

ENVIRONMENTAL IMPACT ASSESSMENT

FOR

THE PROPOSED CAPACITY EXPANSION OF BAILADILA IRON ORE MINE DEPOSIT NO. 10 FROM EXISTING 4.2 TO 6.0 MTPA AT BACHELI, SOUTH BASTAR, DANTEWADA DISTRICT, CHHATTISGARH

EXECUTIVE SUMMARY

Sponsor :



NMDC Limited

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South Bastar Dantewada District,
Chhattisgarh-494 553
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1.0 INTRODUCTION

NMDC is a Government of India enterprise, incorporated on November 15, 1958, is engaged in the activities of exploring, developing and exploiting mineral resources of the country other than oil, natural gas and atomic minerals. NMDC is the largest iron ore producer and exporter in the country sharing about 25% of the country's production and export business in iron ore.

About Proposed Project

NMDC proposes to expand the capacity of existing iron ore production from Bailadila Deposit-10 from 4.2 MTPA to 6.0 MTPA at Bacheli, South Bastar Dantewada District, Chhattisgarh. No expansion of Mining Lease is involved in capacity expansion of Bailadila Deposit-10 mine from 4.2 to 6.0 MTPA. No R&R issues are involved in the present proposal. The gross block value as on 31-3-2014 is about Rs. 387.13 Crores.

About the Bailadila Range of Deposits

The Bailadila range of hills has iron ore reserves of about 1500 Million Tonnes of high grade ore in 14 deposits. The iron ore deposits of Bailadila are rich in iron content (Fe >65% on an average) and hence are commanding high market value. Bailadila range comprises a group of hills of about 40 km in length and 10 km in width.

Bailadila Deposit-1 to Deposit-5 occurs in western ridge and Deposit-6 to Deposit-12 exists in the eastern ridge. Deposit-13 and Deposit-14 occur along the southern closure of the range. Deposits-10 and 11 lies in the eastern range of the Bailadila hills. The Indian Bureau of Mines (IBM) later sub-divided the 7.2 km long Deposit-11 into three blocks identified as 11A, 11B and 11C for the convenience of exploration. The Bailadila range of deposits is given in **Table-1**.

TABLE-1
BAILADILA RANGE OF DEPOSITS

Sr. No.	Name of the Mine	Operating Since	E.C Capacity (MTPA)
1	Deposit-14	1968	5.0
2	Deposit-5	1977	10.0
3	Deposit-11C	1987	7.0
4	Deposit-10/11A	2003	7.0
5	Deposit-11B	2015	7.0
Total Production capacity			36.0

Note : Project Commissioned on 29.03.2015

About the Proposed Project – Deposit 10

Bailadila iron ore Deposit-10 is one of the highly mechanized mines of NMDC in Bailadila range. Project was commissioned during 2003. The products are Lump ore (10 mm to 150 mm) and Fine ore (-10 mm).



The proposed increase in the production capacity of iron ore Deposit-10 is from 4.2 MTPA to 6.0 MTPA. The total Mine Lease area under Deposit-10 possession is 309.340 ha. The area falls in Forest compartment no: 1839 (672), 1840 (669), 1841 (667), 1842 (659) and 1843 (668), 1844 of Bacheli Forest Range, Dantewada forest division, C.G.

NMDC has obtained Environmental Clearance (EC) for capacity expansion of Deposit-10 from 3.3 to 4.2 MTPA from MoEF vide letter no: J-11015/506/2008-IA.II (M) dated 13th October' 2011 and amended letter dated 19th February'2014.

Six monthly Environmental progress reports on status of compliance of conditions given in E.C. letter are being submitted regularly to MoEF & CC, Regional Office, Bhopal.

1.1 Location of the Project and Description of Environment

The environmental setting of the Deposit-10 mining project is presented in **Table-2**.

