CHAPTER - V

MINING

5.0 Mining Status:-

Existing Status-

Phularitand Colliery-

Phularitand Colliery has a total Lease hold area of 741.88 Ha as per the official record of the Colliery. In this mining plan, a part of total Lease hold area falls in Cluster-II and rest part in Cluster-XV group of mines of BCCL. The Dhanbad-Chandrapura Railway line separates these two Clusters as common boundary. The northern part of Lease hold area of Phularitand Colliery falls in Cluster-II group of mines of BCCL whereas southern part falls in Cluster-XV.

Presently Phularitand Colliery is operating both underground and opencast/Quarry which are under consideration in this mining plan.

In past, a number of small quarries had been worked in scattered way towards northern side of lease hold area and mostly located along the incrop regions of different coal seams. Such old quarry (P.B Section) also exist on western part of the Colliery which was also worked in past with base as the floor of V/VI/VII seam and it was left as partially filled.

Later-on, BCCL/ Colliery authority has decided to make drivages from this quarry floor to approach underlying Seam-III. Two Inclines and drift drivages have been made and touched the coal seam. Coal production from Seam-III has been started from the year 2014-15. Coal is being produced from underground by Bord & Pillar mining method by drilling/blasting at face and produced coal is then transported to surface by SDL-Haulage combination through these Inclines.

In this Colliery, a quarry (Phularitand west patch) was also operated departmentally with floor of V/VI/VII seam as base of the quarry upto the year 2002-03. Later-on, a patch has been identified by BCCL in continuation of this quarry and work has been outsourced as hired HEMM patch. Production from this hired patch quarry on hired basis was commenced from 2009-10.This quarry is presently extracting earlier developed/depillared underground workings/sections of V/VI/VII Seam and also other seams lying above V/VI/VII combined Seam. The quarry face is advancing towards east of Phularitand Colliery property.

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As this quarry is being operating on hiring basis, after drilling/blasting at faces of Coal benches, produced coal is transported contractually by tipper trucks to Coal dump from where partly is send for local sale and rest is send to Mithon Power Limited by road. Produced coal from quarry is also sent to Coal Crushers to crush it in to required sizes before dispatch to KKC Railway sidings. Presently, overburden is being dumped within the excavated area and also in earlier worked old quarries.

Muraidih Colliery -

Earlier, there were two independent Collieries namely Muraidih Colliery and Shatabdi Colliery having separate lease boundaries. These Collieries were operated separately by underground as well as opencast mining method within their lease boundaries. In long back, both Muraidih and Shatabdi Collieries had underground B&P workings in V/VI/VII combined seam worked in different sections and also in seams lying above this combined seam.

In past, Muraidih Colliery had also an isolated underground B&P workings (partly developed/partly depillared) in limited area near incrop region of Seam-III and lying on northern side of Khudia(Khodo) Nala. A number of Inclines were made near incrop region of Seam-III & Seam-I which are sealed/dozed. In this area, small quarries were also worked with floor of Seam-III as base. OB dumps were also made at two/three places in this area. A small unused quarry of Seam-III is still exists in this area towards eastern part near Muridih Inclines made for Global bid project. In rest of the area, Seam-III and seams lying below this seam are still remains as virgin.

In Muraidih Colliery, a entire area has been excavated by opencast method with floor of V/VI/VII combined seam as base on southern side of Khuida(Khodo) Nala and mostly excavated earlier developed/depillared workings along with virgin areas of this seams as well as other seams lying above this V/VI/VII combined seam. A number of overburden dumps have been made on the floor of this V/VI/VII combined seam in scattered manner.

Shatabdih Colliery -

Shatabdi OCP was located on southern side of Muraidih OCP. This OCP has also excavated large area by opencast method with floor of V/VI/VII seam as base and excavated earlier developed /depillared workings or virgin areas within its lease hold

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area and dumps were made on the floor of V/VI/VII seam. Production from Shatabdi OCP was continued upto the year 2013-14 by departmental as well as contractual means.

In both Muraidih & Shataddih Colliery, there was active fire and excavated during opencast operation. Still fire exists in certain part of the existing Muraidih Colliery which is formed after amalgamation of earlier Muraidih Colliery and Shatabdih Colliery.

Amalgamated Muraidih Colliery-

Opencast-

Due to large scale of opencast operation in both Muraidih & Shatabdih opencast mines having same base, the common boundary separating both Collieries has been excavated to eliminate fire in the common boundary and as a result, workings of both Collieries are merged with each other. Considering this merger, BCCL authority has applied to DGMS for amalgamation of earlier Muraidih and Shatabdi Collieries into a single amalgamated Colliery. DGMS has given permission for amalgamation of Muraidih and Shatabdi Collieries into a single mine and presently amalgamated area is known as "amalgamated Muraidih Colliery" (Annexure-IX). The amalgamated Muraidih Colliery is presently excavating coal/OB departmentally from south-western part of the quarry i.e near to the earlier NLW Barora siding. After drilling/blasting at faces of Coal/OB benches, it is transported departmentally to respective Coal dump/OB dump sites by Shovel/Dumper combination. OB dumps are made on the floor of V/VI/VII seam within the excavated area (Refer Plate no.II). Though most of the fire area has been excavated but still two separate active fire exists at different location within the boundary of amalgamated Muraidih Colliery (Refer Plate no.II)..

Underground-

For enhancement of production from underground from this mine, BCCL wants to extract coal by underground method from underlying virgin seams (e.g III,II & I) of amalgamated area of Muraidih Colliery. For this, Bharat Coking Coal Limited (BCCL) had floated a global tender in March 2010 for development of Muraidih underground mine and extraction of coal from Muraidih III, II & I seam by mass production technology package for a minimum guaranteed production of 2 MTPA of coal on turnkey basis. After scrutiny of tenders, M/s Minop/BHEC Consortium has

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emerged as successful Bidder/Contractor for the above work and proposed for extraction of Seam-III & Seam-I by Longwall method of mining.

The Project was approved in 265th CIL Board Meeting held on February 14, 2011 and the initial services and supply contract was executed on March 25, 2011 between BCCL and the supplier for the Project. Subsequently, an amendment to this agreement was executed between parties on June 22, 2012 to realign the agreement with the provisions of NIT. The final DPR was submitted by the bidder on September 22, 2012 which was accepted by technical committee of BCCL on January 29, 2013 (vide letter Ref. no. D(T)PP/F-78/2013/34, Dated; 29.01.2013). The M/s Minop Consortium approached BCCL for handing over encumbrance free project site as per approved DPR and the Consortium put continued effort to demarcate project site till June'2013, but it was futile due to tremendous land dispute by private owners whose land was falling within approved project site. Finally BCCL handed over a part of the land (vide letter no. GM/AR-I/AGM/MINOP/2014/5207, dated: 10/11.02.2014) to relocate the position of Inclines and all other surface Infrastructures so as to reduce requirement of private land to a bare minimum which necessitating shifting of Inclines towards the northern side of the newly constructed metaled village road.

In view of the above, M/s Minop Consortium submitted a supplementary report on approved D.P.R to D(T) P&P BCCL on 10th Feb 20115 (Annexure-VIII) with the name as "Supplementary Report on Approved DPR for development of Muraidih underground mines and extraction of coal from Muraidih seam no. III and seam no. I by mass production technology package" prepared on January 2015.
BCCL has accepted the above mentioned supplementary report as per letter no. BCCL/D(T) P&P/F-114/2015/297 dated 24.12.2015 (Annexure-VII).

At present, as per the DPR/Supplementary note, two inclines (Main Inclines & Auxiliary Inclines) have been made and drift drivages of both inclines has touched the coal of Seam-III. A return air shaft having inner diameter of 6.0m has also been sunk upto 11m from surface of OB dump as identified by Bidder in the above mentioned Supplementary note. Fan drift of 20m (approx.) has been completed and made upto surface. Work has been suspended by the contractor, M/S MINOP, since 01.06.2016.

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M/s MINOP, lead member of the consortium of the executing agencies, has asked for modification in terms of payment as contained in the agreement. Representation of M/s MINOP was referred to M/s SBI Capitals, whose Report was referred to M/s Fox &-Mandal, Kolkata for legal vetting. Final Report was submitted to on 26.06.2017. The committee set up for the purpose has examined the Report from Fox & Mondal and submitted its recommendation to the competent authority. M/s MINOP has been asked to confirm supply of imported P&M as per Price BID (Vide letter no BCCL/GM(CMC)/F-Global-Muraidih/2017/516 dated 19.12.2017). M/s MINOP has submitted vague reply reiterating its earlier position.

In separate case, M/s Minop has been suspended for six month on 13.02.2017. Proposal for management decision regarding termination of contact has been initiated in the light of inordinate delay in completion of activities and business ban for three years from 18/19.01.2018. The proposal has been vetted by the legal department.

In recent development, Honorable High Court of Jharkhand vide order no.10 dated 28/8/2018 has quashed the "Banning of Business Order" issued to M/s Minop Innovative Technologies Pvt. Ltd. Considering the above, BCCL has asked to commence the project work in Muraidih global bid Project as per NIT provision. At present, no work is being going on at the mine site of Muraidih Colliery. Inclines are filled with water up to the mouth. It is expected that the Contractor is likely to re-start / commence the suspended project work soon. A chronology of Muraidih Global bid Project is enclosed as Annexure-IV

5.1 Amalgamated Muraidih-Phularitand (part) Colliery boundaries –

It has been stated earlier that mining plan of amalgamated Muraidih-Phularitand (part) Colliery is prepared considering the area of existing amalgamated Muraidih Colliery and part of the lease hold area of neighbouring Phularitand Colliery on western side. Both areas are falling in Cluster-II group of mines of BCCL.

Considering the above, the total amalgamated area (as per official record) is measured as 1118.71 Hectares. Out of which, area of existing amalgamated Muraidih Colliery is 717.71 Ha and part of Phularitand Colliery is 401 Ha.

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The boundaries of the proposed amalgamated Muraidih-Phularitand (part) Colliery is defined as below (Refer Plate No.II) -

North -	Lease hold boundary of Phularitand and Muraidih Colliery
South -	Dhanbad-Chandrapura Railway line and Masehspur Dyke
East	Eastern side lease hold boundary of Muraidih Colliery/ Western Side mine boundary-of Jogidih Colliery
West	Mahuda-Gomoh (S.E.Railway) Railway line

5.2 a) Project Area for amalgamated Muraidih-Phularitand (part) Colliery -

Out of total amalgamated area of 1118.71 Ha as mentioned in paragraph 5.1, the Project area is measured as 887.75 Ha considering extent of mining operations of existing workings along with proposed mining in both underground and opencast mines.

The boundaries of above Project area is considered for mining is demarcated as follows (Refer Plate No.II) -

North -	15m Hard Cover line of Seam-I and Fault F6F6 & Fault F5F5
South -	Dhanbad-Chandrapura Railway line and Masehspur Dyke
East	Eastern side lease hold boundary of Muraidih Colliery/ Western Side mine boundary of Jogidih Colliery
West	A line keeping 45m barrier from Railway property of Mahuda-Gomoh (S.E.Railway) Railway line

b) **Mine Closure Area** of Amalgamated Muraidih-Phularitand(Part) Colliery-

The Mine Closure area is considered as 934.78 Ha in this mining plan which is more than the Project area. This is due to annexing of additional area which was worked in past either by underground or opencast mining and laying mainly below the Railway property towards south-western part of the amalgamated area.

5.3 Seams Nomenclature (Geological name vis-à-vis Colliery name):

The standard geological nomenclature vis-à-vis Colliery nomenclature of different coal seams in descending order which has been extracted or proposed to be extracted are given below-

Geological Nomenclature	Colliery Nomenclature (Phularitand Colliery)	Colliery Nomenclature (Amalgamated Muraidih Colliery)
XIII	XIII	
XI/XII	XI/XII	
XI/X	10	
VIIIC	9 TOP	IX TOP
VIII B	9BOT	VIII TOP
VIII A	8	VIII BOT
VIII	-	Virgin
V/VI/VII Comb	7 (In old Plans), Worked in sections(presently V/VI/VII Comb)	V/VI/VII Comb.
IV Top	Virgin	Virgin
IV	Virgin	Virgin
IV Bot	Virgin	Virgin

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Geological Nomenclature	Colliery Nomenclature (Phularitand Colliery)	Colliery Nomenclature (Amalgamated Muraidih Colliery)
III	III (Mostly Virgin) (B&P development is being done in this seam)	III (Virgin) (B&P mining was done in past between Khodo Nala & Incrop)
II	II (Virgin)	II (Virgin)
I/II comb	I/II comb (Virgin)	-
I	I (Virgin)	I (Virgin)

5.3 Present status of underground mining in different Seams within Amalgamated Muraidih-Phularitand (part) Colliery:-

Within the amalgamated Muraidih-Phularitand(part) Colliery boundary, Seam XIII to Seam-I exist in descending order. The status of exploitation of various coal seams and area under fire considered in this mining is based on the mine working plan supplied by the colliery authorities. The status of working and fire limit of different seams in proposed amalgamated mining boundary falling in Cluster-II is given below:-

XIII Seam-

This seam is the top most coal seam located on the southernmost of the considered area near DC railway line. Seam incrops only in Phularitand Colliery boundary and it has not continued in existing amalgamated Muraidih Colliery. This seam has been extensively worked by underground mining in past and goaved in major part falling within the considered area. The underground workings are water logged and unapproachable. (Refer Plate No.VI). It has been proposed for excavation in this mining plan.

XI/XII Seam-

Seam XI/XII occurs as combined seam and lying is below XIII seam. This seam has been quarried out in small patches in past near incrop region and has been extensively worked by underground method (through incline and pits also). The seam has been goaved in major part of the area. As per the earlier study, the seam is under fire at places. The dip side underground workings are water logged and unapproachable. A hired patch quarry is in operation near the incrop region. Though, surface edge has extended over the incrop but coal horizon has not yet exposed. It has been proposed for excavation in this mining plan.(Refer Plate No.VII).

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IX/X Seam-

Underlying seam is IX/X Seam and incrop of this seam occur in southern part which has continued from Phularitand Colliery to existing amalgamated Muraidih Colliery on southernmost part. The seam has been quarried in the incrop zone and it was extensively worked by underground B&P method in one/two sections. As per the record, the seam is under fire in part area towards western side near Mahuda-Gomoh Railway line. The earlier underground workings in this seam including fire area is presently being extracted by opencast method through hired HEMM patch operating in Phularitand area. Near fiery zone, exposed coal of developed galleries in batter is of different colour indicates once it was firey and due to waterlogging the fire was suppresed. The dip side underground workings are water logged and unapproachable. (Refer Plate No.VIII). It has also been proposed for excavation in this mining plan

VIIIC Seam

Incrop of this seam occur in southern part of the amalgamated Muraidih-Phularitand (part) Colliery. This seam has been worked in the section by B&P method and working is goaved in patches. The seam has been also quarried in patches in past. The seam is presently being excavated in Phularitand part through hired patch OCP in a limited area near incrop and rest of the area is virgin on southern side of this Colliery. At present, this seam is also being excavated departmentally within existing amalgamated Muraidh Colliery in southern part. (Refer Plate No.IX). It has been proposed for excavation in this mining plan

VIIIB Seam

Next underlying seam is VIIIB. In past, this seam has also been worked in one section and is goaved in patches near incrop zone which occurs centrally in Phularitand property and continued in amalgamated Muraidih Colliery where it is being extracted departmentally. The seam has been quarried also in patches near incrop zones in past. The seam is virgin in major part of the area on southern side mostly in Phularitand property i.e southern side of proposed amalgamated Muraidih-Phularitand Colliery where it is being extracted through hired patch OCP. The seam has also been extracted in near past on the south-eastern part in amalgamated Muraidih Colliery. (Refer Plate No.X). This Seam has also been proposed to excavate by opencast method within the area considered in this mining plan.

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VIIIA Seam

The seam is extensively developed in one section in part area and is standing on pillars while, rest of the seam is virgin in the area in Phularitand Colliery whereas this seam has mostly excavated in existing amalgamated Muraidih Colliery except in small area on south-west corner. The seam has been quarried out in patches along incrop region in Phularitand property and a part of which is being excavated through hired patch. There is occurrence of active fire in underground B&P workings/incrop region near southern side of old P B section quarry within Phularitand property in incrop region of this seam (Refer Plate No.XI).

VIII Seam

Seam VIII underlies seam VIIIA. This is thin seam having seam thickness <1.0m and no underground workings were made in this seam. This seam is partly being excavated through hired patch in Phularitand Colliery in limited area leaving rest as virgin whereas it has been mostly excavated in amalgamated Muraidih Colliery. (Refer Plate No.XII). Extraction of this seam by opencast method has also been proposed in this mining plan.

V/VI/VII Seam

This is a combined seam in whole of the property. In past, this seam was quarried in the outcrop zone scatter way in patches. This seam has also been developed in past by underground B & P method in three sections (1^{st}, 3^{rd} & 4^{th}) in Phularitand Colliery and is goaved in patches. The seam is virgin in the southern part area in this colliery. In amalgamated Muraidih Colliery, earlier underground B&P workings were also worked in three sections (1^{st}, 2^{nd} and 4^{th}) which are mostly excavated in entire area except small area at center where active fire exists and unable to excavate due to land dispute, existence of forest land etc. A limited area is also remains as unexcavated on south-west corner of the amalgamated Muraidih Colliery. Presently, this seam is being extracted departmentally on southern side with floor of V/VI/VII as base in this Colliery. (Refer Plate No.XIII).

Seam IV,

This seam is virgin in entire area. The seam is impersistent due to less seam thickness in major part of the proposed area. This seam occurs as combined in Phularitand Colliery and splits in two section as IVT & IVB towards eastern side mainly in Muraidih Colliery. Seam-IV has attained thickness 1.5m to 2.0m in limited

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area in central-southern part of the amalgamated area and cannot be approached separately from surface as the area is excavated and huge OB dump has been made on this area. Seam IVT & IVB seams are thin seam and thickness varies from 0.5 to 1.2m in IVT seam and 0.5m or less in IVB seam. No underground working has been made in this seam in both Collieries. (Refer Plate No.XIV & XV).

Seam-III

Seam-III is virgin and it has attained workable thickness in entire area. In north-eastern part i.e on northern side of Khodo (Khudia) nala where it was worked by underground B&P method in the year 1988. This seam is presently being extracted by underground B&P method on western part in Phularitand Colliery. It is virgin in rest of the proposed project area of amalgamated Muaridih-Phularitand(Part) Colliery.

It is to be noted that in south-western corner of the amalgamated Muraidih-Phularitand(part) Colliery, drilling has not been done up to III seam, hence an area of indicated zone has been demarcated and accordingly net geological reserve estimation has been done in indicated category in this seam as well as other seams lying below Seam-III. (Refer Plate No.XVI).

Seam-II

This seam is virgin in entire area and has attained seam thickness 1.5m to 2.0m in limited area in central part within Phularitand Colliery area. This seam has not been worked in past. This seam has not been proposed for extraction due to less parting i.e <3.0m with Seam-I and has limited workable area. ((Refer Plate No.XVII).

Seam-I & I/II Comb

This seam occur as combined seam on north-west corner and splits into Seam-II and Seam-I in rest of the area. In south-western corner, drilling has not been done upto this seam, hence an area of indicated zone has been demarcated and accordingly net geological reserve estimation has been done in indicated category in this seam. No underground as well as opencast working has been done in this seam within the proposed area. (Refer Plate No.XVIII).

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5.4 Choice of Mining Method and justification for optimized target production:-

Opencast-

At present, two Quarries/OCs in operation within the proposed project area of amalgamated Muraidih-Phularitand (part) Colliery. One is hired HEMM patch quarry within the property of Phularitand Colliery and another is departmental quarry which is operating in amalgamated Muraidih Colliery. Both quarries/opencast are excavating seams with floor of V/VI/VII seam as base and during excavation, overlying seams (developed/virgin) are being extracted. Seam wise Opencast workings have been shown in plates as stated earlier.

Proposed-

As stated earlier that part area of existing Phularitand Colliery laying on northern side of D C Railway Line falling in cluster-II and existing amalgamated Muraidih Colliery will be further amalgamated to make a single amalgamated Muraidih-Phularitand (part) Colliery because rest of the lease hold area of Phularitand Colliery falling in another cluster i.e Cluster-XV located on southern side of D C Railway line. Due to large scale of opencast operation (hired as well as departmental) within the above mentioned amalgamated area, there is very small area is left to excavate. Moreover, surface constraint like D B Road, Village/Basti, etc restricts the opencast operation in this area. Such constraints are slowly overcome.

In this amalgamated mining plan, it has been proposed to make one combined opencast project within the area of amalgamated Muraidih-Phularitand(part) Colliery with floor of V/VI/VII seam as base. Underlying Seam-IV is impersistent and this seam will be left un-extracted. Moreover, huge overburden dumps in scattered way have been made on the floor of V/VI/VII seam in all over the excavated area and still it is being done. A District Board Road (D B Road) runs north-south direction (Dumra to Nawagarh) within the proposed amalgamated property towards its western side. A huge quantity of coal is blocked below this road and village /basti located besides this road. Moreover, expansion of western side Hired OCP boundary is restricted due to this D B Road. Considering coal conservation point of view and recommendation of ESC, the diversion of D B Road is proposed. The diverted road will be laid along the railway property on western side and over the 45m barrier kept with the Railway property. Considering the above,the Amalgamated OCP (with base V/VI/VII Seam) is planned in this mining plan.

It is to be mentioned that a small quarry with floor of Seam-III has been proposed in this mining plan on north-eastern part of existing amalgamated Muraidih Colliery. In

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this area, Seam-III was worked by underground B&P mining method in past and left as partly developed / partly depillared. Unless, this earlier worked area along with virgin area is excavated, underground longwall panel of Seam-I identified by successful bidder in approved DPR of Muraidih Global bid project cannot be extracted. Hence a separate quarry has been proposed on rise side of Khudia Nala and this proposal has been mentioned in the approved DPR. It has also been proposed that before extraction of longwall panels in Seam-III & I, Khudia Nala has to be diverted on rise side just outside of the proposed project area. If Khodo nala is not diverted, huge amount of coal will be left in this area and from coal conservation point of view it is necessary to extract coal from this area. To excavate this small opencasts, drilling-blasting with shovel-dumper combination has been proposed in this mining plan for extraction of both coal and overburden benches. Over burden will be dumped on the quarry floor by dumpers.

Underground-

In past, large scale of underground B&P mining was made in V/VI/VII combined seam in different sections and also in other seams lying above this combined seam These seams are presently being extracted by opencast method and will continue to be extracted in future within the proposed mining/project area. It is to be noted that the old underground workings in these seams are seems to be waterlogged on the dip side as these workings are unapproachable at present. In this mining plan, virgin area of V/VI/VII combined seam and other seams lying over this combined seam will be extracted by opencast method. Seam-IV underlies V/VI/VII combined seam. This seam and its split sections are impersistent in nature and having less seam thickness, hence not considered for underground mining.

Seams lying below IV seam are Seam-III, II & I in descending order and virgin in entire project area considered in this mining plan. Out of the above, Seam-III and I are potential seams for underground mining whereas Seam-II is thin seam and having inconsistent thickness in major area within the proposed mining area. In small are on the north-western side, seam-I and II are combined together and occur as combined seam. However, in major part of the property II and I seam are split into two independent coal horizons. In this mining plan, development as well as depillaring of panels in Seam-III, I/II (Comb) & Seam-I is proposed. All these seams are non-coking type and average GCV grade of Seam-III is G9 (i.e 4601 to 4900 Kcal/Kg) and average GCV grade of Seam-I/II & I is G5-G9 (i.e 4601 to 6100 Kcal/Kg).

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As per the "Grade notification for the year 2019-20" for different mines of BCCL, coal produced from Muraidih OCP (excavating the floor of V/VI/VII Combined seam as base) is declared as Steam / Slack as W-III /W-IV respectively. In Phularitand Colliery, coal produced from the hired OCP (excavating the floor of V/VI/VII Combined seam as base) is also declared as Steam / Slack as W-III /W-IV respectively but where hired OCP which is also extracting VIII(A) Seam, the grade of coal is declared as Steam / Slack as W-II /W-IV respectively.

Coal produced from Pure Benedih Section Incline i.e Phularitand Incline, the declared grade is G-10.

Considering the above, Seam-III and Seam-I along with Seam-I/II combined part has been considered for underground mining within the proposed project area of amalgamated Muraidih-Phularitand (part) Colliery.

As stated earlier that, development in Seam-III by B&P method is presently going on with SDL-haulage combination on the western part of the existing Phularitand Colliery falling in Cluster-II.

Different underground mining methods that are generally followed are-

1) Conventional Bord & Pillar method with caving or with stowing
2) Bord & Pillar with Continuous Miner package
3) Longwall retreating or advancing with caving

To choose a method for underground mining depends on geo-mining parameter as well as its techno-economic viability.

5.4.1 Proposed Mining Method-

Underground-

A Global bid project has been approved by BCCL Board in Muraidih Colliery for extraction of Seam-III & Seam-I from the area lying below excavated opencast working and work has been awarded to M/s Minop/BHEC Consortium. The Global bid project report has envisaged longwall retreating with caving method using PSLW set and gate road development by Bolter Miner with minimum guarantee production of 2.0 Mt per annum in commercial period of 9 years from Seam-III and Seam-I. Major part of the area proposed to be extracted by longwall mining except at few places B&P working is proposed where laying of longwall panels is not possible. Based on this approved DPR and the Supplementary note of approved DPR, the successful bidder has already developed mine site with limited civil infra-structures, completed two incline/ drift drivages to touch coal of Seam-III, partly sunk a return air shaft from OB dump and completed fan drift upto surface. Since work has been awarded to successful bidder as per approved DPR and it is an on-going project, hence the same method of mining and other provisions as envisaged in approved

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DPR /Supplementary note of approved DPR has been considered in this amalgamated mining plan of Muraidih-Phularitand(Part) Colliery.

Considering the above, most of the remaining area of Seam-III & Seam-I are falling in existing the property of Phularitand Colliery falling in Cluster-II and a certain area towards western part of existing amalgamated Muraidih Colliery. It has been proposed that excluding the area considered in Global Bid project, rest of the area will be extracted by Bord & Pillar method from existing mine entries of Phularitand Colliery. In this amalgamated mining plan, proposed mining method in these areas of Seam-III and Seam-I/II(comb) & its split Seam-I is detailed below.

Considering the geo-mining parameter of these seams, conventional Bord & Pillar with SDL-Belt conveyor combination and Continuous Miner with Belt conveyor have been proposed for extraction of Seam-III and Seam-I/II(comb) & I in from above mentioned area of Phularitand Colliery and its annexed part of Muraidih Colliery toward eastern side. Due wide range of thickness variation of above seams, it has been proposed that area having seam thickness more than 2.2m, panels will be extracted by Continuous Miner package with belt conveyor whereas in area where thickness is less than 2.2m, will be extracted by conventional drilling blasting at face and transportation by SDL-Belt combination to surface. At present, Seam-III is being developed by SDL-haulage Combination.

5.5 Depth of proposed Panels/ Workings-

The details of depth range of different seams and partings between seams within the amalgamated Muraidih-Phularitand(part) Colliery falling in Cluster-II has been given in Geology chapter (Chapter-IV) in table no.4.2.

The approximate depth range of proposed panels/workings of target seams i.e in Seam-III and Seam-I/II & I within the proposed project area of 887.75 Ha is given below-

Approximate depth of proposed panels in Muraidih-Phularitand(part) Colliery

Seams considered for underground extraction	Phularitand(Part) (SDL & CM area)		Amalgamated Muraidih Colliery (Longwall Project area)	
	From	To	From	To
Seam-III (upto roof of seam)	48m	227m	47m	140m
Seam-I/II Combined	35m	93m	-	-
Seam-I	35m	242m	27m	163m

The Seam-II is having seam thickness more than 1.5m in limited area on western part of area considered for B&P mining. Whereas Seam-I is workable in entire area.

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The parting between Seam-II and Seam-I is less than 3.0m in this area. To maintain a minimum parting thickness of 3.0m between two workings, a portion of coal of seam-II has to be considered to maintain parting thickness of 3.0m and thus, seam thickness of Seam-II becomes to unworkable thickness i.e less than 1.5m. Seeing the extent of workability, Seam-II has not been considered for extraction in the mining plan.

