

EXECUTIVE SUMMARY

1.0 INTRODUCTION

Gondkhari Coal Block is proposed underground coal mining project in Gondkhari area (Kamptee coal field) in Nagpur District of Maharashtra State. The lessee M/s Adani Power Maharashtra Limited (APML) applying to grant Environmental Clearance for Gondkhari Underground Coal mine (ML Area 862.00 Ha. and Production Capacity is 2.00 MTPA (rated capacity) / 3.0 MTPA (Peak Capacity)).

The Mine lease area is 862.00 Ha with production capacity of Coal is 2.00 MTPA (rated capacity) / 3.0 MTPA (Peak Capacity). The method of mining is Mechanised Underground mining method. Life of mine is 26 years. The draft EIA-EMP report is prepared as per EIA Notification 2006 as amended and the ToR granted vide letter No. IA-J-11015/46/2022-IA. II(M) dated on 13.02.2023 by EAC (Coal Mining Projects), MoEFCC, New Delhi.

The mine plan has been approved from Ministry of Coal, Government of India, New Delhi vide letter dtd. 09/01/2023.

1.1 IDENTIFICATION OF PROJECT

Gondkhari Coal Mine is proposed underground coal mining project in Gondkhari area (Kamptee Coal field) in Nagpur District and which is allotted to M/s Adani Power Maharashtra Limited (APML) vide vesting order no. NA-104/7/2021-NA, dtd. November 18, 2021. Application for mining lease has been submitted and Approval is under progress. Currently the mine plan has been approved from Ministry of Coal vide letter dtd. 9th January 2023.

1.1.1 Location of the Project

The lease over an area of 862.00 Ha is located in Village Gondkhari, Tehsil – Kalmeshwar, District - Nagpur, Maharashtra. The nearest habitation is village Gondkhari a distance of 1.50 km in SW direction from the periphery of ML area. The lease area falls under Survey of India Toposheet no. 55 K/16 on 1: 50,000 scale and lies between latitudes N 21°07' 57" - N 21°10' 56" and longitudes E 78° 54' 45" - E 78°56' 26". Environmental settings of the site are presented in **Table 1**. Index Map of the project provided in **Figure 1**. Study area map given in **Figure 2**. There is no critically polluted identified cluster by CPCB/MoEFCC in the vicinity of the project.

TABLE 1: DETAILS OF ENVIRONMENTAL SETTING

Sr.	Particulars	Details
1.	Project Location	Mine Lease area – 862 ha. Village – Gondkhari, Tehsil – Kalmeshwar, Dist. – Nagpur, Maharashtra.
2.	New/Expansion	New
3.	Co-ordinates	Latitudes N 21 ⁰ 07'57" to N 21 ⁰ 10'56" Longitudes E 78 ⁰ 54'45" to E 78 ⁰ 56'26"
4.	Survey of India Topo Sheets No.	55K/16
5.	Climatic Conditions	Mean annual rainfall is 1100.3 mm Temperature: Pre monsoon 4.5 C (Min.) 47.8 C (Max.) : Winter 3.9 C (Min.) 39.7 C (Max) : Post monsoon 5.5 C (Min.) 39.7 C (Max.) Source : IMD, Nagpur (Sonogaon)
6.	Nearest IMD Station	IMD Nagpur (Sonogaon) – 12.5 KM (SE)

Sr.	Particulars	Details
7.	Site elevation above Mean Sea Level	324 – 380 m.
8.	Nearest National/State Highway	NH 53 (AH 46) – Adjacent (S) SH 250 – 6.5 km (N) SH 255 – 6.8 km (S) SH 260 – 7.0 km (ESE) SH 248 – 4.7 km (NE) NH 547E- 3.5km (W)
9.	Tourist Places (within 15 km)	Vitthal Rukmini Temple, Dhapewada – 13.1 km (N) Highland's Water Park – Adjacent (E) Surabardi Shiva Temple – 1.3 km (E) Satpuda Botanical Garden – 10.4 km (E) Telankhedi Garden – 11.4 km (E) Adasa Ganesh Temple – 16.7 km (NNE)
10.	Archaeologically important places	Junapani Stone Circles, Fetri – 7.8 km (ENE)
11.	Nearest Railway Station	Kalmeshwar – 5.4 km (NNE)
12.	Tourist Places	Dr. Babasaheb Ambedkar Museum & Memorial – 4.6 (ENE) Kasturchand Park – 14.6 km (E) Central Museum, Nagpur – 14.2 km (E) Mahurzari Megalithic Stone Circles – 10.1 km (E) Maharaj Bagh Zoo – 13.8 km (E) Junapani Stone Circles, Fetri – 7.8 km (ENE) Gorewada Jungle Safari - Wildlife and safari park – 9.37 km (ENE)
13.	Nearest Airport	Dr. Babasaheb Ambedkar International Airport 10 km (ESE)
14.	Nearest State/National Boundaries	Madhya Pradesh – 33.6 km (NNE)
15.	Nearest village/habitation	Surabardi – 0.6 km (E) Gondkhari – 0.3 km (W)
16.	Nearest major city with 2,00,000 population	Nagpur – 12 km (E)
17.	Nearest City	Wadi – 5.8 km (E)
18.	Distance from sea coast	Bay of Bengal – 576 km (SE)
19.	Nearest Reserved/ Protected forests	Bazargaon RF – 5.1 (W) Madhogarh RF – 9.7 km (W) Open Mixed Jungle – Gorewada 6.3 (ENE)
20.	Nearest River/water bodies	Saptdhara Nadi – 8.1 km (N) ; Vena River – 1.2 km (S) Ghordyo Nala – 8.9 km (WNW) ; Unna Nala – 8.9 km (W) Devadkasha Nala – 4.5 km (WSW); Jhilpi Nala – 5.5 km (S) Vena Canal – 1.7 km (SSW); Anas Nala – 2.5 km (SSW) Nag Nala – 5.5 km (SE) ; Kharkari Nala – 3.1 km (SSE)
21.	Nearest Lake	Ambajhari Lake – 8.5 km (ESE); Bhivkund Dam – 9.9 km (SW) Futala Lake – 10.0 km (E) Alesur Local Lake – within proposed mining area Mordham Dam & Reservoir – 11.5 km (NW)

Sr.	Particulars	Details
		Suraburdi Lake – Adjacent (E) Vena Dam – 4.2 km (W) Jhilpi Talav – 9.1 km (SW)
22.	Seismic zone	Seismic Zone-II as per IS-1893 (Part-1)-2002. Hence, seismically the site is a stable zone.
23.	Nearest Industries	Chanvim Engineering (I) Pvt. Ltd. – 2.7 km (W) Paragon Polymer Products Pvt. Ltd. – 1.8 km (W) Sunny Infra Engineers Pvt. Ltd. – 3.8 km (E) JDS Transformer Industries Pvt. Ltd. – 6.0 km (ESE) Bharat Electricals – 0.3 km (SSW) Shri Salasar Industries – 5.5 km (E) MIDC Kalmeshwar – 5.2 km (N) Minex Metallurgical Co Ltd, Nimji – 4.41 km (W) Nice Papers Limited – 7.6 km (NNW) Hingna MIDC – 6.3 km (SE)
24.	Protected areas as per Wildlife Protection Act,1972 (Tiger reserve, Elephant reserve, Biospheres, National parks, Wildlife sanctuaries, community reserves and conservation reserves)	None

