



PUBLIC HEARING DOCUMENT OF EIA/EMP

FOR

CAPACITY ENHANCEMENT OF EXISTING GEVRA OPENCAST PROJECT

(Gevra Area)

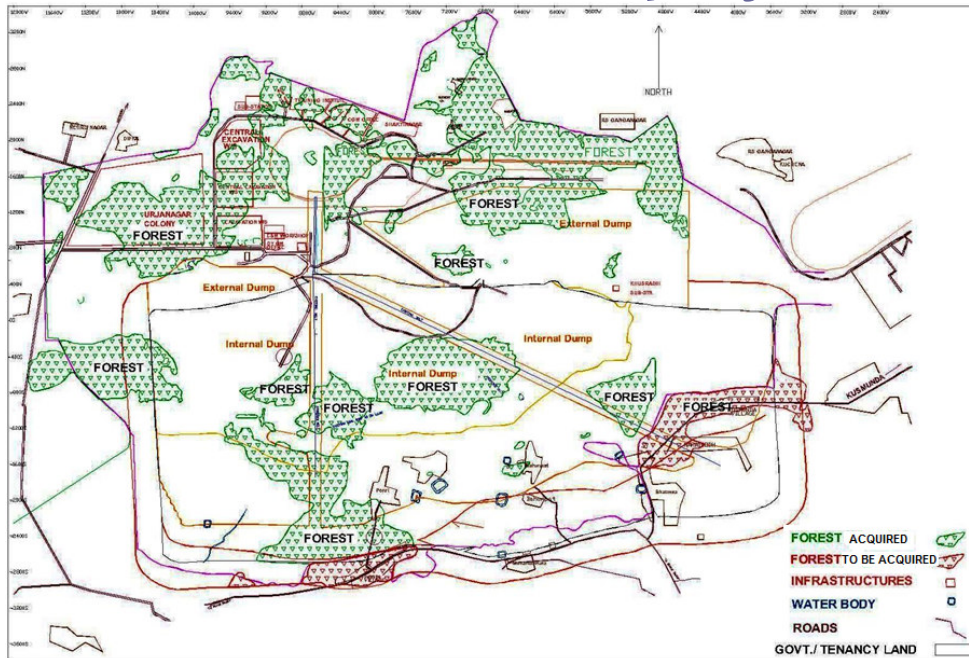
**Village: Gevra; Tahsil: Katghora; District: Korba;
State: Chhattisgarh**

Capacity: 41.00 MTPA to 45.00 MTPA

Project area: 4184.486 Ha.

South Eastern Coalfields Limited

(A Mini Ratna Company)



JULY 2017

**Central Mine Planning & Design Institute Limited
Regional Institute – V
SECL Complex, Post Box No. 22
BILASPUR (C.G.)**

1.1 INTRODUCTION :

1.1.1 Purpose:

Purpose of the project:

The Gevra OCM is an existing mega opencast project in the thick seam zone of SECL command area. It is under the administrative control of Gevra Area.

Mining Plan of the project for 35 MTPA was approved by the Ministry of Coal on 20.12.2006. Further, EC was granted vide letter no. J-11015/484/2007-IA.II(M) dated 3rd June 2009 for capacity expansion from 25 MTPA to 35 MTPA.

Gevra OCP had the potential to produce coal 35% higher than 35 MTPA. In view of this, it was proposed to increase the coal production from 35 MTPA to 47.25 MTPA. However, EC was issued vide letter no. J-11015/85/2010-IA-II(M) dated 31st January 2014 to enhance the production to 40 MTPA. Further, the production was increased to 41 MTPA and Environmental Clearance (EC) was issued vide letter no. J-11015/85/2010-IA-II(M) dated 6th February 2015.

Based on “Road Map for Enhancement Coal Production of CIL” the target of SECL for the year 2017-18 is 165 MT. To meet this growth in production of SECL in the year 2017-18 and to avoid consequential delay in opening of new project, Gevra OC has been identified for enhancement of production from its present production of 41 MTPA to proposed production of 70 MTPA. However, since the land/ forestland required to produce 70 MTPA is yet to be acquired, increasing production to 45 MTPA is proposed as a Stop-Gap Arrangement, for next 3-5 years, in the process of increasing production capacity from 41 MTPA to 70 MTPA. As soon as the additional land is acquired, application to MoEF&CC would be made to increase the production from 45 MTPA to 70 MTPA.

Since this proposal of 45 MTPA is a Stop-Gap Arrangement between coal production of 41 MTPA and 70 MTPA, calendar programme, provision of infrastructure, and other financial provisions for Environmental protection, including submission of annual corpus for mine closure, will be done as per the approved Project Report of Gevra OC (70 MTPA).

Till date, total land acquired for Gevra OC is 4184.486 Ha and for the last two years (2014-15 and 2015-16) Gevra OCP has been producing 41 MTPA of coal in this already acquired land. In view of available coal reserves in 4184.486 Ha of acquired land and dispatch infrastructure of 45 MTPA available, it is proposed that production capacity of mine be further enhanced to 45 MTPA for first five years.

This additional coal @4 MTPA is proposed to be produced in the already acquired land of 4184.486 Ha which includes diversion of 1016.412 Ha of forest land out of which process for diversion of 112.385 ha is in progress and is awaited shortly (*Stage II forest clearance is available for 904.027 ha*). *Forest area of 112.385 ha will be broken up only after obtaining Stage-II forest clearance.* This enhancement of coal production from 41-45 MTPA is in accordance with the calendar program proposed in the approved PR of 70 MTPA.

SECL Board approved the mine plan of 45 MTPA in its 253rd meeting held on 13.01.2017.

This application is being made under clause 7(i) of EIA Notification, 2006 for grant of Environmental Clearance (EC) to enhance the production capacity of Gevra OCP from 41 to 45 MTPA.

1.1.2 Location:

Gevra Opencast Block is located in the South-Central part of Korba Coalfield in Korba District of Chhattisgarh. The Gevra Mining Block is having an area of about 19.03 sq.km. and is located in the Central part of Korba Coalfield. It is included in the Survey of India Topo-sheet No. 64 J/11 and is bounded by latitudes 22°18'00" N to 22°21'42" N and longitudes 82°32'00" E to 82°39'30" E.

1.1.3 Communication:

The block is well connected by rail and road. Gevra Road and Korba Railway Stations on Champa-Gevra Road branch line of S.E. Railway are at a distance of 10 km and 16 km respectively. Important distance by Rail to Gevra Road Station -

| | | |
|----------------------------|---|--------|
| From Bilaspur (Company HQ) | - | 93 km |
| From Howrah (CIL HQ) | - | 708 km |

1.1.4 Scope of the study:

CMPDI had started drilling in and around Gevra in 1977-78 and first phase of drilling was completed in 1986-87. However, the detailed drilling in second phase on the dip side started in 1997 and completed in 1998. On the basis of detailed drilling, G.R. was prepared. A total 81 boreholes were drilled in the mine take area of 20.00 sq.km. Based on GR, project report and further expansion project report and scheme/mining plan has been prepared. Based on GR & approved PR/Scheme/Mining Plan, EIA/EMP has been prepared.

Baseline environmental data in respect of micro-meteorological data, air, water, soil quality data, noise level data, flora & fauna data have been generated by Govt. approved labs.

Meteorological data has been collected from Indian Meteorological Department at Bilaspur and rainfall data from Katghora.

Socio economic data in respect of population statistics, economic profile, work force pattern, land use pattern, civic amenities etc. have been considered from census data 2011 and socio economic survey data generated by Govt. approved agency.

Data incorporated from PR-35 MTPA, PR of Gevra opencast expansion project-70 MTPA and other data collected from Area/Mine authority, Gevra opencast project.

Ground water data has been collected from Ground Water Survey Unit of Bilaspur District for Kaddidabri village and Kapatmura village.

1.2 Project description:

1.2.1 Need for the Project:

Liberation of power sector by Govt. of India has generated wide spread interests private & public sector investments in power generation and other industrial development. As such, there is an appreciable increase in the number of upcoming new projects as well as expansion of existing projects. The demand projection of coal nationally as well as from CIL/SECL is increasing rapidly. Hence, a road map has been prepared to meet the demand. CIL has to produce nearly 1 billion ton in 2019-20 in which SECL has to share 239 MT.

Based on the “Road Map for Enhancement Coal Production of CIL” the target of SECL for the year 2017-18 is 165 MT. To meet this growth in production of SECL in the year 2017-18, Gevra OC has been identified for enhancement of production from 41 MTPA to 70 MTPA. This proposal of Gevra OC (45 MTPA), in the land area of 4184.486 Ha, is being submitted as a Stop-Gap Arrangement for the next 2 years, until the remaining required land (for 70 MTPA) is acquired.

1.2.2 Justification:

- i. Sufficient strike length and additional proved reserves are also available at favourable stripping ratio on the dip side of existing Gevra OCP for planning its expansion to 45 Mty capacity.
- ii. As the project will be an expansion of the existing Gevra OCP, the basic infrastructure is already available and additional production can be planned with less gestation period.
- iii. All the additional 4 Mty production of Gevra OCP is proposed to be linked to Seepat STPS (under construction) of NTPC located at a distance of about 35 km from the project. The location of Gevra OCP is ideal for supplying coal to this STPS.
- iv. Coal from Gevra OCP is to be mined by open-cast method. It is characterized by the presence of up to four opencast seams with dip angles of 2°-6°. Seam thickness ranges from 1.10 m to 45.23 m. The thickest seam is Lower Kusmunda (19.28m-45.23m). Original mineable reserve was 1337.68 MT (as on 01/04/2014) at average strip ratio of 1.27.
- v. Considering all the above points and geo-mining parameters of the quarry, the annual production of 45 Mte is the optimum and sustainable production from this property.