5.6 Parting between Seams -

V/VI/VII Seam	
Parting	3.56m – 31.69m
IV / IV (Top) Seam	
Parting	1.04m – 7.0m
IV / IV (Bot) Seam	
Parting	15.99m -32.30m
III Seam	
Parting	6.35m – 16.73m
I/II comb and II Seam	
Parting	1.18m – 12.23m
I Seam	

From the above, the parting of Seam-III with V/VI/VII seam varies from 20.6m to 71m within the project area.

Borehole wise Parting Table between II & Seam-I :-

Parting between Seam-II and Seam-I in area where Seam-II is having workable seam thickness.

BH No.—>	MR-30	MR28	BA-10	BA-15	BA-9	BA-2	BA-18	BA-11	BA-16	BA-20	PH-18
Seam-II FRL	164.02	185.94	172.24	161.95	126	135.58	124.5	85.99	32.48	28.76	-5.75
Seam-I FRL	158.8	182.76	168.34	158.11	121.71	130.18	120.64	82.09	26.99	24.51	-11.22
Seam-I Thickness (m)	2.82	1.64	2.64	2.66	2.71	2.71	2.21	2.3	2.98	3.00	2.80
Parting	**2.40**	**1.54**	**1.26**	**1.18**	**1.58**	**2.69**	**1.65**	**1.60**	**2.51**	**1.25**	**2.67**

5.7 Seam thickness and gradient, Strike & Dip etc.-

The seam considered for underground mining within the proposed project area of alamgamated Muraidih-Phularitand(part) Colliery are Seam-III and Seam-I in descending order. Both seams has attained workable thickness more than 1.5m in entire area considered in this mining plan except in one or two boreholes where seam thickness of seam-I is less than 1.5m.

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5.7.1 Seam thickness and gradient in Global Bid Project area lying in existing amalgamated Muraidih Colliery i.e in the area of Longwall panels -

The seam folio plan shows the seam thickness of Seam-III varies from 2.48m (MR-03) to 5.25m (MR-15) and average seam thickness is 4.0m considering the proposed panels in working areas. Bidder has considered average thickness of this seam as 4.4m for reserve estimation. In seam-I, the thickness varies from 1.85m (MR-07) to 3.49m (MR-10) except one borehole MR-02 where seam thickness is 1.05m. Considering the major part of proposed working area, the average thickness is 2.4m which is also considered same by the successful bidder during estimation of reserves.

The gradient of Seam-III within above mentioned area varies from 1 in 7.8 to as much as 1 in 40 and the gradient of Seam-I varies from 1 in 6 to 1 in 36 in central part. Due to swing of floor contours, the gradient of these seams are flatter along the axis in central part of this property in both seams and seam dips from north-west to south-east.

5.7.2 Seam thickness and gradient in remaining part of the Project area (i.e in Phularitand Colliery falling in Cluster-II and annexed part of amalgamated Muraidih Colliery) -

The thickness of Seam-III varies from 2.01m (BA-22) to 4.12m(PH-18) and average seam thickness is 2.8m considering the proposed panels in considered areas. In seam-I, the thickness varies from 1.63m (PH-20) to 3.61m (PH-16) whereas in combined areas of Seam- I/II, the seam thickness varies from 3.67m (BA-22) to 5.07m (BA-17). Considering the entire workable area for in this seam where SDL and CM panels are proposed, the average seam thickness is 3.22m.

It is to be noted that there is an indicated zones on south-west corner of this property where boreholes have not been drilled upto Seam-III and its below. The thickness of seams for development of maindip and panels in this indicated area of both seams has been considered as an average of surrounding boreholes.

The gradient of Seam-III within above mentioned area varies from 1 in 5.8 to 1 in 13 and the gradient of Seam-I varies from 1 in 6.5 to 1 in Due to swing of floor contours, the dip of both seams are from east to south-west i.e just opposite as it is in the property of existing amalgamated Muraidih Colliery.

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5.7.3 **Strike -**

Within the project area of amalgamated Muraidih-Phularitand(part) Colliery, the general strike of the area is E-W which swings to N-S locally in the central part and again swinging to NW-SE to almost E-W in the eastern part.

5.7.4 **Dip -**

In general, the dip of the beds is varying from 5°-10° in the boundary regions to 10°-20° in the central part. The dip direction is generally towards SE in existing amalgamated Muraidih Colliery area where longwall panels are proposed whereas in Phularitand property dip is towards SW (Refer Plate no. XVI & XVIII)

5.8 Mining strategy-

5.8.1 Underground Mining strategy-

Within the proposed global bid project area, Longwall retreating method with caving will done in Seam-III & Seam-I in the area of existing amalgamated Muraidih Colliery as proposed in approved DPR/Supplementary note on approved DPR. Due to thinness of seams, Seam-IVT & IVB and Seam-II has also not been considered for extraction in DPR.

As per the approved DPR, two Inclines (Main Incline & Auxiliary Incline} including drift drivages in stone are proposed to be made upto Seam-I by intersecting Seam-III. From intersecting point in Seam-III, development of trunk headings and then longwall panels will be made in Seam-III. Development of trunk headings in Seam-I will be made keeping superimposition with the trunk headings of overlying Seam-III. Location of Inclines and return air shaft are selected by the bidder on north-eastern rise most side within lease hold boundary. As per the approved DPR, all the infra-structures were proposed to be constructed in a complex near the inclines. Due to land constraint, the location of auxiliary Incline, return air shaft and site for infra-structures as proposed in approved DPR has been revised. To construct infra-structures, three different location has been considered to minimize land acquisition. Considering the above mentioned changes, M/s Minop Consortium has submitted a supplementary note on approved DPR showing new location of incline, return air shaft, shifting of drift drivages and trunk headings. Later-on, the same was approved by BCCL management with certain condition that there should not be any financial changes and schedule as made in approved DPR.

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As per the approved supplementary note, auxiliary inclines and return airs shaft has been made at revised location. In the revised layout plan, it has been proposed to make drift dirvages upto Seam-III and after touching of coal, trunk headings will be made in coal upto a distance of 497.2m in seam-III from drift touch point. Further two drift drivages will be made to touch coal of Seam-I where parting between seam-III & Seam-I is less. Proposed drifts drivages to touch Seam-I has been shown in the revised layout plan of Seam-III. As per the area authority, Inclines/drift drivages has touched the coal of Seam-III and air shaft has sunk upto 11m measuring from top of OB dump at revised location.

In this mining plan, the revised plan of Seam-III submitted by M/s Minop Consortium has been incorporated showing trunk headings drivages, location of proposed drift drivages from seam-III to Seam-I, return air shaft position etc but the revised layout plan of Seam-I as well as revised surface layout plan showing new sites / location for construction of Infra-structures is not available at area office as well as BCCL HQ. Hence, the above revised layout plan of Seam-I as submitted in approved DPR is considered

By shifting of auxiliary incline and air shaft position, the layout of trunk headings drivages in both seams has changed but panel layout of both seams remain same as proposed in the approved DPR except one or two panels where length is increased due to shifting of trunk headings. As per the revised plan, both inclines will act as main Intake airways whereas air shaft act as main return airway for workings of both seams. Auxiliary incline and air shaft is made at the revised location as proposed in approved supplementary note. The revised location of Air shaft is sited over old OB dump

As per existing status, both Inclines have been made and touched the coal of seam-III after making drift drivages from surface. Return Air shaft has been sunk upto a depth of 11m. M/s Minop has suspended the work from 2016. BCCL management imposed ban on M/s Minop for three years but Honorable high Court has quashed the ban imposed on M/s Minop. After lifting of banning, BCCL management has asked to commence the work as soon as possible. In this mining plan, it has been considered in mine schedule that work will commence within one year.

The trunk headings in both seams are to be laid on the dip side i.e on the extreme eastern side of the property and Longwall panels will be opened from the dip-rise.

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trunk headings towards western side upto the western boundary of existing amalgamated Muraidih Colliery. Only one longwall retreating panel with caving method will be worked at a time. Longwall Panel of Seam-III will be extracted first and then panels of underlying Seam-I. After development of trunk headings in each seam, sumps (e.g B&P-I & B&P-IV) in each seam will be made by bord & pillar method further eastern side of trunk headings i.e further on dip side of the property. During development of trunk headings, upthrow faults e.g F2F2 and F1F1 has to be crossed to approach areas on other side of the faults. Bord & Pillar workings have also been proposed in each seam in-between longwall panels where laying of Longwall panel is not justified due to geo-mining constraint.

As per the approved DPR, as soon as the trunk headings including sump is made in Seam-III, development of gate roads (each of twin headings) will be commenced from trunk headings so that longwall panels can be made for early production.

It has been proposed by successful that one Bolter Miner will be deployed for development of trunk headings, sump preparation, gate roads and also crossings of faults.

Successful Bidder/Contractor has identified six(6) longwall panels named as 301 to 306 in Seam-III and eight (8) panels in Seam-I. As per the agreement, the contract tenure is 14 years, out of which 5 years is earmarked as development period and 9 years will be for production excluding the time for face installation & transfer and overhauling of equipment. Later on the gestation/ development period is reduced to 2.5 years and total contract tenure reduced to 11.5 years. To meet the guaranteed production for nine (9) years, contractor has considered initially for extraction of all the six(6) panels of seam-III and then four panels (Panle no.101 to 104) from Seam-I. As stated earlier that a small area in the north of mine near incrop / outcrop region in Muraidih property, Seam III was exploited by Bord and Pillar method through incline. The mine is abandoned since 1988. In the early of year 2000, a small patch of Seam III near the outcrop was extracted by opencast method and OB dumps were made on and around these old workings. Due to heavy blasting, the underground pillars of the old workings might have weakened. Additionally OB dumps were also made over this area produce from Muraidih Colliery. It may not be possible to extract this coal by underground mining method due to safety reasons. BHEC/ Minop propose that the virgin area of Seam III near the incrop / outcrop and the old Bord and Pillar workings which are standing on pillars are to be extracted by

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opencast mining method. This will not only help to ensure the safe underground mining but also will enhance the resource recovery. The Khodo nala flows from west to east within the Muraidih underground project. It will not only block substantial coal but it will remain a source of danger throughout the life of underground mine. BHEC/Minop also proposes that after the extraction coal near the northern property by opencast method as proposed earlier, the Khodo nala is to be diverted along the northern boundary and will ultimately meet to it's own natural course on the eastern part of the property.

Since trunk heading drivages will encounter fault at longwall panel no.303 & diversion of nala will take time, to expedite the production of coal it is proposed to start mining from the rise side of the property and first panel will be longwall panel no.301 (refer plate no. XVI).

For preparing a longwall panel, initially top & bottom gate roads has to be developed on both side of the panel and gate roads will be extended upto the end of the panel. It has been proposed in DPR that each gate road will be developed twin headings by Bolter Miner and inter connection between twin headings will be made. It is proposed to make interconnection between two headings to maintain adequate ventilation and ease operation during gate road development.

To prepare first longwall panel, development of two gate roads i.e top gate and bottom gate will be made for this panel. After making of face connection between Top gate & bottom gate of Panel no.301, bolter miner will be shifted for development of bottom gate road (by twin headings) of panel no.302 lying on dip side of panel no.301 and production will commence from longwall Panel no.301 by retreating with caving method. Thus, all the panels of seam-III will be extracted and last panel will be extracted is panel no.306 located on rise side of this seam. While developing of gate roads, development B&P workings i.e B&P-II & B&P-III will also be made. Depillaring of B&P-II proposed to be done before retreat of longwall panel because approach to this area will be cut off once nearby longwall panel is extracted. Once the development of gate roads in seam-III completes, Bolter Miner will be shifted to underlying seam-I for development of trunk headings, sumps etc. As per the DPR, after retreat of last longwall panel no.306 of seam-III, Longwall equipment including powered support will be brought to surface for major over hauling before installing in panels of Seam-I .

As such major overhauling is planned after the completion of extraction of all panels in Seam III. However to avoid any major breakdown during operation of the panel,

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repair of moving equipment will be undertaken at the time of face transfer. Since the thickness of the coal Seam in Seam I is lesser than that of Seam III, the same powered support and the shearer cannot be used unless these are modified. It will be necessary for modification & overhauling of the Seam-III equipment after the exhaustion of longwall panel in Seam III and the equipment will be made suitable for using in Seam-I. The main modification of the supports will be support leg and lemniscates linkages. As the height of the coal Seam in Seam I will be lows, the shearer of Seam III may not likely match the requirement. Since the shearer will have much useful service life left, shearer manufacturer may examine the possibility of modification to make the shearer of Seam III compatible for Seam I. Otherwise the shearer to be replaced by new shearer. BCCL desires to deploy a new set of PSLW equipment in panels of Seam-I instead of changes as proposed by Contractor. But it will be done as per condition stipulated in the agreement between M/s Minop Consortium and BCCL and also as per the supplementary note.

In remaining part of existing amalgamated Muraidih Colliery area, i.e on western part of global bid project area identified by Bidder, it has been proposed to extract Seam-III and Seam-I by underground B&P mining method. This part of the property of Muraidih Colliery will be annexed with the property of existing Phularitand Colliery falling in Cluster-II for extraction of Seam-III & Seam-I. Seam-III is already under extraction by Bord and pillar method whereas Seam-I is completely virgin. Both seams are potential for underground mining. Above this area, overlying seams are being extracted by opencast method with floor of V/VI/VII seam as base. Seam-III is approached by two Incline drifts which has touched coal of seam-III on mid of the property. The present development is being made on dip side of the property by SDL-Haulage combination with drilling-blasting at face. In this mining plan, Bord & Pillar mining method is proposed for extraction of Seam-III and Seam-I by deploying SDL and Continuous Miner package. Initially, Seam-III will be extracted and then Seam-I. In both seam, SDL panel with drilling blasting is proposed where seam thickness is less than 2.2m whereas area having seam thickness more than 2.2m, will be extracted by Continuous Miner package except in north-west part where Seam-I & II is combined. In this area, seam thickness in more than 2.2m but only development of panel is proposed due to surface and sub-surface constraint.

A conceptual meeting with (P&P),BCCL and Area Official has been conducted at CMPDI for deciding the strategy for mining operation (Annexure-I). According to the area official, acquiring of land will be major constraint in the area lying on northern

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side of incrop of V/VI/VII seam in Phularitand Colliery. Moreover, as per the area official, diversion of D B Road (Nawagarh to Dumra) which is crossing the property in north–south direction is also major constraint and at present scenario, diversion of this D B road and vilages/basti located besides this road is not possible (Annexure-III). During presentation of mining plan before Empowered Sub-commitee (ESC) at New Delhi on 27-6-2019, theses constrains were explained. Considering the coal conservation point of view, the Empowered Sub-committee has directed to the BCCL management to take adequate steps to acquire land for diversion of D B Road and other types of land for opencast as well as underground mining operation purpose. Also take steps to rehabilitate and resettle Village/Basti etc required for this purpose otherwise huge coal will be lost forever if such steps are ignored.

Considering the above, it has been decided to depillar underground panels in seam-III, I/II & I in the area lying on northern side of incrop of V/VI/VII seam. Also development/depillaring of panels have been proposed below D B Road(Dumra to Nawagarh) after diversion towards western side, rehabilitation of villages/bastles located beside D B Road. Underground operation below these sites can be done only after excavating these area upto V/VI/VII seam. Considering the above, it has been decided to divert the D B Road towards west and proposed to be laid along between railway property and project boundary i.e on the area of 45m barrier to be left from the railway property.

The underground workings (with different sections) of V/VI/VII seam and other seams lying above V/VI/VII seam were left partly developed and partly depillared in past. Presently these seams are un-approachable and dipside workings are assumed to be water logged. Moreover, V/VI/VII seam is virgin on dipside of the considered property. On the eastern side of existing D B Road, the running opencast workings (Hired HEMM patch) has excavated these old workings with floor V/VI/VII seam as base and thus, earlier developed galleries are opened/exposed along the batter of the opencast. Unless the overlying virgin seams are extracted, underlying seams cannot be depillared. The workings of overlying V/VI/VII seam is assumed to be water logged and parting with Seam-III is less than 60m. A part of IX/X seam as well as XI/XII seam is in fire. Moreover, active fire occur in incrop region of VIIIA seam on southern side of old P B Quarry (refer Plate no.XI). Unless the D B Road is diverted, the running hired HEMM patch cannot be extended further on western side to excavate these old workings. As per the directives of ESC, it has been proposed for diversion of D B Road towards west along railway property to release the blocked coal for opencast upto V/VI/VII seam as well as for lower seams.

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for underground mining. Hence, in this mining plan, underground mining is also proposed in Seam-III & Seam-I within the area lying in between Mohuda-Gomoh Railway line and existing D B Road (Dumar to Nawagarh) after its diversion along with rest of the property and will be depillared only after extraction of seams developed/depillared in past by B&P workings.

As stated earlier that development of maindip headings are in progress in seam-III. Considering the existing development of maindip, it is proposed to further develop main dip with five(5) headings and also develop mainrise for extraction of northern side property. Although, Seam-III & Seam-II are not contiguous, but the proposed that maindip and panels in seam-III and seam-I are to be kept super-imposed with each other for ease of mining operation except on dip side two to three panels in seam-I, where the pillar size increases with depth. Thus, two three panels on dip side of seam-III are wider than the seam-III. The floor contour plans of Seam-III & I shows that there is a swing seams, hence dipping of seams are from east to west in Phularitand Colleiry whereas from west to east in amalgamated Muraidih Colliery. Considering the above, panels are so laid to be of self draining type dipping towards maindip of respective seams. It has been proposed to depillar panels in seam-III & seam-I and depillaring will be done only after acquisition of land either for opencast working or for underground depillaring operation.

To extract Seam-III, Bord & Pillar method of mining is proposed. Total three numbers of panels will be worked at a time to achieve the target production. Out of which two will be SDL panels and one will be Continuous Miner Panel. It has been proposed to make two sets with SDL for deploying in two panels. First set will be of 3 nos. of standard height SDLs in one panel whereas second set will be of 2 nos. of SDL in 2nd panel. Thus, total area of SDL panels can be extracted in both seams. The third panel will be Continuous Miner package panel. In all panels, out-bye transportation of coal will be done through belt conveyor and material will be through haulage system.

From the existing maindip in Seam-III, five headings maindip will be developed further towards dip side five headings by first set of SDLs and will be developed upto the southern side mine boundary. In dip side, boreholes were not drilled upto seam-III. Hence, there is an indicated zone where seam parameters may change during actual operation.

To approach underlying Seam-I, two drifts will be made from the floor of Seam-III in developed area and after touching of coal, four headings development in coal will be made in strike direction in seam-I by 2nd set of SDL upto a certain distance from coal.

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touch point and these headings will be kept in superimposition with galleries/pillars of already developed in overlying Seam-III. A strata bunker in stone is proposed in-between Seam-III & Seam-I. By doing such development, strata bunker can be made in early stage of the mine development. To manage underground water, a sump will also be developed in this seam on western side.

At present, two inclines are in use for development of Seam-III. Out of which, one incline acts as main Intake airway and another as main return airway. In this mining plan, a return air shaft is proposed to be sunk upto Seam-I and this shaft will act as main return. The existing inclines will act as main intake for both seams. Since main dip of Seam-III is already developed to a certain distance in proposed maindip, hence initially Continuous miner can be deployed for opening of panel (P3-9) on strike direction. In this area, overlying V/VI/VII Seam already extracted by opencast method in past. Thus, depillaring of panel can be done in this area. It has been proposed to develop Mainrise towards southern side in both seams with five headings upto the fault F4F4 by SDL. The Fault F4F4 is a down throw fault with throw of about 5m because fault is dying in these areas. This fault will be crossed by three numbers of drifts in respective seams and from coal touch touch point of these drifts, further development of mianrise will be made upto the northern boundary. From these five headings, mainrises of Seam-III & Seam-I on down-throw side of fault F4F4, panels will be opened in strike direction. Underground workings area proposed in area having more than 15m hard cover line in both seams.

It has been proposed to deploy Continuous miner in panels where seam thickness is more than 2.2m. In rest part of the property, SDL panel will be deployed for extraction of coal. Though it has been proposed for deployment of Continuous miner equipment package for extraction of coal from Seam-III & Seam-I considering the seam thickness and availability of reserves but its deployment depends on the economic viability of the Project. If it becomes un-economic, then proposed panels in respective seams will be extracted by SDLs only. The Phularitand mine along with the annexed area of Muraidih Colliery does not have sufficient extractable reserves for longwall mining in Seam-III & Seam-I i.e more than 20 Mt to have sufficient life of equipment. Another factor which restricts deployment for LW equipment in this mine is shorter panel lengths. To avoid frequent shifting, sufficient number of longer panels (>2.0km) is preferred for Longwall mining. Hence Continuous miner is proposed in this mine along with SDLs. The grade of coal is non-coking type with average grade is G10 for Seam-III and G5 for Seam-I.

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5.8.2 Opencast Mining Strategy:-

At present, the production is being obtained from two independent and separate Opencasts namely Amalgamated Muraidih Opencast(departmental) and Phularitand Opencast(Hired patch). The amalgamated Muraidih Opencast and Phularitand Opencast are being excavating seams with floor of V/VI/VII/VIII Seam as base and during opencasting, earlier worked B&P working of above seams are also being extracted through this opencast. The Muraidih Opencast operation is being carried out through departmental means adopting Shovel-Dumper system of mining whereas Phularitand opencast operation is being carried out through outsourcing means adopting Shovel-Dumper system of mining. In addition of existing opencasts, another opencast is proposed towards northern side to extract coal of Seam-III and other seams (if any) above this Seam. This opencast is located on the northern side of khodo river flowing west to east within the property. The details of the quarry are given in relevant Para. Opencast operation is proposed to be carried out by Shovel-Dumper system of mining and BCCL management has to decide the operation of opencast whether it should be done departmentally or by outsourcing means.

Top soil shall be stacked in two different locations, one near the south of PB section quarry for V/VI/VII Quarry and another is south-west of the III Seam Quarry for III Seam Quarry. The location of top soil is given in Plate No XXVII. The height of top soil will be kept upto 2.0 m.

After completion of OC operation (i.e 11th year onward) in V/VI/VII Seam, an area between the final stage quarry and internal dump will be left as void. Considering safety point of view, this void area will be filled with water after completion of underlying panels proposed for extraction i.e 24th year onwards as shown in the Plan (Plate No-XXVII) or as permitted by DGMS.

Assumptions made, if any-

It is assumed that opencast method with Shovel-Dumper System of mining may be done by departmental HEMM or by hired HEMM basis. It is also assumed that required excavation & transport capacity will be available for opencast mining operation.

5.8.2.1 Brief Description of Opencast Operations-

Proposed Opencast Mine Boundaries for V/VI/VII Seam Quarry:

The quarry limits of the Amalgamated Muraidih Phularitand (Part) Colliery on the surface for V/ VI/ VII Seam working is delineated within the leasehold boundary as under: North : Incrop of V/VI/VII seam

South : Minimum of about 45 m from the railway acquired land

East : Minimum of 60 m from khodo river.

West : Minimum Distance of about 100m from the proposed D.B. Road

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Proposed Opencast Mine boundaries for III Seam Quarry:-

The quarry limits of the Amalgamated Muraidih Phularitand (Part) Colliery on the surface for III seam is delineated within the leasehold boundary as under:

North : Minimum Distance of about 60m from the diverted khodo river
South : Boundary proposed by MINOP
East : Minimum of 100 m from Incline and Boundary proposed by MINOP.
West : Minimum Distance of about 100m from the Hirak Road and Minimum Distance of about 60m from the Khodo river.

Basic dimensions of the Quarries-

Basic dimensions of the **V/VI/ VII Seam quarry** is tabulated below:

Sl. No.	Description	Unit	Value
1	Area of Excavation	Ha	566.96
2	Strike Length	Km	3.2-3.6
3	Dip rise width	m	800-1600
4	Maximum depth	m	180
5	Base of quarry		Floor of V/VI/VII Seam

Basic dimensions of the **III Seam quarry** are tabulated below:

Sl. No.	Description	Unit	Value
1	Area of Excavation	Ha	42.28
2	Strike Length	Km	1.5
3	Dip rise width	m	315
4	Maximum depth	m	60
5	Base of quarry		Floor of III seam

Opencast Operations-

It has been proposed to mine out all occuring seams (V/VI/VII seam and above occurring seam) only by opencast mining in the Amalgamated Muraidih Phularitand (Part) Colliery falling in Cluster II except on the north side of khodo river where opencast will be made with floor of Seam-III as base of the quarry. Opencast has a life of about 10 years considering the seams & area as stated above. It is also proposed to extract the III Seam & all above occurring seams in the north side of khodo river through opencast operation. III Seam quarry production will start after two (2) years i.e from 2021-22, considering time for land acquisition, taking necessary permission from DGMS and other agencies etc. The broad parameters of proposed Amalgamated Muraidih-Phularitand(Part) Colliery are given here-

Mineable/Extractable Coal : 65.48 Mt.
Overburden including Loose OB : 123.0 M. Cum.
Av. Stripping Ratio : 2.01 M^3/Te

Base of the Quarry

Floor of V/VI/VII seam is the base of the quarry for V/VI/VII seam Quarry and Floor of Seam-III for III-seam Quarry.

Haul Road Layout : It is proposed to lay 20 m haul road at 1 in 16 gradient to reach the maximum quarry depth.

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Excavation

All the seams considered for exploitation will be mined in separate single benches where ever possible.

Variation in thickness of OB will make it difficult to maintain uniform bench height in OB horizons. However, it is proposed to have a ceiling on OB bench height from safety reasons. The height of the bench generally shall not exceed the boom height of shovel. The height of the OB bench is proposed as 10 m. Height of the coal bench will be equal to seam thickness subject to maximum bench height as 10 m.

At present 86.54 M.cum. of In-situ OB is internally dumped at the floor of combined seam. Till the completion of mining operations, 123.0 M.cum of In-situ OB will be excavated which is proposed to be dumped internally. Hence total volume of OB to be dumped internally is 209.54 M.cum of In-situ. Final Stage dump Plan has been shown in Plate no. XXVII. Existing externally dumped OB should be re-handled along surface edge of the quarry and should be accommodated with in the proposed internal dump. Hot OB should be quenched and dumped in non-coal bearing area.

In III-Seam Quarry, out of total 8.48 Mm^3 OB volume, 2.96 M.cum of OB will be dumped internally in the decoaled area of the quarry and the rest around 5.52 M.cum will have to be dumped externally. The balance remaining 5.52 M.cum of OB will be placed in V/VI/VII seam dump.

All the dump will be accommodated in the proposed internal dump.

Parting wise OB to be removed (solid OB) of V/VI/VII seam quarry-

Partings	Volume in M.Cum
Top OB above XIII seam	9.67
Parting in between XIII & XII	6.78
Parting in between XII & XI seam	0.11
Parting in between XI & IX/X seam	15.45
Parting in between IX/X & VIIIC	9.81
Parting between VIIIC & VIIIB	9.45
Parting between VIIIB & VIIIA	14.97
Parting between VIIIA & VIII	31.3
Parting between VIII & V/VI/VII	25.46
Total	**123.00**

Parting wise OB to be removed (solid OB) of III seam quarry-

Partings	Volume in M.Cum
OB above III seam	8.48
Total	**8.48**

~~Total OB to be handled – 131.48 M.Cum~~

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For convenience of operation it is proposed to keep a minimum working width of coal and OB bench as 10 to 20 m. The working benches of OB and coal will be kept at a slope angle of 70° and 80° respectively during operation.

The final pit slope of the quarry has been planned at 39° for the final depth of the quarry (180 m). In the light of the experience gained of mining system can be modified during the actual mining operations depending upon the physical and mechanical properties of the rock. Final Pit layout should be maintained as shown in plate no. XXVII and filling of OB should be done wherever it is required keeping stability of OB benches. Care should be taken to avoid the formation of highwall.

About 8.85 MT of additional coal is extracted and 29.91 M.Cum of additional OB to be rehandled after diversion of D B Road.The effect of inter bench access roads on the quantity of Coal extracted and OB removed is not incorporated in the Pit layout determination. Some quantity of OB to be rehandled to extract coal along the edge of PB section quarry. To extract coal along the PB section quarry, PB section OB dump should be maintained safe distance from the surface edge of the proposed layout.

At present, 4K pit and 1K pit is closed which was used in past for underground mining operation on the southern side of the D C Railway line. The final pit layout is proposed considering the above. But, if any underground mining activities are re-started in future through these pits, the surface edge of the proposed layout should be maintained safe distance from 4K pit and 1K pit.