TABLE-2
ENVIRONMENTAL SETTING OF DEPOSIT-10 MINE (10 KM RADIUS)

Sr. No	Particulars	Description
1	Area	309.340 ha
2	Location	Bacheli, Nagar Palika Parishad Bade Bacheli, South Bastar Dantewada District, Chhattisgarh.
3	Toposheet nos	Core Zone: E44J2(65F/2) Buffer zone: E44J1, E44J2, E44J5, E44J6, (65 F/1, F/2, F/5, F/6)
4	Geographical Coordinates	
	Latitude	18° 41' 40" N to 18° 43' 15" N
	Longitude	81° 13' 15" E to 81° 13' 45" E
5	Current status of land	Iron Ore Mine
6	Elevation above MSL	Hilly and rough terrain, 1200 m above Mean Sea Level (MSL)
7	Distance of mines from ML area	Operating NMDC mine leases: <ul style="list-style-type: none">• Deposit 5, 2.5 km, SW• Deposit 11C, 7.2 km, SSE• Deposit 14, 9.3 km, SSE
8	Nearest highway (in km)	NH-16 (30 km, N)
9	Nearest town	Dantewada (30.7 km by road, NE)
10	Nearest railway station	Bacheli of East Coast railway (1.5 km, E)
11	Nearest airport	• Non-commercial airstrip: Jagadapur (118.0 km by road, NE)



Environmental Impact Assessment for Proposed Capacity Expansion of Bailadila Iron Ore Mine Deposit No. 10 from existing 4.2 to 6.0 MTPA at Bachel, South Bastar Dantewada District, Chhattisgarh

Executive Summary

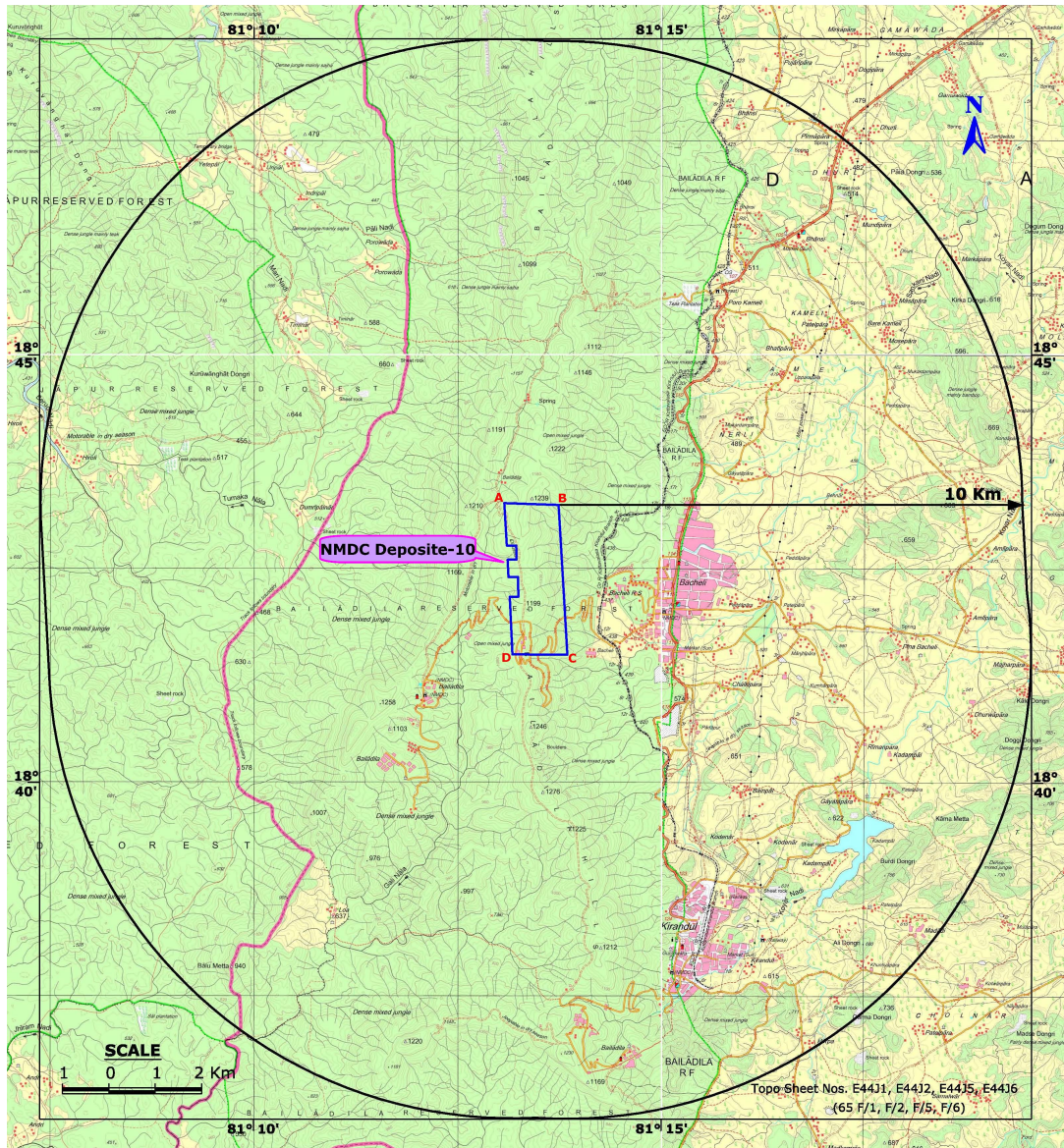
Sr. No	Particulars	Description
		<ul style="list-style-type: none">• Visakhapatnam (434.0 km by road, SE)• Raipur (425.0 km by road, N)
12	Tourist places	Nil in 15 km radius
13	Places of archaeological important	There are no archeologically important places within 10 km radius
14	Protected areas as per Wildlife Protection Act, 1972 (Tiger reserve, Elephant reserve, Wildlife sanctuaries, National park, Conservation reserve and community reserve)	Nil within 10 km radius
15	Reserve Forests within 10 km radius from mine lease boundary	<ul style="list-style-type: none">• Mine lease area falls in Bailadila Reserve Forest• Bijapur RF (3.2 km, W)
16	Rivers/Lakes	<ul style="list-style-type: none">• Galli Nalla (0.6 km, W);• Sankhani River (3 km, E)
17	Industries in 15 km	<ul style="list-style-type: none">• Essar beneficiation plant, Kirandul, 7.8 km, SSE
18	Seismic Zone	Seismic Zone-II as per IS 1893 (Part I): 2002