1.2.3 Description of Coal Seams:

The block exhibits a rolling strike throughout the area. The strata including coal seams show a broad E-W trend. The strata in general shows southerly dip. The general dip of the strata varies from 2 deg-4 deg in Central & North-Eastern part. The dip of the strata varies from 6 deg-8 deg in South-East and Western part.

1.2.4 Reserve:

The reserves are depicted in the table below:

Table 1.1: Reserves within PR boundary as on 1/04/2014

| Coal Seam / Parting | Thickness Range (m) | | Geological Reserves (In MT) | Minable Reserves (In MT) | OB Volume (In MCum) | Inseam band OB (In MCum) |
|---------------------|---------------------|-------|-----------------------------|--------------------------|---------------------|--------------------------|
| | Min. | Max. | | | | |
| TOP OB | | | | | 594.91 | |
| C | 0.90 | 4.34 | 1.64 | 0.96 | | 0.04 |
| Parting | 9.96 | 20.46 | | | 4.59 | |
| DT | 0.70 | 7.97 | 9.67 | 7.52 | | 0.04 |
| Parting | 2.07 | 12.55 | | | 14.97 | |
| DB | 5.31 | 25.02 | 58.86 | 46.68 | | 1.31 |
| Parting | 60.12 | 90.05 | | | 102.67 | |
| EF | 2.95 | 19.95 | 101.43 | 80.27 | | 4.82 |
| Parting with DB | 63.64 | 78.69 | | | 100.54 | |
| E | 0.90 | 13.60 | 33.06 | 21.63 | | 0.32 |
| Parting | 2.42 | 7.08 | | | 8.69 | |
| F | 1.53 | 6.30 | 8.49 | 5.76 | | 0.22 |
| Parting with EF | 24.98 | 83.81 | | | 366.10 | |
| Parting with F | 55.35 | 93.70 | | | | |
| UK | 23.33 | 36.65 | 455.42 | 327.21 | | 17.18 |
| Parting with EF | 24.75 | 59.10 | | | 16.17 | |
| UTM | 11.60 | 17.95 | 11.68 | 9.29 | | 0.71 |
| Parting with EF | 8.11 | 37.70 | | | 31.58 | |
| Parting with F | 15.20 | 23.10 | | | | |
| UT | 0.69 | 5.85 | 11.32 | 8.35 | | 0.17 |
| Parting | 3.15 | 29.84 | | | 18.08 | |
| UMB | 19.00 | 31.76 | 37.29 | 29.85 | | 5.54 |
| Parting with UT | 5.81 | 32.29 | | | 5.95 | |
| UM1 | 1.85 | 3.75 | 2.85 | 1.26 | | 0.09 |
| Parting | 3.10 | 21.60 | | | 2.04 | |
| UM2 | 1.17 | 4.55 | 3.28 | 1.27 | | 0.12 |

| Coal Seam / Parting | Thickness Range (m) | | Geological Reserves (In MT) | Minable Reserves (In MT) | OB Volume (In MCum) | Inseam band OB (In MCum) |
|--|---------------------|-------|-----------------------------|--------------------------|---------------------|--------------------------|
| | Min. | Max. | | | | |
| Parting with UM2 | 2.90 | 17.85 | | | 5.57 | |
| Parting with UTM | 3.43 | 13.10 | | | | |
| UB | 7.27 | 17.25 | 19.18 | 10.90 | | 1.14 |
| Parting with UK | 39.80 | 87.25 | | | 404.61 | |
| LK | 43.78 | 70.34 | 729.14 | 474.11 | | 19.23 |
| Parting with UK | 45.14 | 94.00 | | | 230.70 | |
| Parting with UMB | 39.70 | 53.40 | | | | |
| Parting with UB | 36.05 | 70.25 | | | | |
| LKT | 27.85 | 43.73 | 243.12 | 174.89 | | 3.80 |
| Parting with UK | 23.31 | 60.19 | | | 82.38 | |
| Parting with UMB | 15.18 | 53.55 | | | | |
| Parting with UB | 10.18 | 55.64 | | | | |
| LT1 | 12.78 | 29.08 | 75.14 | 48.54 | | 2.48 |
| Parting with LT1 | 3.30 | 22.73 | | | 14.55 | |
| LT2 | 6.49 | 17.86 | 45.33 | 29.49 | | 0.83 |
| Parting with LKT | 3.27 | 38.00 | | | 101.86 | |
| Parting with LT2 | 10.93 | 40.25 | | | | |
| LKB | 3.28 | 23.19 | 94.06 | 59.68 | | 2.60 |
| | | | 1940.98 | 1337.68 | 2105.95 | 60.66 |
| TOTAL GEOLOGICAL RESERVES(MT) | | | | | | 1940.98 |
| TOTAL COAL(MT) as on 01.04.2014 | | | | | | 1337.68 |
| TOTAL OB(MCum) as on 01.04.2014 | | | | | | 2105.95 |
| TOTAL INSEAM BAND(MCum) as on 01.04.2014 | | | | | | 60.66 |
| TOTAL OB INCLUDING INSEAM BAND(MCum) as on 01.04.2014 | | | | | | 2166.61 |

Coal produced each in 2014-15, 2015-16 and 2016-17 was 41 MTPA. OB extracted in 2014-15 was 45.44 M.Cum., in 2015-16 was 44.01 MCum and that extracted in 2016-17 was 47.07 M.Cum. Hence, Balance Coal Reserve as on 01/04/2017 is 1214.68 MT and Balance OB as on 01/07/2017 is 2030.13 M.Cum. (As per approved PR of 70 MTPA).

1.2.5 Geo-mining characteristics:

The block exhibits a rolling strike throughout the area. The strata including coal seams show a broad E-W trend. The strata in general shows southerly dip. The general dip of the strata varies from 2°-4° in Central & North-Eastern part. The dip of the strata varies from 6°-8° in South-East and Western part.

The sequence of workable coal horizons worked out on their intersection in drill holes, along with the thickness and the thickness of the parting between seams is as given below:-

Table- 1.2: Sequence of coal seam

| Coal Seam / Parting | Thickness Range (m) | |
|---------------------|---------------------|-------|
| | Min. | Max. |
| C | 0.90 | 4.34 |
| Parting | 9.96 | 20.46 |
| DT | 0.70 | 7.97 |
| Parting | 2.07 | 12.55 |
| DB | 5.31 | 25.02 |
| Parting | 60.12 | 90.05 |
| EF | 2.95 | 19.95 |
| Parting with DB | 63.64 | 78.69 |
| E | 0.90 | 13.60 |
| Parting | 2.42 | 7.08 |
| F | 1.53 | 6.30 |
| Parting with EF | 24.98 | 83.81 |
| Parting with F | 55.35 | 93.70 |
| UK | 23.33 | 36.65 |
| Parting with EF | 24.75 | 59.10 |
| UTM | 11.60 | 17.95 |
| Parting with EF | 8.11 | 37.70 |
| Parting with F | 15.20 | 23.10 |
| UT | 0.69 | 5.85 |
| Parting | 3.15 | 29.84 |
| UMB | 19.00 | 31.76 |
| Parting with UT | 5.81 | 32.29 |
| UM1 | 1.85 | 3.75 |
| Parting | 3.10 | 21.60 |
| UM2 | 1.17 | 4.55 |
| Parting with UM2 | 2.90 | 17.85 |
| Parting with UTM | 3.43 | 13.10 |
| UB | 7.27 | 17.25 |
| Parting with UK | 39.80 | 87.25 |
| LK | 43.78 | 70.34 |
| Parting with UK | 45.14 | 94.00 |
| Parting with UMB | 39.70 | 53.40 |
| Parting with UB | 36.05 | 70.25 |
| LKT | 27.85 | 43.73 |

| Coal Seam / Parting | Thickness Range (m) | |
|---------------------|---------------------|-------|
| | Min. | Max. |
| Parting with UK | 23.31 | 60.19 |
| Parting with UMB | 15.18 | 53.55 |
| Parting with UB | 10.18 | 55.64 |
| LT1 | 12.78 | 29.08 |
| Parting with LT1 | 3.30 | 22.73 |
| LT2 | 6.49 | 17.86 |
| Parting with LKT | 3.27 | 38.00 |
| Parting with LT2 | 10.93 | 40.25 |

1.2.6 Method of mining:

Overburden would be excavated in a series of generally horizontal slices (benches). Generally, the maximum bench height would be maintained at 15-20m. Height of benches in the detrital mantle would be quite variable depending upon the thickness of these strata.

Coal too would be excavated in a series of generally horizontal slices (benches). Generally, the maximum bench height would be maintained at 15m. In the parting between UK & LK Seams and that between UK and E&F, the maximum bench height would be maintained at 15-20m.

