Draft Environment Impact Assessment & Environment Management Plan
Kumirkola Sand Mine

(on the Riverbed of Damodar River, DSR Potential Code: PBBD_GL2_DA_05

at

MOUZA – KUMIRKOLA, BLOCK - KHANDAGHOSH
DISTRICT- PURBA BARDHAMAN, STATE - WEST BENGAL

SAND BLOCK CODE: MIN_EBUR_45

Mine Lease Area: 10.24 Ha
Production: 69071.394 CUM / 183039.19 TON (MAX.)
Mine Lease period: 20 years
Mining Plan period: 5 years
Study Period: (December2024 to February2025

[Project falls listed under activity 1(a) Mining of Minerals of EIA Notification, 2006 and falls under Category 'B1' as the area of mining is 10.24 Ha]

APPLICANT

WEST BENGAL MINERAL DEVELOPMENT AND TRADING CORPORATION LIMITED
(GOVERNMENT OF WEST BENGAL UNDERTAKING)

CONSULTANT	
SPPL™ Engineering the future with expertise	SATHI PLANNERS PRIVATE LIMITED 6th Floor, Damro Furniture, Opposite to Shakti Petrol Pump Garikhana Chowk, Harmu Road, Ranchi, Jharkhand – 834001

REVIEW AND REVISION HISTORY

History of revisions of the present report:

Table I: History of the Revisions

S.No.	Rev.	Date	Modifications	Remarks
1.	Rev.00 Draft	11.05.2025	Draft EIA/EMP Report	Report has been prepared by team M/s Sathi Planners Pvt. Ltd. and all comment of reviewers has been incorporated in Draft EIA/EMP Report.

DOCUMENT NO. 2020_01_001

Table II: Record of Review

Rev.	Date	Description	Review-1	Review-2	Approval
Rev.00	11.05.2025	Draft EIA/EMP Report	Mr. K.M. Khare	Mr. A. K. Sinha	Mr. Abhijit Bardhan
	-	-			

DOCUMENT NO. 2020_01_001

This Report has been prepared by **Sathi Planners Pvt. Ltd**. on behalf of and for the use of the **West Bengal Mineral Development and Trading Corporation Limited (WBMDTCL),** with due consideration and skill as per our general terms and conditions of business and terms of agreement with the **WBMDTCL.**

DECLARATION BY CONSULTANT

NABET ANNEXURE – VII

Declaration by Experts contributing to the EIA of Kumirkola Sand Mine in the River bed of Damodar, Purba Bardhaman, West Bengal.

Declaration by Experts contributing to the EIA:

I, hereby, certify that I was part of the EIA team in the following capacity that developed the above EIA.

EIA Co-ordinator:

Name: Mr. K M Khare

Signature with date: **13.05.2025**

Period of involvement: July, 2024 to till date

Contact information: 6th Floor, Damro Furniture, Opposite to Shakti Petrol Pump Garikhana Chowk, Harmu Road, Ranchi, Jharkhand – 834001

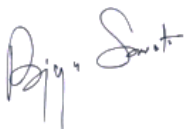
Contact no: 9835877778

Email: info@sathiplanners.in

Functional Area Experts (FAEs):

Sl. No	Functional Areas	Name of the expert/s	Involvement (Period & Task)	Signature
1.	**AP**	**FAE** Mr. KM Khare	a) **July, 2024 to till date** Identifying the sources of emissions and mitigation measures. b) Inventorisation of point Source Stacks emissions details. c) Site-specific micro-metrology Monitoring. d) Ambient Air Quality (AAQ) monitoring Impact predictions and mitigations. e) Budget Allocation	

Sl. No	Functional Areas	Name of the expert/s	Involvement (Period & Task)	Signature
2.	**WP**	**FAE:** Mr. RC Srivastava	a) **July, 2024 to till date** Surface water and ground water quality monitoring and assessment, impacts on Water environment and mitigations. b) Identification, characterisation of effluent streams and treatments there of Water balance and conservation measures c) Budget Allocation	
3.	**AQ**	**FAE:** Dr. Jhumoor Biswas	**July, 2024 to till date** Processing of site- specific micro-meteorological data a) Collection and use of inversion/mixing Height data for modelling. **b)** Air dispersion modelling for prediction of GLCS due to PM_{10}, SO_2 and NOx	
4.	**SW**	**FAE:** Mr. Subhashish Parida	**July, 2024 to till date** a) Non-hazardous solid wastes generation, recycling and disposal b) Storage and management of hazardous solid wastes c) Budget Allocation	
5.	**SE**	**FAE:** Dr. D K Khan	**July, 2024 to till date** Determination of demographic profile including socio economy & livelihood a) Assessing the changes in socio economic pattern b) Budget Allocation	
6.	**EB**	**FAE:** Prof. S.C. Santra	**July, 2024 to till date** Biological environment status in respect of terrestrial fauna and aquatic eco system a) Impact on ecological environment	
7.	**HG & GEO**	**FAE:** Mr. Santhosh Mandal	**July, 2024 to till date** a) Ground water resource assessment	

Sl. No	Functional Areas	Name of the expert/s	Involvement (Period & Task)	Signature
			b)Impact on ground water potential and mitigation measures for avoiding Ground water contamination.	
8.	**HW**	**FAE:** Mr. A.K. Sinha	**July, 2024 to till date** a) Non-hazardous solid wastes generation, recycling and disposal b) Storage and management of hazardous solid wastes c) Budget Allocation	
9.	**NV**	**FAE:** Mr. K.M. Khare	**July, 2024 to till date** a) Analysis of ambient noise quality data b) Impact due to plant noise and abatement measures	
10.	**LU**	**FAE:** Dr. Somenath Bhattacharyya	**July, 2024 to till date** a) Analysis of data related to land use pattern b) Land use map development. **c)** Impact on land environment in respect to land form change	
11.	**SC**	**FAE:** Mr. Gopal Chandra Das	**July, 2024 to till date** Monitoring, analysis and characterization of soil a) Assessment of impact on soil quality and mitigation measure.	
12.	**RH**	**FAE:** Mr. Bijayen Srivastava	**July, 2024 to till date** Identification of hazardous prone areas a) Environment risk evaluation **b)** On-site and Off-site emergency planning	

Declaration by the Head of the accredited consultant organization/authorized person

I, Abhijit Bardhan, hereby, confirm that the above-mentioned experts prepared the EIA of "Kumirkola Sand Mine on the River Damodar" at mouza Kumirkola, Block – Khandaghosh, Dist. – Purba Bardhaman district of West Bengal, hereby, certify that I was a part of the EIA team in the following capacity that developed the above EIA.

I, also confirm that I shall be fully accountable for any misleading information mentioned in this statement.

Name: **Abhijit Bardhan**

Signature

Designation: **Chief Executive Officer**

Name of the EIA Consultant Organization: Sathi Planners Pvt. Ltd., QCI/NABET Accredited Environment Consultancy

NABET Certificate No. & Issue date: **NABET/EIA/ 2225/RA 0264** issued on **06.12.2022** and valid up to 14.02.2025.

NABET CERTIFICATE

QUALITY COUNCIL OF INDIA
Creating an Ecosystem for Quality

National Accreditation Board for Education and Training

Certificate of Accreditation

Sathi Planners Private Limited, Ranchi

Lake Avenue, Behind Cambrian Public School, Kanke Road, Ranchi-834008, Jharkhand

*The organization is accredited as **Category-B** under the QCI-NABET Scheme for Accreditation of EIA Consultant Organization, Version 3: for preparing EIA-EMP reports in the following Sectors –*

S.No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals including opencast	1	1 (a) (i)	A

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in RAAC minutes dated April 12, 2022 and supplementary minutes Nov 15, 2022 posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no QCI/NABET/ENV/ACO/22/2598 dated Dec 06, 2022. The accreditation needs to be renewed before the expiry date by Sathi Planners Private Limited, Ranchi following due process of assessment.

Sr. Director, NABET
Dated: Dec 06, 2022

Certificate No.
NABET/EIA/2225/RA 0264

Valid up to
Feb 14, 2025

For the updated List of Accredited EIA Consultant Organizations with approved Sectors please refer to the QCI-NABET website.

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Annexure 1	ToR letter
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Annexure 7	Cluster certificate
Annexure-8	Undertaking of CER

TERMS OF REFERENCE -STATUS OF COMPLIANCE

Point wise compliance of terms of reference (ToR) issued by SEIAA, West Bengal with respect to proposal no. SIA/WB/MIN/490852/2024 dated 16/08/2024 has the ToR Identification No. of TO24B0107WB5607992N dated 31.12.2024 with the File No.: EN/T-II-I/204/2024 are provided ins table below:

S. No.	TOR Point	Reply	Citation
Specific 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 came into force w.r.t. the highest production achieved prior to 1994.	Not Applicable. The project proposal pertains to fresh mining of river sand by open cast method on the allotted mine lease area in the seasonal river Sakari in the Mouza Kumirkola, Block – Khandaghosh, Dist. – Purba Bardhaman district of West Bengal.	--
2	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	A provisional lease grant order has been issued by the Department of Industries, Commerce and Enterprises, Government of West Bengal, to WBMDTCL vide letter No.-430-ICE-12011(99)/27/2022-MINES dated 05.07.2023 in reference to Memo No. MDTC/SAND/003/Part-8/1656 dated 26.06.2023. WBMDTCL has further allocated Sathi Planners Private Limited the duty to prepare the Mining Plan and Environment Clearance of the said lease area vide Revised Work Order No. MDTC/SAND/003/Part-8/275 dated 06.02.2024 in reference to NIT No. MDTC/SAND/002(IV)/1306 dated 22.05.2023, to pursue	Chapter-1

S. No.	TOR Point	Reply	Citation
		sustainable scientific mining with minimum possible environmental impacts.	
3	All documents including approved mine plan, EIA and public hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management and mining technology and should be in the name of the lessee.	Complied All documents are synchronizing with one another in terms of mine lease area, production, waste generation and its management and mining technology. Both the Approved mining plan and Mine Lease area in the name of West Bengal Mineral Development Corporation.	
4	All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/Toposheet 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 corners of the coordinates of ML area are superimposed on a High Resolution Toposheet of survey of India F45D12 (73M/12). The land use land cover of the study area has been determined using the Web Map Service of Bhuvan, NRSC. Imagery is provided at page no C3-59 and clearly shows the land use and other ecological features of the study area both for the core and buffer zone.	Fig.:3.8 Page C3-59
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.	All the maps are in 1:50,000 scale. The land forms of the area, important water bodies, streams and rivers etc. are shown in land use land cover map given at figure no 3.8 page no C3-68 of Chapter-3. Geological map is given in Chapter -3, figure 3.9	Fig.:3.9 Page C3-60
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	The provisional lease grant order has been issued by the Department of Industries, Commerce and Enterprises, Government of West Bengal, to WBMDTCL vide letter No.-	Chapter-1

S. No.	TOR Point	Reply	Citation
	diversion for mining should have approval from State land use board or the concerned authority.	430-ICE-12011(99)/27/2022-MINES dated 05.07.2023 in reference to Memo No. MDTC/SAND/002(IV)/1306 dated 22.05.2023. Details of the same incorporated in this Final EIA/EMP Report.	
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.	Noted; Details regarding Environmental Policy carried out by lease holder are incorporated in this Final EIA/EMP Report.	--
8	Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.	Issues relating to Mine Safety will be followed as per prescribed Rules & Regulation. Subsidence Study is not applicable as this is a River Bed Mining Project.	Chapter-7
9	The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained	Study area comprises of 10 km radius from the proposed riverbed mining project area.	Chapter-2

S. No.	TOR Point	Reply	Citation
	in the EIA such as waste generation etc. should be for the life of the mine/ lease period.	Details regarding core & buffer zone incorporated in this EIA/EMP Report. Data like Reserve estimation, Waste generation etc. has been incorporated in this Final EIA/EMP Report.	
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 are incorporated in this Final Draft Report. No wildlife sanctuary and national park, migratory routes of fauna exist in the study area. Land use plan of the mine lease area to encompass preoperational, operational and post operational phases are incorporated in this Draft EIA/EMP Report. There will not be any permanent change in land use as mining activity involves collection of deposited sand which will be replenished annually during monsoon.	Chapter-3 Chapter-2
11	Details of the land for any outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given.	No waste will be generated due to mining activities as it involves only collection of RBM from river bed. As per revenue record area, proposed area falls under Jad Khad, hence therefore R&R is not required.	Chapter-2

S. No.	TOR Point	Reply	Citation
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 proposed area falls in Jad Khad as per revenue record and no forest land is involved. Application regarding confirmation of no forest land has been submitted to West Bengal Forest Department. Same is under process with concerned department.	--
14	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	
15	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.	
16	The vegetation in the RF/ PF areas in the study area, with necessary details, should be given.	Detail of vegetation in the study area is described in Chapter 3.	Chapter-3

S. No.	TOR Point	Reply	Citation
17	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.	Ecology and biodiversity Study have been carried out by the Ecology and Biodiversity Expert (NABET/QCI Approved) in and around the lease area to study the wild life of the area. Impacts on ecology & biodiversity and its mitigation measures described in Chapter 4. None of the plants belongs to endemic or endangered categories. Most of the plants are widely distributed in village settlements, river banks and degraded landform areas.	Chapter-4
18	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, 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 State Wildlife Department/ Chief Wildlife Warden under the Wildlife (Protection) Act, 1972 and copy furnished.	No National Parks, Sanctuaries, Biosphere Reserves Wildlife Corridors, Tiger/Elephant Reserves/Critically Polluted areas are falling within 10 Km of the study area.	--
19	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, duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna	The biological study was under taken by Ecology & Biodiversity Expert. A survey was conducted to study the flora around 10 km radius. Some of the information was gathered from the local habitants.	Chpater-3

S. No.	TOR Point	Reply	Citation
	present. In case of any scheduled-I fauna found in the study area, the necessary plan for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.	The dominant trees & shrubs terrestrial tested in the Table - 3.17. The faunal wealth of the area in wild is very sparse as there is extreme human interference in both terrestrial aquatic habits. However, some record of butterflies, amphibians, reptiles, avifauna made are provided in Table 3.18. Aquatic habitats in river bed where shallow water bodies are there, a lot of aquatic marshy plants, plautons, benthos, fishes, water birds etc. are often seen. The most common biota area listed in Table 3.19. None of the plants belongs to endemic or endangered categories. Most of the plants are widely distributed in village settlements, river banks and degraded landform areas.	
20	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.	Not applicable. The project site is neither falling in proximity to the area declared as Critically Polluted nor falling in Aravali Range.	
21	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	Not Applicable, since the project site does not come under coastal area.	

S. No.	TOR Point	Reply	Citation
	falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).		
22	R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/ National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action program prepared and submitted accordingly, integrating the sectoral program of line departments of the State Government. It may be clearly brought out whether the village located in the mine lease area will be shifted or not. The issues relating to shifting of Village including their R&R and socio-economic aspects should be discussed in the report.	Not applicable. As proposed project is for riverbed sand mining on allotted mine lease area of 10.24 Ha. at the Sakari seasonal river, no project affected people.	
23	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	Complied. Baseline data was collected for summer season (December'24 to February'25) for AAQ and others and presented in the EIA Report. Site specific meteorological data was also collected for the same period. Date wise monitoring reports are enclosed as Annexure-3.	**Annexure-3**

S. No.	TOR Point	Reply	Citation
	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 PM_{10}, particularly for free silica, should be given.	Mineralogical composition of PM_{10} particularly for Free silica is incorporated in Table no 3.5 at page no C3-44 of Chapter-3.	
24	Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing predominant wind direction may also be indicated on the map.	Air quality modeling was carried out by using, American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) to calculate air pollutant concentrations at gridded receptor locations for prediction of impact of the project on the air quality of the area. The wind rose diagram showing predominant wind direction of Study Period is provided at Figure 4.1 on page C4-88 of Chapter 4 of the EIA/EMP report. Details are given in Chapter-4.	Chapter-4
25	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 drinking & domestic water need for the people engaged in project activity have been envisaged to be met from nearby villages Pasai, Danre having wells and tube wells and by Water Tanker. Water requirement in this project site is 31.29 Kld **Sl. No. | Purpose | Water requirement (KLD)**	Para 2.7 Chapter-2 Page -37

<table>
<tr><th>S. No.</th><th>TOR Point</th><th>Reply</th><th>Citation</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>1.</td><td>Drinking & domestic</td><td>5.552</td></tr>
<tr><td>2.</td><td>Dust Suppression</td><td>0.39</td></tr>
<tr><td>3.</td><td>Greenbelt</td><td>25.35</td></tr>
<tr><td colspan="2">Total</td><td>31.29</td></tr>
</table>
</td><td></td></tr>
<tr><td>26</td><td>Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.</td><td>Not applicable.
The project does not consume any process water except for drinking, dust suppression and plantation. Minimal uses of groundwater resources are envisaged.</td><td>--</td></tr>
<tr><td>27</td><td>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.</td><td>The project does not consume any process water except for drinking, dust suppression and plantation. Plantation is proposed, which will increase the water holding capacity and help in recharging of ground water.</td><td>Chapter-4</td></tr>
<tr><td>28</td><td>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.</td><td>No waste water is generated from the mining activity as the project only involves lifting/excavation of Sand and transportation directly to the consumers. Only wastewater generation will be sanitary wastewater, which will be treated in movable bio toilets. No adverse effect on surface water source is envisaged.</td><td>Chapter-4</td></tr>
<tr><td>29</td><td>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</td><td>The Central Ground Water Board regularly checks the ground water levels in this locality. During May 2012, the depth to water levels in wells tapping shallow aquifer ranged from 4.55 to 8.00 m bgl. Depth to ground water levels during the post</td><td>Chapter-3</td></tr>
</table>

S. No.	TOR Point	Reply	Citation
	groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. 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.	monsoon period (November 2012) varied between 2.25 and 8.34 m bgl. The water table will not be intersected during mining in the riverbed as ultimate depth is limited up to 1.5 meters and the water table is 5-10 m bgl. Proper analysis/Monitoring will be done to check the ground and surface water. Mining shall be discontinued when water is encountered during mining.	
30	Details of any stream, seasonal or otherwise, passing through the lease area and modification /diversion proposed, if any, and the impact of the same on the hydrology should be brought out.	Not applicable. No stream, seasonal or otherwise, passing through the lease area hence no stream modification/ diversion has been proposed.	--
31	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.	Depth to ground water levels during the post monsoon period (November 2012) varied between 2.25 and 8.34 m bgl. Depth of working restricted to 3 m or water level whichever is less Schematic diagram of mining depth is incorporated in figures on page no 4.17 at page no C2-29 &30 of **Chapter-2**.	Chapter-3
32	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 river bank area near the mining zone and transport route from the river bank to lease road will be properly developed and also cover with greenbelt to arrest the spread of dust & sand mass during mining operation. The common board leaved native evergreen plant species will be selected in planting in greenbelt area. A time bound Progressive Greenbelt Development Plan has been prepared in a tabular form (indicating the linear and	--

S. No.	TOR Point	Reply	Citation
	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.	quantitative coverage, plant species and time frame) and given in the para 4.6 at page no. 104 in chapter 4. Zone-wise plan of plantation indicating the number of trees and corresponding length is given in the table no 4.7 at page no C4-105 of chapter 4. Capital Budget of Rs. 84.50 lakhs for greenbelt development and annual budget of Rs. 1.0 lakh for maintenance of greenbelt has been kept.	
33	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 traffic study was carried out for two locations SH-8 for 24 hours which is near to the proposed plant and is a medium for transportation of sand from the mines. The result of the traffic study has been assessed as per Indian Road Congress Guidelines IRC 64-1990 and are shown in Table 3.20 and the pie chart representation of total vehicles during baseline studies for both the highways is depicted in Fig.3.14 The transportation map is shown in Fig. 3.15. No change in V/C ratio is expected during mining operation when compared with the existing scenario. However, proper traffic management plan will be adopted to minimize the impending impacts.	Chapter-3
34	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA report.	In order to provide the rest to the workers working in the area and to provide tea etc., the arrangement shall be made to install a rest shelter cum canteen. The size of the rest shelter	

S. No.	TOR Point	Reply	Citation
		will be 10mx3m along with first-aid facility, temporary office structure and Portable Bio-toilets, etc.	
35	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.	Implementation of reclamation and rehabilitation of mined out area or Progressive Reclamation Plan is not required as river sand is replenished/reclaimed every year during rainy season. However, mitigation measures envisaged to maintain the aquatic condition of the surroundings are provide in Clause 4.7 of Chapter 4.	Chapter-4
36	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area May be detailed.	Occupational health and safety monitoring programs shall verify the effectiveness of prevention and control strategies. A team of qualified doctors and nurses will visit periodically for health checkup of all the workers, team and its record will be maintained properly. Health & Safety aspects shall be re-assessed on annual basis. The workers will be provided all necessary PPE, especially dust masks for their safe guard from dust, Ear Plugs/Ear Muffs for noise, boots etc. The project specific occupational health mitigation measures are detailed out in Clause 7.7 of Chapter-7.	Chapter-7
37	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial	The occupational health and safety monitoring program shall include to carryout inspection and testing of all safety features and hazard control measures and Surveillance of	Chapter-7

S. No.	TOR Point	Reply	Citation
	measures should be detailed along with budgetary allocations.	workers health. Regular Health check-up camps will be organized. Health of the population in the impact zone will be periodically checked and evaluated for probable impact of the mining operation, if any. Details given in Chapter 7 of this EIA/EMP report.	
38	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.	A significant benefit to the socio-economic environment is likely to be created by project activity as it will provide employment to nearly 26workers during the operation phase along with sanitations (toilets) and drinking water facility at Village Pasai, assist formation of Village Working Group (VWG), Mahila mandal etc. and in organizing sports & cultural activities, and thus. Organizing sports & cultural activities Mining and transportation of sand will generate indirect employment in the area of small shops, dhabas, repair garage etc.	
39	Detailed environmental management plan 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.	Measures to mitigate the environmental impact which inter-alia included the impacts on environment change of land use, occupational health, air, water soil, noise, Socioeconomic and ecology; incorporated in chapter 4. Budget for implementation of mitigation measures proposed is given in Chapter-10	Chapter-4 Chapter-7

S. No.	TOR Point	Reply	Citation
40	Public hearing points raised and commitment of the project proponent on the same along with time bound action plan to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.	Will be incorporate in the final EIA/EMP Report of the Project.	
41	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. No litigation against the Company	
42	The cost of the project (capital cost and recurring cost) as well as the cost towards implementation of EMP should clearly be spelt out.	The capital cost of the project is. Rs. 28,02,00,000/-. The cost for implementation of EMP cost is Rs. 85,20,000 (capital cost) and Rs. 5,40,600 per year (recurring cost) and the same is described in Chapter - 10 of EIA/EMP.	Chapter-2 & Chapter-10
43	A Disaster Management Plan shall be prepared and included in the EIA/EMP report.	The Hazard Identification and Risk Assessment for the project activities has been carried out and corresponding risk control measures are elaborated in in Chapter 7 of EIA/EMP report.	Chapter-7
44	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.	Environmental, social, economic and employment benefits of the mining project have been prepared and incorporated in Chapter 8.	**Chapter-8**
45.	**Besides the above, the below mentioned general points are also to be followed:**		
a)	Executive Summary of the EIA/EMP Report.	Complied.	**Attached**

S. No.	TOR Point	Reply	Citation
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 original analysis/testing reports should be available during appraisal of the project.	Enclosed as Annexure- 3	**Annexure-3**
e)	Where the documents provided are in language other than English, an English translation should be provided.	Provided.	
f)	The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall be filled and submitted.	Will be submitted in final EIA.	
g)	While preparing the EIA report, the instructions for the proponents and instructions for the Consultants issued by MoEF vide O.M. No. J-11013/41/2006-IA.II (I) dated 4th August, 2009, which are available on the website of this Ministry, should be followed.	Complied	
h)	Changes, if any made in the basic scope and project parameters (as submitted in Form-1 and the PFR for	No modifications done	

S. No.	TOR Point	Reply	Citation
	securing TOR) should be brought to the attention of MoEF & CC with reasons for such changes and the permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the Final EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.		
i)	A per the circular No.-J-11011/618/2010-IA.II (I) dated 30.05.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.	Not applicable The project proposal pertains to fresh mining of river sand on semi-mechanized basis by open cast method on allotted mine lease area at the Sakari.	
j)	The EIA report 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.	Given in Chapter-1 of EIA Report	Chapter-1
46	After preparing the draft EIA (as per the generic structure prescribed in Appendix- III of the EIA Notification, 2006) covering the above-mentioned issues, the proponent will get the public hearing	Shall be complied	

S. No.	TOR Point	Reply	Citation
	conducted and take further necessary action for obtaining environmental clearance in accordance with the procedure prescribed under the EIA Notification, 2006.		
47	The prescribed TORs would be valid for a period of three years for submission of the EIA / EMP reports, as per the O.M. No. J-11015/10/2013-1A.II(M), dated 12.01.2017.	The terms of reference (ToR) were issued by SEIAA File No: EN/T-II-I/052/2025 dated 12.03.2025 and thus stands valid.	

CHAPTER-1
INTRODUCTION

1.0 INTRODUCTION

West Bengal has large deposits of minerals, providing a solid launching pad for mining and mineral based industries. With 40% of nation's mineral reserves, the State Government is committed to rapid industrial development by leveraging the advantage to the state, provides due to the presence of variety of minerals in abundance.

- To acquire, take mining lease, prospecting license, reconnaissance permit, acquire mines, beneficiation plants, concentration and refining plants, acquisition reclamation and improvement of railways, tramways, roads, sewerage, drainage, power supply work, power generation plants, irrigation tube-wells, canals, water works, water reservoir, surface water rights.
- To work on mines and mining rights acquired by it for crushing, quarrying, smelting, refining, dressing, marketing and prepare other value-added products from ores, metals, mineral substance, carry out metallurgical operations.
- To provide technical consultancy services in exploration, mining, process engineering, manufacturing, operating data, plants and other related matters.
- To encourage joint ventures in the State, Union Territory, other States and abroad with private concerns or corporate bodies in the field of reconnaissance, mapping, prospecting, detailed exploration, mining, beneficiation, metallurgy, mineral processing, manufacture of products, civil construction on mines, power plants and other activities related to its objectives.
- To enter into long-term agreement for supply of minerals, coal, coal bed methane, processed ore, minerals, raw materials, rocks on long term basis by the said joint ventures or independently.
- To construct mine entries and carry out all civil work related to mining.

1.1 PURPOSE OF THE REPORT

The project is a Sand Mining Project in the and listed under activity 1(a) Mining of Minerals of EIA Notification, 2006 and falls under Category 'B1' as the area of mining is 10.24 Ha. As per the notification, prior Environmental Clearance (EC) from State Level Environment Impact Assessment Authority (SEIAA) is mandatory before starting the mining operation. Hence, the WBMDTCL has followed due course of procedure for obtaining Environmental Clearance. The provisional lease grant order has been issued by the Department of Industries, Commerce and Enterprises, Government of West Bengal, to WBMDTCL vide letter No.-430-ICE-12011(99)/27/2022-MINES dated 05.07.2023 in reference to Memo No. MDTC/SAND/003/Part-8/1656 dated 26.06.2023.

ToR was granted by SEIAA, West Bengal on 12-03-2025 ***(Annexure-1)***.

The objective of the EIA study report is to take stock of the prevailing quality of the environment, to assess the impacts of proposed industrial activity on environment and to plan appropriate environmental control measures to minimize the adverse impacts and to maximize beneficial impacts of expansion proposed. The following major objectives have been considered:

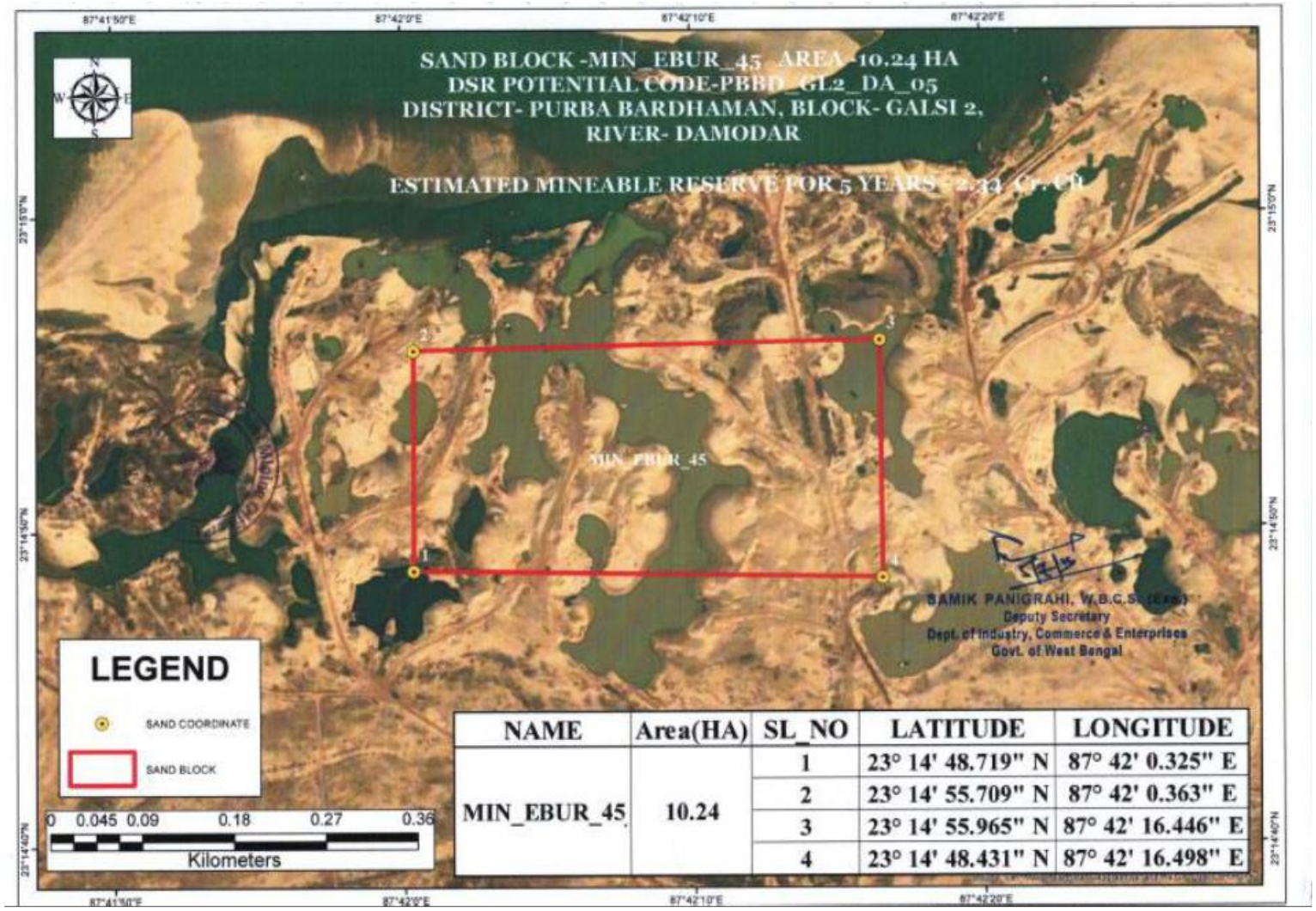
- Information for decision makers
- Internalizing the externalities

1.2 IDENTIFACTION OF PROJECT & PROJECT PROPONENT

1.2.1. Project

This Sand Block falls under the DSR potential zone PBBD_GL2_DA_05, mentioned in the DSR. WBMDTCL has been allotted 10.24 Hectares (25.29 Acres) of area with Block ID MIN _EBUR_45 in Damodar river-bed, for the purpose of sand mining. The area belongs to J.L. NO. – 9, PLOT NO. - 1569(P), 1573(P), 1574(P), 1576(P), 1579(P), 1580 (P), 1606(P), 1608 (P). The baseflow level was encountered at 1.40 m so working depth has been proposed to be 1 m less than the water level, as per the Standard Environmental conditions mentioned in the Sustainable Sand Mining Management Guidelines 2016.

The proposed mining area falls under Mouza – Kumirkola, Block – Khandaghosh, Dist. – Purba Bardhaman, State–West Bengal. The mine is connected to NH-8, at a distance of 3.58 km in S direction, AH-1 at about 8.05 km in the NNE direction and to the Dadpur-Shikarpur Road at a distance of about 0.88 km in the N direction. The Mine is at a distance of 17.11 km from Purba Bardhaman Zilla Parishad-local Government office in the E direction, 62.50 km from Kazi Nazrul Airport in the NW direction and 10.26 km from the Ishan Chandi Halt railway station in the NNE direction.



NAME	Area(HA)	SL_NO	LATITUDE	LONGITUDE
MIN_EBUR_45	10.24	1	23° 14' 48.719" N	87° 42' 0.325" E
		2	23° 14' 55.709" N	87° 42' 0.363" E
		3	23° 14' 55.965" N	87° 42' 16.446" E
		4	23° 14' 48.431" N	87° 42' 16.498" E

Fig.1.1: Mining Lease Areas

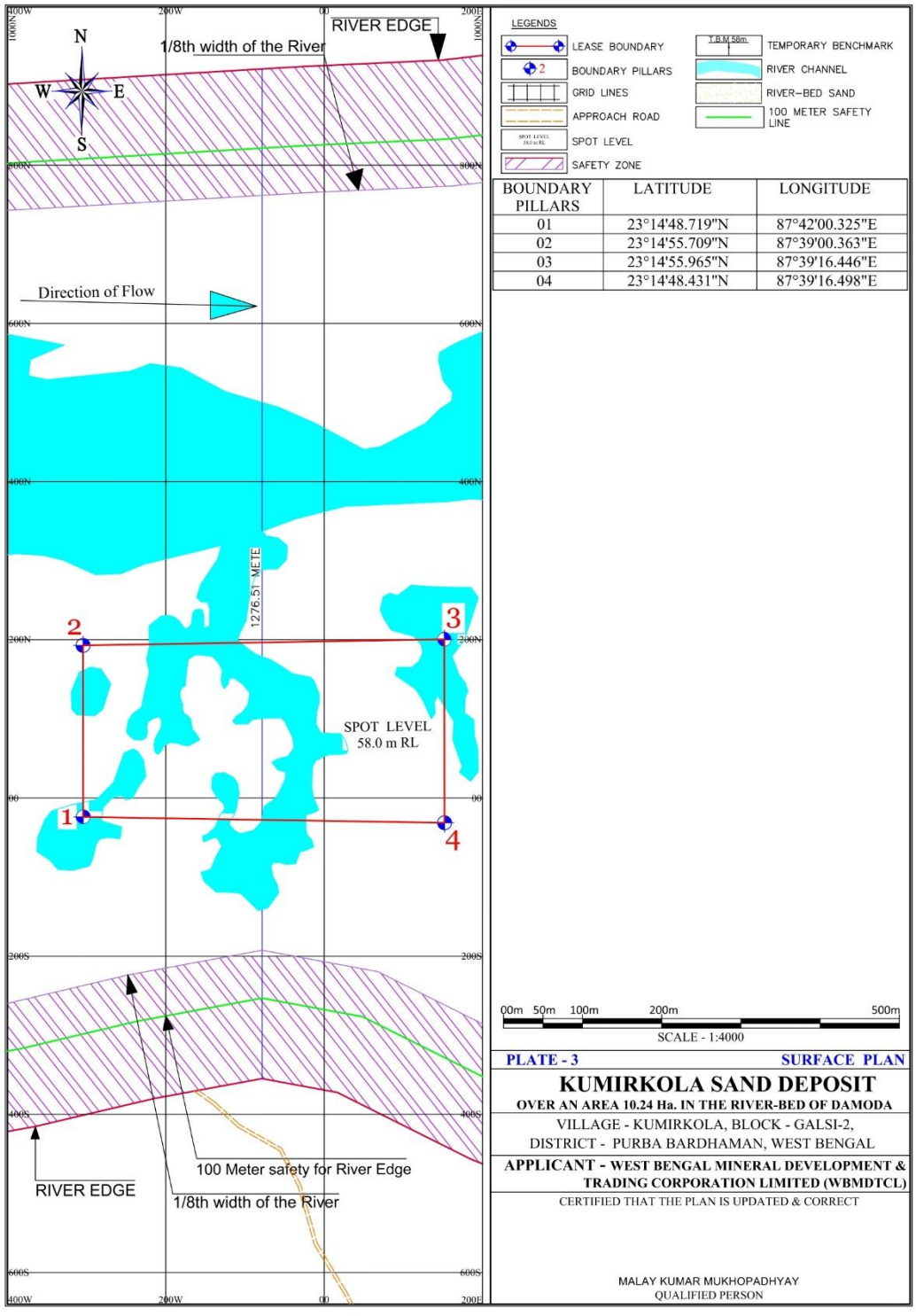


Figure 1.2: Surface Plan & Coordinates of Mining Areas

1.2.2 Project Proponent

West Bengal Mineral Development & Trading Corporation Limited (WBMDTCL) is the project proponent.

Address of Project Proponent:

3rd Floor, DJ-10, WBIIDC Building,
DJ Block, Sector II, Salt Lake City
District – Kolkata
State – West Bengal
PIN - 700091
E-mail: wbmdtclltd@gmail.com
Phone: +91- 9681229600

Lease Period: 20 Years

Mine Plan and Progressive Mine Closure Plan: Mining Plan and Progressive Mine Closure Plan of the proposed mine is prepared by Qualified Person Shri Malay Kumar Mukhopadhyay of M/s Sathi planners Pvt. Ltd. and Chief Mining Officer, Government of West Bengal (Copy of approval letter of Mine Plan is enclosed as ***Annexure-2***). Revised Mining plan approved by government of West Bengal, Office of the Chief Mining officer , vide letter no.- 294/CMO/XVI/EBUR (608) on dated 10/07/2024,

1.3 BRIEF DESCRIPTION OF THE PROJECT

The project proposal pertains to mining of river sand on manual to semi-mechanized method basis by open cast method on allotted mine lease area at the Damodar River at Mouza – Kumirkola, Block – Khandaghosh, Dist. – Purba Bardhaman, State–West Bengal.

1.3.1. Size of the Project

The total allotted mining lease area of the proposed project is 102400 m^2 The total geological reserve of five years considering 76.17% replenishment rate from the 2nd year is 580149.24 m^3 and the total mineable reserve for five years considering 76.17% replenishment rate from the 2nd year comes to about 279518.11 m barring the blocked reserve..

1.3.2. Nature of the Project

This project is for Sand Mining and listed under activity 1(a), Mining of Minerals under the Schedule of EIA Notification, 2006 and categorized as Category-B1 as the area of the mine is > 5 Ha.

1.3.3 Location of the Project

The project is, located on the Damador riverbed River located at Mouza – Kumirkola, Block – Khandaghosh, District – Purba Bardhaman, State - West Bengal over J.L. NO. – 9, PLOT NO. - - 1569(P), 1573(P), 1574(P), 1576(P), 1579(P), 1580(P), 1606(P), 1608(P). Mining lease area is 25.29 Acres (10.24 Ha), Block code - MIN_EBUR_45. The area for proposed project is 7.59 Ha. The digitized map of the area is shown in **Figure 1.3**.

Table 1.1: Location Details of the Project

Particulars	Details	
J.L. No.	9	
Plot No.	1569(P), 1573(P), 1574(P), 1576(P), 1579(P), 1580(P), 1606(P), 1608(P).	
Co-ordinates of the mine	**Latitude**	**Longitude**
	23°14'48.719''N	87°42'00.325"E
	23°14'55.709''N	87°42'00.363"E
	23°14'55.965''N	87°42'16.446"E
	23°14'48.431''N	87°42'16.498"E

The mine is connected to NH-8, at a distance of 3.58 km in S direction, AH-1 at about 8.05 km in the NNE direction and to the Dadpur-Shikarpur Road at a distance of about 0.88 km in the N direction. The Mine is at a distance of 17.11 km from Purba Bardhaman Zilla Parishad-local Government office in the E direction, 62.50 km from Kazi Nazrul Airport in the NW direction and 10.26 km from the Ishan Chandi Halt railway station in the NNE direction.

1.4 IMPORTANCE OF THE PROJECT FOR COUNTRY OR REGION

Due to rapid infrastructure development in India, the demand of construction material has increased and sand is the main constituent of infrastructure. To meet this demand, mining of sand is done. This project operation will provide employment, directly and indirectly, to the people residing in vicinity, thus improving the socio-economic status of the area.

Formation, deposition and movement of river sand is a renewable and dynamic process. River sand rough in texture and it is devoid of any clay or silt and salts and hence it is the most suitable raw material for the construction work. Further, the sediment in the form of river bed material deposited in the last many years may change the shape of the river bed from a valley to a dune. Hence, it is necessary to remove the materials so that the river gets channelized.

1.5 Scope of Study

The Environmental Impact Assessment (EIA) studies are aimed to identify and analyze the aspects that affect the environmental conditions within the mine lease area and surrounding areas around 10 km radius from its epicenter. The project scope includes detailed characterization of various environmental components like air, noise, water, land, ecology and socio-economic within this project study area and around the proposed mine site.

The objectives set for carrying out this EIA study are based upon the requirements that fulfill the EIA Notification 2006 and their subsequent amendments under the guidelines of MoEF&CC and its various amendments. These objectives are described as follows:

- To carry out environmental monitoring in order to establish a baseline environmental status of the study area.
- To identify various existing pollution loads due to industrial and domestic activities in the ambient zone.
- To predict the impacts on environmental attributes.

1.5.1 Terms of Reference issued by MoEF&CC

Proposal for grant of Terms of Reference (TOR) issued by SEIAA, west Bengal, vide letter TO24B0107WB5788199N dated 12/03/2025 (SIA/WB/MIN/496365/2024) for preparation of EIA Report for obtaining Environmental Clearance for the proposed project.

1.5.2 Preparation of EIA

This EIA Report is prepared in accordance with the EIA Notification, 2006 and has been divided into twelve chapters (in addition to The Executive Summary) as listed here under:

Chapter 1 – Introduction

Chapter 2 – Project Description

Chapter 3 – Description of the Environment

Chapter 4 – Anticipated Environmental Impacts and Mitigation Measures

Chapter 5 – Analysis of Alternatives (Technology and Site)

Chapter 6 – Environmental Monitoring Program

Chapter 7 – Additional Studies

Chapter 8 – Project Benefits

Chapter 9 – Environmental Cost Benefit Analysis

Chapter 10 – Environmental Management Plan

Chapter 11 – Summary and Conclusion

Chapter 12 – Disclosure of Consultant

1.5.3 LAWS APPLICABLE TO THIS PROJECT

Table 1.2: Applicable Environment & Other Regulations

Legal Channel	Responsible Ministries/Bodies	Objective of Legislation	Roles & Responsibilities
The Water (Prevention & Control of Pollution) Acts 1974/ Rules 1975	CPCB, SPCB	The prevention, control and abatement of air pollution	• Not to discharge any effluent, not confirming to standards, prescribed by SPCB into any stream, well, sewers or land. • Not to discharge air pollutant(s) in excess of standards, prescribed by the State PCB. • Obtain 'Consent to Establish' prior to establish any process, operation or treatment system. • Obtain 'Consent to Operate' prior to operation of system which is likely to discharge effluent. • Apply for renewal of the 'Consent to Operate' before the expiry. • Comply with conditions as prescribed under consents.
The Air (Prevention & Control of Pollution) Acts 1981/ Rules 1982	CPCB, SPCB	The prevention and control of water pollution and also maintaining or restoring the wholesomeness of water	
The Environment (Protection) Acts 1986/Rules 1986 The Environmental Impact Assessment (EIA) Notification, 2006	MoEF&CC, CPCB, SPCB	Protection and Improvement of the Environment	• Prevent discharge or emission of environment pollutants in excess of the prescribed standards. • Submit 'Environmental Statement' every year.

