EXECUTIVE SUMMARY

1.1 INTRODUCTION

M/s. Shri Bajrang Power and Ispat Ltd, Raipur is seeking Environmental Clearance for Proposed Chhotedongar Iron Ore Mine located at Chhotedongar Village, Narayanpur Forest Range Tehsil of Narayanpur (Erstwhile Bastar District) District, Chhattisgarh State over an area of 57.00 Ha area for a maximum production of 3,00,960 TPA.

Chhattisgarh State Government vide their letter on 3-23/2010/12 dated 30/08/2010 recommended the proposal to Secretary, Ministry of Mines, Government of India for grant of Mine Lease in favor of Project Proponent. Ministry of Mines, GOI also issued a letter to Secretary, Govt, of Chhattisgarh, Mineral Resource Dept. vide letter no. 5/96/2010-M.IV dtd. 13.04.2011 for grant of mine lease for Iron ore mine over an area of 57.00 Ha at Village Chhotedongar, District - Narayanpur in favour of Shri Bajrang Power & Ispat Ltd. for a period of 30 years. Chhattisgarh State Govt. has issued a letter of intent for preparation of mining plan vide letter No. F-3-23/2010/12, dtd. 24/12/2014 for Chhotedongar iron ore deposit at village Chhotedongar, Forest Range Narayanpur, District - Narayanpur (Erstwhile Bastar District) over an area of 57 Ha in favor of M/s Shri Bajrang Power & Ispat Ltd, Raipur.

Regionally, the lease area is a part of southernmost hilly terrain of Chhotedongar Reserved Forest. As per EIA Notification 2006 and subsequent amendments, the project falls in Schedule 1 (a) in Category 'A' and needs Environmental Clearance from MoEF, New Delhi. The application for prior Environmental Clearance (Form-1) for the Chhotedongar Iron Ore Mine was considered by the Reconstituted Expert Appraisal Committee (Non-Coal Mining) in its 3rd meeting held during February 23-25, 2016 for prescribing Terms of Reference (ToR) to prepare Environmental Impact Assessment (EIA) report. The Terms of Reference (ToR's) has been issued by MOEF&CC vide its letter No.J-11015/93/2016-IA.II(M) dated 15th March 2016.

1.1.1 Identification of Project

The Chhotedongar Iron Ore Mine located in 57.00 Ha area in forest compartment No. New (2180, 2184, 2179, & 2185), old (252, 267, 268, 269) of Narayanpur Forest Range, Narayanpur (Erstwhile Bastar District) District of Chhattisgarh State has applied for Environmental Clearance. Application has been submitted to MOEFCC forest wing (MoEFCC File No. FP/CG/MIN/11479/2015) for Forest clearance. The Lessee proposed to produce a maximum of 3,00,960 Tons/annum of Iron Ore from the Chhotedongar Iron Ore Mine.

The applicant is seeking prior Environmental Clearance as per EIA notification 2006 and its amendments. Since the applied mine lease area is greater than 50 Ha i.e. 57.00 Ha, hence it falls under "Category A" based on the Schedule Clause no 1(a) of EIA notification 2006 and subsequent amendments. As a pre-requisite for getting environmental clearance, EIA studies have to be carried out for the preparation of EIA report to be submitted to regulatory agencies, M/s Shri Bajrang power and Ispat Limited, Raipur retained M/s Anacon Laboratories Pvt. Ltd. Nagpur for this purpose.

1.1.2 Location of the Project

The applied Mine lease area is located in forest compartment No. New block No. New (2180, 2184, 2179, & 2185), old (252, 267, 268, 269) in Chhotedongar village, Narayanpur Forest Range, District – Narayanpur (Erstwhile Bastar District), Chhattisgarh, India over an area of 57 Ha. The Mine lease area falls under Survey of India Toposheet no. 65 E/7 and lies between Latitudes 19°24′12.5″ to 19°24′51.4″N & Longitudes 81°16′58.6″ to 81°17′31.9″ E.

The salient features of the project are given in **Table 1.1.**

TABLE 1.1
SALIENT FEATURES OF THE PROJECT SITE

Particulars	Details
Project Location	Chhotedongar Iron Ore Mine Forest compartment No. (2180, 2184, 2179, & 2185), old (252, 267, 268, 269) Village – Chhotedongar, Narayanpur Forest Range, District – Narayanpur (Erstwhile Bastar District), Chhattisgarh
Site elevation above MSL	960 mRL to 830 mRL
Land use of project site	The land proposed to be utilized for mining activity in forest land. The land is part of Chhotadongar Reserve Forest in Narayanpur Forest Range.
Site topography	Hilly Terrain
Nearest roadway	Rajnandgaon - Dantewara State Highway (SH-5) :9.5 Km E Raipur-Jagdalpur National Highway (NH 43) : 44.0 Km E
Nearest Railway Station	Tokapal Railway Station, 75km, SE
Nearest village/major town	Village: Chhotedongar Village – 6 km, NE Town: Narayanpur : - 35 km, N
Hills/valleys	Lease area is hilly terrain surrounded by Hills
Ecologically sensitive zone	None within 10 km radius
Reserved/ Protected forests	Chhotadongar R.F.: Mine lease area falls in Reserved Forest. Dhaurai R.F.: 9.5 km NE
Historical/tourist places	None within 10 km radius
Nearest Industries	None within 10 km radius
Nearest water bodies	Madinnadi: 5.4 km North Gudra river: 8.7 km E Dabrannala: 0.8 km SW KadamNala: 4.3 km NW Kundelnala : 3.0 km SW OrchhaNala : 7.0 km S NawinDodanala : 7.7 km S PoriyabaharNala : 9.7 km NE
Seismic zone	Seismic Zone-II as per IS-1893 (Part-1)-2002. The site is located in a stable zone