Compliance of Conditions given in DGMS Permission Letter:

Amalgamated Muraidih Phularitand (Part) Colliery authority should comply with the condition as given in permission letter of DGMS for opencast mining operation at Phularitand Colliery vide letter no. R-3/010220/P-21/2014/390 dated 29.03.16 & at Muraidih Colliery R-3/010212/P-32-2017/Reg. 106 / 2018/ 297 dated 28.03.2018 received from Director of Mines Safety.

OB Dump Benches

Bench height for OB dumps will be 30 m and slope of individual dump benches will be 37°. Width of berm between two adjacent benches will be about 40 m. Dumping will be done by End-Tipping method.

Drilling and Blasting

O.B. will be excavated in benches after proper drilling & blasting. Drilling in OB benches will be done by 160mm drills or as decided by the outsourcing agency. The blasted OB will be dozed, heaped and loaded on to 35t/ 60t dumpers or as decided by the outsourcing agency for transportation to OB dumps.

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Drilling in coal benches will be done by 100 mm/ 160mm drills or as decided by the outsourcing agency and after proper drilling & blasting, the blasted coal will be loaded by hydraulic Shovels on to 35t/60t dumpers or as decided by the outsourcing agency for transportation up to the surface stock yard.

Transportation

The ROM coal from the OC will be transported to feeder breaker to crush it in to required sizes and from feeder breaker to KKC link Sidings. Coal from face to coal dump in Muraidih colliery is done by dumper / tipper. Coal is further transported from KKC link Sidings for onward transport to Power Stations. The distance from Dump to KKC Link siding is about 7 km (Muraidih Colliery). The coal / OB is to be transported either by departmentally or contractually as decided by BCCL Authority.

5.8.2.2 Fire Dealing Measures in Opencast workings-

As reported by Colliery / Area authorities, there is fire in Amalgamated Muraidih Phularitand (Part) Colliery. The excavation of fire area will be required during opencast operation of Amalgamated Muraidih Phularitand (Part) Colliery. Therefore, method of work and other statutory provisions in this respect must be adhered to while working in the fire zone.

However, the method may be improved / upgraded after suitable scientific field trials. During implementation of the fire dealing measures and excavation & dumping of hot materials, monitoring of status of fire, its movement, temperature condition and efficiency of fire dealing measures, is to be done regularly. Even on dump sites, such a monitoring is required so that quenching can be done in time to avoid dump fire

5.8.2.3 Modification in unit operations for excavation over fire area-

For excavation of the area, standard unit operations of opencast mining e.g. drilling, blasting, excavation, transportation and dumping will be followed. But due to presence of fire, the unit operation will be modified slightly which are as follows:

a) Cooling of faces:

Over the benches under excavation, application of firefighting chemicals/ additives like Di-Ammonium Phosphate (DAP) with Urea, mixed with water has to be carried out for suppressing the fire, extracting the heat and reducing the flame rapidly followed by profused water jetting by high pressure nozzles for safe deployment of man & machines.

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b) Cooling of Blast-hole & Insertion of Fire Resistant & Thermal Insulation Casing in the Blast Hole-

Over the benches under excavation, drilling of blast-hole will be followed by cooling of the hole by use of water and / or water-chemical mixture to bring down the temperature below 70°C (if temp is very high). Finally fire resistant and thermal insulator casing will be inserted inside the hole before charging the explosive into it.

c) Blasting of the Excavation Bench-

The size of each blast will be small with fewer number of blast holes established on the basis of rate of increase in temperature within the blast-hole, so that temp inside the hole before blasting is kept under detonation limit.

d) Quenching of Blasted Bench with Flushing of Water-

After blasting the bench, the excavation area will be quenched by profused use of water. For this, pipe range be laid along the strike of benches on fire and high pressure nozzles has been proposed to be connected at regular interval with T-joint so that water can be sprayed over hot/fire excavation benches. Water will be pumped out at faces for quenching purpose.

Excavation of the blasted & quenched material shall be done by use of Shovels and loaded into Rear Dumpers.

5.8.2.4 Transportation & Dumping of OB & Coal-

OB will be transported to external/internal OB dumps for dumping. After dumping, the OB will be again sprayed with water to quench the fire, if any, completely, so that chances of re-appearance of fire at OB dumps is eliminated.

Coal, if recovered, will be transported to Surface Coal Stock Pit (located within the coal stock yard) filled up with water where hot ROM coal will be quenched completely. However, the fire area has been considered devoid of coal reserve.

5.8.2.4 Sealing off at Pit Limit-

At the end of the mine life, end pit slope within the seam and every exposed mouths of development gallery along the length of the bench / box-cut should be closed with non-combustible material (OB rock & mutti), compacted properly and sprayed with Thermoseal (a mica based sealant). The exposed gallaries will be filled up first followed by sealing of exposed coal on the highwalls of the quarry.

5.8.2.5 **Mining strategy proposed to work below Forest Land area :-**

The surface plan submitted by Area authority shows that a major area of forest land of Muraidih Colliery has been excavated/used by opencast mining operation details of which are described in Chapter-IX. As per the Colliery record, there are few hactares of balance forest land exists which are still untouched/unused. No forest

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land exists in the area of Phularitand(Part) Colliery falling in Cluster-II. Application for regularization/diversion of forest land of 46.61 Ha is under process.

It has been decided in the draft report meeting (Annexure-XVI) that the following mining strategy is to be adopted during mining operation –

Opencast operation-

At present, opencast operation (Hired as well as departmental) is being done on the southern part of the proposed amalgamated area. In the mining plan, it is proposed to continue the opencast mining operations on the southern part of the amalgamated property for atleast 2 years so that within this period, the required Forest Clearance is obtained by BCCL from respective forest department. After obtaining of forest clearance, the left out area of opencast which lie on the north-central part near incrop of V/VI/VII seam will be excavated which are presently under active fire.

Underground Operation-

In Muraidih Colliery, extraction of Seam-III and Seam-I will be carried out as per the approved Global Bid Project on turnkey basis. The layout of longwall panels and B&P workings as proposed by the successful Bidder/Contractor is lying below these forest lands (refer plate no.XVI & XVIII). Hence, before commencing of any type of underground operations below these forest land, forest clearance has to be obtained. Considering the present scenario, a tentative period of 2 years may be required for commencing of mining operations mainly below forest land which is still remains as untouched/unused. It is to be noted that major area of the forest land towards north-eastern part of the property has already been extracted by opencast operations. Hence, forest clearance has to be taken as early as possible to keep the mining operation un-interrupted. Already mine authority has processed for the same.

5.9 Mining system-

The proposed project area of amalgamated Muraidih-Phularitand (part) Colliery is divided in two parts considering mining operation. One part on eastern side where Global bid longwall projects have been proposed covering major area of amalgamated Muraidih Colliery and another part on western side where major area is in existing Phularitand Colliery annexing rest area of amalgamated Muraidih Colliery where SDL and Continuous Miner panels are proposed. A common vertical boundary of 60m solid coal barrier is proposed to be maintained

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in both seams i.e Seam-III & Seam-I between working area of longwall panels and working area of SDL/CM panel.

Mine entries on surface and trunk headings for Longwall workings have been proposed on extreme eastern side of the designated area whereas same for SDL/CM workings have been made on extreme western side of the project area. This is mainly due to swing of the floor contours of seams in both parts so that panels can be laid as self-draining type for better water management.

Contractor has considered the mine entries for Longwall project on north-eastern corner due to the following advantages-

- All the panels can be laid for downhill transportation of coal and will require moderate capacity conveyors.
- Power cost will be reduced.
- As the water will be the self-draining in all of the panels, it would be easier and simpler to handle water from the goaf.
- Operational ease.
- Length of the panel will be very long resulting lesser face transfer.
- De-watering of old underground water logged workings of Seam III of Muraidih mines by the side of the inclines will help to lay few more panels in Seam I.
- Higher recovery of coal.
- Requirement of lesser number of belt conveyors.
- The coal quantity blocked in safety pillars will be lesser.
- The amount of work for mine development will be lesser.

Mine entries of existing Phularitand Colliery has been selected by the Area authority and driven from the floor of earlier excavated V/VI/VII seam old quarry to reduce the drivage length. After touching of coal of Seam-III, main dip drivages toward dip direction have been made in this seam and it is progress.

Considering the above, same mine entries have been considered in this amalgamated mining plan of Muraidih-Phularitand(part) Colliery for extrcation of Seam-III & Seam-I.

5.9.1 Longwall Panel development in Seam-III & Seam-I Seam -

Gate Road Development-

Each Gate road will be developed by developing two coal headings simultaneously along with interconnection to be made after advance to a certain distance of the headings. Thus, chain pillars are formed as the gate road headings progresses and thus reaches upto the end of a panel. Dimension of a Chain Pillar depends mainly on the depth from surface, abutment pressure and time period.

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Initially Top and bottom gate roads will be made on both side of a longwall panel. Thereafter, only one Gate road with two headings will be developed for forming of adjoining Longwall panel. If panels are located at different place, then two parallel twin gate roads have to be developed for forming a longwall panel.

Contractor has proposed to extract the identified panels by Longwall retreating with caving, hence each pair of headings of a twin gate road will be developed upto the end of the proposed longwall panel and face connection will be made between Top Gate & Bottom gate roads of the panel for installation of PSLW equipment set for retreating of panel for coal production. Gate road of the panel are kept rising to facilitate self-drainage. Inter-connected galleries within a twin gate road are in dip-rise direction hence connections are self-draining type. The above strategies will be maintained in both seams for development of longwall panels

As stated earlier that seam thickness of seam-III varies from 2.48m (MR-03) to 5.25m (MR-15) in the area considered for extraction by longwall panel whereas seam thickness of seam-I varies from 1.85m (MR-07) to 3.49m (MR-10) except one borehole MR-02 where seam thickness is 1.05m. The average seam thickness is considered as 4.0m for Seam-III and 2.40m for Seam-I for reserve estimation in this mining plan.

The successful bidder/Contractor has considered the width of each coal heading or gallery of a gate road as 5.2m in both seams. For the purpose of face capacity, height of extraction has been considered as seam height maximum upto 4.4 m for Seam-III and 2.4m for Seam-I.

As per the DPR, Since the incubation period of both seams is 15-18 months, MINOP have planned to extract the Seam as maximum as possible at one lift; this will not allow any coal to be left in roof and possibility of spontaneous combustions will be eliminated.

Hence, for extraction coal of Seam-III by longwall method, equipment so selected will be able to extract up to a height of 4.8 m in one lift. For the purpose of face capacity, height of extraction has been considered as 4.4 m. For Seam-I, it will be extracted up to a height of 2.4 m in one lift on average. For the purpose of face capacity, height of extraction has been considered by bidder as 2.4 m.

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During development of gate road by twin headings, rectangular chain pillars will be formed due to inter-connection between headings in both seams. As per the successful bidder/Contractor, the spacing of gate roads in Seam-III is considered as 35m and the width of solid pillars is 30m whereas the spacing of gate roads in Seam-I is considered as 45m and width of solid pillars in Seam I is considered as 40m.

Face length of Longwall panel -

Bidder has proposed inward staggered layout where the length of face in upper seam is longer than the length of face in lower seam. In this layout, Gate road pillars in Seam III takes the load of the caved arch after extraction and thereafter it transfer to the pillar of the lower seam if the parting between the seams is lesser because coal seam and stratum in fracture zone are destroyed, stress will be released. Thus, the gate road failure of lower seam will also be decreased. Hence, inward staggered layout of panels is the most suitable layout of panels, which has been considered in this mine.

For high recovery of coal and less drivage of the gate roads, successful Bidder/Contractor has proposed the face length of 200m for Seam-III and 190m for Seam-I. The longer face length will also help for easier caving of the roof.

Length of Longwall panel-

The length of the panel is another critical area which influences to maximize the production in a yearly basis. Planners always prefer to have the length of the panel as long as it is manageable & within the product range of the equipment. This helps to reduce the numbers of face shifting, making more time available for the coal production.

As per the revised layout plan of Seam-III, the length of panel varies from 1052m (Panel no.305) to 2231.72m (Panel no.301) whereas as per layout plan of Seam-I submitted with DPR, the length of longwall panels varies from 1236m (Panel no.101) to 2305m (Panel no.101). It has been stated earlier that the revised layout plan of Seam-I as per Supplementary note is not available with Area authority not at HQ, BCCL. Hence it could not be furnished in this mining plan. According to Bidder/Contractor and as per their submitted supplementary note, due to shifting of Auxiliary Incline and Return Air Shaft, there is slight shifting of trunk headings in both seams. Due to this, there is slight increase in panel length of rise side panels which may be a pillar or so.

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Longwall Face mining technique-

For maximization of the available shift time into shearer cutting time, design has considered bi-direction cutting instead of uni-directional cutting having the web depth as 0.865m.

Face working organization-

For maximization of gainful deployment of high investment in the longwall package, "four shift operations" has been envisaged. Out of the 4shifts, 3 will be the production shift and 1 for maintenance. The duration of each production shift will be for 6 hours at face.

5.9.2 Continuous Miner (CM) Panel/SDL Panel development in Seam-III & Seam-I Seam –

5.9.2.1 Development of Panel-

The coal seams (III, I/II Comb. and I seam) will be developed by Bord and Pillar method with panel system. The development shall be done along the floor upto a minimum height of 1.5 m or the seam thickness whichever is less.

After approaching the respective seam, each seam will be developed by driving five main dip/rise headings which will be developed upto the project boundary on the dip side and on the rise side up to the location where the thickness of hard cover from the surface is not less than 15m

Continuous Miner panels area proposed in Seam-III and Seam-I within the area of existing property of Phularitand Colliery annexing with remaining part of existing amalgamated Muraidih Colliery (i.e where longwall panels are not proposed). These panels will be either departmentally or outsourced depends on techno-ecomonic viability of the project.

From the maindip, five headings panels will be developed by Continuous Miner package equipment in strike direction (i.e towards eastern side of maindip) leaving panel barrier between two panels equal to one pillar width as per Reg. 99 of CMR 1957. The levels are proposed to be driven slightly rising to facilitate the self-drainage of seepage/spraying water at the face. The size of the panels will depend on incubation period of the seam. The size of the coal pillars will be according to the Reg.. 99 (1) of CMR 1957. The maximum width and height of development galleries will be 4.8 m and 3.0 m respectively. However, considering

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the introduction of CM, the width and height of the development galleries in a panel may be increased beyond 4.8m and 3.0m respectively and for this permission from the DGMS has to be obtained. It has been proposed to develop eastern side panels by CM with 5 headings level galleries whereas rest panels proposed on north-western part including main-rise and main-dip will be SDL panels of 5 headings level galleries in both seams. In CM panel, Continuous mine package equipment will be deployed for formation of pillars during development with place changing technique between Continuous Miner (CM) and Roof Bolting machine. In this method, CM will cut the headings upto permitted distance by remote operation and then shifted to next heading. Roof bolting machine will support the un-supported roof cut by CM. Same type of operation is followed during splitting/slicing of pillars.

On north-western side, development of few panels is proposed by 4 or 3 headings due to restricted mining area and also due to proposed location of air shaft as shown in Panel projection layout.

In a five heading SDL Panel, development and depillaring will be done by drilling –solid blasting at coal face. After supporting of immediate exposed roof, SDL will load the blasted coal at face and unload onto a pony belt conveyor. Pony belts will discharge coal onto a gathering belt and then onto gate belt for out-bye transportation from the panel. The panels proposed to be developed in Seam III and Seam-I/II & Split Seam-I have been shown in Plate Nos. XVI & XVIII respectively.

The general mining parameters of the panels (CM as well as SDL Panel) are as below:

No. of Headings	-	5 nos. (Panel/Maindip)
Gallery width	-	4.8m
Development Height	-	2.2m (min) to 3.0m for CM panel
	-	1.5m to 3.0 m (min) for SDL panel
Extraction Height	-	4.5m (max.)/seam thickness (CM/SDL Panel)

Pillar sizes(Centre to Centre) -

a) In Panels- For Seam-III: 26mX26m to 36m x 36m
For Seam-I/II & Seam-I: 26m x 26m, 36m x 36m & 45m x 45m.

b) In Main Dip For Seam- III, I/II & I : 36m x 45m & 45m x 45m
c) In Main Rise- For Seam- III & I/II : 26m x 26m

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A Typical five heading development district by SDL and Continuous Miner package has been shown in figures-Fig.No.1 (SDL) and Fig.No.2 to Fig.No.4 (CM district) respectively for both seams i.e Seam-III and Seam-I.

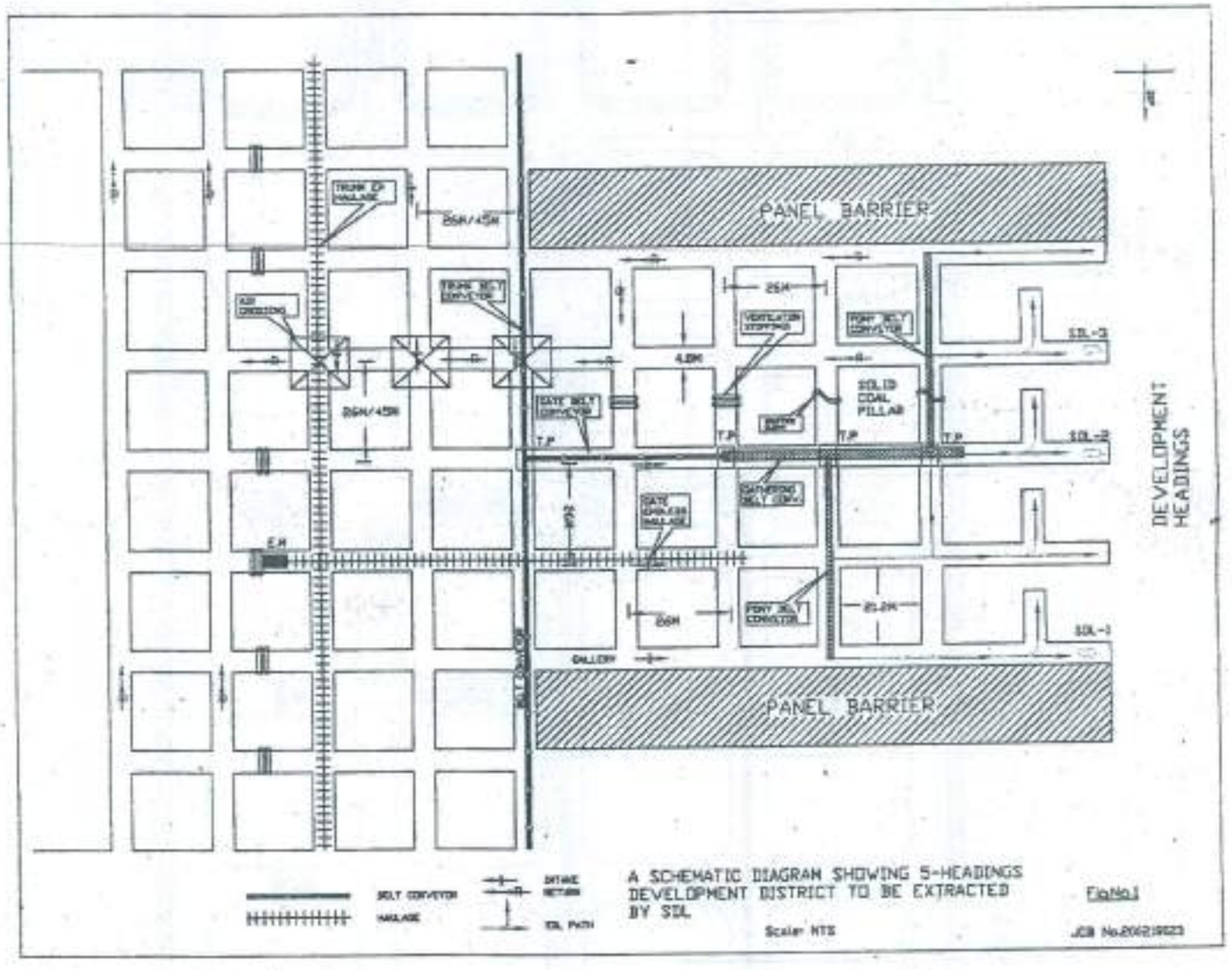

Fig No.1

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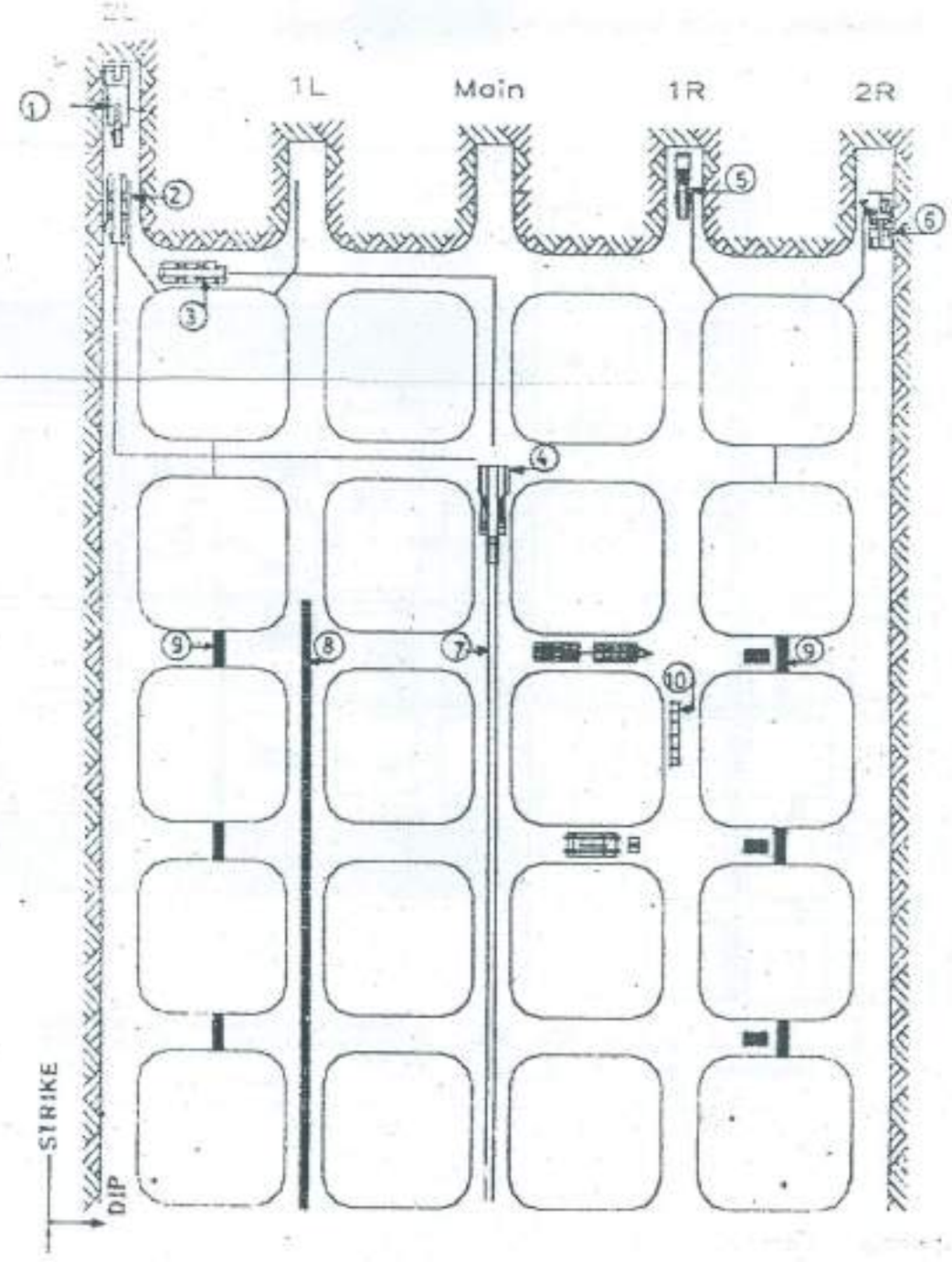

A TYPICAL 5 HEADINGS MINING LAYOUT

1. Continuous Miner
2. Shuttle Car
3. Shuttle Car
4. Feeder Breaker
5. LHD
6. Roof Bolter
7. Gate Belt
8. Haulage Track
9. Ventilation Stoppings
10. Electrical Equip.