Mining system has been shown vide Plate no. IV of EIA/EMP, indicating various system parameters for the average mining conditions, which are liable to variation on account of variable thickness of coal seams, variable thickness of partings as well as variable seam floor gradient. Some major system parameters are given below:-

1. Bench Height
 - Overburden - 15 - 18 m (generally)
 - Detrital Mantle - upto 8.0 m
 - Parting - 15 - 18 m
 - Coal - 15 - 18 m (for Surface Miner)
2. Pit Floor Gradient
 - Minimum - 2 - 4 Deg.
 - Maximum - 6 - 8 Deg.
3. Minimum Width of Transport Road/ Berm - 30 m
4. Usual Width of Coal Bench - 60 - 80 m
5. Usual Width of Spoil Bench - 30 m
6. Usual Height of Spoil Bench - 30 m
7. Bench Slope - 70 Degree
8. Overall Pit Slope (at 340 m depth) - 37 Degree

1.3 Description of the environment:

1.3.1 Study Area, Period, Components & Methodology:

Study area is considered area within 10 km radius from the periphery of the project as all the base line data have already been studied and assessed within this definition of ambit of the study area.

1.3.1.1 Components:

As mentioned before in section 3.1.1 of EIA/EMP.

1.3.1.2 Methodology:

1.3.1.3 Socioeconomic study:

Referring to Census 2011 the socioeconomic study has been made.

1.3.1.4 Land Use pattern:

Referring to Census data-2011, the Land Use pattern study has been considered.

1.3.2 Ambient Air Quality:

- A. Methodology:** The Ambient Air monitoring encompasses the results and statistical evaluation of the data monitored at six locations in the Gevra OC project site. The study includes baseline monitoring for ambient air for three Months from April to June 2016. The AAQM Stations were selected in such a way that One should be in Upwind, Two in Down Wind, One in Core Zone & Two in Predominant wind direction. Different parameters like SPM, PM10, PM2.5, Oxides of Sulphur, Oxides of Nitrogen, Ozone, Ammonia, CO, Lead, Nickel, Arsenic, Benzene, Benzo (a) Pyrine, Mercury, Chromium and Cadmium were monitored for representing the baseline status of ambient air quality within the study area. The following standard methods for collection, analysis & interpretation of data have been considered.

1.3.3 Water Quality:

- A. Sampling Methodology:** To assess the water quality of the project area, two locations, viz. Kadkidabri and Kapatmura, were selected for drinking water sampling, two ponds from two villages viz. Jhabar & Raliya village were selected for surface water sampling & Mine water at discharge point & Mine water after settling tank were collected for effluent water quality assessment throughout the project period.

The quality of drinking water samples were compared with respect to IS 10500:2012 specification, the surface water quality was compared with respect to IS 2296: 1982 Class C, the effluent water quality was compared with respect to GSR no 422(E) of part A (Class-A) Bacterial examination was also carried out to find out the coliform contamination in drinking water sources.

1.3.4 Noise Quality:

- A. Sampling Methodology:** To know the background ambient noise level at the project and surrounding environment, noise level were measured at all the ambient air monitoring stations. The Day time & Night time Noise Level data are given in

tabular formats as well as in graphical way for easy interpretation. Day Time means 06:00 am to 10:00 pm & Night Time means 10:00 pm to 06:00 am.

$$Leq = \frac{10 \text{ Log}_{10} (t_1 \times 10^{L_1/10} + t_2 \times 10^{L_2/10} + t_3 \times 10^{L_3/10} + \dots)}{T}$$

Where,

- Leq = Equivalent continuous noise level (dB) (A)
- t₁ = time at L₁ (Hours)
- t₂ = time at L₂ (Hours)
- L₁ = sound pressure level dB (A) at time 1
- T = total time over which the Leq is required (Hours)

- B. Noise Level Monitoring:** “Protocol for Ambient Level Noise Monitoring, CPCB July 2015” was followed to collect and analyze the Ambient Noise level surrounding the Project Site.

Table – 1.3 Noise Monitoring Protocol

| Parameters | Standard Methods | Analytical Instruments | Make & Model |
|------------|---|------------------------|--------------|
| Leq | Protocol for Ambient Level Noise Monitoring, CPCB July 2015 | Noise Level Meter | HTC, 1352 |

1.3.5 Soil Quality:

- A. Methodology:** “Indian Standard Method of Test for Soils (IS: 2720)” & “Soil Chemical Analysis by M. L. Jackson” for the analysis of soil sample in the laboratory have been followed. pH of Soil is analyzed by pH Meter after overnight shaking of 10% soil solution. Electrical conductivity of Soil is determined by Conductivity Meter of the same soil solution. SAR is determined by mathematical calculation after the analysis of Na, Ca, Mg, K in soil by Atomic Absorption Spectrophotometer (AAS). Water Holding Capacity is determined gravimetrically by taking a measured amount of soil sample and by using Whatman 42 filter paper. WHC is actually the amount of water which is absorbed by the measured amount of soil sample. Specific gravity is measured gravimetrically by calibrated pycnometer with respect to the density of Water. Ammoniacal Nitrogen is measured by digesting soil with freshly prepared NaOH solution and absorbed in borate buffer & indicating boric acid solution and then titrating against 0.01N sulphuric acid. Phosphorus is measured in UVVisible spectrometer at 430 nm by developing colour with molybdo venadate reagent. Potas (as K₂O) is calculated from the concentration of available potassium by AAS. Cation exchange capacity is calculated by measuring the sodium content of 10% of the solution by AAS by adding 25 ml of 1.0 M sodium acetate solution and by centrifuging it at 2000 rpm and after getting the sample whose EC is below 40 mS/cm.

Mechanical soil analysis (Soil Texture) is determined by hydrometer by taking 10 gm of soil sample and by giving 10 ml of sodium hexametaphosphate solution to break down the soil aggregates by taking the hydrometer readings in a room temperature in different time intervals like 40 sec and 2 hour. Organic carbon is calculated by digesting 1 gm of the soil with conc. H₂SO₄ and 1 N K₂Cr₂O₇ solution in digester and by titrating against ferrous ammonium sulphate solution with ferroin indicator.

1.3.6 Socio -Economic Profile:

Socio-economic study including demographic, economic, workforce, civic amenities and basic & civic amenities within 10 km. radius of the project is based on 2011 census data.

A. Methodology:

The study of Socio-economic environment is an integral part of Environmental Impact Assessment (EIA). The study includes the Social profile, Economic, Infrastructure facilities, Occurrence of historical / Archaeological sites and presence of important features of the study area (Core zone and Buffer zone 10 Km radius from mine lease area). Census 2011 Village boundary map is used as a reference for identifying the villages. All the information is collected from the census and reported in this report.

In order to validate the census data, house hold survey of 250 households was made by floating questionnaire to the residence and local people/Village head (Mukhia/Sarpanch) of different project affected villages. House Hold data was collected in the presence of representative of South Eastern Coalfields Ltd. Sample size varies as per need, time and convenience. Occupational health status of the above for the different age group and sex was also collected.

B. Rationale behind sampling:

As per census 2011, since there is no inhabitation in core zone or within 500m boundary from core zone, villages from buffer zone closest to the core zone boundary were selected and surveyed. Villages were present in the Villages for HH Survey was chosen as per Accessibility, Population density, Vicinity to core zone.

1.3.7 Land use distribution:

Land use and land management practices have a major impact on natural resources, including water, soil, nutrients, plants and animals. Land use information can be used to develop solutions for Natural Resource Management.

A. Core Zone Land use:

Presently, the mine is producing 41 Mty in the already acquired land of 4184.486 Ha. This includes land for quarry, external dumps, infrastructure, workshop, administrative building, roads, green belt and safety zone etc. The break-up of land use for 4184.486 Ha. for 45.00 MTPA is as given in table-1.4 below:

Table-1.4 Land Use

| Particulars | Tenancy Land (Ha.) | Forest Land (Ha.) | Government Land (Ha.) | Total Land (Ha.) |
|------------------------------------|---------------------------|--------------------------|------------------------------|-------------------------|
| Quarry Area | 1285.888 | 441.410 | 304.952 | 2032.250 |
| Area for Top Soil in Quarry | 0.00 | 0.00 | 5.00 | 5.00 |
| External Dump | 291.31 | 0.00 | 188.69 | 480.00 |
| Infrastructure, etc. | 504.509 | 509.434 | 88.839 | 1102.782 |
| Roads | 6.00 | 0.00 | 0.00 | 6.00 |
| Residential Colony | 65.00 | 0.00 | 0.00 | 65.00 |
| R&R Site | 69.28 | 0.00 | 0.00 | 69.28 |
| Explosives Magazine | 0.00 | 6.00 | 0.00 | 6.00 |
| Nala Diversion, if any | 0.00 | 0.00 | 0.00 | 0.00 |
| Safety Zone | 298.584 | 59.568 | 60.022 | 418.174 |
| Total Land | 2520.571 | 1016.412 | 647.503 | 4184.486 |

The detailed land use map is prepared based on topo-sheets and then supplemented by information collected from Forest Department, revenue department and mouza maps of the neighbouring villages. Study area map is shown in plate-II of EIA/EMP.

Census data of 2011 have been collected and utilised for knowing the land use pattern. Summarised details are shown in table-1.5.