1.2 PROJECT DESCRIPTION

1.2.1 Method of Mining

It is proposed to carry out opencast mechanized mining for this plan period by creating systematic benching system having height of 5m and width of 8 to 10 m. It is proposed to deploy 100mm dia wagon drilling to drill blast holes having burden and spacing of 2.7 m x 2.8 m in stagger grid pattern. Muffle blasting will be adopted as precautionary measure.

Drilling and blasting will be conducted in the mine for extracting hard rock. The pattern of delay blasting in conjunction with use of detonating fuse. Gelatin explosives are used for blasting. Powder factor of over 7.25 tonnes / kg is expected. Blasting will be done by contractual agency, hence storage of explosive is not required.

1.2.2 Anticipated life of the mine

The mineable reserves of iron ore is 1.0116 million tonnes, considering the annual production rate of maximum 0.300 million tonnes, the life of the mine will be about 6 years. But, after completion of proposed boreholes, the reserves of iron ore will likely to increase and accordingly the life of the mine will get increased.

1.2.3 Conceptual Mine Plan

Total 6.93 ha will be mined out at the end of conceptual period. The infrastructure will be shifted to a safer place during the course of conceptual plan period. The overburden will be reclaimed by plantation. The voids left due to mining will be filled with rain water and used as water reservoir. The ultimate pit limit at the end of conceptual period is 900 mRL.

SALIENT FEATURES OF THE MINE

Particulars	Details
Method of mining	Mechanized Open Cast Mining
Area	57.00 ha
Proposed Production	3,00,960 TPA Iron Ore
Mineable Reserves	10,11,627 Tonne
Life of the Mine	~6 years (may be increased after future exploration)
Bench Height and Width	5 m Height & 8-10 m Width
Maximum Depth of Mining	upto 900 mRL
Topsoil thickness	Not Available
Ultimate Pit Slope angle	45°
Elevation Range	960 to 830 m above MSL
Water requirement	53 KLD
Source of Water	Ground water from bore wells and Mine Pit Water (if available)
Water table	10 m bgl from general ground level i.e. 540mRL
Number of working days	280 (1 shift per day)

1.2.4 Waste Generation & Disposal

Waste generation in ML area will be mainly in the form of overburden (includes BHQ & ferruginous shaly BHQ rocks). Total 176900 Cum of waste will be generated during mining plan period. Thereafter upto conceptual period, the generated waste will be about 30,000 Cum, The waste generated during mine life will be dumped on the north western side of the lease area with dump height of 6 m and covered by fast growing grass and shrubs and protected by retaining wall & garland drain, if required.

1.2.5 Water Requirement & Source

Total water requirement for the project will be 53 KLD, which will be met from bore well and mine pit water (if available).

1.2.6 Manpower Requirement

Total manpower requirement for the project will be 141 persons.

1.2.7 Site Infrastructure

The following facilities will be established near the mine lease area for the mine employees:

Statutory Requirement		Manager's office.
		Rest shelter.
		Drinking Water Facility.
		First Aid Box.
		Latrines and urinals.
Maintenance Requirement		Room for storage of spare parts and fuel.
Other Requirement		Security Office, Haul Road/Approach Road, Chemical Laboratory, Crushing Screening Unit

1.3 EXISTING ENVIRONMENTAL SCENARIO

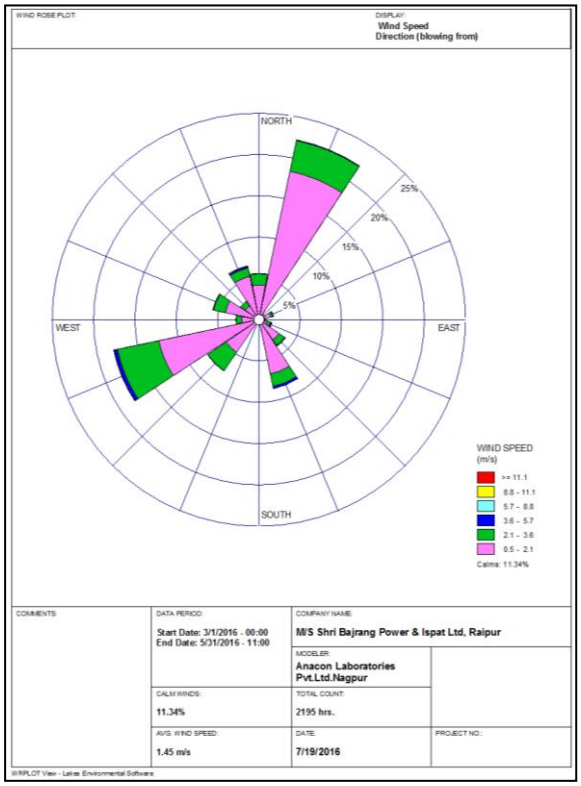
1.3.1 Baseline Environmental Studies

Baseline environmental studies were carried out within 10 km radius of the Chhotedongar Iron Ore Mine area to assess the existing environmental scenario in the area. For the purpose of EIA studies, Mine lease area of Chhotedongar Iron Ore Mine was considered as the core zone and area outside the mine upto 10 km radius was considered as buffer zone. The baseline environmental monitoring for various components of environment, viz. Air, Noise, Water, Land was carried out during summer season i.e. March to May 2016 in the study area covering 10 km radial distance from the mine.