* All distances mentioned above are aerial unless specified



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Executive Summary



Mining Lease Area Deposit-10

Sr.No	Latitude	Longitude
A	18°43'16.5" N	81°13'05.5" E
B	18°43'15.0" N	81°13'44.5" E
C	18°41'30.2" N	81°13'52.0" E
D	18°41'30.5" N	81°13'10.5" E

CONVENTIONAL SYMBOLS

- Express highway with toll, with bridge, with distance stone
- Roads, installed according to importance
- Roads, double carriageway, according to importance
- Unimproved road, Cart-track, Puck-track with pass, Foot path
- Streams with track in bed, Underfed, Canal
- Dam, masonry or rock-fill, earthen, Weir
- River dry with water channel, with sand & rocks, Tidal river
- Submerged rocks, Shoal, Swamp, Reeds
- Wells, lined, Tube-well, Spring, Tanka, perennial, dry
- Embankments, road or rail, bank, Breaker ground
- Railways, broad gauge, double, single with station, under station
- Railways, other gauges, double, single with distance stone, etc.
- Mineral line or tramway, Kiri, Cutting with tunnel
- Contours with sub-features, Rocky slopes, Cliffs
- Sand features (Fluvial, Zeland-Hills) (Dunes/berm) (Dunes/berm)
- Towns or Villages, inhabited, deserted, Fort
- Hills permanent, temporary, Tower, Antiquities
- Temple, Chhatra, Church, Mosque, Igala, Tomb, Graves
- Lighthouse, Lightship, Buoy, lighted, unlighted, Anchorage
- Mine, Vene on track, Glass, Stack
- Palms, palmiya, other, Plantain, Conifer, Bamboo, Other trees
- Areas, cultivated, wooded, Surveyed tree
- Boundary, international
- State, demarcated, undemarcated
- State, subdivision, taluk or block, forest
- Boundary pillars surveyed, uncollected
- Height, triangulated station, point, approximate
- Benchmark, geodesic, lectary, canal
- Post office, Telegraph office, Outpost, bank
- Rest house or inspection bungalow, Circuit house, Police station
- Camping ground, Forest, reserved, protected
- Special names, administrative, locality or tribal
- Hospital, Dispensary, Veterinary Hospital / Dispensary
- Headstone, Helical, Turret, etc.
- Power line, with pylons surveyed, with poles unsurveyed

**FIGURE-1
STUDY AREA MAP (10-KM RADIUS FROM ML BOUNDARY)**



2.0 PROJECT DESCRIPTION

2.1 Salient Features of Mine Lease

The salient features of the proposed capacity expansion mining project are presented in **Table-3**.