Legal Channel	Responsible Ministries/Bodies	Objective of Legislation	Roles & Responsibilities
			• Obtain prior "Environmental Clearance' from MoEF&CC in case of new project or for Modernization / Expansion.
Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016	MoEFCC, CPCB, SPCB, DGFT	Management & Handling of hazardous wastes in line with the Basel convention	• It is the responsibility of the occupier to identify the hazardous wastes in their units and ensure proper handling and disposal • Sri Venkatesh Iron & Alloys (India) Limited to take all steps to contain contamination, prevent accident and limit consequences on human being and environment • Obtain authorization from JSPCB and comply with the conditions. • Maintain records of Hazardous Waste generated in Form-3 and submit yearly return for generation, treatment, recycling, disposal etc., to SPCB in Form-4 • Used Oil to be send / sold to the registered recycler, re-processor, registered authorized facility • Shall be transported in accordance with the rule. • Site storage is allowed for 90 days only
Noise Pollution (Regulation and Control) Rules, 2000 and its amendments	CPCB, SPCB, MoEF&CC	To maintain the noise levels with respect to the place/equipment/ industry	• Noise Quality Monitoring & submission of reports on weekly/monthly basis. • Providing Ear plugs and Muffs to the workers

Legal Channel	Responsible Ministries/Bodies	Objective of Legislation	Roles & Responsibilities
			working in noise prone areas. • Dampening the source noise level or making the noise characteristics less annoying by providing suitable enclosures and barriers.
The Solid Waste Management Rules, 2016	CPCB, SPCB	To manage/ utilize the generated solid waste without damaging the environment and surroundings	• Segregate waste in to three streams, Wet (Biodegradable), Dry (Plastic, Paper, metal, wood, etc.) and domestic hazardous wastes (diapers, napkins, empty containers of cleaning agents, mosquito repellents, etc.) and handover segregated wastes to authorized rag-pickers or waste collectors or local bodies.
Batteries (Management and Handling) Rules, 2001.	SPCB, CPCB and MoEF&CC	To control the hazardous waste generation (lead waste) from used lead acid batteries	• It is the responsibility of the generator to ensure, used batteries are not disposed of in any manner other than depositing with dealer, manufacturer, importer, re-conditioner registered recycler or at designated collection centre • Submit half yearly return for disposal of used batteries to State PCB by 30th June & 31st December, every year • In case of auction, ensure batteries are auctioned to the registered recycler only • File half yearly return for the auction • Maintain record for such auction
E-Waste (Management)	SPCB, CPCB and	To recycle /manage the electronic	• Consumers or bulk consumers of electrical

Legal Channel	Responsible Ministries/Bodies	Objective of Legislation	Roles & Responsibilities
Rules, 2016	MoEF&CC	waste from the industry	and electronic equipment listed in Schedule I shall ensure that e-waste generated by them is channelised through collection centre or dealer of authorised producer or dismantler or recycler or through the designated take back service provider of the producer to authorised dismantler or recycler; • Bulk consumers of electrical and electronic equipment listed in Schedule I shall maintain records of e-waste generated by them in Form-2 and make such records available for scrutiny by the concerned State Pollution Control Board; • Consumers or bulk consumers of electrical and electronic equipment listed in Schedule I shall ensure that such end-of-life electrical and electronic equipment are not admixed with e-waste containing radioactive material as covered under the provisions of the Atomic Energy Act, 1962 (33 of 1962) and rules made there under; • Bulk consumers of electrical and electronic equipment listed in Schedule I shall file annual returns in Form-3, to the concerned State Pollution Control Board on or before the 30th day of June following the financial year

Legal Channel	Responsible Ministries/Bodies	Objective of Legislation	Roles & Responsibilities
			to which that return relates. In case of the bulk consumer with multiple offices in a State, one annual return combining information from all the offices shall be filed to the concerned State Pollution Control Board on or before the 30th day of June following the financial year to which that return relates
Mineral Concession Rules, 1960.	IBM	Guidelines for mining of minerals in the lease area	• Mineral will be extract as per the mining plan approved by IBM.
Mines & minerals Development Restoration and Rehabilitation Act 1957	DMG	Regulation of mines and the development of minerals	• Development Restoration and Rehabilitation fund will be spend as per Mines & minerals Development Restoration and Rehabilitation Act 1957.
Wildlife protection Act 1972	Forest Department, PCCF	Protection of plants and animal species	• Wildlife conservation plan has been prepared to protect the Schedule species in the study area.
Land Acquisition, Rehabilitation and Resettlement Act, 2013	Administration	Right to Fair Compensation and Transparency in Land Acquisition	• Land Acquisition will be done as per Land Acquisition, Rehabilitation and Resettlement Act, 2013
The Central Motor Vehicle Rules, 1989	Ministry of Shipping, Road Transport and Highways	To consolidate and amend the law relating to motor vehicles including to regulate the transportation of dangerous goods with a view to	• Ensure compliance to safety provisions in the transport vehicle carrying dangerous and hazardous substances inside works • Display of emergency information panels at

Legal Channel	Responsible Ministries/Bodies	Objective of Legislation	Roles & Responsibilities
		prevent loss of life or damage to the environment	front, back and both side of vehicle • Every transporter to ensure safe transportation of dangerous/ hazardous goods. • Earthing chain for grounding, any prevalent static charge. • All motor vehicle entering the works shall have properly maintained brakes, lights, signal system for brakes, blinkers and registration number displayed, and valid Pollution under Control Certificate.

CHAPTER-2
PROJECT DESCRIPTION

2.0 PROJECT DETAILS

2.1 General

Proposed proposal pertains to riverbed sand mining by manual to semi-mechanized method, on allotted mine lease area on the Damodar riverbed under mouza Kumirkola, Block – Khandaghosh, Dist. – Purba Bardhaman district of West Bengal. The area belongs to J.L. No. 9, PLOT NO. - 1569(P), 1573(P), 1574(P), 1576(P), 1579(P), 1580 (P), 1606(P), 1608 (P). The total allotted Mine lease is for 20 years for the proposed project in 10.24 Hectares (25.29 Acres) with their maximum annual production capacity of 69071.394 cum/ 183039.19 Ton/annum. This chapter deals with the broad description of the project, location, type of mineral deposit(s), quality of reserve, Mining methodology, various site utility and infrastructure, etc.

2.1 TYPE OF THE PROJECT

The project is proposed for mining of "Sand" from the allotted mine lease area on the bed of River Damodar. It is an opencast manual cum semi-mechanized method of mining project. **West Bengal Mineral Development and Trading Corporation Limited,** is the project proponent who is seeking prior environmental clearance for the proposed project.

2.2 NEED OF THE PROJECT

Due to rapid infrastructure development in India, the demand of construction material has increased and sand is the main constituent of infrastructure. River Sand does not require any up gradation by any intermediate industries. The fine grain sand associated with other mineral having 70 to 80% silica is being used in glass industries. The black sand of sea in the south India contains precious minerals by processing.

To meet this demand, mining of sand has to be conducted. This project operation will provide employment directly and indirectly to the people residing in vicinity, thus improving the Socio-economic status of the area.

Formation, deposition and movement of river sand is a renewable and dynamic process. River sand rough in texture and it is devoid of any clay or silt and salts and hence it is the most suitable raw material for the construction work. Further, the sediment in the form of river bed material deposited in the last many years may change the shape of the river bed from a valley to a dune. Hence, it is necessary to remove the materials so that the river gets channelized.

Apart from this, the project will also generate various employment opportunities especially to the local people hosting the mining project and thus will contribute to the economic development of the state by contributing to state exchequer.

This chapter provides details on the project, its location, quality of reserve & mineral deposit(s), mining methodology along with a brief of various other site utilities, infrastructure, etc.

2.3 Location of Project

Mining site falls under mouza Kumirkola, Block – Khandaghosh, Dist. – Purba Bardhaman, State–West Bengal. The mine is connected to NH-8, at a distance of 3.58 km in S direction, AH-1 at about 8.05 km in the NNE direction and to the Dadpur-Shikarpur Road at a distance of about 0.88 km in the N direction. The Mine is at a distance of 17.11 km from Purba Bardhaman Zilla Parishad-local Government office in the E direction, 62.50 km from Kazi Nazrul Airport in the NW direction and 10.26 km from the Ishan Chandi Halt railway station in the NNE direction.

Table 2.1: Habitation near to the mining area is as follows:

Name of Village	Distance from Sand Ghat	Direction
Kumirkola	0.20 km	S
Keleti	1.53 km	SW
Dumur	1.62 km	NW
Jujuti	3.52 km	NE

Table 2.2: Nearby Amenities and Utilities from the study area:

Dadpur Primary School	1.47 km	NW
Kumirkola High School	1.87 km	SW
Jujuti Govt. of West Bengal Hospital	1.63 km	NE
SH-8	3.64 km	S
Jujuti Bypass to Dadpur Link	0.95 km	NNE
Khana Junction Railway Station	9.37 km	NE
Kazi Nazrul Islam Airport, Durgapur	64.05 km	NW

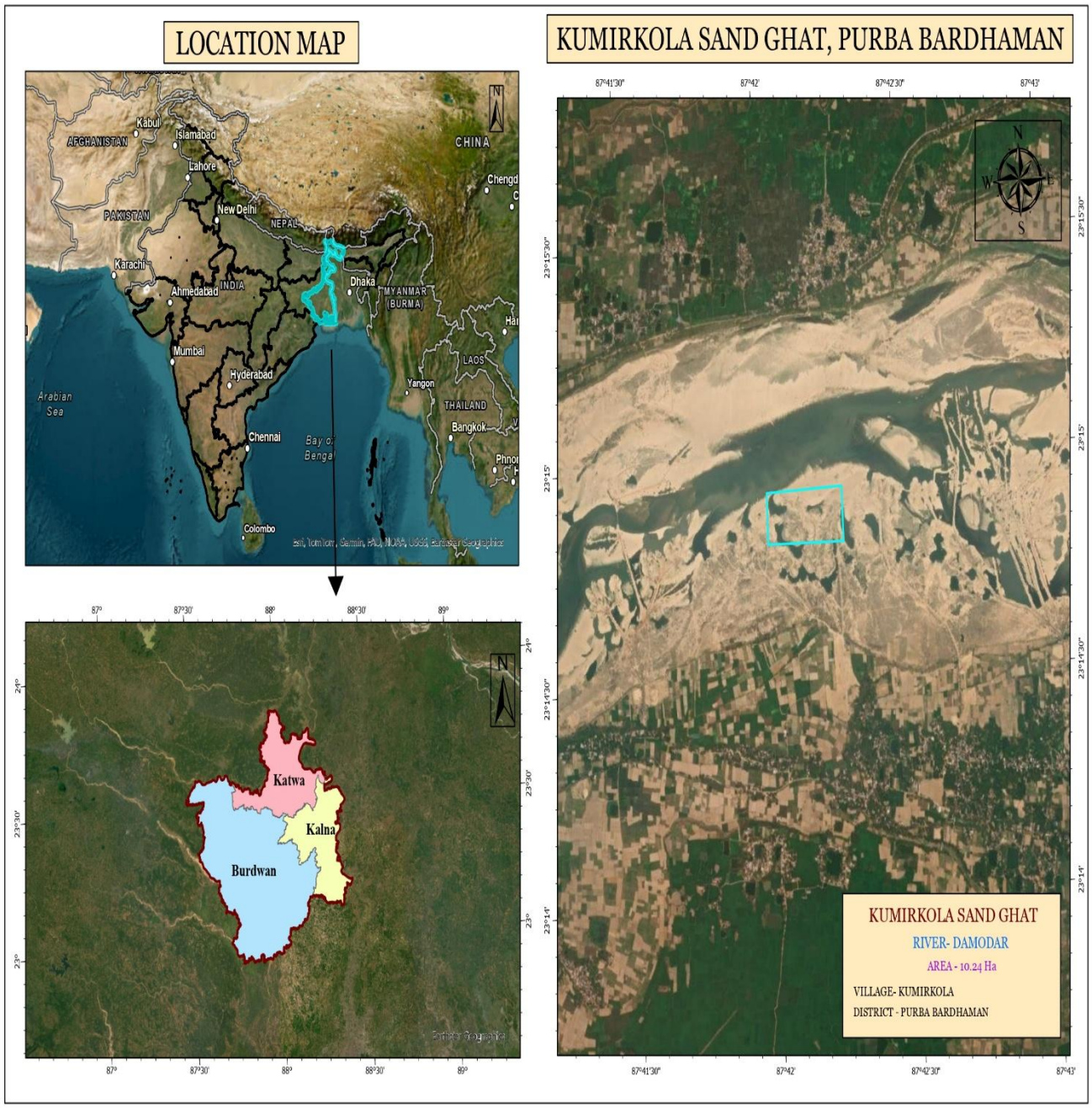


Fig 2.1: Map showing location of project site

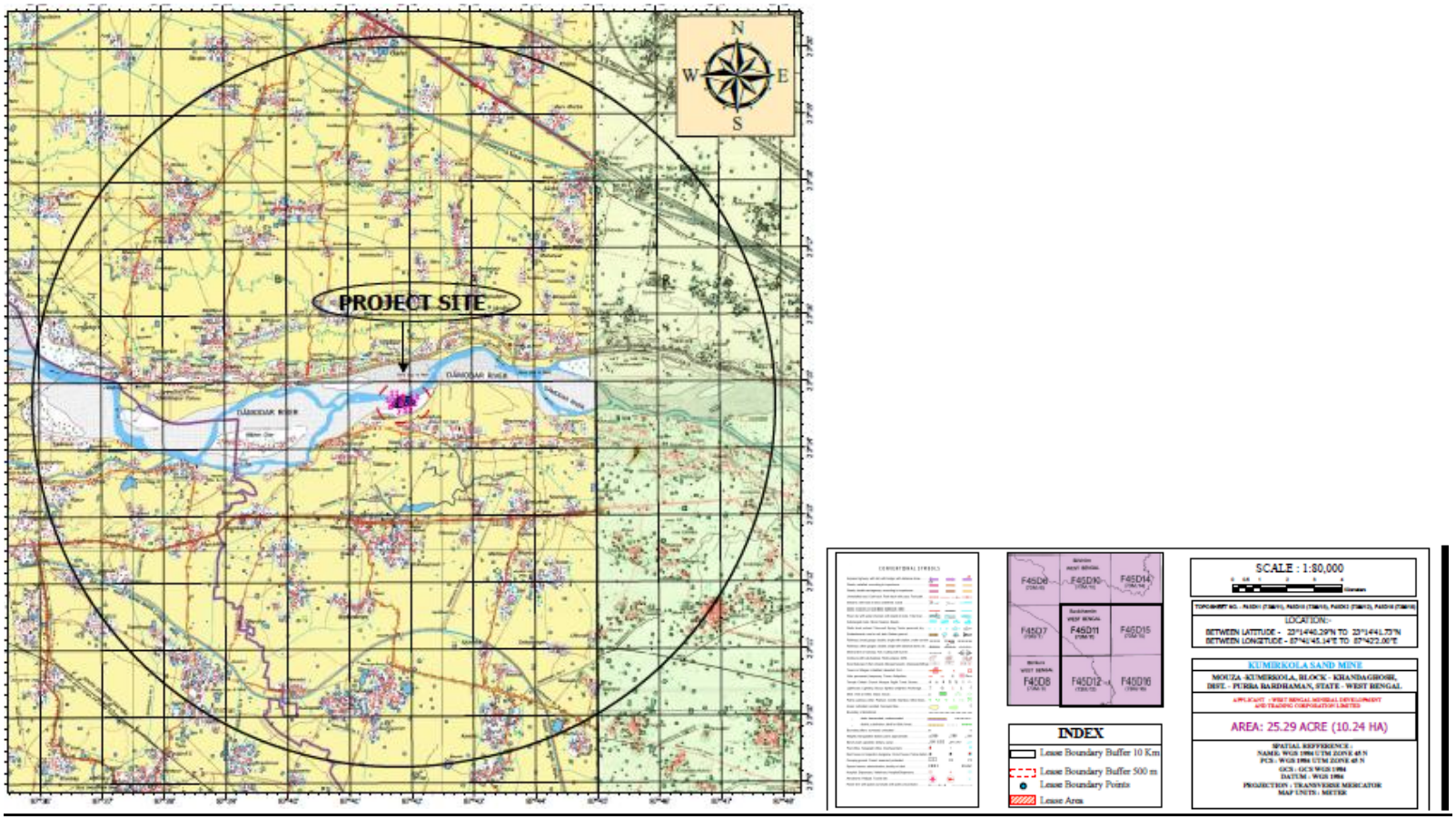


Fig 2.2: Key Plan of project site

Fig 2.3: Map showing location of project site

PROJECT DESCRIPTION

The project proposal pertains semi-mechanized riverbed sand mining by open cast method on allotted mine lease area on the Damodar River located at Mouza – Kumirkola, Block – Khandaghosh, District – Purba Bardhaman, State - West Bengal over J.L. NO. – 9, PLOT NO. - - 1569(P), 1573(P), 1574(P), 1576(P), 1579(P), 1580(P), 1606(P), 1608(P). Damodar River is a perennial river. The total allotted Mine lease area of the proposed project is 69071.394 cum/ 183039.19 Ton/annum with a maximum annual production capacity of 107071.79 cum.

The total Geological reserve of 580149.24 cum and Mineable Reserve of 279518.11 cum has been estimated for 5 years considering the replenishment rate from 2nd year onwards. The Mineable / Permissible reserves are replenishing every year after monsoon. As such the life of mine will continue based on the replenishment of sand, every year, hence it is a continuous process. Therefore, it is envisaged the life of mine for 5 years and for subsequent years also on lease renewal.

The estimation of reserves has been drawn on the basis of actual measurement of the area of the river bed, falling within the leasehold area and multiplied by the envisaged depth of the mining 1.40 m for total (Geological) Reserve and leaving safety-zone of 7.5 meters around the mine for Mineable Reserve.

Lease Period: 20 Years

Mine Plan and Progressive Mine Closure Plan:

Mining Plan and Progressive Mine Closure Plan of the proposed mine contract area has been prepared by Mr. Malay Kumar Mukhopadhyay (Qualified person) of Sathi Planners Private limited, considering the IBM Manual of Appraisal of Mine Plan -2017 well as keeping in mind the MoEF & CC guidelines of "Enforcement & Monitoring Guidelines for Sand Mining 2020" & "West Bengal Sand Mining Policy, 2021" vide Memo No. 294/CMO, dated 10.07.2024 and approved by Chief Mining Officer, Government of West Bengal (Copy of approval letter of Mine Plan is enclosed as ***Annexure-2***)

Letter of Intent:

A provisional lease grant order has been issued by the Department of Industries, Commerce and Enterprises, Government of West Bengal, to WBMDTCL vide letter No.-430-ICE-12011(99)/27/2022-MINES dated 05.07.2023 in reference to Memo No. MDTC/SAND/003/Part-8/1656 dated 26.06.2023. WBMDTCL has further allocated Sathi Planners Private Limited the duty to prepare the Mining Plan and Environment Clearance of the said lease area vide Revised Work Order No. MDTC/SAND/003/Part-8/275 dated 06.02.2024 in reference to NIT No. MDTC/SAND/002(IV)/1306 dated 22.05.2023, to pursue sustainable scientific mining with minimum possible environmental impacts. (Copy of lease Grant has been enclosed as ***Annexure-5***).

Table 2.3: Salient feature of the project

Sl. No	Particulars	Details	
A	**Name of the Project**	Kumirkola Sand Mine.	
B	**Nature and Size of the Project**	Kumirkola Sand Mine in the Damodar Riverbed over an area of 10.24 Ha. (25.29 Acres).	
C	**Location Details**		
	J.L. No:	9	
	Plot No:	1569(P), 1573(P), 1574(P), 1576(P), 1579(P), 1580 (P), 1606(P), 1608 (P)	
	Mouza:	Kumirkola	
	Block:	Khandaghosh	
	District:	Purba Bardhaman	
	State:	West Bengal	
	Coordinates	**Latitude**	**Longitude**
		23°14'48.719"N	87°42'00.325"E
		23°14'55.709"N	87°42'00.363"E
		23°14'55.965"N	87°42'16.446"E
		23°14'48.431"N	87°42'16.498"E
	Toposheet No.	F45D12 (73M/12)	
D	**Lease Area Details**		
	Lease Area	10.24 Ha.	
	Period of Lease	20 years	
	Type of Land	Damodar River Bed (Non-Forest)	
	Total Resources/Reserve	580149.24 Cum/1537395.49 Ton	
	Mineable Reserve	279518.11 Cum/740722.99 Ton	
	Topography	The areas around buffer zone are low-lying alluvial plains, similar to pre-dominating rice lands of Bengal. The Project is for river bed sand mining on Damodar River. The gradient is westerly to the west and to the east, it is northerly towards Ajay and southerly towards Damodar below the latitude	
E	**Cost Details**		
	Cost of the Project	Rs. 28,02,00,000/-	
	Cost for EMP	Capital Cost Rs. 85,20,000/- Recurring Cost Rs. 5,40,600/-	
	Cost of CER	2% of project cost	

Sl. No	Particulars	Details
F	**Details of Environmental Setting**	
	Ecological Sensitive Areas (National Park, Wild Life Sanctuary, Biosphere Reserve, Reserve/ Protected Forest etc.) within 10 Km radius	None within 10 km radius of the project
	Archaeological Important Place	None within 10 km radius of the project
	Nearest Town	Khandaghosh town is situated at a distance of 3.80 km in the SSW direction from the mining site
	Nearest Railway Station	Ishan Chandi Halt railway station – 10.26 km in the NNE direction
	Nearest State Highway / National Highway	SH-8 – 3.58 km in the S direction
	Nearest Airport	Kazi Nazrul Islam Airport, Durgapur – 62.50 km in the NW direction
G	Seismic Zone	Area falls under Seismic Zone-IV i.e. high earth quake damage risk zone. Flood hazard is very low and low Flood damage risk zone. Other natural hazard is also not expected because of the location of the project.
H	**Requirements**	
	Water Requirement	31.29 KLD
	Power Requirement	Not required. Operation will be carried out during day time. One DG Set of 25 KVA will be installed
	Manpower requirement	26
	Fuel Requirement	HSD – 5616 l/day (1123.2 kl/year)

2.5 ESTIMATION OF MINERAL RESERVES

As per the guideline of MoEF & CC guidelines of "Enforcement & Monitoring Guidelines for Sand Mining 2020" & "West Bengal Sand Mining Policy, 2021" the Geological resource & Mineable reserve has been calculated considering the location, type of river bed, deposition i.e. thickness of sand.

1. Depending upon the location, thickness of sand, deposition, agricultural land/Riverbed, the method of mining is semi-mechanized. (Excavator & Tipper will be used)
2. Depth of working restricted to 1.60 m or water level whichever is less.

3. No sand mining activities will be carried out within 15 m of the edge of the river or 1/5th of the total width of the river which ever if greater.
4. No sand mining activities will be carried out in upstream or downstream within 500 meter of railways, road, bridge, water intake, wires & notified aquarium or bridging places.
5. No sand mining activities will be carried out within in 250 m from the forest.
6. No stream mining shall be allowed.
7. Use of tarpaulin during transportation.
8. EC will be valid for the period of 5 years after which the Mining Plan will be revised as per the relevant updated DSR.

Table Error! No text of specified style in document.**.4: Parameter Considered for Estimation of Reserve**

Sl. No	Parameters	Values
1.	Permissible Working depth	The permissible depth of mining in River Damodar in the area is proposed to be 1.40 m as per the DSR, Purba Bardhaman-Mar, 2024
2.	Working depth restriction	The working depth has been proposed to 1.40 m as the baseflow in the area was encountered at about 3.0 m (As per "Sustainable Sand Mining Management Guidelines 2016; page 74, Rule 12 – Ultimate working depth shall be not less than 1 m from the water level of the River channel).
3.	Mining limits of Edge	No sand mining activities will be done within 7.5 m safety barrier inwards from the lease boundary & 1/8th of river width as Safety Zone from the River banks (Distance from the bank should be 1/4th of River width and should not be less than 7.5 meters. (Enforcement and Monitoring for Sand Mining, 2020 by MoEF & CC)).
4.	Upstream or downstream mining limits	No sand mining activities in upstream or downstream within 500 meter of railways, road, bridge, water intake, wires & notified aquarium or bridging places. Moreover, no sand mining activities within in 250 m from the forest.
5.	Bench design	Single bench of 1.6 m height
6.	Density of Sand	2.65

Geological Reserve and Mineral Resource as per UNFCC Classification

Year	Total Area (m^2)	Thickness (m)	Replenishment Rate (%)	Geological Resource (m^3)
1st	102400	1.40	---	143360.00
***2nd**	102400	1.06638	76.17%	109197.31
***3rd**	102400	1.06638	76.17%	109197.31
***4th**	102400	1.06638	76.17%	109197.31
***5th**	102400	1.06638	76.17%	109197.31
			Total Geological Reserve	**580149.24**
***Remarks:** From the 2nd year production will vary considering the 76.17% replenishment rate of Sand in Damodar River in Purba Bardhaman District, as per DSR, Purba Bardhaman-Mar, 2024				

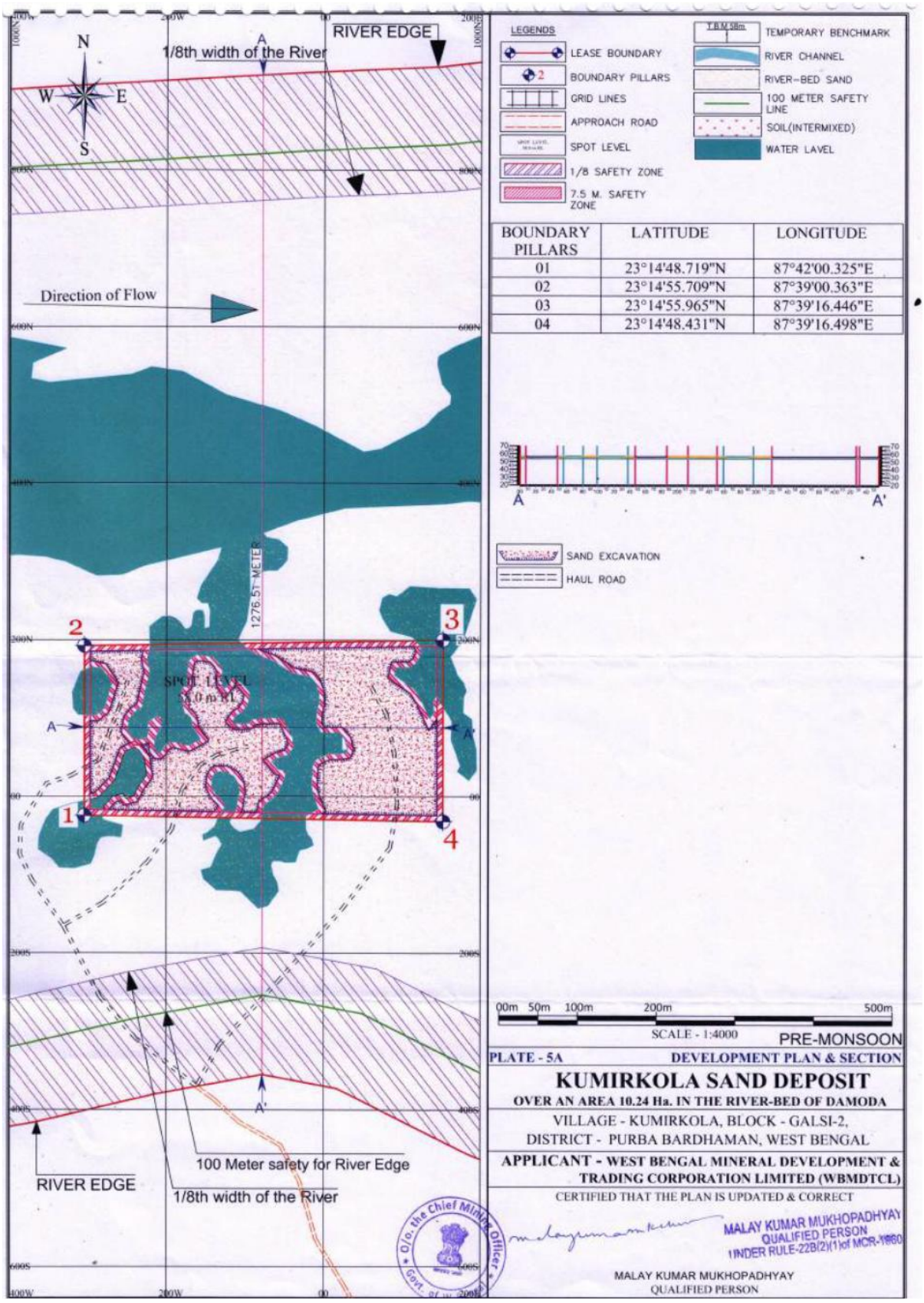
The sand reserves calculated on volumetric basis are summarized below in the Table 2.6.

Table 2.6 Proposed Year-wise tentative mineable reserve

Year	Mineable Area (Ha)	Mineable Area (m^2)	Replenishment Rate	Average thickness (m)	Production (Cum/m^3)	Production (CFT/ft^3)
1st	4.93	49336.71	---	1.40	69071.394	2439235.56
***2nd**	4.93	49336.71	76.17%	1.06638	52611.68	1857965.69
***3rd**	4.93	49336.71	76.17%	1.06638	52611.68	1857965.69
***4th**	4.93	49336.71	76.17%	1.06638	52611.68	1857965.69
***5th**	4.93	49336.71	76.17%	1.06638	52611.68	1857965.69
				TOTAL	**279518.11 m^3**	**9871098.32 CFT**
***REMARKS: -** From the 2nd year production will vary considering the 76.17% replenishment rate of Sand in Damodar River in district Purba Bardhaman, as per DSR, Purba Bardhaman-Mar, 2024.						

Life of the mine:

Sand mining is generally carried out every year based on the replenishment. The mining lease grant order has been issued for 20 years; however this mining plan has been prepared for 5 years and will be reviewed in every 5 years as per the provision of WBMMCR, 2016. Since sand is a replenish-able resource, replenishment study will be reviewed and this mining plan will be modified according to the data of the replenishment study.



BOUNDARY PILLARS	LATITUDE	LONGITUDE
01	23°14'48.719"N	87°42'00.325"E
02	23°14'55.709"N	87°39'00.363"E
03	23°14'55.965"N	87°39'16.446"E
04	23°14'48.431"N	87°39'16.498"E

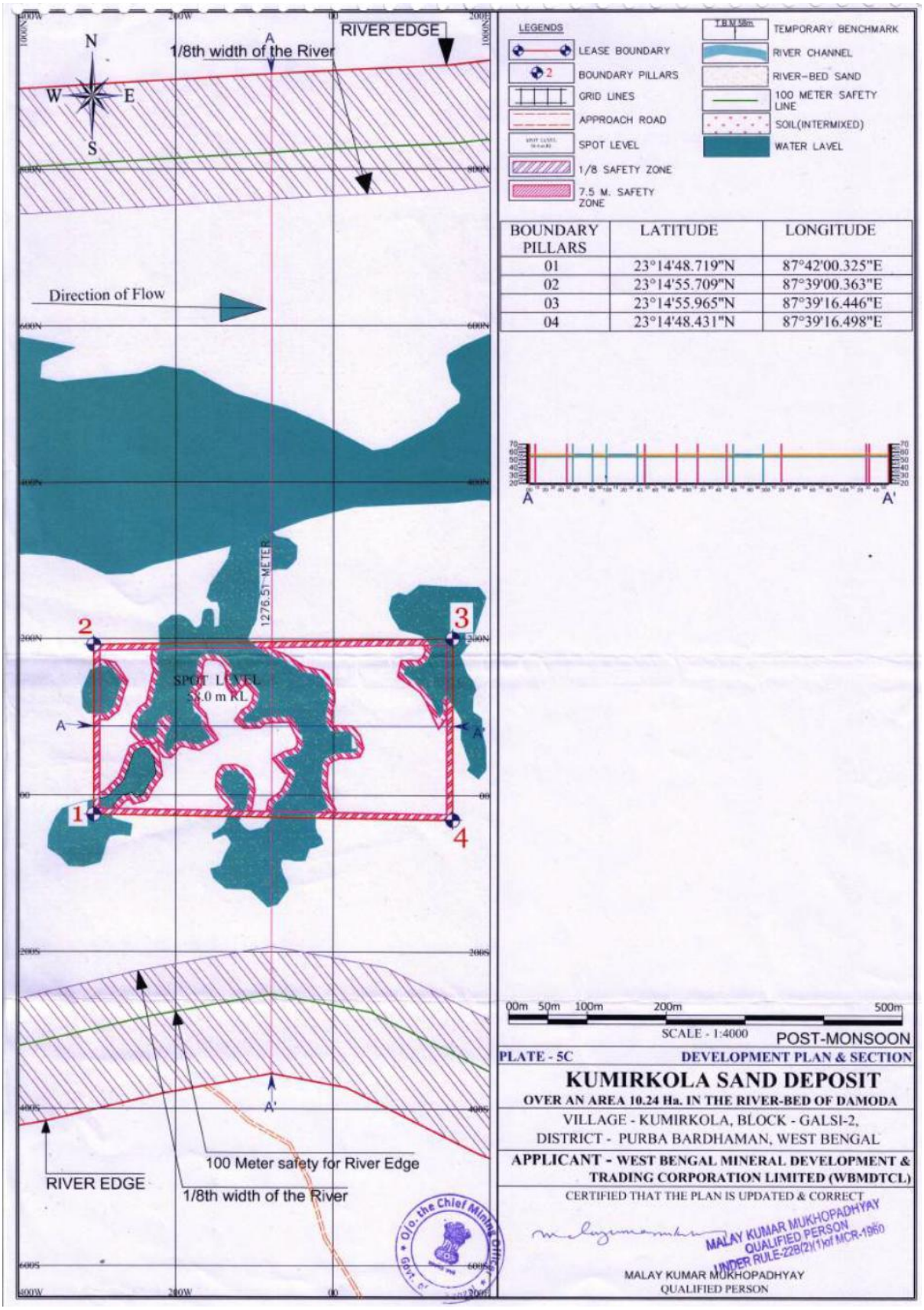


Fig: Pre-moonson and Post-monsoon developmental plan of the sand block

Table 2.7: Five Years Proposed Production Details

Year	PRODUCTION	
	Cum/year	Cum/Day
1st	69071.394	345.36
*2nd	52611.68	263.06
*3rd	52611.68	263.06
*4th	52611.68	263.06
*5th	52611.68	263.06
REMARKS: - Subsequent year production will vary considering the 76.17% replenishment rate of Sand in Damodar River in Purba Bardhaman District, as per DSR, Purba Bardhaman-Mar, 2024		

2.6 MINING METHODOLOGY

Extraction Method: Kumirkola Sand Deposit in Damodar River over an area of 10.24 Ha shall be operated by opencast strip mining method preferably manual with combination of semi-mechanized method of mining through deployment of light machineries such as Backhoe Loaders, Excavator (JCB), Tippers and Tractors by WBMDTCI. for twenty years.

The river-bed Sand deposit will be collected in its existing form by means of manual or semi-mechanized mining. The manual method of mining shall be practiced by using spade, hand shovel. pan, sieve etc., whereas semi-mechanized method of Sand lifting shall be carried out by deployment of small scale machineries like J.CB., Excavator and Tippers or Tractors. The uplifted Sand shall be stacked at the stock-pile away from the river-bed. Mining activities will be carried out in a manner so that there is no obstruction to the movement of water flow, if any, during rainy season. Roads will be properly made and sprayed by water for suppression of dust. Roads in the mining area for the movement of loaded tippers/trucks will not have slopes more than 1 in 20.

Each cycle of operation shall consist of the following operation:

i) Over Burden Removal: No overburden is anticipated. So there is no need of removal of Overburden.

ii) Digging of Sand: Digging of Sand will be done by manually by labours with the help of Spades (Pawadas) or semi-mechanized method by deployment of small scale machineries like J.C.B., Excavator and Tippers or Tractors.

Loading of Tractor Trolley: Loading of Tractor Trolley will be done by manually with the help of Man heads. Labours with the help of Spades (Pawadas) & Pans (Ghamelas) combination or by J.C.B./Excavator.

iv) Transportation of Sand from Sand Deposit to Customers: Transportation of Sand will be done by the use of tractors trolleys from Sand Deposit to various Customers with permissible quantity. Transportation will be done as per the rules and regulations.

Working Depth: The proposed project is river bed mining project, so entire deposit lies within the river bed area. The thickness of available sand deposit is considered about 2.45m depth, ultimate depth of mining is considered upto 1.40 m.

Table 2.8: List of Machinery and Tools

Sl. No.	Type	Capacity	Fuel consumption	Nos.
1	EXCAVATOR	1.2 m^3	30L/hr	1
2	TIPPER/TRACTOR	10 tons	4L/km	10
3	SPRINKLER	-	8L/km	1
4	HELMETS	-	-	10
5	HAND GLOVES	-	-	10

2.6.1 Additional Measures Consideration

While carrying out mining activity following measures will be taken:

- Mining activities will be carried out only in dry bed. No in stream mining will be practiced.
- There will be no mining near the bank to protect the bank erosion and river migration.
- Sand from this area will be restricted to a maximum depth of 1.60 m from the existing bed level. This is for safety and sustainability.
- As the mining area is quite large and long in length, systematic extraction will be carried out to prevent seasonal scouring and enhanced erosion.
- Extraction will be carried out in a manner that there is no obstruction to flow of water, if any, during rainy season.
- There shall be no generation of overburden waste material in case of river bed mining.

2.7 Water Requirement

The nearby area has potable and drinkable quality, the villagers and habitants have been using this water since long period. The drinking & domestic water need for the people engaged in project activity have been envisaged to be met from nearby villages by Water Tanker. However, Damodar river water will be used for the purpose of

suppression of dust arising due to movement of vehicles also for the purpose of greenbelt plantation and maintenance.

Table 2.9: Water requirement

Details	Requirement of Water (KLD)
1. Dust Suppression. (8 KLD in 1 Km)	Total length of approach road 0.347 Km. Requirement of water = 0.347 x 8 = 2.776 KLD Water Sprinkling twice each day = 2.776 x 2 = 5.552 KLD
2. Drinking & Domestic	Water requirement for drinking & domestic purpose per person is 15 L per day. Therefor requirement is 15 x 26 = 390 L/day say 0.39 KLD
3.Greenbelt Development	Water requirement for Greenbelt Development is 3 L/Plant. Requirement of water = 8450 x 3 = 25350 L = 25.35 KLD
Total	**31.29 KLD**

Water supply for drinking purposed shall be made available from nearby villages by tankers.

2.8 Power Requirement

Only day time Mining operations will be carried out, hence no power requirement for the project.

2.9 Manpower Requirement

Total employment in the Mining activities will be around 15 People and local villagers will be preferred for skilled and non-skilled jobs after training. Rest room shelter/Tents, first-aid facility, temporary office structure office and Portable Bio-toilets, etc. shall be provided at site. The mining operations will be carried out in day time. only thus no electricity will be required. Moreover, no mineral/material processing is proposed or envisaged.

Table Error! No text of specified style in document.**.10: Manpower Details**

Manpower Details		
Categories	**Category /Type**	**No. of Heads**
Mining Supervisor	Skilled	1
Office Clerk & Trip man	Semi-skilled	1
Data Operator	Semi-skilled	1

Manpower Details		
Tipper/Excavator Operator	Semi-skilled	10
Sprinkler Operator	Semi-skilled	1
JCB Operator	Semi-skilled	1
Security Guard	Semi-skilled	1
Labour/Helper	Non-skilled	10
Total		**26**

2.10 Land Use Pattern

Table 2.11: Land Use Pattern of the Mining Area

Sl. No.	Particulars	Proposed Land use Pattern in current Plan Period	
		Acres	Ha.
1	Excavated Area	12.17	4.93
2	Safety zone	12.67	5.13
3	Area for 45^{o} slope of mining	0.45	0.18
	Total	**25.29**	**10.24**

2.11 Infrastructure Facilities

Workers are mostly locals and living in close proximity and will work in shift during day time only, hence no major infrastructure facility required at site. The following infrastructure facility will be made available for workers:

Mine Office: One Mining Supervisor will be required to supervise the mining operations. An office for manager 5x3 meters shall be provided at approx. 1 to 1.5 km away from the Mine.

Stock Yard: No stock yard has been proposed for the current project.

Canteen-cum-rest shelter: In order to provide the rest to the workers working in the area and to provide tea etc., the arrangement shall be made to install a rest shelter cum canteen. The size of the rest shelter will be 10 m x 3 m.

First Aid: To provide first-aid for any sort of injury during mining operations, first aid facility shall be provided at Mining office.

Crèche: No women worker for the mining operation has been proposed. However, if any women worker engaged for any ancillary work like plantation, canteen etc., a small crèche as per the requirement shall be considered.

2.12 GREENBELT DEVELOPMENT

The river bank area near the mining zone and transport route from the river bank to lease road will be properly developed and also cover with greenbelt to arrest the spread of dust & sand mass during mining operation. Greenbelt plan is provided at **Chapter-4.** The common board leaved native evergreen plant species were selected in planting in greenbelt area. The plant species identified for greenbelt development shall be planted using pitting techniques.

2.13 PROJECT COST

Capital cost of the project is Rs. 28.02 Crore and the break down has been provided in the following table

Table 2.12: Project Cost

Sl. No.	Description	Rate	Amount (in Rupees)
1.	Premium Charges of **98,71,098.32 cft** (2,79,518.11 Cubic Metre) sand material	@ Rs. 24.65/cft	24,33,22,573.59/-
2.	Royalty (including Cess, DMF, GST, etc.) of **98,71,098.32 cft** (2,79,518.11 Cubic Metre) sand material	@ Rs. 3.60/cft	3,55,35,953.95/-
3.	Miscellaneous (Temporary Labour Room, Temporary Toilet, etc.)		13,41,472.46/-
		Total	**28,02,00,000/-**

2.14. DESCRIPTION OF MITIGATION MEASURES

Air Environment

Dust is the major pollution in sand mining activity due to vehicular movement in the mining area and transportation activities in surrounding area which increase Particulate Matters concentration in the ambient air. Plant growth is also affected by dust deposition on leaf. Since the sand mining activity generally far off the surrounding villages the particulate matter concertation in the ambient air will be marginal. Water sprinkling on haul road and plantation along haul road will be done.

Water Environment

The mining of sand during the lease period will be worked out from the top surface above the ground water table. Thus, no ground water pollution is expected as mining will not intersect the ground water.