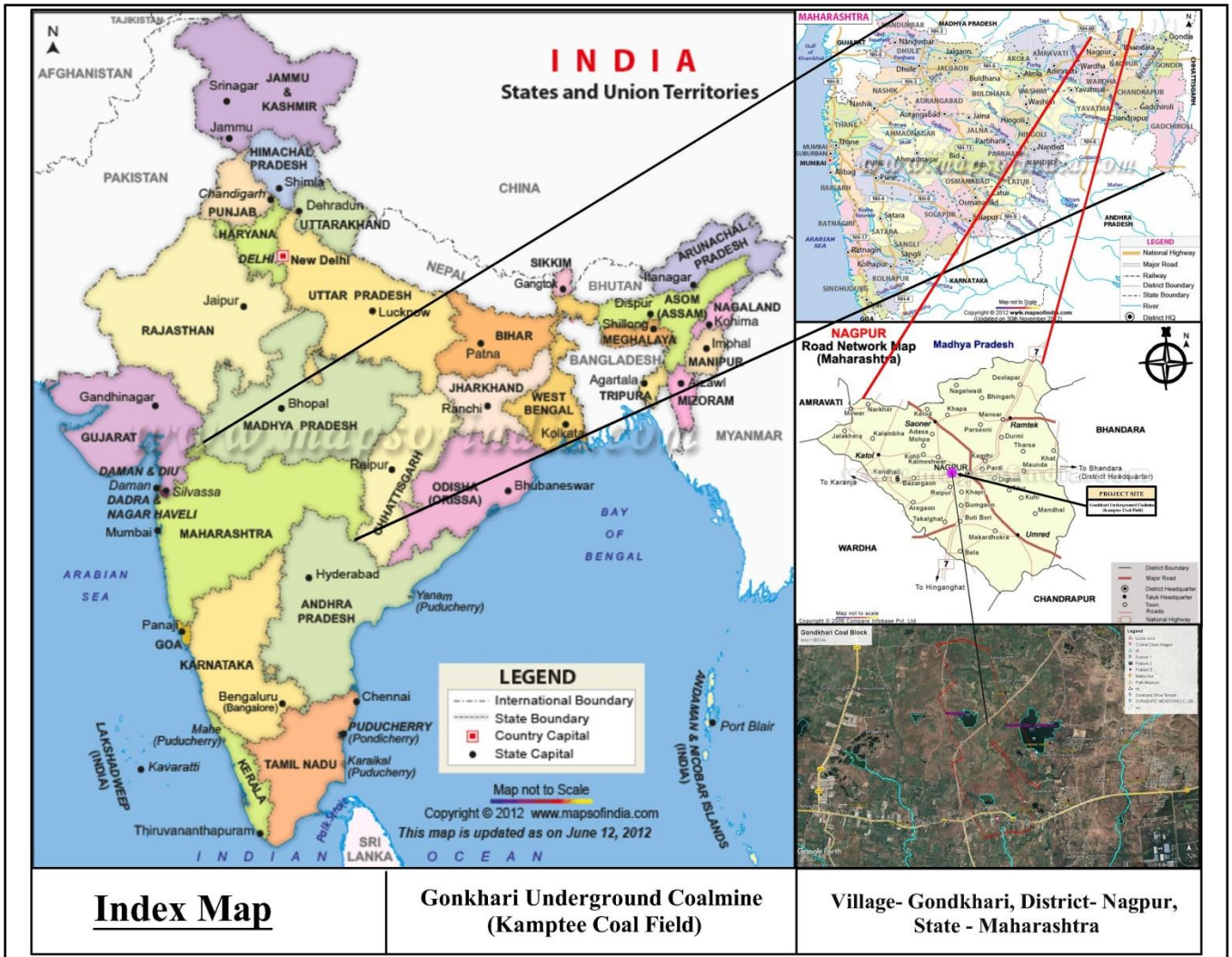


FIGURE 1: INDEX MAP OF THE PROJECT SITE

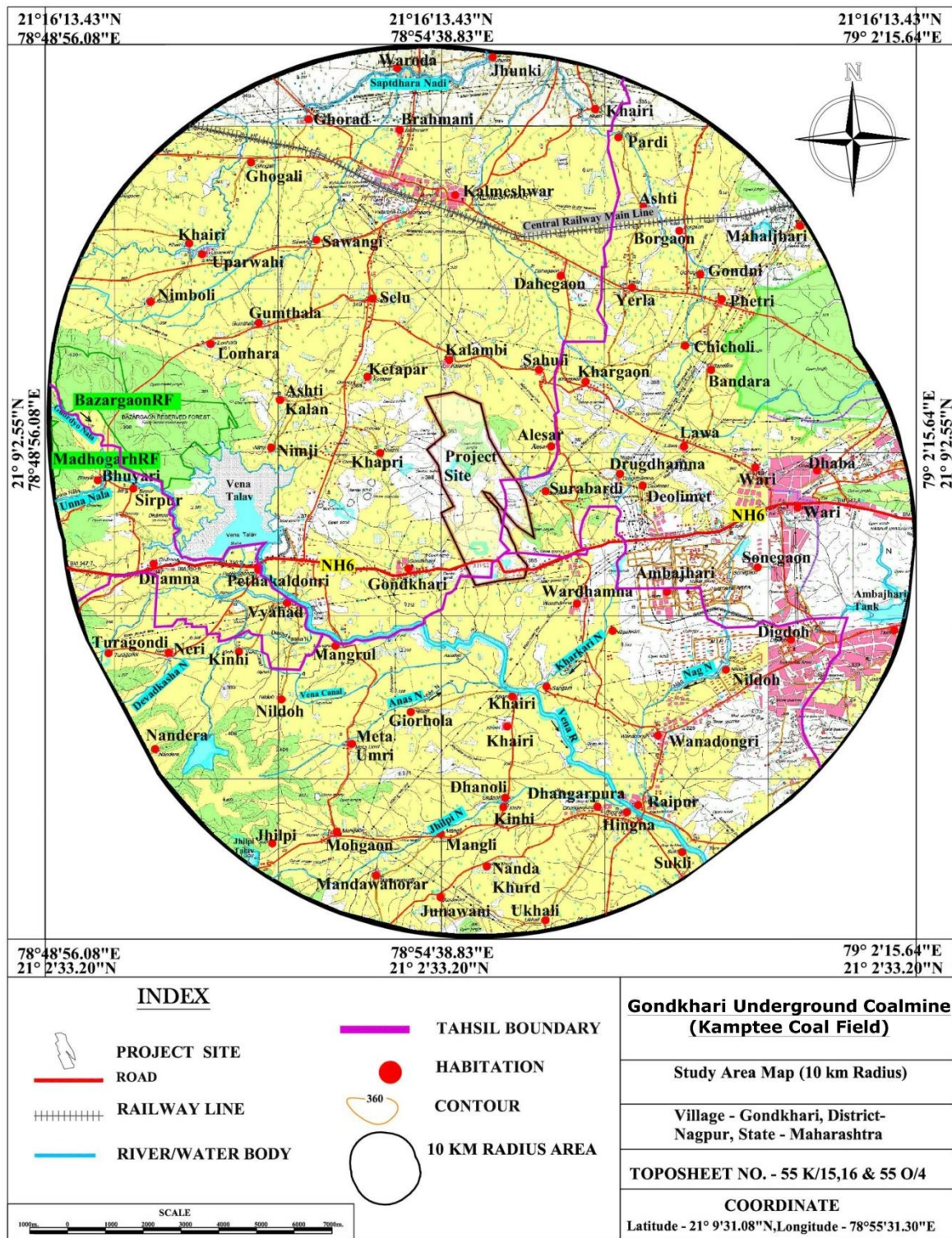


FIGURE 2: STUDY AREA MAP (10 KM RADIAL DISTANCE)

2.0 PROJECT DESCRIPTION

2.1 METHOD OF MINING

Gondkhari Coal Mine (UG mine) is a proposed coal mining project in Gondkhari area of Kamptee coal field in Nagpur District which belongs to M/s Adani Power Maharashtra Limited (APML). The method of mining is Mechanised Underground mining method i.e., Longwall mining method is proposed for excavation.

The proposed method to work the deposit is done by mechanized Longwall (retreating) method will be adopted as method of Mining. With high level of production planned from the mine, the following mechanization has been planned. Six Road headers and Two sets of Longwalls are adopted for development and depillaring. Coal evacuation via lump breeder on to a system of belt conveyers. Side Discharge Loaders with compressed air drills for high pull solid blasting and compressed air bolter for roof support. Coal evacuation by chain conveyers on to feeder breaker and belt conveyors for stray area.

2.1.1 Anticipated life of the Mine

Total Mineable Reserves is 52.496 million tonnes and Life of the mine @ 2.0 MTPA (For Coal) = 26 Years.

2.2 CONCEPTUAL MINE PLAN

The conceptual plan is prepared for the lease period which is till 2049. A provision has been made towards dismantling of underground equipment and disposal of mining machinery, dismantling of workshop, rehabilitation of dismantled facilities etc. during progressive mine closure activity.

The end land use of the mine is controlled by the following factors:

- Waste generation is envisaged during mining.
- Backfilling towards restoring entire worked out area to pre-mining land use is feasible.
- As it is not feasible to bring the mine pits to the ground level it is not found useful to convert it into rainwater storage.
- Worked out area can be reclaimed by means of rainwater storage body.
- The surrounding areas have very low vegetation discouraging fauna habitats; hence a flora and fauna habitat will be useful.

In view of the above, it would be appropriate to backfill the mine upto ground level and proposed to be stabilized for ecological and aesthetic restoration.