Table-1.5: Summary Land – use distribution

| Forest Area | Area under Non-Agricultural Uses | Barren & Uncultivable Land Area | Permanent Pastures and Other Grazing Land Area | Land Under Miscellaneous Tree Crops etc. Area | Cultivable Waste Land Area | Total Un-irrigated Land Area | Area Irrigated by Source | Fallow Land |
|-------------|----------------------------------|---------------------------------|--|---|----------------------------|------------------------------|--------------------------|-------------|
| 35.75% | 7.14% | 3.20% | 3.85% | 0.03% | 3.82% | 29.61% | 2.93% | 13.68% |

1.3.8 Meteorological Trend:

The meteorological data with respect Temperature for 1984 to 2014 are available so far from the nearest Bilaspur Meteorological Observatory, which is situated approximately 90 km. from the project. Brief description thereto is given as in table-3.9. The temperature varies from 5⁰C to 44.7⁰C. The average rainfall as per rain gauge station at Katghora for 1954 to 2014 is 1490.4 mm.

1.3.9 Micro-meteorological Study:

A) Location & Rationale of Sampling:

A Meteorological station was set up on the terrace of a house at “DETP” & Micro meteorological parameters like ambient temperature, relative humidity, wind direction, wind speed, rain fall & barometric pressure were recorded on hourly basis during the study period. Location is shown in Plate IIC of EIA/EMP.

B) Methods Followed: “EPA454/R99005, February 2000” was followed for micrometeorological data collection & result interpretation.

Table – 1.6 Standard Methods for Met Data

| Parameters | Standard Methods | Sensors | Make & Model |
|---------------------|------------------|----------------------------|--|
| Air Temperature | EPA454/R99005 | Digital sensor | Virtual Electronics Company (Eco Serise) |
| Relative Humidity | EPA454/R99005 | Digital Sensor(Hygrometer) | |
| Wind Speed | EPA454/R99005 | 3 Cup anemometer | |
| Wind Direction | EPA454/R99005 | Hall Effect (Wind Vane) | |
| Barometric Pressure | EPA454/R99005 | Piezo Resistive | |
| Rain Fall | EPA454/R99005 | Tipping Bucket | |

- C) **Weather Monitoring:** Weather monitoring would help in keeping track of different parameters like temperature, humidity, rainfall, wind direction, wind speed & barometric pressure. Real time meteorological data is used to support a number of programs including public aviation, agricultural activity, disaster management etc. In the present study, the “ambient temperature, relative humidity, wind speed, wind direction, barometric pressure, cloud cover” at the proposed project area are monitored.

1.3.10 Ambient air quality:

The locations for air sampling were selected on the basis of “joint site survey”, “examination of topo sheet of the project area”, “secondary micrometeorological data analysis”, historical wind direction pattern” and “availability of resources” for ambient air quality monitoring & micrometeorological monitoring. A synopsis about the locations is as follows:

Table – 1.7 Air Monitoring Stations

| Location Code | Name of Location | Latitude | Longitude | Wind Direction | Distance |
|---------------|------------------|------------------|------------------|----------------|----------|
| L1 | Rohina Village | N 22° 22'04.06'' | E 82° 37'06.74'' | Downwind(NNE) | 2.2 km |
| L2 | Kapatmura | N 22° | E 82° | Downwind(NE) | 1.9 km |
| L3 | Katkidabri | N 22° | E 82° | Upwind(SW) | 3.0 km |
| L4 | Salora Village | N 22° | E 82° | Crosswind(SE) | 0.8 km |
| L5 | Gobarghora | N 22° | E 82° | Crosswind(NW) | 1.7 km |
| L6 | Filter Plant, | N 22° | E 82° | Core Zone | 0 km |
| Weather | DETP | N 22° | E 82° | MET Data | 0.0 km |

AAQM Monitoring Stations:

Six Ambient Air Quality Monitoring stations were selected as per the Guidelines mentioned in IS:5182 (Part-14): 2000 for Rapid Environmental Impact Assessment in the project area. On the basis of wind rose pattern, these AAQM stations were so selected that one would be at upwind direction, two at downwind direction, two at crosswind direction & one at the core zone. Air Monitoring stations shown in Plate IIC of EIA/EMP.

Rohina Village (L1): It is selected to assess the baseline environmental status & to know the increase of the pollutant at the downwind direction of the project activity. This station was situated at north north east & nearly 2.2 km away from the core-zone.

Kapatmura village (L2): It is selected to assess the baseline environmental status at the downwind areas of the proposed project activity. This station was situated at north east & nearly 1.9 km away from the core-zone. The longitude & latitude of this station was 82° 38'34.17'' (E) & 22° 21'45.92'' (N).

Kadkidabri (L3): It is selected to assess the baseline environmental status in the upwind direction of the proposed project. This station was situated at south west & nearly 3.0 km away from the core- zone. It will help to know the background of the pollutant at the south west of the project. This station was situated at 22°17'35.91'' (N) & 82° 33'47.85'' (E).

Salora Village (L4): It is selected to assess the baseline environmental status in the crosswind areas of the proposed project. It will help to know the increase of the pollutant at the crosswind due project activities. This station was situated at south east & nearly 0.8 km away from the core-zone.

Gobarghora Village (L5): It is selected to assess the baseline environmental status at the crosswind direction of the proposed project activity. The longitude & latitude of this station was 82° 33'02.25'' (E) & 22°21'14.76'' (N). This station was situated at north west & nearly 1.7 km away from the core- zone.

Filter Plant, Gevra OC (L6): It is selected to assess the baseline environmental status at the core zone of the proposed project activity. The longitude & latitude of this station was 82° 33'38.06'' (E) & 22°20'44.36'' (N).

1.3.11 Water quality:

A) Inventory of existing water pollution sources:

Sources of pollution are given as in table-11.8

Table-1.8 Sources of Water Pollution

| Sl. No. | Sources | Major Pollutants |
|---------|--------------------------------|---|
| 1 | Mine Water | Coal fines/ suspended solid |
| 2 | Effluents from CHP/ Workshop | Suspended solids, oil & grease & COD |
| 3 | Domestic waste water discharge | Suspended solid and organic pollutants. |

B) Sampling Station & their Rationale:

Sampling Methodology: To assess the water quality of the project area, two locations, viz. Kadkidabri and Kapatmura, were selected for drinking water sampling, two ponds from two villages viz. Jhabar & Raliya village were selected for surface water sampling & Mine water at discharge point & Mine water after settling tank were collected for effluent water quality assessment throughout the project period.

Table-1.9 Water Monitoring Stations

| Sl. No. | Sources | Reason for selection |
|---------|--------------------------------|--|
| 1 | Borewell at Kadkidabri Village | To assess drinking water quality at village areas. |
| 2 | Borewell at Kapatmura Village | To assess drinking water quality at village areas. |
| 3 | Pond at Jhabar Village | To assess surface water quality |
| 4 | Pond at Raliya Village | To assess surface water quality |
| 5 | Mine water at discharge point | To assess effluent water quality. |
| 6 | Mine water after settling tank | To assess effluent water quality. |

The above locations/stations have been chosen in such a way so as to cover the Core and Buffer zone area of the mine. This will enable to obtain a comprehensive idea of water quality in and around the mining area.

1.3.12 Noise level:

At all locations, viz. Rohina Village, Kapatmura Village, Kadkidabri Village, Salora Village, Gobarghora Village, and Filter Plant, Gevra OC, the average value of Leq the average noise level at day time was in the range of around 60.9 dB(A) to 50.0 dB(A) & at night time it was in the range of 50.6 dB(A) to 42.7 dB(A). It is easily concluded that all the Leq values, for all the locations, both for Day & Night time were within the CPCB prescribed Limit.

1.3.13 Soil Quality:

pH value of 10% Soil solution was found in the range of 5.32 to 7.36. Electrical conductivity was found was in the range of 16 µs/cm to 110.20 µs/cm. Water holding capacity was found in the range of 31.9% to 33.40 %. The Specific gravity of the soil was in the range of 2.11 gm/cc to 2.29 gm/cc. Available Nitrogen was found in the range of 2.78 mg/kg to 8.38 mg/kg.

1.3.14 Forest flora & fauna:

A. Baseline status of flora:

Flora of the project areas is classified into Terrestrial and Aquatic flora.

Terrestrial Flora: Terrestrial flora consists of the following:

- (i) Agriculture crops cultivated (cereals, pulses and vegetables) during rainy season (Kharif) and post rainy moths of winter season (Rabi);

- (ii) Commercial crops;
- (iii) Natural vegetation of Forest type includes endemic species/ endangered species.
- (iv) Plantations and Agro-forestry species.
- (v) Grass lands.

B. Baseline status of fauna:

Animals have had specific responses to climate change. Species respond to climate changes by migration, adaptation, or if neither of those occur, death. These migrations can sometimes follow an animal's preferred temperature, elevation, soil, etc., as said terrain moves due to climate change. Adaptation can be either genetic or phenological, and death can occur in a local population only (extirpation) or as an entire species, otherwise known as extinction.

Climate changes is projected to affect individual organisms, populations, species distributions and ecosystem composition and function both directly (ex. Increased temperatures and changes in precipitation) and indirectly (through climate changing the intensity and frequency of disturbances such as wildfires and severe storms).

Every organism has a unique set of preferences or requirements, a niche and biodiversity has been tied to the diversity of animals' niches. These can include or be affected by temperature, aridity, resource availability, habitat requirements, enemies, soil characteristics, competitors, and pollinators. Since the factors that compose a niche can be so complex and interconnected, the niches of many animals are bound to be affected by climate change.

1.3.15 Hydrogeology:

Annual Groundwater Recharge:

In the study area, rainfall is the major recharge source to groundwater. This area experiences an average annual rainfall of about 1371 mm (Period: 1990-2015), monitored at GM Office, Gevra OCP. The highest rainfall recorded within 24 hrs was 205 mm as per PR. Part of the mine water discharged into the local drainage has been utilized by villagers for irrigational purposes and 20% of recharge to the groundwater system as a return flow.