Noise Environment

It is a semi-mechanized operated quarry. Drilling & blasting are not proposed, hence there will be insignificant noise pollution due to excavation, loading and transportation.

Land Pollution

No Land Pollution in sand mining.

Solid waste Generation

No solid & liquid waste generate in sand mining.

2.15 ASSESSMENT OF NEW & UNTESTED TECHNOLOGY FOR THE RISK OF TECHNOLOGICAL FAILURE

Sand mining through semi-mechanized are well proven technology. Hence, there will not be any risk of technological failure.

2.16. MARKETABLE PRODUCT

Product – sand; Approximate production 107071.79 cum per year (max.)

2.17. CONCLUSION

The proposed sand mining project on river Damodar is located at Kumirkola, Block – Khandaghosh, Dist. – Purba Bardhaman, State–West Bengal, over an area of 10.24 Hectares (25.29 Acres) At J.L. NO. – 9, PLOT NO. - 1569(P), 1573(P), 1574(P), 1576(P), 1579(P), 1580 (P), 1606(P), 1608 (P), Block code - MIN_EBUR_45. It is well connected with rail, road and airport. The mining lease area is 10.24 Ha mineable for 5 years. The proposed project has positive impact on socioeconomic conditions of the area.

CHAPTER – 3

DESCRIPTION OF THE ENVIRONMENT

3.1 INTRODUCTION

This chapter illustrates the description of the existing environmental status of the study area with reference to the major environmental attributes. The existing environmental setting is considered to establish the baseline conditions which are described with respect to physical environment, air environment, water environment, noise environment, traffic pattern & density, land environment, biological environment and socio-economic environment.

The monitoring of environmental parameters has been conducted within the core zone and buffer zone (10 km radial distance) from project site at Kumirkola, Block – Khandaghosh, Dist. – Purba Bardhaman, State–West Bengal, in accordance with the guidelines issued by the Ministry of Environment, Forests and Climate Change and CPCB, New Delhi, during the study period (December'24 to February''25).

3.2 STUDY AREA

Studies of various environmental parameters have been done within 10 km radius area of the proposed project site. The study area map is given in **Figure 2.2 in Chapter 2**. The impact identification always commences with the collection of baseline data such as Ambient Air Quality, Micro-Meteorology, Ground and Surface Water Quality, Noise levels, Soil Quality, Land use pattern, Biological Environment and Socio-economic aspects, Solid and Hazardous waste, Risk Assessment, Geology and Hydrology within the study zone of 10 km. radius. The air, noise, water and soil sampling locations have been presented in Figure 3.2, 3.3, 3.4 and 3.5, respectively.

3.3 STUDY PERIOD

The baseline environmental study has been done for the period of December'24 to February''25 by Eco care Laboratory., Kolkata which is NABL Accredited Laboratory, Certificate No. TC-15136, in accordance with the Guidelines for EIA issued by the Ministry of Environment Forests and Climate Change, Govt. of India and CPCB, New Delhi. Secondary data also collected from different sources.

3.3.1 COMPONENTS & METHODOLOGY

The data was collected from both primary and secondary sources. The baseline primary information on micro-meteorology, ambient air quality, water quality, noise levels, soil quality are largely drawn from the data generated by Eco care Laboratory., Kolkata (NABL Accredited Lab). Long term meteorological data has also been collected from the Indian Meteorological Department (IMD) website. Micrometeorological data at site was recorded using automatic weather station. Apart from these, secondary data have been collected from Census Handbook, Revenue Records, Statistical Department, Soil Survey

and Land use Organization, District Industries Centre, Forest Department, Central Ground Water Authority, etc. Data on flora and fauna of the area is generated through authentic sources of Govt. authorized organizations. The short-term data is validated through the long-term data source to establish baseline of the area

The studies involved conducting field studies and analyzing various parameters that might be affected due to the mining operation and conducting socio-economic survey among the people.

The various parameters surveyed and studied for the baseline study are tabulated below:

Table No. 3.1 Environmental components and their methodologies

S.N.	Environmental components	Parameters	Methodology
1	Air	Meteorology (Ambient Temperature, Relative Humidity, Wind Speed, Wind Direction, Rainfall)	USEPA (Meteorological Monitoring guidance for regulatory modeling applications)
		Ambient Air Quality (PM10, PM2.5, SO2, NOx, CO)	IS-5182, CPCB (guidelines for measurement of Ambient Air Pollutants).
2	Water	Water Quality (Surface & Ground)	Standard limits: Surface-IS:2296 Ground-IS 10500 Sampling Methodology-IS: 3025
3	Noise	Ambient Noise Quality (Lmax, Lmin, Leq)	IS:9989(Assessment of noise with respect to community response)
4	Soil	Soil Quality (pH, EC, BD, Infiltration, Texture, SAR, Key nutrients, OM, OC, Fe, Zn and Cu)	Sampling Methodology and Analysis- IS: 2720
5	Land Use	Land use types, Land schedules, Satellite imagery	Bhuvan, NRSA
6	Ecology	Ecology studies (Floristic diversity, Terrestrial ecosystem sustainability, Green belt development, sinking capacity of pollutants)	Field Study / Secondary Data
7	Socio Economic	Demography and Occupational details, agricultural situation etc.	Census, District report Public Consultation by Questionnaire survey

S.N.	Environmental components	Parameters	Methodology
8	Hydrology & Geology	Geological, hydrological, geomorphologic studies	Geological Survey of India
9	Traffic Study	PCU/hr, LOS	IRC 106:1990

3.4 ESTABLISHMENT OF BASELINE FOR VALUED ENVIRONMENTAL COMPONENTS, AS IDENTIFIED IN THE SCOPE

The scope of the study is as per ToR letter issued by SEIAA, West Bengal with respect to proposal no. SIA/WB/MIN/496365/2024 dated 21/09/2024 has the ToR Identification No. of TO24B0107WB5788199N dated 12/03/2025 with the File No.: EN/T-II-I/052/2025.

3.4.1 Meteorological Data

Assessment of the micro and macro meteorology is important from the point of view of understanding the nature of environment in the study area. Climate has an important role in the build-up of pollution levels. Purba Bardhaman district has a tropical climate – hot and humid. While the hottest month is May, The coldest is January. The monsoon season is from June to September, with an annual average rainfall of 1,400 mm, 75% of it falling in the monsoon months. Local is thunder storms, called kalbaisakhi in Bengali, are a special feature from March until the monsoon sets in.

The cold season starts from about the middle of November and continues till the end of February. March to May is dry summer intervened by tropical cyclones and storms. June to September is wet summer while October and November are autumn. (Source: Indian Meteorological Department)

Table-3.2: Onsite Meteorological Data (Period: December'24 to February''25)

Month & Year	Temperature (°C)		Relative Humidity (%)		Precipitation Rate (mm)	Wind Speed (km/h)	
	Max	Min	Max	Min	Max	Max	Min
December – 2024	23	14	55	42	2.8	5	9.23
January – 2025	20	6	61	49	2.6	5	8
February – 2025	23	10	62	52	3.4	7	11

The predominant wind direction during this study period is observed mostly from North-west to South-East directions. The average wind speed during this period is 9.41 km/hr.

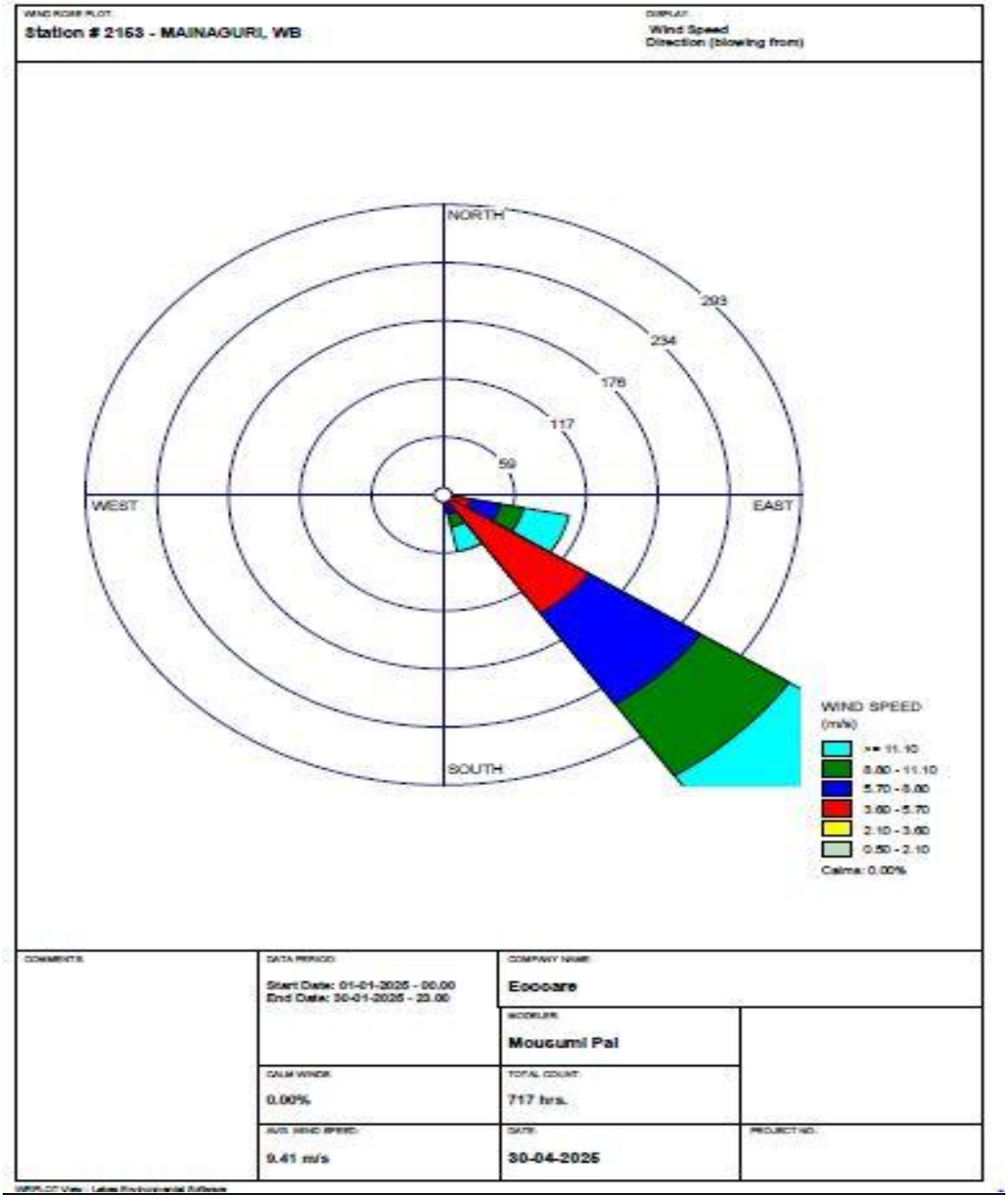


Figure 3.1: Wind Rose Diagram of Study Period (December'24 to February''25)

3.5 AIR QUALITY

3.5.1 Analytical Techniques for Air Quality Monitoring

PM_{10} and $PM_{2.5}$ have been estimated by gravimetric method. Modified West and Gaeke Method (IS: 5182 Part – II, 1969) has been adopted for estimation of SO_2. Jacobs –

Hochheiser Method (IS: 5182 Part-VI, 1975) has been adopted for the estimation of NO_x. NDIRS (Non-Dispersive Infra-Red Spectroscopic) Method (IS: 5182 Part-X, 1999) has been adopted for the estimation of CO. Summary of the analytical techniques and their references are as given in **Table-3.3**.

Table-3.3 Techniques Adopted/Protocols for Ambient Air Quality Monitoring

Sl. No	Parameters	Techniques	Technical Protocol
1	Sulphur Dioxide (SO_2)	West & Gaeke	IS:5182 (P2)
2	Nitrogen Dioxide (NO_2)	Jacob & Hochheiser	IS:5182 (P6)
3	Particulate Matter PM_{10}	Gravimetric	IS:5182 (P15)
4	Particulate Matter $PM_{2.5}$	Gravimetric	-

3.5.2 Air Quality Monitoring

The baseline air quality was established by monitoring major air pollutants like suspended particulate matter, sulphur di-oxide, oxides of nitrogen at various locations near the project site. Respirable dust collector and fine particulate matter samplers were used for ambient air sampling. Samples were collected continuously from all the stations for 24 hours, twice in a week. Samples thus collected were analyzed for various pollutants.

Baseline data for ambient air quality was collected at 7 locations within the study area during the period of December'24 to February''25. The sampling stations along with their distance and direction from the project site, ambient air quality monitoring stations, wind rose diagram showing the direction of the blowing wind during the analysis period, are detailed in **Table 3.2** and **Figure 3.1**. Ambient air quality analysis data for various parameters are given in **Table 3.5**.

To study the existing ambient air quality monitoring made during the study period are presented under the forthcoming sub-sections.

3.5.3 Methodology Adopted for The Study

The baseline status of the ambient air has been established through a scientifically designed ambient air quality monitoring network. The following criteria were taken into account during selection of the sampling stations:

- Topography of the area.
- Human settlements within the study area.
- Safety, accessibility and non-interference with general routine of the people residing near the station.

The frequency of monitoring was 48 hrs per week at each station spread over the season, with gaseous samples being changed six times, (at 8-hour intervals).

3.5.4 Air Quality of Study Area

Ambient air quality analysis reports are appended below in the **Table-3.4** and attached as ***Annexure-3***.

Table 3.4: Location of Air Monitoring Stations

Location Code	Location Name	Latitude	Longitude
AAQ 1	Kumirkola	23°14'35.41"N	87°41'58.08"E
AAQ 2	Khandagosh	23°12'34.62"N	87°41'28.65"E
AAQ 3	Hamirpur	23°12'36.02"N	87°42'50.15"E
AAQ 4	Tentulmuri	23°17'35.08"N	87°40'25.54"E
AAQ 5	Mohora	23°17'11.22"N	87°39'34.47"E
AAQ 6	Garomba	23°15'15.26"N	87°39'4.86"E
AAQ 7	Chandipur	23°14'12.12"N	87°44'59.84"E

Fig.3.2: Air Sampling Monitoring Locations

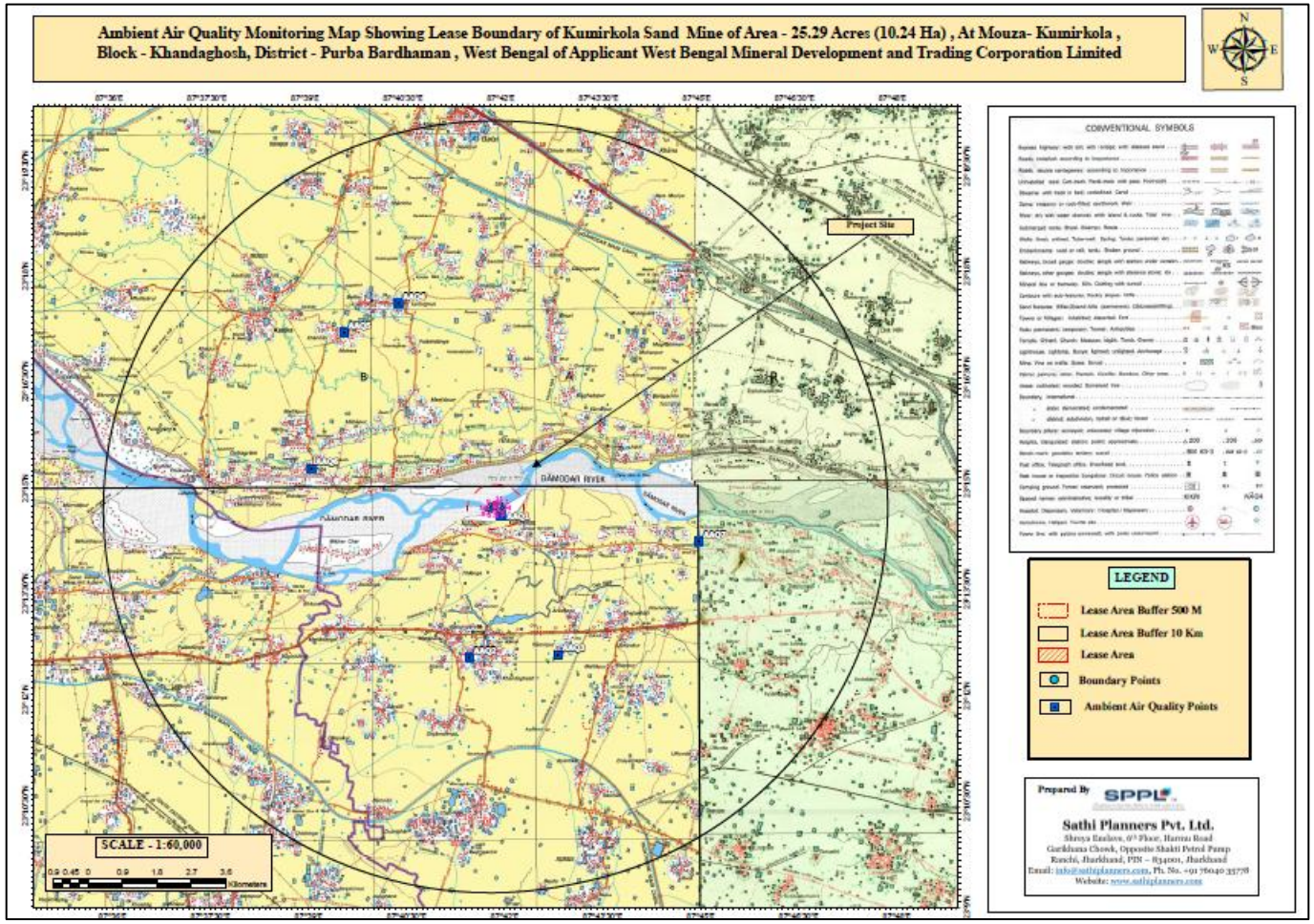


Table 3.5 Ambient Air Quality Monitoring Results

Parameters	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	NO_2 (µg/m³)	SO_2 (µg/m³)
Norm	**60**	**100**	**80**	**80**
(A1) Kumirkola				
Max	39.60	76.60	12.40	29.50
Min	23.60	48.50	6.60	6.60
Avg	32.01	65.48	9.72	18.95
98 Percentile	39.35	75.55	11.95	29.33
(A2) Khandagosh				
Max	39.50	79.60	9.80	29.40
Min	22.20	53.20	7.40	20.20
Avg	28.34	66.71	8.70	25.93
98 Percentile	37.35	78.00	9.75	29.40
(A3) Hamirpur				
Max	39.60	78.50	9.50	29.60
Min	21.50	54.30	5.20	20.20
Avg	27.77	68.74	7.16	25.60
98 Percentile	38.38	77.28	9.44	29.60
(A4) Tentulmuri				
Max	33.40	78.80	9.60	29.30
Min	20.20	57.00	6.10	20.40
Avg	27.76	68.57	8.19	25.33
98 Percentile	33.25	77.80	9.55	29.25
(A5) Mohora				
Max	32.10	70.20	9.40	28.20
Min	20.10	55.50	5.20	20.30
Avg	26.21	63.72	7.36	24.29
98 Percentile	31.35	70.05	9.30	28.00
(A6) Garomba				
Max	29.90	71.80	37.80	28.60
Min	18.20	55.50	20.40	19.80
Avg	24.28	63.76	28.33	24.99
98 Percentile	29.85	71.75	37.25	28.55
(A7) Chandipur				
Max	33.30	70.60	8.90	29.50
Min	18.60	57.00	5.80	21.20
Avg	25.82	64.73	7.37	24.69
98 Percentile	31.75	70.35	8.80	29.15

3.5.5 Observations:

Ambient Air Quality Monitoring reveals that the minimum and maximum concentrations of PM_{10} for all the seven (7) Air Quality monitoring stations were found to be **63.4µg/m³ and 69.1 µg/m³** respectively, while for $PM_{2.5}$ it vary between **34.1 µg/m³ and 32 µg/m³**. As far as the gaseous pollutants SO_2 and NO_2 are concerned, the prescribed limits under NAAQ Standards for residential and rural areas has never surpassed at any station. The minimum and maximum concentrations of NO_2 were found to be **19 µg/m³ and 26.2 µg/m³** respectively. The minimum and maximum concentrations of SO_2 were found to be **7.1 µg/m³ and 28.7 µg/m³** respectively and the prescribed limit of SO_2 and NO_2 is **80 µg/m³** which has never surpassed at any monitoring station. Detailed Air Monitoring Lab report is attached as ***Annexure-3*.** The standards of Ambient Air Quality in India are available online at *http://cpcb.nic.in/National_Ambient_Air_Quality_Standards.php*.

3.6 NOISE ENVIRONMENT

Noise levels were measured at seven (7) locations within the study area in **Table 3.6** and shown on map at **Figure 3.3.** Noise monitoring has been carried during day and night time and Leq values have then been computed hourly. Day time & Night time monitoring were conducted from 6 a.m. to 10 p.m. and from 10 p.m. to 6 a.m., respectively. Ambient noise levels were measured using integrated sound level meter.

Table 3.6: Noise Level Sampling Stations

Location Code	Location Name	Latitude	Longitude
NQ 1	Kumirkola	23°14'35.41"N	87°41'58.08"E
NQ 2	Khandagosh	23°12'34.62"N	87°41'28.65"E
NQ 3	Hamirpur	23°12'36.02"N	87°42'50.15"E
NQ 4	Tentulmuri	23°17'35.08"N	87°40'25.54"E
NQ 5	Mohora	23°17'11.22"N	87°39'34.47"E
NQ 6	Garomba	23°15'15.26"N	87°39'4.86"E
NQ 7	Chandipur	23°14'12.12"N	87°44'59.84"E

The proposed project requires excavation, loading and transportation of sand. Background noise levels were measured using integrated sound level meter in eight (7) locations **(Table-3.7).** Monitoring results are given below:

Table 3.7: Noise Level during Sampling

S.No.	Locations	Lmax		Lmin		Leq	
		Day	Night	Day	Night	Day	Night
1	(AN-1) - Kumirkola	55.6	44.2	62.77	53.88	65.4	54.1
2	(AN-2)- Khandagosh	54.2	43.8	61.2	51.17	50.2	42.7
3	(AN-3) - Hamirpur	52.2	44.1	64.36	52.36	47.8	38.8
4	(AN-4) - Tentulmuri	51.5	45.3	60.11	50.18	52.4	40.2
5	(AN-5)- Mohora	56.6	47.7	65.04	54.63	53.2	41.2
6	(AN-6)- Garomba	51.2	40.2	58.9	49.07	50.6	44.3
7	(AN-7)- Chandipur	53.8	47.5	63.72	55.42	51.5	39.6

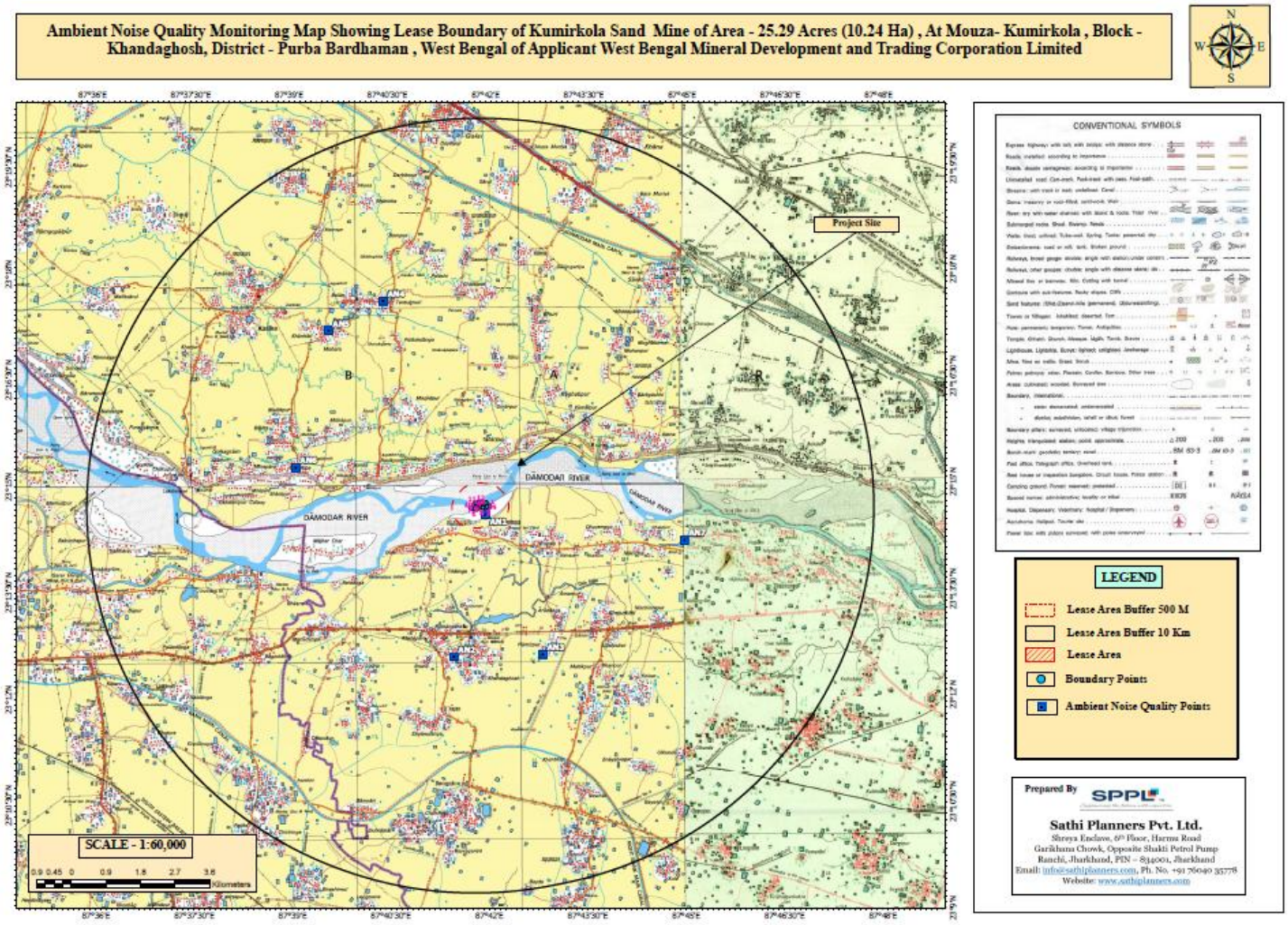


Figure 3.3: Noise Monitoring Locations

3.6.1 Observations

Ambient noise levels were measured at 7 (seven) locations around the proposed project site. Minimum and maximum noise levels recorded during the day time were from **51.2 Leq dB(A) and 55.6Leq dB(A)** respectively and minimum and maximum level of noise during night time were **40.2 Leq dB(A) and 47.7 Leq dB(A)** respectively. Lab result is attached as ***Annexure -3*** From the above study and discussions it can be concluded that noise levels in the study area are well within the prescribed limits as prescribed by MoEF&CC under Noise Pollution (Regulation & Control) Rules, 2000. Ambient Air Quality Standards in respect of Noise is available online at *http://cpcb.nic.in/divisionsofheadoffice/pci2/noise_rules_2000.pdf*.

3.7 WATER ENVIRONMENT

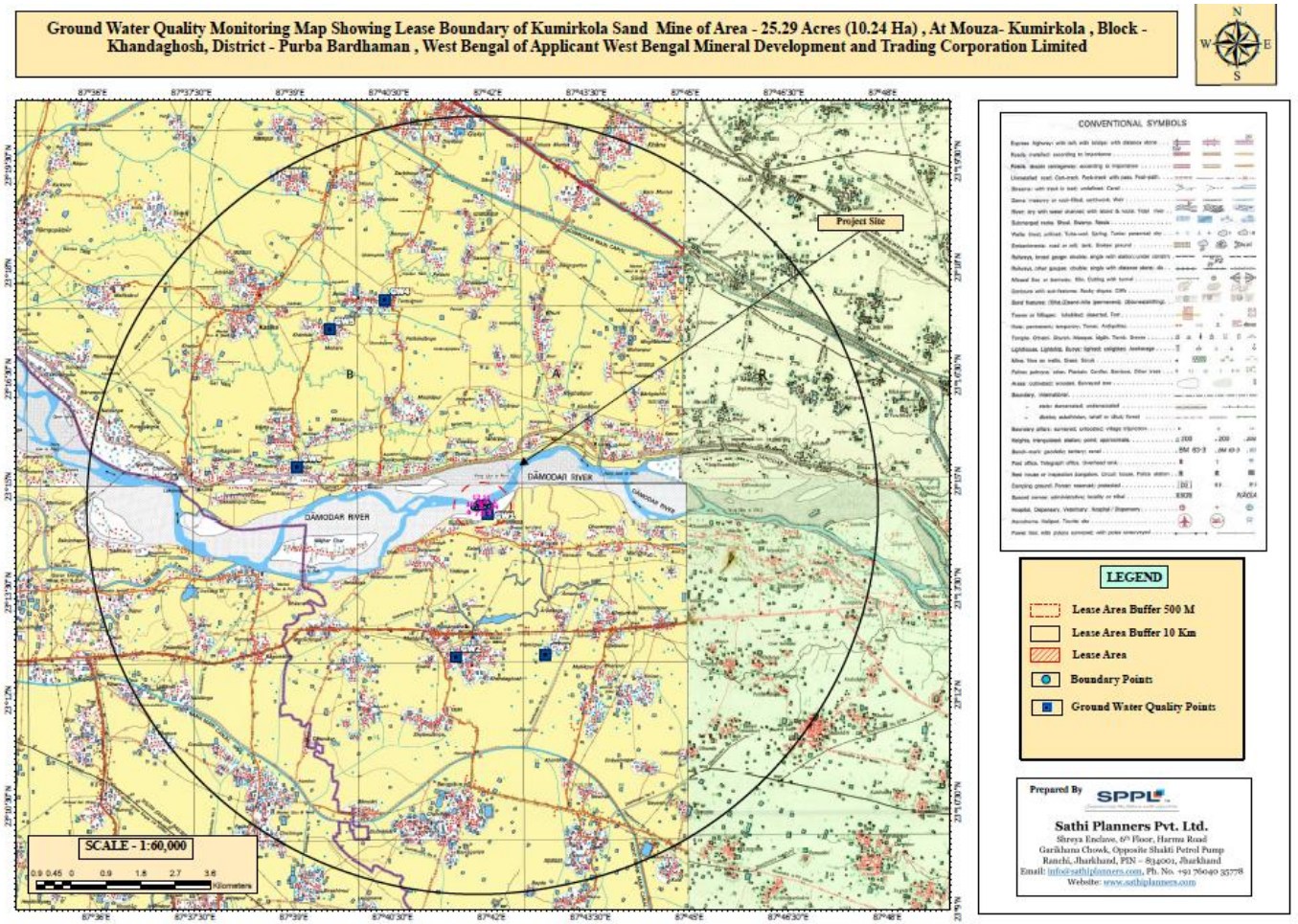
The impact has been assessed on randomly selected surface and groundwater sources falling within the impact zone. In order to assess the existing water quality, the Groundwater samples were collected from six (6) different locations and Surface Water quality from one (1) locations within the study area and analyzed as per the procedure specified in standard methods for examination of water and wastewater published by American Public Health Association and Bureau of Indian Standards (APHA/BIS).

The groundwater samples were drawn from the hand pumps and open wells being used by the villagers for their domestic needs. Surface water sampling was carried out from rivers present within 10 km of the project site. The details of the locations are given in **Table 3.8.**

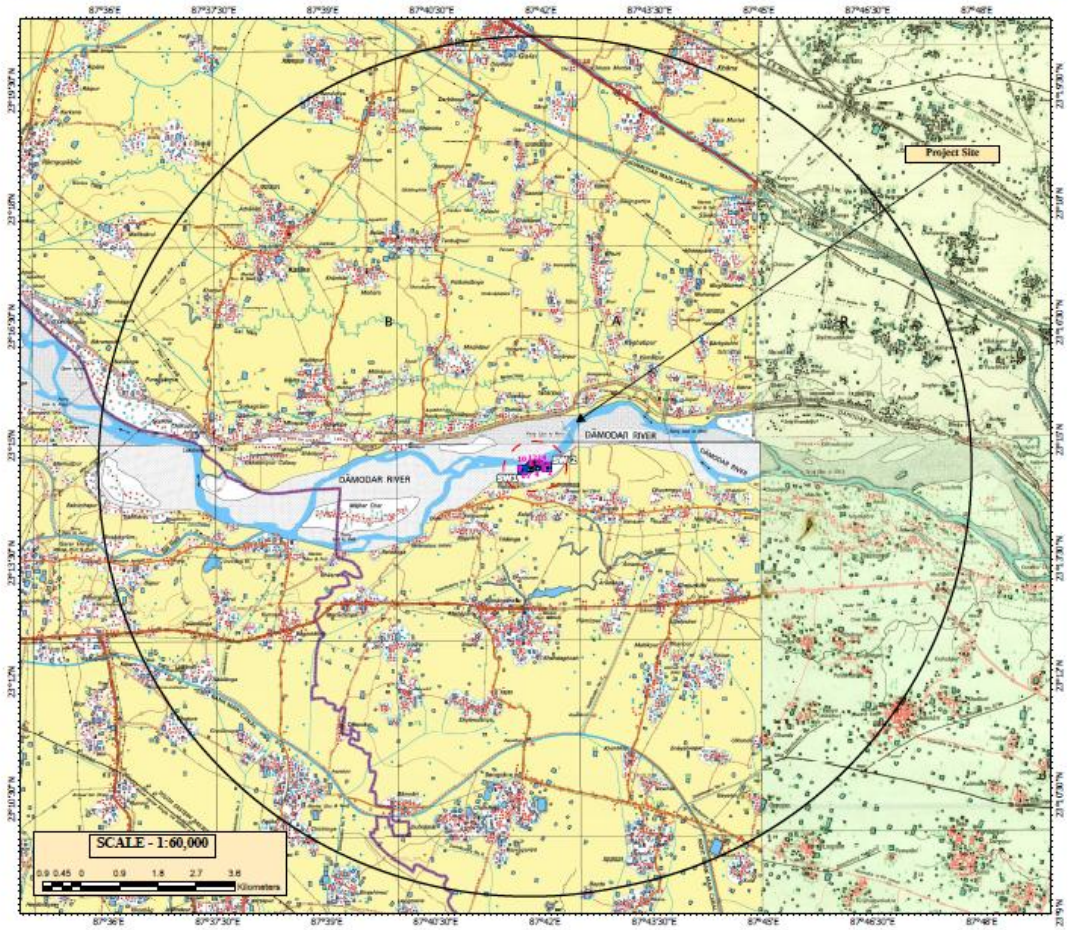
Table 3.8: Water Monitoring Station Details

SL NO	MARK	LOCATION	LATTITUDE	LONGITUDE
1	GW1	Kumirkola	23°14'35.41"N	87°41'58.08"E
2	GW2	Hamirpur	23°12'34.62"N	87°41'28.65"E
3	GW3	Tentulmuri	23°12'36.02"N	87°42'50.15"E
4	GW4	Mohora	23°17'35.08"N	87°40'25.54"E
5	GW5	Garomba	23°17'11.22"N	87°39'34.47"E
6	GW6	Chandipur	23°15'15.26"N	87°39'4.86"E

Figure 3.4: Map showing Water Monitoring Locations



Surface Water Monitoring Map Showing Lease Boundary of Kumirkola Sand Mine of Area - 25.29 Acres (10.24 Ha) , At Mouza- Kumirkola , Block - Khandaghosh, District - Purba Bardhaman , West Bengal of Applicant West Bengal Mineral Development and Trading Corporation Limited



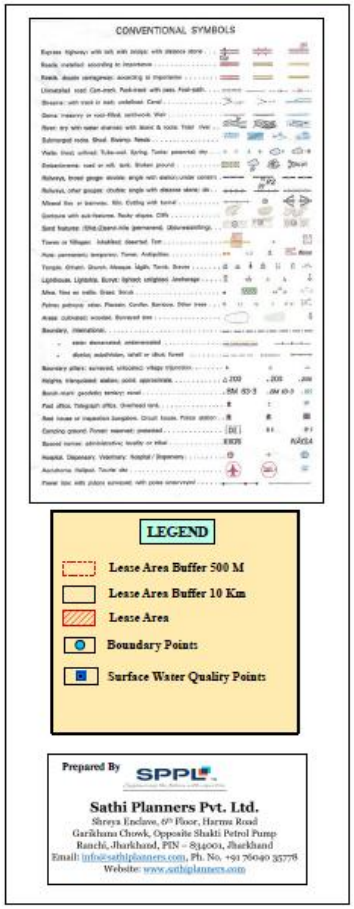


Table 3.9: Water Analysis Result (Ground Water & Surface Water)

Sl. No.	Parameter	Test Method	Location	Location	Kumirkola	Khandagosh	Hamirpur	Tentulmuri	Mohora	Garomba
			Long	Lat	23°14'35.41"N	23°12'34.62"N	23°12'36.02"N	23°17'35.0" N	23°17'11.22"N	23°15'15.26"N
			Lat	Long	87°41'58.08" E	87°41'28.65" E	87°42'50.15" E	87°40'25.54"E	87°39'34.47"E	87°39'4.86"E
			UoM	UoM	GW1	GW2	GW3	GW4	GW5	GW6
1	pH (at 25°C)	IS 3025 (P-11):1983, RA 2017	--	°C	6.7	6.79	6.65	6.82	6.52	6.9
2	Total Dissolved Solids (TDS)	IS 3025 (P-16):1984, RA 2017	mg/L	--	267.1	274.8	327.5	241.8	277.84	341.2
3	Turbidity	IS 3025 (P-10):1984, RA 2017	NTU	µS/cm	2.6	4.5	<1.00	3.1	2.4	1.7
4	Color	APHA 2120 B	Hazen	mg/L	< 5	< 5	< 5	< 5	< 5	< 5

5	Total Alkalinity (as $CaCO_3$)	IS 3025 (P-23):1986, RA 2019	mg/L	mg/L	**180.09**	**130.41**	**204.93**	**151.84**	**193.44**	**291.2**
6	Total Hardness (as $CaCO_3$)	IS 3025 (P-21):2009, RA 2019	mg/L	NTU	**254.52**	**202**	**234.32**	**163.2**	**214.2**	**236.64**
7	Chloride (as Cl^-)	IS 3025 (P-32):1988, RA 2019	mg/L	Hazen	**18.72**	**58.15**	**15.17**	**21.04**	**17.12**	**15.65**
8	Sulphate (as SO_4^{-2})	IS 3025 (P-24):1986, RA 2019	mg/L	mg/L	**14.42**	**22.27**	**19.72**	**15.2**	**23.7**	**19.6**
9	Nitrate (as NO_3)	IS 3025 (P-34):1988, RA 2019	mg/L	mg/L	**24.97**	**30.7**	**10.14**	**1.24**	**9.03**	**9.86**
10	Chlorine Residual (as Cl_2)	APHA 4500 - Cl- B	mg/L	mg/L	**< 0.50**	**< 0.50**	**< 0.50**	**< 0.50**	**< 0.50**	**< 0.50**

11	Fluoride (as F^-)	IS 3025 (P-60):2008, RA 2019	mg/L	mg/L	**0.35**	**0.74**	**0.59**	**0.14**	**0.65**	**0.58**
12	Calcium (as Ca^{+2})	IS 3025 (P-40):1991, RA 2019	mg/L	mg/L	**87.44**	**63.15**	**71.25**	**52.33**	**67.86**	**66.23**
13	Magnessium (as Mg^{+2})	IS 3025 (P-46):1994, RA 2019	mg/L	mg/L	**8.84**	**10.8**	**13.74**	**7.93**	**10.91**	**17.35**
14	Iron (as Fe)	IS 3025 (P-53):2003, RA 2019	mg/L	mg/L	**0.09**	**0.16**	**0.11**	**0.07**	**0.13**	**0.1**
15	Arsenic (as As)	APHA 3111B	mg/L	mg/L	**< 0.01**	**< 0.01**	**< 0.01**	**< 0.01**	**< 0.01**	**< 0.01**
16	Total Chromium (as Cr)	APHA 3111B	mg/L	mg/L	**<0.03**	**<0.03**	**<0.03**	**<0.03**	**<0.03**	**<0.03**
17	Total Coliform	APHA 9221 D	MPN/100 ml	mg/L	**Not Detacte**	**Not Detacte**	**Not Detacte**	**Not Detacte**	**Not Detacte**	**Not Detacte**
18	Escheria Coli	APHA 9221 D	MPN/100 ml	mg/L	**Absent**	**Absent**	**Absent**	**Absent**	**Absent**	**Absent**

Sl. No.	Parameter	Test Method APHA 24TH Edition	Location UoM	Upstream 23°14'40.01"N 87°41'43.04"E SW1	Downstream 23°14'42.20"N 87°42'4.91"E SW2
1	pH (at 25°C)	4500-H^+ B	--	7.25	7.37
2	Total Dissolved Solids (TDS)	2540 C	mg/l	153.8	191.2
3	Turbidity	2130 B	NTU	12.4	8.6
4	Color	2320B	Hazen	10	10
5	Total Alkalinity (as $CaCO_3$)	2320 B	mg/l	115.44	131.04
6	Total Hardness (as $CaCO_3$)	2340 C	mg/l	118.32	136.68
7	Chloride (as Cl^-)	4500 – Cl^- B	mg/l	8.81	12.33
8	Oil and Grease	4500 – Cl^- B	mg/l	<2.00	<2.00
9	Sulphate (as SO_4^{-2})	4500 – SO_4^{2-} E	mg/l	16.24	14.1
10	Nitrate (as NO_3)	4500 – NO_3^- E	mg/l	2.11	2.42
11	Fluoride (as F^-)	3500 – Fe B/D	mg/l	0.31	0.27
12	Calcium (as Ca^{+2})	3500 – Ca B	mg/l	34.34	40.8
13	Magnesium (as Mg^{+2})	3500 – Mg B	mg/l	7.93	8.43
14	Iron (as Fe)	3500 – Fe B	mg/l	0.16	0.14
15	Arsenic (as As)	3500 As – B	mg/l	<0.01	<0.01
16	Total Chromium (as Cr)	IS3025(P-52):2003	mg/l	<0.03	<0.03
17	COD	2150B	mg/l	15.12	18.14
18	Total Suspended Solids	APHA 24TH EDITION 2540 D:2023	mg/l	14.6	11.2
19	BOD	5210B:2023	mg/l	3.9	4.7
20	DO	IS 3025(Part-3):1989	mg/l	7.1	6.7
21	Chloride Residual(as Cl2)	IS 3025 (Part 26);196	Mg/l	<0.50	<0.50

3.7.1. Observations

Analysis results of groundwater reveal the following;

- pH varies from 6.52 to 6.9
- Total Hardness varies from 194.64 to 292 mg/l.
- Total Dissolved Solids varies from 272 to 377 mg/l.

Analysis results of surface water reveal the followings;

- pH is 7.65 to 7.92
- Total Hardness is 112 to 128 mg/l.
- Total Dissolved Solids is 391 to 430 mg/l.

