

Pre-feasibility Report of Karo Expansion OCP

1. INTRODUCTION

Karo Expansion OCP is located in Bokaro district of Jharkhand and lies in the B&K area of CCL. Presently opencast operations are being carried out in the minetake area of proposed Karo OCP (Quarry-I). The lay and disposition of coal seams are such that the mine capacity may be enhanced to 6.0 MTY and 5.0 MTY from Karo and Kaveri Blocks, respectively with opencast operation. The present proposal envisages opencast mining upto seam VI/VII combined in Karo block (Quarry-II) and seam VI/VII/VIII combined in Kaveri block (Quarry-I). The normative capacity of Karo Expansion OCP after expansion will become 11MTPA (15 MTPA peak).

Karo UG was in operation in Kaveri block partly within the mine take area of Quarry-I in Seam V & III underlying Seam VI/VII/VIII with a parting of about 35m. It was developed by Bord & Pillar method. It is suggested to avoid operation of underground mine simultaneously with the operation of Quarry-I of Karo OCP. Adequate safety precaution will be taken while working above underground workings and waterlogged area.

The Project Report of Karo Expansion OCP (March 2013) was approved by CCL Board in 396th (No 4 of 2013) meeting held on 21.05.2013.

2. ACCESSIBILITY AND COMMUNICATION

The East Bokaro Coalfield lies on the Gomoh-Barkakana-Dehri-on-Sone loop line of Eastern Railway. Bermo railway station on this line is located at a distance of about 5 Km to the south of Kaveri (Karo-II) Block.

The east-west running Gomia-Jarangdih-Phusro-Jaina More Road, which meets the Bishnugarh-Petarwar Road and Dhanbad-Ramgarh Road, connects the coalfield with Hazaribagh, Dhanbad and Ranchi. This road is located to the south of the Kaveri (Karo-II) Block. The block is also connected to Bokaro Thermal Power Station in the west and Phusro in the southeast by metal road. The nearest township Phusro, is situated at a distance of about 7 Km. Phusro is connected to the G.T. road by Phusro Dumri road. The nearest airport is Ranchi.

3. CLIMATE AND RAINFALL DATA

The climate is extreme. The summer, which is between April and June, is very hot. The maximum temperature reaches upto 46^oC during summer and the minimum temperature reaches 4^oC during winter months of December and January. The average rainfall is usually about 1200 mm during monsoon.

4. TOPOGRAPHY WITH DRAINAGE PATTERN OF AREA

The entire topography of the block is rugged and pronounced with hills and valleys. The ground elevation varies from a maximum of 335m in north to a minimum of 236m in the south of the block. The general slope is towards south.

The drainage of the block is controlled by two nalas namely Karo nala (HFL 244 m) and Gati nala (HFL 245 m to the west of Quarry-II) flowing towards south. These nalas ultimately flow into the Damodar River near Bokaro-Kargali Colliery. The block also has few ponds in the southeastern part.

5. EMP CLEARANCE

Environmental clearance of Revised EMP of Karo OCP (1.5 MTPA) was granted vide letter number J-11015/544/2009-IA.II(M) dated 24.12.2014.

LAND REQUIREMENT-

Details of land requirement is given below.

The project area is 543.84 Ha in core zone & 31.52 Ha land falling outside core zone is required for colony & clean coal conveyor layout (5 & 26.52 Ha respectively), so the total land requirement is 575.36 Ha.

NOTE: Forest land- 326.68 Ha in core zone+ 7.50 Ha for conveyor layout outside core zone.

6. STATUS OF FORESTRY CLEARANCE

FC granted for 77.43 ha forest land diverted vide letter number: F.No.8-22/2003-FC Dated 31st March 2004.

FC applied for 226.67 ha forest land on 9.03.2006. Advance CAMPA fund of Rs 18.20 crore deposited on 31.03.2015.

FC to be applied for 7.50 ha forest land for conveyor layout outside core zone & remaining forest land in core zone.

7. REHABILITATION & RESETTLEMENT

Karo Basti lies to the dip side of mine in Quarry I. This basti is to be rehabilitated as soon as possible for mine advance. Around 360 PAFs are to be rehabilitated from this basti.

8. AGENCY WISE EXPLORATION STATUS

A total of 7091.35m of drilling were done in 56 boreholes in Kaveri and Karo-I blocks by different agencies. Out of 56 boreholes, 25 boreholes drilled by NCDC and CMPDI fall within the Karo-I block and rest of the boreholes fall within the Kaveri block .