TABLE 2: SALIENT FEATURES OF THE MINE

Sl	Description	Details
1.	Production/estimated reserves	Targeted Capacity – 2.0 MTPA Peak rated Capacity – 3.0 MTPA Estimated Gross Geological reserves: 109.447 Mt. Net Geological Reserve: 98.5030 Million tonnes Mineable Reserve: 52.946 Million tonnes
2.	Total reserve for Mining	Extractable Reserves: 42.946 Million tonnes
3.	Mining methods & technology	Underground mining: Longwall retreating method with caving by deploying DERDS and Road Headers for tunnelling.
4.	Mine lease area	862.00 Ha.
5.	Life of mine	30 years (including construction phase)
6.	Lease period	Application for mining lease has been submitted and Approval is under progress.
7.	Total water requirement & source	Total water requirement is 496 KLD (436 KLD from mine seepage and 60 KLD from borewell) Source: Industrial water requirement will be met from existing reservoirs, ground water and mine water sources. Potable water requirement will be met from ground water sources with appropriate treatment.
8.	Power requirement & source	The power requirement is 19.742 MW and source as below- <ul style="list-style-type: none"> The mine will receive power from nearest 33/11 kV Surabardi Substation under Maharashtra State Electricity Distribution Company Limited in Nagpur district which is located at about 3 km from the proposed Mine sub-station. To cater the demand of power for peak production of 2 MTPA, it is proposed to install 2 x 5 MVA 33/3.3 kV outdoor transformers at proposed substation.
9.	Manpower requirement	863 (Peak)
10.	Raw material required	The allocated block is a commercial coal block for sale of coal.
11.	Grade of Coal	G8 (Average)
12.	Minimum Depth of Workings	169 m
13.	Maximum Depth of Workings	394 m
14.	Gradient	90 to 220
15.	Seam details	Workable seam out of 10 coal seams are:

Sl	Description	Details
.		II seam, III Seam, V Seam & VIII seam.
16	Estimated cost of the project	1303 Cr.
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2.3 WASTE GENERATION & DISPOSAL

The solid waste generated from the proposed project during incline drivages and shaft sinking in the sub-soil and hard rocks for mine entries and also from drivages of cross-cuts in hard rock is estimated to be about **127000 Cum** of solid waste. The solid waste produced during these drivages will be separately stacked on the surface and used in embankment for preparation bank head and filling of low lying areas, development of the land for infrastructure and development of greenery. The municipal wastes are expected to be generated is 50 kg/day during construction activities and 170 kg/day during operation phase. Solid wastes generated will be properly collected, segregated and reused / disposed-off appropriately as per Solid Waste Management Rules, 2016 as amended.

2.4 WATER REQUIREMENT & SOURCE

Total water requirement is 496 KLD (436 KLD from mine seepage and 60 KLD from borewell). Industrial water requirement will be met from existing reservoirs, ground water and mine water sources. Potable water requirement will be met from ground water sources with appropriate treatment.

2.5 MANPOWER REQUIREMENT

The total manpower requirement is 863 nos. and no further additional manpower is required.

2.6 SITE INFRASTRUCTURE

The infrastructure will be in the form of mines office, rest shelter, Transformer and machinery. The haul road, the road from mining to connecting NH already exists. The first aid center, water drinking point will be available inside mine lease area.

3.0 EXISTING ENVIRONMENTAL SCENARIO

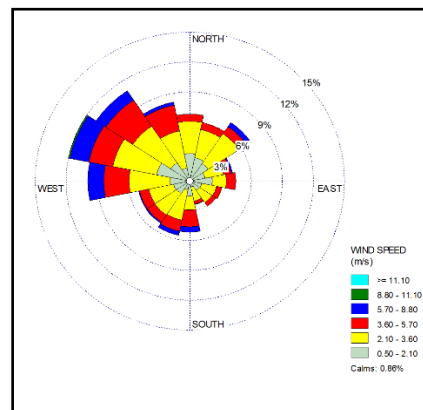
3.1 BASELINE ENVIRONMENTAL STUDIES

Baseline environmental studies were conducted at project site along with 10 km radial distance from the project site. An environmental baseline monitoring was carried out as a part of EIA studies for the proposed project, during **pre-monsoon season (1st March 2022 – 31st May 2022)** along with additional AAQ monitoring conducted at 2 different locations during pre-monsoon season from **1st March 2023 – 31st March 2023**.

3.1.1 Meteorology & Ambient Air Quality

Summary of Meteorological data generated at site

Predominant Wind Direction	Pre-monsoon season - 2022
First Predominant Wind Direction	WNW (11.96%)
Second Predominant Wind Direction	NW (10.91%)
Third Predominant Wind Direction	W (9.87 %)
Calm conditions (%)	0.86
Avg. Wind Speed (m/s)	2.95



Month	Temperature (°C)		Relative Humidity (%)		Rainfall Monthly Total (mm)
	Min	Max	Min	Max	
March – 2022	17.4	43.5	5.5	63.5	0
April – 2022	24.1	45.9	5.3	49.9	0
May – 2022	27.6	46.2	8.7	57.0	0
Range	17.4 – 46.2		5.3 – 63.5		Total = 0.0

Ambient Air Quality Status

The ambient air quality monitoring with respect to parameters of significance was carried out during pre-monsoon season (1st March 2022 – 31st May 2022) whereas additional AAQ monitoring at 2 different locations was conducted during 1st March 2023 to 31st March 2023 in line with approved ToR by EAC. Altogether the ambient air quality monitoring carried out at 12 locations. The levels of Respirable Particulate Matter (PM₁₀), Fine Particulates (PM_{2.5}), Sulphur Dioxide (SO₂), Oxides of Nitrogen (NO_x), Carbon monoxide (CO), Ozone (O₃) and Ammonia (NH₃) were monitored for establishing the baseline status. The minimum and maximum values of monitoring results are summarized and given in **Table 3**.

TABLE 3: SUMMARY OF AMBIENT AIR QUALITY MONITORING RESULTS

Sr. No.	Location		PM ₁₀	PM _{2.5}	SO ₂	NO ₂	CO	Ozone	NH ₃
			µg/m ³	µg/m ³	µg/m ³	µg/m ³	mg/m ³	µg/m ³	µg/m ³
1	Project site-Location at North end	Min	55.4	21.6	7.3	18.1	0.323	6.2	5.3
		Max	74.3	35.6	10.4	28.9	0.369	9.9	7.9
		Avg	67.1	28.4	9.1	23.8	0.345	8.1	6.7
		98 th	73.8	35.0	10.3	28.2	0.368	9.9	7.9
2	Project site-Location at South end	Min	52.8	18.7	5.8	14.9	0.224	5.1	4.2
		Max	67.4	32.4	8.1	20.3	0.286	7.4	6.1
		Avg	59.8	25.1	6.9	17.6	0.263	6.3	5.2
		98 th	66.9	31.7	8.1	20.1	0.285	7.2	6.0
3	Kalambi	Min	41.5	15.8	4.8	11.4	0.215	4.8	4.3
		Max	56.6	22.1	6.9	15.1	0.258	7.0	6.2
		Avg	49.6	18.6	5.9	13.2	0.235	5.9	5.1
		98 th	55.8	21.5	6.9	14.8	0.255	7.0	6.0
4	Waddhamna	Min	59.9	26.2	8.9	21.4	0.328	6.4	5.9

Sr. No.	Location		PM ₁₀	PM _{2.5}	SO ₂	NO ₂	CO	Ozone	NH ₃
			µg/m ³	µg/m ³	µg/m ³	µg/m ³	mg/m ³	µg/m ³	µg/m ³
		Max	77.2	34.0	13.8	26.6	0.421	9.2	8.3
		Avg	68.2	30.1	11.5	24.6	0.377	7.9	6.8
		98 th	75.4	33.8	13.6	26.5	0.415	9.1	8.2
		Min	51.6	22.4	6.6	16.1	0.328	5.9	5.1
5	Carmel Academy CBSE	Max	70.2	31.3	9.7	25.8	0.388	8.6	7.9
		Avg	61.5	26.4	8.2	21.2	0.356	7.2	6.4
		98 th	69.2	30.6	9.7	25.2	0.383	8.6	7.9
		Min	49.5	19.4	6.0	14.0	0.278	5.4	4.8
6	Ketapar	Max	63.9	27.5	9.2	19.9	0.376	7.9	6.9
		Avg	56.5	23.6	7.6	16.4	0.319	6.7	5.9
		98 th	63.4	27.2	9.0	19.5	0.372	7.8	6.8
		Min	59.5	25.7	7.0	14.8	0.314	5.2	5.5
7	Alesar	Max	71.6	33.0	10.4	23.5	0.423	9.8	9.1
		Avg	65.3	29.1	8.7	18.8	0.373	7.8	7.3
		98 th	71.5	32.5	10.3	22.5	0.419	9.8	8.8
		Min	66.4	29.0	8.8	21.0	0.380	7.0	5.4
8	Gondkhari	Max	88.4	41.0	15.9	31.1	0.419	9.6	9.2
		Avg	74.5	34.9	13.2	27.5	0.402	8.5	7.6
		98 th	86.5	40.6	15.9	31.1	0.417	9.6	8.9
		Min	57.6	22.7	9.3	15.6	0.351	6.1	4.5
9	Surabardi	Max	76.7	32.1	13.8	23.1	0.387	8.4	7.6
		Avg	64.7	27.3	11.5	20.4	0.371	7.4	6.3
		98 th	75.0	31.8	13.6	23.1	0.385	8.4	7.4
		Min	44.5	17.4	5.8	12.7	0.270	5.1	4.4
10	Khapri	Max	60.6	24.3	8.5	20.3	0.319	7.4	6.8
		Avg	53.1	20.5	7.2	16.7	0.293	6.2	5.5
		98 th	59.7	23.7	8.5	19.8	0.315	7.4	6.8
		Min	47.2	23.5	6.7	8.8	0.280	5.3	5.5
11	Sahuli	Max	59.8	28.7	8.3	12.1	0.328	7.7	7.0
		Avg	54.7	26.2	7.5	10.4	0.305	6.8	6.3
		98 th	59.7	28.5	8.2	12.0	0.327	7.7	7.0
		Min	50.9	22.6	7.1	13.9	0.373	6.2	5.7
12	Drugdhamna	Max	62.0	32.1	10.0	17.6	0.435	8.7	8.2
		Avg	57.3	28.1	8.3	15.6	0.412	7.5	6.9
		98 th	61.9	32.0	9.8	17.5	0.435	8.7	8.1
		CPCB Standards		100 (24hr)	60 (24hr)	80 (24hr)	80 (24hr)	2 (8hrs)	100 (8hr)

From the above results, it is observed that the ambient air quality with respect to PM₁₀, PM_{2.5}, SO₂, NO_x, CO, Ozone and NH₃ at all the monitoring locations was within the permissible limits specified by CPCB.