1.3.2 Meteorology & Ambient Air Quality

Summary of Meteorological data generated at site (March to May 2016)

Temperature (°C)	20°C to 40°C
Relative Humidity (%)	10% to 95%
Wind Direction	NNE (17.9%)
Calm wind %	11.34%



Ambient Air Quality Status

The status of ambient air quality within the study area was monitored for summer season during March - May 2016 at 9 locations including the Mining lease area and in nearby villages. Total locations were selected based on the meteorological conditions considering upwind and downwind

directions. The levels of Respirable Particulate Matter (PM_{10}), Fine Particulates ($PM_{2.5}$), Sulphur Dioxide (SO_2,), and Oxides of Nitrogen (NO_X), alongwith carbon monooxide (CO), Ozone (O3) and Ammonia (NH3) were monitored. The minimum and maximum values of monitoring results are summarized in **Table 1.2**.

TABLE 1.2
SUMMARY OF AMBIENT AIR QUALITY RESULTS

Station code	Location	Description	PM10, ($\mu g/m^3$)	PM2.5 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	CO (mg/m^3)	O_3 ($\mu g/m^3$)	NH3 ($\mu g/m^3$)
AAQ1	Project Site	Minimum	48	16	5	12	0.215	10.4	12
		Maximum	68	38	9	28	0.358	18.2	32
		Average	56	24	6	18	0.291	15.1	21
		98th %tile	66	36	9	26	0.355	18.2	30
AAQ2	Dhanora	Minimum	49	21	5	11	0.242	10.8	12
		Maximum	64	34	8	26	0.362	19.2	29
		Average	55	26	6	17	0.291	15.3	20
		98th %tile	63	33	8	25	0.353	18.9	28
AAQ 3	Madamnar	Minimum	51	21	5	12	0.217	11.4	12
		Maximum	66	32	7	24	0.341	19.2	28
		Average	57	26	6	18	0.280	15.6	20
		98th %tile	64	32	7	24	0.337	19.1	27
AAQ 4	Banker	Minimum	40	18	5	12	0.248	10.1	12
		Maximum	56	32	8	28	0.355	18.2	29
		Average	47	24	6	19	0.301	14.1	20
		98th %tile	56	30	8	27	0.355	18.2	29
AAQ 5	Chameli	Minimum	42	18	5	11	0.242	11.6	12
		Maximum	62	28	9	26	0.328	19.4	28
		Average	52	24	6	18	0.283	15.1	21
		98th %tile	60	28	9	25	0.327	19.0	28
AAQ 6	Rotar	Minimum	34	13	5	7	0.165	6.7	5
		Maximum	44	19	7	13	0.220	13.8	13
		Average	38	16	6	10	0.193	9.8	9
		98th %tile	44	19	7	13	0.220	13.0	12
AAQ 7	Hornar	Minimum	37	16	5	5	0.248	10.7	10
		Maximum	43	19	7	9	0.286	18.9	32
		Average	40	18	6	7	0.258	14.9	18
		98th %tile	43	19	7	9	0.280	18.6	30
AAQ 8	Adebara	Minimum	37	16	5	6	0.212	9.8	12
		Maximum	44	22	8	12	0.272	16.8	23
		Average	41	18	6	9	0.252	12.6	17
		98th %tile	44	22	8	12	0.270	16.4	23
AAQ 9	Rajpur	Minimum	32	10	5	5	0.202	7.8	12
		Maximum	42	21	6	8	0.243	15.6	21
		Average	37	13	6	6	0.223	11.7	16
		98th %tile	41	20	6	8	0.243	15	21
CPCB Standard			**100 (24 hrs)**	**60 (24 hrs)**	**80 (24 hrs)**	**80 (24 hrs)**	**2 (8 hrs)**	**100 (8 hrs)**	**400 (24 hrs)**

From the above results, it is observed that the ambient air quality with respect to PM_{10}, $PM_{2.5}$, SO_2, and NOx at all the monitoring locations was within the permissible limits specified by CPCB.

1.3.3 Ambient Noise Levels

Ambient noise level monitoring was carried out at the 9 monitoring locations. The monitoring results are summarized in **Table 1.3.**

TABLE 1.3
SUMMARY OF AMBIENT NOISE LEVEL MONITORING RESULTS

Time	Plant site	Dhanora	Madamnar	Banker	Chameli	Hornar	Adebara	Rajpur	Rotar
Min	35.4	36.2	43.2	42.0	39.9	39.8	43.3	40.7	41.1
Max	57.5	57.4	56.8	54.8	55.1	53.6	56.8	55.0	56.4
Ld	53.5	53.3	53.4	51.7	51.4	50.0	53.3	51.6	52.6
Ln	44.8	43.3	43.8	42.3	41.3	40.4	44.5	41.2	42.5

It is observed that the ambient noise levels at all the selected locations were well within the permissible limits of 55 dB(A) for daytime and 45 dB(A) for night time.