9. PIT FORMULATION STRATEGY

Following variant has been proposed in this Expansion Project Report for mining activity:

Coal	OB
Coal by Surface Miner & Dumpers-	OB by Electric Hyd. Shovels & Dumpers

It has been proposed to mine up to seam VI/VII/VIII combined (in Quarry I) and VI/VII combined (in Quarry-II).

Sequence of Operation

Due to moderate gradient (6° - 10°) of the property concurrent back filling is proposed while working in both the quarries. Both the quarries are proposed to be worked simultaneously to attain the targeted production.

Base Seam

In Quarry - I, the base Seam considered is Seam -VI/VII/VIII combined. In Quarry- II, the base Seam considered is Seam -VI/VII combined.

Mine Boundary

Quarry I (Kaveri / Karo II Block)

Northern Boundary

Along the incrop of Seam-VI/VII/VIII combined. The present extent of mining has also been considered while defining this boundary.

Western Boundary

Along faults F_3 , which is the common floor boundary with Quarry-II.

Southern Boundary

At a distance of about 30m from the DVC lease line.

Eastern Boundary

Along the fault F_{1b} that acts as the common floor boundary of this quarry with Amlo (Dhori West) OCP in the east of Quarry-I. Amlo has already worked upto the upthrow side of the fault and the area is free from any OB Dump.

Quarry II (Karo I Block)

Northern Boundary

Along the incrop zone of Seam-VI/VII combined.

Western Boundary

Leaving a minimum distance of 60m from Gati Nala

Southern Boundary

At a distance of about 30 m from the DVC leasehold line and 60m from Baid Karo village.

Eastern Boundary

Along fault F_3 . This partly forms a common boundary with Quarry-I.

Mineable Reserve

Sl.No.	Seam Name	Mineable Reserve (MT)		
		Quarry-I	Quarry-II	Total
1	Seam-VI/VII Combined		15.07	15.07
2	Seam-VIII		24.09	24.09
3	Seam-VI/VII/VIII Combined	28.41		28.41
4	Seam-IX	3.26	6.29	9.55
5	Seam-X	8.76	16.55	25.31
6	Seam-XI	1.62	1.12	2.74
Total		42.06	63.12	105.17

However reserve blocked between the inter quarry barrier (Coal Transport horizon) is proposed to be taken out from dip side to rise side gradually after exhaustion of both the quarry.

Calendar Program

YEARS	SUMMARISED CALENDAR PROGRAMME		
	COAL in (MT)	OB in Mcum	SR (Cum/Te)
1	3.00	2.45	0.82
2	6.00	4.90	0.82
3	11.00	9.19	0.84
4	11.00	9.97	0.91
5	11.00	9.97	0.91
6	11.00	9.73	0.88
7	11.00	9.41	0.86
8	11.00	8.91	0.81
9	11.00	8.81	0.80
10	8.56	7.22	0.84
11	6.00	5.54	0.92
12	4.62	4.27	0.92
TOTAL	105.18	90.38	0.86

10. TARGET OUTPUT AND MINE LIFE

Karo OCP has been planned for normative capacity of 11.0 MTY and peak capacity of 15.0 MTY. The target production will be achieved in 3rd year of quarry operation.

Integrated Project Life

The total life of the project is 15 years. The break-up is as under:

- Construction period: 3 years, including washery & infrastructure development period.
- Production build-up period: 2 years
- Production period with target output: 7 years
- Tapering period: 3 years
- Total period : 15 Years

11. MINE PARAMETERS

Final Stage Mine Parameters of Quarry I

Parameters	Unit	Min	Max
Mineable reserves	(MT)	42.06	
Total OB	(MCum)	30.09	
Average Stripping Ratio	(Cum/T)	0.71	
Capacity (Maximum)	(MTY)	5.00	
Length along strike at floor	Km	0.56	1.09
Length along strike at surface	Km	0.75	1.19
Width along dip at floor	Km	0.98	1.2
Width along dip at surface	Km	1.39	1.90
Depth of quarry	m	125	
Area of Excavation at floor	Sqkm	1.07	
Area of Excavation at surface	Sqkm	1.48	