Water table fluctuation method: The annual ground water recharge by water level fluctuation method, as specified in GEC, 1997, for the rechargeable area (567.22 km²) was estimated as 74.51 M.Cum (44.24 M.Cum + existing draft 30.27M.Cum). As the local ground water levels get affected near mine area, the recharge estimated by water level fluctuation method for future projections may not be authentic. Hence, in the present context, the rainfall infiltration method may be considered as more practical and reliable.

- a. **Rainfall infiltration method:** Of the total study area of 567.22 sq.km, about 412.22 sq.km is covered by sedimentary and rest by 155 hard rock (metamorphics). Gently undulating terrain was considered for the recharge estimation. As reported in GEC Report 1997, for sedimentary terrain (sandstone) an infiltration factor of 12% and 8% for hard rock (gneiss and schist) area were considered in the study area. Accordingly, the gross recharge in the study area was estimated, by rainfall infiltration method, as 84.82 M.Cum (Sedimentary: 67.82 + Hard rock: 17.0). After considering, 15% of gross recharge as natural losses (i.e. 12.72 M.Cum), the net annual groundwater recharge in study area was assessed as 72.10 M.Cum.

1.4 Anticipated Environmental Impact & Mitigation Measures:

1.4.1 Socio economic Impact:

Table-1.10 Socio-Economic impacts

| | |
|-------------|--|
| 1.00 | Impact on Socio-economic |
| 1.01 | Population Growth & In-migration |
| 1.02 | Human Settlement & Resettlement / Rehabilitation |
| 1.03 | Transport & Communication |
| 1.04 | Income & Employment |
| 1.05 | Civic Amenities& Community Development |
| 1.06 | Educational facilities & Literacy Drive |
| 1.07 | Economic growth |
| 1.08 | Growth of Financial Revenues- State & Central |
| 1.09 | Social status growth |

The above impacts are discussed below:

Table-1.11 Description of Socio-Economic Impacts

| Sl. No. | Impact on | Impact |
|---------|---|---|
| 1 | Population Growth & In-migration | Population growth in the project area as well as in the buffer zone is already accelerated owing to immigration of people from outside resulting in increased job and income opportunities. |
| 2 | Human Settlement & Resettlement/ Rehabilitation | The incoming population to the project is already moved in search of jobs; and thereby, a problem of new human settlement comes into existence, and additional worker colonies start growing in. In view of that, the existing civic amenities such as water supply, power supply etc. is in improvement with the ongoing of the project. Total number of PAFs involved is 3428 families. As on 30/06/2017, 838 families have been rehabilitated in 03 R & R sites and 785 families have taken cash compensation in lieu of house plot. 434 families are not eligible for house plot |

| Sl. No. | Impact on | Impact |
|---------|---|--|
| | | or cash grant. Balance 1371 families would be rehabilitated in due course. The total no. of land owners is 7632 and number of persons entitled for employment is 3695. Out of 3695 persons, 42 persons opted for cash compensation in lieu of employment and employment has been given to 2567 persons till date. Balance 1086 persons are to be given employment. |
| 3 | Transport & Communication | Due to increase in industrial activities and population growth in the area, the existing transport and communication system have already improved with a view to catering to increased traffic volume and frequency. |
| 4 | Income & Employment | Coal mining project forms the basic sector of employment. With increase in income opportunities and employment potentialities in this sector as the mining activities increase, the other economic sectors starts gaining in momentum. New avenues of employment in the sectors such as construction, trade & commerce and service is also getting on the move resulting in shooting up demand of workers and others. |
| 5. | Civic Amenities & Community Development | Due to the infrastructural facilities created and the consequent migrational happenings in the project area and nearby, socio-cultural interaction has resulted amongst population consisting of people from different areas. With added educational, medical and communication facilities developed in the areas, the standard of living has improved. With ongoing of mining activities additional facilities for local population by way of better communication, postal services, educational facilities, advanced medical services etc. are on in the area. |
| 6 | Educational facilities & Literacy Drive | A number of educational institutes are already existing in the buffer zone. This has attracted nearby villages to avail such facilities which in turn has increased literacy level in the area. An action plan for achieving 100% literacy among workers in the SECL, was launched in the year 1992. Under the same scheme, workers of Gevra project will be covered to achieve 100% literacy level. |
| 7 | Economic growth | The mining activities have accelerated the economic transformation and urbanization in the region with the creation of new employment opportunities. This has boosted or will boost the economic growth of the region. |
| 8 | Growth of Financial Revenues- State & Central | State Government is benefited through financial revenues in crores of rupees by way of royalty, sales tax etc. from the direct and indirect operations in the project area. Central exchequer is also getting financial revenues by way of Income tax, Central Sales Tax etc. |
| 9 | Social status growth | There is a marked change in social status of the area with opening of the project. |

1.4.2 Impact on land use:

Table - 1.12 Impacts on Land Use

| SI No. | Parameters | Impact Assessment | |
|--------|--|---|--|
| | | Within mining area | Outside mining area |
| 1.00 | Topography | In the quarry area, the dump area and the mining equipment area, there will be a marked change in topography. | No appreciable damage is envisaged. |
| 2.0 | Change in Landscape and Land use pattern than pre-mining scenario such as visual impact-loss of aesthetic beauty, ugly scar on land; deforestation-loss of surface soil and vegetation cover | Total scenario of landscape and land use pattern will undergo a stark change. | Landscape and land use pattern will change where erection and development of plants, service /allied services buildings are established. |
| 3.0 | Change in Surface Drainage | There will be a stark change in surface drainage; rather a new pattern drainage will be developed. | Surface drainage is likely to change where construction of colony, roads and drains is to be executed. |

1.4.3 Impact on environment:

A. Air environment:-

Table - 1.13 Impacts on Air

| SI No. | Parameters | Impact Assessment | |
|--------|--------------------------|---|---|
| 1.00 | Meteorological condition | Coal dumps are susceptible to fire, and combustion may occur therein; hence there may be a likely change in ambient temperature, wind speed and direction to somewhat extent. | |
| 2.00 | Ambient air quality | Type | Impact |
| 2.01 | | Direct | Minimal increase in dust & noxious emission to the air owing to transport vehicles, Blasting, coal & dump handling causing to slight increase in the ambient SPM and CO levels. |

| | | | |
|------|--|------------|---|
| 2.02 | | Indirect | Surface coal transport & dump handling & Workshop will generate indirect impact in the long run |
| 2.03 | | Short term | Drilling and Blasting may be attributed to slight increase in the ambient SPM and CO levels |
| 2.04 | | Long term | Surface coal transport, dump handling & Workshop will produce long term impact upon the air quality |

B. Water environment :-

Table - 1.14 Impacts on Water

| Sl. No. | Parameters | Impacts Assessment |
|-------------|---|--|
| 1.00 | Hydro-geological-Ground water | |
| 1.01 | Topography & Drainage | Topography and drainage by developing micro basins |
| 1.02 | Aquifer geometry | Changes in aquifer geometry, water level in the vicinity of the mine and disturb ground water flow direction. This can also create secondary fractures and higher permeability zones within the aquifer. After the mining activity, the aquifer restores its original water level and mined out area acts as a good reservoir. |
| 1.03 | Water levels | . |
| 2.00 | Water Quality- Physico-Chemical and Bacteriological ones | |
| 2.01 | Ground Water Quality | |
| 2.02 | Surface Water Quality | |

C. Noise environment :-

Table - 1.15 Noise Impact

| Sl. No. | Parameters | Impacts Assessment |
|---------|---|--|
| 1.00 | Increase in Noise Levels at drilling and blasting | May have impact upon the workers and the nearby habitants. The impact of noise more than permissible dosage may cause Annoyance and irritation, Mental and Physical fatigue, Interference in normal activities, Health hazards resulting from impaired hearing. In extreme cases, cardio-vascular diseases etc., Task interference, Interference with communication i.e., masking. |
| 2.00 | Increase in Noise Levels at Operation of HEMMs like shovel, dumper, dozer, excavator etc. | Do |

| | | |
|------|---|----|
| 3.00 | Increase in Noise Levels at Operation of equipment in CHP, workshop etc | Do |
| 4.00 | Increase in Noise Levels due to transport system | Do |

D. Soil Environment:

Table - 1.16 Impacts on Soil

| Sl. No. | Parameters | Impact Assessment |
|---------|---|---|
| 1.00 | pH | Existing pH of the soil level 7.36 to 5.32 is alkaline indicative and the mining activities are mainly opencast, therefore, the likely effect on surface soil quality will be to a few extent. |
| 2.00 | Electrical conductivity(EC) | Existing EC being 110.2 to 16 µs/cm is not going to an appreciable change as the mining activities are mainly opencast, therefore, the likely effect on surface soil quality will be to some extent. It will hardly attain harmful germination condition level of EC in this project. |
| 3.00 | N, K & P | The mining activities are mainly opencast, therefore, dump leachate may have likely some extent of effect on surface soil quality. |
| 4.00 | Soil characteristics, erosion aspects and engineering parameters such as Textural class, Bulk density, Liquid limit, Field capacity, Wilting coefficient and Water storage capacity | The mining activities are mainly opencast, therefore, the likely effect on surface soil quality will be to a few extent. |