3.7.2. Interpretation on water Quality

A review of the above chemical analysis reveals that there is some variation in chemical composition of water tapped from different sources but the groundwater (**Table 3.8**) from all sources remains suitable for drinking purposes as all the constituents are within the limits prescribed for drinking water standards promulgated by Indian Standards (IS: 10500). Indian standard Drinking water Specification, IS 10500:2012 for water quality is available online at http://cgwb.gov.in/Documents/WQ-standards.pdf. Lab result is attached as ***Annexure -3***

From the result represented in **Table 3.9** it may safely be concluded that the physico-chemical characteristics of the surface water samples had a good resemblance with respect to almost all the parameters and were well within the limits specified in Surface Water Standard IS: 2296. With regard to heavy metals, except Iron and Zinc, all the other were not traceable. From the above, it may be concluded that all the parameters of the surface water samples are within the specific limits of Indian surface water quality standard for Surface Water, BIS 2296: 1982. It is available online at

http://wqaa.gov.in/WriteReadData/UserFiles/Documents/Tolerance%20and%20Classification.pdf.

3.8 SOIL ENVIRONMENT

The soils of district are mainly two types: Gangetic soil, Vindhyan soil and Red Soil.

3.8.1 Soil Quality

The information on soils has been collected from various secondary sources and also through primary soil sampling analysis of which is described in this section.

For studying the soil profile of the region, soil samples were collected from five locations to assess the existing soil conditions within the study area representing various land uses. The sampling locations have been finalized with the following objectives:

- To determine the soil characteristics of the mine site.
- To determine the impact of the mining on soil.
- To determine the impacts on soils from agricultural productivity point of view.

3.8.2 Criteria Adopted for Selection of Sampling Locations

For studying the soil types and soil characteristics, 5 sampling locations were selected to assess the existing soil conditions representing various land-use conditions and geological features.

3.8.3 Methodology and Sampling

The homogenized soil samples were collected from each location at different strata and packed in a polyethylene plastic bag and sealed. The sealed samples were sent to laboratory for analysis. The important physical, chemical parameter concentrations were determined from all samples.

3.8.4 Soil Sampling Locations

Details of the soil sampling locations are given in **Table 3.10**

Table 3.10: Soil Sample Monitoring Station

SL NO	MARK	LOCATION	LATTITUDE	LONGITUDE
1	SQ1	Kumirkola	23°14'35.41"N	87°41'58.08"E
2	SQ2	Khandagosh	23°12'34.62"N	87°41'28.65"E
3	SQ3	Hamirpur	23°12'36.02"N	87°42'50.15"E
4	SQ4	Tentulmuri	23°17'35.08"N	87°40'25.54"E
5	SQ5	Mohora	23°17'11.22"N	87°39'34.47"E

Figure 3.5: Location of Soil sampling Monitoring Stations

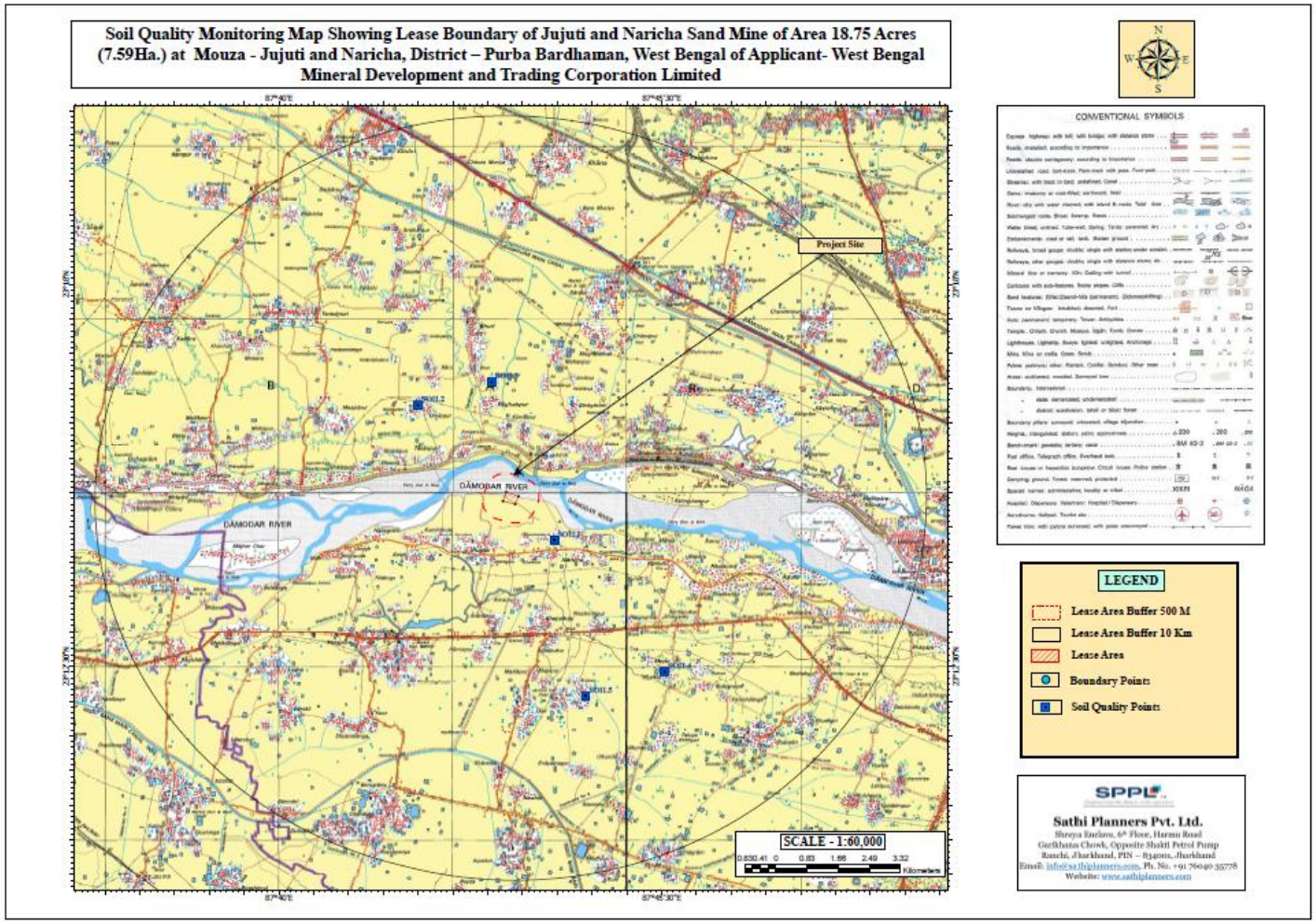


Table 3.11: Physico-chemical Properties of Soil

Sl. No	Parameters	Unit	Protocol	Sampling Location					
				Kumirkola	Khandagosh	Hamirpur	Tentulmuri	Mohora	Garomba
				23°14'35.41"N 87°41'58.08"E	23°12'34.62"N 87°41'28.65"E	23°12'36.02"N 87°42'50.15"E	23°17'35.0"N 87°40'25.54"E	23°17'11.22"N 87°39'34.47"E	23°15'15.26"N 87°39'4.86"E
1	pH	--	IS 2720 (P-26):1987	7.49	7.35	7.57	7.41	6.92	6.31
2	Arsenic	mg/kg	IS 3025 (Part 37):2022	< 0.35	< 0.35	< 0.35	< 0.35	< 0.35	0.35
3	Conductivity	µS/cm	IS 14467:2002	0.63	0.47	0.52	0.83	0.3	0.33
4	Water holding capacity	%	Soil Testing India 2011	40.1	38.05	40.3	35.7	16.8	17.1
5	Bulk Density	gm/cc	Soil Testing India 2011	1.24	1.27	1.26	1.36	1.2	1.32
6	Moisture	%	IS 2720 (P-2):2011	6.39	5.84	7.31	6.61	7.31	5.77

7	Iron	mg/l	EPA1311/EPA200.8:1992	2.5	3.5	2.5	< 2.50	<2.50	<3.50
8	Organic Matter	%	IS 2720 (P-22):1972	1.14	1.03	0.93	0.86	0.86	4.93
9	Available Magnesium	mg/kg	IS 3025 (Part 59):2023	2206.9	1675	215.35	2667.65	1770.35	1794.6
10	Available Calcium	mg/kg	Soil Testing India 2011	2670	1675	215.35	2667.65	1770.35	1794.6
11	Organic Carbon	%	Soil Testing India 2011	0.66	0.6	0.54	0.5	0.5	2.86

3.8.5. Interpretation

The analysis results show that soil is neutral in nature as pH value ranges from 6.31 – 7.57 with organic carbon percent from 0.36% - 0.82%. The percentage of available Nitrogen varied from 0.50 to 2.86. The NPK (Compound fertilizer containing N, P_2O_5 and K_2O) ratio is 8:1:3. The consumption of fertilizers is as important a factor as their production. There should be appropriate balance in the consumption of different fertilizer nutrients. The appropriate NPK ratio under Indian soil conditions is stated to be 4:2:1 (National Academy of Agricultural Sciences, 2009).

3.9 LAND ENVIRONMENT

Object of this study is to provide a baseline status of the study area covering 10 km radius around the proposed Mine site so that temporal changes due to the mining activities on the surroundings can be assessed.

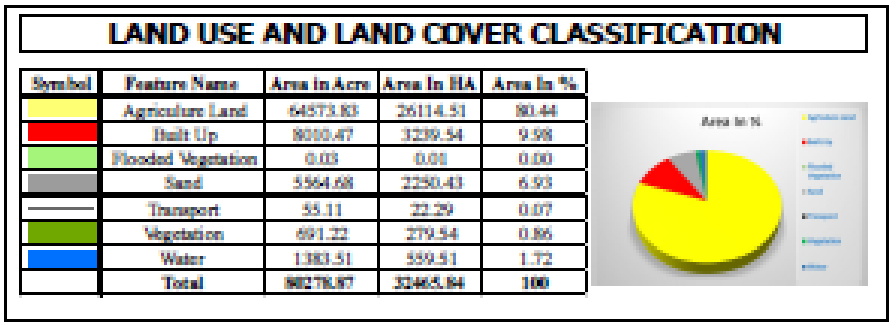
3.9.1 Topography and General Features

Physiography: Purba Bardhaman district is a flat alluvial plain area that can be divided into four prominent topographical regions. On the north, the Kanksa Ketugram Plain lies along with the Ajay, which joins the Bhagirathi. The Bardhaman Plain occupies the central area of the district, with the Damodar on the south and the south-east. On the southern part is the Khandaghosh Plain. The Bhagirathi flows along the eastern boundary of the district, and the Bhagirathi Basin occupies the eastern part of the district. The undulating laterite topography of Purba Bardhaman district extends up to the Ausgram area of this district.

Drainage: The gradient is westerly to the west and to the east, it is northerly towards Ajay and southerly towards Damodar below the latitude. The Ajay- Damodar inter-stream tract is made up of several stows consisting of vales and low convex spurs which run in almost all directions except north-east and thus lends a very complicated character to local relief.

3.9.2 Land Use Land Cover of the Study Area

The Google image of the study area, as considered for the Land Use Land Cover is as follows:



LAND USE AND LAND COVER CLASSIFICATION

Symbol	Feature Name	Area in Acre	Area In HA	Area In %
	Agriculture Land	64573.83	26114.51	80.44
	Built Up	8010.47	3239.54	9.98
	Flooded Vegetation	0.03	0.01	0.00
	Sand	5564.68	2250.43	6.93
	Transport	55.11	22.29	0.07
	Vegetation	691.22	279.54	0.86
	Water	1383.51	559.51	1.72
	Total	80278.87	32465.84	100

Figure 3.6: LULC Information of Purba Bardhaman District (Source: Bhuvan, NRSC)

It has already been described that Bhuvan, NRSC data has been used for describing the Land Use Land Cover of the study area.

The study area falls under the Purba Bardhaman District of the State of West Bengal. The land use land cover of the study area has been determined using the Web Map Service of Bhuvan, NRSC prepared by NRSC, Government of India on 1:50,000 scale using the Resource sat P-6 LISS III data of different seasons: Post monsoon season and Pre-monsoon season followed by detailed ground truth survey. All these LULC maps have been uploaded in the web server in picture mode so as to use it in QGIS (Open Source) / ArcGIS Software for extracting the required LULC map.

The study area was determined using the Google Map and the boundary of the 10 km was converted into vector mode in QGIS Platform. That vector layer was used to extract the LULC map of the study area. The LULC maps of both the states namely West Bengal in picture modes were imported into the QGIS platform. Since, both the two maps are geo-referenced and were prepared with the same Datum and Projection System, it was expected that both the two maps will merge with each other in a seamless manner. It seems there are some problems with geo-referencing and as a result the two maps although placed side by side had some gaps in between. However, the error is minor and the LULC map on 1: 50,000 scale has been created.

The LULC map of the study area is given in the next page. The LULC map shows agricultural land or crop land dominating the entire area with 80% land coverage followed by settlements with 10%. The rest are covered by water body, fallow land, vegetation and sand. Sand makes upto 5% of the land cover area and the lease azrea belongs to this category. It clearly indicates that the land use pattern of the study area follows the pattern of the LULC of Purba Bardhaman district, as shown above. The trend of distribution and percentage of different LULC class of the study area are almost same as can be identified visually. There is no forest land or ecologically sensitive land use unit near the mining site.

In addition to that, a land use land cover map on 1:5,000 scale i.e. in large scale for the immediate 500 meters in the vicinity of the mining area which is also given for proper

understanding of the land use pattern just outside the mining area so as to understand the impact of mining. It is obvious from the Land Use Land Cover map on 1: 50,000 scale of the 10 km study area as also the largescale map on 1:5,000 scale map of near vicinity, there is no appreciable impact of mining on the region so far as Land Use Land Cover is concerned.

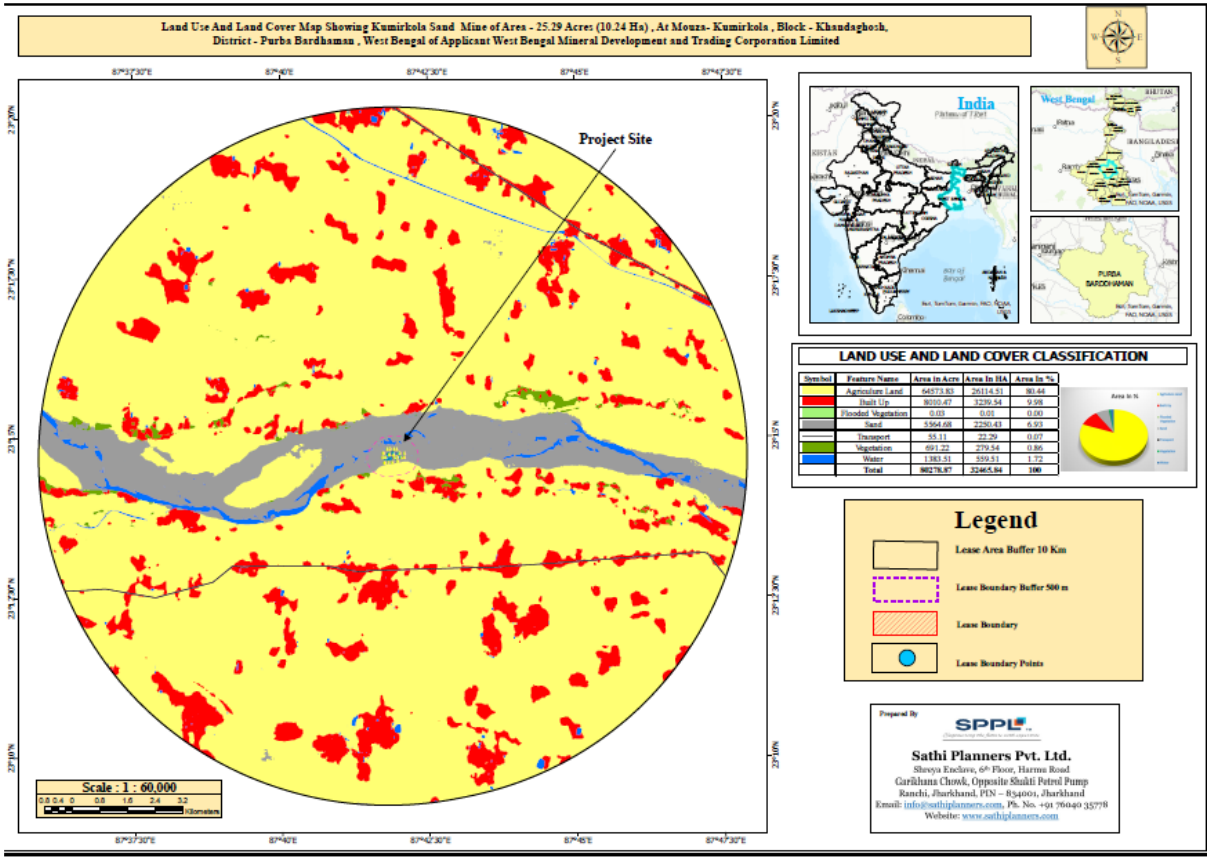


Fig. 3.7: Land Use / Land Cover Map of the Study Area

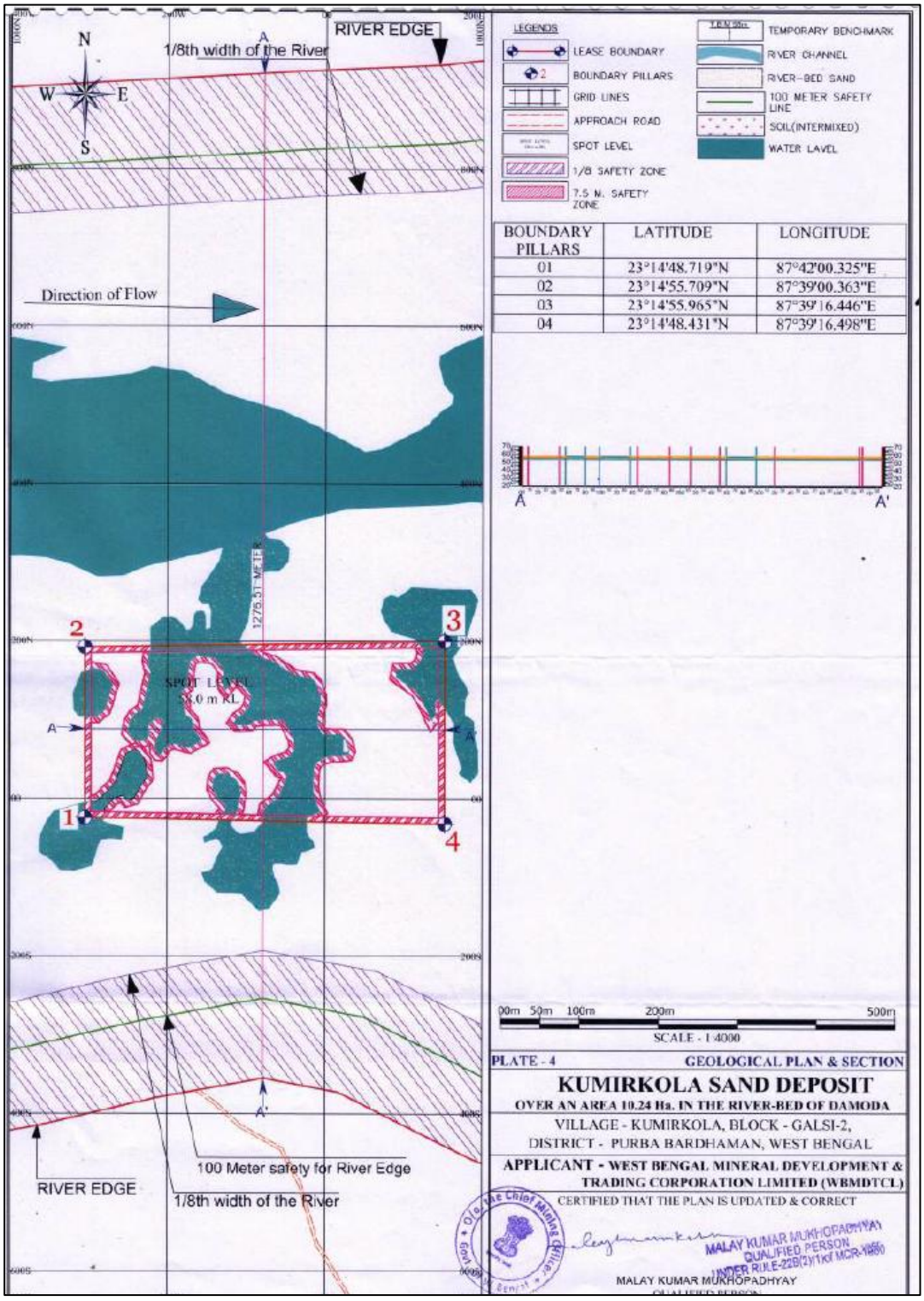


FIG. 3.9: Geological Map of the Area

3.10 GEOLOGY

3.10.1 Regional Geology

Bardhaman district has a variety of tectonic elements and riverine features. It is the transitional zone between Jharkhand plateau in the west and the Ganga-Brahmaputra alluvial Plain in the north. Jharkhand plateau consist of metasedimentary rocks of Precambrian age, Gondwana sedimentary rocks, Rajmahal basalt and upper tertiary sediments. Laterites are developed in some places and towards the south deltaic plains sediments of Damodar-Kasain-Subarnerekha.

The western half of the district resembles a promontory jutting out from the hill ranges of Chotonagpur plateau and consists of barren, rocky and rolling country with a laterite soil rising into rocky hillocks, the highest being 227 m. These diversify the otherwise monotonous landscape and lend a special charm to the skyline around Asansol sub-division. Ajay-Barakar divide is a convex plateau, the average altitude being 150 m. The gradient is westerly to the west and to the east it is northerly towards Ajay and southerly towards Damodar below the latitude. The Ajay- Damodar inter-stream tract is made up of several stows consisting of vales and low convex spurs which run in almost all directions except north-east and thus lends a very complicated character to local relief.

Purba Bardhaman district is a flat alluvial plain area that can be divided into four prominent topographical regions. On the north, the Kanksa Ketugram Plain lies along the Ajay, which joins the Bhagirathi. The Bardhaman Plain occupies the central area of the district, with the Damodar on the south and the south-east. On the southern part is the Khandaghosh Plain. The Bhagirathi flows along the eastern boundary of the district, and the Bhagirathi Basin occupies the eastern part of the district. The undulating laterite topography of Paschim Bardhaman district extends up to Ausgram area of this district.

The area under study is covered by a huge thickness of Recent to Sub-Recent Alluvium of the Ganga river system (Quaternary age). The area comes under the Bardhaman geological succession and has recent fluviatile sediments consists of clay, silt, sand and gravel succession. Sand is grey coloured with fine to coarse grained and highly micaceous in nature. Gravels are mainly composed of quartz, rock fragments and laterites.

The regional Geology of the area is shown in **Figure 2.4**.

Geological Succession of Bardhaman (Purba and Paschim):

Lithology	Geologic Unit	Age	
Sand, Silt, Clay	Diara Formation	Quaternary	Upper Holocene to Recent
Clay Alternating with Silt and Sand	Paskura Formation		Middle to Upper Holocene
Clay with Caliche Aoncretion	Sijua Formation		Upper Pleistocene to Middle Holocene
Laterite	Laterite		Cainozoic
Very Coarse Sandstone	Durgapur Bed	Gondwana Super Group	Jurassic
Red Shale, Sandstone	Panchet Formation		Triassic
Fine Grained Sandstone, Siltstone with Coal Seams	Raniganj Formation		Permian
Micaceous Shale, Sandstone	Barren Measure Formation		Permian
Gritty Pebbly Sandstone with Coal Seams	Barakar Formation		Permian
Sandstone, Conglomerate	Talchir Formation		Carboniferous-Permian(?)
Granite Gneiss and Migmatite	Chhotanagpur Granite Gneissic Complex		Achaean(?)-Proterozoic

3.10.2 Local Geology

The project is for River-bed Sand mining on Damodar River. The mining area consists of rocks different geological era. The river basin geology constructed by variety of rocks ranging from Archaean deposits of Granite gneiss, Migmatite Sandstone & Shale upto recent age rocks with the Paskura Formation and Diara Formation bearing Clay alterations with Silt & Sand, covering considerable areas are in the middle part of the basin. The greater portion of the surface is covered by Alluvium. The Lateritic Gravel and Sandstone are common in surface layer. The river bed sand consists of disaggregated sands with a very high percentage of quartz (silica) grains along with a few percentages of clay due erosion of river. The characteristics of sand is given in **Table 3.12**.

Table 3.12: Types of sand found in rivers (depend on the size of the sand)

Sl. No.	Type of Sand	Size in mm
1	Very Coarse Sand	1 -2

2	Coarse Sand	0.5 - 1
3	Medium Sand	0.25 – 0.5
4	Fine Sand	0.125 – 0.25
5	Very Fine Sand	0.062 – 0.125
6	Silt & Clay	< 0.062

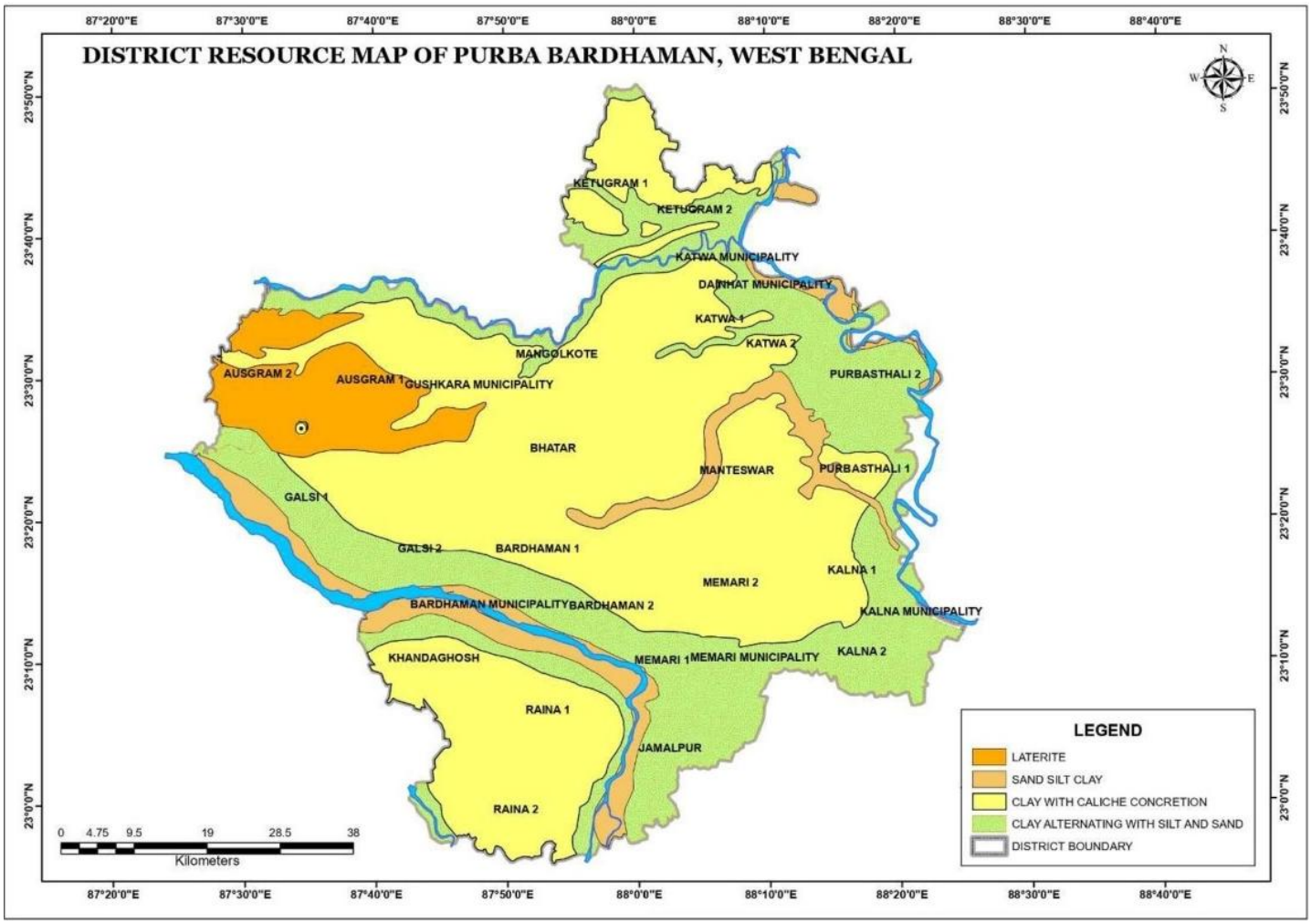


Figure 3.10: Geological Map of Purba Bardhaman District (Source: GSI, 2001)

3.10.3 Hydrogeology

Purba Bardhaman district has the rock type of Granite Gneisses, Migmatite, Schist, Sandstone with shale, Laterite, Sand, Silt and Clay. Thickness of the rock types is about 50 m and they have water yield value of about 150 cum/day.

Ground Water Development

Ground water systems are the result of complex combination of different lithological and structural types within an area that together constitutes an aquifer within which ground water accumulates and moves. In the major part of the district, ground water in thick unconsolidated Quaternaries and Tertiaries deposited under fluviatile

environment, the sand and/or gravel in different proportions of this formation constitute the main aquifer and they occur down to 295 mbgl in the central and eastern part of the district.

Deeper aquifers occur under semi-confined to confined condition. Groundwater in the western part of Upper- Palaeozoic- Mesozoic- Tertiary sequences of Gondwana Supergroup of sedimentaries occur under both unconfined and confined conditions down to 150.35 mbgl. Groundwater in the extreme north western small part of Salanpur Block occupied by the Archaean metamorphics occurs down to a depth of about 82 mbgl under both unconfined and confined conditions down to 150.35 mbgl. It mainly occurs under unconfined condition in the dug well zone and under semi confined to confined condition in the deeper horizons. In Bardhaman district, ground water occurs in semi-confined to confined aquifer conditions in the depth span of 12.00-38.00 mbgl, 31.00-55.00 mbgl and 70.00-88.00 mbgl (Source: *http://cgwb.gov.in/Regions/GW-year-Books/GWYB-%202016-17/WB%20&%20Andaman.pdf*).

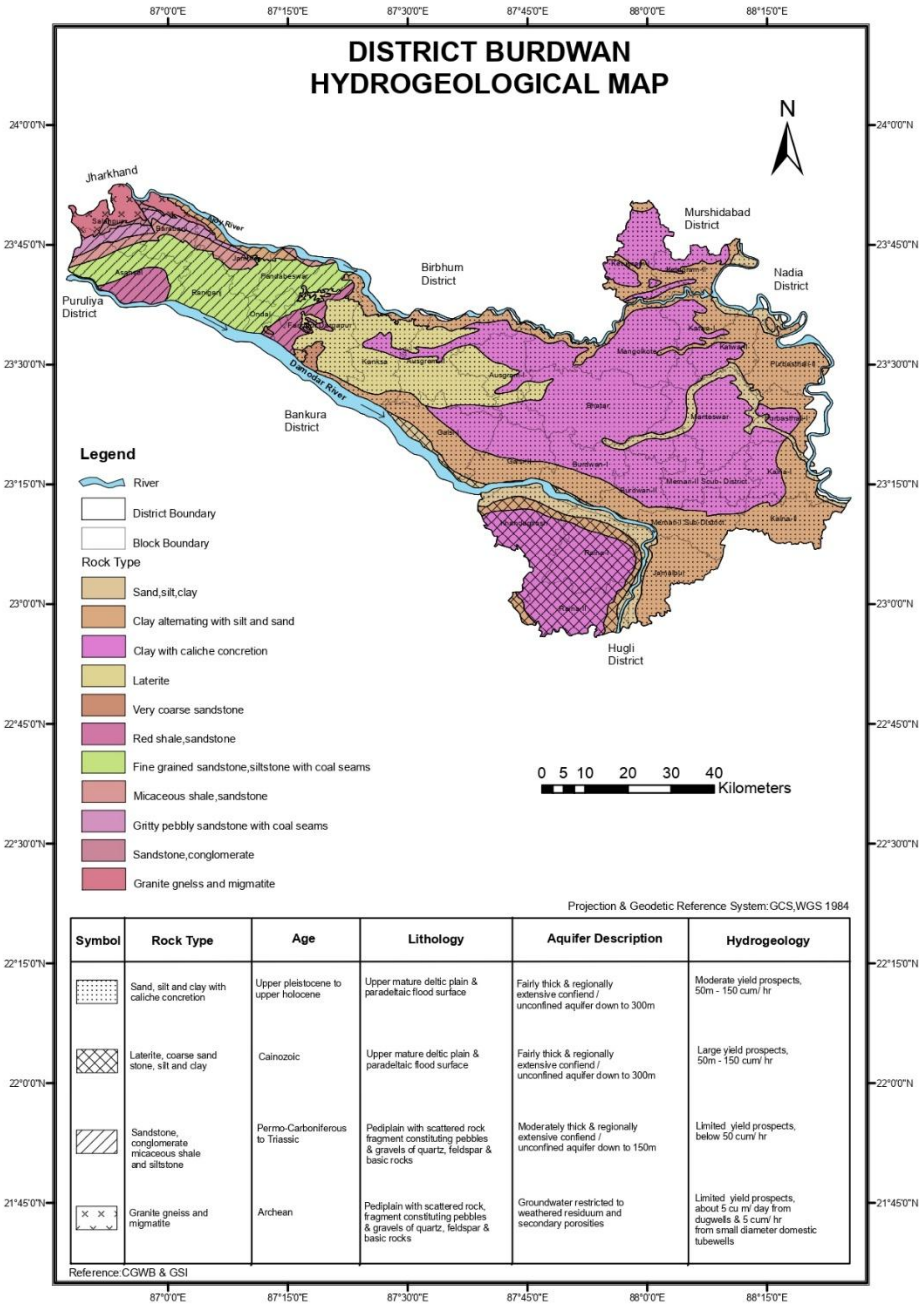


Figure 3.11: Hydrogeology of Purba Bardhaman District (Source: DSR, Purba Bardhaman-Mar, 2024: *http://wbwridd.gov.in/swid/mapimages/BARDDHAMAN.pdf*)

Hydraulic Characteristics

The ability of an aquifer to transmit water depends upon its hydraulic conductivity, storability and transmissivity. Geology analysis done by CGWB shows Quarternary alluvium underlying the area forms a rich repository of groundwater. It occurs in a thick zone of saturation within these alluvial sediments. Several promising saturated granular zones are present in the depth span of 25-210 m bgl (commonly 25-150 m bgl). Ground water in the area occurs under unconfined to semiconfined conditions, though

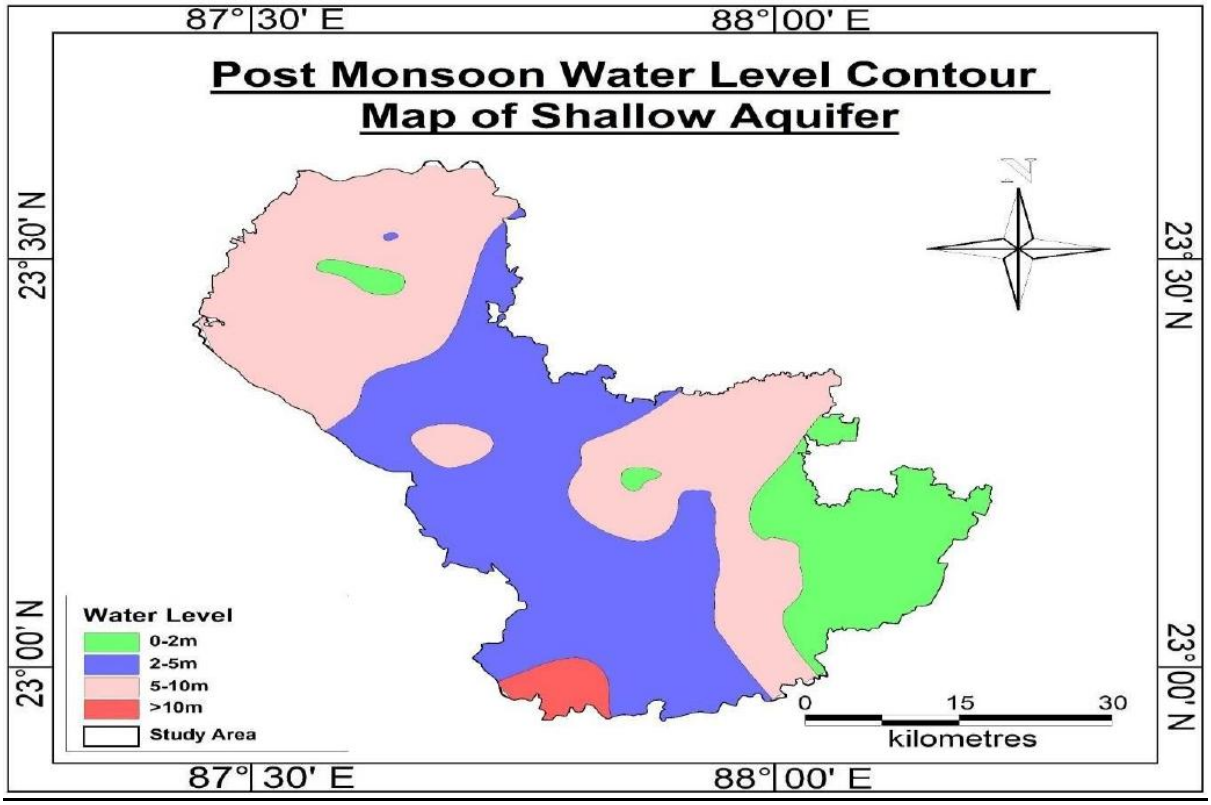
predominantly under semiconfined. Underlain by older alluvium, laterite, Tertiary and Quaternary sediments, groundwater occurs under unconfined conditions within a maximum depth of 70 m bgl and the zone is tapped through a system of open dug wells and shallow tube wells. Shallow aquifers in Tertiary Formations are composed of coarse sand and gravel. Whereas, they are represented by layers of fine to medium sand with occasional gravel and pebble in Quaternary Formation. Sometimes these sand and gravels are separated by relatively thin layer of clays which makes them to occur under semi-confined to confined conditions. Yields from tube wells tapping Tertiary and alluvial sediments vary from 10 m^3/hr to 47.7 m^3/hr. The values of Co-efficient of Transmissivity (T) of the Tertiary and alluvial sediments range from 88m m^3/hr /day lo 1700 m^3/day and the values of Storage Co- efficient (S) range from 1.6X10 to 2 5X10 (Source: CGWB).

Table 3.13: Aquifer Characteristics and zones tapped in the study area of Purba Bardhaman District. (Source: CGWB, ER, Kolkata and PHED, West Bengal)

Block	Location	No. of Aquifers	Water bearing zone (Zones Tapped)	Aquifer Thickness (m)		Discharge (lpm)	T (m^2/day)	SWL (mbgl)	Drawdown (mbgl)	S
				Aquifer-I (Within 50 mbgl)	Aquifer-II (Below 50 mbgl)					
Ausgram-II	Kota Chandipur	2	40-70	10	20	--	--	--	--	--
	Debsala	2	56-77,98-104		17	--	--	--	--	--
	Pubar	3	221-236, 248-257	18	30	--	--	--	--	--
Burdwan-II	Palsit	2	72-102	28	40	--	--	--	--	--
Galsi-I	Mankar	3	28-34, 42-50, 102-114,115-121	14	53	64200	2.446		20.26	
	Budbud	3	90-96, 186-192, 232-238	6	50	--	--	--	--	--
	Chaktentul	2	45-54, 64-73, 100-109	19	p2	--	--	--	--	--
Galsi-II	Adra	2	28-43	24	29	--	--	--	--	--
	Ura	2	43-68	29	43	--	--	--	--	--
Jamalpur	Chakdighi	2	27-33	11	30	--	--	--	--	--
	Jaugram	2	96-125	26	60	--	--	--	--	--
	Abujhati	3	115-145	5-8	70	--	--	--	--	--
	Madhabpur	2	101-131	13	48	--	--	--	--	--
Khandaghosh	Sargai	2	59-62, 72-84, 86-89, 92-98	21	48	--	--	--	--	--
	Bagdipara	3	107-116, 128-146	10	63	--	--	--	--	--
Memari-I	Maheshdanga	3	113-125, 131-149	24	47	--	--	--	--	--
	Palla	3	90-120	27	52	--	--	--	--	--
Raina-I	Madanagar	2	94-124	19	30	--	--	--	--	--
	Teandul	2	74-96	41	27	--	--	--	--	--
Raina-II	Keunta	2	81-109	44	36	--	--	--	--	--
Ausgram-I	Dharapara	3	74-89, 178-190	13	27	522	80		12.65	1.03X10-3
	Banagram	3	226-232, 241-253, 282-294	19	69	2037	186.5		12.4	1.88X10-3
Burdwan-I	Mirjapur	2	42-48, 96- 108, 166-172	15	44	--	--	--	--	--

Ground Water Levels

The ground water levels within the state of West Bengal are regularly measured by the Central Ground Water Board. CGWB carries out study of shallow and deeper aquifers for the per-and post-monsoon water levels.