1.3.4 Surface and Ground Water Resources Availability & Quality

Water Resources

There is no perinial stream or nallah flowing through the mining area. However there are seasonal nallahs flowing near Kanhargoan (0.6 km NE), and near Adebara village (0.5 km SE). Madin river with its tributaries form the major drainage of the study area.

The pre monsoon water level in the area was observed at 10-15m bgl, while post monsoon water level was observed from 3-6m bgl from a general elevation of 26m amsl. The general elevation within the study area was from 26m to 50m. The entire Narayanpur block has 25.17% ground water development status. Thus it falls in safe category (CGWB, 2008).

Water Quality

The existing status of groundwater quality was assessed by identifying 4 ground water (Bore wells/dug wells) locations from different villages.

Groundwater Quality

The pH of the water samples collected ranged from 5.30 to 7.45 and within the acceptable limit of 6.5 to 8.5 except ground water collected from mining site. The total dissolved solids were found in the range of 68-148 mg/l. The total hardness varied between 26-98.3 mg/l for all samples collected at 4 locations. In all samples, iron content varied in between 0.16 - 0.77 mg/l, Nitrate in between 2.4 – 8.6 mg/l, fluoride varied between <0.1-0.37 mg/l, chloride 12.5 – 18.6 mg/l, Sulphate 4.2-6.9 mg/l, alkalinity 12.0-112.6 mg/l. The overall ground water quality was found to be good except iron content, which was observed to exceed the desired levels of 0.3 mg/l in most of the ground water samples.

Bacteriological Characteristics

Coliform group of organisms are indicators of faecal contamination in water. Water samples were analyzed for total and faecal coliform by membrane filtration technique. The ground water was found

to be fairly contaminated. From the results, it was observed that, groundwater is suitable for drinking and domestic uses provided disinfection is given.

1.3.5 Land use Land Cover classification

The Land Cover classes were extracted following a visual interpretation method or on screen digitization of the Resource Sat-1 Imagery, sensor LISS-3 having 23.5 m spatial resolution image. These were later verified by using SOI toposheet and Google Earth imagery. Polygon layers for each class were digitized and the respective areas were calculated. The land cover classes and their coverage are summarized in **Table 1.4.**

TABLE 1.4
LU/LC CLASSES AND THEIR COVERAGE IN SQ. KM OF 10 KM RADIUS

LU/LC classes and their coverage in Sq. Km			
Sr. No.	**LU/LC Class**	**Area (Sq.Km²)**	**Percentage (%)**
1	Built up Land Rural/Urban)		
	Settlement	4.56	1.45
	Road Infrastructure	10.89	3.47
2	Agriculture Land		
	Cropland	39.27	12.51
3	Water bodies		
	River/Nala/Stream	42.87	13.65
4	Scrub/Waste Land		
	Land with scrub/Open Scrub	25.63	8.16
5	Forest		
	Dense Forest	180.56	57.50
6	Mining/Stone Quarry	10.22	3.25
	Total	**314.00**	**100.00**

1.3.6 Soil Quality

Soil quality monitoring was carried out in the study area. Sampling locations were selected to assess the existing soil conditions in and around the study area representing various land use conditions. The samples were collected by ramming a core-cutter into the soil up to a depth of 15-20 cm. Total 9 soil samples within the study area were collected and analyzed for their physico-chemical and fertility status.

From the analysis results of the soil samples, it was observed that the soil was low to medium fertile and having low productivity. The soil in the study area needs additional fertilizers for improving the fertility status and increase in crop productivity. The concentration levels of soluble heavy metals were found to be low with a negligible concentration level of cadmium, chromium, lead, cobalt and selenium. The presence organic matter and organic carbon was found to be in the range of 2.98 to 5.92% and 1.12 to 3.14 % respectively in the soil. Overall, the soil quality in the area was found to be moderate fertile.

1.3.7 Biological Environment

Flora in the core & Buffer Zone

The proposed Iron ore mine comes under forest compartment no. 267, 268, 269 & 252 of Orchha and Chameli forest beat of Chhotedongar forest range of Narayanpur Forest Division, Chhattisgarh state. Proposed mining area is located on hilly terrain having elevation 960 meters above mean sea level (MSL). The vegetation observed within the study area is mainly comprised of tropical dry deciduous & tropical moist deciduous Category. Availability of plants and associated composition is one of the

major characteristics of environmental features which are dependent on site features and other climatic conditions. The type of plant species and their diversity was recorded and presented in the EIA report.

Only 141 plant species were enlisted within the study site. the comparative accounts of habit wise species in different zone of study site is given in **Table 1.5**.