Fig No.2

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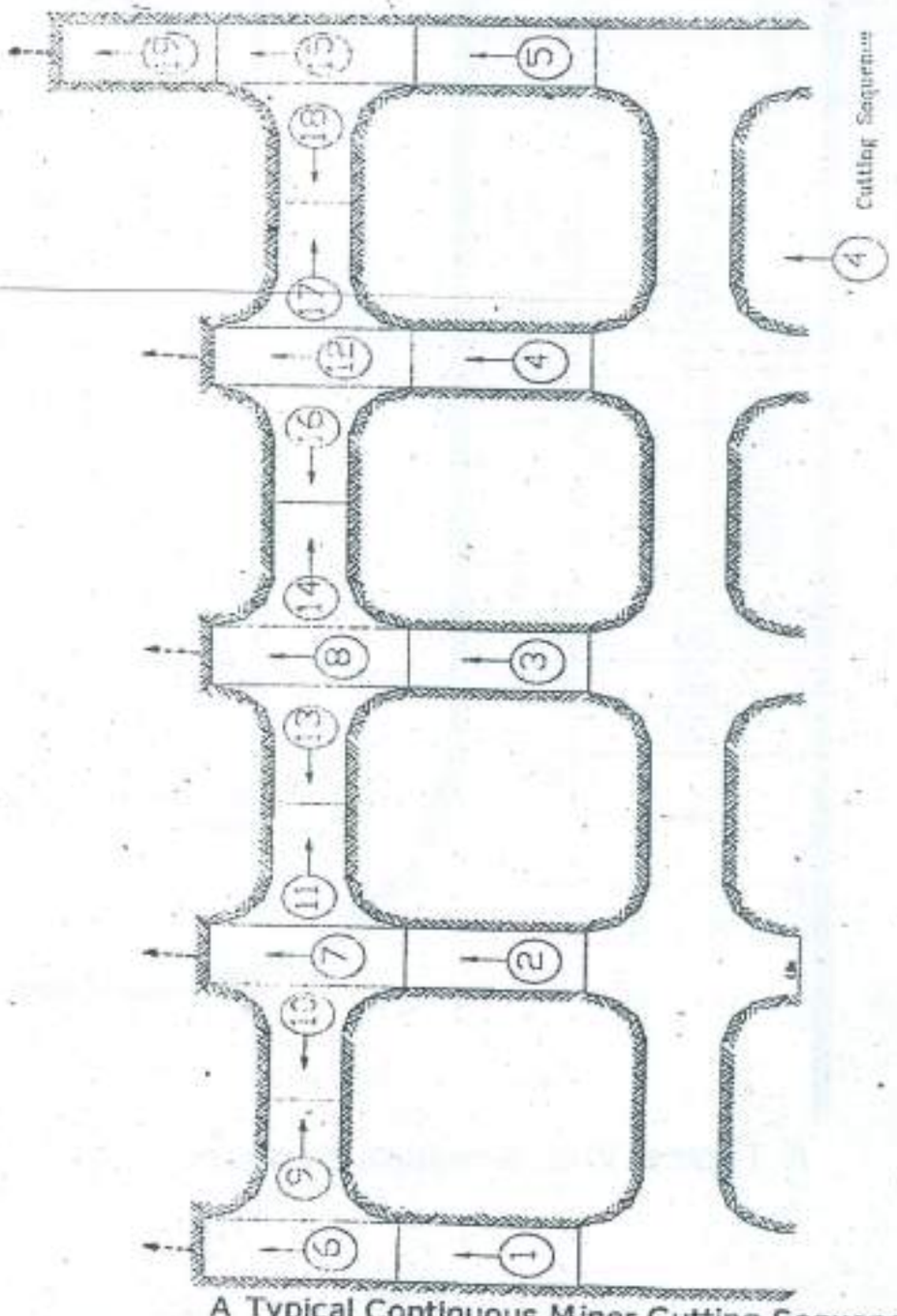

A Typical Continuous Miner Cutting Sequence

Fig No.3

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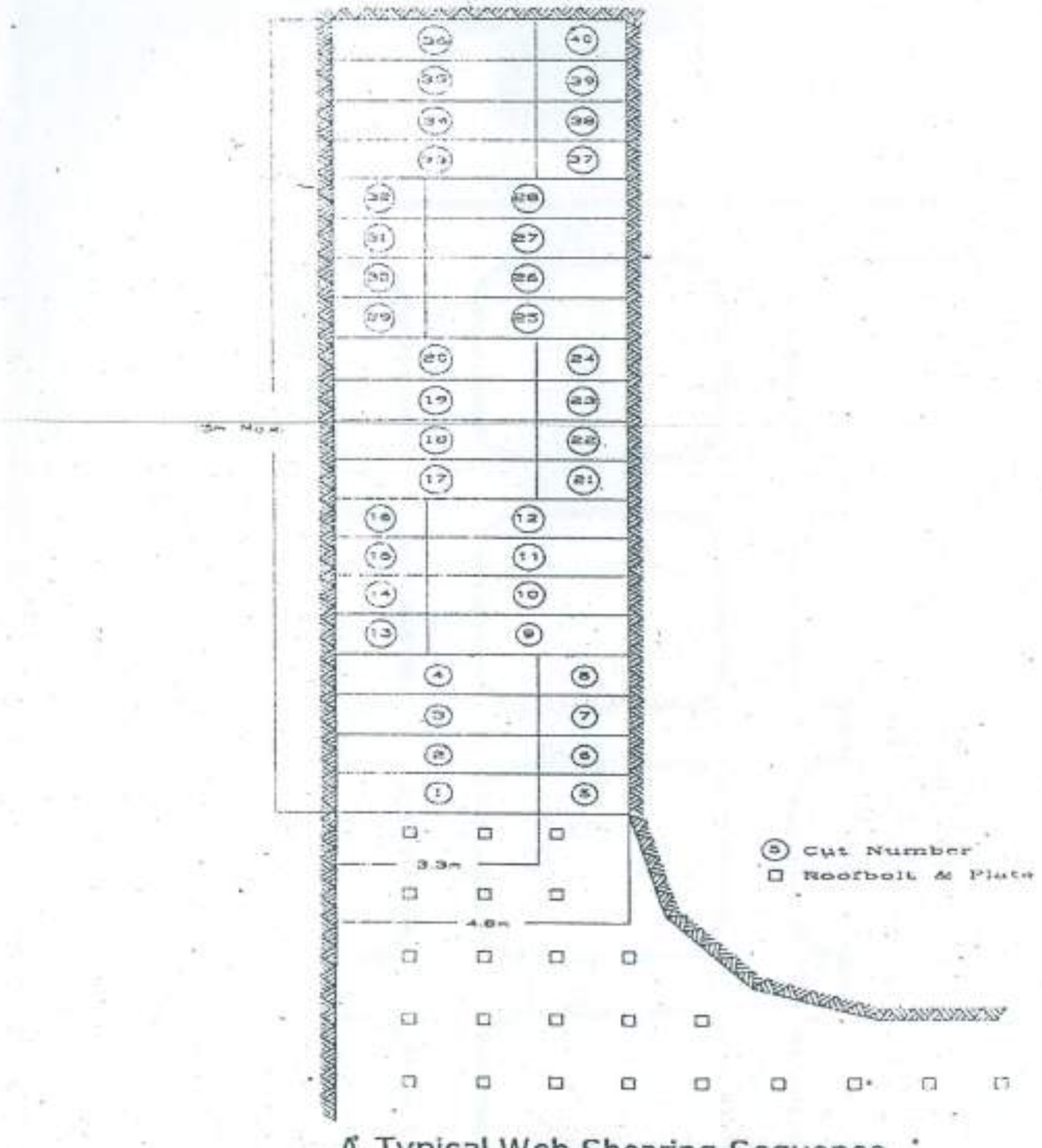

A Typical Web Shearing Sequence

Fig No.4

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- 5.9.2.2 Depillaring of Panel -

The method of extraction/depillaring is proposed by caving. The manner of extraction is envisaged as follows:

Depillaring of SDL Panel –

As per the proposed seam extraction layout plan, a few SDL panels are proposed for depillaring due to Land acquisition constraint as well as surface constraint. However, where depillaring is proposed following method of extraction will be followed-

In a developed SDL panel, each pillar shall to be split into two equal parts by a 4.8m wide level split gallery. Each half of the pillar shall be extracted in slices (4.8 m wide), leaving coal rib of suitable thickness against goaf / slice not less than 2.0 m keeping factor of safety more than two (2). The ribs shall be robbed off judiciously on retreat if safety permits. After completion of the slice, the goaf edge support (like cogs) will be shifted outbye and the roof of the extracted area will be allowed to cave in.

Depillaring of Continuous Miner (CM) Panel –

As stated earlier that CM panels are proposed on eastern side of maidips in both seams. Panels to be worked by CM, each pillar shall to be split into two equal parts by about 6.6m wide level split gallery. Each half of the pillar shall be extracted in slices (about 6.6 m wide), leaving coal rib of suitable thickness against goaf / slice. After completion of the slice, the goaf edge support (Breaker Line Support) will be maintained/shifted outbye and the roof of the extracted area will be allowed to cave in.

Splitting of pillars shall not be done more than two pillars from the pillars under extraction by slicing. The manner of extraction including the maximum void allowed at a time shall be governed by the provisions of DGMS permission granted for the purpose.

A Typical five heading depillaring district by SDL has been shown in figures-Fig.No.5. and depillaring of a panel by Continuous Miner package along with sequence of operation has been shown in Fig.No.6.

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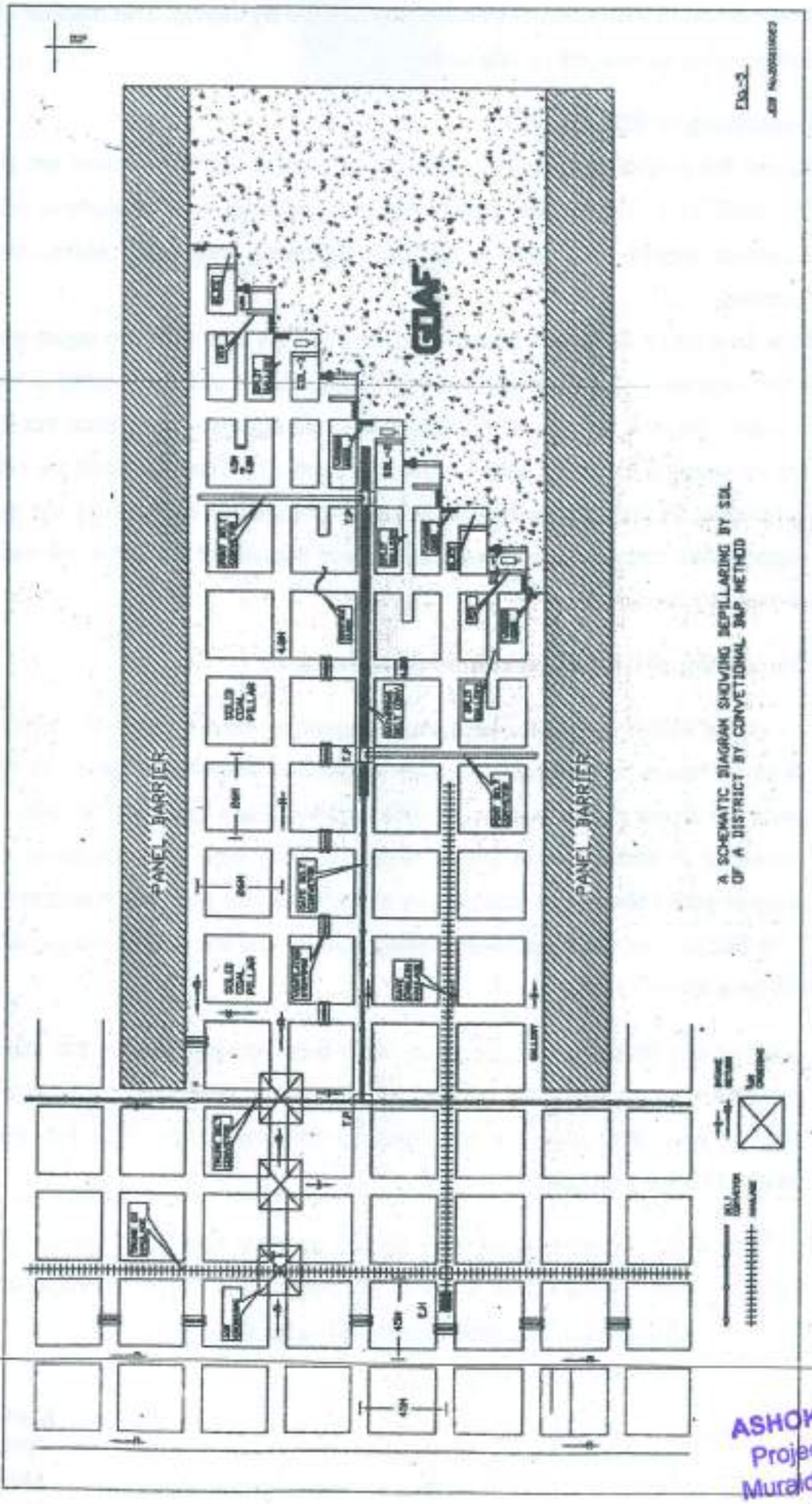

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Fig No.5

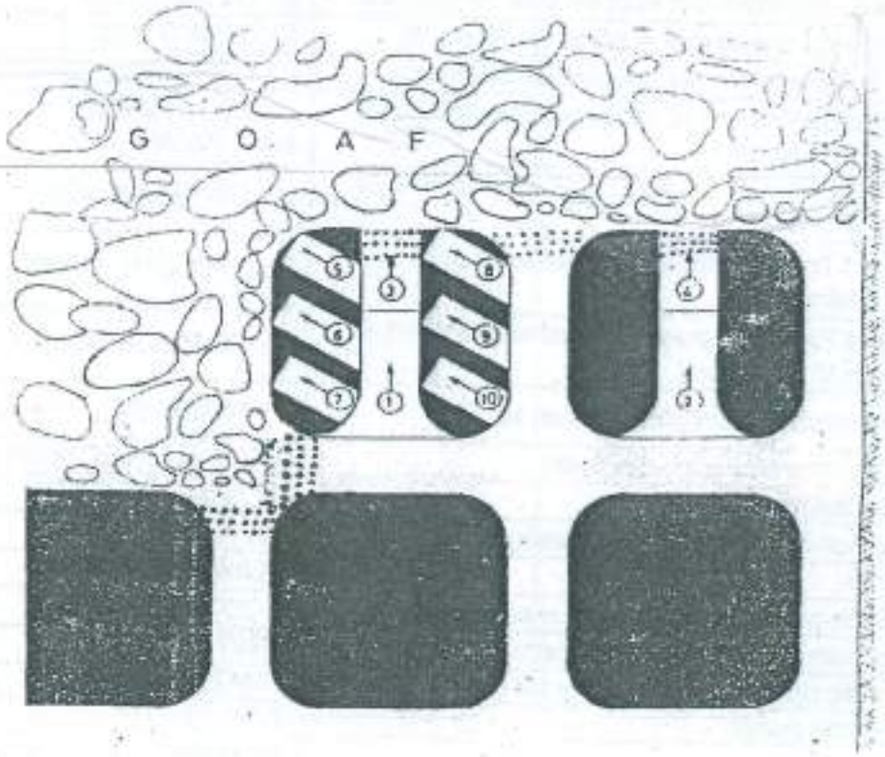

Fig No.6

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5.10 List of Equipment

5.10.1 For longwall operation –

Sl. No.	Name	Model No./Equivalent	Unit	QTY
1	Double ended ranging drum shearer for Seam III	MG500/1180-WD/ N=1180kW	SET	1
2	Hydraulic powered roof support face for Seam III	ZY11000/25/50D	PC	111
3	Transition powered roof support for Seam-III	ZYG11000/25/50D	PC	2
4	Face-end powered roof support for Seam III	ZYT11000/25/50D	PC	5
5	Modified Double ended ranging drum shearer of Seam III for Seam I	MG500/1180-WD N=1180kW	-	-
6	Modified Hydraulic powered roof support face of Seam III for Seam-I	ZY11000/16.5/30D	-	-
7	Modified Transition powered roof support of Seam III for Seam-I	ZYG11000/16.5/30D	-	-
8	Modified Face-end powered roof support (№1～3) of Seam III for Seam I	ZYT11000/16.5/30D	-	-
9	Self advancing main gate support set	ZY800/25/48	SET	1
10	AFC (Armoured Face Conveyor)	SGZ800/2×525,2×525	SET	1
11	Bridge Stage loader	SZZ800/400, 375kW	SET	1
12	Self-advance tail end of belt conveyor	MT1200	SET	1
13	Crusher	PLM2200, 250kW	SET	1
14	Emulsion power pack(Three pumps and two tanks)	S-300/50, 262kW	SET	1
15	Water pump(two pumps and one tank)	BPW 315/10	SET	1
16	Hydraulic open circuit props for tail gate supporting	DWQ 35-250/110X	PC	120
17	Pneumatic pump	BQF-11	PC	4
18	Set of Gate belt conveyor for PSLW	B=1200mm, L= 2400m 2×250 KW, 1200 TPH	SET	1
19	Electrical Package	Baldwin & Francis Make	SET	1
20	Misc installation & salvage equip, including 2Nos. shield hauler		SET	1
21.	Bolter Miner Package	Sandvik or any International Reputed manufacturers	SET	1
22 a	Trunk conveyor, TB1	Width 1200mm, TPH 1200, Power 2 x 400 KW	SET	1
22 b.	Trunk conveyor, TB2	Width 1200mm, TPH 1200, Power 2 x250 KW	SET	1
23 a	Set of gate conveyors for Bolter Miner / LCCM	Width 900 mm, L-2400 m, TPH 575, Power 2 x 90 KW	SET	2
23.b	Set of gate conveyors for Bolter Miner / LCCM	Width 900 mm, L- 500 mm, TPH 575, Power 1x 90 KW	SET	1
24	Set of main pumps	-	SET	1
25	Set of intermediate pumps	-	SET	1
26	Direct Haulage	150 KW	SET	3
27	Endless Haulage	75 KW	SET	4

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Shearer-

According to mining thickness of seam-III as well as adaptability and reliability of Shearer to geological condition, MG500/1180-WD type of chainless electric haulage double drum shearer is selected by the successful bidder/Contractor which can easily meet the requirements for both theoretical as well as realistic production capacity.

The main technical feature of shearer as follows:

Type:	MG500/1180-WD
Mining height:	1.9~5.0m
Web:	0.865m
Total installed power:	1180kW
Power supply voltage:	3300V
Haulage speed:	0~13.5m/min
Haulage force:	975kN
Diameter of drum:	2500mm

Above shearer will be used in Seam III. Seam I will be mined after completion of mining for Seam III. One set of shearer will be used in Seam III and Seam I, cutting drum and base frame will only be changed to make it suitable for working in Seam I. Considering the thinner Seam, the same type of MG500/1180-WD shearer will be used after modification. So the detailed parameters for Seam-I operation is as follows:

Type:	MG500/1180-WD
Mining height:	1.4~3.1 m
Web:	0.865m
Total installed power:	1180kW
Power supply voltage:	3300V
Haulage speed:	0~13.5m/min
Haulage force:	975kN
Diameter of drum:	1600mm

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AFC

The average cutting capacity of shearer is about 1100 t/h. The capacities of AFC scraper conveyor, stage loader and crusher should not be less than 1500t/h. For extraction of both Seam III and Seam I, one set of AFC scraper conveyor, stage loader and crusher will be used in above Seams.

The Contractor has considered 210m long, double drive each of 525 KW motor armoured face conveyor for transportation of coal along with the coal face. The AFC has the capacity as high as 1500 tonne/hour at a chain speed of 1.3m per second. The main gate drive may be end or cross side-discharged type. The line pan is 1750 mm. The height is 310 mm and inner width is 800mm. It is a closed bottom pan. Since it is closed bottom pan, it may be necessary to inspect the chain or pan in the closed bottom section. To facilitate the inspection, adequate nos. of inspection pans have been provided. It is fitted with twin in bord chain of 34 x 126 mm size placed at centre distance 200 mm. The ram plate is an integral part of the line pan while the spill plate is attached with the AFC.

The main functions of the AFC are:-

- It conveys coal along face and discharge on to bridge stage loader.
- It provides an anchor to the powered roof support.
- It works as rail for the shearer
- It makes the system continuous.

AFC scraper conveyor:	Type:
Design length:	SGZ800/2×525;
Average Transport capacity:	210m
Peak Transport capacity:	1200t/h
Motor power:	1500t/h
Rated voltage:	2×525kW
	3300V
Stage loader:	
Design length:	Type: SZZ800/400
Average Conveying capacity:	40m
Peak Conveying capacity:	1200t/h
Rated voltage:	1500t/h
Installed power:	3300V
	375kW
Crusher:	
Rated crushing capacity:	Type: PLM1500
Installed power:	1500 t/h
Rated voltage:	160 kW
	3300 V

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Gate Belt Conveyor-

The length of gate belt conveyor should meet the length of the panel and the conveying capacity per hour should also be matched with production capacity of face. The conveying capacity is selected as 1200t/h. The main parameters of gate belt conveyor will be as follows: Belt width: 1200mm, Conveying capacity: 1200t/h, Conveyor length: 2300m, Belt speed: 3 m/s, Power: 2 x250 KW, Rated voltage: 3300V.

Emulsion Pump Station

For the high productive face, one of the key objective of the planner to reduce the cycle time of the support shifting. It is therefore necessary to ensure that the flow rate of the pump will be adequate to operate efficiently. In a PSLW face, higher setting of the powered support is more important than the capacity of the powered support. Emulsion pump is one of the key equipment in the longwall package. The underground longwall face pump station consists of emulsion pump unit and water pump unit. For the faster movement of the powered support, BHEC/Minop has planned to include three pumps and two tanks, where two pumps work and one remain as spare in the emulsion power pack. The pump station is arranged at the track car, which located at 100m far from the longwall face. Its major technical parameters are: working pressure 31.5bar, filtering fineness 40μm, flow rate 400L/min.

Powered support

The powered support of ZY11000/25/50D type has been selected for Seam III with supporting resistance of 1.21-1.35MPa; 48.4-54.00m height of rock can be supported in unit area. According to calculation, the maximum height of caving zone and fissure zone is 22.727+13.4=36.127 m during mining of Seam III and it is less than 48.4m, thus the strength & capacity of support is adequate to take care of and not likely to pose problem. Similarly, during the extraction of seam I, supporting strength is 1.15 to 1.32 MPa, 46.0 to 52.8m height of rock can be supported in unit area. According to calculation, the height of caving zone and fissure zone for Seam-I is 20.32m. whereas the support can take the dead load of 46 m. Even the height of caving zone in Seam III as 22.727 m, the total height will be 43.047m (22.727 +20.32) which is lower than 46.0m , so the support force is fine. After 3 years for completing extraction in Seam III, only less pressure generated from caving zone and fissure zone will transmit to hydraulic support.

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Self advancing Gate road supports

It is one of the safety requirement for advance support in the gate roads both top & bottom gate to take care of the front abutment pressure. It is generally about 25/30 m in advance from the goaf edge. Generally individual open or the closed circuit hydraulic prop is used for the support of the gate roads. It takes longer time for shifting and one of the key constraints for the delays between two cutting cycles. Since it has been proposed high capacity longwall package, the performance of the package will greatly depend on faster rearrangement or shifting of the gate supports. Generally the main gate is very congested & shifting of individual prop is a time consuming event as such it has been provided new generation self-advancing type gate road support for the main gate road. It will not require any physical shifting. It will be shifted like self advancing powered support. It is being commonly used in all high production longwall face. However, for the support of the tailgate, conventional single telescopic hydraulic prop shall be used.

Self-advancing device of stage loader

Over the years, it has been realized that advancing of BSL after each shear is one of major constraints to achieve the higher production from a mechanised longwall face. In the recent years, a self-advancing device for shifting BSL have been developed. Compared with the traditional advancing method, the self-advancing device ensures the BSL supported mutually by stage loader, crusher and the ground surface, based on the rolling friction principle, is able to realize the automatic moving of stage loader and crusher, so as to meet the requirement of big cutting height and fast advancing of high productive and high efficiency working face.

Self advancing gate belt tail end device

Traditionally the drive head of the BSL moves on the belt return end structure & the travel distance is generally about 9m. After advancement of the face by 9m, the belt return end is pulled. This is very arduous & time consuming. This causes delays & adversely affects the production cycle of the longwall face. The self-advancing belt conveyor tail-end device is developed for fast advancing of BSL and tail end of belt conveyor in high productive mines. The gate belt conveyor has the facility of auto loop take up with storage of 100 m conveyor belting. With the advancement of the tail end the conveyor is shortened automatically. The connecting devices of belt tail end and BSL can rotate horizontally, swing from

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left to right and front to back; thus the belt tail end can adapt to the uneven, bending and inclined gateway and advance once after the Shearer working for one/two cycles depending on the web depth.

Auto loop take up for the gate belt conveyor

Bridge Stage Loader will deliver the coal on to the 1200 mm wide gate belt conveyor. The length of the panel will be over 2300 m. The belt conveyor tail end is self-advancing type and continuously backed with progress of face. It is provided with auto loop take up with storage of 100 m of belting and the belt conveyor is thus gradually shortened. 2×200KW drive motor is selected. For the soft start, we have selected hydraulic fluid coupling. The type of belting will be PVC which is duly approved by DGMS.

Bolter Miner (BM) for Gate Road development-

To ensure the higher rate of gate road development Bolter miner is used in gate road. In this case no shuttle car is required. Bolter miner is continuous miner. It can cut coal as well does the support simultaneously. As per the Contractor, the floor of the gate road is likely be soft, the operation of shuttle car will be difficult. It is proposed to drive the two headings together which will act as gate road of two adjacent panels. As the length of panel will be long, considering the better ventilation & operational comfort, gate roads will be interconnected after 100 m. It has been planned to lay gate belt conveyor in both the headings. Bolter miner will discharge coal on the extendable belt conveyors, through feeder conveyor. After the drivages of 100m, the bolter miner will retreat & will be taken to the next heading of the twin gate road for drivage. BM will start cutting & will continue to drive 100m. The interconnection will be made from both the side with the help of the crawler mounted feeder conveyor.

Transport of equipment to underground

The equipments will be dismantled as per requirement & loaded on the special transport trolley. These will be lowered from surface by slow speed haulage to minimize the possibility of derailment through the material transport haulage road. The lowering of the equipment will be made as per the installation sequence so that materials are not jumbled up at underground. At the underground transfer point, it will be shifted from the direct haulage route to a slow speed endless haulage installed in the gate roads. A towing car will be used for proper & positive attachment with the haulage rope to prevent any runaway.

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Shield hauler & utility vehicle

A modern high capacity longwall face will require handling of about 6000 tonne of steel materials. It is the management's object and desire as to how those materials can be handled safely, economically within the shortest period so that the equipment can be deployed gainfully for coal production. Generally such transport equipment is kept for a nos. of longwall panels for proper utilization of the mechanized transporters. Contractor has proposed 2 nos. of shield hauler having capacity of transportation of 40 tonne shields. This is tyre mounted diesel machines with attachment of forks at the front. The support which will be transported from surface on trolley through a series of haulages to the face. The chock transporters will lift from the trolley and carry through the face and place at the appropriate location. Apart from the chock transportation, the transport will also carry the shearer, AFC pans, etc; this mechanized transportation will help to complete the installing within 40 days. For the easy and faster transportation, there will be a parallel gallery with the face having a couple of entries between the escape gallery and coal face gallery for the movement of the chock transporter.

Out of the 2 nos. of shield haulers, one shield hauler will be earmarked for the recovery of the support at the time of face shifting and the other one will be engaged for face installation at the new panel. Shield hauler will have an extremely robust and failsafe longwall recovery vehicle capable of hauling larger longwall equipment with optional cameras fitted at the front and rear, along with LCD displays in the operators cabin ensure the operator has excellent visibility in all directions at all times.

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5.10.2 List of equipment for Continuous Miner Panel (Proposed)-

Sl No.	Equipment	Quantity
1	Continuous Miner, Cutting height, Operating range 2.16m to 4.6m, Cutting width-3.3m, Cutting Power-621 kW,1100V	1 no.
2	Shuttle car (electric) Capacity-10.19m^3, Power-219 kW, 1100V	2 nos.
3	Roof Bolter, Operating range 2.16m to 4.6m, power 2X37 Kw, 550 V	1 set
4	Feeder Breaker, 500 tph, Power 112 kW, 1100V	1 no.
5	Load Haul Dumper, 1.5 m^3, 550V,5.7t	1 no.
6	Gate Belt Conveyor,500tph, 1000mm width, 2x90kW,550V	1 set
7	Electricals for the above equipment	1 set
8	Face pump, Discharge-11 lps, head- 33 m, power-7.5kw with 550V FLP electricals.	3 nos.
9	Aux. fan 12 m3/s, 100mm WG, 22.5 Kw with 550v, FLP electricals.	3 nos.
10	Endless haulage, 30 kw with 550V with FLP electricals.	1 no.
11	Ventilation duct, 800mm dia, semi-rigid type	300m
12	Pipe , dia – 100mm	LS
13	Rail Track	LS

5.10.3 List of equipment for SDL Panel (Proposed along with existing equipment)-

For Standard height & low height SDL Panels-

Sl No.	Equipment	Quantity
1	SDL, Standard height,1.1m3, 48 kw 550V, 8t with bi- directional chain conveyor bucket including cable reel and gate end bow, crawler mounted with FLP electrical.	3 nos.
2	SDL, low height,1.0m3, 48 kw 550V with bi-directional chain conveyor bucket including cable reel and gate end bow, crawler mounted with FLP electrical.	2 nos.
3	Pony conveyor, L-100m W-800mm 1x22 kW, 150 tph, 550V with FLP electrical.	6 sets
4	Gathering Belt Conveyor, L-200m W-800mm 1x30kW, 150 tph, 550V with FLP electricals.	2 nos.
5	Gate belt conveyor (Length depends on Panel length), W-800mm, 1x55 kW, 550V, FLP.	2 set
6	Endless haulage, 30 kw with 550V with FLP electrical.	1 no.
7	Endless haulage, 22 kw with 550V with FLP electrical.	1 no.
8	Hand held drill machine 1.1 kw with 110V FLP electrical.	6 nos.
9	Face pump, Discharge - 11 lps, head – 33m, power-7.5kw with 550v FLP electricals.	4 nos.
10	Aux. fan 3-6m3/s, 250-60mm WG,15 Kw with 550v, FLP electrical.	4 nos.
11	Exploder (Multi shot)	4 nos.
12	Ventilation duct, 800mm dia, semi rigid type	1000m
13	Pipe , dia – 100mm	LS
14	Rail Track (15 Kg)	LS

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5.10.3 List of existing equipment in Opencast Operation-

Existing machinery details-

a) Muraidih OCP Colliery (Departmental)-

The list of Equipment presently being operated departmentally in Muraidih colliery OCP with base of floor of V/VI/VII seam is given below-

Sl. No.	Equipment	Capacity	Nos.
1	Shovel	10 Cu.m.	1
2	Shovel	5 Cu.m.	2
3	Hydraulic Shovel	4.8 Cu.m.	3
4	Hydraulic Shovel	3.2 Cu.m.	2
5	Dumper	85 Te.	4
6	Dumper	60 Te.	21
7	Water Tanker	28KL	1
8	Water Tanker	20KL	3
9	Crane	80 Te.	1
10	Crane	40 Te.	1
11	Crane	30 Te.	1
12	Crane	20 Te.	1
13	Crane	8 Te.	1

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5.10.2 List of equipment for Continuous Miner Panel (Proposed)-

Sl No.	Equipment	Quantity
1	Continuous Miner, Cutting height, Operating range 2.16m to 4.6m, Cutting width-3.3m, Cutting Power-621 kW,1100V	1 no.
2	Shuttle car (electric) Capacity-10.19m^3, Power-219 kW, 1100V	2 nos.
3	Roof Bolter, Operating range 2.16m to 4.6m, power 2X37 Kw, 550 V	1 set
4	Feeder Breaker, 500 tph, Power 112 kW, 1100V	1 no.
5	Load Haul Dumper, 1.5 m^3, 550V,5.7t	1 no.
6	Gate Belt Conveyor,500tph, 1000mm width, 2x90kW,550V	1 set
7	Electricals for the above equipment	1 set
8	Face pump, Discharge-11 lps, head- 33 m, power-7.5kw with 550V FLP electricals.	3 nos.
9	Aux. fan 12 m3/s, 100mm WG, 22.5 Kw with 550v, FLP electricals.	3 nos.
10	Endless haulage, 30 kw with 550V with FLP electricals.	1 no.
11	Ventilation duct, 800mm dia, semi-rigid type	300m
12	Pipe , dia – 100mm	LS
13	Rail Track	LS

5.10.3 List of equipment for SDL Panel (Proposed along with existing equipment)-

For Standard height & low height SDL Panels-

Sl No.	Equipment	Quantity
1	SDL, Standard height,1.1m3, 48 kw 550V, 8t with bi- directional chain conveyor bucket including cable reel and gate end bow, crawler mounted with FLP electrical.	3 nos.
2	SDL, low height,1.0m3, 48 kw 550V with bi-directional chain conveyor bucket including cable reel and gate end bow, crawler mounted with FLP electrical.	2 nos.
3	Pony conveyor, L-100m W-800mm 1x22 kW, 150 tph, 550V with FLP electrical.	6 sets
4	Gathering Belt Conveyor, L-200m W-800mm 1x30kW, 150 tph, 550V with FLP electricals.	2 nos.
5	Gate belt conveyor (Length depends on Panel length), W-800mm, 1x55 kW, 550V, FLP.	2 set
6	Endless haulage, 30 kw with 550V with FLP electrical.	1 no.
7	Endless haulage, 22 kw with 550V with FLP electrical.	1 no.
8	Hand held drill machine 1.1 kw with 110V FLP electrical.	6 nos.
9	Face pump, Discharge - 11 lps, head – 33m, power-7.5kw with 550v FLP electricals.	4 nos.
10	Aux. fan 3-6m3/s, 250-60mm WG,15 Kw with 550v, FLP electrical.	4 nos.
11	Exploder (Multi shot)	4 nos.
12	Ventilation duct, 800mm dia, semi rigid type	1000m
13	Pipe , dia – 100mm	LS
14	Rail Track (15 Kg)	LS

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b) Phularitand OCP Colliery-

OB Loading			
Category	**Model**	**Qty**	**Capacity (CuM)**
Excavator	Volvo EC-480	10	2.45
Excavator	Cat 349	3	3.4

Coal Loading			
Excavator	Hyundai 390	1	2.3
Excavator	Hyundai 340	1	2
Excavator	Hyundai 220	1	1.7
Excavator	Hyundai 210	1	0.92

OB Transporation			
Tipper	Volvo - 440 / 460	42	19.5

OB Transporation (Mines to CHP)			
Tipper	Volvo - 440 / Eicher Pro 8030 / MAN	15	

OB Transporation (CHP to Railway Siding)			
Tipper	Tata / MAN	8	

Rack Loading			
Payloader	HM - 2021/L&T 9020 / LiuGong	8	

Supporting Equipments			
Dozer	Catterpiller D8R & D6R	6	
Grader	Catterpiller 140k2	3	
Water Tanker	Volvo / AMW	3	
Wheel Loader	L&T 9020 / HM-2021	2	
Service Van	Eicher	3	

In this mining plan, additional provisioning of HEMM has not been made considering the final pit layout because this OCP will be made by amalgamating of existing Muraidih Colliery (departmental) and Hired HEMM of Phularitand Colliery. The final operation is to be decided by BCCL management for operation of this amalgamated OCP whether by Outsourced or departmental method.