**TABLE-3
SALIENT FEATURES OF DEPOSIT-10 IRON ORE MINE**

Sr. No.	Description	Particulars
1	Mine lease area	309.340 ha
2	Type of mine	Open cast mine
3	Method of mining	Fully mechanized open cast method
4	Rated capacity	4.2 to 6.0 MTPA
5	Expected life of mine	37 years
6	Production MT (for first five years)	30.0 Million Tonnes
7	Ore to Waste ratio	1: 0.05
8	Mineable reserves	219.42 MT(As on 11.09.2015 Anticipated Face)
9	Average no. of working days	305
10	Number of shifts	3 shifts
11	Working hours	8 hrs
12	Bench height	12 m
13	Overburden/waste to be generated	10.87 MT(As on 11.09.2015 Anticipated Face)
15	Ultimate pit slope	45°
16	Power requirement	Sourced from C.G.S.E.B.
17	Water requirement	Water requirement for the project will be 12,375 KLD, which is obtained from surface water sources such as Gallinalla and is sufficient for catering to the additional iron ore production.
18	Project Cost (Gross block)	Rs. 387.13 Crores

Source: Mine Plan

2.2 Mineral Reserves and Life of Mine

The total mineable reserve 219.42 Million Tonnes with Fe% 62.54. As per the conceptual plan, the annual excavation rate of 6.0 MTPA would be from south block & part of north block of Deposit-10 during first 10 years. Then the excavation of North block of Deposit-10 was planned to be taken up along with south block of Deposit-10 during the subsequent stages. Thus, the total life Deposit-10 project would be 37 years from 2015-16 onwards.

2.3 Method of Mining

The Bailadila Deposit-10 mine is fully mechanized mine. The mining operation is carried out using electric rope/hydraulic shovels, blast hole drills, crawler drills, dozers, water sprinklers motor graders etc. Drilling for blast hole primary is done by using 250 mm rotary drills, working on electricity. Blast holes for primary



blasting are of 250 mm diameter. Holes are drilled to a depth of 13-m including sub-grade drilling for the bench height of 12-m.

2.4 Mining Machinery

The production capacity shall be augmented by increasing the net utilization of Heavy Earth Moving Machinery for achieving the proposed target of 6.0 MTPA.

2.5 Details of Existing Ore Processing Plant

Primary and secondary crushing of ore is being done at the hilltop. The capacity of primary crusher is 2500 ton/hr. Crushed iron ore of (-) 350 mm size from primary gyratory crusher of 54" x 74" size is sent to secondary crusher using belt conveyors. The material from hill top silo is fed to downhill conveyors through apron feeder. 3 number storage silos (each silo capacity 5000 tons) are located at the foot hill-Bachel.

The material from the intermediate silo is fed to the respective screens (four lines of 750 TPH, one in standby, 3 working) in screening building through apron feeders & belt conveyors. The existing screening plant can handle upto 7.0 MTPA. The existing tailing dam-2 of Deposit-10 project has adequate capacity of 17.15 lakh cu.m is being utilized for storing the slimes generated from screening plant.

A stockpile of 2 lakh ton was available for lump ore stacking and stockpile of 4 lakh ton was available for fine ore stacking. No additional facilities are planned on lump ore and fine ore stacking.

Hence, no augmentation of crushing, downhill conveyor system, screening plant is envisaged for proposed capacity expansion of Deposit-10 mine from 4.2 to 6.0 MTPA.

2.6 Reclamation and Afforestation Programme

Biological Reclamation of Mined out Areas

All benches of 12 m height are remaining active till the end of the mine life. Therefore, Biological reclamation of these mined out areas of Deposit-10 project is proposed after the ultimate stage only. The total area used for mining will be 159.82 Ha.

The reclamation procedure is given below.

Soil binding species like Agave sisalana (Sisal), Dendrocalamus strictus (Kanta Bamboo) etc are planned to stabilize the slopes while densification to an extent of 2000 saplings per hectare of native and pioneer species like Albizia lebbek (Siris), A. nilotica (Babul), A. Catechu (Khair), A.auriculiformis (Acacia), Emblica officinalis (Amla), Pongamia pinnata (Karanj), Dendrocalamus strictus (Bamboo), Phoenix lumilis (Khajur) etc., succeeded by leguminoseae planned on the terraces.



Waste Dumps and its Reclamation

The entire ML area of 309.34 ha lies in the Bailadila reserve forest. Therefore, land with 100% devoid of forest is not available in the vicinity. Hence, those areas where the forest is open in nature with gentler slopes and devoid of forming any drainage channels are selected for waste dumping. The phase wise reclamation is given in **Table-4**.