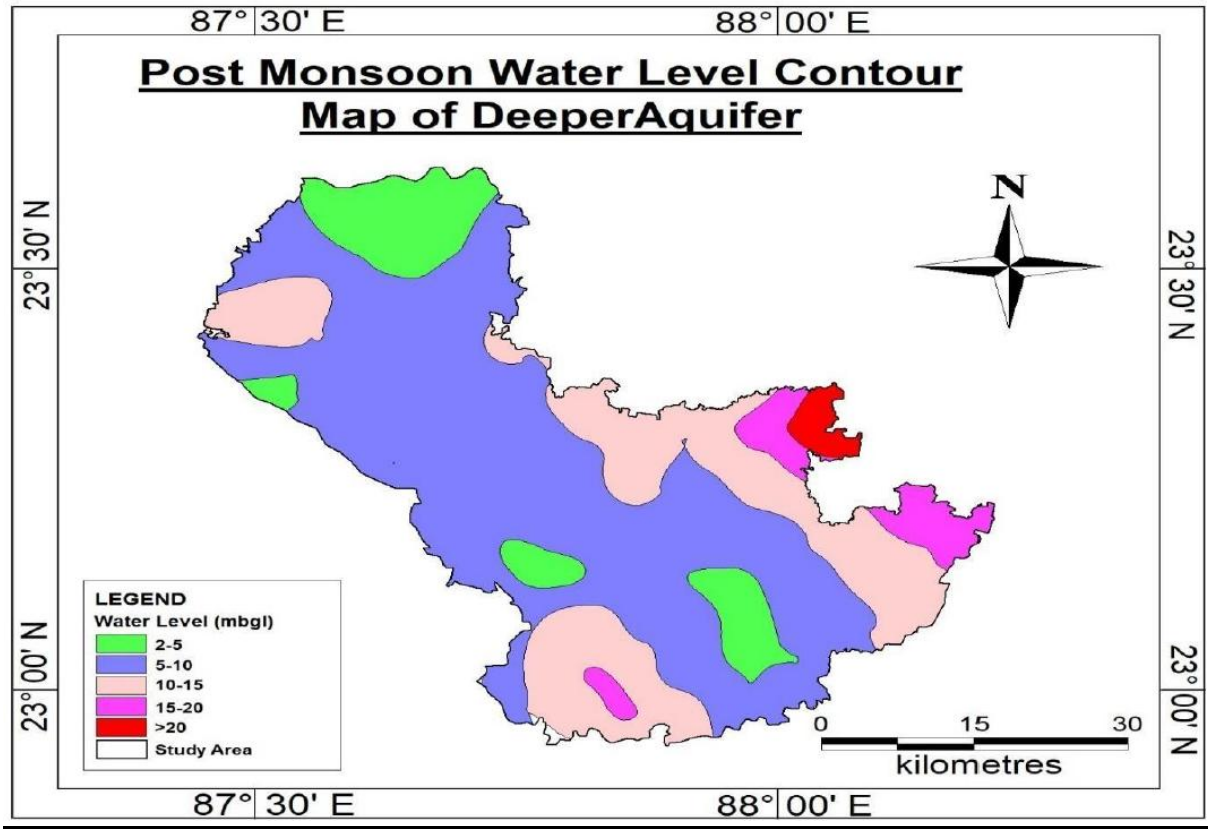
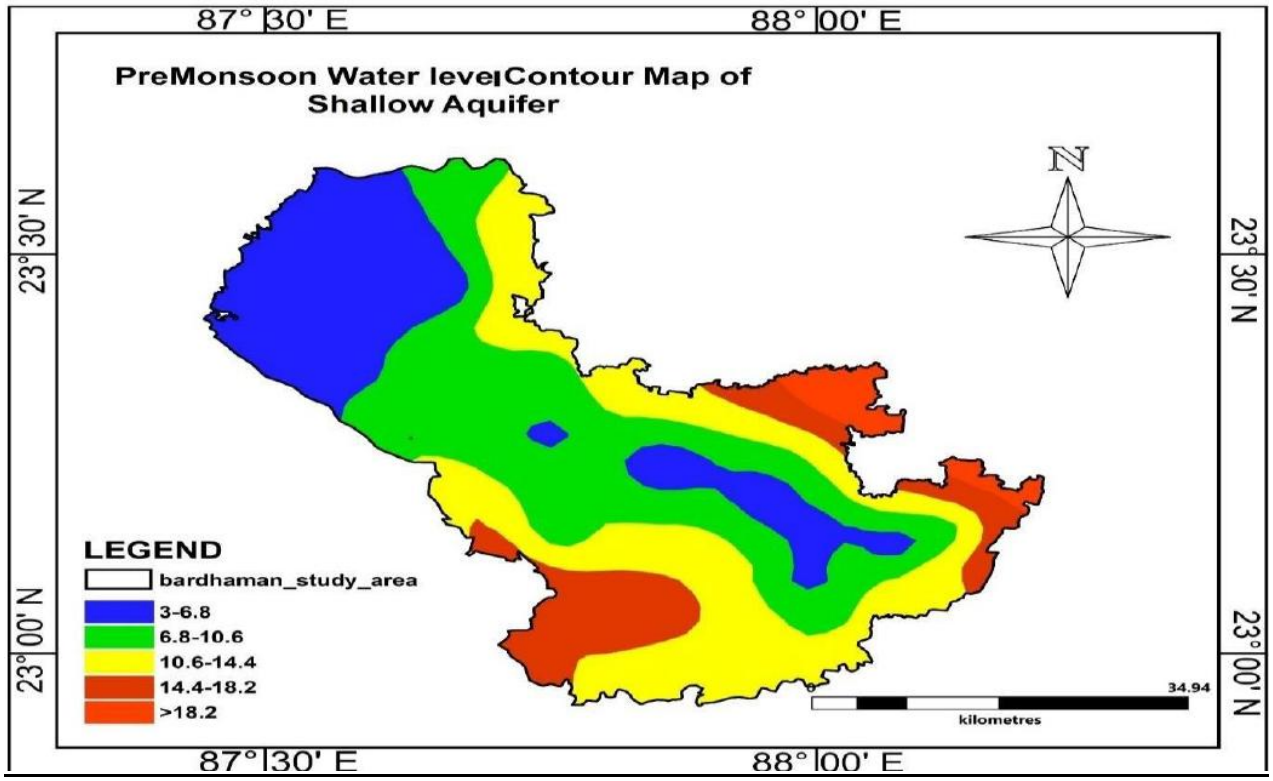


Fig: Post-monsoon Water levels in District Purba Bardhaman


87° 30' E
88° 00' E
PreMonsoon Water level Contour Map of Shallow Aquifer
N
23° 30' N
23° 00' N
LEGEND
bardhaman_study_area
3-6.8
6.8-10.6
10.6-14.4
14.4-18.2
>18.2
34.94
kilometres

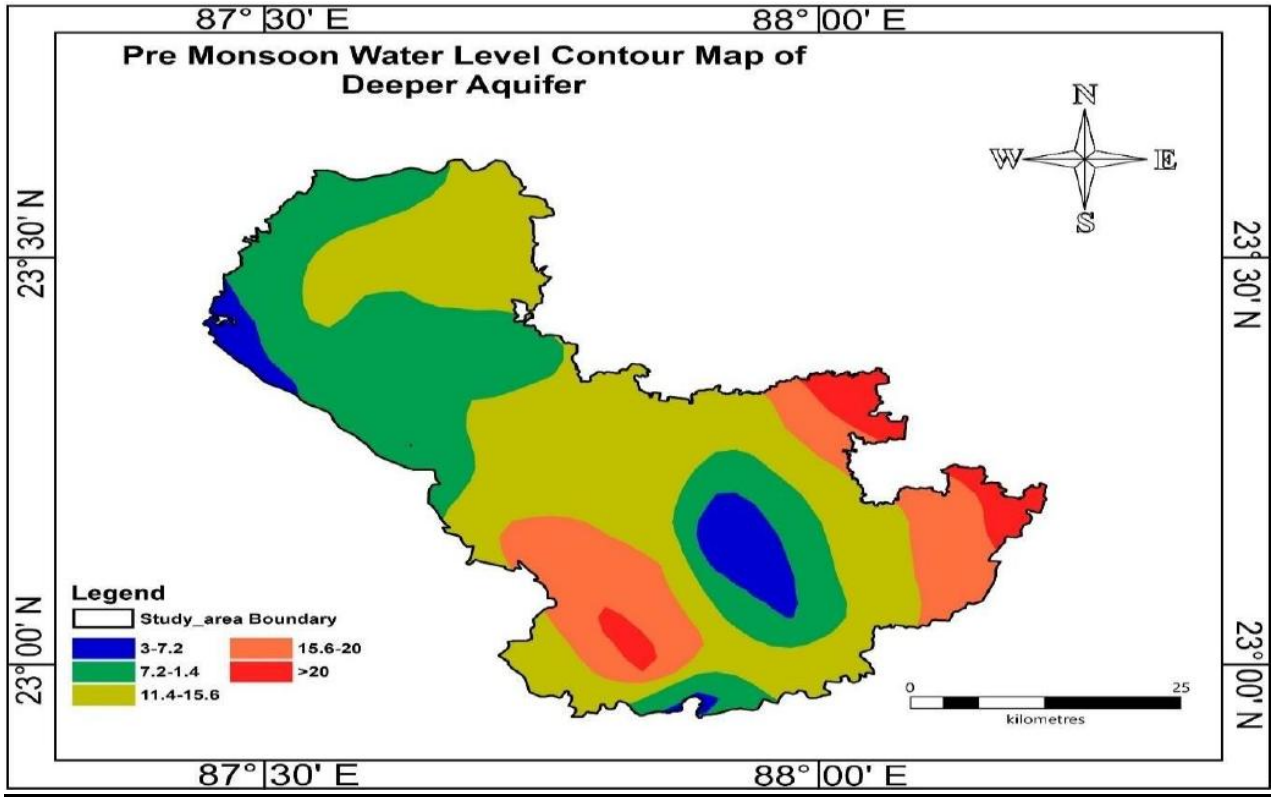

87° 30' E
88° 00' E
Pre Monsoon Water Level Contour Map of Deeper Aquifer
N
W
E
S
23° 30' N
23° 00' N
Legend
Study_area Boundary
3-7.2
7.2-1.4
11.4-15.6
15.6-20
>20
0
25
kilometres

Fig: Pre-monsoon Water levels in District Purba Bardhaman

Ground Water Quality

Ground water samples were collected during pre-monsoon period from the monitoring key wells established for the NAQUIM studies and National Hydrograph Stations falling in the study area and those have been analysed in the departmental Chemical Laboratory. Chemical quality of ground water occurring in shallow and deeper aquifers does not vary significantly, except arsenic concentration. The water, in general, is slightly alkaline (Source: Report on National Aquifer Mapping & Management Plan in Parts of Purba and Paschim Bardhaman District, West Bengal).

Shallow aquifer: pH of water, in general, varies between 6.84 and 7.83 and EC ranges between 174 and 1010 µS/cm. Most the ground water in burdhaman , EC is laying less than 500 µS/cm. EC is higher than 500 µS/cm in parts of Ausgram-I, galsi-I, Khandaghosh and some portions of Rayna-I blocks. The range of EC in Assansol area is around 980-1366 µS/cm which makes it unsuitable for drinking. Concentrations of Na ranges from 7.2 to 92.4 mg/1. Cl is mostly in the range of 14.18 – 138.2 mg/1. Fluoride ranges from 0.07 – 0.7 mg/1, whereas Nitrate concentration ranges from BDL– 15.8 mg/1. Total hardness ranges from 40-390 mg/1. The maximum contaminant level for Uranium in is 30 ppb , Uranium concentration in all these blocks are within permissible limit.

Table 3.14A Block-wise range of chemical Parameters in Deeper Aquifer

Block	pH	EC	TH	Ca	Mg	Na	K	HCO3	TA	Cl	NO3	F	TDS	U
Galsi-I	6.84-7.71	174-1010	50-265	012 - 64	4.9-27.9	10.75-92.4	0.94-2.9	61-384.3	75-315	17.7-120.5	0.2-3.2	0.07-0.52	85.6-541.7	0.079-6.55
Galsi-II	7.4-7.59	360.8-466.9	170-220	30-46	18.2-31.6	11.02-35.1	0.75-2.14	189.1-280.6	155-230	28.36-42.54	0.2-1.0	0.26-0.42	212.1-305.9	0.66-1.56
Bardhaman	7.2-7.77	196.9-492.5	95-230	30-48	4.9-31.6	9.03-38.9	1.08-2.09	122-317.2	100-260	24.81-49.63	0.1-2.0	0.23-0.62	171.2-344.6	0.21-3.39
Rayna-II	7.39-7.77	472-581.4	200-260	40-56	20.6-38.8	11.33-29.7	0.86-2.7	244-347.7	200-285	17.72-56.72	0.3-2.6	0.4-0.62	263-340.9	0.95-4.19
Ausgram-II	6.87-7.48	219.5-271.4	40-145	18-30	8.5-17.0	7.1-16.2	1.61-3.76	49-195.2	55-160	14.18-28.36	0.2-0.5	0.08-0.3	70.2-203.3	<0.0030
Augram-I	6.88-7.65	179-643.3	70-240	18-48	2.4-34.0	15.9-31.92	1.04-3.24	97.6-347.7	80-305	14.18-46.085	0.1-1.1	0.12-0.57	140.6-349.1	0.16-2.30
Khandaghosh	7.5-7.74	444-996	200-390	40-52	18.2-60	19.56-42.9	0.83-11.21	268.4-366	220-300	21.27-138.255	0.1-15.8	0.4-0.75	308.8-496	0.83-4.3
Rayna-I	7.72-7.83	397.3-779.6	170-295	26-44	25.5-34.0	28.91-40.5	0.87-1.24	256.2-366	210-300	14.18-85.08	0.1-0.5	0.34-0.6	269-435.5	0.82-5.91
Jamalpur	7.28-7.79	237.8-707.2	95-225	18-54	8.5-43.7	20-68.58	0.81-32.76	158.6-408.7	130-335	14.18-77.99	7.5-8.0	0.22-0.61	173.6-433.8	0.2664-3.59
Memari-I	7.23-7.9	254.6-473.4	100-200	16-52	4.9-27.9	16.31-36.5	1.35-2.1	146.4-292.8	120-240	14.18-42.54	0.0-7.9	0.18-0.42	201-319.3	BDL-1.9023
Kanksa	6.33-7.59	102.4-841.2	65-290	18-32	4.9-51	2.86-56.7	0.7-3.52	91.5-439.2	75-360	17.72-67.35	0.1-1.2	0.04-0.47	126.1-477.3	10.5
Assansol	7.8	980.1-1366	160-420	22-100	25.48-41.26	75.24-294.3	6.2-14.2	378.2-701.5	310-575	74.44-159.52	0.49-0.98	0.39-1.23	477.29-897.49	3.40-6.25

Deeper aquifer: pH of water, in general, varies between 6.34 and 7.81 and EC ranges between 114 and 636 µS/cm. The EC contour map (Fig-8.2&2A) shows that, the ground water in deeper Aquifer is mainly having less than 500 µS/cm in most of the part and in some parts like in Galsi-I & II , Rayna-I and some parts in Jamal pur where EC value goes

above 500 µS/cm. A exceptional higher Ec value noticed in assansol that is 897 µS/cm. Concentrations of Na ranges from 13.37 to 64.5 mg/1. Cl is mostly in the range of 14.18 – 53.6 mg/1. Fluoride ranges from 0.04 – 0.66 mg/1, whereas Nitrate concentration ranges from 0.1– 9.7 mg/1. Total hardness ranges from 45-285 mg/1.

Table 3.14B Block-wise range of chemical Parameters in Deeper Aquifer

Block	pH	EC	TH	Ca	Mg	Na	K	HCO3	TA	Cl	NO3	F	TDS	U
Galsi-I	7.71	583.2	210	52	19.4	34.5	0.99	292.8	240	35.45	1.9	0.52	323.4	3.4799
Galsi-II	7.25-7.72	179.2-556.3	115-255	40-52	3.6-30.3	13.54-16.07	0.92-1.02	122-305	100-250	17.72-31.90	0.5-2.5	0.28-0.58	169.6-318.4	<0.368
Bardhaman	7.36	443.5	260	48	34.0	17.35	0.75	298.9	245	35.45	1.6	0.43	319.9	2.7483
Rayna-II	7.64	436.1	205	42	24.3	26.1	1.04	317.2	260	14.18	0.1	0.46	301.6	BDL
Ausgram-II	6.43-7.81	114.5-532.2	60-160.5	16-34	4.9-18.3	20.4-42.1	1.58-9.63	48.8-298.9	40-245	21.27-42.5	0.4-9.7	0.04-0.36	125.4-312	BDL
Ausgram-I	7.18-7.49	354.4-416.9	155-190	28-40	13.3-29.1	13.37-28.4	1.17-1.41	164.7-244	200-135	21.27-53.6	0.6-2.3	0.21-0.5	228.3-254.4	<0.4170
Khandaghosh	7.58-7.7	491.6-543.9	230-260	36-46	34-35	15.61-24.06	0.8-1.14	317.2-347.7	260-285	14.18-35.45	0.1-6.2	0.56-0.61	327.2-328.3	2.44-4.22
Rayna-I	7.64-7.76	584.7-604.3	240-265	28-30	41.3-46.1	26.9-39.2	1.35-1.41	372.1-414.8	305-340	17.7-24.81	0.1-0.6	0.62-0.64	343.5-395.3	2.89-3.01
Jamalpur	7.47-7.63	385.3-636.9	125-168	36-54	15.8-30.3	26.3-64.5	1.08-2.43	183-427	150-350	17.7-31.9	4.8-8.4	0.38-0.66	217.3-426.3	0.33-1.88
Memari-I	7.65-7.8	266.7-507.1	45-285	36-40	16-44.9	18.95-39.6	1.14-2.51	183-317.2	150-260	14.18-42.54	7.6-7.9	0.3-0.44	206-349.1	0.11-1.14
Kanksa	5.8-7.16	39.4-138	55-95	08-22	3.6-9.7	3.95-9.36	1.43-3.33	61-103.7	50-85	14.18-21.27	0.2-0.5	0.03-0.8	75-123.8	<0.8009
Assansol	7.8	759-.1-897	285-305	26-54	36.4-58.3	62.3-76.1	1.38-3.35	402.6-518.5	330-425	42.54-56.72	1.0-89.5	0.65	532.6-538.4	1.209-3.50

3.11 SEISMICITY STUDY

As per the Seismic Zoning Map of India (IS: 1893-2002), Indian Sub-continent is divided into four zones named II, III, IV and V. The area under investigation falls under Zone-IV of the Seismic Zonation Map of India (**Figure 2.6**) prepared by the Bureau of Indian Standards. With reference to the MSK intensity scale used for all engineering design purposes, the region lies in the "High" damages risk zone.

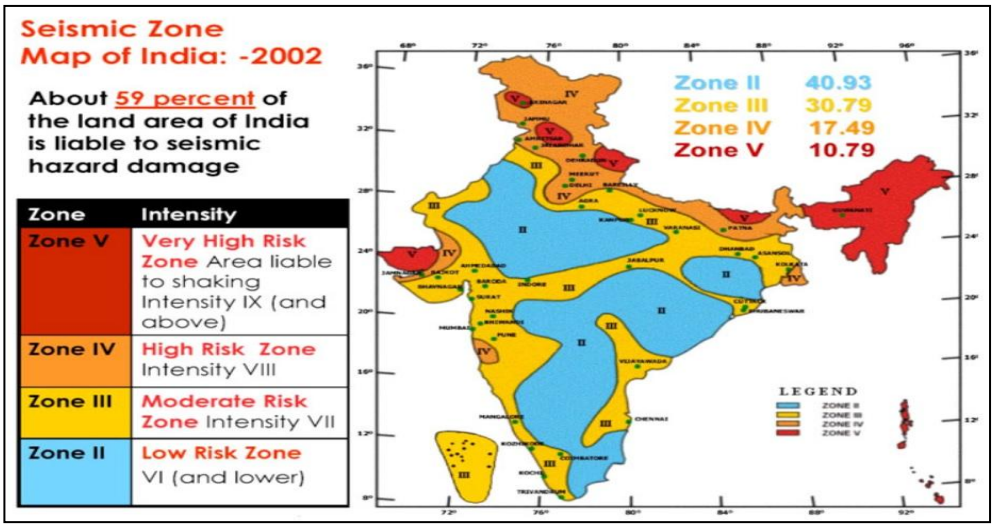


Figure 3.12: Seismic Zones of India

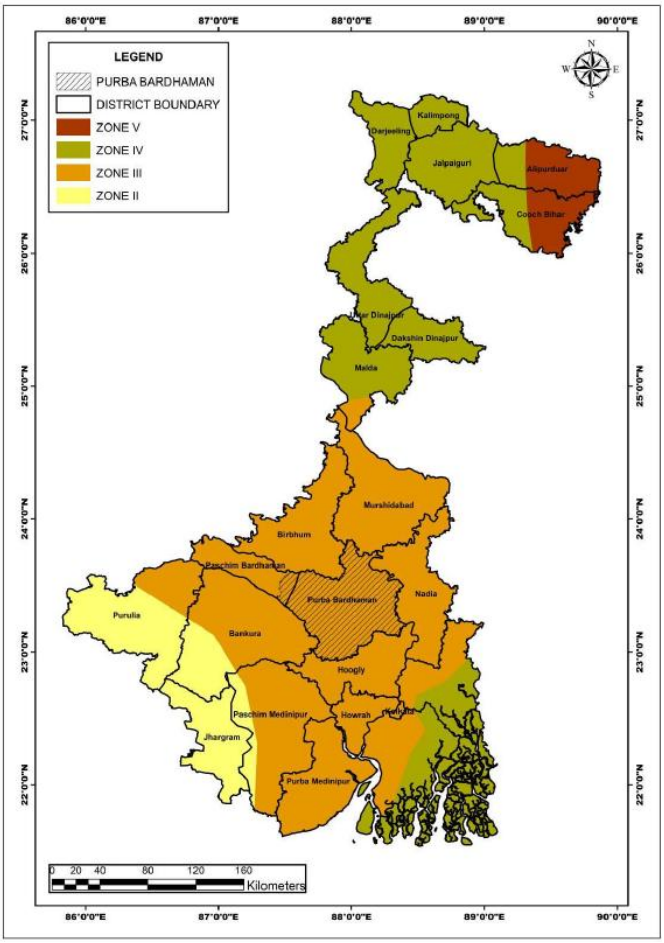


Figure 3.13: Earthquake zonation map of West Bengal highlighting the Purba Bardhaman district Position (Source: https://pib.gov.in/PressReleasePage.aspx?PRID=1740656)

Purba Bardhaman district is categorized under seismically active zone - III i.e., moderate seismic intensity zone. Bureau of Indian Standards, based on the past seismic history, grouped the country into four seismic zones, viz. Zone - II, Zone –III, Zone-IV and Zone-V. Of these, Zone V is the most seismically active region, while Zone II is the least.

3.12 SOCIO ECONOMIC STUDY

Developmental activity influences the socio-economic condition of any region. The beneficial effects are outweighing the adverse effects of such developmental activity. The beneficial effects are usually associated with improved livelihood of the population of the region. Hence various components of socio-economic study help us to identify in

predicting and evaluating the likely impacts of the project activity in the surrounding region.

The baseline data such as demographic pattern, occupational status, educational, health and other amenities as existing in the study area have been studied.

3.12.1 Baseline Status

The latest available data has been compiled to generate the existing socio-economic scenario of the study area. Information on socio-economic profile was collected from the Primary Census Abstract, 2011 including the population details of the region.

3.12.2 Brief Profile of the District

In 2017 Bardhaman District was bifurcated into Purba and Paschim Bardhaman. Purba Bardhaman has 23 blocks and 6 municipalities under 4 sub-divisions, viz.: Bardhaman Sadar (N) Bardhaman Sadar (S), Katwa and Kalna. The district has 215 Gram Panchayats and 2215 Census villages.

3.12.2.1 Demographic Profile

As per census 2011, undivided Bardhaman district has a majority of population residing in the rural area. The total rural population in study area is around 2152351 that is 68% of the total population. The rest 32% around 1076017 lives in urban areas. About 59% of the total working population is involved in agricultural sector. Recast after bifurcation of Bardhaman district in 2017, Purba Bardhaman district had a total population of 4,835,532. There were 2,469,310 (51%) males and 2,366,222 (49%) females. 726,345 (15.02%) live in urban areas (https://purbabardhaman.nic.in/).

Village

Revenue villages are the basic unit in rural areas. With a definite surveyed boundaries revenue village may comprise one or more hamlet but the entire village is treated as one unit for presentation of data.

Study Area

The study area was defined as an area within 5 km radius around the proposed mining project site. It covers the villages of Bhuri, Itaru, Chakalam, Rupsa, Dharmmapur, Dadpur, Naricha, Nabagram, Omarpur, Dumur, Jujuti, Taherpur, Golpalpur, Kumirkola, Bichkhara, Khandoghosh, Hamirpur, Aradanga, Khejurhati, Ujjalpur, Nischintopur, Notungra, Maladharpur, Mashila, Napara, Chandipur, Kalimonohorpur, Merual, Ketna, Badagachi, Ghosh Kamalpur, Gomotpur, Raghabpur, Banamalipur, Masidpur, Dighirpara, Oari, Keleti and Bhenpur in the Galsi-II and Khandoghosh blocks in Purba Bardhaman district of West Bengal.

Demographic Structure

Purba Bardhaman district has a population of 4835532 people with the male population percentage being 51.07 % and female percentage being 48.93 %. The population is majority in the rural area with 84.98 % and the urban percentage is 15.02 %. The population has 40.36 % of workers and 59.64 % of non-workers. Total population density per sq km is 1269. Medical facilities include 3 Hospitals, 5 Rural Hospitals, 19 Block Primary Health Centres and 74 Primary Health Centres. Sex Ratio in the district is 945 (Urban-932, Rural-954) and the population Growth rate is 11.9 % (Urban-20.9, Rural-6.7). The literacy rate of Purba Bardhaman is 76.2 % with 82.4 % of the male and 69.6 % of female population are literate (Source: https://www.burdwanzp.org/district-profile, https://www.burdwanzp.org/district-profile, District Environment Plan, Purba Bardhaman, west Bengal).

The summarized demographic structure of District Bardhaman is presented in the following table.

Table 3.15A: Summarized demographic structure of undivided Bardhaman District

Block / M.C. / M	Rural Population			Urban Population			Total Population			Population Denity Per Sqkm
	Male	Female	Total	Male	Female	Total	Male	Female	Total	
Purba Bardhaman										
Burdwan-I	89471	86365	175836	20370	19737	40107	109841	106102	215943	862
Burdwan-II	74013	72579	146592	3263	3084	6347	77276	75663	152939	807
Burdwan(M)	-	-	-	159936	154329	314265	159936	154329	314265	13640
Ausgram-I	60521	58842	119363	-	-	-	60521	58842	119363	537
Ausgram-II	77184	73712	150896	-	-	-	77184	73712	150896	419
Galsi-II	74751	72426	147177	-	-	-	74751	72426	147177	672
Galsi-I	84915	79552	164467	11840	11281	23121	96755	90833	187588	729
Memari-I	108465	105540	214005	2247	2173	4420	110712	107713	218425	1169
Memari-II	76500	73752	150252	-	-	-	76500	73752	150252	804
Memari(M)	-	-	-	20957	20494	41451	20957	20494	41451	2824
Jamalpur	134529	131809	266338	-	-	-	134529	131809	266338	1013
Raina-I	88396	84698	173094	3996	3862	7858	92392	88560	180952	680
Raina-II	77538	73863	151401	-	-	-	77538	73863	151401	666
Khandaghosh	97092	92244	189336	-	-	-	97092	92244	189336	714
Paschim Bardhaman										
Asansol (MC)				292387	271530	563917	292387	271530	563917	4410
Kanksa	53213	50381	103594	38137	36394	74531	91350	86775	178125	637

Area, Population and Density of Population in the district of Burdwan, 2011				
Sub-Division / C.D.Block / M.C. / M	Area (Sq. Km.) (2001)	Population (Number)	Density of Population (per Sq. Km.)	P.C. of population to district population
Burdwan(N) Sub-Division	1701.06	1399035	822	18.13
Burdwan-I	250.41	215943	862	2.80
Burdwan-II	189.57	152939	807	1.98
Ausgram-I	222.34	119363	537	1.55
Ausgram-II	360.45	150896	419	1.95
Bhatar	415.01	263064	634	3.41
Galsi-II	219.09	147177	672	1.91
Burdwan(M)	23.04	314265	13640	4.07
Guskara(M)	21.15	35388	1673	0.46
Burdwan(S) Sub-Division	1410.03	1198155	850	15.53
Memari-I	186.91	218425	1169	2.83
Memari-II	186.84	150252	804	1.95
Jamalpur	263.02	266338	1013	3.45
Raina-I	266.07	180952	680	2.35
Raina-II	227.28	151401	666	1.96
Khandaghosh	265.23	189336	714	2.45
Memari(M)	14.68	41451	2824	0.54
Katwa Sub-Division	1070.48	963022	900	12.48
Mongalkote	365.44	263240	720	3.41
Ketugram-I	193.98	165408	853	2.14
Ketugram-II	160.03	118567	741	1.54
Katwa-I	168.94	173087	1025	2.24
Katwa-II	163.20	136708	838	1.77
Katwa(M)	8.53	81615	9568	1.06
Dainhat(M)	10.36	24397	2355	0.32
Kalna Sub-Division	993.75	1087732	1095	14.09
Purbasthali-I	148.44	206977	1394	2.68
Purbasthali-II	192.47	212355	1103	2.75
Kalna-I	169.08	206945	1224	2.68
Kalna-II	172.17	167335	972	2.17
Monteswar	305.19	237398	778	3.08
Kalna(M)	6.40	56722	8863	0.73
District Total 2011	7024.00	7717563	1099	100.00

3.12.2.2 Occupational Pattern

Occupational pattern of any region depends mainly upon its economically active group, such as, the working population involved in productive work. Work is defined as participation in any economically productive activity. Such participation may be physical

or mental. Persons on leave and under training are also treated as workers. Rent receivers and pensioners are excluded from workers category.

Main Workers: Main workers are those persons who have been engaged in any kind of work participation for a major part of the year (i.e. at least six months or 183 days in a calendar year). Main activity of a person who was engaged in more than one activity was reckoned in terms of time disposition. The main worker population in undivided Bardhaman district is 2166742 (28.08 %) out of which 342166 (11.75 %) persons are engaged as cultivators, 973182 (33.43 %) as agricultural labourers, 124558 (4.28 %) of total working population are engaged as household industry while the other worker population is 1471345, i.e. 50.54%.

Marginal Workers: Marginal workers are those who do not work for the major part of the reference period (i.e. less than 6 months). Undivided District Bardhaman has 744509 (9.65 %) of marginal workers.

Non-Workers: Non-workers are defined as those persons who have not engaged any kind of work participation during the entire calendar year under the reference period. The proportion of non-workers also displays the unemployment level of the region. The non-worker population in undivided Bardhaman District is very high, 4806312 (62.28 %) persons of the total population.

		State		District	
		Number	Percentage	Number	Percentage
Literates	Persons	61,538,281	76.26	5,247,208	76.21
	Males	33,818,810	81.69	2,918,040	82.42
	Females	27,719,471	70.54	2,329,168	69.63
Scheduled Castes	Persons	21,463,270	23.51	2,115,719	27.41
	Males	11,003,304	23.51	1,079,584	27.21
	Females	10,459,966	23.52	1,036,135	27.63
Scheduled Tribes	Persons	5,296,953	5.8	489,447	6.34
	Males	2,649,974	5.66	243,581	6.14
	Females	2,646,979	5.95	245,866	6.56
Workers and Non-Workers					
Total Workers (Main and Marginal)	Persons	34,756,355	38.08	2,911,251	37.72
	Males	26,716,047	57.07	2,293,083	57.81
	Females	8,040,308	18.08	618,168	16.48
(i) Main Workers	Persons	25,686,630	28.14	2,166,742	28.08
	Males	21,678,279	46.31	1,838,681	46.35
	Females	4,008,351	9.01	328,061	8.75
(ii) Marginal Workers	Persons	9,069,725	9.94	744,509	9.65
	Males	5,037,768	10.76	454,402	11.45
	Females	4,031,957	9.07	290,107	7.73
Non-Workers	Persons	56,519,760	61.92	4,806,312	62.28
	Males	20,092,980	42.93	1,673,806	42.19
	Females	36,426,780	81.92	3,132,506	83.52
Category of Workers (Main & Marginal)					
(i) Cultivators	Persons	5,116,688	14.72	342,166	11.75
	Males	4,500,041	16.84	319,113	13.92
	Females	616,647	7.67	23,053	3.73
(ii)Agricultural Labourers	Persons	10,188,842	29.32	973,182	33.43
	Males	7,452,814	27.9	700,508	30.55
	Females	2,736,028	34.03	272,674	44.11
(iii)Workers in household industry	Persons	2,464,124	7.09	124,558	4.28
	Males	1,114,683	4.17	64,799	2.83
	Females	1,349,441	16.78	59,759	9.67
(iv) Other Workers	Persons	16,986,701	48.87	1,471,345	50.54
	Males	13,648,509	51.09	1,208,663	52.71
	Females	3,338,192	41.52	262,682	42.49

3.12.3 Economic Resource Base

Agriculture and its allied activities are the major income source of the people in the rural region of the district. On an average about 58 % of the total population belong to the agricultural sector. Major crops include paddy, wheat, vegetables, paddy, potato, sesame, paddy, vegetable, mustard, jute etc. Among commercial crops, jute, sugarcane,

potato and oilseeds are major crops. The majority of the crops grown in the district are rice, wheat, pulses, oilseeds, jute and potato. Among these jute and rice are Kharif crops and rice, wheat, pulses, oilseeds and potato are the Rabi crops (Source: District Disaster Management Plan, 2015-2016). Due to poor irrigation facilities, the productivity of land is mostly low in the study area. However, most of the local populations are engaged in other activities. Mining activities plays an important role in increasing the economic resource base for the people in the study area.

Cultural and Aesthetic Attributes

As such no culturally and aesthetically important places are located within the four villages in the study area.

3.12.4 Socio-economic Survey

In order to access and evaluate likely impacts arising out of any development projects on socio-economic environment, it is necessary to gauge the apprehensions of the people in the study area.

3.12.4.1 Methodology applied for selection of sample and data collection

The methodology which is applied for primary source of data collection, i.e., gathering data through field survey for socio-economic environment is given below:

3.12.4.2 Sampling Method

A judgmental and purposive sampling method is used for choosing respondents belonging to the various sections of the society, i.e., Sarpanch, adult males and females, teachers, businessmen, cultivators, agricultural labours, unemployed groups etc. Judgmental and purposive sampling method includes the right cases from the total population that helps to fulfil the purpose of research needs.

Data Collection Method

For the purpose of data collection through primary sources certain methods are used these are:

Field Survey and Observations

Field survey and observations are made at each sampling village and the socio-economic status of that village is studied. Visits are made at primary health centres and sub-centres to know the health status of the region. Different government departments, like, statistical department, census operation visited to collect the population details of the region.

Interview Method

Structured questionnaire is used during interview to collect data regarding the awareness and opinion of the sample population selected from various socio-economic sections of the community. Structured interviews involve the use of a set of predetermined questions that includes fixed and alternative questions. The questionnaire mainly highlights the parameters such as income, employment and working conditions, housing, food, water supply, sanitation, health, energy, transportation and communication, education, environment and pollution to assess the standard of living of that particular region and general awareness, opinion and expectation of the respondents about the proposed project. Interview method helps to collect more correct and accurate information as the interviewer is present during the field survey. Socio-economic survey was conducted in the villages within the study area located in all directions with reference to the clusters. Four villages were surveyed in the study area.

The respondents were asked for their awareness / opinion about the proposed sand mining and also their opinion about the impacts of the sand mining which are important aspects of socio-economic environment, viz., job opportunities, education, health care, housing, transportation facility and economic status.

3.12.5 Summary

The implementation of the mining project will generate both direct and indirect employment. Jujuti and Naricha sand mining (in the riverbed of Damodar in Purba Bardhaman district) area is an agriculturally based area. The basic facilities like, roads and railway network, medical facilities are available. While post and telegraph, market, drinking water facilities and educational facilities are available. Purba Bardhaman district has a population of 4835532 people with the male population percentage being 51.07 % and female percentage being 48.93 %. The population is majority in the rural area with 84.98 % and the urban percentage is 15.02 %. As per the 2011 census data, recast after bifurcation of Bardhaman district in 2017, the total number of literates in Purba Bardhaman district was 3,232,452 (74.73 % of the population over 6 years) out of which males numbered 1,781,090 (80.60 % of the male population over 6 years) and females numbered 1,453,362 (68.66% of the female population over 6 years).

BIOLOGICAL ENVIRONMENT

The biodiversity we see today is the fruit of billions of years of evolution, shaped by natural processes. The vast array of interactions among the various components of biodiversity makes the planet habitable for all species, including humans. There is a growing recognition that, biological diversity is a global asset of tremendous value to present and future generations. At the same time, the threat to species and ecosystems has never been as great as it is today. Species extinction caused by human activities

continues at an alarming rate. Protecting biodiversity is in our self-interest. The biological study was under taken by Ecology & Biodiversity Expert, as a part of the EIA study report to understand the present status of ecosystem prevailing in the study area, to compare it with past condition with the help of available data, to predict changes in the biological environment as a result of present activities and to suggested measures for maintaining its health.

A survey was conducted to study the flora around 10 km radius. Some of the information was gathered from the local habitants. All the collected data were classified to interpret the impact of pollution on the flora and fauna of that region. Survey of the mild plants as well as cultivated crop plants was made and all the available information was recorded. The primary data collected was compared with the Secondary data collected from literature published by District Forest Office, Bardhaman Division.

3.13.1 Survey Methodology

Detailed ecological survey was conducted for one season to evaluate floral and faunal composition of the study area. Primary data on floral and faunal composition was recorded during site visit and secondary data was collected from the Forest department and published relevant literature.

3.13.1.1 Methodology for Terrestrial Ecology

The sampling plots for floral inventory were selected randomly in the suitable habitats. The methodology adopted for faunal survey involve random survey, opportunistic observations, diurnal bird observation, active search for reptiles, faunal habitat assessment, active search for scats and foot prints, animal call, and review of previous studies. The aim was to set baselines in order to monitor and identify trends after the commissioning of the mining activity. Emphasis has been placed on presence of endemic species, threatened species if any present in the study area. Inventory of flora and fauna has been prepared on the basis of collected data.

Mode of data collection & parameters considered during the survey are given in 3.16

Table 3.16: Mode of data collection & parameters considered during the survey

Aspect	Data	Mode of Data Collection	Parameters Monitored
Terrestrial Ecology	Primary data collection	By field survey	Floral and Faunal diversity
	Secondary data collection	From authentic sources like District Forest Office, Bardhaman Division	Floral and Faunal diversity and study of vegetation, forest type, importance etc.

Aspect	Data	Mode of Data Collection	Parameters Monitored
Aquatic Ecology	Primary data collection	By field survey	Floral and Faunal diversity
	Secondary data collection	From authentic sources like District Forest Office, Bardhaman Division	Floral and Faunal diversity and study of vegetation, forest type, importance etc.

3.13.1.2 Objectives and Purpose of Study:

The basic objectives of the study are to evaluate the status of the flora and fauna of the core area and the buffer areas with specific reference to the rare or endangered or endemic or threatened (REET) species. The study is also designed to evaluate the adverse impacts of the proposed activity, if any and to suggest remedial / mitigation measures in accordance with the objectives as desired by the Ministry of Environment and Forests (MoEF&CC), Government of India (GoI).

3.13.2 FLORA & FAUNA

An in-depth assessment of both terrestrials and aquatic ecosystem of the sandy area (both mine site core zone and its buffer zone 3-5 kms around the mines were undertaken by ecology and biodiversity expert). This is a part of the EIA study report to understand the present status of ecosystem prevalence in the study area to compare it with past condition with the help of available data to predict change in the biological environment as a result of present activities and to suggest measures for maintaining ecosystem health.

There is no forest area in the study area, only scattered patches of orchards with fruit-bearing trees and timber yielding plants particularly around settlement areas and roadsides. The dominant trees & shrubs terrestrial tested in the **Table - 3.17**.

Table 3.17 Dominant terrestrial trees and shrubs of the district

Sl. No.	Scientific Names	Common Name/Local name	Family
(A) Trees			
1	Mangifera indica	Mango	Anacardiaceae
2	Artocarpus integrifolia	jackfruit	Moraceae
3	Madhuce Longifolia	Mahua	Sapotaceal
4	Gmelia arborea	gamar	Verbenaceae
5	Terminalia tomentosa	Asan	Combretaceae
6	Alstonia scholaris	Chatian	Apocyaceae
7	Terminali Arjuna	Arjun	Combretaceae

Sl. No.	Scientific Names	Common Name/Local name	Family
8	Terminalia catappa	Katbadam	Combretaceae
9	Butea monosperma	Palas	Leguminosae (Papilionoidae)
10	Delonix regia	Gulmohar	Leguminosae (Cesalpinoidae)
11	Cassia fistula	Amaltas	Leguminosae (Papilionoidae)
12	Acacia auriculiformis	Akashmani	Leguminosae (Mimusoidae)
13	Albizia lebbeck	Siris	Leguminosae (Mimusoidae)
14	Agel ruarmelos	Bel	Rutaceae
15	Ailanthus excelsa	Araluka	Simaroubaceae
16	Azadirachta indica	Neam / Nimba	Meliaceae
17	Syzygium cumini	Jamun	Mytraceae
18	Ficus bengalensis	Banian	Moraceae
19	Ficus religiosa	Aswatha	Moraceae
20	Tamarindus indica	Tamarind	Leguminosae (Papilionoidae)
21	Pithecellobium dulce		LeguminBae (Mimusoidae)
22	Lagerstromea pariflora	Jarul	Lythraceae
23	Pterospermum acerifalium	Murga / Kathchampa	Sterculiaceae
24	Emblica officinalis	Imli	Combretaceae
25	Anthocephalos chinemis	Kadam	Rubiaceae
26	Morniga obofera	Sajina	Moringaceae
27	Bombax malabaricum	Silk cotton (Simal)	Bombacacae
28	Thespesia populnea	Habul	Malvaceae
29	Feronia elepbautum	Woodaprple	Rutaceae
30	Casuarina equisitifolia	Jhau	Casurinaceae
31	Borassus flabelifer	Fan Palm	Palmae
32	Phoenix sylvestus	Date Palm	Palmae
33	Ziziphus mauritianus	Bair	Rhamnacaea
(B) Shrubs			
34	Lantana camara	Putus	Verbenacea

Sl. No.	Scientific Names	Common Name/Local name	Family
35	Calotropis procera	Akanda	Apocynaceae
36	Ipomoea carnea	Berakalmi	Convolvulaceae
37	Lawsonia inernais	Mehendi	Lythraceae
38	Anona squamosa	Caster apple / Sitaphal	Anonaceae
39	Vitex negurido	Nisenda	Verbenaceae
40	Glycosmis pentaphylla		Rutaceae
41	Clerodeudrum inerme		Verbanaceae
42	Hyptis suaveolens	Bantulsi	Labiate
43	Abutilori indicum		Malvaceae
44	Solanum surateusis	Kantakari	Solanaceae
45	Ricinus communis	Castor	Euphorbiaceae
46	Pandanous fruticosa	Keya	Pandanaceae
47	Capparis spinosa		Capparidaceae
48	Pongamia pinnota	Karanga	Leguminosae (Papilionoidae)
34	Lantana camara	Putus	Verbenacea

There are many more herbaceous plants including grasses & sedges. Among these plants a good number have medicinal values. None of these plants belongs to endemic or endangered categories. Most of these plants were widely distributed in village settlements, river banks and degraded landform areas.

The faunal wealth of the area in wild is very sparse as there is extreme human interference in both terrestrial aquatic habits. However, some record of butterflies, amphibians, reptiles, avifauna and were made **(Table 3.18)** during field survey and previous reports.

Table – 3.18 Common faunal wealth in terrestrial habitats and also swamps along the river banks.

Sl. No.	Scientific Name	Common Name
(A) Butterflies		
1	Papilio polytes	Common Mormon
2	Euploea core	Common Crow
3	Papilio demolius	Lemon Butterfly
(B) Amphibians		
1	Rana cyanophlyctes	Skipper Frog

Sl. No.	Scientific Name	Common Name
2	Rana crassa	
(C) Reptiles		
1	Calotes versicolor	Garden lizard
2	Varanus sp.	Lizard monitor
3	Ptyras mucosus	Rat snake
4	Naja Naja	Cobra
(D) Avifauna		
1	phalacrocorax niger	cormorant
2	Ardeola Grayii	Pond Heron
3	Bubulcus ibis	Cattle gret
4	Anastomus oscitans	Open bill stork
5	Elanus Caeruleus	Black winged kite
6	Falco op	kestrel
7	Gallinula chloropus	Indian moorhen
8	Streptopelia decaocto	Ring Dove
9	Euqynamys scolopacea	Koel
10	Cypsiurus parvus	palm swiff
11	Alcedo attlis	Common King fish
12	Merops orientalis	Small green bee- eat
13	Dinpium Benghalense	Woodpeacker
14	Dicrurus adsimilis	Black Drongo
15	Acridotheres tristis	Myna
16	Corvus splendens	House crow
17	Passer domesticus	House sparrow
18	Tringa hypoleucos	Common sandpit
19	Hirundo rustics	Common swallo
20	Podicepo rupicollis	Little grebe
(E) Mammals		
1	Paradoxurus sp.	Civet
2	Funumbulus Sp.	Squirrel
3	Macaca Mulata	Monkey
4	Canis Qureus	Jackel
5	Bandicuta bengalensis	Rat

However, most of this faunal wealth is wild distributed in different area, none them are

endemic or serious threatened.