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5.11 · Mine Entries-

5.11.1 Details of existing Mine Entries for Global Bid Longwall Project-

(Located on north-eastern part in existing Muraidih Colliery)

Sl. No.	Particulars	Main Incline No.1 (Existing)	Auxiliary Incline No.2 (Existing)	Air Shaft (Existing)
1.	Length of Open excavation/ Concreating for Incline / shaft including drift drivage in stone to touch coal of seam-III	**52.7m** (actual) (as per Plan-51.2m)	**48.2m** (actual)	**11.1 m**(actual) (Out of 125m depth as per approved Supplementary note'2015)
2.	Cross-sectional dimension (width/height)	**5.0m x 3.5 m**	**5.0m x 3.5 m**	**Inner Dia-6.0m & Outer Dia 6.8m,** Concrete lining, located on OB dump
3.	Gradient of Incline/Drift (as per FDPR)	**13°**	**15°**	
4.	Fan Drift			**Length-19.3m, 4.2m x 3.5m Gradient-1 in 2**
5.	Status	Completed.(touched Seam-III). Presently water logged	Completed.(touched Seam-III). Presently water logged	Sinking partly Constructed. Yet to touch Seam-III Fan drift - completed
6.	Length of drift drivage /Sinking to be made	**228m** (Seam-III to Seam-I) (as per Plan submitted with approved Supplementary note' 2015)	**228m** Seam-III to Seam-I) (as per Plan submitted with approved Supplementary note' 2015)	**113.9m** (to be sunk rest part upto Seam-I)
7.	Name of coal Seam to be touched	**Seam-I**	**Seam-I**	**Seam-III and then Seam-I**
8.	Status	**Work is suspended since 01.06.2016 by Contractor**		
9.	Inclines proposed to be equipped with Belt/Haulage and capacity (Kw)	Belt conveyor		
4.	Purpose	Intake airway, Coal Transportation, Travelling Roadway	Intake airway, Material Transportation, Emergency exist	Return Airway

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5.11.1 Details of existing/proposed Mine Entries in property of Phularitand Colliery-

(Located on Western part)

Sl. No.	Particulars	Incline No.1 (Existing)	Incline No.2 (Existing)	Air Shaft (Proposed)
1.	Length of Open excavation/ Concreating for Incline including drift drivage in stone to touch coal of seam-III	Total Length - 319m (Including 40m incline mouth)	**Total Length - 323m** (Including 40m incline mouth)	**Total depth 85m** (upto Seam-I)
2.	Cross-sectional dimension (width/height)	**4.8 m x 3.0 m**	**4.8 m x 3.0 m**	Inner Dia-6.0m
3.	Status	**Existing (in operation)** (being used as return airway), Exhaust Fan installed at Incl.mouth.	**Existing (in operation)** (being used as Intake airway), Direct Haulage installed at surface, Coal transport, material & Travelling	Proposed
4.	Purpose (to be used in future)	Intake airway, Coal transportation through Belt Conveyor, Travelling roadway	Intake airway, material transportation through Haulage	Return airway
5.	Proposed Drift Drivages (D1 & D2) from Seam-III to Seam-I/II Comb.floor)	**Drift Length(D1)** Length-100m(approx.), 4.8m x 3.0m, 1 in 5	**Drift Length(D2)** Length-85m(approx.), 4.8m x 3.0m, 1 in 4.5	**Fan Drift** Length- 25m 4.5m x 2.5 m
6.	Purpose (to be used in future)	Intake airway, Coal transportation through Belt Conveyor, Travelling roadway to Seam-I	Intake airway, material transportation through Haulage to Seam-I,	Return, Air shaft will be sunk upto Seam-I.

Proposed Drifts

Sl. No.	Activity	Width x Height	Length	Gradient	Location	Purpose
1	Drift from Seam-I/II Comb to Seam-III (top of Strata bunker in stone). Drift (D3)	4.5 m X 2.5 m	60m (approx)	1 in 5 (Parting 12m)	Seam-I/II comb. floor to Seam-III floor	Coal Transport from Seam-I/II to Seam-I
2	Drift to Cross Fault (F4F4), Throw-5m (approx.) in Seam-III Drifts (D4 & D5)	4.5 m X 2.5 m	25m (approx)	1 in 5	III seam to III seam	Both Intake airways
3	Drift to Cross Fault (F4F4), Throw-5m (approx.) in Seam-III Drifts (D6)	4.5 m X 2.5 m	25m (approx)	1 in 5	III seam to III seam	Return airway
4	Drift to Cross Fault (F4F4), Throw-5m (approx.) in Seam-I/II combined Drifts (D7 & D8)	4.5 m X 2.5 m	25m (approx)	1 in 5	I/II comb. seam to I/II comb seam	Both Intake airways
5	Drift to Cross Fault (F4F4), Throw-5m (approx.) in Seam-I/II Comb. Drifts (D9)	4.5 m X 2.5 m	25m (approx)	1 in 5	I/II comb. seam to I/II comb seam	Return airway

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5.12 Highest Flood Level (HFL)-

The Khodo Nala (Khudia) is flowing from west to east within the property of amalgamated Muraidih Colliery and after crossing the western side lease boundary, it flows from north to south. The highest flood level (HFL) of Khodo Nala is 197.3m as shown in surface plan submitted by area authority.

5.13 Degree of Gassiness-

In existing Phularitand Colliery, development in Seam-III is going on and Seam-I/II & I is virgin. This mine has been categorised as Degree-I gassy mine. In future, it is assumed that workings in both seam will be Degree-I. In amalgamated Muraidih Colliery, Both seam-III & Seam-I is virgin and assumed to be Degree-I

5.14. Roof & Floor

Seam-III-

As per the geological parameter, the roof of Seam-III within the proposed project area of amalgamated Muraidih-Phularitand (part) Collier is generally carbonaceous shale and medium to coarse grained sandstone while immediate floor is carbonaceous shale and medium to coarse grained sandstone.

Seam-I/II combined-

The roof is generally coarse grained sandstone while immediate floor is either carbonaceous shale.

Seam-I -

The roof is generally intercalation of shale and sand while immediate floor is coarse grained sandstone or shale.

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5.15 Reserves

The integrated geological assessment on the basis of available surface and sub-surface data have clearly established 247.039 million tons of coal within the proposed Project area of Muraidih-Phularitand(part) Colliery) falling in Cluster-II. Out of which 34.139 million tons is coking coal and 212.90 million tons is non-coking coal.

TOTAL RESERVES (In Mt) (Falling inCluster-II)

Total Coking & Non Coking Coal Resource (in million Tonnes) Within the Leasehold Area falling in Cluster-II						
SEAM	COKING		NON-COKING		TOTAL	
	PROVED	INDICATED	PROVED	INDICATED		
XIII	0.271				0.271	Open Cast Norm
XI/XII	5.229				5.229	
IX/X	9.83				9.83	
VIIIC	3.627		0.2		3.827	
VIIIB	4.867		0.67		5.537	
VIIIA	9.166		0.13		9.296	
VIII	1.149		0		1.149	
V/VI/VII			99.66		99.66	
IVT			2.42		2.42	
IV			7.64		7.64	
IVB			0.94		0.94	
III (for OC) (Northern side of Khodo Nala)			2.36		2.36	
Sub total	**34.139**	**0**	**114.02**	**0**	**148.159**	
III (Rest)			44.44	3.27	47.71	Under Ground Norm
II			11.41	1.52	12.93	
I/II			6.59		6.59	
I			28.36	3.29	31.65	
Sub-Total	**0**	**0**	**90.8**	**8.08**	**98.880**	
Grand Total	**34.139**		**204.82**	**8.08**	**247.039**	

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Production from 1989-90 to March 2019-

Production from 1989-90 to March'19				Production in Mt
Production in Mt	Phularutand Colliery North of DC Line(Cluster-II)	Muraidih OC Colliery	Shatabdih OC Colliery	Total
UG Prod.	0.292			0.292
OC Prod. (Departmental)	6.226	50.023	10.798	67.047
OC Prod. (Contractual)	11.556	0.587	2.105	14.248
Total	18.074	50.610	12.903	81.587
Note :- Production before 1989-90 is not available with the Mine authority				

5.16. Extractable Reserves-

5.16.1 Underground Extractable Reserves-

Underground extractable reserves have been estimated in area having more than 15m Hard cover.

A) Extractable reserves of Seam-III and Seam-I/II Combined & Seam-I where SDL/Continuous Miner Panels area proposed within the Project area

SEAM	Proved		Indicated		Total		Total Proved	Total Indicated	Grand Total
	Dev	Dep	Dev	Dep	Dev	Dep			
Seam-III	2.03	3.25	0.90	1.32	2.93	4.57	5.28	2.22	7.50
Seam-I & I/II Comb	2.79	4.00	0.43	0.65	3.22	4.65	6.79	1.08	7.87
Total	4.82	7.25	1.33	1.97	6.15	9.22	12.07	3.30	15.37

B) Extractable reserves of Seam-III and Seam-I where Longwall Panels area proposed within the Project area i.e in Global bid Project area.

Extractable Reserves Longwall Panels, Gate Roads & other Development (in Mt)			
	Seam-III	Seam-I	Total
Longwall Reserves	12.551	8.687	21.238
Gate Road Development Reserves	1.49	0.904	2.394
Development (B&P) Reserves	1.489	0.673	2.162
Total Reserves	15.53	10.264	25.794

Total Extractable Reserves (Mt) (A+B) within the proposed project area is given below-

Seams	SDL+CM	Longwall+Gate Road+B&P	Total
Seam-III	7.50	15.53	23.03
~~Seam-I/II & Seam-I~~	~~7.87~~	~~10.264~~	~~18.134~~
Total	**15.37**	**25.794**	**41.164**

Details of Seam wise & Equipment wise Extractable Reserves are given below-

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Underground Extractable Reserves (Seam-wise & Panel-wise)

The panel wise extractable reserve of Seam-III and Seam-I/II & Seam-I has been shown below and next pages-

LONGWALL PANEL PRODUCTION — Reserves in Mt

Panel No.	Panel Length (m)	Face width (m) (Coal to Coal)	Caving with retreating (% of extraction.) As considered by Contractor	Av Seam Th.(m) considered for Reserve estimation (Data of BHs near panels)	Av. Ash% of Coking coal	Av. GCV	Av. Sp.gr (t/m3	Longwall Prod. (Mt)	LW Prod. Per Day (Considered for 2.0 Mty production)	Working Months (Considered 305 working Days in a year as per bidder)
LONGWALL PANELS OF SEAM-III										
301	2332	200	90%	4.24	39.32	4781	1.55	2.759	6500	16.70
302	2270	200	90%	4.01	41.11	4843	1.55	2.54	6500	15.37
303	1884	200	90%	3.90	42.25	4510	1.60	2.116	6500	12.81
304	1419	200	90%	4.14	40.93	4500	1.55	1.639	6500	9.92
305	1052	200	90%	4.24	43.38	4207	1.60	1.285	6500	7.78
306	1943	200	90%	4.08	39.63	4771	1.55	2.212	6500	13.39
Total Longwall Reserves of Seam-III								12.551		
Average				4.10		4602 Grade G9	1.57		6500	
LONGWALL PANELS OF SEAM-I										
101	2305	190	90%	2.70	36.68	5960	1.45	1.543	6500	9.34
102	2171	190	90%	2.41	38.00	5543	1.50	1.342	6500	8.12
103	1748	190	90%	2.42	38.48	5658	1.50	1.085	6500	6.57
104	1275	190	90%	2.42	38.18	5735	1.50	0.791	6500	4.79
105	1236	190	90%	2.11	41.46	5323	1.50	0.669	6500	4.05
106	1159	190	90%	2.42	40.24	5564	1.50	0.719	6500	4.35
107	1652	190	90%	2.53	39.33	5603	1.50	1.072	6500	6.49
108	2064	190	90%	2.77	38.38	5776	1.50	1.466	6500	8.87
Total Longwall Reserves of Seam-I								8.687		
Average				2.47		5645 Grade G6	1.49		6500	
Total Longwall Reserves of Seam-III & Seam-I								21.238		

The Longwall equipment selected by bidder has higher production capacity of around 9000 Tpd which can produce upto 2.6 Mty but to match with schedule of gate road development, reducing frequent shifting face equipment and preparing longwall panel, the average production considered as 6500 Tpd with annual target of 2.0Mt as per the NIT requirement.

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GATE ROAD DEVELOPMENT EXTACTABLE RESERVES

Reserves in Mt

BOLTER MINER RESERVES SEAM-III

Panel/Heading name to be dev. by Bolter Miner	Dev Length (m)	Weight av. Seam Thick(m)	Av Seam Th.(m) Considered for Resv.Estimate	Av Width (m) considered by Bidder	Area of Cross Section (Sq.M)	% of extraction	Av. GCV	Sp.gr (t/m3	Development Coal by BM (Mt)	Prod./ Day (Te) (BM Adv. 40m/Day/BM)	Working Months
	As per FDPR, Service Life of BM considered as @0.335 Mty i.e 1098 TPD for Seam-III with 305 working days										
	For Mine Scheduling, Gate road Development and B&P Development/depillaring for both Seam-III & Seam-I by Bolter Miner is considered as 1000 Tpd										
Seam-III Gate Road Dev.	Total working Days considered by Bidder as=				305	Days/Year					
	For Extraction of Gate road, Mining height and width is considered by Bidder as 4.4m and 5.2m respectively										
Main Trunk Headings Development in Seam-III	4251	4.73	4.40	5.2	22.88	1	4386	1.60	0.156	1000	6.14
Gate Road Seam-III BM-2	5406	4.21	4.21	5.2	21.89	1	4676	1.55	0.183	1000	7.20
Gate Road Seam-III BM-3	5440	4.41	4.40	5.2	22.88	1	4781	1.55	0.193	1000	7.59
Face Connection Panel 301	200	3.24	3.24	5.2	16.85	1	4536	1.6	0.005	1000	0.20
Gate Road Seam-III BM-4	5440	4.05	4.05	5.2	21.06	1	4825	1.55	0.178	1000	7.00
Face Connection Panel 302	200	2.70	2.70	5.2	14.04	1	4367	1.6	0.004	1000	0.16
Gate Road Seam-III BM-5	5418	3.90	3.90	5.2	20.28	1	4423	1.6	0.176	1000	6.92
Face Connection Panel 303	200	2.94	2.94	5.2	15.29	1	4351	1.6	0.005	1000	0.20
Gate Road Seam-III BM-6	5846	4.19	4.19	5.2	21.79	1	4275	1.6	0.204	1000	8.03
Face Connection Panel 304	200	3.19	3.19	5.2	16.59	1	4525	1.6	0.005	1000	0.20
Gate Road Seam-III BM-7	1308	4.71	4.40	5.2	22.88	1	4835	1.55	0.046	1000	1.81
Gate Road Seam-III BM-8	2731	4.07	4.07	5.2	21.16	1	4338	1.6	0.092	1000	3.62
Face Commection Panel 305	200	4.06	4.06	5.2	21.11	1	4858	1.55	0.007	1000	0.28
Gate Road Seam-III BM-9	2558	4.26	4.26	5.2	22.15	1	4771	1.55	0.088	1000	3.46
Gate Road Seam-III BM-10	4748	3.70	3.70	5.2	19.24	1	4820	1.55	0.142	1000	5.59
Face Connection Panel 306	200	3.52	3.52	5.2	18.3	1	4536	1.6	0.006	1000	0.24
Total Resaves of Gate Road Dev (Seam-III)		3.87	3.83		←---Average→		4581	1.58	1.49		
	44346						i.e Av.Grade G9				

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BOLTER MINER RESERVES SEAM-I

Reserves in Mt

Seam-I Gate Road Dev	As per FDPR, Service Life of BM considered as @0.305 Mty i.e 1000 TPD for Seam-I with 305 working days Max. Height of Seam Extraction of Gate road is also considered by Bidder as 2.4m and width as 5.2m										
Panel/Heading name to be dev. by Bolter Miner	Dev Length (m)	Weight av. Seam Thick(m)	Av Seam Th.(m) Considered for Resv.Estimate	Av Width (m) considered by Bidder	Area of Cross Section (Sq.M)	% of extraction	Av. GCV	Sp.gr (t/m3	Development Coal by BM (Mt)	Prod./ Day (Te) (BM Adv. 40m/Day/BM)	Working Months
Main Trunk Headings Development in Seam-I	4739	2.28	2.28	5.2	11.86	1	5652	1.50	0.084	1000	3.30
Gate Road BM I-2	5643	2.55	2.40	5.2	12.48	1	6007	1.45	0.102	1000	4.01
Gate Road BM I-3	5607	2.41	2.40	5.2	12.48	1	5510	1.5	0.105	1000	4.13
Face Connection Panel 101	190	3.01	2.40	5.2	12.48	1	5869	1.45	0.003	1000	0.12
Gate Road BM I-4	5596	2.42	2.40	5.2	12.48	1	5523	1.5	0.105	1000	4.13
Face Connection Panel 102	190	2.77	2.40	5.2	12.48	1	5742	1.5	0.004	1000	0.16
Gate Road BM I-5	5713	2.45	2.40	5.2	12.48	1	5683	1.5	0.107	1000	4.21
Face Connection Panel 103	190	2.73	2.40	5.2	12.48	1	5746	1.50	0.004	1000	0.16
Gate Road BM I-6	5659	2.24	2.24	5.2	11.65	1	5671	1.5	0.099	1000	3.89
Face Connection Panel 104	190	3.01	2.40	5.2	12.48	1	5590	1.5	0.004	1000	0.16
Gate Road BM I-7	3011	2.54	2.40	5.2	12.48	1	5762	1.5	0.056	1000	2.20
Face Connection Panel 105	190	2.14	2.14	5.2	11.13	1	5323	1.5	0.003	1000	0.12
Gate Road BM I-8	2887	2.4	2.40	5.2	12.48	1	5827	1.45	0.052	1000	2.05
Gate Road BM I-9	4033	2.56	2.40	5.2	12.48	1	5602	1.5	0.075	1000	2.95
Face Connection Panel 106	190	2.40	2.40	5.2	12.48	1	5627	1.50	0.004	1000	0.16
Gate Road BM I-10	5016	2.57	2.40	5.2	12.48	1	5844	1.45	0.091	1000	3.58
Face Connnection Panel 107	190	2.78	2.40	5.2	12.48	1	5895	1.45	0.003	1000	0.12
Face Connection Panel 108	190	3.23	2.40	5.2	12.48	1	6152	1.45	0.003	1000	0.12
Total Reseves of Gate Road Dev Seam-I		**2.58**	**2.37**		**←----Average-→**		**5724**	**1.48**	**0.904**		
	49424					**i.e Av.Grade G6**					
Total BM Reserves of Seam-III & Seam-I									**2.394**		

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BORD & PILLAR DEVELOPMENT RESERVES SEAM-III & SEAM-I

Reserves in Mt

For Mine Scheduling, Gate road Development and B&P Development/Depillaring for both Seam-III & Seam-I by Bolter Miner is considered as 1000 Tpd

As per FDPR, Service Life of BM considered as @0.335 Mty i.e 1098 TPD for Seam-III with 305 working days

SEAM	PANEL NO.	DEV. AREA (m2)	DEP. AREA (m2)	PILLAR SIZE (M x M) Center to Center) Considered by Bidder	% Extrn. By Bidder		AV. Thickness (m)			Equipment	Av. Sp. Gravity (t/m3)	Extractable Reserve (Mt.)							
					DEV	DEP	Seam	Dev	Dep			Total Dev. (Mt)	Av. Prod./ per/Day (By Bidder	Working Months		Total Dep (Mt)	Prod./ per/ Day	Working Months	Total Ext. Resv. (Mt)
III SEAM	Dev. Seam-III (B&P-IV)	33976	26476	35 x 35	0.28	0.42	5.15	4.4	4.4	BM	1.55	0.064	1000	2.52		0.08	1000	3.15	0.14
	Main Sump Dev. Seam-III (B&P)-I	84515	80262	35 x 35	0.28	0.42	4.92	4.4	4.4	BM	1.55	0.159	1000	6.25		0.23	1000	9.05	0.39
	Dev.t Seam-III (B&P)-II	98502	98502	35 x 35	0.28	0.42	4.74	4.4	4.4	BM	1.55	0.185	1000	7.28		0.29	1000	11.41	0.48
	Dev. Seam-III (B&P)-III	116834	116834	35 x 35	0.28	0.42	3.83	3.83	3.83	BM	1.55	0.191	1000	7.51		0.29	1000	11.41	0.48
	Total Reaserves of Seam-III											0.599				0.890			1.489
	As per FDPR, Service Life of BM considered as @0.305 Mty i.e 1000 TPD for Seam-I with 305 working days																		
I SEAM	Dev. Seam-I (B&P-IV)	34641	26436	45 x 45	0.28	0.42	2.59	2.40	2.40	BM	1.45	0.033	1000	1.30		0.04	1000	1.57	0.07
	Main Sump Dev. Seam-I (B&P)-I	82465	63792	45 x 45	0.28	0.42	2.32	2.32	2.32	BM	1.5	0.079	1000	3.11		0.09	1000	3.54	0.17
	Dev. Seam-I (B&P)-II	56550	56550	45 x 45	0.28	0.42	1.98	1.98	1.98	BM	1.5	0.046	1000	1.81		0.07	1000	2.75	0.12
	Dev. Seam-I (B&P)-III	126309	126309	45 x 45	0.28	0.42	2.63	2.40	2.40	BM	1.5	0.125	1000	4.92		0.19	1000	7.47	0.32
	Total Reaserves of Seam-I											0.283				0.390			0.673
	Total B&P Development Reserves of Seam-III & Seam-I by BM											0.882				1.280			2.162

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Reserves within area of Phaularitand(Part) Colliery and annexed area of Muraidih Colliery

EXTRACTABLE RESERVE (VITHIN > 15M HARD COVER LINE)