**TABLE-4
PHASE WISE RECLAMATION**

Zone No.	Area in ha	Items Covered	Year of Reclamation
RA-1	10.51	Waste Dump2	2025-30
RA-2	8.51	Waste Dump3	2040-45
RA-3	18.74	Waste Dump1	After 2055
RA-4	159.82	Excavation Area	After 2052
RA-5	111.76	Infrastructure Area (Including Low Grade Dump Area) etc.	After 2055

The maximum height of the proposed waste dumps are about 20 m to 25 m respectively, which are as per DGMS circulars on the subject. One intermediary berm is placed so that the height of fall of debris is reduced. Further, to check the flow of screen, contour trenching and retaining walls of adequate height are envisaged all along the toe of the waste dumps.

2.7 Land use Pattern-ML Area

The classification of the land use pattern is given in **Table-5**.

**TABLE-5
DETAILS OF LAND USE PATTERN IN ML AREA**

Sr. No.	Head	Area put on use (Ha)	Additional Requirement during life of mine (Ha)	Total
1	Area under mining	125.52	34.30	159.82
2	Storage for top soil	Nil	Nil	Nil
3	Overburden/Dump	45.50	3.80	49.30
4	Mineral Storage	Nil	Nil	Nil
5	Infrastructure (Workshop, Crushing Plant Administrative Building, Roads, Barrack, Water Treatment Plant etc.)	46.51	10.22	56.73
6	Others to specify#	91.810	-48.32	43.49
Total		309.34	0	309.34



3.0 BASELINE ENVIRONMENTAL STATUS

The baseline data generated during the period 1st December 2014 to 28th February 2015 representing winter season and secondary data collected from various government, semi-government and public sector organizations.

3.1 Land Use

The land use pattern of the 10 km radius area has been studied by analyzing the available secondary data published in Census records. The forest land occupies an area of about 27831 ha comprising to about 73.19% total geographical area under the study. There is no irrigated land in 10 km area as per 2001 census land use records, un-irrigated cultivable land was 7166 ha comprising about 18.85%, cultivable wasteland was 1378 ha comprising about 3.62% and land not available for cultivation was 1150 ha comprising about 3.02% of the total study area.

3.2 Soil Quality

Eight soil samples were analysed in and around the mine lease area to assess the present soil quality of the region. The pH of the soil indicates that the soil is neutral to slightly alkaline in nature. The nitrogen concentration of the soil indicates that the soil is very less to more than sufficient category, phosphorous concentration of the soil indicates that the soil is medium to sufficient category and potassium concentration of the soil indicates that the soil is very less to more than sufficient category.

Based on the results, it is evident that the soils are not contaminated by any pollution sources.

3.3 Meteorology

Meteorological data at the site was monitored by VIMTA during December-2014 to February 2015 representing winter season. It was observed that the during study period, temperature ranged from 7.0^oC to 27.4^oC. During the same period of observations, the relative humidity recorded was ranged from 20.0% to 98.1%. Total rainfall 4.3 mm was recorded during that period.

3.4 Ambient Air Quality

Ambient Air Quality Monitoring (AAQM) has been carried out at eight locations with a frequency of two days per week for three months during winter season of 2014-2015. The results thus obtained indicate that the concentrations of PM₁₀, PM_{2.5}, SO₂, NO_x and CO in the ambient air are presented in Table-6 and the values were observed to be well within the National Ambient Air Quality (NAAQ) standards for Residential and Rural areas.

**TABLE-6
AMBIENT AIR QUALITY LEVELS**

Sr. No.	Parameters	Values (Range) ($\mu\text{g}/\text{m}^3$)	Limits ($\mu\text{g}/\text{m}^3$)
1	PM _{2.5}	16.4-50.6	60
2	PM ₁₀	31.9-73.8	100
3	SO ₂	9.8-15.8	80
4	NO _x	11.2-18.3	80
5	CO	219-416	2000

3.5 Water Quality

To assess the physical and chemical properties of water in the region, water samples from four surface and eight ground water locations were collected by VIMTA from various water sources around the project site. The results indicate groundwater is generally in conformity with the drinking water standards (IS:10500) standards. In surface waters, the Iron concentrations are found to be in the range of 0.08 to 0.12 mg/l and were observed to be within the desirable limit of 0.3 mg/l. The TDS are in the range of 36.0 to 105.0 mg/l, and is observed to be within the desirable limit of 500 mg/l. The BOD and COD were observed to be <3.0 mg/l and <5.0 mg/l respectively.