3.2 AMBIENT NOISE LEVELS

Ambient noise level monitoring was carried out at the 8 monitoring locations; these eight (8) locations were identified based on the activities in the village area, traffic and sensitive areas like hospitals and schools. The monitoring results are summarized in **Table 4**.

TABLE 4: SUMMARY OF AMBIENT NOISE LEVEL MONITORING RESULTS

Sr. No.	Monitoring Locations	Equivalent Noise Level	
		Leq _{Day}	Leq _{Night}
Residential Area			
•	Ketapar	53.9	41.3
•	Khapri	54.7	42.6
•	Alesur	51.2	39.7
CPCB Standards dB(A)		55.0	45.0
Commercial Area			
•	Gondkhairi	62.5	47.2
•	Surabardi	59.8	43.7
CPCB Standards dB(A)		65.0	55.0
Silence Zone			
•	Kalambi – Pratap High School	46.7	37.4
•	Somalwad School Waddhamna	48.1	39.2
CPCB Standards dB(A)		50.0	40.0
Industrial Area			
•	Project site- Nr. Alesur Lake Farm House	51.5	38.3
CPCB Standards dB(A)		75.0	70.0

Source: Field monitoring and analysis by Anacon Laboratories Pvt. Ltd., Nagpur

The overall ambient noise quality with respect to various zones was found to be within prescribed limits by CPCB.

3.3 SURFACE AND GROUND WATER RESOURCES & QUALITY

Site Specific Geology

Project area consists of basalt; Cherty Limestone and soil cover which is having thickness of around 1.0-1.5m. Outcrops are very rare in project site. The Gondkhary block covered by a thick layer of Deccan trap followed by a blanked of Kamthis. Structurally Gondkhari block is moderately complicated. The major faults have a trend of NW-SE i.e. sub parallel to the strike of beds.

Site Specific Hydrogeology

Entire study area is comprises of basaltic rock formations of cretaceous age belongs to Deccan trap formation. The primary porosity and permeability of these formations is very poor. The ground water in these formations occurs in fractured zone and joints. The weathered part and fractured zones constitute the aquifers in the area.

Depth to water level scenario in the study area:

Pre-monsoon Water levels- 4.5 to 9.5 m bgl

Post-monsoon water levels: 1.5 to 5.2 m bgl

Water Quality

The existing status of groundwater and surface water quality was assessed by identifying 16 water samples, 8 ground water and 8 surface water sampling point from different villages & water bodies, respectively.

A. Groundwater Quality

The physico-chemical characteristics of groundwater are analysed and compared with the IS-10500 standards. The analysis results indicate that the pH ranged 7.03 – 7.61. The TDS was ranging from 348 – 786 mg/l. Total hardness was found to be in the range of 210.63 – 478.05 mg/l. The fluoride concentration was found to be in the range of 0.14 – 0.29 mg/l. The nitrate and sulphate were found in the range of 9.62 – 18.59 mg/l and 9.62 – 24.01 mg/l respectively. The chloride concentration was found in the range of 39.82 to 209.81 mg/l. The Total suspended solid concentration was found below detection limit (DL -10mg/l) at all sampling location. Heavy metals like As, Pb, Ni was found below detection limit i.e. BDL (DL-0.01), BDL (DL-0.001), BDL (DL-0.1) respectively and Iron was found in the range of 0.13 to 0.24 mg/l.

Sr. No.	Locations	WQI	Quality	Remark
1	Project site	60.77	Good	Water quality assessed based upon above physico-chemical parameters and samples were found to be physico-chemically good.
2	Kalambi	72.21	Good	
3	Ketapar	79.96	Good	
4	Khapri	67.48	Good	
5	Alesur	52.33	Good	
6	Gondkhari	86.04	Good	
7	Surabardi	50.69	Good	
8	Waddhamna	70.09	Good	

B. Surface Water Quality

The physico-chemical characteristics of the surface water samples collected and analysed are analysed and are compared with the IS-10500 standards. The analysis results indicate that the pH ranged between 7.12 – 8.37 which is well within the specified standard of 6.5 to 8.5. The pH of water indicates whether the water is acid or alkaline. The TDS was observed to be 381 – 1100 mg/l which is within the permissible limit of 2000 mg/l. The total hardness recorded was in the range of 211.95 – 712.19 mg/l as CaCO₃ which is also within the permissible limit of 600 mg/l. The levels of chloride and sulphate were found to be in the range of 58.6 – 240.8 mg/l and 9.28 – 57.61 mg/l respectively.

Dissolved oxygen (DO) refers to the amount of oxygen (O₂) dissolved in water. Because fish and other aquatic organisms cannot survive without oxygen, DO is one of the most important water quality parameters. The reported value of range of 5.1 – 6.3 mg/l. Phosphorus (as PO₄) is an important nutrient for plants and algae. Because phosphorus is in short supply in most fresh waters, even a modest increase in phosphorus can cause excessive growth of plants and algae that deplete dissolved oxygen (DO) as they decompose. PO₄ concentration was found to be in the range of 0.36 – 0.62 mg/l. COD ranges from 26 – 88 mg/l and BOD ranges from 3.6 – 17.3 mg/l.

Heavy metals like As, Pb, Ni was found below detection limit i.e. BDL (DL-0.01), BDL (DL-0.001), BDL (DL-0.1) respectively and Iron was found in the range of 0.21 to 0.61 mg/l.

C. Bacteriological Contamination

Coliform group of organisms are indicators of faecal contamination in water. All surface water samples were found to be bacteriologically contaminated. Presence of total coliforms in surface water indicates that a contamination pathway exists between any source of bacteria (septic system, animal waste, etc.) and the surface water stream. A defective well can often be the cause

when coliform bacteria are found in well water. For surface water, treatment followed by chlorination or disinfection treatment is needed before use for domestic purpose. Groundwater samples were not found to be bacteriologically contaminated.

3.4 LAND USE LAND COVER CLASSIFICATION

The land-use & land cover map of the 10 km radial distance from the periphery of project site is prepared and the details are present below:

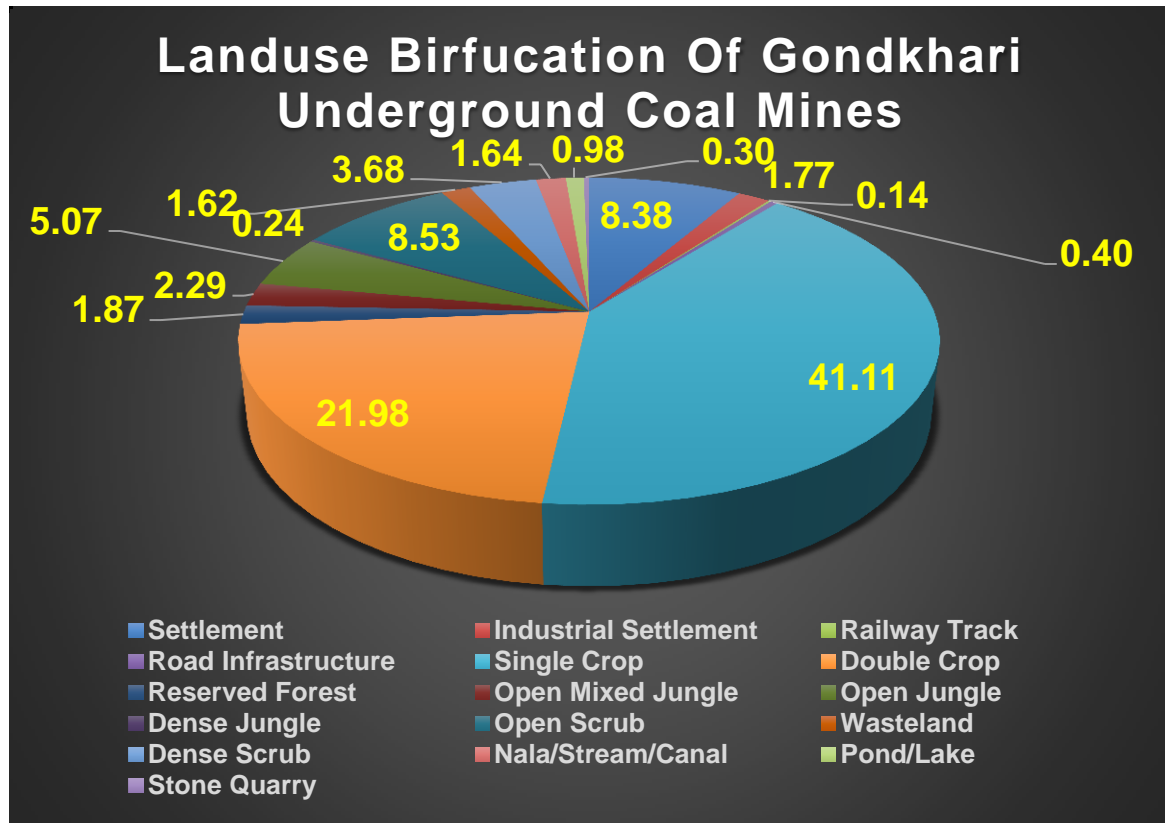


FIGURE 4: PIE CHART DISTRIBUTION OF THE LU/LC CLASSIFICATION WITHIN 10 KM RADIUS

The Land Cover classes and their coverage are summarized in **Table 5**.