SEAM	Reserves Type	PANEL NO.	DEV. AREA (m2)	DEP. AREA (m2)	PILLAR SIZE (M x M) Center to Center)	X Extn.		AV. Thickness (m)			Loading Equip.	Av. Sp. Gravity	Extractable Reserve (Mt.)							
						DEV.	DEP.	Seam	Dev.	Dep.			Total Dev.(M	Prod./ per/Da	Working	Dep.	Total Dep	Prod./ per/Da	Working	Total Est.
		MAINDIP-IIIA		50400	26 x 26	0.34	0.36	3.14	3.00	3.14	SDL	1.60		0		0.09	0.09	1000	3.60	0.09
		MAINDIP-IIIB	78167	39572	36 x 36	0.25	0.45	2.91	2.91	2.91	SDL	1.60	0.09	200	18.20	0.07	0.07	200	14.00	0.16
		MAINDIP-IIIB	41291	41290	36 x 36	0.25	0.45	2.91	2.91	2.91	SDL	1.60	0.05	200	9.60	0.09	0.09	200	18.00	0.14
	III Indicated	MAINDIP-IIIC	87805	87805	36 x 36	0.25	0.45	2.94	2.94	2.94	SDL	1.60	0.10	300	13.72	0.19	0.19	300	25.32	0.29
		MAINRISE-IIID	30120	26416	26 x 26	0.34	0.36	2.83	2.83	2.83	SDL	1.60	0.05	300	6.12	0.04	0.04	300	5.32	0.09
		MAINRISE-IIIE	29253	26002	26 x 26	0.34	0.36	2.01	2.01	2.01	SDL	1.55	0.03	300	4.12	0.03	0.03	300	4.00	0.06
		P3-1	35480		26 x 26	0.34	0.36	2.47	2.47	2.47	SDL	1.55	0.05	300	6.12			300		0.05
		P3-2	25930	9130	26 x 26	0.34	0.36	2.47	2.47	2.47	SDL	1.55	0.03	300	4.40	0.01	0.01	300	1.32	0.04
		P3-3	22621		26 x 26	0.34	0.36	2.31	2.31	2.31	SDL	1.55	0.03	300	3.60			300		0.03
III SEAM		P3-4	25568	19362	26 x 26	0.34	0.36	2.65	2.65	2.65	SDL	1.55	0.04	300	4.68	0.03	0.03	300	4.00	0.07
		P3-5	77100	74403	26 x 26	0.34	0.36	3.13	3.00	3.13	CM	1.55	0.12	1500	3.20	0.13	0.13	1500	3.48	0.25
		P3-6	85895	91257	26 x 26	0.34	0.36	3.32	3.00	3.32	CM	1.55	0.13	1500	3.56	0.17	0.17	1500	4.52	0.30
		P3-7	95005	100128	36 x 36	0.25	0.45	3.27	3.00	3.27	CM	1.55	0.11	1500	2.92	0.23	0.23	1500	6.12	0.34
		P3-8	149971	142929	36 x 36	0.25	0.45	3.56	3.00	3.56	CM	1.55	0.17	1500	4.60	0.36	0.36	1500	9.60	0.53
		P3-9	168743	163958	36 x 36	0.25	0.45	3.32	3.00	3.32	CM	1.55	0.20	1500	5.20	0.38	0.38	1500	10.12	0.58
		P3-10	180817	175634	36 x 36	0.25	0.45	3.46	3.00	3.46	CM	1.55	0.21	1500	5.56	0.43	0.43	1500	11.48	0.64
		P3-11	185078	179894	36 x 36	0.25	0.45	2.98	2.98	2.98	CM	1.60	0.22	1500	5.68	0.39	0.39	1500	10.40	0.61
		P3-12	185000	179816	36 x 36	0.25	0.45	2.83	2.83	2.83	CM	1.60	0.21	1500	5.56	0.37	0.37	1500	9.88	0.58
	III Indicated	P3-13	192382	187198	36 x 36	0.25	0.45	3.17	3.00	3.17	CM	1.55	0.22	1500	5.96	0.42	0.42	1500	11.20	0.64
	III Indicated	P3-14	210464	194926	36 x 36	0.25	0.45	3.16	3.00	3.16	CM	1.55	0.24	1500	6.52	0.43	0.43	1500	11.48	0.67
	III Indicated	P3-15	122612		36 x 36	0.25	0.45	2.66	2.66	2.66	CM	1.60	0.14	1500	3.60			1500		0.14
		P3-16	53594	27254	26 x 26	0.34	0.36	1.90	1.90	1.90	SDL	1.55	0.05	300	7.08	0.03	0.03	300	4.00	0.08
		P3-17	11870	8911	26 x 26	0.34	0.36	1.90	1.90	1.90	SDL	1.55	0.01	300	1.60	0.01	0.01	300	1.32	0.02
		P3-18	17383	14488	26 x 26	0.34	0.36	1.90	1.90	1.90	SDL	1.55	0.02	300	2.28	0.02	0.02	300	2.68	0.04
		P3-18A	14487	11590	26 x 26	0.34	0.36	1.90	1.90	1.90	SDL	1.55	0.01	300	1.88	0.01	0.01	300	1.32	0.02
		P3-18B	24343	21638	26 x 26	0.34	0.36	1.90	1.90	1.90	SDL	1.55	0.02	300	3.20	0.02	0.02	300	2.68	0.04
		P3-19	44448	38922	40 x 40 (Rombu	0.23	0.47	3.02	3.00	3.02	CM	1.60	0.05	1500	1.28	0.09	0.09	1500	2.40	0.14
		P3-20	69773	63042	40 x 40 (Rombu	0.23	0.47	3.00	3.00	3.00	CM	1.60	0.07	1500	1.96	0.14	0.14	1500	3.72	0.21
		P3-21	74508	63045	40 x 40 (Rombu	0.23	0.47	2.74	2.74	2.74	CM	1.60	0.07	1500	1.96	0.13	0.13	1500	3.48	0.20
	III Indicated	P3-22	71638	57277	40 x 40 (Rombu	0.23	0.47	2.63	2.63	2.63	CM	1.60	0.07	1500	1.80	0.11	0.11	1500	2.92	0.18
	III Indicated	P3-23	57314	45850	40 x 40 (Rombu	0.23	0.47	2.35	2.35	2.35	CM	1.60	0.05	1500	1.32	0.08	0.08	1500	2.12	0.13
	III Indicated	P3-24	57313	38687	40 x 40 (Rombu	0.23	0.47	2.35	2.35	2.35	CM	1.60	0.05	1500	1.32	0.07	0.07	1500	1.88	0.12
	III Indicated	P3-25	22917		40 x 40 (Rombu	0.23	0.47	1.98	1.98	1.98	SDL	1.60	0.02	300	2.12			300		0.02
		Total of Seam-III											2.93			4.57	4.57			7.50

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Muraidih Colliery

Mining Plan and Mine Closure Plan for Amalgamated Muraidih Phularitand(Part) Colliery, BCCL

SEAM	Reserves Type	PANEL NO.	DEV. AREA (m2)	DEP. AREA (m2)	PILLAR SIZE (M x M) Center to Center	% Extn. DEV.	% Extn. DEP.	AV. Thickness Sea m	AV. Thickness Dev.	AV. Thickness Dep.	Loading Equip.	Av. Sp. Gravity	Extractable Reserve (Mt.) Total Dev.(	Prod./ per/D	Working	Dep.	Total Dep	Prod./ per/Da	Working	Total Est.	
I_II SEAM & Seam-I																					
	I_II COMB	MAINLEVEL-I_IIA	36151	28490	26 x 26	0.34	0.36	4.21	3.00	4.21	SDL	1.45	0.05	200	10.60	0.06	0.06	1000	2.40	0.11	
	I_II COMB	MAINDIP-I_IIB	19454	19454	26 x 26	0.34	0.36	4.06	3.00	4.06	SDL	1.45	0.03	300	3.72	0.04	0.04	1000	1.60	0.07	Depillaring will be done by CM
	I	MAINDIP-IB	157434	138637	36 x 36	0.25	0.45	2.88	2.88	2.88	SDL	1.45	0.16	300	21.90	0.26	0.26	1000	10.40	0.42	Will be Depillared by CM
		MAINDIP-IB		18797			0.45	2.88		2.88	SDL	1.45				0.04	0.04	300	5.32	0.04	Will be Depillared by SDL
	I Indicated	MAINDIP-IC	81223	66836	36 x 36 & 45 x 45	0.25	0.45	3.14	3.00	3.14	SDL	1.45	0.09	300	11.72	0.14	0.14	300	18.68	0.23	
	I_II COMB	MAINRISE-I_IID	37280	37280	26 x 26	0.34	0.36	3.67	3.00	3.67	SDL	1.45	0.05	200	10.80	0.07	0.07	1000	2.80	0.12	
	I_II COMB	MAINRISE-I_IIE	39796	35374	26 x 26	0.34	0.36	5.07	3.00	4.50	SDL	1.45	0.06	200	11.60	0.08	0.08	300	10.68	0.14	
	I_II COMB	P-1	45993		26 x 26	0.34	0.36	3.53	3.00	3.53	SDL	1.45	0.07	200	13.40			200		0.07	No Dep. Sump
	I_II COMB	P-2	24118	14577	26 x 26	0.34	0.36	3.53	3.00	3.53	SDL	1.45	0.04	200	7.00	0.03	0.03	200	6.00	0.07	Part will be depillared
	I_II COMB	P-3	35273		26 x 26	0.34	0.36	4.48	3.00	4.48	SDL	1.45	0.05	200	10.20			200		0.05	No Depillaring to protect Incline,s Drift & Shaft
	I_II COMB	P-4	25343	19164	26 x 26	0.34	0.36	4.67	3.00	4.50	SDL	1.45	0.04	200	7.40	0.05	0.05	300	8.68	0.09	
	I_II COMB	P-5	20673	17968	26 x 26	0.34	0.36	2.65	2.65	2.65	SDL	1.45	0.03	300	3.60	0.03	0.03	300	4.00	0.06	
	I	P-5	56461	56461	26 x 26	0.34	0.36	2.65	2.65	2.65	SDL	1.45	0.07	300	9.72	0.08	0.08	300	10.68	0.15	
	I_II COMB	P-6	25750	22375	26 x 26	0.34	0.36	2.65	2.65	2.65	SDL	1.45	0.03	1500	0.88	0.03	0.03	1500	0.96	0.06	
	I	P-6	71518	71518	26 x 26	0.34	0.36	2.65	2.65	2.65	CM	1.45	0.09	1500	2.44	0.10	0.10	1500	2.68	0.19	
	I	P-7	108906	101720	36 x 36	0.25	0.45	2.99	2.99	2.99	CM	1.45	0.12	1500	3.08	0.20	0.20	1500	5.32	0.32	
	I	P-8	148509	140320	36 x 36	0.25	0.45	2.75	2.75	2.75	CM	1.46	0.15	1500	3.92	0.26	0.26	1500	6.92	0.41	
	I	P-9	147492	131359	36 x 36	0.25	0.45	2.78	2.78	2.78	CM	1.50	0.15	1500	4.08	0.25	0.25	1500	6.68	0.40	
	I	P-10	180838	175654	36 x 36	0.25	0.45	2.34	2.34	2.34	CM	1.50	0.16	1500	4.20	0.28	0.28	1500	7.48	0.44	
	I	P-11	185071	179897	36 x 36	0.25	0.45	2.55	2.55	2.55	CM	1.50	0.19	1500	4.68	0.31	0.31	1500	9.28	0.49	
	I	P-12	185225	180040	36 x 36	0.25	0.45	2.70	2.70	2.70	CM	1.45	0.18	1500	4.80	0.32	0.32	1500	8.52	0.50	
	I Indicated	P-13	39883	31790	45 X 45	0.23	0.47	3.14	3.00	3.14	CM	1.45	0.04	1500	1.04	0.07	0.07	1500	1.88	0.11	
	I	P-13	2E+05	200589	45 X 45	0.23	0.47	3.14	3.00	3.14	CM	1.45	0.20	1500	5.24	0.43	0.43	1500	11.48	0.63	
	I Indicated	P-14	97607	87357	45 X 45	0.23	0.47	3.27	3.00	3.27	CM	1.45	0.09	1500	2.28	0.15	0.15	1500	4.00	0.24	Part will be depillared.
	I	P-14	2E+05	76922	45 X 45	0.23	0.47	3.27	3.00	3.27	CM	1.45	0.15	1500	4.04	0.17	0.17	1500	4.52	0.32	Part will be depillared.
	I Indicated	P-15	74054		45 X 45	0.23	0.47	2.90	2.90	2.90	CM	1.45	0.07	1500	1.88					0.07	No Dep to protect Railway Propert
	I	P-15	26267		45 X 45	0.23	0.47	2.90	2.90	2.90	CM	1.45	0.03	1500	0.68					0.03	No Dep to protect Railway Propert
	I_II COMB	P-16	52977	26477	26 x 26	0.34	0.36	6.07	3.00	4.50	SDL	1.45	0.08	200	15.40	0.06	0.06	200	12.00	0.14	Partly Dep to protect Incline ,Shaft
	I_II COMB	P-17	20793	17700	26 x 26	0.34	0.36	5.07	3.00	4.50	SDL	1.45	0.03	200	6.00	0.04	0.04	200	8.00	0.07	
	I_II COMB	P-18	21726	18706	26 x 26	0.34	0.36	5.07	3.00	4.50	SDL	1.45	0.03	200	6.40	0.04	0.04	200	8.00	0.07	
	I_II COMB	P-18A	14498	11590	26 x 26	0.34	0.36	5.07	3.00	4.50	SDL	1.45	0.02	200	4.20	0.03	0.03	200	6.00	0.05	
	I	P-19 (Including	36266	33614	26 x 26	0.34	0.36	2.37	2.37	2.37	SDL	1.50	0.04	300	5.72	0.04	0.04	300	5.32	0.08	
	I_II COMB	P-20	31756	29053	26 x 26	0.34	0.36	2.23	2.23	2.23	SDL	1.50	0.04	200	7.20	0.04	0.04	300	5.32	0.09	
	I	P-20	54971	54970	26 x 26	0.34	0.36	2.23	2.23	2.23	SDL	1.50	0.06	200	12.40	0.07	0.07	300	9.32	0.13	
	I	P-21	39934	36740	26 x 26	0.34	0.36	2.23	2.23	2.23	SDL	1.50	0.05	300	6.00	0.04	0.04	300	5.32	0.09	
	I	P-22	44726	41532	26 x 26	0.34	0.36	2.23	2.23	2.23	SDL	1.50	0.05	200	10.00	0.05	0.05	200	10.00	0.10	
	I	P-23	47921	44727	26 x 26	0.34	0.36	2.23	2.23	2.23	SDL	1.50	0.05	200	10.80	0.05	0.05	200	10.00	0.10	
	I	P-24	47921	44727	26 x 26	0.34	0.36	3.01	3.00	3.01	SDL	1.45	0.07	200	14.00	0.07	0.07	200	14.00	0.14	
	I	P-25	44559	38822	40 x 40 (Rombo	0.23	0.47	2.63	2.63	2.63	CM	1.45	0.04	1500	1.88	0.07	0.07	1500	1.88	0.11	Will be depillared after diversion of D B Road & excavating of overlying seams upto VI/VII/VII SEAM
	I	P-26	68773	57314	40 x 40 (Rombo	0.23	0.47	2.48	2.48	2.48	CM	1.45	0.06	1500	1.48	0.10	0.10	1500	2.68	0.16	----do----
	I	P-27	74508	63065	40 x 40 (Rombo	0.23	0.47	3.45	3.00	3.45	CM	1.42	0.07	1500	1.92	0.15	0.15	1500	4.00	0.22	----do----
	I	P-28	29802	24318	40 x 40 (Rombo	0.23	0.47	3.44	3.00	3.44	CM	1.47	0.03	1500	0.80	0.06	0.06	1500	1.60	0.09	----do----
	I Indicated	P-28	41936	30130	40 x 40 (Rombo	0.23	0.47	3.44	3.00	3.44	CM	1.47	0.04	1500	1.08	0.07	0.07	1500	1.88	0.11	----do----
	I	P-29	71642	53731	50 x 50 (Rombo	0.18	0.52	3.49	3.00	3.49	CM	1.53	0.06	1500	1.60	0.15	0.15	1500	4.00	0.21	----do----
		P-30	58203	26866	50 x 50 (Rombo	0.18	0.52	3.49	3.00	3.49	CM	1.53	0.05	1500	1.32	0.07	0.07	1500	1.88	0.12	----do----
	Total of Seam III & Seam-I												3.22			4.65	4.65			7.87	
Grand Total (III Seam +I & I_II Comb Seam)													6.15			9.22	9.22			15.37	

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SUMMARY OF EXTRACTABLE RESERVES (within area of Phularitand(Part) Colliery and annexed area of Muraidih Colliery)

TOTAL EXTRACTABLE RESERVES (>15M HARD COVER LINE) IN SEAMS PROPOSED FOR EXTRACTION

SEAM	Proved (Mt)		Indicated (Mt)		Total (Mt)		TOTAL PROVED (Mt)	TOTAL INDICATED (Mt)	GRAND TOTAL (Mt)
	Dev	Dep	Dev	Dep	Dev	Dep			
Seam-III	2.03	3.25	0.90	1.32	2.93	4.57	5.28	2.22	7.50
Seam-I & I_II Comb	2.79	4.00	0.43	0.65	3.22	4.65	6.79	1.08	7.87
GRAND TOTAL	4.821	7.250	1.331	1.970	6.152	9.220	12.071	3.301	15.37

NOTE:-

1) The above mentioned extractable reserves has been estimated considering geo-mining parameter of the property. It has also considered that different underground constraint (like water logging, fire etc) in overlying seams and also surface constrains(like villages, village roads,ponds,BCCL qrts, infra-structures etc are removed including D B Road which passing across the property in North-South direction.

2) It is to be noted that depillaring of Panels of Seam-III and Seam-I & Seam-I/II (Comb) can only be possible below these surface feature, otherwise only development reserves will be available from these seam.

3) It has been proposed to divert D B Road (runs North-South direction) towards western side laying along the Railway property. Development and depillaring panels will be done after excavation of overlying seams and workings will be extended upto 45m from proposed D B road after diversion.

4) Coal left in roof during development of galleries in thick areas(>3m) of the seam has not been considered for extraction during depillaring operation.

5) It has been assumed that remaining surface area lying dipside (souther-side) of V/VI/VII seam icrops will be acquired during for operation of OCPs which are presently being operated departmentally as well as Contractually.

6) Panels of Seam-III and Seam-I/II & Seam-I has been proposed for depillaring towards northern side upto >15m Hardcover. for which surface land has to be acquired. Otherwise only development will be done in this area and total extractable reserves and life of the mine will reduce.

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SEAM	Reserves Type	PANEL NO.	Remarks	Av. Quality (Kcal/Kg	AV. GCV (Kcal/Kg)	Panelwise Resv(Mt)	GCV x Resv.(Mt)	Av. Seamwise GCV (Kcal/Kg).	Av.GCV Grade
		MAINDIP-IIIA	Standing on pillars 42 mss (as on date)	45.33	4404	0.09	396		
		MAINDIP-IIIB	Development by Existing SDL, Overlying Seams extracted, Partly will be depillered	43.80	4565	0.16	740		
		MAINDIP-IIIB (Rest)		43.60	4408	0.14			
	III Indicated	MAINDIP-IIIC		43.60	4408	0.29	1292		
		MAINRISE-IIID		44.65	4336	0.09	373		
		MAINRISE-IIIE		42.80	4724	0.06	288		
		P3-1	Main Sump. No Depillaring	44.00	5111	0.05	235		
		P3-2	Partly depillaring. Rest to protect incline & shaft	43.80	5111	0.04	220		
		P3-3	No Depillaring to Protect Shaft &Inclines	44.00	5111	0.03	136		
III SEAM		P3-4		45.00	4724	0.07	307		
		P3-5		45.55	4783	0.25	1191		
		P3-6		45.87	4763	0.30	1448		
		P3-7		45.00	4903	0.34	1667		
		P3-8		45.34	4918	0.53	2617		
		P3-9		45.45	4646	0.58	2672		
		P3-10		45.20	4645	0.54	2505		
		P3-11		44.90	4515	0.61	2754		
		P3-12		44.70	4803	0.58	2660		
	III Indicated	P3-13		44.93	4837	0.54	2581		
	III Indicated	P3-14	Partly Dep. Rest not to Dep to Protect Rly Line/Proeerty	44.80	4660	0.67	3141		
	III Indicated	P3-15	No Dep, Itermediate sump & to Protect Rly Line/Proeerty	42.02	4455	0.14	603		
		P3-16	Partly Dep to protect Incline ,Shaft etc	43.45	5111	0.08	424		
		P3-17		43.45	5111	0.02	112		
		P3-18		43.45	5111	0.04	189		
		P3-18A		43.45	5111	0.02	123		
		P3-18B		43.45	5111	0.04	225		
		P3-19	Will be depillared after diversion of D B Road & excavating of overlying seams upto VI/VII SEAM	44.30	4585	0.14	634		
		P3-20	---Do---	45.35	4465	0.21	966		
		P3-21	---Do---	44.60	4462	0.20	910		
	III Indicated	P3-22	---Do---	45.08	4444	0.18	791		
	III Indicated	P3-23	---Do---	44.25	4405	0.13	569		
	III Indicated	P3-24	---Do---	44.25	4408	0.12	525		
	III Indicated	P3-25	No Depillaring to protect D B Road	40.83	4408	0.03	71		
		Total of Seam-III							
				44.24	4703	7.59	34221	4564	G10

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SEAM	Reserves Type	PANEL NO.		Av. Quality (Kcal/Kg	AV. GCV (Kcal/Kg)	Panelwise Resv(Mt)	GCV x Resv.(Mt)	As. Seamwise GCV (Kcal/Kg).	Av.GCV Grade
I_II SEAM & Seam-I									
	I_II COMB	MAINLEVEL-I_IIA		35.00	6277	0.11	709		
	I_II COMB	MAINDIP-I_IIB	Depillaring will be done by CM	34.14	6290	0.068	428		
	I	MAINDIP-IB	Will be Depillared by CM	35.02	6180	0.42	2630		
		MAINDIP-IB	Will be Depillared by SDL	35.02	6180	0.04	247		
	Indicated	MAINDIP-IC		34.04	5638	0.23	1304		
	I_II COMB	MAINRISE-I_IID		37.37	6393	0.12	755		
	I_II COMB	MAINRISE-I_IIE		33.80	6185	0.14	884		
	I_II COMB	P1-1	No Dep. Sump	33.18	6288	0.07	421		
	I_II COMB	P1-2	Part will be depillared	33.18	6288	0.07	409		
	I_II COMB	P1-3	No Depillaring to protect Inclines,Drift & Shaft	33.82	6219	0.05	317		
	I_II COMB	P1-4		33.81	6207	0.09	540		
	I_II COMB	P1-5		35.46	5839	0.06	333		
	I	P1-5		35.46	5839	0.15	893		
	I_II COMB	P1-6		35.10	5692	0.06	371		
	I	P1-6		35.10	5692	0.19	1131		
	I	P1-7		37.65	6068	0.32	1918		
	I	P1-8		37.64	5608	0.41	2364		
	I	P1-9		38.04	5607	0.40	2292		
	I	P1-10		37.64	5773	0.44	2529		
	I	P1-11		37.09	5635	0.49	2739		
	I	P1-12		37.31	5854	0.50	2927		
	Indicated	P1-13		35.39	5917	0.11	645		
	I	P1-13		35.39	5917	0.53	3210		
	Indicated	P1-14	Part will be depillared	34.71	6115	0.24	1443		
	I	P1-14	Part will be depillared	34.71	6115	0.32	1963		
	Indicated	P1-15	No Dep to protect Railway Propert & Line and Intermediate	33.11	5938	0.07	416		
	I	P1-15	No Dep to protect Railway Propert & Line	33.11	5938	0.03	148		
	I_II COMB	P1-16	Partly Dep to protect Incline ,Shaft etc	33.80	6185	0.14	847		
	I_II COMB	P1-17		33.80	6185	0.07	433		
	I_II COMB	P1-18		33.80	6185	0.07	465		
	I_II COMB	P1-18A				0.03			
	I	P1-19 (Including rise		34.23	5627	0.08	467		
	I_II COMB	P1-20		34.24	5572	0.08	423		
	I	P1-20		34.24	5572	0.13	736		
	I	P1-21		34.24	5572	0.08	474		
	I	P1-22		34.24	5572	0.10	567		
	I	P1-23		34.24	5572	0.10	579		
	I	P1-24		35.78	5869	0.14	822		
	I	P1-25	Will be depillared after diversion of D B Road & excavating of overlying seams upto V/VI/VII SEAM	34.72	6180	0.11	667		
	I	P1-26	---do---	35.31	6125	0.16	956		
	I	P1-27	---do---	33.90	6428	0.22	1427		
	I	P1-28	---do---	34.23	5725	0.20	1161		
	I Indicated Rx	P1-28	---do---						
	I	P1-29	---do---	35.57	5282	0.21	1109		
	I	P1-30	---do---	35.57	5282	0.12	628		
		Total of Seam I/II & Seam-I				7.87	46835	5973	G8
Grand Total (II Seam +I & I_II Comb Seam)						15.37			

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5.16.2 Opencast Extractable Reserves-

Total Mineable/Extractable Coal	:	**65.48 M.Te.**
a) V/VI/VII Seam Quarry	:	**63.36** M.Te
b) III Seam Quarry	:	2.12 M.Te
Total Overburden including Loose OB	:	**131.48 M.Cum.**
a) V/VI/VII Seam Quarry	:	123.0 M.Cum.
b) III Seam Quarry	:	8.48 M.Cum.
Stripping Ratio (III Seam Quarry)	:	4.00 **M^3/Te**
Stripping Ratio (V/VI/VII Seam Quarry)	:	1.94 **M^3/Te**
Overall **Av. Stripping Ratio**	:	**2.01 M^3/Te**

5.17 Production-

5.17.1 Existing Production-

A) Underground Production-

Last five years production from underground in Phularitand Colliery is as follows-

	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19 (upto 31st March,19)
Seam-III	Nil	54967	84702	97396	34830	38529
Seam-I/II & I	Nil	Nil	Nil	Nil	Nil	Nil
Grade (As per Colliery)	G9	G9	G9	G9	G9	G10

At present, there is no underground production in amalgamated Muraidih Colliery i.e from Global bid Project.

B) Opencast / Hired HEMM Patch Production -

Last five years production from opencast/Hired Patch in Phularitand Colliery with V/VI/VII Seam as base of the Opencast is as follows-

	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19 (upto 31st March,19)
Hired/Outsourced	837190	2329738	859482	1930145	2079711	2400028
Departmentally	7830					
Grade (As per Colliery)	W-IV	W-IV	W-IV	W-IV	W-IV	W-IV

The above information/data are submitted by Mine authority.

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The Grade Notification, year 2019-20 for these Collieries of Barora area are given below-

	Colliery Name	Seam	Size	Notified Grade for 2019-20
1.	Muraidih OCP	V/VI/VII(Comb)	Steam ROM	W-III W-IV
2	Phularitand OCP	V/VI/VII(Comb)	Steam ROM	W-III W-IV
		VIII(A)	Steam ROM	W-II W-IV
3.	Pure Benedih Incline	III	ROM	G-10

Seam-wise geological Grade of coal for different seams in these collieries have been given in Chapter-IV.

5.17.2 Proposed Production from amalgamated Muraidih-Phularitand(part)Colliery-

5.17.2.1 Longwall Production-

As per Seam parameter of Seam-III and Longwall equipment specification, production from Lonwall Panel can be achieved upto 10000 tpd/Panel. Bidder in their extraction schedule plan considered 9000 tpd. Considering the existing surface constraint i.e huge over burden dump on the floor of Seam-V/VI/VII seam, less parting with seam-III and also to achieve minimum target production of 2.0Mty, average LW Panel production for Seam-III & Seam-I is considered uniformly as 6500 tpd. Details of production calculation from LW is given below-

	CALCULATION FOR LONGWALL PANEL PRODUCTION						
	DATA CONSIDERED AS PER FINAL DPR SUBMITTED BY CONTRACTOR						
Sl. No.	Activity	Unit	Length		Length		
1	Longwall Face Width	m		200		190	
2	Average Feeting Speed	(m/min)		10		10	
3	Average Cutting Speed	(m/min)		6		6	
4	Face End cutting Length	Min	35	6.0	35	6.0	
5	AFC Fleeting time	Min		10		10	
6	Cutting time for Remaining Face Length	Min	165	28	155	26	
7	Fleeting of AFC	Min	35	3.5	35	3.5	
8	Total time for bi-directional Cutting i.e for two Shears			95		91	
9	Cycle Time for two Cuts or Shears		Say	100		90	
10	Cycle time per for One cut or Shear			50		45	
11	Available Shift in Min/Shift	(6 Hrs/Shift)		360		360	Min/Shift
12	Production Shift/Day			3		3	per Day
13	Available Min/Day	(3*6*60)		1080		1080	Min/day
14	No. of Cut/Day	(1080/50)		22		22	Cuts/Day
15	System Efficiency	As considered by Contractor)		0.45		0.5	
16	Actual No. of Cuts per Day	(Cut*0.45)		10		12	Cuts/Day
17	Efficiency of Web	0.865*90%		0.779		0.779	m

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18	Retreat per Day	(No. of cut * Effct. Web)		7.79		7.79	m/Day
19	Face Length Including Gate Road(TG & MG)(Center to Center)			205.2	-	195.2	m
20	Width of each Gate Road			205.2		5.2	m
21	Av. Height of Extraction (In this Mining Plan, Av Operating Ht is considering all Panels as per reserve table) In DPR, Bidder has considered 4.4m for Seam-III and Seam-I as 2.4m			4.10		2.47	m
22	Av. Specific Gravity (Av. in Panels stated above)			1.57		1.49	Kg/Cum
23	Face Length (Coal to Coal)			200		190	m
24	Production/Day			10029		6537	tonne/Day

Panel-wise Longwall Production

	Panel No.	Seam-III	Panel No.	Seam-I	
	301	10239	101	6954	
	302	9684	102	6421	
	303	9722	103	6447	
	304	9998	104	6447	
	305	10569	105	5621	
	306	9853	106	6447	
			107	6740	
			108	7380	
Average		10011		6557	

In this mining plan, for Mine Scheduling and year-wise production, average Production form each Longwall panel in Seam-III & Seam-I is considered as **6500 TPD** for maintaining uniform target production of 2.0Mty as per the minimum requirement of NIT. However this production may vary depend on efficiency of longwall operation to be carried by successful bidder/ Contractor.

5.17.2.2 Continuous Miner Panel Production-

Continuous Miner along with its ancillary equipment will be deployed in one panel and where seam thickness is more than 2.2m to maximum 4.5m. Initially it will be deployed in a panel of Seam-III. After extraction of all proposed CM panels of this seam, it will be shifted to underlying Seam-I. In general, CM develops up to the end of the panel and retreats by splitting & slicing of standing on pillars formed during development. As on date, no Continuous Miner is manufactured in India and hence this CM package equipment are foreign equipment. Hence, deployment of CM will be on risk-gain sharing basis only for panel operation upto gate belt conveyor. In this mining plan, a guaranteed production of 1500 TPD (0.45 Mty) will be obtained from one CM Panel by the successful bidder which is likely to be achievable in geological condition of this colliery. The overlying V/VI/VII has to be excavated first by opencast method before commencement of depillaring operation in a Continuous Miner panel.