3.6 Noise Levels

Ambient noise levels were measured at eight locations around the proposed expansion mine site. The daytime and night time noise levels in all the residential locations were observed to be within the permissible limits. The Leq values in the range of 44.6 to 55.6 dB(A).

3.7 Ecological Environment

Entire ML area is part of Bailadila reserve forest area. Based on the field studies and review of published literature, it is observed that there are no endangered and protected flora and fauna in the core zone. The important mammal species of the buffer zone are Hare, Hyena, Jackal, Langur, Monkey, Squirrel, Wild pig, Wild dog, Field mouse, Common mongoose, Bandicoot, Panther, Bear, Wild fox, Blue Bull or Nilgai, Indian Gazella, Sambhar and Cheetal. Some of the mammals recorded are parts of Schedule-I and schedule-II of Wildlife Protection Act. However, there are no wildlife sanctuaries and National Parks in 25 km radius area.

3.8 Social Environment

The study area (10 km radius) area has a total population of 52664 according to 2011 census. Total male population is about 51.09% and total female population is around 48.91%. The average literacy rate is 72.22%.



4.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The environmental impacts due to the proposed capacity expansion of mining project, associated activities like ore crushing, screening and loading plant have been assessed and adequate management plan has been devolved to mitigate the impacts.

4.1 Topography

There would be overall changes in the topography of the area due to the proposed capacity expansion of mining operations. The mining shall be carried out by a system of benches. The bench height to be maintained at 12 m and width of the bench varies in each deposit depending upon the operation feasibility. At the final stage of the mine, the biological reclamation will be done by planting vegetation at the mined out areas.

4.2 Air Quality

The air pollution impact of iron ore mines depends on the intensity of ore extraction operations and mode of transport. All proposed mining operations are mechanized and operated on electricity/diesel. The maximum incremental ground level concentrations of dust (SPM) due to the mining operations are estimated through computer aided software approved models (AERMOD techniques) and found to be occurring within the mine lease with effective implementation of Environment Management Plan.

Adequate control measures like water sprinkling, dense plantation, regular maintenance of vehicles & machinery and good housekeeping would be continued to reduce the impacts.

4.3 Noise Levels and Ground Vibrations

With the mining operations, due to the expansion of machinery, drilling and blasting for mine development, excavation, transportation and crushing of iron ore and men, it is imperative that noise levels would increase. However, as the mine lease boundary is located 2.0 km away from the nearest settlement, the expected noise levels will not have significant effect on the community.

The blasting operations are proposed to use deep hole drilling and blasting using delay detonators which are bound to reduce the ground vibrations. Further, the ground vibrations shall be controlled by using modern shock tubes with delay non-electric (nonel) detonators. In addition various mitigation measures as given EMP are being practiced at the mine site and will be continued. Hence, ground vibrations will be well within the specified maximum limits.

4.4 Water Resources

The total water requirement for Deposits-10 project after expansion will remain about 12,375 m³/day as no addition of lines are proposed in screening plant and no major addition of mining machineries is involved.



There will not be any impact on the ground water resources as there is no ground water tapping for mining or allied activities. Further, the mining activities will not puncture the ground water table during its life time.

The wastewater from vehicular washing is treated in Effluent Treatment Plant. The wastewater (slime) from screening plant/beneficiation plant is sent to tailing dam. Sufficient number of check dams / check bunds has been constructed on various nalla courses to reduce velocity of flow water coming from hill top during monsoon season. The check dams and check bunds are arresting the flow of turbid water and only clear water is flowing from check dams during monsoon season. The domestic waste water is treated in Oxidation pond. However, new Sewerage Treatment Plant based in SBR Technology is under construction at Bacheli for treatment of domestic waste water generated from Township.

Natural drains in the ML area are not disturbed and no wastewater is sent to these bodies. No siltation of drains from mine operations is envisaged.

Hence, no impact on surface water bodies due to mining operations is envisaged.

4.5 Soil Environment

The environmental impacts of the mining activities on topsoil are based on the quantity of removal of topsoil and its dumping. In the present project, as it is proposed to temporarily store the topsoil and use it for plantation schemes, no impact of dozing of topsoil is envisaged. No waste rock generation will be involved.