TABLE 5: LU/LC CLASSES AND THEIR COVERAGE WITHIN 10 KM RADIUS

Sr .No.	Level-I	Level-II	Area (Sq. Km)	Percentage (%)
1	Built-up land	Settlement	38.03	8.38
		Industrial Settlement	8.02	1.77
		Railway track	0.63	0.14

		Road Infrastructure	1.80	0.40
2	Agricultural Land/ Crop Land	Single Crop	186.52	41.11
		Double Crop	99.72	21.98
3	Forest	Reserved Forest	8.47	1.87
		Open Mixed Jungle	10.41	2.29
		Open Jungle	22.99	5.07
		Dense Jungle	1.09	0.24
4	Scrubs/ Wastelands	Open Scrub	38.72	8.53
		Waste Land	7.37	1.62
		Dense Scrub	16.72	3.68
5	Waterbodies	River/Nala/Stream/Canal	7.43	1.64
		Pond/Lake/reservoir	4.45	0.98
6	Mines Area	Stony Waste	1.37	0.30
Total			315.28	100

3.5 SOIL QUALITY

For studying soil profile of the region, sampling locations were selected to assess the existing soil conditions in and around the project site representing various landuse conditions. The physical, chemical and heavy metal concentrations were determined. The samples were collected by ramming a core-cutter into the soil from 15 cm up to a depth of 60 cm.

Physical Characteristics of Soil

From the analysis results of the soil samples, it was observed, the bulk density of the soil in the study area ranged between 1.498 - 1.643 g/cc which indicates favourable physical condition for plant growth. The water holding capacity is between 14.93 - 21.21%. Infiltration rate, in the soil is in the range of 18.37 – 22.15 mm/hr.

Chemical Characteristics of Soil

pH is an important parameter indicative of alkaline or acidic nature of soil. It greatly affects the microbial population as well as solubility of metal ions and regulates nutrient availability. pH is found to be acidic (5.34 – 6.57) in reaction. Electrical conductivity, a measure of soluble salts in the soil is in the range of 210 – 792 μ S/cm.

The important water soluble cations in the soil are calcium and magnesium whose concentration levels ranged from 229.5 – 825 mg/Kg and 234.72 – 417.12 mg/Kg respectively. Chloride is in the range of 107.2 – 161.5 mg/Kg.

The available concentration of major nutrients fertility status of soil with respect to NPK value is found to be in the range of 116.80 – 297.0 kg/ha (quality good to better), 13.01 – 40.15 kg/ha (quality less to medium) and 120.32 – 358.47 kg/ha (quality less to better) respectively. Organic carbon was found in the range of 0.22% – 0.67% (quality less to an average sufficient).

3.6 BIOLOGICAL ENVIRONMENT

Floral Biodiversity of the Study Area

As per the bio-geographical classification, the project area comes under Bio-geographic province (6D) Deccan Peninsula-Central Plateau region. Whereas, as per Champion & Seth, 1968 vegetation types of the area grouped as Tropical Dry Deciduous Forest.

Marginal vegetation observed on ML site like *Butea monosperma* (Palash), *Tectona grandis* (Teak), *Acacia sp.*, *Maytenus emarginata* (Bharati), *Lantana camera* (Ghaneri) and *Hyptis suaveolens* (Rantulsi), *Calotropis procera* (Rui), etc. Some upper story trees are found on the banks of nala crossing over within the ML area and the central northern part of the ML area.

Total 133 floral species were observed in the study area. The details about the floral composition are as follows.

- a. **Trees:** Total 66 species were found in the study area.
- b. **Shrubs:** Total 25 species were enumerated from the study area.
- c. **Herbs:** In the study area 16 species were observed.
- d. **Grasses:** Total 12 species were enlisted from the study area
- e. **Climbers:** 12 species of climbers were recorded in the study area.
- f. **Parasite:** 02 species enlisted in the study area.

RET (Rare, Endangered and Threatened species) STATUS

Among the enumerated flora in the study area, none of them were assigned any threat category, by RED data book of Indian Plants. (Nayar and Sastry, 1990) and Red list of threatened Vascular plants (IUCN, 2010; BSI, 2003).

Endemic Plants of the Study Area

De Candolle (1855) first used the concept of “Endemic”, which is defined as an area of a taxonomic unit, especially species which has a restricted distribution or habitat, isolated from its surrounding region through geographical, ecological or temporal barriers. Among recorded plant species none were assigned the status of endemic plant of this region.

Fauna of the Study Area

The 10 km radius study area was found to be a home to several species of mammals, reptiles, aves and other lower invertebrates. As described earlier, the part of study area covered forest. The big animals like Wild boar, Sabhar, Nilgai, Barking deer, Spotted deer as well as small sized fauna like Jackal, Monkey, Fox, etc. were found abundantly in the Bazargaon and Madhogarh Reserve Forest area. Birds were observed throughout the study area mostly near the forest area water bodies and agriculture fields. Amphibians were also observed in the study area. Fresh water fishes were found in the Vena river and water reservoir.

- **As per IUCN RED (2013) list**

Among the reported animals, all are categorized under Least Concern (LC) category as per IUCN.

- **The Wild Life (Protection) Act, 1972**

Some of the sighted fauna were given protection by the Indian Wild Life (Protection) Act, 1972 by including them in different schedules.

Among the herpetofauna, Indian Cobra (*Naja naja*), Russell’s Viper (*Daboia russelii*) and Common Rat Snake (*Ptyas mucosus*) were provided protection as per Schedule-II of Wild life protection act, (1972) and Common Indian Krait (*Bungarus caeruleus*) and Indian Toad (*Duttaphrynus parietalis*) were provided as per Schedule – IV of Wildlife protection act, (1972).

Among mammals; Common Mongoose (*Herpestes edwardsi*), Fox (*Canis aureus*), Jungle cat (*Felis chaus*), Hanuman/Common Langur (*Presbytis entellus*), are protected in schedule –II, Wild Boars (*Sus scrofa*) is provided protection by incorporating them in schedule–III whereas Hare and squirrels are included in schedule IV and Rats & Bats are included in schedule V of Wild Life Protection act 1972.

Among the Avifauna in the study area, all the birds are included in schedule IV as per wild life protection act, (1972).

3.7 SOCIO-ECONOMIC ENVIRONMENT

Details of Demographic Details

**TABLE 6
POPULATION DETAILS IN STUDY AREA**

Zones	Total household	Total Population	Total Male	Total Female	Total 0-6 child	Total SC	Total ST	Population Literate	Population Illiterate
0-2 km	2689	11180	5820	5360	1347	2103	810	8557	2623
2-5km	5834	24639	12826	11813	2801	7532	1940	19067	5572
5-10km	16964	74191	38489	35702	8171	11670	9045	57752	16439
10km	25487	110010	57135	52875	12319	21305	11795	85376	24634
In %			51.94	48.06	11.20	19.37	10.72	77.61	22.39

Source: Primary census abstract 2011, State Maharashtra.

Details of sex ratio in the study area

As per census record 2011 sex ratio is the ratio of female to male in the population (normalize to 1000). The sex ratio in the study area showed unevenly distributed trends. Overall sex ratio is 925 female to thousand male. Child 0-6 sex ratio was 935 female to 1000 male. In SC category 946 female and ST category 943 female to 1000 male.

Details of employment pattern

Employment and main worker employment pattern in the study area is given in **Table 7**

**TABLE 7
EMPLOYMENT & MAIN EMPLOYMENT PATTERN IN ALONG THE MAIN PIPELINE**

Zones	Breakup of Total Employment		Breakup of total Workers		Breakup of total Main Worker			
	Total Workers	Total Non Workers	Total Marginal Workers	Total main Workers	Cultivators	Agricultural workers	Household industry workers	Main other workers
0-2km	4749	6431	416	4333	710	1843	60	1720
2-5km	9948	14691	1190	8758	675	1858	166	6059
5-10km	31232	42959	3464	27768	4455	9871	697	12745

10km	45929	64081	5070	40859	5840	13572	923	20524
In%	41.75	58.25	4.61	37.14	5.31	12.34	0.84	18.66

Source: Primary census abstract 2011, State Maharashtra.