E. Solid Waste:

Table - 1.17 Impacts of Solid waste

| Sl No. | Pollution source | Impact Assessment |
|--------|------------------|--|
| 1.00 | External dumps. | The top R.L. of the OB dump would be 400 m which is 90 m above the general topography. This will cause obstruction to the surface drainage pattern. Source of air & water pollution due to wind & water erosion until vegetative cover has been grown up on the dump surface. |
| 2.00 | Internal dumps | Same as above |
| 3.00 | Top soil dumps | Same as above |

F. Health Environment:

Table - 1.18 Impacts on Health

| Sl No. | Health affecting factors | Impact assessment |
|--------|--------------------------|--|
| 1.00 | Air pollution borne | Slight expected increase of SPM/RPM can cause minor problems like bronchitis, bissynosis, throat infections, lung infections, etc among workers within mines premises, but, the increase is expected to be nominal being it an opencast project. |
| 2.00 | Water pollution borne | Water quality affected by mining activities and if not treated will give rise to gastro-intestinal disorders among people if they take in polluted water. |
| 3.00 | Noise pollution borne | Workers working near higher level noise emitting mining equipment are likely to get affected with annoyance and irritation, mental and physical fatigue, interference in normal activities, health hazards resulting from impaired hearing, in extreme cases, cardio-vascular diseases etc., task interference, interference with communication i.e. masking, Hypertension and higher blood cholesterol. |

G. Flora & Fauna:-

Table - 1.19 Impacts on Flora and Fauna

| Sl. No. | Parameters | Impact Assessment |
|-------------|------------------|--|
| 1.00 | Negative | |
| 1.01 | Vegetation Cover | <p>During survey it is observed that, areas which are important or sensitive for ecological reasons – wetlands, coastal zone, biospheres, mountains are not present within the 10 km buffer zone of the project. Also, areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration are not present within the study area.</p> <p>Except the area used for quarry excavation, erection & development of plants, service & allied structures, colony, roads, drains, culverts, etc., no other area is going to be affected directly or indirectly by mining activities.</p> <p>Hence, impact on flora and fauna out of core zone will not be of stark appreciable level.</p> |

| Sl. No. | Parameters | Impact Assessment |
|-------------|---|---|
| 1.02 | Forests degradation | <p>(i) Mining activities will be carried in 4184.486 Ha of land out of which 1016.412 Ha is forest land i.e. 24.29 % of total land of project is going to be affected.</p> <p>(ii) The impact on the terrestrial ecosystem due to operation of the proposed mining would mainly occur from deposition of air pollutants. By OB & coal transportation air pollution may affect photosynthesis and transpiration in plants by plugging their leaves pores. Dust in atmosphere, contributed by mining and associated activities, when deposited on leaves of the plants in the surrounding areas may thus retard their growth.</p> <p>(iii) There will be loss of vegetation by excavation and dumping thereby affecting the species for which such vegetation was the host.</p> <p>(iv) Although, SO₂ causes Necrosis disease in plants, the effects of air emissions on nearby vegetation and crop lands are not likely to be injurious and noticeable as the pollutants concentrations are expected to be well below the prescribed standards.</p> |
| 1.03 | Ecological change | <p>(i) As the fauna is closely related to and dependent on the flora, there will be movement of species away from mine core zone with the loss of vegetation and influence of noise, vibrations and lights, etc.</p> <p>(ii) Since, this is an expansion project without increasing its existing land area, the fauna of buffer zone will not be so disturbed due to enhancement of proposed mining activities.</p> <p>(iii) Pollution of surrounding water bodies and the Ahiran Nadi flowing adjacent to the core zone, may affect the aquatic bodies to some extent due to leaching from overburden dumps and pollutants from other activities.</p> |
| 1.04 | Hydro-geological aspects | <p>Owing to opencast project, water level and draw down are likely to be affected to a nominal value; ground water and surface water on which the flora and fauna of the area directly or indirectly depend upon are not going to be affected to an appreciable and discernible level.</p> |
| 2.00 | Positive | |
| 2.01 | Plantation work and forest & wild life conservation | <p>(i) Plantation work & conservation in reclaimed areas will develop habitat for flora & fauna</p> <p>(ii) Conservation of forest & wild life in a scientific way by project authorities will take care of flora & fauna to revive in the area.</p> |

H. Impact on Meteorology:

Meteorological data with respect to temperature for 1984 to 2014 have been collected from nearest IMD station at Bilaspur. The annual month-wise average rainfall for 1954 to 2014 have been collected from rain gauge station at Katghora. Average rainfall is 1371 mm. Maximum rainfall is received during monsoon months of June to September. During summer season, the temperature rises to a maximum of more than 44.7°C with daily maximum and minimum temperatures averaging about 39°C and 23°C respectively. In winter, daily maximum and minimum temperatures averaging at about 27°C and 5°C respectively.

Looking into general trend of rainfall, differences are within normal cyclic pattern and cannot be attributed to mining activity in the area. There is slight temperature variation in its annual cycle. The variation is normal and cannot be attributed to mining operations.

I. Impact on Hazards:

Ground Vibration:

Ground vibrations produced from blasting operations are another cause of environmental concern. Apart from the effective utilization of explosive energy in fragmenting and displacing rock mass, a lot of energy is wasted in the form of detrimental side effects like ground vibrations, air blast, fly rocks, etc. which create problems to miners as well as nearby inhabitants in many ways.

1.4.4 Environmental Conservation Measures:

A. Control measures for air pollution:

Following activities for air pollution control measures are being performed within the mining area and at coal handling plants and railway siding site in Gevra Expansion Project, Gevra Area:

1. Sufficient number of Mobile Water Sprinklers of capacity 70 KL are used for dust Suppression in mine haul roads and in coal tipper roads on regular basis.
2. At all along conveyor, Transfer Points, CHP, Silo's and at 30,000 T Ground Bunker water-sprinkling arrangement is working effectively to suppress dust at source. At all crusher/ Feeder breakers and at 5000 Te capacity Ground Bunker mist spray water sprinklers are operating for dust control. □
3. Trucks are optimally loaded to prevent spillage on haul roads. Coal loaded trucks are covered with tarpaulin before leaving the mine premises. □
4. Whenever the coal dust / slurry accumulate on Haul roads and other roads of Mine premises, the same is cleaned by the use of Graders & loaders. □
5. Dust extractors are working effectively in Drills to reduce dust emission. □
6. Extensive Plantation done on overburden dumps, which act as dust & noise barrier □between mine area and residential area. □
7. Thick green belts developed around residential areas. Also plantation done along colony □roads and around other mine infrastructures. □
8. Employees are provided with LP Gas connections, restricting burning of coal for

- domestic use.
- 9. All approach roads to mine and all other roads which are in regular use are concrete or black topped. Internal roads & other permanent haul roads in side mine are WBM roads.
- 10. Production from Surface Miners reduced the requirement of drilling & blasting and further crushing at In Pit & Surface crushers.

B. Water Conservation:

Following activities for water pollution control measures are being performed within the mining area and at coal handling plants and railway siding site in Gevra Expansion Project, Gevra Area:

1. Effluent Treatment Plant (ETP) is in operation for treating effluent water from HEMM Washing. After treatment, water is reused for HEMM washing. This ETP has zero discharge
2. Settling ponds are provided for treating the mine water discharge as well as OB Dump run-off.
3. Construction and maintenance of catch drain (11.5 KM length) around the active Mine. Check dams are provided in the catch drains.
4. Domestic Effluent Treatment Plant (DETP) is constructed for treating Domestic Effluent of the residential colonies.
5. Properly constructed storm water drains have been maintained in the colony.

C. Control measures for Noise:

The present noise levels are below the prescribed limits. If the impulsive noise levels increase due to mining operation, sufficient measures will be adopted to maintain the noise level within permissible limits at working zone. The following measures are being adopted and will be continued:

1. Generally the blasting operations are carried out in between 12.00 noon to 4.00 PM.
2. Proper maintenance of HEMM to reduce the avoidable vibrations and noise.
3. Employees who are exposed to higher level of noise are provided with Ear Plugs.
4. Extensive Plantation done on overburden dumps, which act as noise barrier between mine area and residential area.
5. Thick green belts developed around residential areas. Also plantation done along Colony roads and around other mine infrastructures. These green belts also act as noise barriers.
6. At crushers/feeder breakers synthetic liners are fitted in few hoppers to reduce noise generation.
7. HEMMs are provided with noise proof cabins for operators.
8. Shock tube initiation system of delay blasting is adopted for Coal & OB Blasting to reduce blast related noise & vibrations.
9. Introduction of Surface Miners reduced the requirement of drilling & blasting and further crushing at In Pit & Surface crushers.

D. Green Belt Development:

In the directions where natural forest does not exist, green belt of adequate width on Govt. land are being developed around the periphery of mining area. (Ref:-table – 1.20) The trees planted in the green belt area shall act as buffers and shock absorber against dusts, noise and stone flying. The trees in the green belt will be tall, wind firm, broad leaved and evergreen.