4.6 Flora and Fauna


The ML area is under reserve forest area. As per forest records of Dantewada (Sukma) forest division, there is no wild life sanctuary in 25 km radius. There no wildlife corridors in 10 km radius area.

As the mining activity is restricted to core zone, no significant impact on the flora of the buffer zone due to the proposed mining of iron ore is anticipated.

The hilltop is with laterite capping and thus area is devoid of forest growth The plains and the areas around the mining activity and overburden are covered with shrubby vegetation. With afforestation on overburden dumps and proper management of forest and development of greenbelt around the mine are being done.

The impact on the flora and fauna of the buffer zone due to the mining activity will be marginal. The proposed progressive plantation over a period of time will reduce the impact, if any.

A detailed Wild Life Conservation Plan will be implemented to mitigate the impacts, if any, on the fauna of the 10-km radius area.

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4.7 Socio-Economic Aspects

The project will definitely help for the improvement of the socio-economic status of the society in the region by extending the direct/indirect employment opportunities. The project will also increase the development of ancillary and related small-scale industries in the adjoining areas.

NMDC through its CSR activities is playing a key role in development of surrounding areas under the following schemes.

- The Shiksha Sahayog Yojana: In F Y 2014-15, an amount of Rs.6,30,29,000/- has been disbursed as 18,000 scholarships
- NMDC-Balika Shiksha Yojana: A professional education Sponsorship programme for empowerment of tribal girl Students of Chhattisgarh State.
- NMDC-ITC, Bhansi: NMDC has established Industrial Training Center at Bhansi, Dantewada District More than 200 Students are being trained in 5 trades. NMDC-Polytechnic at Javanga, Geedam, Established in the year 2010 inclusive of Hostel facilities for around 1000 Students.
- NMDC-Aastha Gurukul: A residential CBSE School, for Students from disadvantaged background and fully supported by NMDC has been successfully operating since A Y 2009-10 and 748 Students are studying in the School. The School is currently classes from Class-I to Class-VI.
- Tribal Health Care: NMDC's support for tribal health care in 66 villages around Bailadila Projects of Bastar region in Chhattisgarh State is one of the Community Health Initiatives, which provides free health care through Project Hospitals, as well as at the door step in the above CSR villages. In the F Y 2014-15 around 86000 patients were treated.
- Drinking Water Support Schemes: While NMDC has partnered Govt. of Chhattisgarh in providing drinking water to nearby villages of Bacheli complex.
- Infrastructure Support for benefit of Community: NMDC has partnered with the State Govt. for the benefit of the local community and stake holders in creating infrastructure in the form of Gaurav Path, Dantewada, Dankini Bridge, Dantewada, Education Hub, Geedam.
- Swachh Vidyalaya Abhiyaan – Construction of Toilet Blocks

NMDC has committed itself to take up construction of 2117 toilet blocks & dysfunctional toilets in 1361 schools which do not have toilets in the districts



of Dantewada, Sukma, Bijapur, Bastar, Kondagaon & Narayanpur in Bastar division of Chhattisgarh . A Budget of Rs. 52.00 Crore has been provided for the purpose.

5.0 ENVIRONMENTAL MONITORING PROGRAM

Regular monitoring of important and crucial environmental parameters is of immense importance to assess the status of environment during mining operations. The regular monitoring is already being carried out at NMDC, which is suggested to improve covering as given in **Table-7**.

**TABLE-7
ENVIRONMENTAL MONITORING PROGRAM**

Sr. No.	Particulars	Monitoring Frequency	Duration of Sampling	Important Monitoring Parameters	
1	Air Pollution and Meteorology				
	A	Ambient Air Quality Monitoring			
		AAQM at selected 8 locations in and around ML area	Once in 15 days during each season except monsoon season.	24 hr continuously	PM _{2.5} , PM ₁₀ , SO ₂ , NOx and CO
	B	Fugitive dust sampling at 10 locations	Once in a month during each season except monsoon season.	24 hr	Particulate Matter
	C	Respirable Dust monitoring at 7 locations. Personal Respirable Dust monitoring at 7 locations.	Once in a year	8 hrs	Respirable Dust.
	E	Gravimetric Dust Sampling at 5 locations. Source Respirable Dust at 7 locations.	Once in a year	8 hrs	Respirable Dust.
	F	Free Silica at 5 Location	Once in a year	8 hrs	Free Silica
		Meteorology			
	a	Meteorological data	Daily	Continuous Monitoring	Wind speed, direction, temperature, relative humidity and rainfall.
	2	Water and Wastewater Quality			
A		Industrial/Domestic			
1		Sewage treatment plant from colony	Once in a month	24 hr composite	As per the parameters specified under GSR: 422E/IS:10500
B		Water quality in the study area			
1		Surface Water at 3 locations	Once in season	Grab	Parameters specified under IS: 2296 / IS:10500.
2	Effluent Treatment Plant samples at 3 locations	Once in season	Grab	Parameters specified under GSR: 422E /	