TABLE 1.5
HABIT WISE FLORISTIC COMPOSITION IN DEFERENT ZONE OF STUDY SITE

Habit	Core	BF-I	BF-II
Tree	72	59	90
Grasses	12	8	15
Shrub	9	9	12
Herb	3	12	5
Climber	4	4	4
	100	**92**	**126**

Fauna in the core & Buffer zone

The core zone (ML 57 ha.) falls under the Narayanpur Forest Division which is subsisted on hillock which is Sal mixed forest area and it continues downward. Thus, it is obvious that, movement of common wild animals may takes place in the core zone from surrounding area. Major carnivore like Panther may be visited in the applied area in search of food. However, there is no migratory corridor of any schedule fauna as well as no national park or sanctuary within 15 km radius. The reptiles observed in the study area include Common garden lizard, Common rat snake, House Gecko, Indian Cobra, Russell's Viper and Common Indian Krait. Birds observed in the study area include Common Swift, Little swift, Cattle Egret, Indian Pond-Heron, Small Indian/pariah kite, Red-wattled Lapwing, Little Cormorant, Red-naped Ibis, Rock Pigeon, Common Kingfisher, Indian Roller, Little Green Bee-eater, Asian Koel, Grey Francolin, Common moorhen, Black Drongo, House Crow, Indian Robin, Purple Sunbird, House Sparrow, Red-whiskered Bulbul, Bank Myna, Brahminy starling, Common Babbler, Common Tailorbird, Rose-ringed Parakeet, Spotted Owlet and Eurasian Hoopoe, etc.

As per IUCN RED list, some mammals like *Panthera pardus* (Vulnerable), *Cervus unicolor* (Vulnerable), Tetracerus quadricornis (Vulnernable), *Hyaena hyaena* (Near Threatened), *Melurus urisinus* – *Vulnerable,* other species of mammals belonging to least concern category. and in reptiles like *Python molurus* – Near threatened, other species of reptiles belonging to least concern category and almost all encountered avifauna are in least concern category.

As per Indian Wild Life (Protection) Act, 1972 birds in the study area like Pea fowl (*Pavo cristatus*), is included in schedule I while many other birds are included in schedule IV. Among the reptiles, *Python molurus* (Python) is provided in Schedule – I, Indian Cobra (*Naja naja*), Common rat snake (*Ptyas mucosus*), were provided protection as per Schedule-II. Among mammals like *Panthera pardus* (Panther/Leopard), *Tetracerus quadricornis* (Four horned antelope) and *Melursus ursinus* (Sloth beer) protected under schedule – I, Mongoose (*Herpestes edwardsi*), Jungle cat (*Felis chaus*), Indian Fox (*Vulpes bengalensis*) and Common langur (*Presbytis entellus*), *Muccaca mulata* (Rhesus macaque), *Felis chaus* (Jungle Cat) are schedule –II animals. Wild boar (*Sus sucrofa*), *Axis axis* Spotted Deer (Chital), *Cervus unicolor* (Sambhar), *Mutiacus muntajak* (Barking Deer) are protected as Schedule-III animal and *Hystrix indica* (Sehi), Hares & striped squirrel are included in

schedule IV of Wild Life Protection act 1972. Rats protected in Schedule V of Wild Life Protection act 1972.

It was observed during the study that the study Area, once known for its thick & extensive forest, existence, is now bereft of its jungle wealth. There has been large-scale destruction of forests in the past years. So the Subsistent agro based economy, which was earlier supplemented by forest and forest produce, has been badly affected. The chhotedongar and adjoining village population of this district carry on their livelihood on the forest products like Mahua, Sal patta, mahul patta, bamboo, sabai grass, simal cotton & tendu (Bidi) leaves.
Agriculture area is covered less than 15 % of geographical area. mono-cropping with paddy as the dominant crop is practiced in the area. Irrigation facilities are not available in the area. Most of the area is uncultivated and unirrigated.

Khajur, Achar and Sal, were observed arround most of the villages in the study area. Other fruit yielding varieties observed in the study area were Papaya, Guava, Vilayti imali, Imli, Sitafal and Ber.

1.3.8 Socio-economic Environment

Information on socio-demographic status and the trends of the communities in the 10 km radius, was collected through primary social survey and secondary data from census 2011 & village directory 2001. Summary of the socio-economic status of the study area is given in **Table 1.6.**

TABLE 1.6
SUMMARY OF SOCIO-ECONOMIC ENVIRONMENT OF VILLAGES WITHIN 10 KM RADIUS AREA

No. of villages	23
Total households	2,222
Total population	10,707
Male Population	5,426
Female population	5,281
SC Population	845
ST Population	8,535
Total literates	4,153
Total workers	5,608
Total main workers	1,652
Total marginal workers	3,956
Total non-workers	5,099

Salient observations of the socio-economic survey

Proportionate and purposive sampling methods were used for selecting respondents (male and female) for house hold survey. For official information of villages, sarpanch / Gram Panchayat members/ Govt. School teachers were chosen. Structured questionnaire were used for survey. Total 5 villages were surveyed out of 23 villages within the study area. For group discussion, panchayat bhavan, Aanganwadi bhavan, community halls were used for discussion to seek the information related to the facilities available and opinion of the people regarding project. Based on the information collected, quality of life of the people in the area was found out.

- **House pattern:** Types of housing varied from thatched to pucca houses. 40% houses were in pakka form, 30% in semi pakka and 30% houses were observed in kaccha form.