Infrastructures facilities

INFRASTRUCTURE FACILITIES

Infrastructure facilities	Availability (In percentage) As per year 2011, Census Nagpur
Educational Facilities	95
Drinking water	97
Road	97
Power	95
Communication	94
Transportation	90
Govt. PHC & SC	20
Bank & Society	65
Drainage	73
Recreation	13

Salient Observations Of The Survey / Study Area

Education:

Government Pre Primary, Govt Primary, Private Primary, Govt Middle, Private Middle and Govt Secondary Schools are available in this Village. Nearest Govt Engineering College and Govt Medical College are in Hingna. Nearest Govt Disabled School, Govt Arts and Science Degree College, Govt MBA College, Govt Polytechnic College and Govt ITA College are in Nagpur.

Health:

Primary Health care centre , 1 Primary Health Sub-Centre , 1 Maternity And Child Welfare centre , 1 TB Clinic , 1 Modern Hospital , 1 Veterinary Hospital , 1 Family Welfare centre , 2 Medical Shops are available in this village.

Agriculture:

Pipe Factory is Product Manufactured in this village. Total irrigated area in this village is 639 hectares from Boreholes/Tube wells 236.2 hectares is the Source of irrigation.

Drinking-Water and Sanitation:

Tap Water Supply all round the year. Covered Well, Uncovered Well and Hand Pump are other Drinking Water sources. Open Drainage System Available in this Village. There is system to collect garbage on street. Drain water is discharged directly into water bodies.

Communication:

Post Office is available in this Village. Landline and Mobile Coverage is also available. Internet Centre available in this village. Private Courier Facility available in this village.

Transportation:

Public Bus service available in villages. Private bus service is also available in these villages. There is no Railway Station in less than 10 km. Autos Available in this Village. National Highway passes through this village. No Nearest State Highway in less than 10 km. District Road passes through this village. Pucca road, Kuccha Road, Macadam Road and Foot Path are other Roads and Transportation within the village.

Commerce:

Commercial Bank available in villages. Cooperative Bank available in this village. Agricultural Credit Society, Mandis/Regular Market, Weekly Haat/santha and Agricultural Marketing Society are available in this village.

Other Amenities:

Villagers get Power supply with 20 hour in summer and 22 hour power supply in winter, Anganwadi centre, ASHA, Birth & Death registration office, Sports facilities, Cinema Theater in village or near by, Public library, Daily News Paper and Polling station are the other amenities in the village.

3.8 QUALITY OF LIFE

The quality of Life is best described in relation to the public amenities avail to resident population. Gondkhari is a Village in Kalmeshwar Taluka in Nagpur District of Maharashtra State, India. block is approachable by an all-weather Zilla Parishad tar road starting from NH-6 and is located about 20 Km West from Nagpur city. It lays just North of NH-6. Kalmeshwar township is at a distance of about 8 Km towards North of the block while Nagpur city is about 20 Km on the East. The Nearest Railway station is Kalmeswar which is at a distance of 10 Kms. The nearest Airport is Nagpur which is at a distance of about 20 km from the block. Governement Pre Primary, Govt Primary, Private Primary, Govt Middle, Private Middle and Govt Secondary Schools are available in this Village. Nearest Govt Engineering College and Govt Medical College are in Hingna. Nearest Govt Disabled School, Govt Arts and Science Degree College, Govt MBA College, Govt Polytechnic College and Govt ITA College are in Nagpur. 1 Primary Health care centre , 1 Primary Health Sub-Centre , 1 Maternity And Child Welfare centre , 1 TB Clinic , 1 Modern Hospital , 1 Veterinary Hospital , 1 Family Welfare centre , 2 Medical Shops are available in this village. Pipe Factory is Product Manufacturer in this village. Total irrigated area in this village is 639 hectares from Boreholes/Tube wells 236.2 hectares is the Source of irrigation. Public Bus service available in villages. Pucca road, Kuccha Road, Macadam Road and Foot Path are other Roads and Transportation within the village. Tap Water Supply allround the year. Covered Well, Uncovered Well and Hand Pump are other Drinking Water sources. Open Drainage System Available in this Village. There is system to collect garbage on street. Post Office is available in this Village. Landline and Mobile Coverage is also available. Internet Centre available in this village. Private Courier Facility available in this village. Commercial Bank available in villages. Cooperative Bank available in this village. Agricultural Credit Society, Mandis/Regular Market, Weekly Haat/santha and Agricultural Marketing Society are available in this village. Villagers get Power supply with 20 hour in summer and 22 hour power supply in winter; Anganwadi centre, ASHA, Birth & Death registration office, Sports facilities, Cinema Theater in village or nearby, Public library, Daily News Paper and Polling station are the other amenities in the village.

4.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.1 IDENTIFIED IMPACTS DURING CONSTRUCTION PHASE AND PROPOSED MITIGATION MEASURES

Table 4.1. Impact during Construction Stage

Construction Stage	Activity	Potential Environmental Impact
a) Pre-construction Activities	i) Soil investigation	Negligible
	ii) Environmental monitoring	Negligible
b) Site work / other facilities	i) Cleaning and grading	Negligible
	ii) Temporary facilities, such as, sheds, approach roads, sanitary facilities	Dust emission and change in traffic intensity
	iii) Earth work comprising of excavation, garlanding and tranches	Soil erosion, run off, increase in traffic, Dust emission
	iv) Foundation work, pilling and drainage system or construction of check dams	Dust, visual and noise pollution
	v) Construction of roads	Dust and noise pollution
	vi) Equipment erection and utility systems	Dust, noise and visual impact

Continuous water spraying arrangements are made to minimise dust level to a large extent. The effect due to construction stage is however, of temporary nature and will have no permanent impact on environment.

4.2 IMPACT AND MITIGATION MEASURES DURING CONSTRUCTION AND OPERATION PHASE

Impact on topography and Land Environment

Subsidence due to total extraction of coal may cause changes in topography by developing micro basins, subsidence fractures, ridges, pot holes etc.

Care will be taken during mining activity to leave enough pillars in underground as barriers below water body to avoid any damage to surface water bodies.

Large-scale excavations are the basic causes for impact on land use.

Mitigation Measures:

- Various barrier buffers are created as per the criteria for lease boundary, river/nalas, public roads, rail and shafts in consultation with mines as per existing norms.
- The waste generated from the mine development shall be transported and dumped separately to waste dump area within the Mine Lease area.
- The greenbelt will be developed on the non-moving waste dumps, which will improve the stability of the dump and aesthetics of the area.

- The Underground workings of the mine are well ventilated by adequate ventilation arrangements. The requirements and standards specified in this regard by Director General of Mines Safety (DGMS) would be adhered.

After exhaustion of the total workable coal reserves, within the lease area, the changed land forms will be subjected to post mining reclamation activities, for best possible land uses.

Impacts on Air Quality

The mining activities are restricted to underground only; there will not be any significant impact on surface air quality. However, the mine exhaust contains minor percentage of methane and CO₂, which are easily diffused in the ambient atmosphere. The mine is provided with online sensors for monitoring the concentrations of CO and methane within the mine. The projected traffic volume due to the movement of dumpers (35 Ton) for transportation of coal from mine to railway sidings has been assessed and Maximum Trips per day to be taken at a time (35 Ton dumpers). These movements of trucks are expected to contribute to oxides of nitrogen, carbon monoxide and particulate matter.

Mitigation Measures

- All the vehicles used for transportation of coal shall be covered with tarpaulin to avoid dust pollution.
- With stringent traffic management system within the coal mine lease area, scope for air pollution due to movement of coal transports will be minimized. The layout of the project has generous area earmarked for greenery development. This will act as effective media for arresting the emissions within the coal mine lease area.
- The vehicular traffic plying in and out of the project site is one of the significant sources of air pollution. If the site is not properly regulated, it can create disruption in free traffic movement leading to air pollution problems. This difficulty can be tackled to a great extent by properly regulating the traffic and by following strict and disciplined vehicular movement and operation at the project site. By imposing vehicular emission standards, this problem can be further curbed to a large extent.
- BS-6 trucks/dampers will be used for the transportation of coal.
- GPS tracking and speed monitors shall be installed in the Vehicles
- The Trucks which are found to have Pollution under Control Certificates only will be allowed. Every other vehicle used in the plant even for passenger transport will be checked for Pollution under Control at the prescribed frequency.
- Adequate and planned road network will be set up at the project site for smooth movement of the goods vehicles.
- It would be ensured that all the vehicles plying in the working zone are properly tuned and maintained to keep emissions within the permissible limits. At loading and unloading points, arrangement for Water sprinkling will be made so that dust generation during transportation of materials will be minimized further.
- All the internal roads within the plant are metaled; hence dust arising from the internal roads will be insignificant. The greenbelt development shall further help in reduction in fugitive emissions.

4.1.1 Impacts on Ambient Noise Levels and effect

As the mining operations will be carried out in underground, there will be no significant impact on the ambient noise levels. The only activity affecting the noise level could be due to surface mine

ventilation fan. But due to isolation around the fan house not envisaged any adverse noise level to any extent. Hence, no tangible impact is assessed on the ambient environment near the pits.

