OF CONSULTANT ENGAGED

CHAPTER -12
DISCLOSURE OF CONSULTANTS

12.1 Undertaking

Pacific Scientific Consultancy Pvt. Ltd. (PSCPL) hereby gives the undertaking that the prescribed TORs have been complied with and that the data submitted in this report is factually correct.

12.2 Details of Consultant

The EIA/EMP Report is based on the project report given by M/s N. P. Minerals. In preparation of this report some experts and advisor were involved. All the instruction of TOR are complied as far as possible relevant to our project characteristics. The name of Consultants/Experts is given below.

- Dr. Mohit K. Ray
- Dr. Sumit Baran Chowdhury
- Mr. Dines Bhunia
- Dr. Ajoy Paul
- Mr. Biswajit Rakshit
- Dr. Paulomi Das
- Mr. Shubhradeep Moitra
- Mr. Upamannyu Banerjee
- Mr. Subhajit Pal
- Mr. S. Devi Prasad
- Mr. Shahbaz Malik

For monitoring report, we have taken the services of Environmental laboratory approved by W.B.P.C.B. The monitoring and analysis of Air, Water, Soil and Noise is done by M/s Envirocheck, Kolkata.

For Pacific Scientific Consultancy Pvt. Ltd.

Mr. B. Rakshit
(**EIA Coordinator**)

List of Experts along with field:

	Name of Experts		**Area of Experts**	**Signature**
1.	Ajoy Paul	:	SHW, WP	
2.	Mohit Kumar Roy	:	AP, AQ, SHW, RH	
3.	Subhajit Pal	:	NV	
4.	Upamannyu Banerjee	:	SE	
5.	Sumit Baran Chowdhury	:	AP, WP, SHW, AQ	
6.	Biswajit Rakshit	:	AP, WP, SHW, AQ	
7.	Shahbaz Malik	:	HG, GS	
8.	Dines Bhunia	:	AP, WP, SHW, AQ	
9.	Paulomi Das	:	EB, SHW, WP	
10.	Shubhradeep Moitra	:	AP, WP, SHW, AQ	
11.	S. Devi Prasad	:	LU	

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SL. No.	Name and Address EIA Consultant Organization	Scope of Accreditation			
		As per NABET Scheme			Project or Activity as per Schedule of MoEFCC Notification dated September 14, 2006 and subsequent Amendments
		Sect Num ber	Name of Sector	Categ	
1	Akshar Consultants **Address:**813, Sakar-5, Mithakhali Rly. Crossing, Off. Ashram Road, Ahmedabad – 380009 **Email:** akshar.consultants@vsnl.net **Tel:** 079 – 26583525,09825036435 **Remarks:**Conditions apply				
2	Environ India **Address:**UNS-75, Unnayan Commercial Complex, 1050/1, Survey Park, Kolkata – 700075 **Email:** info@environindia.org , environ.india@gmail.com **Tel:**033-65363212, 09831005864 **Remarks:**Conditions apply				

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SL. No.	Name and Address EIA Consultant Organization	Scope of Accreditation As per NABET Scheme Sect Number / Name of Sector / Categ / Project or Activity as per Schedule of MoEFCC Notification dated September 14, 2006 and subsequent Amendments
3	Environment & Power Technologies Private Limited **Address:**Flat No. 3, 2nd Floor,No.10, N S Bhavan , 4th Main, 4th Cross, Gandhinagar, Bangalore - 560 009 **Email:** enviropowertech@yahoo.co.in **Tel:**080 – 22260333,09448975813 **Remarks:**Conditions apply	
4	K.R. S Enterprises **Address:**# 66/15, 1st floor, 1st cross,1st Main Road, R.T.Nagar post, Ganganagar, Bangalore-560 032. **Email:** krsenterprises09@gmail.com; krsenterprises09@gmail.com. **Tel:**080- 23437714, 08050719833 **Remarks:**Conditions apply	
5	Pacific Scientific Consultancy Pvt. Ltd. **Address:**14/5, Dum Dum Cossipore Road, Kolkata – 700074 **Email:** pscpl.env@gmail.com **Tel:** 033- 25470810, 09830067043 **Remarks:**Conditions apply	