Aquatic habitats in river bed where shallow water bodies are there, a lot of aquatic marshy plants, plautons, benthos, fishes, water birds etc. are often seen. The most common biota area listed in Table 3.19.

Table 3.19 Aquatic Biota of Riverbed of Damodar

Scientific Name	Common Name
(A) Planktons (Phyto/Zoo Planktons)	
Micro Cystis Sp.	Cyanobacteria / Cyanophycean algae
Nostoc Sp.	
Anabaena Sp.	
Navicula Sp.	bacillariophyceae algae (Diasome)
Cymbella Sp.	
Mellosira Sp.	
Zygnema Sp.	Chlorophycean algae
Spirogyra Sp.	
Oedogonium Sp.	
Brachionuds Sp.	Zoo plantons of rotifers & copepods and cladocera.
Keratella Sp.	
Cyclops Sp.	
Bosmina Sp.	
Cyprism Sp.	
Dhaphnia Sp.	
(B) Banthos	
Tubifex Sp.	Macrozoobenthos of Annelida, Arthropoda and Mollusca
Prirtina Sp.	
Gerris Sp.	
Chironomus Sp.	
Pila Sp.	
Lamellidens Sp.	
(C) Aquatic/Semiaquatic macrophytes	
Azolla pinnata	Water fern
Salnnia molesta	

Scientific Name	Common Name
Sagittaria triflolia	Aquatic macrophytes
Pistia stratiotes	
Hydrilla verticillata	
Vallisneria Spiralis	
Eichhornia crassipea	
Nagas indica	
Potamogeton crispus	
Typha angustifolia	
Hygrophila spinosas	
Alternanthera philizeroide	
Cyperus Sp.	
(D) Fresh water fishes	
Catla catla (Catla)	Common Indian major carp
Cirrhinus mrigala (Mrigal)	
Labeo rohita (Rahu)	
Puntius ticfo	Barb
Puntius sophore	
Puntius sarana	
Notopterus notopterus	Pholi
Channa punctatus	Spotted/Stripped snake beaded
Channa striatus	
Chanda nama (Chanda)	

(E) Aquatic birds are listed inside as fauna

However, most of these faunae of aquatic habitats are again said to be commonly found in almost all Riverian habitats. None of these are said to be endemic and threatened severely.

3.13 TRAFFIC STUDY

The traffic study was carried out for two locations SH-8 and Jujuti Bypass to Dadpur Link road for 24 hours which is near to the proposed plant and is a medium for transportation of sand from the mines. The result of the traffic study is shown in Table 3.20 and the pie chart representation of total vehicles during baseline studies for both the highways is depicted in **Fig.3.14** The transportation map is shown in **Fig. 3.15.**

Table 3.20: Recommended PCU Factors on Rural Roads

Types of Vehicles	Passenger Car Equivalency (PCE)

Motor Cycle or Scooter (2-Wheeled)	0.50
Passenger Car, Pick-up van or Auto - rickshaw	1.0
Light Commercial Vehicle	1.5
Truck or Bus	3.0
Bicycle	0.5

Thus, volume of vehicles was estimated as : PCU unit = No of vehicles* X PCE of those particular.

Node-1

Data was collected by physically counting the number of vehicles plying in both directions at Node 1. The daily counts were carried out for the different type/category of vehicles. The variation in the traffic flow at the given road along with the number of vehicles during peak hour & lean hour is presented in the **Table.**

Traffic Survey, Node I

Vehicles	Number of Vehicles distribution Per day	PUC Factor	Number of Vehicles per day in PCU's
Two Wheelers	360	0.50	180.00
Three Wheelers	22	1.00	22.00
Cars/Jeeps	65	1.00	65.00
Bus/Trucks/Lorries	56	3.0	168.00
Total	**503**	**-**	**435.00**

Existing Traffic Scenario & Level of Service

Capacity of road as per IRC = 2000 PCU"s/day
Total Volume in PCUs Per days = 435.00

Level of Service

Sl. No.	Existing Volume/Capacity	Level of Services
1	0.0 to 0.2	"A" (Excellent)
2	0.2 to 0.4	"B" (Very Good)
3	0.4 to 0.6	"C" (Good)
4	0.6 to 0.8	"D" (Fair)
5	0.8 to 1.0	"E" (Poor)

Modified Traffic Scenario & Level of Service

3 additional trucks i.e., 9 trips assume to enter and exit during a day for the proposed project.
Node I : ~ 1 trucks of 9 additional volume in PCU will be 1 x 9 = 9.0 per day.
Traffic Flow at Node I
Total volume in PCUs after execution of the project (V) = 435.00 + 9.00 = 444.00
Capacity of Road as per IRC (C) = 2000 PCU's/day
Modified Existing Volume/Capacity ratio will be (V/C) = 444.00/2000 = 0.222 The level of service of the road will be "B" after the proposed project that is **"Very Good".**
The above results indicated that the post project scenarios will contribute to addition in existing traffic, the level of service will continue to be Very Good. Traffic will continue to run smoothly without congestion and no widening of road is anticipated.

2.18.3 Carrying Capacity of the Roads

Comparison Carrying Capacity of Road in Existing &Proposed PCU

Location	Existing Traffic Load			Total Traffic load including applied project		
	No of PCUs	V/C	LoS	No of PCUs	V/C	LoS
Project site to SH-8	435.00	0.21	B	444.00	0.222	B

3.13.1 Interpretation

- The LOS study shows that the existing traffic scenario is "Very Good" and the free flow of vehicles is observed during the study period.
- Out of the total traffic vehicles, Trucks are very high followed by Bus and Cars. The movement of Buses and light vehicles are largely found in daytime.
- The difference of heavy vehicle movement both day and night time was very marginal. The density of heavy vehicles was comparatively low.
- Due to the expansion of proposed project the traffic density will increase as all the sand material will be transported through the road under study.
- Suitable traffic management plan will be adopted to minimize the impacts on the traffic scenario of the area.

CHAPTER- 4
ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

4.0 INTRODUCTION

River bed mines can be mined by open pit or quarrying methods, normally using some excavators and tippers. Fragmentation by drilling and blasting is not necessary. The sand is loaded on haul trucks and taken to stockpiles.

The operations may disturb the environment of the area in various ways, such as removal of mass, change of landscape, flora and fauna of the area, surface drainage, and changes in air, water and soil quality. The impacts of mining on different environmental parameters should be assessed so that mitigation measures could be planned ahead for eco-friendly mining in the area. Fugitive emissions are generated from sand mining operations and road dust from sand transportation can impact air quality. The primary air pollutants are particulate matter concentrations. This study is focused on environmental impact of sand mining operations on air quality parameters specifically aerosols.

As per the interpretations of **Chapter–2** and **Chapter–3,** the project area is mainly susceptible to air pollution due to transportation of sand through village road and needs special emphasis on the impact and mitigation of the same and needs to be addressed accordingly. Water, noise pollution, solid waste management and impact on land environment are not a major concern in the area.

All components of the environment were considered and wherever possible impacts were evaluated in quantitative/qualitative terms and predicted the impact of project on environmental attributes such as water, air, noise, land ecological socio-economic.

The resultant (post-project) quality of environmental parameters is reviewed with respect to the permissible limits. Based on the impacts thus predicted, preventive and mitigation measures were formulated and incorporated in the environmental management plan to minimize adverse impacts on environmental quality during and after project execution.

4.1 ENVIRONMENT IMPACT ASSESSMENT

The environment and development should be considered as mutually complementary, interdependent, and an instrument of reinforcing the quality of life. Environmental Impact Assessment (EIA) is the important aspect of overall environmental management strategy and an important tool for sustainable development. It identifies major impacts of mining and associated activities on the environment and provides guideline to prepare the necessary control measure termed as Environmental Management Plan (EMP).

Alteration or modification of the above attributes may cause impact on environment of the site. Besides this there will be some other reasons which will affect the environment viz. traffic network route, and other vehicular movements, impacts on flora and fauna of that area, surface drainage, and change in air, water and soil quality. While for purpose of development and economic upliftment of people, there is need for establishment of mining, but these have to be environmentally friendly. Therefore, it is essential to assess the impacts of mining on different environmental parameters, before starting the mining operations, so that abatement measures could be planned in advance for eco-friendly mining in the area. The increasing awareness among the people about ecological imbalance and environmental degradation has raised many apprehensions. The impacts on different environmental parameters due to this mining project are discussed below.

The projected impact may be broadly divided into two phases.

- During construction phase: These may be regarded as temporary or short term and ceases with implementation of the project.
- During operation phase: These impacts are continuous warranting built in permanent measures for mitigation and monitoring.

4.2. IMPACT AND MITIGATION MEASURES DURING CONSTRUCTION PHASE

This is a sand mining project on the riverbed and no construction is involve for the mining operation, hence no impact on the environment due to construction

4.3. IMPACT ON ENVIRONMENT DURING OPERATION

This section deals with an assessment of impact of mining activities on the existing environmental conditions. The methodology of assessment is based upon identification and description of the existing project activities as well as environmental components followed by evaluating the impact of mining and associated activities on the environment. The environmental components that are likely to be influenced or modified by the continuation of project activities are; Air, Water, Noise, Soil, Hydrology, Ecology & Bio-diversity, Socio-economic status etc.

Major activities involve in the operation phase are;

- Excavation,
- Loading of material on truck by excavator
- Movement of vehicle on 'kaccha' road of villages

4.3.1 IMPACT ON AIR

Air Quality Modeling – AERMOD Model

It is a numerical tool used to describe the causal relationship between emissions, meteorology, atmospheric concentrations and other factors. An air dispersion model predicts concentrations based on the knowledge of emission characteristics, topography and meteorology. It uses a single wind field to transport emitted species. An air-quality model, American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) was used to calculate air pollutant concentrations at gridded receptor locations. It is a United States Environmental Protection Agency (USEPA)-approved plume model (USEPA, 2017), which is a steady-state dispersion model that calculates plume distribution based on planetary boundary layer turbulence using the fundamental Gaussian dispersion model, and is applicable to both rural and urban areas, surface and elevated releases, flat and complex terrain, and multiple sources such as point, area, open pit and volume sources .

The general equation to calculate the steady state concentration of an air contaminant in the ambient air resulting from a point source is given by:

$$C(x,y,z)=\frac{Q}{2\pi\sigma_y\sigma_z\bar{u}}\exp\left[-\frac{1}{2}\left(\frac{y^2}{\sigma_y^2}+\frac{(z-H)^2}{\sigma_z^2}\right)\right]$$

Where,

C (x, y, z) = mean concentration of diffusing substance at a point (x,y,z) [kg/m3]
X = downwind distance [m]
y = crosswind distance [m]
z = vertical distance above ground [m]
Q = contaminant emission rate [mass/s]
σy = lateral dispersion coefficient function [m]
σz= vertical dispersion coefficient function [m]
$\bar{u}$ = mean wind velocity in downwind direction [m/s]
H = effective stack height [m]

Meteorological data from surface and upper air observations were processed by AERMOD Meteorological Preprocessor (AERMET) to create meteorological inputs to AERMOD. A terrain data preprocessor of AERMOD AMS/ EPA Regulatory Model Terrain Preprocessor (AERMAP was used to create terrain-ready input files into AERMOD. Receptor and source elevation data from AERMAP output was formatted for direct input into AERMOD control file. The meteorological processed surface wind speeds and wind directions that served as inputs to AERMOD and play such a critical role in dispersion air pollutants are shown for the study area in Figure 1. It is seen that predominant wind directions are from the south-east directions (16- 20) % of the time in the study

area. The wind can directly blow over the river sand mine causing more release of fugitive emissions.

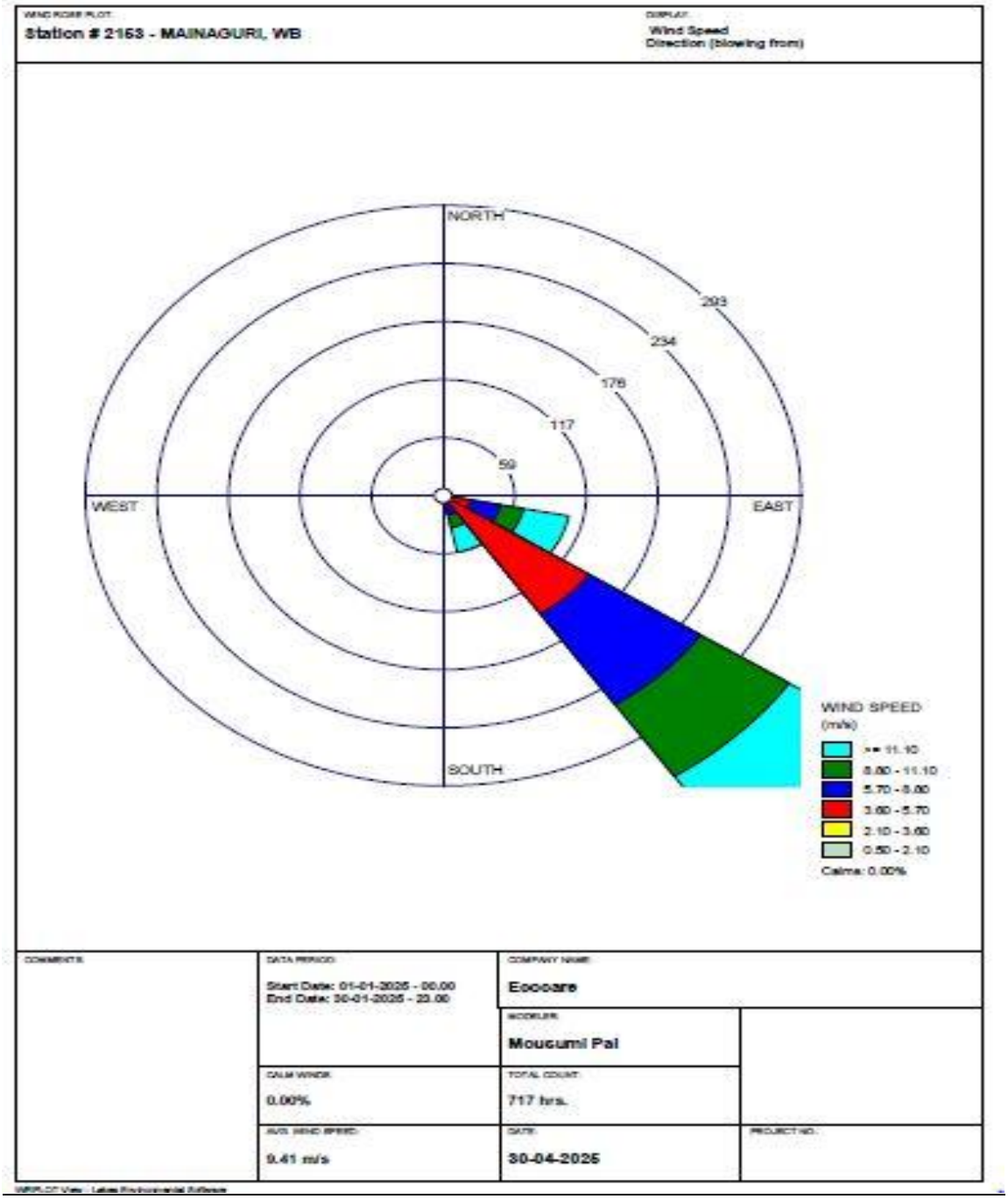


Figure 4.1: Wind speed and Wind Direction in Study Area

Emission of PM_{10}

The major sources of PM10 emission in case of boulder gravel and sand mining project are the loading activity at mine site (loading of material over trucks / trucks by excavators)

and the movement of vehicles on unpaved haul roads. The emission rates for these sources are given in latest USEPA's AP-42 guidelines.

Loading of Material

The excavated materials will be loaded on dumpers using excavators. The PM10 emission rate due toloading activity is calculated using below equation.

$$E = k \times 0.0016 \times \frac{\left(\frac{u}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \qquad \text{(USEPA's AP42, Nov 2006)}$$

Where,
E = Emission Factor, kg/ton
k = Particle size multiplier, 0.35 for PM_{10}
M = Moisture Content, %
u = Mean wind speed, m/s

Emission of PM10 due to Transportation

The hauling of minerals from the mine lease area to the end users via haul road (unpaved road) will cause emission of particulate matters. This emission will be limited to the extent of unpaved haul road starting from mining pit to nearest paved road connectivity. As per the mining plan the material will be transported during the working shift only. Each day maximum 10 dumpers (25-ton capacity each) will make 20 trips for transporting the minerals. The following empirical expressions are used to estimate the quantity in pounds (lb.) of size-specific particulate emissions from an unpaved road in industrial sites per vehicle mile traveled (VMT).

$$E = \frac{k\,(s)^a\,(w)^b}{12\ 3} + C \qquad \text{(USEPA's A42, Nov., 2006)}$$

Where,
k, a, b are empirical constants i.e. different for different particle size.
E = size-specific emission factor (lb/VMT)
s = surface material silt content (%)
W = mean vehicle weight (tons)
C = emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear,
0.00047 lbs. /VMT for PM10

The source characteristics S and W are referred to as correction parameters for adjusting the emission estimates to local conditions. The effective emission rate after considering reduction

considering reduction in emission potential of haul roads due to water sprinkling was calculated.

Table-4.1: Emission Rate for PM_{10}

Sl.No.	Activities	Scenario	Units	Emission Rate
1	Loading of Material	Worst Case – No Control	g/s	0.0154
2	Transportation on haul road	Worst case – No mitigation measures	g/mile	42.63
3	Transportation on haul road	With mitigation measures	g/mile	30.152

Table-4.2: Emission Rate for $PM_{2.5}$

Sl.No.	Activities	Scenario	Units	Emission Rate
1	Loading of Material	Worst Case – No Control	g/s	0.0005384
2	Transportation on haul road	Worst case – No mitigation measures	g/mile	40.933815
3	Transportation on haul road	With mitigation measures	g/mile	10.714

Model Run

The river sand mine was considered as an open pit source in AERMOD and the sources followed the coordinates of the confluence of the river where mining activities take place. The two haul roads on either side of the mine (1 km in length) with haul trucks carrying sand from mine to stockpile were considered as a series of line sources. The fugitive emissions from the open pit source are the major sources of particulate matter concentrations in the model run. The emissions from haul roads do not contribute significantly towards particulate concentrations.

For emissions reductions we have assumed overall 30% emissions reduction with strict emission control techniques as given below.

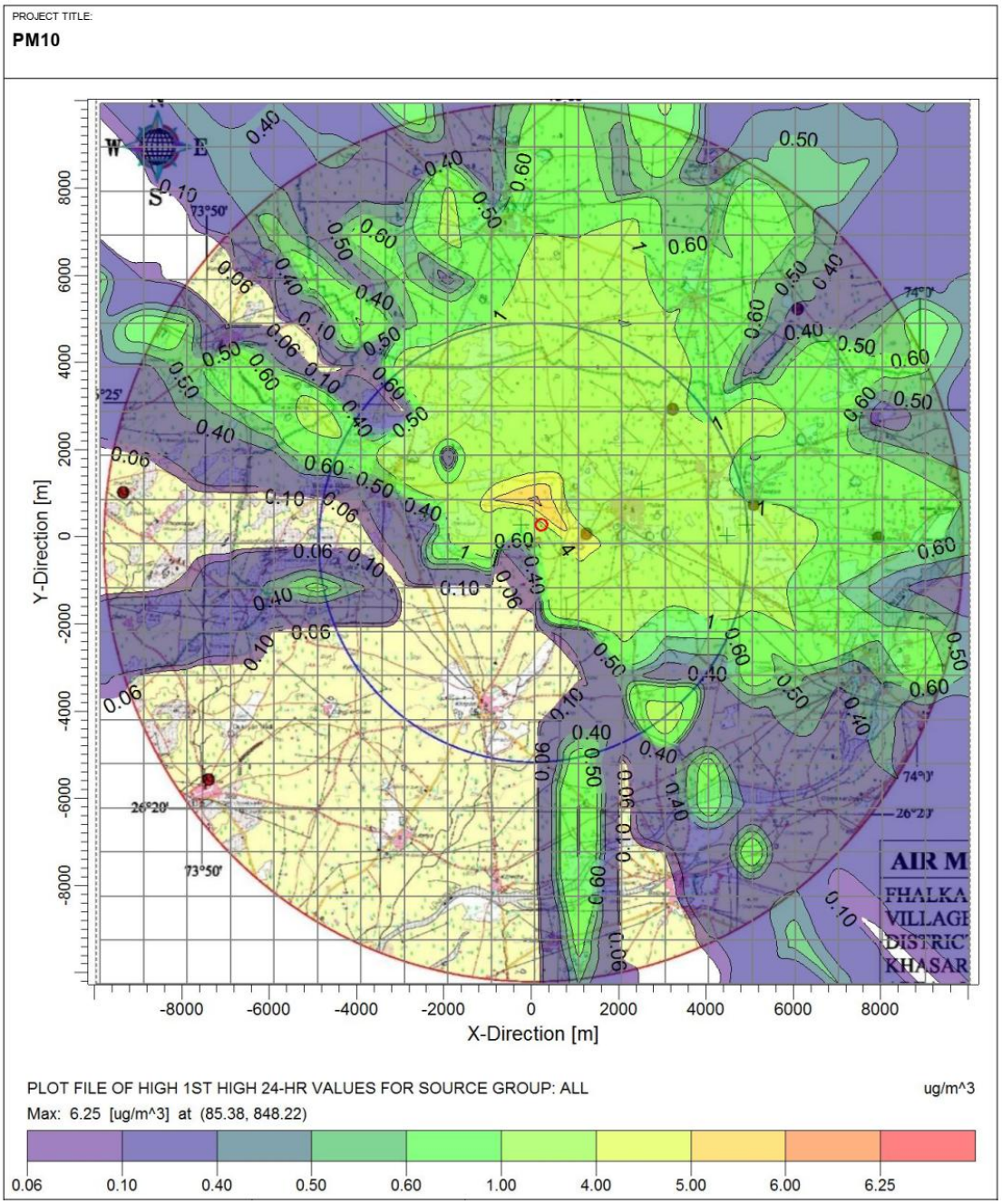
Results and Discussion

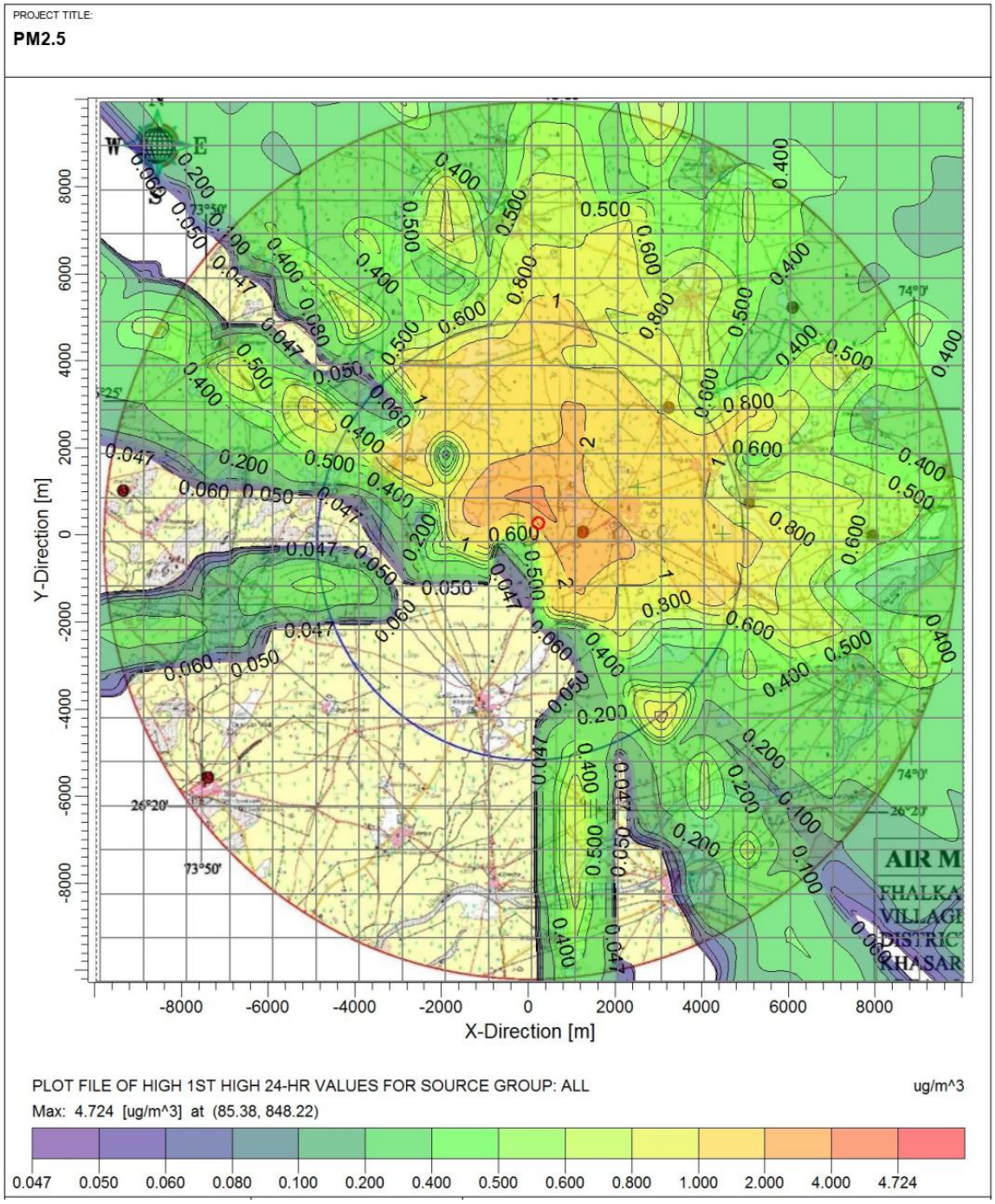
In this study two cases have been considered;

a) Worst case scenario and
b) Strict control measure where 30% reduction has been assumed

Control techniques (emission reduction techniques) for fugitive dust sources generally involve watering, chemical treatment of exposed surfaces to provide longer dust

suppression, or reduction of surface wind speed with windbreaks or source enclosures. Watering, the most common and, generally, least expensive method, provides temporary dust control. The use of chemicals to treat exposed surfaces provides longer dust suppression, but may be costly, have adverse effects on plant and animal life, or contaminate the treated material. Windbreaks and source enclosures are often not practical because of the size of fugitive dust sources and periodic removal of dust. Reduction measures include clean-up of spillage on paved or unpaved travel surfaces and clean-up of material spillage at transfer points (USEPA, 2010)


PROJECT TITLE:
PM10
Y-Direction [m]
X-Direction [m]
PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL
ug/m^3
Max: 6.25 [ug/m^3] at (85.38, 848.22)
0.06
0.10
0.40
0.50
0.60
1.00
4.00
5.00
6.00
6.25



Conclusion:

Dispersion modeling of a river sand mine indicated that PM_{10} reach elevated concentrations at distances (1-2) km from mine excavation. But for majority of the domain, PM_{10} concentrations were substantially below regulatory or guideline values. $PM_{2.5}$ concentrations from sand mining operations are not significant. The fugitive emissions from sand mining from river pit are the main sources of particulate matter.

Transportation of sand on haul roads is not a significant source of particulate emissions. Taken together, community exposures to airborne particulate matter from sand mining activities appear to be unlikely to cause chronic adverse health conditions. The World Health Organization Guidelines indicate that by reducing daily averaged particulate matter (PM_{10}) concentrations from 70 to 20 micrograms per cubic meter (µg/m3), the air pollution-related deaths can be reduced by around 15%. Hence in this case the highest daily averaged concentrations sometimes do exceed WHO's guidelines very close to the mine.

Therefore, emission control measures as suggested need to be adopted so that PM_{10} concentrations remain within limits and do not affect susceptible mine workers and surrounding population.

4.3.2. Impact on Water Environment

The project does not consume any process water except for drinking, dust suppression and plantation. Plantation is proposed, which will increase the water holding capacity and help in recharging of ground water.

No waste water is generated from the mining activity of minor minerals as the project only involves lifting/excavation of Sand and transportation directly to the consumers. Only wastewater generation will be sanitary wastewater, which will be treated in movable bio toilets. No adverse effect on surface water source is envisaged.

Minimal uses of groundwater resources are envisaged. Groundwater was tested at project site and groundwater norms were compared to IS:10500 (1991) for evaluation. Most of the parameters are observed to be within limits prescribed by this standard. No impact on quality of groundwater is envisaged.

4.3.3. Impact on Land/Soil

The proposed extraction of streambed materials, mining below the existing streambed, and alteration of channel-bed form and shape leads to several impacts such as erosion of channel bed and banks, increase in channel slope, and change in channel morphology.

These impacts may cause:

a) Undercutting and collapse of river banks.

b) Loss of adjacent land and/or structures.

c) Upstream erosion as a result of an increase in channel slope and changes in flow velocity.

d) Downstream erosion due to increased carrying capacity of the stream

e) Downstream changes in patterns of deposition.

f) Changes in channel bed and habitat type.

However, all precautionary measures have to be strictly controlled as mentioned in the mitigation measures discussed.

4.3.4. Impact on Environment due to Noise

During the operation phase, the source of noise will be excavation, loading operation, transportation by truck and operation of DG set. The noise levels will thus be within the limits specified by MoEF&CC by The Noise Pollution (Regulation & Control) Rules, 2000 for respective areas.

4.3.5. Flora and Fauna

Ambient air and fresh water quality will remain practically unaffected due to project activities. Thus, indirect adverse impact on flora and fauna is ruled out.

Development of plantation in the project area will provide habitat, food and breeding areas to birds, small animals and insects. Thus, a significant positive impact is envisaged.

4.3.6. Socio-economic Environment

Project activity will provide employment to nearly 36 workers during the operation phase, thus a significant benefit to the socio-economic environment is likely to be created. No adverse impact is expected on sanitation and community health.

4.4. MITIGATION MEASURES

4.4.1 Air Environment

Air pollution in form of dust is common in and around sand and gravel mining areas due to the following two major reasons:

- Finer particles in the stock piles may become air born. Wind spread disposed waste in and around residential areas, crop fields, making the land untidy.
- Emission of dust on haul road due to transportation of sand from the mining area to the stockyard

The sand mining will be from river bed. The sand will be in wet condition as the excavation involves sand mining up to 1.60 m depth maximum. The sand transportation will be through tipping trucks to the mine site. The excavation will be through hydraulic excavator. The excavation will not generate fugitive dust as the sand will be partly in wet condition. The emission from the vehicular movement will be negligible due to low volume of sand offtake.

In this mining project the only source of air pollution is excavation, transportation, loading and handling of minerals etc. The proposed mining operations are not anticipated

to raise the concentration of pollutants beyond prescribed limits. However, Appropriate mitigative measures shall be taken to contain the predicted level within prescribed level. These measures (both preventive and suppressive) are suggested to mitigate the negative impact of the proposed mining activity to control the pollutants by;

- Plantation of trees along haul roads, especially near settlements, to help to reduce the impact of dust on the nearby villages;
- Planning transportation routes of mined material so as to reach the nearest paved roads by shortest route (minimize transportation over unpaved road);
- Regular water sprinkling on unpaved roads to avoid dust generation during transportation etc.
- Overloading will be kept under check by giving prior awareness.
- Planned multiple transportation routes in different direction to minimize the dust generation. Two (2) transportation routes have been considered in this proposal.
- Planned paved roads outside mine lease area to minimize the dust generation. Alternatively, planning transportation routes so as to reach the nearest paved roads by shortest route. (Minimize transportation over unpaved road).
- Frequent water sprinkling on unpaved roads (>2l/m2).
- Dust mask shall be provided to the workers engaged at dust generation points like excavations and loading points.
- Transportation of material shall be carried out during day time only.
- The speed of trucks plying on the haul road should limited to 20 km/hour to avoid generation of dust.
- Covering of material by tarpaulin during transportation on trucks to prevent spillage of materials from the trucks.
- Ensuring all vehicles are well maintained and regularly serviced.

4.4.2. Noise Pollution

It can be stated that the impact on the noise levels due to mining operations will be minimal and shall be restricted to transportation route only. There is no drilling and blasting envisaged in the mining of minerals so there is no impact of blasting and vibration due to the project. Hence, the impact of noise due to the proposed mining operations on the environment will be minimal.

The workmen associated with the operation of different equipment like excavator and loading experience noise level in the range of 75-85 dB (A) for more than 4-4.5 hours per shift. So, suitable mitigation measures will be taken to prevent adverse impacts of high

noise level on the workmen, this includes provision of ear muffs, plantation along haul road and avenue plantation.

Impact	Mitigation Measures
Noise Impact due to mining activities. • Continuous noise from excavation and loading can cause hypertension, high stress level, hearing loss, sleep disturbance etc. due to prolonged exposure. • Increase in the existing traffic due to this mining activity may occur unwanted sound and can also cause impact on human health of neighbouring villagers like effect on breathing and respiratory system, damage to lung tissue, cancer and premature death, influenza or asthma.	• Noise generated be this equipment will be intermittent and does not cause much adverse impact. • The noise measurement data indicated that existing noise levels in the study area is within the permissible limits of Ambient Noise Quality Standards. • Periodical monitoring of noise will be done. • No other equipment except the transportation vehicles and excavator for loading will be allowed. • Proper maintenance of all equipment / machines will be carried out which help in reducing noise during operations. • In addition, truck drivers will be instructed to make minimum use of horns in the village area and sensitive zones. • Plantation will be taken up along the approach roads. The plantation minimizes propagation of noise and also arrests dust. • Ear muffs will be provided to workers working in the noisy areas. • Regular health check-ups will be conducted for identity noise related disorder.

4.4.3. Water Environment

Damage to the water body (in this case, downstream side of Damodar River) depends on its assimilative capacity of the water body. The proposed leasehold area of Jujuti and Naricha Sand Mine lies entirely in the river bed of Damodar. In general, sand mining period has been considered as 7 months (i.e. dry season), when the river remains dry enough to allow mining operation at its bed and the mining operation is planned for during these 7 months only. Sand as a mineral in river bed is of unique nature. The amount of sand mined out in the dry season every year is replenished during flooded condition of the river particularly in the monsoon period. As the reserve of sand in the

proposed sand mine continues to be available in future, no long-term impact on sand availability & river bed profile is foreseen.

Water Pollution Control Measures

There will be no pumping of water from mine site. No effluent will be generated by sand mining process. No impact on water quality is envisaged due to mining. Still, following additional mitigation measures are proposed to be taken for water pollution control.

Impact	Mitigation Measures
• Flow pattern might be changed due to river bed mining. • Mining activities depth will be increased, which may result in increase of flow velocity.	• Mining activities will be restricted to 1.60 m depth, which will not cause change in flow pattern of the river. • Mining shall be discontinued if water is encountered. • No diversion is proposed. There will not be any adverse impact on flow pattern, surface hydrology and ground water regime.
• Change in surface water quality and ground water quality.	• There will be no change in surface water quality as mining shall be carried out in dry pit only. • Ground water quality will not be affected due to mining activities as it is restricted to 1.60 m depth and the water level is 5-10 mbgl below the surface of river bed. • Regular monitoring of water samples will be done as precautionary measures.
• Impact on ground water recharge potential as the thickness of the natural filter materials (sediments) is reduce causing less infiltration.	• Mining will be done as per approved Mine Plan and applicable Rules & Regulation, so that there is no damage on ground water recharge potential due to sand mining.
• Waste water discharge.	• Portable Bio-toilets will be used; hence no sewage / liquid effluent will be generated and contamination is also not expected due to percolation.

4.4.4. Soil Environment

Impact	Mitigation Measures
• During the flood, the soil erosion may occur.	• Mine lease area has been proposed leaving a safety distance from the bank inwards which will protect the banks.

4.4.5 Solid Waste Generation / Management

No solid waste generation in River bed mining.

4.4.6 Land Use

The mining and allied activities involved in river bed mining are creation of temporary haul roads / transportation track and formation of mined pits inside river, etc. The scientific mining i.e. systematic removal of sand will not cause bed degradation and will not affect aquatic environment. This project does not involve any waste generation. Thus, no waste dump sites are needed for the project.

Impact	Mitigation Measures
• Mining in the riverbed may change complete land use pattern including channel geometry, bed elevation, which can reduce flow of the river and downstream erosion.	• The mining is planned in non-monsoon seasons only so that the excavated area will be replenished naturally during the subsequent rainy season for the river bed mining block. • Mine lease area has been proposed leaving a safety distance from the bank inwards which will protect the banks so channel geometry will not be disturbed. • Pre and post monsoon survey for sedimentation in the riverbed will be done regularly

4.4.7 Hydrology

Impact	Mitigation Measures
• The mining in the riverbed area may cause the ground water contamination due to intersection of the water table.	• The water table will not be intersected during mining in the riverbed as ultimate depth is limited up to 1.60 meters and the water table is 5-10 m bgl. Proper analysis/Monitoring will be done to check the ground and surface water. • Mining shall be discontinued when water is encountered during mining.
• Change in the topography will divert the river flow.	• There is no proposal of any stream modification/diversion due to this mining activity

Impact	Mitigation Measures
	hence there will be no any impact on flow of the river.
• Change in topography can change the river flow and flood may occur.	• No change in topography envisaged. Mining will be prohibited in monsoon season.
• Slope of mining area will change which can create soil erosion and divert rain water runoff channel.	• The maximum depth of mining in the river bed will not exceed 1.60 meters and the maximum depth of mining in outside riverbed will not exceed.

4.4.8. Topography, Drainage and Ground water Contamination

Impact	Mitigation Measures
• Spillage of oil from transportation vehicles and equipment.	• Spillage of oil from construction vehicles and equipment will be avoided. This will be inspected by supervisor for any leakage of oil.

4.4.9 Biological Environment

Impact	Mitigation Measures
• Transportation of sand in the trucks/dumper may disturb the wildlife like movement of jungle cat, jackal, and other reptiles. • Fugitive emission from vehicle movement will form a layer of dust on plant leaves thus reducing the photosynthesis process. This may affect the growth of plants. • Chances of collisions of wildlife with transportation truck, attempting to cross roads are possible.	• Transportation of sand will only be in day time. Access roads will not encroach into the riparian zones. • Water sprinkling on 'kaccha' road during dry season will reduce fugitive dust emissions.
• Indiscriminate mining from active channels of rivers causes many adverse effects on the benthic fauna, which is Habits the bottom sandy substratum. Excessive sand extraction from rivers affects the eco-biology of many	• Mining will be done only in riverbed and outside riverbed as per provided by DMG so there will be no impact on benthic

Impact	Mitigation Measures
terrestrial insects whose initial life history begins in aquatic environments	fauna in riverbed hence no mitigation will be required.
• Stomatal index may be minimized due to dust deposit on leaf.	• Water will be sprinkled on unpaved roads to avoid dust generation.

4.4.10 Socio-economic

Impact	Mitigation Measures
• Mining activity will generate direct employment by recruiting 15 people which will be employed locally.	• Positive Impact
• Mining and transportation of sand will generate indirect employment in the area of small shops, dhabas, repair garage etc.	• Positive Impact

4.5 TRAFFIC IMPACT ANALYSIS

Due to the proposed sand mining operation, there will be increased movement of traffic due to the transportation of the mined-out sand to the stockyard. The extent of these impacts will depend on

(a) The rate of vehicular emission within a given stretch of the road

(b) The prevailing meteorological conditions, including wind direction and speed.

The traffic assessment is conducted to assess the impact of traffic with reference to road safety and carrying capacity of roads. This has helped in deciding the geometric design feature and traffic control for safe and efficient traffic movements.

Due to sand production activities there will be increase in the traffic to and from the site. Vehicles used for transportation of sand would be trucks. The site has good road connectivity. Traffic volume on nearby roads will increase due to movement of Trucks. These vehicles move mainly through SH-8. The traffic density on this road is much less than its allowable limits. There will be slight increase in road traffic. The site has good road connectivity. Traffic volume on nearby roads will increase due to movement of medium and heavy vehicles considering the overall size and nature of the Project, the increase in traffic will not have any significant effect.

Table 4.2: Addition of Traffic due to Mining Operation

Material	Production cum/day	Truck capacity	Total No. of Trucks	No. of Trips/day	Through SH-8
Sand	535.36	10	15	10	15

Table 4.3: PCU During Mining Operation Phase

Basis No. of vehicle x 2 (Up and Down)

Table 4.4: Proposed Traffic Scenario and LOS

Location	Existing Traffic Load			Total Traffic load including applied project		
	No of PCUs	V/C	LoS	No of PCUs	V/C	LoS
Project site to SH-8	435.00	0.21	B	444.00	0.222	B

No change in V/C ratio is expected during mining operation when compared with the existing scenario. However, proper traffic management plan will be adopted to minimize the impending impacts.

4.5.1 Daily Emissions from Transportation

The trucks used during operation phase of the project are further evaluated to quantify the emissions from transportation on daily basis. For this evaluation the emission factors of for Heavy diesel vehicles are used which are provided by CPCB. The following are the emission factors used for the traffic emission study:

4.7.2.2 Mitigation Measures

The increase in traffic will not have any significant effect. A traffic management plan for the area will be developed to ease the situation. The following arrangement would be made to ease the situation.

- Vehicles with PUC Certificate will be hired.
- Haulage roads are sprinkled with water at regular intervals for which water tankers with sprinkler arrangement shall be deployed.
- Regular maintenance of vehicles will be done to ensure low emissions and smooth running of vehicle.
- Trucks carrying sand shall be covered with tarpaulin to prevent spreading of dust during transportation.

- Green belt along river edge and either side of the approach road shall be developed. It is proposed to plant 720 trees along the river edge and approach road in consultation with Forest department
- Water spray and sprinkling is practiced at loading unloading locations.
- The roads will be strengthened, if required, for transportation of material, goods etc.
- Drivers of trucks / dumpers engaged in construction work will be instructed to give way to passenger buses, cars etc.
- Dust respirators are provided for the people working at loading and unloading areas
- Speed limit of 10 km/h shall be enforced for vehicles in the plant premises to prevent dust emission.
- Transport of machineries will be carried out during lean traffic period of the day
- Minimize use of roads at any particular time by planning vehicles movements.
- Ambient Air Quality shall be checked at regular interval and will ensure the ambient air quality to be within the NAAQ standards.
- Regular Health check-up camps will be organized.

From above statements, it can be concluded that proposed expansion will have insignificant effect on the traffic and proper management plan will further reduce the negative impacts.