Significant noise could get generated from drilling, cutting, crushing of coal, screening and its handling. But all these are confined to the specific area, which are enclosed. It does not have much impact on the ambient noise since all these operations are carried out under proper enclosures.

It can be further concluded that in actual conditions due to presence of various topographical features in the path of sound propagation the noise levels will be further attenuated.

The damage risk criteria as enforced by OSHA (Occupational Safety and Health Administration) to reduce hearing loss, stipulates that noise level up to 90 dB (A) are acceptable for 8 hrs working shift per day.

Mitigation Measures

1. Designing inherently quiet mining equipment is also included in this technique which aims to control and reduce noise emission. The preferred cost effective system for the underground mining has been the personal protective system ear muffs for the operator of the noise producing units.
2. Drilling will be carried out with sharp drill bits which help in reducing noise and same will be continued.
3. As the mining operations will be carried out in Underground, there is no significant impact on the surface noise levels. The only activity affecting the noise level could be due to surface mine ventilation fan.
4. Underground blasting noise is only momentary and the impact of ground vibrations, due to blasting by delay detonators would be negligible to cause any physical damage.
5. The noise generated by equipment can be reduced by proper maintenance. Also low-noise level generation design will be stipulated, as a necessary specification while purchasing equipment.
6. Regular noise monitoring will be carried at project site to check compliance with prevailing rules.
7. Personal Protective Equipment's (PPEs) like ear plugs/ear muffs are provided.

Impacts due to Ground Vibration

Ground vibrations are caused by blasting operations, subsidence due to mining operations, deployment of mobile equipment, rock bursts and rock bumps. Blasting also generates air vibration waves. Vibration may cause structural damages, which depend on periodical acceleration due to vibration. Air blasts can damage structurally unsound buildings and cause window shattering. The vibrations by the mechanical effects act on existing rocks and subject them to tensile, compressive and shearing stresses which spoil their mechanical characteristics with an immediate consequence. The vibrations are caused due to the permanent installation like crushers, screens, compressors, traffic and blasting. Among all these, blasting is the major source of vibration.

Vibration Control Measures

The blasting operations in the mine will be carried out by deep hole drilling and blasting using delay detonators, which reduce the ground vibrations. The measures that are generally followed and currently proposed are detailed below:

- Proper quantity of explosive, suitable stemming materials and appropriate delay system will be adopted to avoid overcharging and for safe blasting.
- Proper blast design will be made to control ground vibration and fly rocks.
- Adequate safe distance from blasting will be maintained.
- The charge per delay is minimized and preferably more number of delays is used per blasts.
- During blasting, other activities in the immediate vicinity are temporarily stopped.
- Drilling parameters like overburden, depth, diameter and spacing is properly designed to give proper blast.
- Temporary stoppage of all other activities in the mine during blasting,
- Blasting will be carried out only to loosen the strata, thereby reducing the quantity of explosives used per blast.
- Minimizing charge per delay and preferably more number of delays will be used per blasts;
- Periodic monitoring of ground vibrations in the nearby village to assess the efficacy of control measures.

4.1.1 Impact on Water Environment

The underground mining is going on as development and depillaring in II seam, III seam, V seam and VIII seam. Due to the mining operation Groundwater depletion will occur. Alesur Lake and Surabardi Lake are present in lease area which will fulfil surface water requirement for the project. Water from water bodies on surface and below ground aquifers, tends to seep through strata and reach mine workings. Stowing water is also a major source of water entering the mine working. These require regular pumping of water out of this mine. In instant case, since all depillaring will be done with hydraulic sand stowing, danger of monsoon precipitation percolating into U/G working, through subsided areas, gets greatly controlled. However, surface jores & streams need attention for management of surface water to prevent its entry into the mine. The stowing water has to be regularly pumped out in addition to seepage water. There are two sources of inflow of water into Mine workings are one is from development of inclines and another one is from fault zones during mining operation. The water pumped out from the mine, contain coal fines. It needs sedimentation, before its use and its discharge into natural water course/ open land. Large Environmental Impact Assessment for the Proposed Underground Coal Mine settling ponds will be developed, for storage and sedimentation of mine water before its discharge/uses; to conform to the effluent standards as prescribed by water consent conditions, issued by SPCB. The excess mine water, if any, is discharged into nearby tanks & can be used by local villagers for agricultural purpose. This will also augment recharge of the ground water regime near the villages. Routine analysis of effluents, once in fortnight, has been scheduled.

Water Pollution Control Activities and Mitigation Measures

- The water withdrawal through pumping during mining operations contains coal fines that need to be settled before discharge in natural water courses or on open land to avoid contamination of natural water bodies. Further, the water quality will confirm the effluent standards as prescribed by the CPCB and MPCB.
- The mine water will be utilised for underground stowing purposes and recycled; any excess water overflows from the tank after sedimentation occurs. Some of the water will be used in green belt development within 2 Ha of land area. Effluent treatment plant will be provided at workshop for

water treatment. Further, gradient flow will be maintained thus, surface run-off will also diverted to the ponds to ensure that no waste-water is released untreated.

- The excess mine water, if any, is discharged into nearby tanks & can be used by local villagers for agricultural purpose. This also augments recharge of the ground water regime near the villages. Periodic analysis of effluents, once in month will be carried out.
- Effluent treatment plant having oil & grease trap facility will be provided at workshop area. The treated water is reused back in workshop. Domestic waste water will be treated in STP and treated domestic water will be used in green belt development as well as dust suppression.

4.1.1 Impact of hazardous wastes and liquids

There is no mineral processing involved in Gondkhari Coal Mine. Explosives will be used for blasting and will be completely consumed without generating any hazardous waste. Marginal quantity of spent oil and grease generated from mine machinery will be separately collected and stored in leakage proof containers and will be sold to the authorized recycling vendors. No other hazardous wastes will be generated in the Gondkhari Coal Mine.

4.1.7.1 Solid Waste Generation and Management

The generation solid waste in proposed UG mine is significantly less low than opencast mining project. The details of solid waste are as under:

❖ Solid Waste Generation and its disposal

The solid waste generated from the proposed project during incline drivages and shaft sinking in the sub-soil and hard rocks for mine entries and also from drivages of cross-cuts in hard rock is estimated to be about 127000 Cum of solid waste. The solid waste produced during these drivages will be separately stacked on the surface and used in embankment for preparation bank head and filling of low lying areas, development of the land for infrastructure and development of greenery. The solid waste generated from colonies and service buildings shall be dumped in the low-lying areas and suitable plantation will be done over it.

❖ Municipal Solid Waste Generation and Disposal

The municipal wastes in the form of trash, garbage, food waste, waste papers and card board, etc. expected to be generated is 50 kg/day during construction activities and 170 kg/day during operation phase. Solid wastes generated will be properly collected, segregated and reused / disposed off appropriately as per Solid Waste Management Rules, 2016 as amended.

❖ Hazardous Waste Generation and Disposal

Spent oil and lubricants (approx. 5 KL/Year) will be generated and it will be disposed as per Hazardous and other Wastes (Management and Trans boundary movement) Rules, 2016. It will be given to authorised recyclers. Used Batteries and other electronic wastes to be given to authorized re-processors.

4.2 Biological Environment

Aspect - Impact identification and mitigation measures suggestion

S. No.	Project Aspects / Activities	Impacts	Mitigation Measures Suggested
1	Site Preparation: Construction Phase Activity: development of shaft and inclined/underground entry, infrastructure within 18 ha of non-forest land Aspect: Removal of vegetation	Impact: Loss of vegetation in the form of shrubs and seasonal herbs. No significant trees observed (Trees appears stunted and crooked manner due to anthropogenic activities having density 45 Nos./Ha.)	Construction Phase: The overall biological environment study revealed that, it is an underground mine project so the impact of the project would be minimum or significantly low and therefore net loss of biodiversity or long-term degradation of the receiving environment not envisaged. Ecosystem Services report is prepared and mitigation measures will be implemented accordingly. Greenbelt will be developed within 2 ha.
2	Transportation and mining activities	Operation Phase: No protected area was observed within core or buffer zone. Impact studies due to transportation and mining activities on forest land 87.351 ha within core area.	Operation Phase: The total UG ML area is 862 ha. Out of 87.351 ha is forest land having multiple small scattered forest patches. However, mining has been planned below the entire forest land. There will be no disturbance in the forest land as well as the legal status of forest land remains unchanged. Traffic management plan based on traffic studies will be implemented.
3	Land subsidence	Impact of mining activities on forest land due to land subsidence	Land subsidence study conducted by IIT, Kharagpur, mining has been planned below the entire forest land. The largest magnitude of predicted subsidence is 2.158 m corresponding to a tensile strain induced due to mining activity below the forest area. However, no significant subsidence is envisaged in the forest area.
4	Air emission	Impacts of mining activities on nearby vegetation and cropland is anticipated	Some air emission causes disease in plants, the effects of air emissions on nearby vegetation and crop lands are not likely to be injurious and noticeable as the pollutant's concentrations are expected to be well below the prescribed standards.
5	Ecological Changes	Impacts on movement of faunal species in the core and buffer zone of proposed underground mining.	No REET species observed with Core area. Further, the mining operation is underground, thus insignificant impact on local fauna is anticipated.
6	Conservation Measures to maintained local bird diversity within mining areas.	Scarcity of food and water for local birds during summer season anticipated.	It is recommended artificial nesting boxes, bird feeders and hanging earthen pot/dishes to fill water during summer season.