- **Employment:** Main occupation in the study area was agriculture and its allied activities eg. Cattle rearing, dairy farming and labour work. Agricultural activity was mainly depending on monsoon season. Other income generation sources of the area were labour work, small business; private jobs etc. The labours were getting daily wages in the range of 100-250 Rs, depending on type of work they set. During discussion it was found that due to lack of irrigation facilities in summer season, farmers hadn't any work for 2-3 months, this indicates unemployment for few months.
- **Fuel:** The primary sources of cooking fuel were firewood, wood chips cow dung cake, coal etc. Very few villagers were using LPG facility. It was observed that, most of the households had LPG connection but they prefer cooking on wood/coal because it costs less money/easily available in villages/farms
- **Main crops:** The principal crops grown in agricultural farms were wheat, soyabean, pulse, gram etc.
- **Language:** Official language Hindi and mother tongue Chhattisgadi of the study area.
- **Sanitation:** Toilet facility is one of the most basic facilities required in a house. It was observed that more than 70% of the households were not having toilet facilities in their houses. There was no proper drainage line in the villages. Open defication was in practice in most of the villages
- **Drinking water facilities:** During the survey, it was observed diverse sources of drinking water supply in villages. Major source of drinking water in the study area was ground water (hand pumps, tap water and dug wells). Near about (30%) villages were availing treated water through Gram panchayat water supply through tap. During discussion, it was revealed that in summer season water scarcity is faced by most of the villages
- **Education facilities:** Most of the villages had education facilities in the form of Aanganwadi and primary schools. Higher education facilities were available in the range of 5-10 km
- **Transportation facility:** For transportation purpose auto, jeep and private bus services were available in the study area; however villagers reported that transportation facilities were not frequently available. Private vehicles like bicycles & motor cycles were also used by villagers for transportation purpose.
- **Road connectivity:** Most of the roads were pucca and connecting fair enough to villages. More than half the respondents reported that roads they frequently used were pucca.
- **Communication facilities:** For communication purpose mainly mobile phones, newspapers & post offices were present in the villages.
- **Medical facilities:** There were few healthcare facilities available in the study area. In some of the villages primary health sub centres were available. Hospitals and other better health centres were available in the range of 5-10 km at town/city place
- **Electricity:** All villages were availing electricity facility for domestic use, 30% villages availing electricity for agricultural purpose.
- **Market facility:** Study area was predominantly rural. In villages, small shops were available for daily need things. Weekly market facility was available in some villages.
- **Recreation facilities:** Television and radio were the main recreation facilities in the study area.

1.4 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

1.4.1 Impact on Topography, Drainage & Landuse

Regionally, the lease area is a part of southernmost hilly terrain of Chhotedongar Reserved Forest. The entire applied lease area is on the hill; the highest contour level is 960 mRL on the center and gradually reduced in all directions having lowest contour level of 830 mRL, which will go upto 900mRL at conceptual stage.

The proposed mining operations will alter the existing topography of the mining lease area. Proposed mining will require hill cuttings for excavation of iron ore, which will result in creation of mine pits in the lease area.

Mining lease area is devoid of any perennial water body. Some seasonal nallahs are flowing through the nearby mine lease area. The general ground level is about 540 m RL near the village settlements. As observed from the nearby wells, the water table is about 10m below the general ground level. The UPL is 900m RL at conceptual stage of mining. Hence there is no intersection of ground water table anticipated from mining activity.

Proposed mining activities will change the land use pattern of the mining lease area. The present and proposed land use pattern of the mine lease area is given in **Table 1.7.**

TABLE 1.7
STAGE WISE LAND USE (HA)

Category	Present	End of Plan Period	Conceptual stage
Area under Pits	Nil	6.730	6.930
Area under roads	Nil	2.48	2.48
Area under infrastructure/ C&S Plant	Nil	0.31	Nil
Area under top soil Dump	Nil	Nil	Nil
Area under Storage	Nil	Nil	Nil
Area under BHQ Waste Dump	Nil	2.098	2.698
Area under Plantation	Nil	4.70	4.70
Undisturbed Area	57.00	40.682	39.882
Total Leasehold area	**57.00**	**57.00**	**57.00**

1.4.2 Impacts on Air Quality

To assess the impact of the Iron Ore mining activities and crushing operations in the Chhotedongar Iron Ore Mine, air quality modeling was carried out for the mining operations and the mineral transportation activities. The modeling was carried out using MoEF/CPCB approved ISCST3 model.

The maximum predicted GLC of PM_{10} for iron ore mine activity like drilling/ loading/ unloading/ transportation/ crushing and blasting, was found to be 14 µg/m^3, 7 µg/m^3 respectively, in the SSW direction. From the observations of modeling results, it is observed that the cumulative concentrations of PM_{10} in the study area considering the baseline status will remain within the permissible limits after commencement of the mining activities.

Air Pollution Control Measures

Air pollution control measures to be taken during the mining activities are as follows:

- No blasting under unfavorable wind and atmospheric conditions.
- Use of drilling machines equipped with dust collector arrangement.