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5.17.2.3 SDL Panel Production Parameter -

The production parameters of Standard /Low Height SDL panel are shown below-

Particulars		Std. Ht	Low Ht
No. of headings		5	5
No. of dev. Faces (max.)		9	9
Gallery Width(m)		4.8m	4.8m
Gallery Extraction Height (average) considering Seam-III & Seam-I		2.5 m	1.75m
Pull/Round		0.9m	0.9m
Av. Sp. Gravity (Considering Seam-III, I/II Comb. & Seam-I)		1.55 t/m^3	1.6
Coal/Blast/Face		16.74 te	12.10
No. of Blasts/ shift		2	3
No. of Shifts /Day		3	3
No. of faces available for blasting /Shift considering 60% availability		7	7
Coal availability/shift(Te)		100.44 te	108.9 te
Target(Te)/SDL/Day		100 Te	100 Te
Total No. of Panels to be operated		1	1
No. of SDL/Panel		3	2
Target /panel/ day		300 Te	200 Te
Annual Target (Mty) (5 SDLs)		0.15 Mty	

Since seam thickness of Seam-III and Seam-I/II combined is good in areas where panels area proposed to be developed with deployment of SDL, hence, production from standard height and low heght SDLhas been kept as 100 tpd per SDL

5.17.2.3 Proposed Number of Panels and their Production from the mine-

Muraidih Global Bid Project-

Longwall Production-	1 no.	6500 tpd
Gate Road Dev./B&P Dev.	1 no.	1000 tpd

Phularitand(Part) Colliery-

Continuous Miner Panel 1 no.		1500 tpd
SDL Panel	2 nos.	500 tpd

The annual working days considered by Contractor are 305 days for Lonwgwall and Gate road development whereas for Continuous Miner and SDL panel operation is considered as 300 working days.

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5.18 Production Schedule-

5.18.1 Longwall Global Bid Project-

BCCL has floated a tender for extraction of virgin seams e.g Seam-III,II & Seam-I in descending order from the area of combined property of the then Muraidih Colliery and Shatabdih Colliery. At that time, Muraidih Collier and Shatabdih Colliery were two separate Colliery. The Shatabdih Colliery was lying adjacent to Muraidih Colliery on southern side of Muraidih Colliery. The Muraidih Colliery has almost extracted coal by opencast method with floor of V/VI/VII combined seam as base of opencast whereas Shatabdih Colliery was partly extracted and working on south-western part of the Colliery. As per the NIT, the scope of work is to produce a minimum guaranteed production of 2.0 Mt coal per annum for nine years by mechanized longwall method from Seam-III, Seam-II and Seam-I from the combined area of above mentioned Muraidih and Shatabdih Colliery. The M/s Minop/BECC Consortium has emerged as successful bidder/Contractor for the above work and proposed to work one longwall panel initially in Seam-III and then in Seam-I after some modification in longwall equipment. Otherwise, the shearer to be replaced by new shearer. The Seam-II is a thin seam having seam thickness less than 1.0m in entire area and it has not been considered by the Contractor for extraction. BCCL has awarded the work on turnkey basis to extract coal from virgin Seam-III and Seam-I by longwall method of mining within the. As per the approved DPR, Contractor has identified six panels in Seam-III and eight panels from Seam-I. Moreover, Contractor has proposed to develop trunk headings, four B&P development including sumps and the area where extraction cannot be made by longwall method in both seams. Out of eight longwall panels of Seam-I, two panels (i.e 107 & 108) were proposed to be laid below and northern side of Khodo Nala where depth of cover is 40-50m or so. In this area, Seam-III was partly worked by underground mining method left as water logged unused workings and unapproachable. Small quarry was also made with Seam-III as base in this area. Hence, Longwall panel has not been proposed in Seam-III by the Contractor in this area. Considering the existence of Khodo Nala, underground waterlogged workings and quarry, Contractor has proposed in DPR for diversion of Khodo nala on northern side of the property and also proposes to extract the waterlogged underground workings by small opencast with floor of Seam-III as base. After quarrying, the area will be back filled and Khodo nala will be re-instend into its normal course. The diversion of nala and opencast working will be carried out by BCCL and work has to be completed

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before extraction of Longwall panels identified by Contractor in this area. For reserve estimation, all longwall panels and B&P development workings has been considered but to meet the NIT requirement and guaranteed production, Contractor has considered for extraction of all six panels (301 to 306) from seam-III and six panels (101 to106) from Seam-I including B&P development workings. The contractor has proposed for extraction of panels (106 to 108) of seam-I lying below or northern side of Khodo nala on later stage i.e beyond the contract period of 14 years keeping in view that diversion of Khodo nala and opencast working to be done in this area by BCCL will take long time.

Production schedule during the contract period as per Final DPR-

As per the Final DPR, the contract tenure is 14 years, out of which 5 years is earmarked as development period and 9 years will be for production excluding the time for face installation & transfer and overhauling of equipment. There will be 6 panels in Seam III and equipment are to be shifted from one face to another for 5 times. Thereafter the equipment will be shifted to Seam I for extraction of the coal from Seam I. As such major overhauling is planned after the completion of extraction of all panels in Seam III. However to avoid any major breakdown during operation of the panel, repair of moving equipment will be undertaken at the time of face transfer. Since the thickness of the coal Seam in Seam I is lesser than that of Seam III, the same powered support and the shearer cannot be used unless these are modified. Modification & overhauling of the Seam-III equipment after the exhaustion of longwall panel in Seam III and the equipment will be made suitable for using in Seam-I. Contractor proposes that the main modification of the supports will be support leg and lemniscates linkages. As the height of the coal Seam in Seam-I will be low, the shearer of Seam III may not likely match the requirement. Since the shearer will have much useful service life left, shearer manufacturer may examine the possibility of modification to make the shearer of Seam III compatible for Seam I. Otherwise the shearer to be replaced by new shearer

Although the period for the face transfer have been considered about 40 days and about 180 days for the overhauling & modification of the equipment before shifting from Seam III to Seam I. Provision has been kept for shield hauler for the faster transportation of face equipment. The time for installation of 90 days duration has not been considered for the calculation of total durations as this would be done as parallel activity during the operation of Bolter Miner. The face

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transfer from Seam III to Seam I has been included in the time period of modification, over hauling and face transfer which has been considered as 180 days. Total time for the face installation, face transfer & overhauling = 10 x 40 + 180 = 580 days , say 2 years.

Considering above, the duration of the contract period during production, will be 1 year(Panel development) + 8 years(Longwall) + 2 years(Face Transfer and over hauling) = 11 years. In order to keep the total contract period as 14 years i.e. 5 years development period and 9 years production period, it is planned to reduce the development period by 2.5 years. The coal production will start from 3rd year. As such the development period 2.5 years and production period 11 years, totaling 13.5 years.

The year wise deployment of bolter miner for the development of longwall panels as well as development of bord and pillar districts and the extraction of the panels by mechanised powered roof support technology as per the guaranteed productions as considered in FDPR scheduled bellow-

Proposed year wise production schedule in DPR-
Year wise Production Schedule(in million tonnes)

Year	1st APP	2nd APP	3rd APP	4th APP	5th APP	6th APP	7th APP	8th APP	9th APP	10th APP	11th APP	12th APP	13th APP
Bolter Miner & other mechanisim (SUMP)	0.539	0.269	0.296	0.274	0.213	0.323	0.275	0.215	0.245	0.256	0.095	-	
Longwall	NILL	2.406	2.496	2.493	2.125	2.497	0.908	1.526	1.527	1.294	1.292	1.523	0.529
Total	0.539	2.675	2.792	2.767	2.338	2.82	1.183	1.741	1.772	1.55	1.387	1.523	0.529

Total Production considered in Global Bid project is 18.627 Mt on 9th APP

After awarding of work by BCCL, M/s Minop/BECC Consortium was facing constraint to implement the project development work as per the schedule as stated in their supplementary note on DPR mainly due to land required for opening of incline, Air shaft and other Civil infra-structure development required for this project which are not located on BCCL land. BCCL was facing constraint to hand over encumbrance free land to the Contractor. Later-on, Contractor has submitted a supplementary note on approved DPR by revising the location of Auxiliary Incline position, Return Air shaft and construction of different infra-structure at different locations on BCCL land to ease the land acquisition constraint. According to the Contractor, revised layout plans were also submitted

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showing changed locations of Inclines and Infrastructures. But only revised layout plan of Seam-III is available with Area authority. As per the supplementary note, there is no change in the panels layout in both seams except slight changes made in trunk heading drivage in both seams due to change in location of Return air shaft from earlier position in DPR. After obtaining of approval of supplementary note by BCCL management with the condition that there will be no changes in mining schedule and financial provisions as per the agreement, inclines/drift drivages were made by the Contractor and touched the coal of Seam-III. The Return Air Shaft has also been sunk partly at new location along with construction of few infra-strctures/buildings near the Incline mouth. The work was suspended by the Contractor from 01.06.2016 due to financial payment dispute between M/s Minop/BECC Consortium and BCCL. Though BCCL management imposed ban for any type of operation in BCCL for three years onto the M/s Minop in related to other case but later-on in 2018, the Honorable High Court has quashed the banning imposed by BCCL management onto M/s Minop. Till date the work has not yet been commenced by the Contractor at Muraidih Project.

Considering the reasons as stated in earlier paragraphs, the mine schedule and production schedule as proposed by the Contractor in final DPR could not be followed and at present, the total scenario of mine scheduling has changed from the agreed condition.

OPENCAST

Existing Production-

Opencast (Departmental) Production -

Last five years production from opencast of Muraidih Colliery with V/VI/VII Seam as base is as follows-

Opencast	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19 (upto 31st March,19)
Hired/Outsourced	400164	463700	35344	Nil	Nil	Nil
Grade	W-IV,III	W-IV,III	W-IV,III			
Departmental OC	1534501	1547323	1785062	1552085	1587318	1362444
Grade (As per Colliery)	W-II,III	W-IV,III	W-IV,III	W-IV,III	W-II,III, IV & G9	W-II,III, IV & G9

The above data are submitted by Mine authority.

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Production Schedule-

The normative target production of the mine will be 7.30 MTY. However the peak production capacity of 9.49 MTY which may be achieved occasionally by better utilization of resources & favorable geo mining condition.

The calendar programme of mining operation has been formulated based on the adopted sequence of mine development and optimum condition of mining operation for the entire life of opencast project.

The year wise production from the Amalgamated Muraidih Phularitand(Part) Colliery of V/VI/VII seam is given below:

V/VI/VII SEAM		
YEAR	COAL PRODUCTION(M.Te)	O.B Production (M.Cum)
1	4.63	9.3
2	6	12.04
3	7.18	14.18
4	7	13.46
5	6.8	12.66
6	6.8	12.66
7	6.8	12.66
8	7.1	13.86
9	5.7	11.44
10	4.2	8.43
11	1.15	2.31
Total	63.36	123.00

The year wise production from the Amalgamated Muraidih Phularitand(Part) Colliery of III seam quarry is given below:-

III SEAM		
YEAR	COAL PRODUCTION (M.Te)	O.B Production (M.Cum)
1	0.12	0.48
2	0.3	1.20
3	0.5	2.00
4	0.5	2.00
5	0.5	2.00
6	0.2	0.80
Total	2.12	8.48

The year wise total production from the Amalgamated Muraidih-Phularitand(Part) Colliery of seam is given below:-

Sr. No.	YEAR	COAL PRODUCTION	O.B Production
1	2019-20	4.63	9.3
2	2020-21	6.0	12.04
3	2021-22	7.3	14.66
4	2022-23	7.3	14.66
5	2023-24	7.3	14.66
6	2024-25	7.3	14.66
7	2025-26	7.3	14.66
8	2026-27	7.3	14.66
9	2027-28	5.7	11.44
10	2028-29	4.2	8.43
11	2029-30	1.15	2.31
	Total	65.48	131.48

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5.18.1 Mine operation Schedule proposed in this Mining Plan-

A) Longwall Project of amalgamated Muraidih Colliery-

Since, this is an approved on-going project of BCCL and after lifting of ban by the High Court, M/s Minop/BECC Consortium has to commence the work in this part of the project area as early aspossible. Hence, in this Mining plan of amalgamated Muraidih-Phularitand(part) Colliery, a tentative mine schedule plan is proposed keeping in view that the dispute will be settled within a year. During Scheduling, development of trunk headings as well as other development strategies, like fault crossing, Sump preparation, gate road development, sequence of panel extraction, etc in both seams are kept in mind as proposed in final DPR/Supplementary Note. As the per the proposed mine schedule plan, total reserves of both seams will be exhausted within 20 years from the property designated for longwall within existing amalgamated Muraidih Colliery.

B) Scheduling of Continuous Miner and SDL panels proposed in Phularitand Colliery and annexed part of amalgamated Muraidih Colliery-

In this area, development of in Seam-III with SDL maindip is in progress. This seam is touched by driving two numbers of drifts from floor of V/VI/VII seam of an old quarry. Two drifts will be made from the floor of Seam-III to approach Seam-I. To maintain adequate ventilation in the workings, a return air shaft is proposed. To enhance the underground production from this area, one Continuous Miner panels and two SDL panels are proposed. Initially, Seam-III will be exploited and the Seam-I. For development of underground strata bunker in parting between Seam-III & Seam-I, one SDL panel will be deployed for development of level galleries near proposed strata bunker and sump preparation in Seam-I. Then, all SDL panels along with Continuous Miner panel will be worked in Seam-III. The operation of Continuous Miner panel may be done by outsourced method on risk-gain sharing basis or departmental depends on techno-economic viability. At present this part of the project area is being operated departmentally. As per panel extraction schedule, the total reserves of Seam-III and Seam-I will be exploited within 21 years.

Hence, within the proposed project area of amalgamated Muraidih-Phularitand (part) Colliery, extraction of Longwall panel will be made on eastern part along-with extraction of Continuous Miner and SDL Panel on western part. Both working units will have separated mine entries maintaining a 60m solid coal barrier between the workings.

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Considering the sequence of extraction of panels in Seam-III and Seam-I in both working units as stated above, a tentative production schedule has been prepared for the project :-

TENTATIVE YEARWISE PRODUCTION SCHEDULE (Underground+Opencast) FOR AMALGAMATED MUSAIDIH-PHULARITAND(Part) COLLIERY

Year---->		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total	Unit
	2018-19	2019-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	027-28	028-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	37-38	38-39	39-40	040-41	041-42	042-43	043-44	044-45	045-46	046-47	047-48	48-49	2049-50		
Underground Coal Production-	Existing (Upto March																																	
Phularitand UG (Continuous Miner + SDL)	0.0395	0.045	0.060	0.10	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.62	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.58	0.54	0.54	0.54	0.500	0.490	0.450	0.385	0.351	0.015	15.37	Mt
Muraidih Global bid UG Project(Longwall)		0	0	0.247	0.285	0.247	2.211	2.004	2.009	2.224	2.053	1.98	1.72	0.36	1.93	1.97	1.75	1.96	1.81	0.72	0.24	0											25.78	Mt
Total UG Coal Production from Project area	0.0395	0.045	0.06	0.38	0.89	0.89	2.81	2.60	2.62	2.82	2.65	2.58	2.32	0.96	2.53	2.57	2.35	2.56	2.41	1.32	0.84	0.60	0.58	0.54	0.54	0.54	0.50	0.49	0.45	0.385	0.35	0.015	41.16	Mt
B) Opencast Production-																																		
Year---->		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total	
	2018-19	2019-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	027-28	028-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	37-38	38-39	39-40	040-41	041-42	042-43	043-44	044-45	045-46	046-47	047-48	48-49	2049-50		
Phularitand OC (Hirak) (Existing)	2.430																																	
Muraidih OC (Departmental) (Existing)	1.362																																	
Amalgamated Muraidih-Phularitand(Part) OC (Proposed)-																																		
Opencast Coal Production (Proposed)-																																		
A) Muraidih Seam-III OC (on north-eastern part)	Nil			0.12	0.30	0.50	0.50	0.50	0.20																								2.12	Mt
B) Muraidih-Phularitand OC (Seam VI/VII base merged OCP)		4.63	6.80	7.10	7.00	6.80	6.80	6.80	7.10	5.70	4.20	1.15																					63.30	Mt
Total OC Coal Production from Project area (Seam III OC & VI/VII(Seam OC)	3.76	4.63	6.80	7.30	7.30	7.30	7.30	7.30	7.30	5.70	4.20	1.15																					65.40	Mt
Total UG and OC Coal Production from Project area of Amalgamated Muraidih-Phularitand(part)	3.801	4.68	6.86	7.68	8.19	8.19	10.11	9.90	9.92	8.52	6.85	3.74	2.32	0.96	2.53	2.57	2.35	2.56	2.41	1.32	0.84	0.60	0.58	0.54	0.54	0.54	0.50	0.49	0.45	0.38	0.35	0.02	106.54	Mt
Over Burden (M.Cum) (Proposed)-																																		
A) Muraidih Seam-III OC (on north-eastern part)				0.40	1.20	2.00	2.00	2.00	0.80																								8.40	M. Cum
B) Muraidih-Phularitand OC (Seam VI/VII base merged OCP)		9.30	12.04	14.18	13.46	12.65	12.65	12.65	13.85	11.44	8.43	2.31																					123.00	M. Cum
Total Over Burden (M. Cum)		9.30	12.04	14.66	14.66	14.65	14.65	14.65	14.65	11.44	8.43	2.31																					131.40	M. Cum
Stripping Ratio (Muraidih Seam-III OC)				4.00	4.00	4.00	4.00	4.00	4.00		-																							
Stripping Ratio (Muraidih-Phularitand VI/VII OC)		1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94																						
Overall Av. Stripping Ratio (Cum/Te)		2.01 Cum /Te																																Cum/Te

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From the above coal production table, the amalgamated Muraidih-Phularitand(part) Colliery is expected to achieve its underground target production of 2.60 Mty considering production from longwall panel and CM/SDL panels in 6th year i.e from 2024-25 keeping in mind that other activities as mentioned in schedule are commenced in time. In this mining plan, it is considered that 2.0 Mty will be produced from one longwall panel operation and 0.6 Mty by operating of one Continuous Miner and two SDL panels provided that M/s Minop Consortium commences it work within a year (i.e 2019-20) otherwise production schedule will defer from the above. As per the above production schedule table, the tentative year of achieving of underground target production is 2024-25 provided permission from DGMS is to be obtained for amalgamation of existing amalgamated Muraidih Colliery and existing Phularitand (part) Colliery falling in cluster-II along with timely acquisition of land, rehabilitation work, forest land clearance and other related development activities are made in time. In this mining plan, a minimum guaranteed production of 2.0 Mty as per the condition of NIT is considered but production from longwall panel can be more with gaining of better experience of operation after operating of one to two panels because huge OB dumps area made on the floor of V/VI/VII seam and there also exist active fire over certain longwall panels. The target Production from Amalgamated Muraidih-Phularitand opencast is proposed to be achieved in 2021-22 provided the surface constraint are removed, land acquisition and rehabilitation is made timely.If the geo-mining and environmental conditions remain favorable, the mine can achieve 30% more production than the underground target production as considered above by increasing rate of production from longwall panels or by increasing production from Continuous Miner panel. Similarly, 30% more production from the proposed opencast target production can be achieved if geo-mining condition is in favour for mining operation in the area and surface constraint is removed

5.19 Life of the Mine –

The Muraidih-Phularitand(part) Colliery is proposed to be a mixed mine. Opencast workings is upto floor of V/VI/VII Combined seam after maerging of presently running OCPs(Dept. & Hired) and another separate OCP with floor of Seam-III as base on northern side of Khodo nala. Underground workings is proposed to be Seam-III & Seam-I/II combined along with Seam-I. Seam-III is already under development in Seam-III in Phularitand colliery. From the production schedule table as shown in earlier page, the life of the Muraidih-Phularitand(part) Colliery is estimated as 31years. The Longwall operation will be

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continued upto 20 years keeping in view that M/s Minop/BECC Consortium commences their work at Muraidih Longwall project from 2019-20 whereas Continuous Miner/SDL panels operation are proposed to be continued upto 31 years provided surface constraints are removed timely for depillaring operation. On the other hand, open cast operation will continue upto 11 years from 2019-20 provided land is acquired in time which is a major constraint for this Project. If acquisition of land for opencast mining is delayed, life of OC will be changed.

5.20 Coal, Men & Material transportation –

5.20.1 Existing Underground Transport system-

Longwall Project

In Muraidih Longwall Project, two inclines/ drift drivages have been made on the north-eastern corner of the Project area designated for longwall project and inclines are already touched the Coal of Seam-III but due to suspension of work by the Contractor, presently there is no mining activities in the area and inclines are remains as water logged upto the mouth.

Main Incline (Incline no.1)-

It is located on extreme north-eastern side of the longwall property. The width of both inclines is 5.0m and height is 3.5m. The total inclined length from surface to coal touch point of Seam-III is 52.7m. As per the FDPR/Supplementary note, Main Incline will be earmarked for coal transportation as well as intake airways, and travelling roadways. The incline roadways will be comprehensively supported by resin bolting. The footstep, handrail and provision for water drainage will also be set up along main incline no 1.

The trunk belt conveyor having belt width of 1200mm and capacity of 1000 t/h will be equipped in main incline. Run of mine (ROM) coal will be transported from underground face to raw coal surge bunkers through main incline by trunk conveyor. From the surface overhead surge bunkers, it will be loaded onto trucks and will be transported to the railway siding.

Auxiliary Incline (Incline no 2)-

Auxiliary incline is located on the west side of main Incline no 1. The width and height of the auxiliary incline is 5.0m and 3.5m respectively. The total inclined length from surface to coal touch point of Seam-III is 48.2m.

It will be earmarked for material transport and intake airways as well as for emergency exit. Roof will be comprehensively supported by resin bolting as per

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the requirement of the strata condition. The 900mm track gauge having rails of 30kg/m section, will be laid in this incline and a single drum direct haulage will be installed on surface for the transportation of materials. In addition, handrail, water drain & manhole as per the provision of CMR will be provided in auxiliary incline. At present there is no equipment installed in any of the Inclines

Existing transport system in Phularitand Colliery-

At present, only SDLs are being used for development of Seam-III and engaged in maindip drivage of this seam. Two inclines/drifts exist i.e Incline No.1 and Incline No.2. Incline no.1 is being used as main return airways and exhaust Fan is installed in its mouth. Incline No.2 is being used for coal / material transportation and a direct haulage (75 kW) is installed at surface for this purpose. In underground, another direct haulage (75 kW) is installed in rise most side of the maindip of Seam-III. A Tugger haulage (37 kw) is also being used in further dip side for the same purpose. Mine is producing about 250-300 tpd by using 3 SDLs. Existing transport layout has been shown in Plate No.XXI

Existing Transport Equipment in Phularitand Colliery-

Transport Equip.	Capacity	Location	Purpose
Direct Haulage	75 kW	At Surface near Incline mouth of Incline No.2	Coal/material transport
Direct Haulage	75 kW	On rise side of maindip of Seam-III	Coal/material transport
Tugger Haulage	22.5 kW	In 6 Dip,9 Level of maindip	Coal/material transport

5.20.2 Proposed Underground Transport system-

Proposed in Longwall Project

The total underground coal evacuation system in Muraidih project will be through a series of belt conveyors using different type & capacity of belt conveyor earmarked for the purposes, which includes trunk belt and gate belt conveyors with steel cord/PVC belting.

Trunk Belt-

Coal transportation

Coal coming from face will be fed onto the gate belt conveyor which in turn discharges into the Strata bunker which will be made between seam III & seam I. Strata bunker will then discharge load on to the main trunk conveyor no I. The opening of the Strata Bunker will be controlled by pneumatically/ hydraulically operated closure mechanism. Main trunk conveyor will ultimately discharge on the surface coal handling plant.

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As regard the coal transportation from the Southern part of the mine property of seam III, the coal conveyance system will be little different. Coal coming from the face will be fed onto the gate belt conveyor which in turn discharges onto trunk conveyor no .2. This belt will feed the strata bunker having capacity of about 500 t which is placed in between seam III & seam I. Strata bunker will discharge load on to the main trunk conveyor no I. Main trunk conveyor I will ultimately discharge on the surface coal handling plant.

For the coal transportation from the north part of the mine property of seam III, Coal coming from face will be fed onto the gate belt conveyor which in turn discharges into trunk conveyor no 2. TB 2 will feed the strata bunker sunk between seam III & seam I. Strata bunker will then load on to the main trunk conveyor no I. Main trunk conveyor will ultimately discharge on the surface coal handling plant. Due to change in trunk drivage strategy in both seams due to shifting of Auxiliary Inclines and return air shaft as proposed in Supplementary note, there may be little bit deviation as proposed in DPR.

Hence, it is to be decided by bidder how to maintain transport system in both seams.

As per the final DPR, there will be following three categories of belt conveyors-

- Trunk conveyor
- Gate conveyor for the powered support longwall face
- Gate conveyors for development of gate roads for the longwall panels and bord & pillar development

a) Trunk conveyor-

There will be two trunk conveyors in tandem. Each of 1200mm wide having different capacity of 1000 tph & 1200 tph and will be operated at 3300 volt. Since the trunk conveyors will be installed in the main intake and Seams being of degree I gassiness, the electrical will be of Non FLP.

Trunk conveyor 1 -Main trunk conveyor for this longwall package will have two drive each of 400KW at 3300 volts without auto tensioning device.

Trunk conveyor 2 -Trunk conveyor will be laid along coal seam and will feed coal to trunk conveyor no1. Initially it will be laid in the seam no III and after the completion of seam III, it will be shifted to seam I. It will have two drives each of 250 KW at 3300 volts without auto tensioning device. The width of the conveyor will be 1200mm having capacity of 1200 tph. Since it will be laid in the main intake in degree I mine, we have selected Non FLP electrical of 3300 volts. Here also we have proposed steel cord belting.

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Both belts will be controlled by pull cord signaling system which will be laid all along the belt conveyor. In addition to pull cord system there will be communication system as well.

b) Gate belt conveyor for the powered support longwall face

Bridge stage loader (BSL) will deliver the coal on to the 1200 mm wide gate belt conveyor. The length of the longwall panel will be approx. 2400 ms. Since the coal conveyance will be downhill, it will be possible to manage by single belt conveyor. As such it has been planned for one gate belt conveyor having capacity of 1200 TPH, width 1200 mm and the power rating will be 2 x 250KW. The belt conveyor tail end will be self-advancing type to enable faster shifting of the belt tail end and will continuously back with progress of the longwall face. It is provided with auto loop take up with storage of 100 m of belting and the belt conveyor is thus gradually shortened. For the soft start, The Contractor has selected hydraulic fluid coupling. The type of belting will be PVC which is duly approved by DGMS The drive will be FLP and it will be controlled by pull cord signaling system which will be laid all along the belt conveyor. In addition to pull cord system there will be communication system as well.

c) Gate belt conveyor for the drivage of gate roads

In order to ensure faster drivages of pair of gate roads for the longwall panels by Bolter miner, two numbers of gate belt conveyors have been proposed which will be laid in each gate roads of the longwall panel. Bolter miner will load coal on to the gate belt conveyor through a feeder conveyor or continuous haulage system. For the gate road drivage of longwall panel as well as for development of Bord & Pillar, BHEC/ Minop have proposed the use of Bolter miner. For the coal evacuation from the bolter miner districts it is proposed to use belt conveyor of 900mm width having capacity of 575 TPH at a speed of 2.5 m/sec with 2 X 90 KW motor. The length of the gate road drivages will be around 2400 m. As regard the drivages of the longwall panel, it is proposed two gate conveyors, each of 2400 m long will be installed in each gate road and will work for the drivages of the each long headings by bolter miner. It is provided with auto loop take up with storage of 100 m of belting and the belt conveyor is extended when the tail end is pulled by the feeder conveyor. For the soft start, hydraulic fluid coupling have been selected. The type of belting will be PVC which is duly approved by DGMS.

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d) Gate belt conveyor for the development of Bord & Pillar district

It has been stated earlier that the area which cannot be taken by PSLW technology, for maximization of coal recovery & conservation of coal, BHEC/Minop has proposed one more gate conveyor for development of B&P districts. After the completion of formation of LW panels, Bolter miner will be gainfully utilized for the development of the B&P districts to extracts coal which cannot be extracted by LW Method. The gate belt conveyor will be 900mm wide and the capacity is 575 tph. The length of the conveyor will be 500 m. It is provided with auto loop take up with storage of 50 m of belting and the belt conveyor is extended when the tail end is pulled. 1×90 KW drive motor is selected. For the soft start BHEC/Minop has selected hydraulic fluid coupling. The type of belting will be PVC which is duly approved by DGMS.