Final Stage Mine Parameters of Quarry II

Parameters	Unit	Min	Max
Mineable reserves	(MT)	63.12	
Total OB	(MCum)	60.33	
Average Stripping Ratio	(Cum/T)	0.96	
Capacity (Maximum)	(MTY)	6.00	
Length along strike at floor	Km	0.48	1.19
Length along strike at surface	Km	0.57	1.39
Width along dip at floor	Km	1.05	1.2
Width along dip at surface	Km	1.24	1.39
Depth of quarry	m	110	
Area of Excavation at surface	Sqkm	1.48	

12. COAL WINING

Coal will be mined by surface miner in conjunction with F.E. loader (10 cum) and 100T rear dumpers. Coal from both the quarries will be transported from the coal face to the Pit Top through batter roads between the two quarries. The fault F-3, which separates the two quarries has been taken as the common boundary to optimize the usage of the faulted zone as transport zone. The batter thus formed in the common boundary reduces the lead for coal, considerably.

13. OVERBURDEN REMOVAL

OB / partings are envisaged to be removed by 10-12 cum Electric Hydraulic Shovel with 100 T Rear Dumpers. OB will be transported through batters on the side flanks of both the quarries to internal dump horizon.

14. DUMPING ARRANGEMENT

Quarry-I

The total volume of OB to be removed from Quarry I is estimated as 30.05 Mcum. It is envisaged to dump 10.68 Mcum externally and balance 19.38 Mcum internally. The external dumping would be undertaken during the initial years. Internal dumping will start from 3rd year of mine operation itself. External Dump will last upto 7th year of mine operation only. 7th year onwards, only internal dump will take place till the end of Quarry-I. Approach road to project has been designed at a distance of 20 m to the north side from toe of external dump. Proposed route of Karo nala diversion has been kept further 80 m from approach road.

Garland drain and retention wall where ever required around external dump have been provided from safety point of view.

Quarry-II

The total volume of OB to be removed from Quarry II is estimated as 60.33 Mcum. It is envisaged to dump 23.45 Mcum externally and balance 36.88 Mcum internally. The external dump will last upto 7th year and after that only internal dumping will take place till the end of quarry life. External OB is planned on non coal bearing land and small amount of forest land is involved (around 5 Hac only). This could not be avoided due to hilly terrain and forest land. Presently this quarry is virgin and dump has been designed so that internal dump could be

started in 3rd year of quarry operation itself. Approach road to external dump has been designed by filling of OB as and when required. Due to presence of undulating terrain it is required to prepare this road by filling of OB dump to maintain road gradient. Toe of external dump has been proposed at a safe distance of 80 m from the western outline of Charakpania village. Garland drain where ever required around the dump have been provided from safety point of view.

Dump Capacity

Dump Type		Volume (MCum)	Top RL (m)	Average height (m)
Quarry -I	External	10.68	+340	70
	Internal	19.38	+280	25
Quarry-II	External	23.45	+395	75
	Internal	36.88	+310	40

TOP SOIL MANAGEMENT

Soil management in opencast mine is necessary to re-establish the stability & productivity of lands degraded due to mining activities. It is proposed to dump and preserve top soil separately for use while reclaiming the land as well as external and internal dumps

VOID CREATION & MANAGEMENT

The void left at the end of mine life is about 24.16 Ha in Quarry-I and 18.42 Ha in Quarry-II, which is around 16 % of the quarry area in Quarry-I and 12 % of quarry area in Quarry-II. The void so formed will be left till the mine is extended up to the block boundary otherwise may be backfilled by rehandling of top layer of internal dump after end of the mine operation.

15. COAL HANDLING & DESPATCH

A pit top washery has been proposed for washing of non-coking coal @ 7 MTPA. Washed non coking coal will be fed through belt conveyors to nearby Kargali siding for rail dispatch through RLS. Kargali siding is about 5 km away. Coking coal produced from the mine @ 4 MTPA will be fed through belt conveyors to nearby Kargali washery/ siding for washing/ rail dispatch through a separate RLS.

About 1.7 MTPA of low quality fuel (ash 62.4%) generated in washery will be despatched for power generation to the proposed nearby FBC power plant.