Table 1.20 Plantation Details

| STATEMENT SHOWING DETAILS OF PLANTATION OF GEVRA PROJECT | | | | | | | | |
|--|---------------------|--------------------------|--------------------------|----------------------------------|--------------------------------|-----------------------------------|------------------|------------------------------------|
| YEAR | PLANTATION DONE ON | | | | Total Plantation done (in nos) | CPT (1.5mx0.9 mx0.75m) (in Rmtrs) | GRASS BED (Nos.) | Expenditure (in Rupees) Apr to Mar |
| | On Plain area (nos) | On internal dumps (nos). | On External dumps (nos). | Total Plantation on dumps (nos). | | | | |
| 1986 | 236000 | 0 | 0 | 0 | 236000 | 0 | 0 | NA |
| 1987 | 245750 | 0 | 46000 | 46000 | 291750 | 0 | 0 | NA |
| 1988 | 419500 | 0 | 0 | 0 | 419500 | 0 | 0 | NA |
| 1989 | 454000 | 0 | 0 | 0 | 454000 | 0 | 0 | NA |
| 1990 | 372883 | 0 | 0 | 0 | 372883 | 0 | 0 | NA |
| 1991 | 360000 | 0 | 0 | 0 | 360000 | 0 | 0 | NA |
| 1992 | 64900 | 0 | 0 | 0 | 64900 | 0 | 0 | NA |
| 1993 | 87230 | 0 | 26970 | 26970 | 114200 | 0 | 0 | NA |
| 1994 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | NA |
| 1995 | 77000 | 0 | 0 | 0 | 77000 | 0 | 0 | 101055 |
| 1996 | 68000 | 0 | 64000 | 64000 | 132000 | 0 | 0 | 1591413.97 |
| 1997 | 50000 | 17500 | 105500 | 123000 | 173000 | 0 | 0 | 1455346.79 |
| 1998 | 42000 | 52150 | 31850 | 84000 | 126000 | 0 | 15000 | 1718392 |
| 1999 | 11950 | 0 | 65000 | 65000 | 76950 | 3150 | 18000 | 5224383.48 |
| 2000 | 0 | 0 | 130000 | 130000 | 130000 | 0 | 15000 | 2833272.2 |
| 2001 | 0 | 0 | 66000 | 66000 | 66000 | 0 | 13000 | 9349014.8 |
| 2002 | 10000 | 0 | 30000 | 30000 | 40000 | 500 | 4000 | 3055517.12 |
| 2003 | 30000 | 81000 | 20000 | 101000 | 131000 | 1270 | 15000 | 6831909.6 |
| 2004 | 22000 | 5500 | 78500 | 84000 | 106000 | 3583 | 36000 | 5227269.06 |
| 2005 | 76000 | 0 | 39500 | 39500 | 115500 | 4800.33 | 39500 | 12687575 |
| 2005 | 41500 | 0 | 0 | 0 | 41500 | 2000 | 0 | - |
| 2006 | 75000 | 40000 | 5000 | 45000 | 120000 | 4500 | 45000 | 5959232.66 |
| 2007 | 50000 | 0 | | 0 | 50000 | 0 | 0 | 5814353 |
| 2008 | 5000 | 0 | 20000 | 20000 | 25000 | 0 | 0 | 3389957.13 |
| 2009 | 32500 | 0 | 30000 | 30000 | 62,500 | 0 | 20000 | 4769806 |
| 2010 | 2500 | 36500 | | 36500 | 39,000 | 0 | 0 | 5343577 |
| 2011 | 0 | 27500 | 0 | 27500 | 27,500 | 0 | 12500 | 6323264 |
| 2012 | 10000 | 20000 | 0 | 20000 | 30000 | 0 | 3125 | 5701268.25 |
| 2013 | 5000 | 0 | 35000 | 35000 | 40000 | 0 | 5000 | 3648320 |
| 2014 | 0 | 0 | 20000 | 20000 | 20000 | 0 | 0 | 2811872 |
| 2015 | 0 | 0 | 80000 | 80000 | 80000 | 0 | 10000 | 7632507 |
| 2016 | 0 | 0 | 50000 | 50000 | 50000 | 0 | 0 | 5523344 (Up-to Dec) |

1.4.5 Mine closure planning:

Although, the mining activities may last a few decades, but they are liable to leave a long lasting impacts on the landscape, ecology and on local inhabitants.

The objective of mine closure plan is aimed at restoration / reclamation of disturbed area, which should be acceptable to local community as well as regulatory authority.

Mine closure is not something that happens at the end of a mine’s life, rather mine closure is an ongoing series of activities starting from the planning stage of a mine and ending with a suitably restored site that can be returned to the community. The mine closure is planned in two phases.

- a) The first phase/progressive site specific closure plan includes the various activities to be implemented over the life of the mine. The progressive mine closure plan of the project has been approved along with its mining plan. Mine closure cost calculations has been shown in table – 4.16 a. The closure plan approved its required fund under different heads as shown in table 4.16 b.
- b) This plan mentioned and incorporated changes depending upon the actual site condition during implementation, legal & societal requirements in future, availability of additional coal reserves, etc. As such a detailed final closure plan will be prepared five years before the actual/scheduled closure time of the mine. This plan will be the culmination of the activities given under progressive plan.

Since this proposal for enhancement of coal production to 45 MTPA is a stop-gap arrangement in the process of increasing coal production from 41 MTPA to 70 MTPA, the mine closure plan, escrow funds and other details will be followed as per the approved Mine Closure Plan for 70 MTPA.

1.4.6 Air Quality Impact Modelling:

(a) Details of model(s) used for AQIP including grid size, terrain features, and input meteorological data

Model named FDM, USEPA has been used to find out the incremental values of PM₁₀ on the baseline air monitoring stations in Table 11.7 as receptors due to proposed coal production of 45.0 MTY of Gevra OC Expansion Project (existing capacity of 41 MTY). Refer AQIP Output in pages AQM-1 to 22 in Annexure XIV of EIA/EMP.

(b) Maximum incremental GLC values of pollutants based on prediction exercise

Table 1.21 Incremental Values of Pollution

| S.No. | Receptor Locations code | Receptor Locations name | Baseline PM10 values (in µg/m3)- Mean value | Incremental Pollution load due to 4 MTY additional production by Gevra OC from 41 MTY to 45 MTY | | Net pollution load of PM10 (in µg/m3) | |
|-------|-------------------------|-------------------------|---|---|--------------|---------------------------------------|--------------|
| | | | | Without control | With Control | Without control | With Control |
| 1. | L1 | Rohina Village | 86 | 0.00 | 0.00 | 86.00 | 86.00 |
| 2. | L2 | Kapatmura Village | 84 | 0.04 | 0.02 | 84.04 | 84.02 |

| | | | | | | | |
|----|----|------------------------|-----|-------|-------|--------|--------|
| 3. | L3 | Katkidabri Village | 80 | 17.43 | 11.96 | 97.43 | 91.96 |
| 4. | L4 | Salora Village | 79 | 20.52 | 12.60 | 99.52 | 91.60 |
| 5. | L5 | Gobarghora Village | 80 | 5.35 | 3.46 | 85.35 | 83.46 |
| 6. | L6 | Filter Plant, Gevra OC | 166 | 24.24 | 18.23 | 190.24 | 184.23 |

1.5 Analysis of Alternatives:

A. Selection of Technology alternatives:

Method of work to be adopted for any seam depends on many aspects such as depth of occurrence, thickness and gradient of the seam, parting between the seams, structure, gassiness of the seam, geological disturbances etc. In addition the presence of village, built up area and other surface features play an important role in deciding the method of work.

Underground Mining:

Keeping in view the disposition of coal seams in the area, cover over the seams and occurrence of thick of seams it does not suit underground mining.

Opencast Mining:

The above factors have contributed towards selection of mining methods as opencast mining for the seams C, DT, DB, EF, UK (Upper Kusmunda) & LK (Lower Kusmunda) in descending order.

Keeping in view techno-economic viability and environmental consequences of each system the disposition of coal seam in the area does not suit underground mining techno-economically. Considering cover over the seam and occurrence of thick of seams, opencast mining has been proposed.

1.6 Environmental Monitoring Program:

Monitoring Schedule:

A monitoring schedule for Air, Water, and Noise levels is already in operation as per Standards of MOEF vide GSR 742 (E) dated 25.9.2000 & G.S.R-826 (E), dated 16/11/2009.

Ambient Air: Parameters monitored are SPM, PM₁₀, PM_{2.5}, SO₂, and NO_x at the frequency mentioned in GSR 742 (E) dated 25.9.2000 & G.S.R-826 (E), dated 16/11/2009. Monitoring of heavy metal contents such as lead, chromium, arsenic, nickel etc. in ambient air quality is being done half yearly.

Water: For effluent & surface water the parameters monitored are pH, Chemical Oxygen Demand, Total Suspended Solid, Oil & Grease at every fortnight and all parameters once in a year.

For drinking water, monitoring is being done as per IS.10500 once in a month.

Noise: Noise is being monitored during day & night at every fortnight.

Monitoring data thus generated are being submitted to SPCB by end of the following month.

1.7 Additional Studies:

1.7.1 Public consultation:

To ascertain the concern of local affected persons and others who have a plausible stake in environmental impacts due to operations of the project, public consultation for enhancing the production capacity from 41 MTPA to 45 MTPA will be conducted and proceedings will be included in the final EMP.

1.8 Project Benefits:

1.8.1 Secondary Employment opportunities:

The mine is located in a highly industrialized area of Korba district. A no. of mines like Dipka OC, Kasmunda OC and several underground mines of SECL and their colonies are situated in the study area. This has led to creation of social infrastructures like schools, hospitals, roads etc., which have helped in the economic development of the region. The expansion of mine will further help in development of region through CSR activities and creation of direct and indirect employment.