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DISTRICT: NORTH 24 PARGANAS

IN THE HIGH COURT AT CALCUTTA

CONSTITUTIONAL WRIT JURISDICTION

APPELLATE SIDE

SUBJECT MATTER RELATING TO: RESIDUARY

FILING CLERK HIGH COURT 19 APR 2016 CALCUTTA

W.P. No. 7365 (W) of 2016

19.04.2016

In the matter of:

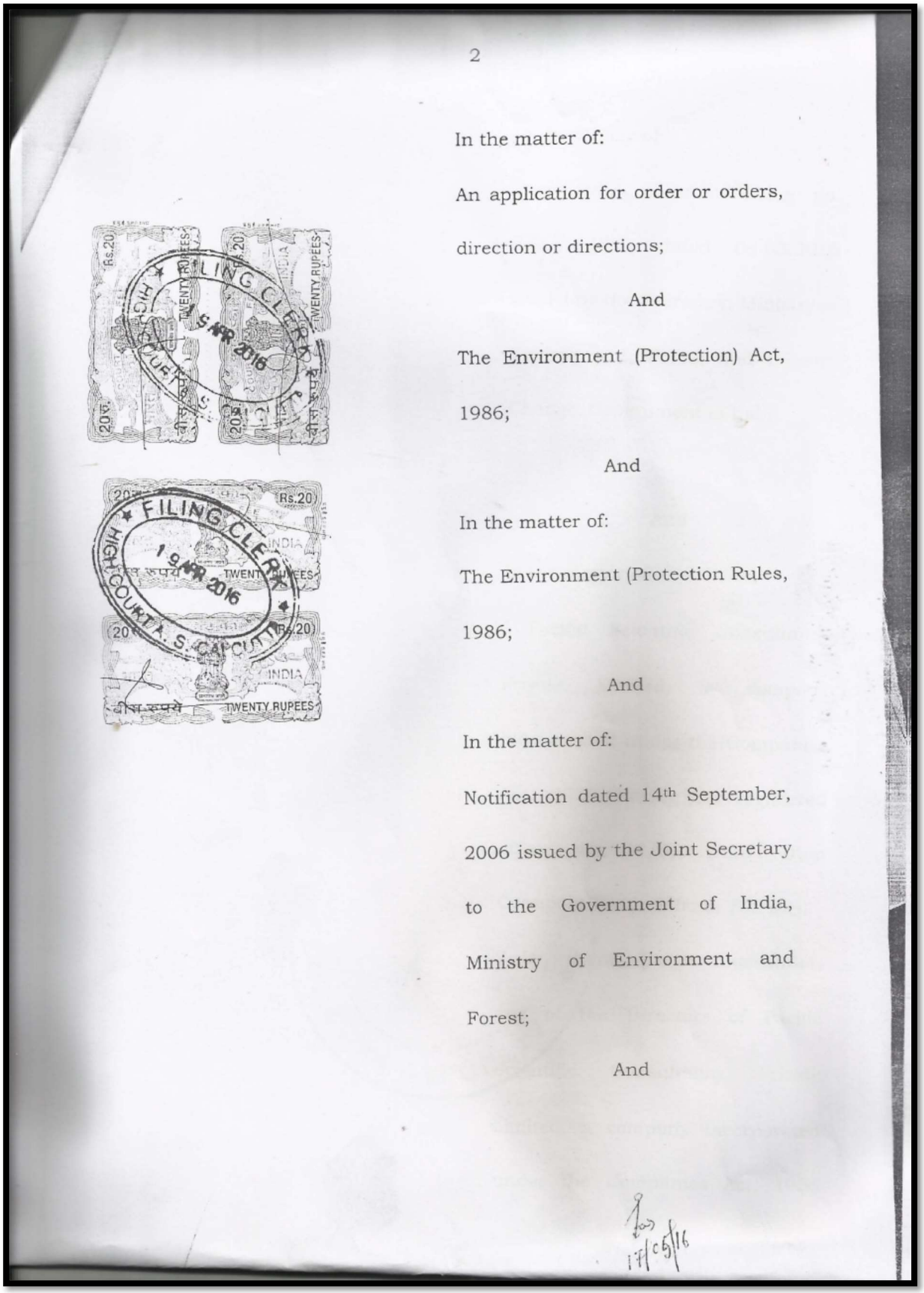
An application under Article 226 of the Constitution of India;