16. LAND REQUIREMENT

Sl. no	Particulars of land (Area Ha)	Forest	Non- Forest	Total
1	Quarry	185.07	110.68	295.75
2	External OB dump-1	24.73	13.27	38.00
	External OB dump-2	5.00	52.24	57.24
3	Infrastructures	45.94	8.31	54.25
4	Safety zone	6.95	11.49	18.44
5	Road, nala diversion, green belt/vacant land	58.99	21.17	80.16
6	Res. colony*	0.00	5.00	5.00
7	Conveyer to Kargali Washery/ siding *	7.50	19.02	26.52
Total Land Required		334.18	241.18	575.36

*Land outside leasehold area.

17. FINANCIAL PROVISION

Project Cost

Total Capital cost of project is Rs. 1626.92 Crores.

Mine Closure Cost

Rs 5.68 per tonne (approx) of coal produced.

Cost of Environmental Control Measures & Allied Activities

Capital Cost

SN	Particulars	Amount (Rs Lakh)
Pollution Control		
1	Anti-pollution measures in mine & Industrial area	1142.28
2	Anti-pollution measures in township	89.55
Sub Total (1)		1231.83
Other Mitigation Measures		
3	Cost of rehabilitation	1274.40
4	Cost of compensatory afforestation	3477.83
5	Cost of restoration	10325.13
6	Other provisions	149.85
7	Compensation for non-forest land	1499.55
Sub Total (2)		16726.76
Grand Total (1+2)		17958.59

PRE-FEASIBILITY REPORT OF KARO WASHERY

SUMMARISED DATA

1. Capacity & Operating conditions
 - a) Annual Capacity (Mty) : 7.0
 - b) Daily Capacity (tonne) : 21500
 - c) Effective working hours per year : 6000
 - d) Hourly Capacity (tonne) : 1200
2. Raw coal linkage : Karo OCP
3. Development period in years : 3
(Including construction period of 1.5 years)
4. Life of the washery after commissioning (in years)
 - a) Considering raw coal availability : 12
5. Balance of Products

Product	Size (mm)	Wt%	Ash%	Qty. (Mty)
Deshaled coal	50-13	43.6	32.3	3.1
Untreated coal	(-)13	31.8	35.2	2.2
Washed coal	(-) 50	75.4	33.5	5.3
Rejects	50-13	24.6	62.4	1.7
Total		100.0	40.6	7.0

6. Broad initial capital investment : Rs. 269.88 Crores
7. Estimated operating cost/ te of Raw coal input : Rs. 119.03
8. Construction period including trial run, PGT & commissioning : 18 Months

PRE-FEASIBILITY REPORT

- 1.0 The Form-I for Karo OCP/ Karo Washery shall be submitted to MoEF after which the Terms of Reference (ToR) is expected to be prescribed by MoEF and then EIA & EMP preparation will be taken up during 2015-16. In view of this, Pre-Feasibility Report for Karo Washery has been prepared for incorporation in EIA & EMP Report.

- 2.0 The seams of linked mines of Karo OCP (VI/VII, VI/VII/VII and VIII) are not exposed. In view of this, the test results generated for Konar washery have been considered for preparation of this pre-feasibility report. It is prudent to mention here that the samples tested for Konar Washery were collected from seams VI/VII and VIII of Khasmahal OCP. As such, the Balance of Products predicted are broad and indicative only. The washability and other tests for RoM coal samples of Karo OCP are required to be assessed for determination of the likely quality of feed coal to Karo Washery, selection of process etc.

- 3.0 Generally, selection of the process depends on seamwise, yearwise production programme of linked mines, quality of feed to the proposed washery, full scale washability test results of representative RoM samples of linked feed coal for the life of the mine and desired quality of saleable product i.e. washed coal for use in thermal power stations. However, in light of non-availability of RoM coal samples as mentioned above, a process flowsheet for achieving washed coal at 33.5% has been finalised based on the available washability test results of Khasmahal OCP. The final process will be selected after generation of washability and other tests of representative RoM samples from the linked mines of Karo Washery.

- 4.0 The salient features of process flow for achieving the targeted ash of 33.5% for thermal power station is briefly mentioned hereafter.
 - ❖ Receiving raw coal of (-) 100 mm from Karo OCP through covered belt conveyors.
 - ❖ Storing of raw coal (-100 mm) in 11000 t ground storage.