- Blasting only in daytime and at a time when there will be no mining activity. No basting during unfavorable wind and atmospheric conditions.
- Blasting by using adequate booster/primer & by proper stemming of the blast hole.
- Minimum excavator bucket height during loading and unloading activity.
- Water sprinkling through mobile tankers at regular intervals on haul roads within the mine and surface transportation road.
- Regular maintenance of vehicles and machinery.
- Dust respirators to workmen.
- Development of green belt/plantation in the safety zone.
- Good housekeeping.
- Regular monitoring of pollutants to strengthen the control measures in case the concentration level exceeds the prescribed limits.

1.4.3 Ambient Noise Levels & Ground vibrations

From the modeling results, it was observed that the resultant noise levels at the mine lease boundary was about 50 dB (A), which will further reduce over short distance. The resultant noise levels due to mine operations at the nearest habitation i.e. Chhotedongar village was about 40 dB (A). Thus, it could be seen that no significant impact will take place on the ambient noise levels due to the Chhotedongar Iron Ore quarry operations.

Ground vibrations

It was overserved from the ground vibration study that the maximum charge per blast of 234 kg/day will not cause any significant ground vibrations in the area. The ground vibrations at Chhotedongar village due to the blasting in Chhotedongar Iron Ore quarry is approximately zero. However, additional control measures need to be adopted to avoid the impacts due to ground vibrations and fly rocks due to blasting.

Proposed Noise Control Measures

- Drilling will be carried out with sharp drill bits which help in reducing noise.
- Secondary blasting will be totally avoided and Hydraulic rock breaker/jack hammer drills will be used for breaking boulders.
- Controlled blasting with proper spacing, burden, stemming and optimum charge/delay will be maintained.
- The blasting will be carried out during favorable atmospheric condition and between 2.00 PM to 2.30 PM when there is less human activity.
- Proper maintenance, oiling and greasing of machines at regular intervals will be done to reduce generation of noise.
- Provision of sound insulated chambers for the workers deployed on machines (HEMM) producing higher levels of noise.
- Proper designing of crushing plant by providing inbuilt mechanism like silencers, mufflers and enclosures for noise generating parts and shock absorbing pads at the foundation.

- Green belt/Plantation will be developed around the mining activity area and along haul roads.
- Personal Protective Equipment (PPE) like ear muffs/ear plugs will be provided to the operators of HEMM and persons working near HEMM; and
- Periodical monitoring of noise will be done.

Measures to Control Ground Vibration & Fly Rocks

- 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 will be minimized and preferably more number of delays will be used per blasts;
- During blasting, other activities in the immediate vicinity will be temporarily stopped;
- Drilling parameters like burden, depth, diameter and spacing will be properly designed to give proper blast.
- Muffle blasting using wire mesh and sand bags will be conducted at mine working near ML boundary.
- Blasting will be carried out only to loosen the strata, thereby reducing the quantity of explosives used per blast.

1.4.4 Water Resources availability & Quality

Impact on Water Resources & Quality

Mining lease area is devoid of any perennial water body. Some seasonal nallahs are present nearby mine lease area. The nearest seasonal nala is Dabra nala at 1.0 km, SW. During the rainy season, there may be accumulation of surface water, which will be pumped out to keep the working area dry and it will be utilized for dust suppression.

Mining activity inevitably leads into generation of sediment and suspended load due to erosional activity of overburden dump and loosened soil by blasting activity. This silt may get carried to the nearby seasonal streams with the surface runoff during rains and may cause siltation of the seasonal water bodies located outside the mining area.

The impact due to mining on the water quality is expected to be insignificant because of no use of chemicals or hazardous substances during mining process. Garland drains will be constructed around the mine pits and around surface dumps. These drains will be connected to the settling tanks constructed within the mine lease area. The surface run-off from dumps and mining area will be collected in this settling tank and will be used for dust suppression and plantation in the mine and crusher. Excess water, if any, will be diverted to the mine sump for storage.

There will be no process wastewater generation in the mine and allied activities. Only domestic effluent will be generated from the mine office and rest shelter. The domestic effluent will be discharged in septic tank followed by soak pit. There is no discharge of effluent from the Iron Ore Mine.

Rainwater accumulated in the mine pit, if any, will be collected in the mine sump and will be used for dust suppression and plantation in mine and crusher.

The ground water table in the nearby villages is observed at about 10 m bgl from normal surface level

540 m RL. The mining is proposed upto 905 m MSL during mining plan period and upto 900 m MSL upto conceptual stage. From the occurrence of water table, it was observed that mining activity will be confined much above the water table and will not intersect the aquifers in the area.

Proposed Water Conservation & Water Pollution Control Measures

The daily water requirement for the proposed Iron Ore Mine is estimated to be 53 KLD which will be met from bore well & mine pit water (whenever available). There is no water requirement for mineral processing in the mine. Also, there is no process effluent generation in the mine. However the following measures will be taken up to reduce the impact:

- Garland drains around the mining pit so that surface water does not enter and is drained outside after treatment in settling tank.
- Water from the working face and working areas will be channelized to flow into the mine sump by gravity from where it will be pumped out to surface settling tank.
- Garland drains having siltation pits at the toe of the dumps to channelize the runoff water from dumps into the settling tank for treatment.
- Retaining walls having water holes along the toe of the dumps to avoid the soil wash out.
- Stabilization of dump slopes by plantation to avoid soil erosion.
- Regular sampling and analysis of treated mine water for taking any corrective actions if required.