4.3 Socio-Economic Environment

Impacts:

- Change in population density and diversity through the immigrants may cause certain adverse social changes in the region. Also, social security problems may increase in the community due to influx of population.
- Reduction in groundwater availability for domestic or local business purposes, irrigation purposes.
- Community annoyance from coal dust deposition.
- There will be an increase in number of vehicles for transportation of the existing road network due to the proposed project. Thus chance of traffic congestion or chance of accident cannot be ruled out among the vehicles and also with the boundary wall of factory premises.

Mitigation Measures

In order to mitigate the adverse impact likely to arise in social, cultural and economic aspects in the surrounding region due to the proposed project and improvement in quality-of-life following mitigation measures should be adopted:

- Total 863 persons will be benefited in terms of direct employment due to the proposed project. During regular operations indirect unskilled employment will also be generated as helpers for maintenance.
- Preference for direct/contractual employment will be given to the locals based on their skills and aptitude. Social development program will be conducted as the part of CER.
- Traffic management plan will be implemented to avoid road accident.
- Equipment will be regularly maintained to ensure that it is in good working order.
- Priority should be given to safety aspects such as use of PPE's, safe working conditions, observance of traffic rules etc. to avoid accidents.

5.0 ANALYSIS OF ALTERNATIVE TECHNOLOGY AND SITE

The mining project is site-specific, thus no alternate sites were considered. Underground coal mining methods can be classified into four distinct categories as Room-and-Pillar, Longwall, Shortwall, and Thick-seam. The minimum depth of occurrence of coal seam is 135m while the maximum is beyond 400m. These conditions rule out open cast mining as the minimum depth of the coal seam is beyond 135. The other alternative is underground mining only. The coal block of proposed project having more than 1000m wide and 5000m length; which cause Longwall mining method is proposed for excavation.

The output is considered technically feasible due to mining by Longwall method because of the following conditions:-

- Gradient of 9° to 22° of the coal seams
- Multiple coal seams (4 of UG)
- Strike Length

- Thin coal seams (due to splitting)
- Variable thickness of OB/partings (High Strip Ratio)
- The minimum working height considered for LW operations is 1.20m and the barrier between 2 panels is 45m
- The face length of the LW panel is considered as 120m
- The gallery Dimensions for drivage is 4.5m width and height as depending upon the thickness of the seam up to maximum 3.50m.

6.0 ENVIRONMENTAL MONITORING PROGRAM

An Environmental Management Cell will be for implementation of the Environmental Management Plan and conducting periodic environmental monitoring of important and crucial environmental parameters to assess the status of environment regularly during mine operations. Environmental monitoring will be carried out for Ambient Air Quality, Water table depth, Water quality, Ambient Noise Levels, Soil Quality, etc. will be carried out through MOEFCC accredited agencies regularly and reports will be submitted to MPCB/MoEF&CC.

7.0 RISK ASSESSMENT & DISASTER MANAGEMENT PLAN

The assessment of risk in the project has been estimated for hazards like fires, explosion, machinery failures, land sagging, inundation, spontaneous heating, mine gases, Subsidence, etc. and corresponding mitigation measures are suggested in the EIA/EMP report.

A detailed Disaster Management Plan for facing disasters due to natural effects and human reasons is prepared and incorporated in the EIA/EMP report for ensuring safety of life, protection of environment, protection of installation in this same order of priorities. For effective implementation of Disaster Management Plan, it is being widely circulated and personnel training rehearsals will be carried out through. Mitigation measures, Site facilities, procedures, Duties and responsibilities, Communications, etc. is considered in detail in the Disaster Management Plan.

8.0 PROJECT BENEFITS

M/s. APML envisage the social development programs that health care, educational facilities developed in the township for the community, providing drinking water to the villages, building/strengthening of existing roads in the area.

A CSR budget of 2% of Company's average net profits of the immediately preceding three years will be assigned by the company owing to the demand of the community.

- The project benefits also entail revenue earnings to national and state exchequer through GST, road tax, income by registration of trucks & trailers, income tax, corporate tax, etc.
- Adherence towards full compliance of Environmental Compliances.
- Thus result in –
 - ❖ Periodic Monitoring of environmental parameters,
 - ❖ Progressive Green Belt Development
 - ❖ No significant solid waste generation.

Thus, protection of environment by adopting pollution control measures and environmental conservation measures in and around the mining area result in improvement in surrounding environment as well as socio-economic aspects of the area.

9.0 ENVIRONMENTAL COST BENEFIT ANALYSIS

Total Benefits (As per Estimation of benefits of Forest Diversion) = **Rs.15766.98 Crores**;
 Total Cost (losses of forests + Cost of the Project) = **Rs. 00.00 + 1303 = 1303.00 Crores.**

Hence, **Benefit/ Cost Ratio =15766.98/1303 = 12.10**

Thus, the project gives positive Benefit/ Cost Ratio. The monetary returns of the Project are positive over the environmental losses.

10.0 ENVIRONMENTAL MANAGEMENT PLAN

The project cost of Proposed UG coal mine of M/s. Adani Power Maharashtra Ltd. is of **Rs. 1303 Cr.** The total cost of EMP is of Rs. 90.60 Cr. The budgetary provision under EMP towards Capital Cost of Environmental Management plan is of **Rs. 10.35 Cr.** and Recurring Cost of **Rs. 2.6 Cr.** The detailed account of the estimates is presented in **Table 12.** The company will also comply with its obligation for CSR as per Company's Act too, in addition to the above EMP budget.

TABLE 12: BUDGET ESTIMATION FOR ENVIRONMENTAL MANAGEMENT PLAN

Sl. No.	Particulars	Proposed EMP Cost (Rs. In Cr.)	
		Capital cost	Recurring cost
1	Waste Water Management, Sedimentation Tank including Wheel Washing System	0.75	0.5
2	Water spraying costs in underground and surface	0.25	0.2
3	Air Quality Management (Dry fog Dust suppression system)	1.6	0.3
4	Implementation of Solar Light	0.2	0.1
5	Greenbelt Development including biological conservation plan	0.2	0.18
6	Solid Waste Management	0.5	0.02
7	Environment Monitoring and Management	2	0.2
8	Restoration of Landuse for Infrastructure (Dismantling of structure)	4.5	1
9	Additional Studies		
	Soil Conservation Plan and Pond Rejuvenation Activities	0.15	0.05
	Water Bodies Conservation Plan	0.20	0.05
	Total	10.35	2.6

11.0 CONCLUSIONS

The proposed Gondkhari Coal Mine (Lease area: 862.00Ha) project of M/s. APML, will be beneficial for the development of the nearby villages in terms of enhancement of livelihood, employment and revenue generation which eventually gives a boost to the regional growth and industrialization. Further improvement in infrastructure will take place like education, roads, availability of drinking water, medical facilities and growth of allied in adjacent villages. There will be no significant pollution of air, water, soil and noise since the mining method is underground. Some environmental aspects like dust emission, noise, siltation due to surface run-off, etc. will have to be controlled within the

permissible norms to avoid impacts on the surrounding environment. Necessary pollution control equipment like water sprinkling, plantation, personal protective equipment's, etc., will form regular practice in the project. Additional pollution control measures and environmental conservation measures will be adopted to control/minimize impacts on the environment and socio-economic environment of the area. Measures like development of thick green belt and plantation within mine lease area and along transport road, adoption of rainwater harvesting in the mine and in nearby villages, etc. will be implemented. The CSR measures to be adopted by the mine management will improve the social, economic status of the nearby villages.

The overall impacts of the proposed underground mine will be positive and will result in overall socio-economic growth of nearby villages.

12.0 DISCLOSURE OF CONSULTANTS

The Environmental studies for Proposed Gondkhari Underground Coal Mine of M/s. Adani Power Maharashtra Limited (APML) are carried out by M/s Anacon Laboratories Pvt. Ltd., Nagpur (M/s ALPL). Anacon established in 1993 as an analytical testing laboratory and now a leading Environmental Consultancy firm backed by testing lab for environment and food in Central India region. M/s ALPL is a group of experienced former Scientists from the Government Institutions and excellent young scientist of brilliant career with subject expertise. It is recognized by Ministry of Environment & Forests, New Delhi for carrying out environmental Studies & accredited by Quality Council of India (QCI) for conducting Environmental studies having accreditation Certificate No: **NABET/EIA/2023/SA0160 (Rev.01) dtd. 13 April, 2022 Valid till March 29, 2023.** Validity of accreditation certificate further extended to June 28, 2023 as per QCI-NABET letter No. QCI/NABET/ENV/ACO/23/2719 dt. March 29,2023.