Sr. No.	Particulars	Monitoring Frequency	Duration of Sampling	Important Monitoring Parameters
				IS:10500.
	3 Drinking water samples at 1 location	Once in season	Grab	Parameters specified under IS:10500.
	4 Ground water level and quality by networking of existing wells and new piezometers at 30 locations (common study for Deposit-5,10/11A)	Once in a season	One time	Water levels in m bgl and water quality parameters specified under IS:10500.
3	Industrial Noise Levels			
	1 Work zone Noise levels at 15 locations.	Once in season	Spot noise levels	Noise level in dB(A)
	2 Ambient Noise levels at 7 locations	Once in season	Spot noise levels	Noise level in dB(A)
4	Soil Characteristics			
	1 Selected 4 locations in core and buffer zone in nearby villages	Seasonal	Grab sample upto 90-cm	Colour, textural class, grain size, distribution, pH, Electrical Conductivity, Bulk Density, Porosity, Infiltration rate, Moisture retention capacity, Wilting Co-efficient, Organic matter Na, N, K, PO ₄ , SO ₄ , SAR, Base Exchange Capacity, Pb, Cu, Zn, Cd, Fe.
	2 OB Soil/ Top Soil From each of the external dump	Seasonal	Composite sample from each dump	Heavy metals

5.1 Environmental Monitoring Cell

NMDC has a full-fledged environmental monitoring cell. At corporate level, Executive Director (Resource Planning) co-ordinates the activities required for new projects and production projects for all Environmental matters. He is assisted by General Manager, Jt. General Manager, Dy. General Manager, Asst. General Manager and Asst. Manager who are well qualified and experience in environmental monitoring and implementation of pollution control measures. .

Budgetary Allocation for Environmental Protection

Every year suitable budgetary provisions were made for undertaking environmental monitoring works and environmental protection works such as desilting of check dams / bunds, construction of additional check dams / check bunds, plantation, waste dump stabilization, ETP maintenance, etc. The amount spent during last 2 years is given in **Table-8**.

	Environmental Impact Assessment for Proposed Capacity Expansion of Bailadila Iron Ore Mine Deposit No. 10 from existing 4.2 to 6.0 MTPA at Bachel, South Bastar Dantewada District, Chhattisgarh
	Executive Summary

**TABLE-8
AMOUNT SPENT FOR ENVIRONMENTAL PROTECTION WORKS**

Sr. No	F.Y	Amount in Rs. lakhs
1	2012-13	17.28
2	2013-14	169.00

6.0 OCCUPATIONAL SAFETY AND HEALTH

Occupational safety and health is very closely related to productivity and good employer-employee relationship. The main factors of occupational health in iron ore mine are fugitive dust and noise. Safety of employee during blasting operation and maintenance of mining equipment and handling of explosive materials is being taken care of as per mine regulations. PPEs such as Dust masks, ear plugs/earmuffs are provided to workmen. Hence, no significant impact on health of workmen is envisaged.

7.0 PROJECT BENEFITS

The iron ore produced from the project is used in various steel industries and generating income for the country. The project is providing education, health, employment (direct and indirect) and infrastructure facilities to the local people. The project is contributing positively for the development of local area, region and country. Hence, the proposed capacity expansion of Bailadila Deposit-10 project from 4.2 to 6.0 MTPA will definitely contribute to Nation grown in development of steel sector.

8.0 CONCLUSIONS

It is a brown filed project, proposed to expand its present iron ore production from 4.2. to 6.0 MTPA from Bailadila Deposit-10, Bachel, South Bastar Dantewada District, C.G. The proposed capacity expansion will be carried out within already sanctioned mining lease area and having necessary statutory clearances. No major changes / modifications are required for proposed production enhancement. The capacity expansion of Deposit-10 mine will be achieved by increasing the net utilization of mining machinery. The project is already implementing Environmental Management Programme which will be continued even after capacity expansion. Hence, there will be minimal impact on environment.