To maintain the water level in the nearby villages, the mine management will suggest Roof top harvesting structures in the public buildings in nearby villages with prior consent from local gram panchayats to collect rain water and recharge the ground water through available dug wells/ tube wells. Also, the reservoir developed in mined out pit in 6.930 Ha area, will act as an additional source of water to the nearby villagers and will also help in recharging ground water table of the area.

1.4.5 Biological Environment

Regionally, the lease area is a part of southernmost hilly terrain of Chhotedongar Reserved Forest. There is no National Park, Wildlife Sanctuary and Biosphere Reserve within 10 km radius of the project site. No rare, endemic & endangered species were reported in the buffer zone. The core & buffer zone belong to mixed forest predominantly Sal & Dhawa species. Dust deposition on leaf lamina will takes place on nearby local plant species which may results in decline the rate of photosynthesis and retards the plant growth.

Proposed Biological Environment Conservation Measures

- Periodic maintenance of mineral transport roads
- Regular sprinkling of water through mobile tankers on mineral transport roads
- Covered Transport of ore
- Development of thick plantation around mine lease area
- Monitoring of dust fall at agriculture land located nearby the mining area

1.4.6 Socio-economic Environment

- There was no habitation or private land in the Chhotedongar Iron Ore Mine. There was no rehabilitation and resettlement involved in the project.
- Total 141 nos. manpower will be deployed directly during operation phase of Iron Ore Mine. Mostly local persons will be employed in the mine. Additional manpower requirement in the mine

will be employed from the nearby villages. Thus, there will not be any population growth in the area due to the proposed mining project.

- Mine management will take efforts as a part of CSR activity for improvement in civic amenities like sanitation, drinking water facilities, transport road, etc in the nearby villages.

1.5 ENVIRONMENTAL MONITORING PROGRAM

An Environmental Management Cell will be established for implementing 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 of Ambient Air Quality, Water table depth, Water quality, Ambient Noise Levels, Soil Quality, CSR activities etc will be carried out through MOEF accredited agencies regularly and reports will be submitted to CECB/MoEF. With the knowledge of baseline conditions, the monitoring program will serve as an indicator for any deterioration in environmental conditions due to operation of the mine so that suitable additional mitigation steps could be taken in time to safeguard the environment.

1.6 RISK ASSESSMENT & DISASTER MANAGEMENT PLAN

The assessment of risk in the Chhotedongar Iron Ore Mine has been estimated for Slope failure, Handling of explosives, Fly-rocks during blasting, Movement of HEMM, Inundation due to surface water, Dust hazards, Hazards associated with use of electricity/ Diesel Generator Sets and flooding of lower benches and corresponding mitigation measures are suggested in the Draft EIA/EMP report.

A detailed Disaster Management Plan for facing disasters due to natural effects and human reasons is prepared and incorporated in the draft EIA/EMP report for ensuring safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities. For effective implementation of Disaster Management Plan, it will be widely circulated and personnel training through rehearsals site facilities, procedures, duties and responsibilities, communications, etc is considered in details in the Disaster Management Plan.

1.7 PROJECT BENEFITS

The Chhotedongar Iron Ore mine project at Chhotedongar village would generate additional employment opportunities which would finally result in improvement in the quality of life of people of the nearby villages. In line with this CSR policy, M/s. Shri Bajrang Power and Ispat Ltd, Raipur will carry community welfare activities in the following areas:

- Education
- Community Health
- Livelihood & Employability
- Infrastructure Development
- Social Welfare

A budget of Rs. 12.00 Lakh per annum as recurring expenses is proposed for implementation of Socio-economic welfare activities for the nearby villages.

1.8 ENVIRONMENTAL MANAGEMENT PLAN

An Environmental Management Plan comprise of following set of mitigation, management, monitoring and institutional measures to be taken during implementation and operation of the project, to eliminate adverse environmental impacts or reduce them to acceptable levels.

- Overall conservation of environment.
- Minimization of natural resources and water.
- Safety, welfare and good health of the work force and populace.
- Ensure effective operation of all control measures.
- Vigilance against probable disasters and accidents.
- Monitoring of cumulative and longtime impacts.
- Ensure effective operation of all control measures.
- Control of waste generation and pollution.

Judicious use of the environmental management plan addresses the components of environment, which are likely to be affected by the different operations in the project. The capital cost of the project is approx. Rs.12.00 Crore. It is proposed to provide an amount of Rs. 72.00 Lakh as capital cost and Rs. 26.15 Lakhs per annum as recurring expenses towards implementation of the environmental action plan.

1.9 CONCLUSION

The proposed Chhotedongar Iron Ore Mine project of M/s. Shri Bajrang Power and Ispat Ltd, Raipur, will be beneficial for the development of the nearby villages. 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, 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 aspects 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 area and in nearby villages, etc. will be implemented. The CSR activities proposed to be carried out by the mine management will improve the social, economic status of the nearby villages.

The overall impacts of the Chhotedongar Iron Ore Mine will be positive and will result in overall socio-economic growth of the nearby villages apart from the reveneu generation through utilization of minerals in steel and ancillary industries.