- ❖ Reclamation of raw coal from ground storage and conveying the same to screen-cum-crusher house.
- ❖ Screening at 50 mm to obtain two size fractions i.e. 100-50mm & (-) 50 mm.
- ❖ Crushing of 100-50 mm coal down to 50 mm and mixing it with natural -50 mm coal.
- ❖ Conveying of entire -50 mm fraction to washery building.
- ❖ Screening of (-) 50 mm coal at 13 mm on vibrating screens to produce two size fractions i.e. 50-13 mm & -13 mm.
- ❖ Deshaling of 50-13 mm fraction in two product electronically controlled improved type jigs to produce deshaled coal (float) and rejects (sinks).
- ❖ Dewatering of deshaled coal obtained from jigs in double deck dewatering screens followed by dewatering of 25-13 mm fraction in basket type centrifuge.
- ❖ Conveying underflow of dewatering screens, centrifuge etc. in radial thickener for thickening.
- ❖ Dewatering of thickened slurry i.e. underflow of thickener in belt filter press and mixing of dewatered slurry with the product.
- ❖ Conveying of washed coal (i.e. deshaled coal 50-13 mm obtained from jigs, untreated -13 mm raw coal fraction and dewatered fines from belt filter press) from washery building to covered washed coal storage of 18000 t capacity.
- ❖ Dewatering of rejects produced from jigs in bucket elevators.
- ❖ Conveying of dewatered rejects by covered belt conveyor to Temporary Reject Storage Site.
- ❖ Reclamation of washed coal from covered storage and conveying to Kargali Washery Railway Siding. Washed coal will be loaded into Railway wagons through Rapid Loading System (3600/ 5500 tph) for onward dispatch to consumers.
- ❖ Provisioning of slurry pond(s) for emergency bleeding of thickener.
- ❖ Provision of rain water harvesting of roof top water.

5.0 Infrastructure facilities:

- a) Washery site An area of land around 22 Ha has been allocated for setting up of the washery including green belt of at least 10m width around the washery site as per the guidelines of the State

Pollution Control Board.

b) Water

During construction period, water shall be supplied from incline nos. III & V of Karo UG, which is closed and water logged since 2005. Total accumulated water in the above inclines is about 61 million gallon. By putting bore hole from surface to the dip most points i.e. quarry floor of both the U/G dip side workings water can be provided through submersible pumps. The distance of seam-III & seam-V are 980 mtr. and 1240 mtr. respectively.

The quantity of water required for operation & maintenance of the proposed washery is about 0.35 MGD. To supply water during operation, CCL has proposed to construct a check dam at Gati Nala which has total accumulated water around 40 million gallon in it. The distance of this check dam will be about 1 km from the proposed washery site. BOMO shall have to make arrangement for collection of water from the proposed check dam. However, construction of the proposed check dam and power supply arrangement for pumping of water from the source is in the scope of CCL.

c) Power

Requirement of power depends on the throughput capacity and the process selected. The tentative requirement of power is about 7.5 MVA for operation & maintenance of the proposed washery.

It is envisaged that the power at 33 kV level will be made available through an overhead transmission line (OHTL) from proposed sub-station of Karo OCP located at a distance of about 0.5 km from the washery site.

During construction period, power shall be supplied from the Excavation workshop of Karo OCP, which is at a distance of

0.5 km (approx.) through overhead line.

- d) Railway siding for Washed coal from the washed coal covered storage will be loading & dispatch reclaimed and conveyed through set of covered belt of saleable conveyors to the Kargali Washery Railway siding. The products tentative distance from the proposed washery site to the Railway siding is about 6.5 km. Washed coal will be loaded into Railway wagons through Rapid Loading System (3600/ 5500 tph) for onward transportation to consumers.

The construction of washed coal conveyors and Rapid Loading System (3600/ 5500 tph) is under the scope of BOMO and cost of the same will be included in the scope of BOM Operator. Responsibility of loading washed coal into Railway wagon is also in the scope of BOM operator. Construction/ strengthening of Railway siding is under the scope of CCL.

- e) Reject disposal/ utilisation Based on the technology selected, the likely average quantity of rejects to be produced from the washery has been estimated at about 1.7 Mty. A temporary reject storage site of 4.87 Ha area, situated between Gati Nala and the proposed washery, is identified for temporary storage of rejects. Rejects produced from the washery shall be transported by covered belt conveyor to this storage site by the BOM Operator. The rejects from this site shall be supplied to the proposed FBC based power plant near Konar Washery site by CCL.

5.0 Balance of products, operating conditions, capital cost, economics etc. are given in Summarised Data.