With the expansion of the project, there will be further improvement of the socio-economic status of the adjoining areas and will help to meet the energy demand of the nation. Project will lead to development of ancillary industries and an overall economic growth of nearby towns to supplement the population of the area.

The project is likely to give a boost to the economy of the area and providing primary and secondary employment to local people. There will be improvement in infrastructure facilities like drinking water, medical, educational, schools etc. There will be overall gain with respect to improvement in social and economic aspect. This will lead to the overall development of the society.

There will be spontaneous economic stimulus in the area with the expansion of opencast mine. Traders and private enterprises will grow in the area with this economic growth. Besides, the State exchequer will derive financial revenues through levy of royalty, sales tax etc. and Central Government will also be benefited by way of Central Sales Tax, Income Tax, Cess etc.

1.9 Environmental Cost Benefit Analysis:

MOEF while issuing TOR has not specifically indicated for carrying out ' Cost Benefit analysis ', hence the same has not been carried out.

1.10 Environmental Management Plan:

1.10.1 Socio Economic Measures :

A. Rehabilitation & Resettlement plan:

Total number of PAFs involved is 3428 families. As on 30/06/2017, 838 families have been rehabilitated in 03 R & R sites and 785 families have taken cash compensation in lieu of house plot. 434 families are not eligible for house plot or cash grant. Balance 1371 families would be rehabilitated in due course. The total no. of land owners is 7632 and number of persons entitled for employment is 3695. Out of 3695 persons, 42 persons opted for cash compensation in lieu of employment and employment has been given to 2567 persons till date. Balance 1086 persons are to be given employment.

1.10.2 Land Restoration:

Land reclamation of mined out areas is the prime need. It not only involves backfilling of overburden into the excavated voids but also includes operations required to bring the land to some productive use, i.e. agricultural, forestry or recreational purposes. Dump reclamation is continuous process and a major activity of progressive as well as final mine closure plan. (Ref: final stage reclamation plan in plate – V of EIA/EMP). Reclamation involves the following processes which include systematic handling, removal, storage, preservation and re-distribution of top soil after completion of technical reclamation. Finally biological reclamation with proper plantation technique is carried out.

1.10.3 Monitoring of Land Restoration / Reclamation:

Land is the most natural resource which embodies soil, water, flora, fauna and total ecosystem. All human activities are based on the land which is the most scarce natural resource in our country. Mining is a site specific industry and it could not be shifted anywhere else from the location where mineral occurs. It is a fact that surface mining activities do affect the land environment due ground breaking. Therefore, there is an urgent need to reclaim and restore the mined out land for its productive use for sustainable development of the area. This will not only mitigate environment degradation, but would also help in creating a more congenial environment for land acquisition by mining companies in future.

Keeping above in view, CIL issued a work order vide letter no. CIL/WBP/Env/2009/2428 dated 29/12/2009 to CMPDI for monitoring land reclamation. Status of all the opencast coal mines having 5 Mcum / annum (coal + OB) based on remote sensing satellite data, regularly on annual basis for sustainable development of mining. Another work order vide letter no. CIL/WBP/Env./2011 dated 23/08/2011 was issued by CIL for monitoring of less than 5 M Cum / (Coal + OB) annum (Coal + OB) capacity projects from the year 2011 at interval of 3 years. Further a revised work order was issued vide letter no. CIL/WBP/Env./2011/4706 dated 12/10/2012 from CIL for 2012 – 13 to 2016 – 17.

Objective: Objective of the land restoration/reclamation monitoring is to assess the area under back filling, plantation, social forestry, active mining area, water bodies,

distribution of waste land, agricultural land and forest in the leasehold area of the project. This will help in assessing the progressive status of mined land reclamation and to take up remedial measures, if any, required for environment protection.

1.10.4 Flora and Fauna Conservation Plan:

Mining activities will be carried in 4184.486 Ha of land out of which 1016.412 Ha is forest land i.e. 24.29 % of total land of project is going to be affected. The impact on the terrestrial ecosystem due to operation of the proposed mining would mainly occur from deposition of air pollutants. By OB & coal transportation air pollution may affect photosynthesis and transpiration in plants by plugging their leaves pores. Dust in atmosphere, contributed by mining and associated activities, when deposited on leaves of the plants in the surrounding areas may thus retard their growth. There will be loss of vegetation by excavation and dumping thereby affecting the species for which such vegetation was the host.

As the fauna is closely related to and dependent on the flora, there will be movement of species away from mine core zone with the loss of vegetation and influence of noise, vibrations and lights, etc.

Since, this is an expansion project without increasing its existing land area, the fauna of buffer zone will not be so disturbed due to enhancement of proposed mining activities.

Pollution of surrounding water bodies and the Ahiran Nadi flowing adjacent to the core zone, may affect the aquatic bodies to some extent due to leaching from overburden dumps and pollutants from other activities.

Owing to opencast project, water level and draw down are likely to be affected to a nominal value; ground water and surface water on which the flora and fauna of the area directly or indirectly depend upon are not going to be affected to an appreciable and discernible level.

However, Plantation work & conservation in reclaimed areas will develop habitat for flora & fauna. Conservation of forest & wild life in a scientific way by project authorities will take care of flora & fauna to revive in the area.

Details of flora & fauna present in study area has been shown in Chapter – III, which are all important from conservation point of view. SECL will take the following measures for their protection.

1.10.5 Protection measures:

With the help of the local people and employees watch will be kept on hunting of these animals. Forest and police department will be informed if such incident happens to take action against the offenders. If necessary help of Forest department will be taken to shift any such stranded animal to a safer place.

Care will be taken to stop undue biotic pressure (both man and its animal) in core and buffer zone. SECL, under the condition stipulated in forest land clearance, provides funds to Forest department for fencing the forest falling out of core zone. The fencing will further strengthen our attempt towards conservation efforts. In addition, while

under taking bio-reclamation of over burden dumps care will be taken to plant fruit trees.

1.10.6 Strengthening of water bodies:

Through Community development work in villages existing in the area existing water sources particularly the village tanks will be improved to provide drinking water to the local community so that biotic pressure on water resources used by fauna is gradually reduced. Snakes being a water loving animal will be greatly benefited by this program.

1.10.7 Afforestation:

Keeping the geo-climatic conditions of the area in mind the following tree species will be planted in the core zone (Over burden dumps, backfilled areas and vacant land) of the project:

- i. Mahwa (*Madhuca latifolia*) – For Deer etc. and a shady tree.
- ii. Jamun (*Syzigium cuminii*) – Monkey, deer etc. and a shady tree.
- iii. Aonla (*Emblica officinalis*) – For the people of the area. A shady tree.
- iv. Aam (*Mangifera indica*) – Monkey etc. and a shady tree.
- v. Tendu (*Dyospyros melanoxylon*) – Different animals and the local people.
- vi. Sehtoot (*Morus Alba*) – Different animals and the local people.
- vii. Guava (*Psidium guajava*) – Different animals and the local people.
- viii. Bad (*Ficus benghalensis*) - Deer and other animals. A shady tree.
- ix. Peepal (*Ficus religiosa*) – Deer and other animals. A shady tree.
- x. Imli (*Tamarindus indica*) – Many animals, the people and & shady tree.
- xi. Kusum (*Schleichera oleosa*) – Shady tree.
- xii. Lasoda (*Cordia dichotoma*) – Fruits for different animals.
- xiii. Kachnar (*Bauhinia varigata*) – Shady and ornamentals tree. Also for herbivores.
- xiv. Arjun (*Terminalia arjuna*) – Monkey etc. and a shady tree.

Planting of fruits and fruit bearing trees will improve the habitat of animals, and will attract birds, insects etc. also. Planting of trees like *Ficus* will provide gainful arboreal habitat to Snakes.

1.10.8 Control of forest fire, fire in coal seam and coal stock.

Fire can destroy the entire habitats (micro and macro) and its life supporting potential in a forest area. Fire does not spare fauna also. SECL will implement the existing DGMS stipulated fire protection norms on coal seams and coal stock. This will ensure that a congenial atmosphere is created and fire does not affect the fauna and flora as well.

SECL will also encourage its employees and villagers to report forest fires (if any) to Forest/Police department. SECL will also extend its firefighting capabilities whenever needed to forest department for fighting forest fires.

1.10.9 Funds for Conservation efforts:

In the EMP funds have been committed under capital & revenue heads for afforestation, reclamation and other miscellaneous expenditure. These funds will be utilized for conservation efforts. However any additional requirement for conservation plan will be met from the normal revenue expenditure of the opencast project.

1.11 Disclosure of Consultants Engaged:

Central Mine Planning & Design Institute Limited. Briefly, it is generally called as CMPDI. It is an ISO 9001 Company and one of the subsidiary companies of Coal India Ltd. (CIL)

Its registered corporate office is situated at Gondwana Place, Kanke Road, Ranchi-834 008, a capital city of Jharkhand state. It operates through seven strategically located Regional Institutes over six states territories of India. These Regional Institutes are engaged in exploration , planning & design works of other subsidiary companies of CIL, namely , ECL, BCCL, CCL,MCL, NCL, WCL,SECL and NECL.

The company was formerly known as Coal Mines Authority Limited. And, the Central Mine Planning & Design Institute Limited (herein after called as CMPDI) is a planning & design division of Coal India Limited (hereinafter called as CIL) as per Memorandum of Association of the company. The CIL is a holding company since November 01, 1975, and the CMPDIL is one of its subsidiaries since then. It is under Ministry of Coal, Government of India.

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