4.6 GREENBELT DEVELOPMENT

The river bank area near the mining zone and transport route from the river bank to lease road will be properly developed and also cover with greenbelt to arrest the spread of dust & sand mass during mining operation. The common board leaved native evergreen plant species will be selected in planting in greenbelt area. The common native plant species such as Gulmohar, Neem, Bargad, Amaltas, Pipal, Teak, Arjuna, Kadamb, Ahhatwar etc will be planted along the transport rout. in the barren area of river bank during the current plan period.

Table 4.7: Greenbelt Development Plan

- Length of Approach Road: 347 m
  Number of plants in a single row along the approach road keeping an interval of 3 m: 115 trees
  For 2 row of plantation it is 230 trees
  Thus, plantation on both side of the approach road has **460 trees**
- Length of both the river banks adjacent to the mining area: 601 & 630 m.
  Number of plants in a single row along the river edge keeping an interval of 3 m: **410 trees**
- No. of trees to be planted in / near-by Govt. school and/or in nearby habitation area: **7,580 trees**

Total number of trees to be planted and maintained by the project proponent is 8,450 trees.

The pit size should be 45cmX45cm and 3-5 rows of plants should be planted (200 plants per km). Around 15-20 different plants species will be selected for this purpose. These are as follows: Bel (Aegle marmelos), Neem (Azadirachta indica), Kanchan (Bauhinia variegata), Palas(Butea monosperma), Amal (Cassia fistula), Mahua (Madhuca lengifolia), Jamun (Syzygium Cumini), Arjun (Terninalia arjun), Aswatha/Pipal(Ficus religiosa), Mango (Mangifera indica), Katbadam (Ternainalia catappa), Chatian (Alstonea scholaris), Jarul (Lagerstromea parvifloga), Katchampa (Pterospermum acerifolium), Akasmoni (Acacia mangium), Kadam (Anthocephalos chinenois), Cannonball (Couroupita guianensis), Gulmohar (Delonix regia), Habul(Thelpetia Pupalnea) and so on. It is better if 2-3 years old sampling could be planted then rate of survibility will be more. Planting in Monsoon with proper free guard should be made possible.

Plantation will be started along with the start of mining operation.

Calculation of Cost for Green belt Development

Expenditure per plant Rs. 1000

Total Numbers of Plant= 7580

Total Expenditure= 7580 x 1000 = Rs. 75,80,000/-

Capital Budget of Rs. 75.80 lakhs for greenbelt development and annual budget of Rs. 6.25 lakh for maintenance of greenbelt has been kept.

4.7 MINE CLOSURE

Implementation of reclamation and rehabilitation of mined out area or Progressive Reclamation Plan is not required as river sand is replenished/reclaimed every year during rainy season. However, it proposed to take the following mitigation measures to maintain the aquatic condition of the surroundings:

1. Abandoned stream channels on terrace and inactive flood plains may be preferred rather than active channels and their deltas and flood plains. Replenishment of ground water has to be ensured if excessive pumping out of water is required during mining.
2. Stream should not be diverted to form inactive channel,
3. Mining below subterranean water level should be avoided as a safe guard against environmental contamination and over exploitation of resources,
4. Large rivers and streams whose periodic sediment replenishment capacity are larger, may be preferred than smaller rivers,
5. Segments of braided river system should be used preferably falling within the lateral migration area of the river regime that eSHances the feasibility of sediment replenishment,
6. Mining at the concave side of the river channel should be avoided to prevent bank erosion. Similarly, meandering segment of a river should be selected for mining in such a way as to avoid natural eroding banks and to promote mining on naturally building (aggrading) meander components.
7. Scraping of sediment bars above the water flow level in the lean period maybe preferred for sustainable mining,
8. It is to be noted that the environmental issues related to mining of mineral including riverbed sand mining should clearly state the size of mine lease hold area, mine lease period, mine plan and mine closure plan, along with mine reclamation and rehabilitation strategies, depth of mining and period of mining operations, particularly in case of river bed mining.
9. The Piedmont Zone (Bhabbar area) particularly in the Himalayan foothills, where riverbed material is mined. This sandy- gravelly track constitutes excellent conduits and holds the greater potential for ground water recharge. Mining in such areas should be preferred in locations selected away from the channel bank stretches. Areas where channel banks are not well defined, particularly in the braided river system, midstream areas should be selected for mining of riverbed materials for minimizing adverse effects on flow regime and in stream habitat.

10. Mining of gravelly sand from the river bed should be restricted to a maximum depth of 3 m from the surface. For surface mining operations beyond this depth of 3 m (10 feet), it is imperative to adopt quarrying in a systematic bench- like disposition, which is generally not feasible in river bed mining. Hence, for safety and sustainability restriction of mining of riverbed material to maximum depth of 3 m. is recommended,
11. Mining of river bed material should also take cognizance of the location of the active channel bank. It should be located sufficiently away, preferably more than 3m away (inwards), from such river banks to minimize effects on riverbank erosion and avoid consequent channel migration,
12. Continued riverbed material mining in a given segment of the river will induce seasonal scouring and intensify the erosion activity within the channel. This will have an adverse effect not only within the mining area but also both in upstream and downstream of the river course. Hazardous effects of such scouring and eSHanced erosion due to river bed mining should be evaluated periodically and avoided for sustainable mining activities.
13. Mineral processing in case of river bed mining of the sandy gravelly material may consist of simple washing to remove clay and silty area. It may involve crushing, grinding and separation of valueless rock fragments from the desirable material. The volume of such waste material may range from 10 to 90%. Therefore, such huge quantities of mine wastes should be dumped into artificially created/ mined - out pits. Where such tailings / waste materials are very fine grained, they may act as a source of dust when dry. Therefore, such disposal of wastes should be properly stabilized and vegetated to prevent the erosion by winds,
14. Identification of river stretches and their demarcation for mining must be completed prior to mining for sustainable development
15. The mined-out pits should be backfilled where warranted and area should be suitably landscaped to prevent environmental degradation.
16. Mining generally has a huge impact on the irrigation and drinking water resources. These attributes should be clearly evaluated for short-term as well as long-term remediation.

4.7.1 Financial Assurance:

The financial assurance can be submitted in any cashable form, preferably a Bank Guarantee from a schedule bank as stated in rule 18(2) of the West Bengal Minor Minerals Concession Rules, 2016. The amount calculated for the purpose of financial assurance based on rule 18(1) of the aforementioned document is Rs. 15,000 x 10.24 Ha

= Rs. 1,53,600/- (as it is more than Rs. 50,000/- as mentioned in the rule), in the form of Bank Guarantee to concerned authorities.

4.8 CARE & MAINTENANCE DURING TEMPORARY DISCONTINUANCE

No emergency plan due to court order or unforeseen circumstances for temporary discontinuance is need. Necessary precautions to be taken during pre –monsoon period between June to September to withdraw all the equipment & manpower from mining site.

CHAPTER-5
ANALYSIS OF ALTERNATIVES (TECHNOLOGY & SITE)

1.0 PREAMBLE

Consideration of alternatives to a project proposal is a requirement of EIA process. During the scoping process, alternatives to a proposal can be considered, either directly or by reference to the key issues identified. A comparison of alternatives helps to determine the best method of achieving the project objectives with minimum environmental impacts or indicates the most environmentally friendly and cost-effective options

5.2. SELECTION OF LOCATION

All sand deposits of West Bengal have been allotted to West Bengal Mineral Development and Trading Corporation Limited. The Kumirkola Sand Mine is on the Damodar riverbed located at Block – Khandaghosh, Dist. – Purba Bardhaman district of West Bengal. This sand mining project is site specific. Hence, alternate site has not been examined for this project.

However, the project site is having following locational advantages:

- Man power is available in local area in plenty.
- Local labours will be deployed so they will either reach mine site by bicycle or by foot.

Benefits:

- Less pressure on Infrastructure
- Less pollution due to transportation of labours.

5.2.1 Environment Sensitivity of the Location

1. There is no Wildlife Sanctuary / National Park / Bio-sphere Reserve / Habitat of Migratory birds within 10 km radius from the project site.
2. There is no Tiger Reserve / Elephant Reserve / Turtle Nesting Ground within 10 km radius from the project site.
3. There is no Archaeological Monument / Défense installation within 10 km radius from the project site.
4. There is no Forest land in project site

5.3. SELECTION OF TECHNOLOGY

River bed Sand mining will be done by opencast semi-mechanized method as per "Sustainable Sand Mining Guideline, 2016', issued by Ministry of Environment & Forest. This will have following benefits:

- Less disturbance to river drainage pattern
- No electric power requirement
- Minimal noise will be generated

- Minimal air pollution

The proposed project has adopted a technically feasible and economically viable and proven technology. Hence, there was no need of any analysis of alternatives technology for the proposed project is required.

The anticipated adverse impacts shall be less due to the following:

- All statutory requirements of JSPCB/CPCB/MoEF shall be complied, including Guidelines issued by Ministry of Environment, Forest & Climate on Sustainable Sand Mining.
- Air emission during transportation shall be controlled by water sprinkling on haul road.
- Continuous efforts shall be made for improvement of the socio-economic status of the surrounding area.

CHAPTER-6
ENVIRONMENTAL MONITORING PROGRAMME

6.1 PREAMBLE

Regular monitoring of the various environmental parameters is necessary to evaluate the effectiveness of the management program so that the necessary corrective measures can be taken in case there are some drawbacks in the proposed program. Since environmental quality parameters at work zone and surrounding area are important for maintaining sound operating practices of the project in conformity with environmental regulations, the post project monitoring work forms part of Environmental Monitoring Program. The Environmental Monitoring Program will be implemented once the project activity commences.

To ensure the effective implementation of the proposed mitigation measures, the broad objectives of monitoring plan are:

- To implement the mitigative measures defined in EMP.
- To evaluate the performance of mitigation measures proposed in the EMP.
- To evaluate the adequacy of Environmental Monitoring Program
- To suggest improvements in management plan, if required
- To improve environmental quality.

6.2 PARAMETERS TO BE MONITORED AND FREQUENCY OF MONITORING

Samples for study of air quality, water quality and noise level will be collected and tested once in six months at strategic places representing all the categories of location. Ground water level shall be monitored regularly. The Implementing Authority will be guided and advised by feedback data obtained from these tests.

6.2.1 Ambient Air Quality

Air quality monitoring at one location in mining area is proposed to be done at a frequency of twice in a week for one week, once in six months. The parameters monitored include the parameters as per National Ambient air quality Standard, 2009.

It is necessary to monitor the air quality at the mine site with respect to PM_{10} and $PM_{2.5}$, SO_2, NOx and Free Silica in downwind direction considering predominant wind direction, at a distance of 500 meters from the following dust generating sources

Table 6.1: Ambient Air Quality – Frequency and Parameters

Description	Number of Monitoring Stations	Frequency
Ambient Air Quality	3	Six Monthly
Parameters – PM_{10}, $PM_{2.5}$, SO_2, NO_2, Free Silica		

6.2.2 Noise Monitoring

Noise monitoring shall be carried out near to the high noise sources like near to Excavator during operation and during loading, once in six months. Monitoring of Ambient noise levels will be monitored once in a quarter during day time (6 AM to 10 PM) and night time (10 PM to 6 AM) as per The Noise Pollution (Regulation and Control) Rules, 2000, Schedule III at Industrial, Commercial, Residential and Silence Zone.

Guidelines prescribed by the Director General, Mines & safety (DGMS) shall be complied with.

6.2.3 Water Monitoring

River water sample on upstream & downstream side of sand mine and two ground water samples from nearby area are proposed to be collected and monitored for all the parameters as per MoEF&CC guidelines / Indian Standard.

The ground water and river water samples will be compared with IS: 10500:2012 drinking water standards.

Monitoring Frequency

Ground water level and ground water quality monitoring will be undertaken twice a year in the months of May and November in each year.

River bed RL will be monitored twice every year preferably in October (post-monsoon) and March (pre-monsoon). If the river bed RL falls 3.0 m beyond the original (pre-mining) lever, no further extraction of sand will be done, till the time of recoupment of original RL in next monsoon.

6.2.4 Plantation

Plant growth, its maintenance and survival rate will be monitored. Monitoring will be continuous up to 5 years so that desired growth of plants and trees is attained.

6.2.5 Occupational Health & Safety Monitoring

Monitoring of health of the workers and staff for identifying occupational diseases etc. in time and initiating remedial measures is being done regularly. Where personal protective equipment is required, workers shall be provided appropriate PPEs.

Occupational health and safety monitoring programs shall verify the effectiveness of prevention and control strategies. Health & Safety aspects shall be re-assessed on annual basis. The occupational health and safety monitoring program shall include:

- To carryout inspection and testing of all safety features and hazard control measures focusing on engineering and personal protective features, work procedures, places of work, installations, equipment, and tools used.

- Surveillance of workers health: When extraordinary protective measures are required, workers shall be provided appropriate and relevant health surveillance prior to first exposure and at regular intervals thereafter.

6.2.6 Socio-Economic Development – Monitoring of CER Program

It is suggested that mining authority should have structured interactions with the community to disseminate the measures taken by them and also to elicit suggestions for overall improvement for the development of the area.

6.2.7 Accidents and Diseases Monitoring

Mining Authority shall establish procedures and systems for reporting and recording of Occupational accidents and diseases and dangerous occurrences and incidents.

These systems shall enable workers to report immediately to their immediate supervisor any situation they believe presents a serious danger to life or health. The systems and the employer shall further enable and encourage workers to report to management all:

- Occupational injuries and near misses;
- Suspected cases of occupational disease; and
- Dangerous occurrences and incidents.

All reported occupational accidents, occupational diseases, dangerous occurrences and incidents together with near misses shall be investigated with the assistance of a person knowledgeable/competent in occupational safety. The investigation shall:

- Establish what happened;
- Determine the cause of what happened; and
- Identify measures necessary to prevent a recurrence

6.3 BUDGET ALLOCATION FOR MONITORING

In order to maintain the environmental quality within the stipulated standards, regular monitoring of various environmental components is necessary which will be complied as per conditions. For this the project proponent has taken decision to assigned responsibility of environmental monitoring to the Mines Manager.

EMP may also require measurement of ambient environmental quality in the vicinity using ecological/biological, physical and chemical indicators. Monitoring may include socio-economic interaction, through local liaison activities or even assessment of complaints. Regular Monitoring of all the environmental parameters viz., air, water and noise as per the formulated program based on CPCB and MoEF&CC guidelines will be carried out every year. The location of the monitoring stations will be selected on the

basis of prevailing micro meteorological conditions of the area like; wind direction and wind speed, relative humidity, temperature.

Along with other budgets, Budget for environmental management will be prepared and revised regularly as per requirement. The budget will include provisions for:

- Environmental Monitoring Program
- Greenbelt development
- Periodical interaction with community for assessment of their social needs.
- Occupational Health assessment of employees and inspection of safety appliances

Table 6.2: Cost of Environmental Monitoring Program

Sl. No.	Item	Cost in Rs. Per year
1.	Cost of monitoring of environmental parameters for Air, Water and Noise	200,000
3.	Occupational Health & Safety	50,000
4.	Plantation	15,000
5.	Socio-economic development	15,000
Total		**280,000**

6.4 ENVIRONMENTAL MANAGEMENT - RESPONSIBILITY

Mine authority is committed for implementation of all the mitigation and management measures suggested in Environmental Monitoring Program. Mines Manager shall look after all environmental related matters of the mine. The Mine Manager will supervise the reported activity from time to time for smooth implementation of Environmental Monitoring Program and Mitigation and Management measures and will take necessary actions if required. Mines Manager will act to ensure the suitability, adequacy and effectiveness of the Environment Management Program also, described in Chapter-10. It will also ensure to meet all the Statutory Requirements and will serve the following purpose:

- Shall be in regular touch with WBMDTCL and shall send them environmental monitoring reports regularly in the prescribed format, as per the prevailing practice. Any new regulations considered by State/Central Pollution Control Board for the Industry shall be taken care of.
- Awareness of pollution control and environmental protection to all workers.
- Operation and maintenance of pollution control equipment.
- Organize field monitoring, laboratory testing of pollutants.
- Occupational health/safety.

- Risk assessment and Disaster management.
- Environmental management.
- Afforestation / plantation and post care of plants.
- Knowledge of norms, regulations and procedures.
- Checking of safety related operating conditions and Visual inspection of safety equipment

Other responsibilities of the Mine's Manager will include

- A WBMDTCL registered agency having NABL accreditation will be retained to generate the environment quality data in respect of air, water, noise and soil and prepare the Environmental report.
- Submitting environmental monitoring report to WBMDTCL. The Mine's Manager will also take mitigative or corrective measures as required or suggested by the Board.
- Obtain statutory permissions (CTE and CTO) from WBMDTCL and timely renewal of Consent to Operate
- Submit annual Environmental Statement to WBMDTCL" in Form V under Rule 14 of the Environment (Protection) Second Amendment Rules 1992 of the Environment (Protection) Act, 1986.
- Conducting safety and health audits to ensure that recommended safety and health measures are followed.

6.5. INFRASTUCTURE REQUIREMENT

The project proponent does not propose to set up its own monitoring facility. It will engage external laboratories and agencies for monitoring through NABL accredited laboratories.

CHAPTER-7
ADDITIONAL STUDIES

7.1 PREAMBLE

In this chapter followings have been discussed:

- Public consultation / Public Hearing
- Annual Replenishment of Mineral
- Hazard Identification and Risk Management

7.2. PUBLIC CONSULTATION

As part of the participatory approach, the project has been designed in due consultation with all the stakeholders. Public consultation is mandatory for any investment in infrastructural development program. The aim of the public consultation is to make the stakeholders aware about the developmental activities being undertaken and to incorporate their views for making sustainable plan during the design and to have successful completion of the project.

7.2.1. Public Hearing

Public hearing is a very significant part of the process of public participation envisaged under guidelines issued by MoEF&CC, Government of India. It facilitates involvement of all the stake holders of the project which is essential for ensuring smooth running of project and benefitting all section of society in the process of economic development of the region.

The public Hearing Issues and its Action plan along with budget will be incorporated in the Final EIA report after Public Hearing is completed.

7.3. CORPORATE ENVIRONMENT RESPONSIBILITY

The CER budget of 2 % of the total project cost is proposed based on the public hearing issues.

7.4. ANNUAL REPLENISHMENT OF MINERAL

District Survey Report (DSR) of Purba Bardhaman District was prepared by the Department of Industry, Commerce & Enterprises, Government of India. It was approved by SEIAA, West Bengal on 01.02.2024 (As published in the Minutes of 30th Meeting of SEIAA under Miscellaneous Section, Point No. 4).

Sand deposition in the River channels are replenished every year during the monsoon season. The stream generally originates in the highlands where due to immense force of the river. Owing to very high gradient and heavy precipitation the process of erosion is accelerated. These eroded materials are then transported along the river channel and during their transportation the eroded material is further reduced in size by various

processes such as abrasion, traction. These materials are then deposited in the river channels where the gradient is low and thus, forms the part of the river channels.

This process is repeated every year during the monsoon season or during heavy precipitation. The process of sand deposition may be hindered due to low rainfall or due to human activities such as building check dams and other construction on the river to store water. These human interferences have a catastrophic effect on the formation of sediments as the base level is adjusted it slows down the process of erosion upstream.

The proposed project is on Damodar river. As this is a perennial river which is being replenished especially during the monsoon.

7.5. HAZARD IDENTIFICATION AND RISK ASSESSMENT

Hazard is a source or situation that has the potential for harm in terms of human injury, ill health, damage to property or the environment, or a combination of these factors. It has got a short or a long-term effect on the work environment with considerable human and economic costs. A hazard can have a potential to create an emergency like situation at the work place. Hazard is a potential cause to generate a disaster.

Hazards exist in every workplace in different forms and required to be identified, assessed and controlled regarding the work processes, plant or substances. They arise from:

a) Workplace environment,
b) Use of equipment and machineries
c) Use of substances and materials,
d) Poor work and/or plant design,
e) Inappropriate management systems and work procedures, and
f) Human behaviour.

Mining operations can cause considerable environmental, health and safety risk to the workforce. All the hazards cause potential risk to the work environment which include work force and work place and hence need proper assessment.

Risk assessments will help mine operators to identify high, medium and low risk levels. This is a requirement of the Occupational Health and Safety Act, 2000. Risk assessments will help to prioritize the risks and provide information on the need to safely control the risks. In this way, mine owners and operators will be able to implement safety improvements.

7.5.1 Approach to The Study

Risk involves the occurrence or potential occurrence of some accidents consisting of an event or sequence of events. The risk assessment study covers the following:

1. Identification of potential hazard areas of the so that necessary design safety measures can be adopted to minimize the probability of accidental events.

2. Identification of representative failure cases;
3. Identification of potential areas of environmental disaster that can be prevented by proper design and controlled mining operation.
4. Assess the overall damage potential of the identified hazardous events and the impact zones from the accidental scenarios;
5. Assess the overall suitability of the site from hazard minimization and disaster mitigation point of view;
6. Furnish specific recommendations on the minimization of the worst accident possibilities;

7.5.2 DEFINITION OF ENVIRONMENT RISKS

The following terms related to environmental risks are defined before reviewing the environmental risks:

HARM:	Damage to the person, property, or environment.
HAZARD:	Something with the potential to cause harm; this could be characteristics of material being processed or malfunctioning of the equipment. An environmental hazard is thus going to be a set of circumstances, which leads to the direct or indirect degradation of environment and damage to the life and property.
RISK:	The probability of the harm or like hood of harmful occurrence. Being released and its severity. Environmental risk is a measure of the potential threat to the environment, life and property.

TOLERABLE RISK:	Risk which is accepted in a given context based on the current values of society.
SEVERITY:	Severity is used for the degree of something undesirable.
RISK ANALYSIS:	A systematic use of available information to determine how often specified events may occur and the magnitude of their likely consequences.

CONSEQUENCE:	Effect due to occurrence of the event, which may endanger the environment permanently or temporarily and or loss of life and property.
ENVIRONMENTAL	
DISASTER:	The consequence is so severe that it can extensively damage a one or all the four components of the environment namely a) Physico – chemical b) Biological c) Human and d) Aesthetics.

PROTECTIVE STEPS: The combination of risk reduction strategies taken to achieve at least the tolerable risk. Protective measures include risk reduction by inherent safety, protective devices, and personal protective equipment, information for use and installation and training.

7.5.3 HAZARD IDENTIFICATION

Following hazard may occur in the River bed mining:

- River Bed Inundation
- Soil Erosion
- Uneven/ Irregular mining of sand.
- Damage to River bank due to access of Ramps.
- River bank collapse due to close proximity of river bed mining.
- Surface degradation due to road network.
- Operation of Equipment
- Movement of heavy vehicles, loading and unloading
- Noise related hazard

Elaborate safety measures have been laid down in the statute concerning safety in sand mines which need to be adhered to. In addition to existing statutory provisions, a reference has been made here to some special precautionary measures, which have been considered important and thus require special attention for the safety of men and machinery engaged in the proposed sand mine of Jujuti and Naricha Sand Mine.

Surface Flooding / Inundation Proper care regarding the surface flooding / inundation from the unforeseen circumstance (like sudden inrush of water from upstream side, flush flood, or blockage of water flow in downstream side of Damodar River) shall be taken, so that the machinery deployed in proposed winning areas in the river bed of Damodar would not get drowned. Suitable warning system both upstream and downstream side will have to be maintained for giving warning signal in advance of impending danger so that machinery deployed could be withdrawn at a safer distance from the proposed sand mining site.

A careful assessment of the dangers of surface flooding / inundation/ flush flood from these unforeseen circumstances shall be made before the onset of every monsoon season and before start of the mining operation. Adequate precautions against such dangers shall be clearly laid down & implemented.

7.5.4 HAZARD ASSESSMENT AND EVALUATION

The different steps of risk assessment procedure are as given below:

Step I: Hazard Identification

The purpose of hazard identification is to identify and develop a list of hazards for each job in the organization that are reasonably likely to expose people to injury, illness or disease if not effectively controlled. Workers can then be informed of these hazards and controls put in place to protect workers prior to them being exposed to the actual hazard.

Step II: Risk Assessment

Risk assessment is the process used to determine the likelihood that people exposed to injury, illness or disease in the workplace a rising from any situation identified during the hazard identification process prior to consideration or implementation of control measures.

Risk occurs when a person is exposed to a hazard. Risk is the likelihood that exposure to a hazard will lead to injury or health issues. It is a measure of probability and potential severity of harm or loss.

Step III: Risk Control

Risk control is the process used to identify, develop, implement and continually review all practicable measures for eliminating or reducing the likelihood of an injury, illness or diseases in the workplace.

Step IV: Implementation of risk controls

All hazards that have been assessed should be dealt in order of priority in one or more of the following hierarchy of controls

The most effective methods of control are:

1. Elimination of hazards
2. Substitute something safer
3. Use engineering/design controls
4. Use administrative controls such as safe work procedure
5. Protect the workers i.e. by ensuring competence through supervision and training, etc.

Each measure must have a designated person and date assigned for the implementation of controls. This ensures that all required safety measures will be completed.

Step V: Monitor and Review

Hazard identification, risk assessment and control are an on -going process. Therefore, regularly review the effectiveness of your hazard assessment and control measures. Make sure that you undertake a hazard and risk assessment when there is change to the workplace including when work systems, tools, machinery or equipment changes. Provide additional supervision when the new employees with reduced skill levels or knowledge are introduced to the workplace.

7.5.4.1 RISK ASSESSMENT

The risk assessment portion of the process involves three levels of site evaluation:

I. Initial Site Evaluation,
II. Detailed Site Evaluation,
III. Priority Site Investigations and Recommendations.

The risk assessment criteria used for all levels of site evaluation take into account two basic factors:

- The existing site conditions
- The level of the travelling public's exposure to those conditions.

The Initial Site Evaluation and Detailed Site Evaluation both apply weighted criteria to the existing information and information obtained from one site visit. The Initial Site Evaluation subdivides the initial inventory listing of sites into 5 risk assessment site groups.

The Detailed Site Evaluation risk assessment is then performed on each of the three highest risk site groups in order of the group priority level of risk. The result of the Detailed Site Evaluation process is a prioritized listing of the sites within each of the three highest risk site groups.

Risk analysis is done for:

a) Forecasting any unwanted situation
b) Estimating damage potential of such situation
c) Decision making to control such situation
d) Evaluating effectiveness of control measures

7.5.4.2 ACCEPTABLE RISK

Risk that is acceptable to regulatory agency and also to the public is called acceptable risk. There are no formally recognized regulatory criteria for risk to personnel in the mining industry. Individual organizations have developed criteria for employee risk and the concepts originally arising from Iron & Steel Industry, chemical process industries and oil and gas industries. Because of the uncertainties linked with probabilistic risk analysis used for quantification of the risk levels the general guiding principle is that the risk be reduced to a level considered **As Low as Reasonably Practicable (ALARP).** The risk acceptability criteria are given in following Table. It can be seen that there are three tiers:

1. A tolerable region where risk has been shown to be negligible and comparable with everyday risks such as travel to work.
2. A middle level where it is shown the risk has been reduced to As Low As Reasonably Practicable level and that further risk reduction is either impracticable or the cost is grossly disproportionate to the improvement gained. This is referred as the ALARP region.

3. An intolerable region where risk cannot be justified on any grounds. The ALARP region is kept sufficiently extensive to allow for flexibility in decision making and allow for the positive management initiatives which may not be quantifiable in terms of risk reduction.

The risk acceptability criteria are given in following table:

Intolerable Region: Risk un-acceptance and must be reduced. The actions may include equipment and people or procedural measures. If risk cannot be reduced to ALARP level, operating philosophy must be fundamentally reviewed by the management.

ALARP Region: Efforts must be made to reduce risk further and to a slow as reasonably practicable, without expenditure that is grossly disproportionate to the benefit gained.

Tolerable Region: Risk level is so low that it not requires actions to reduce its magnitude further.

Table 7.1: Risk Likelihood for Guidance

Probability of Occurrence				Impact				
Definition		Meaning	Value	Catastrophic (A)	Critical (B)	Moderate (C)	Minor (D)	Negligible (E)
D1	Frequent	▪ Occurs Frequently ▪ Will be continuously experienced unless action is taken to change events	5	5	4	3	2	1
D2	Likely	▪ Occurs less frequently if corrective action is taken ▪ Documented through surveillance	4	5	4	3	2	1
D3	Occasional	▪ Occurs sporadically ▪ Discovered through surveillance	3	5	4	3	2	1
D4	Seldom	▪ Unlikely to occur ▪ Rarely, if ever reported	2	5	4	3	2	1
D5	Improbable	▪ Highly unlikely to occur ▪ Never previously reported	1	5	4	3	2	1
A: Fatality; B: Permanent Disability; C: Medical/ Hospital or Loss time; D: First Aid or no loss time; E: No Injury								
Risk Rating: Low Risk: 1-6; Medium Risk: 7-15; High Risk: 16-25								

7.5.5 RISK PRIORITISATION BASED ON HAZARDS

There are various factors, which can create unsafe working conditions/hazards in mining of minor minerals from river bed.

The key risk (hazard x probability) event rating associated with sand bed mining and to assess its impact of such events occurring has been gathered in Tables-7.1 respectively.

The Risk rating of such hazards is as follows:

a. Inundation / Flooding = (D2 x A=20)
b. Quick Sand Condition = (D3 x B=12)
c. Drowning = (D5 x D=2)
d. Accident due to vehicular movement, high concentration of traffic during duty hours = (D3 x C=9)
e. Accident during sand loading, transporting and dumping = (D2 x D=8)
f. Air Borne Respirable Dust Due to Transportation of Material = (D1 x E=5)

7.5.5.1 Possible Risks Due to Inundation/Flooding and its mitigation measures

The risk rating assigned to this activity is assigned as 20, it is only possible, if warnings are neglected and work started without assessment of the river bed condition specially during monsoon season, the event will be catastrophic with major consequences as frequency of this operation is possible. However, the event has to be brought under 'ALARP' Zone by strict supervision based on river water and other metrological data.

1) The possibility of inundation/flooding of the mines are very high during monsoon or during heavy rains as the mine area lies in the riverbed.
2) There is danger to the trucks and other machineries due to flooding.
3) There is danger to the workers working in the mines.

Mitigation Measure:

Inundation of flooding is expected and beneficial for these mines as during this time only the mineral reserve gets replenished.

1) During monsoon months and heavy rains, the mining operations are ceased.
2) There should be mechanism/warning system of heavy rains and discharges from the upstream dams.
3) Mining is done by excavating the mineral in 1½ meter slice at a time with a maximum of 2 such slices.

7.5.5.2 Possible Risks Due to Quick Sand Condition and its mitigation measures

The risk rating assigned t o t his activity is assigned as 12, it is likely event with critical impact as frequency of this operation is likely but the predicted /assumed intensity (Based on experience) is critical.

Hence data of water table must be collected and the mining work must be above the water table (about 1.5 m above to bring under ALARP ZONE) to avoid dangerous condition to vehicles playing over sand dunes.

This condition occurs when the working crosses the water table at a certain depth and the permeability of the strata is very high. This condition occurs when the effective stress in the sand becomes zero due to influx of water. This creates danger condition to the trucks and other machineries plying over the sand dunes on the river banks.

Mitigation Measure:

1) The only way to avoid quick sand condition is by avoiding mineral lifting below water table.
2) The critical hydraulic gradient should be maintained at less than 1 to prevent high artesian pressure in a coarse sand area.
3) At least 0.5 m sand bed should be left in-situ while harvesting sand from riverbed.

7.5.5.3 Possible Risks Due to Drowning and its mitigation measures

The risk rating assigned to this activity is assigned as 2 i.e., it is negligible due to dry season mining. There are no possibilities of drowning in the river, since mining operations are carried out only in the dry seasons. All mining activities will be stopped during the monsoon season.

Mitigation Measure:

1. The mining should be done under strict supervision and only during the dry season.
2. Deep water areas must be identified.
3. No go zones should be clearly marked and made aware to the mine workers.

7.5.5.4 Accident due to vehicular movement and its mitigation measures

The risk rating assigned to this activity is assigned as 9 i.e. it is possible event with moderate consequences as frequency of this operation is more but the predicted/assumed intensity (Based on experience) is less like minor cuts, bodily injury due to reckless or untrained driver. However, a strict control to be exercised to deploy trained drivers with valid driving license with a helper. A strict supervision/control to be exercised to avoid drunken driving or driving by unauthorized per son to bring under ALARP ZONE.

The minerals loaded in 15-20 T trucks are being sent to through public roads.

1) All possibilities of road accidents are possible due to rash driving.
2) Accident may also occur during movement in the mine, in case pathway is not compacted suitably or movement is at the embankment.

3) There are possibilities that due to overloading some pebbles or big boulder may injure the passer-by public. In case Traffic & vehicle load bearing licensed capacity is neglected.

Mitigation Measure:

1. Speed Limit/ Bumper will be imposed to regulate vehicle speed.
2. Transportation will be through covered trucks and wagons.
3. Minimize use of roads at any particular time by planning vehicles movements.
4. Road crossings to be used will be well marked.
5. Implementation of strict traffic management system.

7.5.5.5 Accident during sand loading, transporting and dumping and its mitigation measures

The risk rating assigned to this activity is assigned as "8 i.e. it is likely event with minor impact", as frequency of this operation is more but the predicted/assumed intensity (Based on experience) is less like minor cuts, aberration, fall due to river bank collapse & falling of cattle's, if not under proper supervision to bring under ALARP ZONE.

1) The minerals are loaded in the trucks using hand shovels. There is possibility of injury in the hands during loading with shovels.
2) There is possibility that the workers standing on the other side of loading may get injury due to over thrown sand with pebbles.
3) There is possibility of workers getting injured during opening of side covers to facilitate loading.
4) There is possibility of riverbank collapse.
5) There are chances of falling of cattle/children into pits in river bed by overlooking of fenced area near worksite or improper supervision.

Mitigation Measures

1) The truck should be brought to a lower level so that the loading operation suits to the ergonomic condition of the workers.
2) The loading should be done from one side of the truck only.
3) The workers should be provided with gloves and safety shoes during loading.
4) Opening of the side covers (pattas) should be done carefully and with warning to prevent injury to the loaders.
5) Operations during daylight only.
6) No foreign material should be allowed to remain/spill in river bed and catchment area or no pits/pockets are allowed to be filled with such material.
7) Stockpiling of harvested material on the river bank should be avoided.

8) All transportation within the main working should be carried out directly under the supervision and control of the management.
9) Road signs will be provided at each and every turning point up to the main road (wherever required).
10) The Vehicles must be maintained in good repairs and checked thoroughly at least once a week by the competent person authorized for the purpose by the Management.
11) To avoid danger while reversing the trackless vehicles especially at the embankment and tipping points, all areas for reversing of lorries should as far as possible be made man free, and.
12) A statutory provision of the fences, constant education, training etc. will go along way in reducing the incidents of such accidents.
13) Generally, overloading should not be permitted.
14) The truck should be covered and maintained to prevent any spillage.
15) The maximum permissible speed limit should be ensured.
16) The truck drivers should have proper driving license.

7.5.5.6 Air Borne Respirable Dust and its mitigation measures

The risk rating assigned to this activity is assigned as "5 i.e. it is frequent event with negligible impact", as frequency of this operation is more but the predicted/assumed intensity (Based on experience) is insignificant. At proposed sand mine, dust will be generated due to mining activities (winning & loading) and during transportation by tipping trucks to end-use plants. Exposure to airborne respirable dust beyond permissible limit may lead to occupational health hazard. Suitable measures need to be taken to prevent formation of dust and its chances of being airborne.

Mitigation Measures:

The mitigation measures that will be adopted to have minimal significant impact are:

a. Using paved roads for transportation to minimize fugitive emissions.
b. Transporting material in close truck and storing it under covered facilities.
c. Transport vehicles and machinery will be properly maintained and periodically checked for pollution level to reduce noise and gaseous emission in the surrounding environment.
d. PUC certified vehicle for transportation.

7.5.5.7 Additional measures for risk reduction opportunities

To promote safety in the mine, following additional provisions also need to be made:

- Mining will be done as per approved mining plan to prevent soil erosion. Mining will proceed along the river in the direction from downstream to upstream in each block. No mining will be done across the river / nalla.
- Due to uneven/ irregular thickness of the minerals, river bed mining may result in ponds to develop. Proper management of even excavation can overcome this. Mining will be done for ½ meter thick strip at a time in the direction of river, to avoid ponding effect and maintaining the uniform surface.
- Collection of minerals/working shall be started from the center towards the bank periphery in ½ meter slice so that the river course could not get affected.
- The operation does not anticipate any fire disaster (only use excavators that are diesel-based engines on-site for boulder gravel and sand collection). Regular checking, repairs at least once a week by the competent person authorized to ensure risk free operation. Adequate number of portable fire extinguishers to be used as first aid fire appliances. The distribution and selection of extinguisher will be done in accordance with the requirement of fire protection manual
- All statutory precautions and guidelines should be strictly followed in case of diesel operated excavators.
- Necessary arrangements are to be made to keep the noise level generated by the excavators and tippers within permissible limit by using silencers, dampeners, etc.
- For occupational health hazards, initial medical examination and periodical medical examination of all worker engaged in the proposed sand mine are to be done at time of appointment and at regular interval respectively.
- In addition to the above, all safety precautions which are required to be maintained as per statute should be followed including regular refresher courses for workers and supervisors.

7.6 EMERGENCY PLAN

On realizing anything serious happened anywhere in the mine, the concerned person will immediately inform the nearest mining official & the manager of the mines.

On receiving the information of emergency, Shift in-charge will ensure that all the materials and transport system to deal with emergency situation is kept under readiness.

First aid facilitates are to be kept ready to receive cases.

7.7. OCCUPATIONAL HEALTH AND SAFETY IN RIVER BED MINING

The Occupational Health and Safety Management System is a vital part in Mining Sectors. In this, Management Health and Safety are taken into consideration. The purpose of the Occupational Health and Safety Management System is as follows:

- Minimize risk to employees and others

- Improve business performance
- Assist the organization to establish a responsible image for heath and safety.

Occupational health and safety (OHS) are a cross disciplinary area concerned with protecting the safety, health and welfare of people engaged in work or employment. DGMS (Directorate General of Mines Safety) provides assistance to the State enforcing agencies, training and educating them in the field of occupational health and safety in the industries.

A. Approach

The basic approach for the establishment and implementation of the occupational health and safety management system will involve the following steps:

- Identify the hazards involvement in the activities of the organization.
- Evaluate the risks which are involved in the performance of these activities.
- Control these risks to an acceptable level.

All the employees (technical/ non-technical) will be forced to use needed safety gears. All contractor personnel and temporary staff will also be advised to use safety equipment. Even the visitors will be advised to use helmet and nose mask during visit.

B. Frequency of Medical Examination

- For Mines Employee - Once in three Years
- For Technical and non-Technical - Once in 6 Months

C. Personal Protective Devices and Measures

Protection for	Equipment	Protection Against
Head	Safety helmet	Fall of objects/hitting against objects during construction, maintenance, etc.
	Electrical resistance helmet	Electrical shock.
Eye	Panorama goggles with clear plastic vision	Dust and chips.
Ear	Ear plugs or muffs	High noise level.
Nose	Dust, fume mask Oxygen musk & Air musk	Fine dust particles, fumes & gas
Body	Safety belt	Falling of persons from height.
	Hand gloves	Heat radiation.
	Electrical resistance gloves	Electric shock.
	Canvas gloves	Contact with oil, grease, etc.
Leg	Safety Shoes/ Gum Boots	Striking by objects, fall of objects and stepping on sharp or hot objects.

D. Anticipated Occupational & Safety Hazards

- Musculoskeletal disorder
- Noise Induced Hearing Losses
- The Health impact due to diesel particulates from emission of diesel operated vehicles and equipment
- Silicosis due to sand/Bajri mining
- Dehydration
- Skin Disorder
- Dust Exposure

7.7.1 The Occupational Health Surveillance Program:

A team of qualified doctors and nurses will visit periodically for health checkup of all the workers, team and its record will be maintained properly.

7.7.2 Impact on Human Health

This project will have an impact on the human health due to Boulder, Gravel and Sand, increased dust, creation of breeding grounds for disease vectors, population influx which might introduce new diseases in the area, and inadequate sanitation facilities may result in severe health Impact.

7.7.3 Implementation of Occupational Health and Safety Measures

Occupational Health & Safety measures result in improving the conditions under which workers are employed and work. It improves not only their physical efficiency, but also provides protection to their life and limb.

1. Dedicated safety team
2. Inspection and maintenance of equipment and accessories
3. Pre placement and periodic health check up
4. Removal of unsafe conditions and prevention of unsafe acts.
5. Detailed analysis of each and every incident.
6. To provide standard PPEs and ensure its uses for mining safety.
7. Periodic inspection by internal and external safety experts.
8. Medical facilities & first aid boxes will be established in the mine premises.
9. The mine workers will be provided all necessary PPE, especially dust masks for their safe guard from dust, Ear Plugs/Ear Muffs for noise, boots etc. and measures for other hazards.
10. The workers will be given training related to all safety and health aspects.

7.8 CONCLUSION

River Bed Mining does not involve a hazardous process with no risk related to Fire and Explosion. HIRA shows no major Impact and can be mitigated with proper maintenance and use of PPE to avoid likely accidental scenario.

CHAPTER-8
PROJECT BENEFITS

8.0 GENERAL

The demand of Sand has been rising in the state as a result of rising in construction activities and development of the proposed project aims to fulfill the supply of Sand. Hence, the fine quality of mineral will be used further for development. The sediment in the form of river bed material (RBM) deposited is of critical importance in civil and other infrastructural activities. The proposed project lies on the river bed of Damodar. The quality of Sand is fine and appropriate for the mega infrastructural activities. The demand for Sand is ever growing with the growth of the infrastructure sector in our country. The mineral is used mainly in the construction activities like buildings, bridges etc. The requirement for the mineral is always high in the nearby cities and towns. Therefore, there is always a good demand of the mineral in the domestic market. The local region demand is increasing; hence newer areas for Sand reserves are approached.

According to the Sand Mining Framework 2018 of the central government's ministry of mines, in India, there is a shortage of sand in the country, similar to the situation in other developed and developing countries. It estimated that the demand of sand in the country is around 700 million tons (in the financial year 2017) and it is increasing at the rate of 6-7 percent annually even as the quantity of natural generation of sand is static. Hence, the proposed project aims to fill the demand – supply gap through optimum allocation and excavation of natural resources required to meet the demand effectively in the local region.

The execution of the project will bring overall improvement in the locality, neighborhood and the State by socioeconomic activities in the adjoining areas, improvements in physical infrastructure, improvements in Social Infrastructure, Employment for the locals and revenue for the State. The project will be helpful for the economic growth and support to enhance quality of life through employment.

8.1 EMPLOYMENT

8.1. Direct Employment

During the operational phase, about 26 people will be employed directly. Considering that some of the skilled personnel to be employed for the project will be from outside the area and unskilled/ semiskilled personnel will be from within the study area, the project will add to the wellbeing of the area. In addition to the workforce the indirect employment will also be generated for local persons. It will help in bringing prosperity to the area.