And

In the matter of:

An application for and/or in the nature of writ of Mandamus and/or Certiorari and/or any other appropriate writ or writs;

And



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In the matter of:

An application for order or orders, direction or directions;

And

The Environment (Protection) Act, 1986;

And

In the matter of:

The Environment (Protection Rules, 1986;

And

In the matter of:

Notification dated 14th September, 2006 issued by the Joint Secretary to the Government of India, Ministry of Environment and Forest;

And

In the matter of:

Purported notification being no. S.O. 648(E) dated 03.03.2016 issued by the Secretary, Ministry of Environment, Forest and Climate Change, Government of India.

And

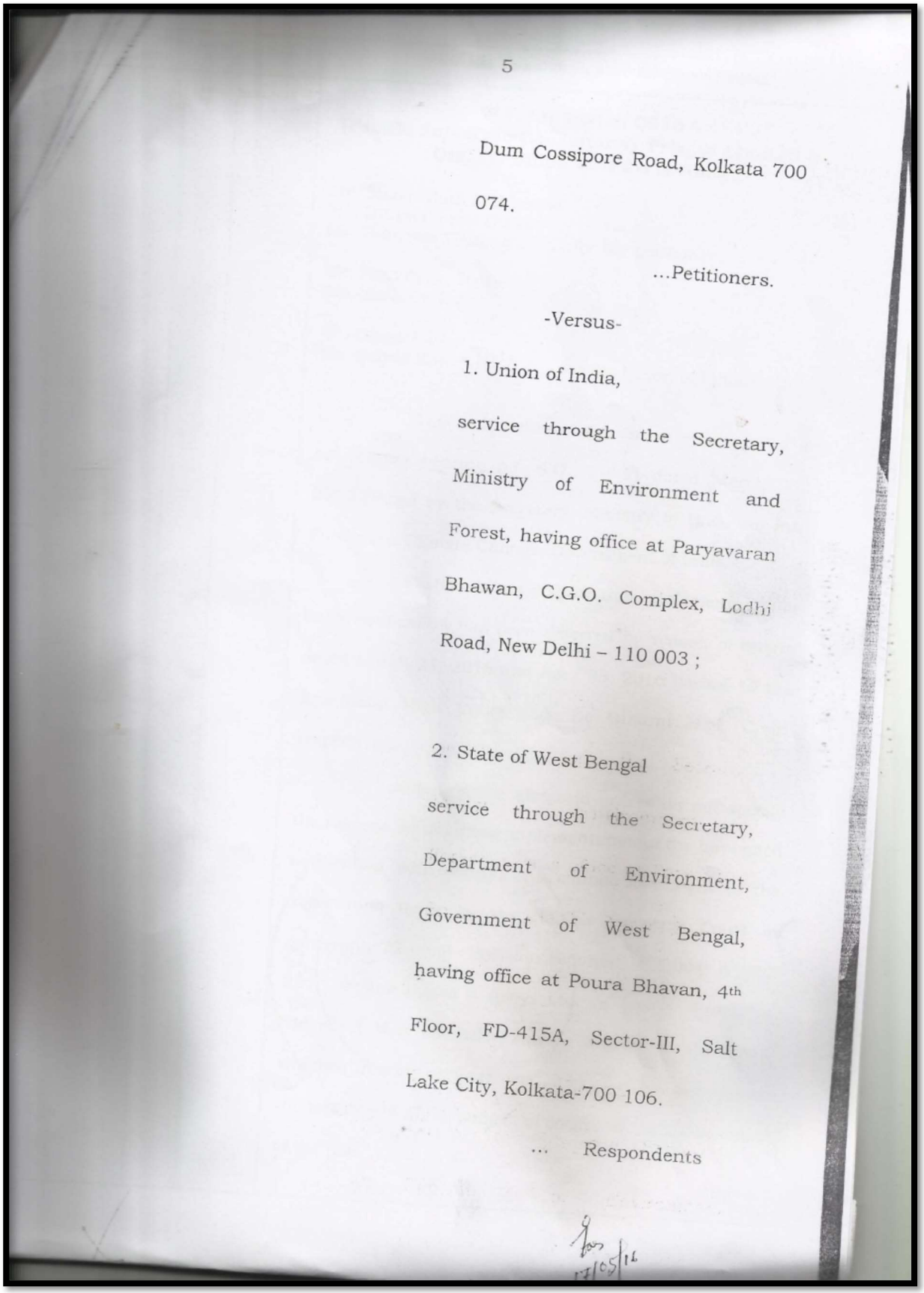
In the matter of:

1. Pacific Scientific Consultancy Private Limited, a company incorporated under the Companies Act, 1956 having its registered office at 14/5, Dum Dum Cossipore Road, Kolkata 700 074.
2. Dr. Sumit Baran Chowdhury, one of the Directors of Pacific Scientific Consultancy Private Limited, a company incorporated under the Companies Act, 1956

having his office at 14/5, Dum Dum Cossipore Road, Kolkata 700 074.

3. Biswajit Rakshit,
one of the Directors of Pacific Scientific Consultancy Private Limited, a company incorporated under the Companies Act, 1956 having his office at 14/5, Dum Dum Cossipore Road, Kolkata 700 074.

4. Dr. Mohit Kumar Ray,
Son of Late Mohini Mohan Ray,
One of the coordinators of Pacific Scientific Consultancy Private Limited, a company incorporated under the Companies Act, 1956, having his office at 14/5, Dum



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Dum Cossipore Road, Kolkata 700 074.

...Petitioners.

-Versus-

1. Union of India,

service through the Secretary, Ministry of Environment and Forest, having office at Paryavaran Bhawan, C.G.O. Complex, Lodhi Road, New Delhi – 110 003 ;

2. State of West Bengal

service through the Secretary, Department of Environment, Government of West Bengal, having office at Poura Bhavan, 4th Floor, FD-415A, Sector-III, Salt Lake City, Kolkata-700 106.

... Respondents

for
11/05/11

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Noting by Office or Advocate	Serial No.	Date	Office notes. reports. Orders or proceedings with signature
	46 Pg	28.04.2016	**W.P.7365(W) of 2016** **(Pacific Scientific Consultancy Private Limited & Ors. vs. Union of India & Anr.)** Mr. Shakti Nath Mukherjee Mr. Durga Prosad Dutta Mr. Sumanta Ganguly.....for the petitioner Mr. Pranab Kr. Datta Ms. Suchitra Ray.....for the State Mr. Bhudeb Bhattacharya Ms. Sabita Roy.....for the Union of India This writ petition registers a challenge to a notification bearing no. S.O. 648(E) dated March 03, 2016 issued by the Secretary, Ministry of Environment, Forest and Climate Change, Government of India. Parties do not dispute that implementation of such notification has been deferred by reason of orders dated March 21, 2016 and April 05, 2016 passed by the Karnataka High Court and the Gujarat High Court respectively. Although the aforesaid orders do not specify the reasons for deferring implementation of the impugned notification with clarity, one cannot lose sight of the observation made by the Hon'ble Supreme Court in paragraph 22 of the decision reported in (2004) 6 SCC 254 : Kusum Ingots & Alloys Ltd. vs. Union of India to the effect that an order staying a parliamentary Act, whether interim or final, would have effect throughout the territory of India, subject of course to the applicability of the Act. DD.
17/05/16			

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Noting by Office or Advocate	Serial No.	Date	Office notes. reports. Orders or proceedings with signature

There is no reason to pass any further interim order on this writ petition. The notification, insofar as the petitioners are concerned, cannot be implemented in view of the order passed by the Gujarat High Court, which is in general terms and not restricted to the petitioners therein.

Let affidavits-in-opposition be filed by the respondents within two weeks after vacation; reply thereto, if any, may be filed within two weeks thereafter.

The writ petition shall be treated as ready for hearing on expiry of the period fixed above for exchange of affidavits and thereafter the parties shall be at liberty to mention it for consideration before the appropriate bench.

If, however, the interim order of the Gujarat High Court is vacated, the petitioners shall have the liberty to seek interim order on the self-same application.

Sd/- Dipankar Datta, J.

(DIPANKAR DATTA,J.)

17/05/16