8.2 In-direct Employment

The project will also provide some indirect employment to the people of nearby area of mine site. Some people will get engaged in some pet shops like tea shop, vehicle repair

Centre etc. It will also provide some need-based opportunity to the local public. The project will provide following indirect employment to the local people:

- The SAND available will provide agency employment in the value chain analysis, for place utility and retail.
- Transportation and warehousing in the region required to transfer the mineral will eventually be needed and therefore trucks and jobs in logistical activities will come up.
- There will be development of externalities for the mine workers pet shops (tea, repair stations for trucks etc.) as supporting services.

8.2. IMPROVEMENT IN PHYSICAL INFRASTRUCTURE

The start of sand lifting will improve the physical infrastructure of the adjoining areas. Following physical infrastructure facilities will be improved in the adjoining areas by the proposed project:

a. Road Transport: Construction of approach road and maintenance of existing transportation facility will be done for the proposed project. There is separate provision of budget has been mentioned under the EMP head in Chapter 10.

b. Market: By improving the economic status of local habitants through employments will attract market to develop their facilities and services near to the project site it's a part of indirect employment which will be developed due to the proposed project.

c. Infrastructure: proposed project will provide the raw material for the infrastructure development like Construction projects, Mine Stowing etc.

d. Enhancement of Green Cover: 6250 trees have been proposed to be planted at the River edge and along the haul road. Some more trees proposed to be planted in the community land, school buildings, and administrative building.

e. Local Employment: This project will enhance the opportunities of employment for the local villagers due to which their economic status will become better. Around 36 direct employment (as per mining plan) will be generated and several other indirect employments will be developed.

8.3. IMPROVEMENT IN SOCIAL INFRASTRUCTURE

The mining activity in the region will have positive impact on the social economic condition by way of creation of new employment opportunities, infra-structural development, better educational and health facilities. The project proponent is committed to provide services to nearby community in the form of environmental social commitment (ESC). The separate annual budget has been proposed in the **Chapter 10** of this EIA Report.

A detailed program for socio economic development under ESC activities is proposed as follows:

Socio-Economic: WBMDTCL is committed to make the expenses upto a maximum limit of 2 % of the total project cost. It is to be noted that, all the expenditure will be made in due consultation with the district authorities and also as per the recommendation of the district authorities. The main objective of these expenses shall be peripheral development and environment protection. The scope of work shall be followed but not limited to the activities listed below:

1. Infrastructure development.
2. Drinking water facility.
3. Electricity development including Solar projects.
4. Roads and drains.
5. Creation of water body for community use.
6. Solid Waste Management System and Scientific Studies.
7. Skill Development Programs.
8. Embankment Protection.

8.4. ECOLOGICAL BENEFITS

The lease area is in the river bed and devoid of any vegetation. Mining activities will not cause any harm to riparian vegetation cover as the working will not extend beyond the offset left against the banks. Plantation will be carried out as social forestry program in villages, school and the areas allocated by the Panchayat / State authorities.

Plantation has been proposed on both sides of the roads and nearby areas as greenbelt to provide cover against dust dissemination and to improve environment of its surrounding area

Native plants like Neem, Pipal, Khejri, Mango and other local species will be planted. The management will give emphasis on plantation and will also motivate local persons for plantation during rainy season. This will also increase the consciousness in workers and near-by villagers for greenery. Fruit trees can contribute towards their financial gains.

Green belt is erected not from biodiversity conservation point of view but is basically developed as a screen to check the spread of dust pollution. A budget of **Rs. 75.80 Lakh** for five-year plan is given in EMP.

8.5 OTHER TANGIBLE BENEFITS

The Mine will contribute to the Exchequer to State & Central Government.

CHAPTER-9
ENVIRONMENTAL COST BENEFIT ANALYSIS

9.1 ENVIRONMENTAL COST BENEFIT ANALYSIS

As per EIA Notification dated 14th September, 2006, the chapter on "Environmental Cost Benefit Analysis" is applicable only if the same is recommended at the Scoping Stage.

As per the ToR letter issued by SEIAA, West Bengal with respect to proposal no. SIA/WB/MIN/496365/2024 dated 21/09/2024 has the ToR Identification No. of TO24B0107WB5788199N dated 12.03.2025 with the File No.: EN/T-II-I/052/2025, the Environmental Cost Benefit Analysis is not required.

CHAPTER-10
ENVIRONMENTAL MANAGEMENT PLAN

10.1 INTRODUCTION

Any developmental project is associated with certain positive impacts as well as some negative impacts on the environment. The negative or adverse impacts cannot possibly rule out of scientific development. The environment management plan is prepared with a view to facilitate effective environmental management of the project, in general and implementation of the mitigation measures in particular. This plan helps in formulation, implementation and monitoring of the environmental management plan during and after commissioning of the project. It also includes the development of green belt in and around the mining area.

10.2. PURPOSE OF ENVIRONMENTAL MANAGEMENT PLAN

The EMP provides a delivery mechanism to address potential adverse impacts and to introduce standards of good practice to be adopted for all project works. For each stage of the program, the EMP lists all the requirements to ensure effective mitigation of every potential biophysical and socio-economic impact identified in the EIA. The Environmental Management Plan provided information for each operation, which could otherwise give rise to impact. The EMP aims at following:

- Abatement treatment and disposal off all the pollutants viz. dust, gaseous and solid waste so as to meet statutory requirements (Relevant Pollution Control Acts).
- To promote green-belt development.
- To encourage good working conditions for employees.
- To reduce accident hazards.
- Budgeting and allocation of funds for environment management system.
- To adopt cleaner production technology.

10.2 IMPLEMENTATION OF ENVIRONMENT MANAGEMENT PLAN

The mitigation measures suggested in the **Chapter-4** should be implemented so as to reduce the impact on environment due to the operations of the proposed project. In order to facilitate easy implementation, mitigation measures are phased as per the priority implementation.

10.3. ENVIRONMENT MANAGEMENT

The project proponent is very much oblivious of its responsibility in protecting the Environment. Thus, various mitigation measures as given in the report shall be taken-up and effort will be made to nullify the effect of the Project, on the Environment, if any. Any action or effort remains incomplete, if it is not monitored properly at regular intervals and corrective measures taken, wherever necessary. Regular monitoring has

thus, been provided. The Mines Manager to take care of all environment aspects and to maintain environmental quality in the project area. The Mines Manager shall report to the JSMDC of the Mine for all environment related matters. The responsibilities of the Mines Manager wrt to Environment Management Plan will be as follows:

- Assists proponent in the preparation of an effective and user-friendly EMP.
- Institution arrangements to monitor effectively and take suitable corrective steps for implementation of EMP.
- Improve the contribution that an EMP can make to the effectiveness of the environmental management process.
- Ensure a minimum standard and consistent approach to the preparation of EMP's.
- Ensure that the commitments made as part of the project's EIA are implemented throughout the project life.
- Ensure that environment management details are captured and documented at all stages of the project.
- To ensure adoption of state of art technological environmental control measures and implementing them satisfactorily.
- Effectiveness of mitigation measures in mitigation of impacts.
- Description of monitoring program of the surrounding environment.
- Submit half yearly EC Compliance report to Regional Office of Ministry of Environment, Forest & Climate Change and SEIAA, west Bengal

10.4 BUDGETORY PROVISION FOR ENVIRONMENTAL PROTECTION MEASURES

Table 10.1: Environmental Management Cost of Project

Sl. No.	Particulars	Capital Cost in Rs.	Recurring Cost in Rs. per year
1	Water facility for Dust Suppression System and watering plants (@ Rs. 1000/day)	---	2,00,000
2	Plantation – including gabion, fertilizer, pesticides, maintenance, etc. (@ Rs. 1000/plant) (8450 X 1000=84,50,000)	84,50,000	1,00,000
3	Environmental Monitoring (1-day monitoring) Ambient Air (3 points for 24 Hours) – Rs. 9,000/- Surface Water (per sample) – Rs. 2800 Ground Water (per sample) – Rs. 2500 Noise (3 points) – Rs. 2500 Soil (per sample) – Rs. 3500 Total Rs. 20,300 (per season) Atleast twice per year so, Rs. 20,300 x 2 = Rs 40,600/-	---	40,600
4	Replenishment survey cost	---	2,00,000
5	Tarpaulin (To improve efficiency, reduce waste and minimize environmental impact)	70,000	---
TOTAL EMP BUDGET		**85,20,000**	**5,40,600**

CHAPTER 11
SUMMARY AND CONCLUSION

11.1. INTRODUCTION

Proposed project is for riverbed sand mining on allotted mine lease area of 10.24 Ha at the Damodar riverbed. The total allotted Mine lease is for 20 years and the Mining Plan has been prepared for 5 years with proposed maximum annual production capacity of 69071.394 cum/ 183039.19 Ton/annum.

A lease grant order has been issued by the Department of Industries, Commerce and Enterprises, Government of West Bengal, to WBMDTCL vide letter No.- No.-430-ICE-12011(99)/27/2022-MINES dated 05.07.2023 in reference to Memo No. MDTC/SAND/003/Part-8/1656 dated 26.06.2023. WBMDTCL has further allocated Sathi Planners Private Limited the duty to prepare the Mining Plan and Environment Clearance of the said lease area vide Revised Work Order No. MDTC/SAND/003/Part-8/275 dated 06.02.2024 in reference to NIT No. MDTC/SAND/002(IV)/1306 dated 22.05.2023, to pursue sustainable scientific mining with minimum possible environmental impacts.

11.2. THE PROJECT

11.2.1 Location Details

The project is, located on the Damador riverbed River located at Mouza – Kumirkola, Block – Khandaghosh, District – Purba Bardhaman, State - West Bengal over J.L. NO. – 9, PLOT NO. - - 1569(P), 1573(P), 1574(P), 1576(P), 1579(P), 1580(P), 1606(P), 1608(P). Mining lease area is 25.29 Acres (10.24 Ha), Block code - MIN_EBUR_45. The area for proposed project is 7.59 Ha. Plot no and Co-ordinates of the Mining Blocks are as follows:

Table 11.1: Location Details of the Project

Particulars	Details	
J.L. No.	9	
Plot No.	1569(P), 1573(P), 1574(P), 1576(P), 1579(P), 1580(P), 1606(P), 1608(P).	
Co-ordinates of the mine	**Latitude**	**Longitude**
	23°14'48.719''N	87°42'00.325"E
	23°14'55.709''N	87°42'00.363"E
	23°14'55.965''N	87°42'16.446"E
	23°14'48.431''N	87°42'16.498"E

11.2.2 The Project

Table 11.2: Salient feature of the project

Sl. No	Particulars	Details	
A	**Name of the Project**	Kumirkola Sand Mine.	
B	**Nature and Size of the Project**	Kumirkola Sand Mine in the Damodar Riverbed over an area of 10.24 Ha. (25.29 Acres).	
C	**Location Details**		
	J.L. No:	9	
	Plot No:	1569(P), 1573(P), 1574(P), 1576(P), 1579(P), 1580 (P), 1606(P), 1608 (P)	
	Mouza:	Kumirkola	
	Block:	Khandaghosh	
	District:	Purba Bardhaman	
	State:	West Bengal	
	Coordinates	**Latitude**	**Longitude**
		23°14'48.719"N	87°42'00.325"E
		23°14'55.709"N	87°42'00.363"E
		23°14'55.965"N	87°42'16.446"E
		23°14'48.431"N	87°42'16.498"E
	Toposheet No.	F45D12 (73M/12)	
D	**Lease Area Details**		
	Lease Area	10.24 Ha.	
	Period of Lease	20 years	
	Type of Land	Damodar River Bed (Non-Forest)	
	Total Resources/Reserve	580149.24 Cum/1537395.49 Ton	
	Mineable Reserve	279518.11 Cum/740722.99 Ton	
	Topography	The areas around buffer zone are low-lying alluvial plains, similar to pre-dominating rice lands of Bengal. The Project is for river bed sand mining on Damodar River. The gradient is westerly to the west and to the east, it is northerly towards Ajay and southerly towards Damodar below the latitude	
E	**Cost Details**		
	Cost of the Project	Rs. 28,02,00,000/-	
	Cost for EMP	Capital Cost Rs. 85,20,000/- Recurring Cost Rs. 5,40,600/-	

Sl. No	Particulars	Details
	Cost of CER	2% of project cost
F	**Details of Environmental Setting**	
	Ecological Sensitive Areas (National Park, Wild Life Sanctuary, Biosphere Reserve, Reserve/ Protected Forest etc.) within 10 Km radius	None within 10 km radius of the project
	Archaeological Important Place	None within 10 km radius of the project
	Nearest Town	Khandaghosh town is situated at a distance of 3.80 km in the SSW direction from the mining site
	Nearest Railway Station	Ishan Chandi Halt railway station – 10.26 km in the NNE direction
	Nearest State Highway / National Highway	SH-8 – 3.58 km in the S direction
	Nearest Airport	Kazi Nazrul Islam Airport, Durgapur – 62.50 km in the NW direction
G	Seismic Zone	Area falls under Seismic Zone-IV i.e. high earth quake damage risk zone. Flood hazard is very low and low Flood damage risk zone. Other natural hazard is also not expected because of the location of the project.
H	**Requirements**	
	Water Requirement	31.29 KLD
	Power Requirement	Not required. Operation will be carried out during day time. One DG Set of 25 KVA will be installed
	Manpower requirement	26
	Fuel Requirement	HSD – 5616 l/day (1123.2 kl/year)

11.2.3. Project Proponent

West Bengal Mineral Development and Trading Corporation Limited (WBMDTCL) is the project proponent who is seeking prior environmental clearance for the proposed project.

A provisional lease grant order has been issued by the Department of Industries, Commerce and Enterprises, Government of West Bengal, to WBMDTCL vide letter No.-430-ICE-12011(99)/27/2022-MINES dated 05.07.2023 in reference to Memo No. MDTC/SAND/003/Part-8/1656 dated 26.06.2023. WBMDTCL has further allocated Sathi

Planners Private Limited the duty to prepare the Mining Plan and Environment Clearance of the said lease area vide Revised Work Order No. MDTC/SAND/003/Part-8/275 dated 06.02.2024 in reference to NIT No. MDTC/SAND/002(IV)/1306 dated 22.05.2023, to pursue sustainable scientific mining with minimum possible environmental impacts..

11.3. DESCRIPTION OF ENVIRONMENT

The monitoring of environmental parameters has been conducted within the core zone and buffer zone (10 km radial distance) from project site at Kumirkola, Block – Khandaghosh, Dist. – Purba Bardhaman, State–West Bengal over J.L. NO. – 9, PLOT NO. - 1569(P), 1573(P), 1574(P), 1576(P), 1579(P), 1580 (P), 1606(P), 1608 (P), in accordance with the guidelines issued by the Ministry of Environment, Forests and Climate Change and CPCB during the study period (December'24 to February''25). .

11.3.1 Meteorological Data

The metrological station was set-up at the project site and baseline data was collected which are reproduced are discussed further.

Table-11.3: Onsite Meteorological Data (Period: December'24 to February''25)

Month & Year	Temperature (°C)		Relative Humidity (%)		Precipitation Rate (mm)	Wind Speed (km/h)	
	Max	Min	Max	Min	Max	Max	Min
December – 2024	23	14	55	42	2.8	5	9.23
January – 2025	20	6	61	49	2.6	5	8
February – 2025	23	10	62	52	3.4	7	11

The predominant wind direction during this study period is observed mostly from North-west to South-East directions. The average wind speed during this period is 9.41 km/hr.

11.3.2 Ambient Air Quality Data

Ambient Air Quality Monitoring reveals that the minimum and maximum concentrations of PM10 for all the seven (7) Air Quality monitoring stations were found to be 63.4µg/m3 and 69.1 µg/m3 respectively, while for PM2.5 it vary between 34.1 µg/m3 and 32 µg/m3. As far as the gaseous pollutants SO2 and NO2 are concerned, the prescribed limits under NAAQ Standards for residential and rural areas has never surpassed at any station. The minimum and maximum concentrations of NO2 were found to be 19 µg/m3 and 26.2 µg/m3 respectively. The minimum and maximum concentrations of SO2 were found to be 7.1 µg/m3 and 28.7 µg/m3 respectively and the prescribed limit of SO2 and NO2 is 80

µg/m3 which has never surpassed at any monitoring station. Detailed Air Monitoring Lab report is attached as ***Annexure-3*.**

11.3.3 Ambient Noise Quality Data

Ambient noise levels were measured at 7 (seven) locations around the proposed project site. Minimum and maximum noise levels recorded during the day time were from 51.2 Leq dB(A) and 55.6Leq dB(A) respectively and minimum and maximum level of noise during night time were 40.2 Leq dB(A) and 47.7 Leq dB(A) respectively. Lab result is attached as Annexure -3 From the above study and discussions it can be concluded that noise levels in the study area are well within the prescribed limits as prescribed by MoEF&CC under Noise Pollution (Regulation & Control) Rules, 2000. Ambient Air Quality Standards in respect of Noise is available online at http://cpcb.nic.in/ divisionsofheadoffice/pci2/noise_rules_2000.pdf.

11.3.4 Water Quality Data

Analysis results of groundwater reveal the following;

- pH varies from 6.52 to 6.9
- Total Hardness varies from 194.64 to 292 mg/l.
- Total Dissolved Solids varies from 272 to 377 mg/l.

Analysis results of surface water reveal the followings;

- pH is 7.65 to 7.92
- Total Hardness is 112 to 128 mg/l.
- Total Dissolved Solids is 391 to 430 mg/l..

11.3.5 Soil Quality Data

The analysis results show that soil is neutral in nature as pH value ranges from 6.31 – 7.57 with organic carbon percent from 0.36% - 0.82%. The percentage of available Nitrogen varied from 0.50 to 2.86. The NPK (Compound fertilizer containing N, P_2O_5 and K_2O) ratio is 8:1:3. The consumption of fertilizers is as important a factor as their production. There should be appropriate balance in the consumption of different fertilizer nutrients. The appropriate NPK ratio under Indian soil conditions is stated to be 4:2:1 (National Academy of Agricultural Sciences, 2009).

1.3.6 Land use/Land Cover

Land Use of the study area consists of 80.44 % of Agricultural land, Builtup 9.98 %, Sand 6.93 %, Transport 0.07 %, Vegetation 0.86 %, Water 1.72 %.

Land Use of the Mining area is given in Chapter-2 of EIA Report.

11.3.7 Hydrology

The Central Ground Water Board reports the ground water levels in this locality. In Bardhaman district, ground water occurs in semi-confined to confined aquifer conditions in the depth span of 12.00-38.00 m bgl, 31.00-55.00 m bgl and 70.00-88.00 m bgl.

11.3.8 Traffic Study

Traffic study measurements were performed at single location at State Highway-8 to assess impact on local transport infrastructure due to this proposed project.

From the study it has been concluded that the LOS study shows that the existing traffic scenario is "Very Good" and the free flow of vehicles is observed during the study period. Due to the expansion of proposed project the traffic density will increase as all the sand material will be transported through the road under study

11.3.9 Socio-Economic Status

Demographic Profile of the Study Area

Purba Bardhaman district has a population of 4835532 people with the male population percentage being 51.07 % and female percentage being 48.93 %. The population is majority in the rural area with 84.98 % and the urban percentage is 15.02 %. The population has 40.36 % of workers and 59.64 % of non-workers. Total population density per sq km is 1269. Medical facilities include 3 Hospitals, 5 Rural Hospitals, 19 Block Primary Health Centres and 74 Primary Health Centres. Sex Ratio in the district is 945 (Urban-932, Rural-954) and the population Growth rate is 11.9 % (Urban-20.9, Rural-6.7). The literacy rate of Purba Bardhaman is 76.2 % with 82.4 % of the male and 69.6 % of female population are literate (Source: https://www.burdwanzp.org/district-profile, https://www.burdwanzp.org/district-profile, District Environment Plan, Purba Bardhaman, west Bengal).

Socio-economic Status of Study Area

The main worker population in the study area is 3842 (22.32%) out of which 1440 (10.66%) persons are engaged as cultivators, 1104 (8.17%) as agricultural labourers, only 0.93% of total working population are engaged as household industry while the other worker population is 505, i.e. 3.74%. The non-worker population in the study area is very high 8080 persons which is about 59.85% of the total population.

The implementation of the mining project will generate both direct and indirect employment. Pasai to Danre confluence sand mining (in the river bed of Sakari in Purba Bardhaman district) area is an agriculturally based area. The basic facilities like, roads and railway network, medical facilities are not available. While post and telegraph, market, drinking water facilities and educational facilities are available.

11.3.10 Ecology and Biodiversity

An in-depth assessment of both terrestrials and aquatic ecosystem of the sandy area (both mine site core zone and its buffer zone 3-5 kms around the mines were undertaken

by ecology and biodiversity expert).

There is no forest area in the study area, only scattered patches of orchards with fruit-bearing trees and timber yielding plants particularly around settlement areas and roadsides. There are many more herbaceous plants including grasses & sedges. Among these plants a good number have medicinal values. None of these plants belongs to endemic or endangered categories. Most of these plants were widely distributed in village settlements, river banks and degraded landform areas.

The faunal wealth of the area in wild is very sparse as there is extreme human interference in both terrestrial aquatic habits. However, some record of butterflies, amphibians, reptiles, avifauna and were made during field survey. However, most of this faunal wealth is wild distributed in different area, none them are endemic or serious threatened. Aquatic habitats in river bed where shallow water bodies are there, a lot of aquatic marshy plants, plautons, benthos, fishes, water birds etc. are often seen. most of these faunae of aquatic habitats are again said to be commonly found in almost all Riverian habitats. None of these are said to be endemic and threatened severely.

11.4 ANTICIPATION ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

11.4.1 Construction Phase

This is a sand mining project on the riverbed and no construction is involve for the mining operation, hence no impact on the environment due to construction.

11.4.2 Operation Phase

Air Environment

In this mining project the only source of air pollution is excavation, transportation, loading and handling of minerals etc. Dispersion modeling of a river sand mine indicated that PM_{10} reach elevated concentrations at distances (1-2) km from mine excavation. But for majority of the domain, PM_{10} concentrations were substantially below regulatory or guideline values. $PM_{2.5}$ concentrations from sand mining operations are not significant. The fugitive emissions from sand mining from river pit are the main sources of particulate matter. Transportation of sand on haul roads is not a significant source of particulate emissions. Taken together, community exposures to airborne particulate matter from sand mining activities appear to be unlikely to cause chronic adverse health conditions.

Mitigation Measures

Both preventive and suppressive) are suggested to mitigate the negative impact of the proposed mining activity to control the pollutants by;

- Plantation of trees along haul roads, especially near settlements, to help to reduce the impact of dust on the nearby villages;

- Planning transportation routes of mined material so as to reach the nearest paved roads by shortest route (minimize transportation over unpaved road);
- Regular water sprinkling on unpaved roads to avoid dust generation during transportation etc.
- Overloading will be kept under check by giving prior awareness.

Noise Pollution

During the operation phase, the source of noise will be excavation, loading operation, transportation by truck and operation of DG set. The noise levels will thus be within the limits specified by MoEF&CC by The Noise Pollution (Regulation & Control) Rules, 2000 for respective areas.

It can be stated that the impact on the noise levels due to mining operations will be minimal and shall be restricted to transportation route only. There is no drilling and blasting envisaged in the mining of minerals so there is no impact of blasting and vibration due to the project. Hence, the impact of noise due to the proposed mining operations on the environment will be minimal.

The workmen associated with the operation of different equipment like excavator and loading experience noise level in the range of 75-85 dB (A) for more than 4-4.5 hours per shift. So, suitable mitigation measures will be taken to prevent adverse impacts of high noise level on the workmen, this includes provision of ear muffs, plantation along haul road and avenue plantation.

Mitigation Measures

- Proper maintenance of all equipment / machines will be carried out which help in reducing noise during operations.
- In addition, truck drivers will be instructed to make minimum use of horns in the village area and sensitive zones.
- Plantation will be taken up along the approach roads. The plantation minimizes propagation of noise and also arrests dust.
- Ear muffs will be provided to workers working in the noisy areas.

Water Environment

Damage to the water body (in this case, downstream side of Damodar river) depends on its assimilative capacity of the water body. The proposed leasehold area of Kumirkola Sand Mine lies entirely on the riverbed of Damodar river. In general, sand mining period has been considered as 7 months (i.e. dry season), when the river remains dry enough to allow mining operation at its bed and the mining operation is planned for during these 7 months only. Sand as a mineral in river bed is of unique nature. The amount of sand mined out in the dry season every year is replenished during flooded condition of the river particularly in the monsoon period. As the reserve of sand in the proposed sand

mine continues to be available in future, no long-term impact on sand availability & river bed profile is foreseen.

There will be no pumping of water from mine site. No effluent will be generated by sand mining process. No impact on water quality is envisaged due to mining.

Mitigation Measures

- Mining shall be discontinued if water is encountered.
- No diversion is proposed. There will not be any adverse impact on flow pattern, surface hydrology and ground water regime.
- There will be no change in surface water quality as mining shall be carried out in dry pit only.
- Ground water quality will not be affected due to mining activities as it is restricted to 1.60 m depth and the water level is 25-70 m bgl below the surface of river bed.

Land/Soil Environment

The proposed extraction of streambed materials, mining below the existing streambed, and alteration of channel-bed form and shape leads to several impacts such as erosion of channel bed and banks, increase in channel slope, and change in channel morphology.

These impacts may cause:

a) Undercutting and collapse of river banks.

b) Loss of adjacent land and/or structures.

c) Upstream erosion as a result of an increase in channel slope and changes in flow velocity.

d) Downstream erosion due to increased carrying capacity of the stream

e) Downstream changes in patterns of deposition.

f) Changes in channel bed and habitat type.

The mining and allied activities involved in river bed mining are creation of temporary haul roads / transportation track and formation of mined pits inside river, etc. The scientific mining i.e. systematic removal of sand will not cause bed degradation and will not affect aquatic environment. This project does not involve any waste generation. Thus, no waste dump sites are needed for the project.

Mitigation Measures

- The mining is planned in non-monsoon seasons only so that the excavated area will be replenished naturally during the subsequent rainy season for the river bed mining block.
- Mine lease area has been proposed leaving a safety distance from the bank inwards which will protect the banks so channel geometry will not be disturbed.

- Pre and post monsoon survey for sedimentation in the riverbed will be done regularly

Flora and Fauna

Ambient air and fresh water quality will remain practically unaffected due to project activities. Thus, indirect adverse impact on flora and fauna is ruled out.

Development of plantation in the project area will provide habitat, food and breeding areas to birds, small animals and insects. Thus, a significant positive impact is envisaged.

Mitigation Measures

- Mining will be done only in dry pit as provided by DMG so there will be no impact on benthic fauna in riverbed hence no mitigation will be required.
- Stomatal index may be minimized due to dust deposit on leaf. Water will be sprinkled on unpaved roads to avoid dust generation.
- Transportation of sand in the trucks/dumper may disturb the wildlife like movement of jungle cat, jackal, and other reptiles, hence transportation of sand will only be in day time. Access roads will not encroach into the riparian zones.

Socio-economic Environment

Project activity will provide employment to nearly 36 workers during the operation phase, thus a significant benefit to the socio-economic environment is likely to be created. No adverse impact is expected on sanitation and community health.

Mining and transportation of sand will generate indirect employment in the area of small shops, dhabas, repair garage etc.

Hydrology

The mining in the riverbed area may cause the ground water contamination due to intersection of the water table. Change in topography can change the river flow and flood may occur.

Mitigation Measures

- The water table will not be intersected during mining in the riverbed as ultimate depth is limited up to 1.60 meters and the water table is 25-70 m bgl. Proper analysis/Monitoring will be done to check the ground and surface water.
- Mining shall be discontinued when water is encountered during mining.

11.5 ANALYSIS OF ALTERNATIVES

The sand mining projects are site specific. Hence, alternate site has not been examined for this project.

11.6 ENVIRONMENTAL MONITORING PROGRAM

Regular monitoring of the various environmental parameters is necessary to evaluate the effectiveness of the management program so that the necessary corrective measures can be taken in case there are some drawbacks in the proposed program. Since environmental quality parameters at work zone and surrounding area are important for maintaining sound operating practices of the project in conformity with environmental regulations, the post project monitoring work forms part of Environmental Monitoring Program has been kept as Rs. 8 lakhs which include monitoring of efficiency of pollution control equipment, once in six months.

11.6.1. Ambient Air Quality

Air quality monitoring at one location in mining area is proposed to be done at a frequency of twice in a week for one week, once in six months. The parameters monitored include the parameters as per National Ambient air quality Standard, 2009.

11.6.2 Noise Monitoring

Noise monitoring shall be carried out near to the high noise sources like near to Excavator during operation and during loading, once in six months. Monitoring of Ambient noise levels will be monitored once in a quarter during day time (6 AM to 10 PM) and night time (10 PM to 6 AM) as per The Noise Pollution (Regulation and Control) Rules, 2000, Schedule III at Industrial, Commercial, Residential and Silence Zone.

11.6.2. Water Monitoring

River water sample on upstream & downstream side of sand mine and two ground water samples from nearby area are proposed to be collected and monitored for all the parameters as per MoEF&CC guidelines / Indian Standard.

The ground water and river water samples will be compared with IS: 10500:2012 drinking water standards.

11.6.3 Plantation

Plant growth, its maintenance and survival rate will be monitored. Monitoring will be continuous up to 5 years so that desired growth of plants and trees is attained.

11.6.4 Occupational Health & Safety Monitoring

Occupational health and safety monitoring programs shall verify the effectiveness of prevention and control strategies. Health & Safety aspects shall be re-assessed on annual basis. The occupational health and safety monitoring program shall include to carryout inspection and testing of all safety features and hazard control measures and Surveillance of workers health.

11.6.5. Socio-Economic Development – Monitoring of CER Program

It is suggested that mining authority should have structured interactions with the community to disseminate the measures taken by them and also to elicit suggestions for overall improvement for the development of the area.

11.6.7 Accidents and Diseases Monitoring

Mining Authority shall establish procedures and systems for reporting and recording of Occupational accidents and diseases and dangerous occurrences and incidents.

11.6.8 Budget for Environmental Monitoring Program

In order to maintain the environmental quality within the stipulated standards and monitoring of various environmental components necessary for compliance of as per conditions, a **budget of Rs. 2 lakhs per year** has been kept.

11.7. ADDITIONAL STUDIES

11.7.1. Public Consultation

Public hearing is a very significant part of the process of public participation envisaged under guidelines issued by MoEF&CC, Government of India. It facilitates involvement of all the stake holders of the project which is essential for ensuring smooth running of project and benefitting all section of society in the process of economic development of the region.

The public Hearing Issues and its Action plan along with budget will be incorporated in the Final EIA report after Public Hearing is completed.

11.7.2 CER Budget

The CER budget of 2 % of project cost is proposed.

11.7.3. Replenishment Study

District Survey Report (DSR) of Purba Bardhaman District was prepared by Department of Industry, Commerce & Enterprises, Government of India. This version-2 of DSR was approved by SEIAA on .1.02.2024 as published in the Minutes of 30th Meeting of SEIAA under Miscellaneous Section, Point No.4, as per Notification No.S.O.141 (E) New Delhi Dated 15th of January 2016, S.O.3611 (E) New Delhi Dated 25th of July 2018 and Enforcement & Monitoring Guidelines for Sand Mining (EMGSM) January 2020, Issued by Ministry of Environment, Forest and Climate Change (MoEF&CC).

The sand deposition in the River channels are replenished every year during the monsoon season. The stream generally originates in the highlands where due to immense force of the river. Owing to very high gradient and heavy precipitation the process of erosion is accelerated. These eroded materials are then transported along the river channel and during their transportation the eroded material is further reduced in size by various processes such as abrasion, traction. These materials are then deposited in the river channels where the gradient is low and thus, forms the part of the river channels.

The proposed project is on Damodar river. As this is a seasonal river which is being replenished especially during the monsoon.

11.7.4 Hazard Identification & Risk Assessment

Some of the hazards likely to occur due to the proposed project are given below:

a. Inundation / Flooding
b. Quick Sand Condition
c. Drowning
d. Accident due to vehicular movement, high concentration of traffic during duty hours
e. Accident during sand loading, transporting and dumping
f. Air Borne Respirable Dust Due to Transportation of Material

(a) Possible Risks Due to Inundation/Flooding and its mitigation measures

Inundation of flooding is expected and beneficial for these mines as during this time only the mineral reserve gets replenished.

1. During monsoon months and heavy rains, the mining operations are ceased.
2. There should be mechanism/warning system of heavy rains and discharges from the upstream dams.
3. Mining is done by excavating the mineral in 1½ meter slice at a time with a maximum of 2 such slices.

(b) Possible Risks Due to Quick Sand Condition and its mitigation measures

1. The only way to avoid quick sand condition is by avoiding mineral lifting below water table.
2. The critical hydraulic gradient should be maintained at less than 1 to prevent high artesian pressure in a coarse sand area.
3. At least 0.5 m sand bed should be left in-situ while harvesting sand from riverbed.

(c) Possible Risks Due to Drowning and its mitigation measures

1. The mining should be done under strict supervision and only during the dry season.
2. Deep water areas must be identified.
3. No go zones should be clearly marked and made aware to the mine workers.

(d) Accident due to vehicular movement and its mitigation measures

1. Speed Limit/ Bumper will be imposed to regulate vehicle speed.
2. Transportation will be through covered trucks and wagons.
3. Minimize use of roads at any particular time by planning vehicles movements.
4. Road crossings to be used will be well marked.
5. Implementation of strict traffic management system.

(e) Accident during sand loading, transporting and dumping and its mitigation measures

1. The truck should be brought to a lower level so that the loading operation suits to the ergonomic condition of the workers.
2. The loading should be done from one side of the truck only.
3. The workers should be provided with gloves and safety shoes during loading.
4. Opening of the side covers (pattas) should be done carefully and with warning to prevent injury to the loaders.
5. Operations during daylight only.
6. No foreign material should be allowed to remain/spill in river bed and catchment area or no pits/pockets are allowed to be filled with such material.
7. Stockpiling of harvested material on the river bank should be avoided.
8. All transportation within the main working should be carried out directly under the supervision and control of the management.
9. Road signs will be provided at each and every turning point up to the main road (wherever required).
10. The Vehicles must be maintained in good repairs and checked thoroughly at least once a week by the competent person authorized for the purpose by the Management.
11. To avoid danger while reversing the trackless vehicles especially at the embankment and tipping points, all areas for reversing of lorries should as far as possible be made man free, and.
12. A statutory provision of the fences, constant education, training etc. will go a long way in reducing the incidents of such accidents.
13. Generally, overloading should not be permitted.
14. The truck should be covered and maintained to prevent any spillage.
15. The maximum permissible speed limit should be ensured.
16. The truck drivers should have proper driving license.

(f) Air Borne Respirable Dust and its mitigation measures

1. Using paved roads for transportation to minimize fugitive emissions.
2. Transporting material in close truck and storing it under covered facilities.
3. Transport vehicles and machinery will be properly maintained and periodically checked for pollution level to reduce noise and gaseous emission in the surrounding environment.
4. PUC certified vehicle for transportation.

11.8 PROJECT BENEFITS

The project will have following benefits:

1. Opportunity to create direct and indirect employment
2. The start of sand lifting will improve the physical infrastructure of the adjoining areas.
3. The mining activity in the region will have positive impact on the social economic condition by providing services to nearby community in the form of environmental social commitment (ESC). The company will undertake following programs:
   - Provision of Sanitations (Toilets) and drinking water facility at nearby village
   - Assist formation of Village Working Group (VWG), Mahila mandal etc.
   - Organizing sports & cultural activities
4. The Mine will contribute to the Exchequer to State & Central Government.
5. Plantation has been proposed on both sides of the roads as greenbelt to provide cover against dust dissemination.

11.9 ENVIRONMENTAL MANAGEMENT PLAN

The EMP provides a delivery mechanism to address potential adverse impacts and to introduce standards of good practice to be adopted for all project works. For each stage of the program, the EMP lists all the requirements to ensure effective mitigation of every potential biophysical and socio-economic impact identified in the EIA. The Environmental Management Plan provided information for each operation, which could otherwise give rise to impact. The estimated capital cost and recurring cost of Environment Management is Rs. 63.20 lakhs & Rs.5.406 lakhs/year respectively.

11.10 CONCLUSION

The project proponent is very much oblivious of its responsibility in protecting the Environment. Thus, various mitigation measures as given in the report shall be taken-up and effort will be made to nullify the effect of the Project, on the Environment, if any. Any action or effort remains incomplete, if it is not monitored properly at regular intervals and corrective measures taken, wherever necessary. Regular monitoring has thus, been provided. The Mines Manager to take care of all environment aspects and to maintain environmental quality in the project area. The Mines Manager shall report to the Owner of the Mine for all environment related matters.

CHAPTER 12
DISCLOSURE OF CONSULTANT

12.1. INTRODUCTION

Sathi Planners Pvt. Ltd. (SPPL) engaged in the business of preparation of Mine Plans, Pre-feasibility Reports for Mining Projects, Environmental Reports, Forest Diversion proposals, Mine Survey including topographical survey, Geological Reserve Estimation, Cost modelling of Mining Operations and providing services for obtaining Environmental and other statutory clearances in the field of Mining and Highway Projects.

SPPL Headquarter is in 6th Floor, Damro Furniture, Opposite to Shakti Petrol Pump Garikhana Chowk, Harmu Road, Ranchi, Jharkhand – 834001 and branch offices are at Durgapur, West Bengal; Dumka, Jharkhand; Patna, Bihar; Agartala, Tripura and Tura, Meghalaya. The organization brings together a unique team of professionals both senior retired officers from reputed government & private organizations with vast knowledge and experience in their respective field and young technical & support staff from various disciplines who are committed to offer valued added expert services. Our team structure is designed to empowering our employees so that decisions can be made quicker & efficiently.

12.2. SERVICES OF SATHI PLANNERS PVT. LTD.

M/s Sathi Planners Pvt. Ltd. is engaged in the business of followings:

- Environmental Impact Assessment (EIA), Environmental Management Plan (EMP), Environmental Compliance, Mining Plan, Social Impact Assessment,
- Preparation of Mine Plans for Mining Projects (Coal and Non-Coal both)
- Preparation of District Survey Reports
- Preparation of Detailed Project Report /Pre-feasibility Reports for Mining and Highway Projects
- Forest Diversion Proposals
- Providing Services for Surveys
- Geological Estimation
- Environmental Quality Monitoring

12.3. RECOGNITION

Sathi Planners Pvt. Ltd. (SPPL) is accredited by NABET for preparation of Category# 'A' EIA Reports for Mining Projects (Open Cast and Underground both) and Category# 'B' Highway Projects.

SPPL is **ISO-9001:2015** Certified Company and empaneled in following States for providing services for EIA Study, DSR, DGPS/Total Station Survey, Mine Plan Preparation-

I. Jharkhand
II. West Bengal
III. Meghalaya
IV. Bihar
V. Tripura

12.4. KEY MANAGEMENT PERSONNEL OF SATHI PLANNERS PVT. LTD.

Name	Qualification	Experience (Years)
Mr. Abhijit Bardhan	Chief Executive Officer	**12 Yrs.**
Mr. Biswajit Bardhan	Admin Head, Chartered Engineer (I), B.E., M. Tech. (Software Engg.), Life Member of Mining Engineers' Association of India	**6 Yrs.**
Prof. (Dr.) S. C. Santra	Advisor, Professor in Environment Science (Rtd.), University of Kalyani	**46 Yrs.**
Mr. R. C. Shrivastava	Advisor, Prof. & Head, Dept. of Env. Sanitation & Sanitary Engg. (Retd.), All India Institute of Hygiene & Public Health, Kolkata	**47 Yrs.**
Mr. A.K. Sinha	General Manager EIA Coordinator- Mining, First Class Coal Mine Manager's Competency Certificate from DGMS & QP	**42 Yrs.**
Prof. (Dr.) D. K. Khan	General Manager, Professor in Environment Science (Rtd.), University of Kalyani	**45 yrs.**
Mr. K M Khare	EIA Coordinator, Dy. General Manager (Rtd.), Steel Authority of India Limited	**41 Yrs.**
Mr. Santhosh Mandal	EIA Coordinator, Sr. Environment Consultant, MS (Geology & Disater Mitigation)	**15 yrs.**
Mr. Kisun Oraon	First Class Coal Mine Manager's Competency Certificate from DGMS, Dhanbad	**35 Yrs.**
Mr. Malay Kumar Mukhopadhyay	M. Sc. (Applied Geology), Retired from Bharat Refractories Limited as Senior Geologist, Life Member/Fellow of Geological Survey of India, Indian Ceramic Society, National Science Congress.	**40 Yrs.**
Ms. Mamta Kumari Sinha	M. Sc. (Geology), Ranchi University.	**3 yrs.**

12.5. CERTIFICATES OF SATHI PLANNERS PVT. LTD.

Quality Council of India

National Accreditation Board for Education & Training

CERTIFICATE OF ACCREDITATION

Sathi Planners Pvt Ltd., Ranchi
Lake Avenue, Kanke Road, Ranchi - 834008 (Jharkhand)

Accredited as Category - A organization under the QCI-NABET Scheme for Accreditation of EIA Consultant Organizations: Version 3 for preparing EIA/EMP reports in the following sectors:

Sl. No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1.	Mining of minerals including opencast/underground mining	1	1 (a) (i)	A
2.	Highways	34	7 (f)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in IAAC minutes dated September 14, 2018 posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in NABET's letter of accreditation bearing no. QCI/NABET/ENV/ACO/18/0794 dated November 13, 2018. The accreditation needs to be renewed before the expiry date Centre for Sustainable Development following due process of assessment.

Sr. Director, NABET	*Certificate No.*	*Valid till*
Dated: November 13, 2018	*NABET/EIA/1821/IA0040*	*August 27, 2021*

For the updated List of Accredited EIA Consultant Organizations with approved Sectors please refer to QCI-NABET website.

QRO — QUALITY RESEARCH ORGANIZATION

Certificate of Registration

This is to certify that

SATHI PLANNERS PVT. LTD.

HEAD OFFICE: LAKE AVENUE (BEHIND CAMBRIAN PUBLIC SCHOOL), KANKE ROAD, RANCHI - 834008, JHARKHAND, INDIA

BRANCH OFFICE: 295, S.N.ROY ROAD, NEW ALIPORE, KOLKATA - 700038, W.B., INDIA

Has been assessed and certified by QRO cert

as meeting the requirements of

ISO 9001:2015

Quality Management Systems

For the following activities:

PROVIDING SERVICES FOR SURVEY, GEOLOGICAL ESTIMATION, ENVIRONMENTAL MONITORING, DEVELOPMENT OF MINE PLAN, SCHEMES OF MINING, ENVIRONMENTAL REPORT INCLUDING EIA REPORT, BANKABLE REPORT FOR OBTAINING STATUTORY CLEARANCE AND OTHER PURPOSES

Date of certification: 15th April 2017 2nd Surveillance Audit Due: 14th April 2019

1st Surveillance Audit Due: 14th April 2018 Certificate Expiry: 14th April 2020

Certificate No.:- 1041517021A

Head of Certification

Validity of this certificate is subject to annual surveillance audits to be done successfully on or before 365 days from date of the audit (In case if surveillance audit is not allowed to be conducted; this certificate shall be suspended / withdrawn).

The Validity of this certificate can be verified at www.qrocert.com

This certificate of registration remains the property of QRO Certification LLP, and shall be returned immediately upon request.

ANSI