Muraidih Longwall Project Belt Conveyors Specification as proposed in DPR-

Sl. No.	Name	Capacity	Speed	Length	Width	Strength	Power	Lift	Killo	Loop Take-up
		t/h	m/sec	m	mm	N/mm	KW	m	Volt	(m)
1	TB1	1000	2.6	1000	1200	2500	2X400	140	3300	—
2	TB2	1200	3	1200	1200	2500	2X250	60	3300	—
3	LWGB	1200	3	2400	1200	1000	2X250		3300	100
4	B/M GB	575	2.5	1200	900	875	2X90	(-)40	1100	100
5	B/M GB	575	2.5	1200	900	875	2X90	(-)40	1100	100
6	B&P Gate belt	575	2.5	500	900	875	1X90	(-)15	1100	100

Transportation of equipment at face & utility service vehicle-

As for the longwall face installation & transfer, BHEC/Minop has proposed SANDVIK/ other internationally reputed make shield hauler with a carrying capacity of 40 Tonne. This shield hauler will be used for transportation of the power support as well as longwall equipment for the installation of longwall faces. There will be 2 shield haulers. One will be used for salvaging of the equipment and the other will be used for face installation at the time of face transfer.

Material Transportation system-

The material transport will be done through Incline No.2. There will be a direct haulage of 150 KW capacity at 3.3 Kv which will take care of material transportation from surface to Seam No.III and Seam No.I. The main direct haulage will have two speeds. For the transportation of powered support which will be weighing about 40 tonne, it will work at slow speed about 0.75m/sec. Otherwise for the normal transportation of material, it will operate at normal high speed around 1.5m/sec. There will be two more underground direct haulage of

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similar capacity. One will be installed at seam No.III and other will be installed at Seam No.I.

For the transportation of the material to the districts, BHEC/Minop has provided endless haulage of 75 KW in both the gate roads of the operating longwall faces and for the gate roads being developed by bolter miner. As such there will be 4 nos of 75 KW endless haulage for the transportation of materials in the district at underground.

Man Riding System

MINOP/BHEC has proposed high capacity powered support weighing about 30-35 te. So transportation of the material will be one of the critical areas for faster installation as well as face transfer from one panel to another panel. As such the capacity of transport system is so designed, which will take care of the transportation of heavy material safely and efficiently.

The physical parameter of the mine is not very extensive. It will be about 1.5 km along main dip and 2.5 along strike. In a very high capital intensive technology, it is the objective of the management to ensure the higher availability and utilization of the equipment. The common philosophy of the management is to pay for work not for walk. As such MINOP has proposed 4 overlapping shift each of 6 hours duration at the face so that the equipment is handed over as hot-seat condition. In spite of all those actions, Minop/ BHEC have proposed to go for the man rider to minimize the physical fatigue of the work man for traveling along the main incline. The main material transport haulage which will be installed in the auxiliary incline. It will have one 150 KW haulage with dual speed. For the normal transportation, it will go at a higher speed and for the transportation of heavy load and man ridding, it will move at a slower speed. The system will be approved by DGMS. The man riding facility will be given particularly for the face crews.

Proposed underground Transport system for Continuous Miner/SDL panel in Phularitand Colliery-

In this mining plan, it has been proposed to sink an air shaft near the existing Inclines which will be used for main return airway for the mine. Then, existing two inclines will be used for intakes as well as coal/material transport. Incline no.1 will be equipped with Belt conveyor for coal transport along with travelling purpose and Incline no.2 will be used only for material transport. As stated earlier that existing drifts are made upto Seam-III, additional two drifts (D1 & D2) will be made from floor of Seam-III to approach seam-I keeping same alignment with the existing drifts. To increase underground bunkerage capacity, a strata bunker in

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stone is proposed in between Seam-III and Seam-I. The location of strata bunker will be in parting having superimposed level galleries. Another drift (D3) is proposed from the floor of rise side level gallery of Seam-I to the top of the bunker located in dip side level gallery of Seam-III.

The rise side drift (D1) will be equipped with belt conveyor which will collect coal from the bottom of the strata bunker in stone and it will discharge onto the tail end of belt conveyor of Incline no.1. Thus, coal from underground strata bunker will be transported to surface bunker through belts conveyors.

To increase underground production from Inclines of Phularitand Colliery, it has been proposed to operate two SDL panels and one Continuous Miner Panel in the amalgamated area of Phularitand Colliery and part of Muraidih Colliery (i.e rest of the area where Longwall panel has not been proposed by the Contractor) falling in Cluster-II. Initially, panels of Seam-III will be extracted and then shifted to Seam-I. Keeping in view, the floor contour of both seams and their seam thicknesses, maindips in both seams are made in western side of the workable area and CM panels are proposed to lay towards eastern side having slightly rising to make it self-draining type. SDL panels are located on northern side of the property.

5.20.2.1 Proposed Coal Transport system-

Three panels are proposed to be worked at a time, first panel by three nos. of SDLs, second panel by two nos. of SDLs and third panel by a Continuous Miner. Transportation of coal from face to surface will be carried by a series of belt conveyors. The system of transport is proposed as under.

A) Panel Transport-

Continuous Miner Panel-

Within the five headings Continuous Miner Panel, shuttle cars will receive coal from the Continuous Miner and transport/transfer the same onto the feeder breaker. The feeder breaker will crush the coal in required size and discharge it on to gate belt conveyor GBC-1 proposed to lay along the central gallery of the panel. In CM panel one gate belt conveyor (GBC-1) of 1000 mm width has been proposed. The gate belt conveyor (1000mm wide) will transfer coal on to the trunk belt conveyor to be laid along the maindip and mainrise depending on location of panel operation.

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SDL Panel-

Within the five headings SDL Panel, SDLs will load blasted coal from the face and transport/transfer the same onto the pony conveyors. In each SDL panel three numbers pony conveyors have been proposed. SDL will discharge coal on pony belt conveyor. Pony belt conveyor (800 mm wide) will carry coal from the face and discharge to the gate belt conveyor (GBC-3) of 800 mm belt width proposed to lay along the central gallery of the five headings SDL panel. Since, there will be two panels in operation at a time, hence another gate belt conveyor (GBC-5) of 800mm width is proposed. The respective Gate belt conveyor of each panel will discharge coal onto the trunk conveyor installed in the maindip/mainrise trunk belts proposed to lay along the maindip and mainrise depending on location of operation of panels.

B) Trunk Transport-

III Seam-

Dip side transport system in Maindip-

In III Seam, the trunk belt conveyors will be laid along the maindip as well as mainrise. These conveyors will receive coal from the district Gate Belt Conveyors. The trunk belt conveyors of maindip/mainrise will transport/transfer coal on the level belt conveyor laid along the level through transfer point. This level belt conveyor will transport/transfer coal in the strata bunker made in the floor of Seam-III

Rise side transport system in Main dip-

The area/panels on the dip side of the fault (F4–F4) in III Seam will be approached by driving three number of drifts (D4,D5 & D6) which are in reverse direction of maindip from up-throw side of III seam to down throw side of Seam-III. The throw of the fault F4F4 is 5m or so. Hence it is proposed to approach from seam to seam. Out of these three reverse drifts, one drift (D4) will be used for coal transport through belt conveyor, drift (D5) for material transport and third drift (D6) for return airway.

So, coal produced from panels lying on down-throw side of fault F4F4 of seam-III will be brought near the underground strata Bunker through belt conveyors as shown in the transport layout plan and coal will be discharged onto level belt conveyor which will discharge in Strata bunker made in the floor of Seam-III.

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From bottom of this strata bunker,, coal will be transported to surface through Incline No.1

Proposed trunk belt conveyors are as under:

(a) C-1 : In the main dip III C up to coal transfer point TP-1 on main trunk belt heading,

(b) C-2 in the Main dip III B from TP-1 to TP-2 (on main trunk belt heading),

(c) C-3 in the main dip III A, from TP-2 to underground stone strata bunker,

(d) C-4 in Main rise IIID, from TP-3 to TP-4

(e) C-5 in in drift D-4 in Main rise III E from TP-4 to TP-3.

(f) C-6, from strata bunker B-2 to TP-5.

Coal Flow system-

Seam-III-

The gate belt conveyor of Continuous Miner panel (say GBC-1) will discharge coal on trunk conveyor C-1 and then coal will be discharged on belt conveyor C-2 through TP-1 which will discharge coal on level (strike) belt conveyor C-3 through TP-2. The level belt conveyor C-3 will discharge into underground strata bunker proposed to be made in floor of Seam-III. Thus coal produced from dip side CM panels will be stored in strata bunker

The coal produced from SDLs panel located on northern side (Say GBC-3) will discharge coal on level belt conveyor GBC-2 (lay in Panel P3-16) and this coal will be discharged on trunk conveyor C-5 to be installed in Mainrise-IIIE through TP-4 which will discharge coal on trunk conveyor C-4 to be installed in Mainrise-IIID through TP-3 and discharges on level belt conveyor of gallery align with the underground strata bunker. Thus coal transported from rise side will be finally discharged into the strata bunker.

Seam-I/II and Seam-I -

After completion of extraction in III seam, all the coal transport arrangements will be shifted to lower seam i.e I/II combined and its bottom split Seam-I where same number of panels will be operated to meet the target production..

In Seam-I, the trunk belt conveyors will be laid along the maindip. These conveyors will receive coal from the Gate Belt Conveyors of the panel. The trunk belt conveyors of maindip will transport/transfer coal onto the level belt conveyor to be laid in gallery from where rising drift (D3) is proposed to be driven from floor of Seam-I to floor of III seam i.e upto the top of Bunker.

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A belt conveyor will also be installed in this drift(D3) onto which level belt will discharge coal after gathering coal from dip side panel production as well as rise side panels. This drift belt will transport/transfer coal in the top of strata bunker in Seam-III. From level galleries, a five/four headings mainrise will be made and same will be extended upto the northern side working limit after crossing of the fault. The northern side property of fault F4F4 having throw of about 5m will be approached by three numbers of reverse drifts made from up-throw side mainrise headings to down-throw side of the fault in Seam-I. Coal produced in panels lying in down-throw side of the fault F4F4 will be transported through belt conveyors install in drift(D7) to upthrow side mainrise transport network and discharge coal onto level belt conveyor to be laid in gallery near strata bunker as stated in earlier paragraph. Coal will be collected from the bottom of the strata bunker and ultimately will be brought to surface through belt conveyors of Incline no.1 and drifts as stated in transport system of Seam-III.

Coal Flow system-

All the conveyors of seam III will be shifted in seam I/II & Seam-I after extraction of Seam-III panels. For transporting of coal from furthest SDL panel, coal flow transportation layout of Seam-I is considered where distant panel is to be operated. For transport of coal from this panel, it has been proposed to install gate belt (GBC-6) in SDL panel which will discharge coal on level belt conveyor (GBC-5). The Gate belt (GBC-5) will discharge coal on series of trunk belt conveyors of Mainrise-I/II E and Mainrise I/II D consecutively of this seam. The trunk belt conveyors of maindip & mainrise side will discharge coal on level belt conveyor C-3 of this seam. To discharge coal onto top of underground strata bunker, an additional drift belt conveyor (C-3A) in Drift(D3) is to be installed. The level belt C-3A will discharge coal gathered from dip side CM panels as well as rise side SDL panels on to this drift belt.

Main coal Transport system through Incline-

To collect coal from below of underground strata bunker, a belt conveyor C-6 is proposed. The belt conveyor C-7 will receive coal from conveyor C-6 through transfer point TP-5 and coal will be discharge coal on to main incline belt conveyor C-8 through transfer point TP-6 which finally discharge coal into 2 X 250 Te truck loading hoppers on surface for further dispatch of coal to KKC link siding.

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Details of Belt Conveyor proposed for operation of Continuous Miner /SDL panels area-

	LOCATION	CONV. NO.	OUTPUT, Q (TPH)	BELT WIDTH, M (mm)	BELT SPEED, V (M/SEC)	LEN-GTH, L (M)	LIFT, H (M)	Selected POWER, (Kw)	Voltage	Enclo sure type
In seam Maindip/main rise	TBC C-1, in main dip - III C/main dip-IC from GBC-1 to TP-1	C-1	500	1000	2.00	700	85	2x150	3.3 kV	FLP
	TBC C-2, In main dip - III B/main dip-IB from TP-1 to TP-2	C-2	500	1000	2.00	800	85	2x150	3.3 kV	FLP
	TBC C-3, In main dip - III A from TP-2 to strata bunker B-2/In main dip-I_IIA from TP-2 to TP-7	C-3	600	1000	2.50	120	5	1x55	550 V	FLP
	TBC C-4, In main rise IIID/main rise-I_IID from TP-3 to conveyor C-3	C-4	500	1000	2.00	315	5	1x75	550 V	FLP
	TBC cum drift conv. (in drift D-4) C-5, in main rise-IIIE/ main rise-IE from TP-4 to TP-3	C-5	500	1000	2.00	165	5	1x55	550 V	FLP
	TBC C-3A, In main dip-I_IIA from TP-7 to Strata bunker B-2	C-3A	600	1000	2.50	240	5	1x75	550 V	FLP
	TBC C-6, from St. bunker B-2 to TP-5	C-6	600	1000	2.50	150	5	1x55	550 V	FLP
In incline	Incline drift conv. C-7, from TP-5 (In seam II) to TP-6 (In seam III)	C-7	600	1000	2.50	100	20	1x90	550 V	FLP
	Main Incline conv. C-8, fr TP-6 to hopper on surface	C-8	600	1000	2.50	425	80	2x150	3.3 kV	FLP
In panel	GBC-1 In CM Panel	GBC-1	500	1000	2.00	1300	5	2x90	550 V	FLP
	GBC-2 In SDL Panel	GBC-2	150	800	1.00	600	30	1x55	550 V	FLP
	GBC-3 In district Level(strike) gallery	GBC-3	150	800	1.00	200	5	1x55	550 V	FLP
	GBC-4 In SDL Panel	GBC-5	150	800	1.00	500	10	1x55	550 V	FLP
	GBC-5 In district Level(strike) gallery	GBC-4	150	800	1.00	900	20	1x75	550 V	FLP
	Pony Conveyor		100	800	0.75	100	0	1x22	550 V	FLP

5.20.2.2 Proposed Material Transport System-

Panel Transport-

Continuous Miner District-

Within the CM District, an endless haulage will be provided for material transport. The endless haulage will receive material trolleys from the maindip haulage and transport the same at suitable location near the face. From this location the materials will be transported upto the face by LHD.

SDL District -

Within the SDL District, an endless haulage and a tugger haulage will be provided for material transport. The endless haulage will receive material trolleys from the maindip haulage, transport and feed the same to the tugger haulage located about two pillars from the face. From this location the materials will be transported upto the face by tugger haulage.

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Material Transport in trunk roadways -

III Seam

In III Seam trunk, material transport will be affected by a combination of Direct Haulage, Tugger Haulage and Endless Haulage. On the dip side of III seam, the endless haulage of the districts will receive material trolleys from the direct haulages to be laid in the maindip. However, on the rise side, the endless haulage of the districts will receive material trolleys from the Endless haulage laid in the mainrise.

The direct haulage on surface will feed material trolleys (loaded or unloaded) to endless Haulage installed in level (strike) gallery. The endless haulage (EH-3) will feed material trolleys to direct Haulage to be laid along the main dip of Seam-III. This Direct Haulage will feed material trolleys to another Direct Haulage in maindip and subsequently to Endless Haulage of panel to transport material to the last workings of this seam. Endless haulage will also be installed in Mainrise headings. A tugger haulage will be used in drift(D5) to supply material in different panels lying on down-throw side of the fault. (Refer Plate No.XXII)

Seam-I/II Combined and its Split Seam-I -

As stated earlier that all panel and transport equipment will be shifted to lower seam i.e in Seam-I/II combined and Seam-I after completion of extraction of Seam-III. So, for supplying material from surface to Seam-I/II and Seam-I workings, direct haulage on surface will directly feed material trolleys (loaded or unloaded) to Endless haulage to be installed in level (strike) gallery and subsequently to direct haulages in maindip and endless haulage in panel for transporting material to last workings of this seam. To supply material on rise side, endless haulage will also be installed in mainrise. Tugger haulage in drift(D8) will be used to supply material on down-throw side of fault F4F4.

To supply material to the down throw side property of Fault F4F4, a Tugger haulage will be installed in up-throw side of the fault laid along the Drift (D8) which will supply material trolleys to Endless haulage proposed to be installed in level gallery

Main Incline / Drift Transport-

The Direct Haulage (75 kW) is already installed on surface and it is laid along Main Incline No.-2. This direct haulage is presently being used to lower or raise material trolleys as well as coal tubes from surface to underground or vice-versa.

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After installation of belt conveyor in Incline no.1 for coal transport, lower capacity direct haulage will be used for material transport in future.

Proposed material Transport equipment-

For material transport in Panels-

Material transport to the panel is proposed to be done by endless haulages. In SDL districts Endless Haulages EH-4, EH-5 & EH-6 and one Direct haulage DH-3 has been proposed. In CM panel, one Endless Haulage (EH-1) has been proposed.

For material transport in Trunk roadways-

Two Direct Haulages DH-1 & DH-2 has been proposed in the main trunk in Maindip III C & Maindip IIIB respectively. One Endless Haulage (EH-2) has been proposed in the maindip IIIA in main trunk. Another Endless Haulage (EH-3) in the main trunk in the main rise IIID. One tugger haulage TH-1 has been proposed in drift D5 which will connect EH-4 (in SDL panel) to EH-3.

All trunk road haulages of seam III will be shifted in underlying Seam I/II & Seam-I workings after complete extraction of overlying Seam-III.

Main incline material Transport equipment –

In main Incline drift, A Direct haulage (DH-3) will be installed in the main incline, which will connect to EH-2. Details of material transport equipment shown in table below-

SL. No.	Location			Haulage No.	Length (M)	Gradient	Power, (kW)	Connectivity	
								From	To
1	In III seam	In Trunk	In trunk in dip side of main dip III-C.	DH-1	700	1 in 8	37	EH-1	DH-2
2			Main trunk in main dip III-B	DH-2	800	1 in 8	37	DH-1 & EH-1	EH-2
3			Main trunk in main dip III-A	EH-2	500	1 in 20	30	DH-2 & EH-3	DH-3
4			Main trunk in maip rise III-D	EH-3	300	1 in 10	30	TH-1	EH-2
5			In Drift D5	TH-1	175	1 in 5	22	EH-4 & EH-5	EH-3
6		In Panel	SDL panel	EH-4	600	1 in 15	30	Panel	TH-1
7				DH-3	225	1 in 7	22		EH-4
8				EH-5	950	1 in 25	30		TH-1/ EH-3
9				EH-6	450	1 in 20	30		EH-5
10			CM panel	EH-1	1300	1 in 20	30		DH-1 /DH-2
11	In Seam I/II and I		All the haulages of seam III will be shifted to Seam-I/II and I-seam at respective locations.						
12	Common		In main incline	DH-3	500	1 in 5	37	EH-2	Surface

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Travelling roadways-

Incline no.1 will be used for travelling purpose from surface to underground upto Seam-III and Drift (D1) will be used from Seam-III to Seam-I. In main dips of both seams, belt conveyor headings will be used for travelling purpose which is also used as intake airways. **The proposed transport layout of Seam-III and Seam-I have been shown in plate no XXII and plate no. XXIII respectively.**

5.21 Support System:-

5.21.1 Proposed in Longwall workings of Muraidih Global bid Project –

Powered support-

Major parameters for evaluation of powered support will largely depend on the following factors:

- Support efficiency
- Roof to floor convergence
- Active horizontal force
- Roof cavity
- Canopy contact condition
- Uniformity of support load
- Leg resistance

Normally roof support at Longwall face is either 2 legged or 4 legged type Shield powered support. In Muraidih Longwall project, 2 legged Shield powered support is considered by the Contractor.

The main advantages of 2 legged supports are:

- More space along working face
- Lesser element, so easy to maintain
- Less fault and malfunction for hydraulic elements
- More travel space
- Easy to control roof
- Shorter canopy length, short distance of unsupported roof span
- Capacity of overcoming roof cavities
- Wide range of height adjustment
- Active horizontal force during setting
- Lateral force capacity in direction of advance
- Large contraction ratio of support can adopt in change of coal thickness
- Same capacity of support gives higher support resistance
- Features simple structure,
- Ease installation and maintenance

Support resistance-

Although the average thickness of coal Seam is considered at 4.0m in Seam-III, to be on safer side, the maximum height of extraction has been considered for the determination of support capacity as 4.8m and face width is at 200m long.

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(H)

The M/s Minop/BHEC Consortium has determined the support at yield load as 11000KN. At about 80% setting load, the capacity of the supports is coming 11000* 0.8 = 8800 KN = 2 x 4400KN. Each leg will have the capacity of 4400KN. Which works out the cylinder bore as 420mm diameter at working pressure of pump=31.5MPa. According to standard engineering practice for the design specifications of roof support, the maximum height of the powered support is selected after considering some allowances for convergence which about 0.2 – 0.4 m above the maximum Seam height. Therefore the maximum working height of the support will be 4.8 + 0.2 i.e. 5.0 m.

Thus, Contractor has selected the Powered Support as follows-

- The capacity of support- 11000KN
- The length of the canopy 4.158m
- The width of the canopy 1.75m
- The tip clearance 0.5m

Support resistance before cut is 1.349Mpa or about 134T/M^2

Support resistance after cut is 1.151Mpa or about 115 T /M^2 at maximum span of longwall face

Calculation of support capacity-

The length of designed support canopy is about 4.158 m, and the support width is 1.75m but considering the distance between the tip of the canopy and the face as 0.50 maximum, the area will become 8.15 Sq.m before cut. Since the depth of the web of cut is 0.865m & considering the web efficiency as 0.95, the effective web will be 0.82m. The total length of the canopy + unsupported area of 1.32m will be 5.478 and the area after cut will be 9.58 Sq.m.

Support capacity N= P×S=1.1445×9.58×106 ≈10971 (KN)

So the support capacity is designed as 11000KN.

The maximum height is 5.83m at one borehole (MR-6) within the designated mining area. Considering the overall efficiency it is planned to extract 4.8m in one lift leaving allowance for convergence of 0.2m. Thus, the hydraulic support is designed with the maximum height in 5.0 m and minimum height in 2.5m. The best support range of hydraulic support is 2.5-4.5m. Average thickness within the designated area has been considered as 4.00m. Hydraulic support will be main equipment using for powered supporting system with the powered support hydraulic leg. Hydraulic support and face end shield support will be used in longwall face to prevent bed separation and fall of immediate roof. Roof

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convergence and strong dynamic pressure can be caused by using support for low setting load. Roof convergence can be controlled in time by support with high setting load to reduce roof deterioration under variation of stresses of face. Considering the depth of Seams of Muraidih mine, shield support is selected in design. Hence, ZY11000/25/50D type of hydraulic support is selected for mining of Seam III, its supporting height is from 2.5m to 5.0m, center distance is 1.75m, setting load is 11000kN and weight is 38t. In order to ensure higher support set resistance, planning has considered the inclusion of guaranteed pressure valve. The hydraulic circuit is so arranged that the guaranteed set valve takes care of, while it achieves the preset pressure and ensure higher initial set load which is about 80% of the yield load.

Technical parameters table of supports during development of Seam III-

Title	Hydraulic Support	Face end shield support on head	Face end shield support on tail
Supporting Height (mm)	2500-5000	2500-5000	2500-5000
Scope of Working (mm)	2800-4800	2800-4800	2800-4800
Width of Support (mm)	1650	1650	1650
Center Distance (mm)	1750	1750	1750
Working Resistance(kN)	11000	11000	11000
Supporting Strength (MPa)	1.21-1.35	1.18-1.31	1.06-1.18
Weight (t)	38	39	40

Similarly, during the extraction of Seam I, the maximum height of support Hmax ≥ Mmax+S1 =3.00m, the minimum height of support Hmin ≤ Mmin -S2 =1.65m. The same support of Seam III will be used in Seam I after modification of some of the support structure at the time of major overhauling before taking it to Seam I.

Technical parameters table of supports during development of Seam I-

Title	Hydraulic Support	Face end shield support on head	Face end shield support on tail
Supporting Height (mm)	1650-3000	1650-3000	1650-3000
Scope of Working (mm)	1850-2800	1850-2800	1850-2800
Width of Support (mm)	1650	1650	1650
Center Distance (mm)	1750	1750	1750
Working Resistance(kN)	11000	11000	11000
Supporting Strength (MPa)	1.15-1.32	1.15-1.28	1.05-1.15

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5.21.2 Proposed support system in Continuous Miner/SDL Project at Phularitand Colliery-

Nature of the Roof & Floor-

The nature of the immediate roof and floor rock are shown in table below-

Immediate Roof and Floor rock-

Seam	Roof Rock	Floor Rock
Seam-III	The immediate roof of the seam is mostly carbonaceous shale and medium to coarse grained sandstone.	The floor of the seam is carbonaceous shale and medium to coarse grained sandstone.
Seam-I and I/II Combined	The immediate roof of the seam is mostly medium grained sandstone and at places shale and sandy shale.	The floor of the seam is shale and coarse grained sandstone.

5.21.2.1 Existing Systematic Support Rules for development of Gallery at Seam-III-

General Information-

- Seam : III Seam
- Working Height : 3.00m
- Gallery Width : 4.8m
- RMR(Calculated by ISM, Dhanbad on June, 2014) : 59

Calculation of Factory Safety-

- RMR : 59
- Rock Load : 2.48 Te/m2
- Distance between Row : 1.2 m
- No. of Bolts in a Row : 4.0
- Area Covered by 4 Bolts : 4.8m x 1.2m = 5.76 m^2
- **Total Rock Load** : 2.48Te/m^2x5.76m^2 = 14.28 Te
- Each Roof Bolt Load Bearing Capacity with Cement Capsule = **6 Te**
- Total Load Bearing Capacity of 4 Bolts : (6 Te x 4 Nos.) = 24 Te
- **Factory of Safety** : 24 Te /14.28 Te = 1.68

Support of Development working within 10m of coal face-

- Roof will be supported by full column grouted bolts with cement capsules. \installed at \maximum interval of 1.2 m in the same row so that distance between the bolt and side gallery will not more than 0.6 m.
- The spacing between the two rows will not be more than 1.2m. However distance of the first row of Bolts from the face will not be more than 0.60 m before blasting and 1.8 m after blasting.
- All the bolts grouted shall be vertical.
- Before engaging persons to drill holes for roof bolts of installing permanent Support, Temporary support, such as props shall be installed to ensure safety of support personnel. No person will be engaged at any time under unsupported Area.

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Support of Junction extra 25% of Bolts at Junction-

Support of Ledges, Over Hangs and Slips Etc.

- All ledges in the roof shall be supported by providing Cross-bars set on steel props or I-section Girder.
- Wherever the sides of pillars have tendency to spall, these shall be supported by providing side bolts with wire nets.
- Any overhang which cannot be dressed shall be kept support by incline stay props.
- All faults, visible slips, breaks and other geological disturbance in the roof shall be supported either by cogs or cross-bars or W-straps.

Roof Bolts Design-

- Roof bolts will not be less than 20 to 22 mm diameter mode ribbed bar or for steel with threaded of at least 12.5 cm.
- Length of each bolt is 1.65 m including threaded portion.
- Bearing plate size is 15 cm x 15 cm and 6.0 mm thickness
- Quick setting grout shall be such that an anchorage strength of at least 3 Te is developed in 30 minutes and 5 Te in 2 hours, 10Te after 24 hours. Capsules shall be as per DGMS circular standard.

Installation of Roof Bolts-

- Roof bolts shall be installed under the direct supervision of mining supervisor.
- The holes shall be drilled to correct diameter and length with suitable drill. The bore hole diameter shall not be more than 8mm to 12mm of bolt diameter. Due care will be taken to maintain the verticality of holes.

A schematic Layout existing Support System has been shown in Fig No. 7

Monitoring of Roof Bolting Performance

- Anchorage capacity test will be conducted at random of not less than 10% of the installed bolts.
- The test shall be conducted under direct supervision of competent person.
- Records of anchorage test conducted on the installed bolts will be kept in a bound paged book and shall be signed by the person making the test and countersigned by ACM/Manager.

Miscellaneous

- Additional support shall be erected / set as and when necessary.
- No person shall be beneath un-supported area at any time for any reason.

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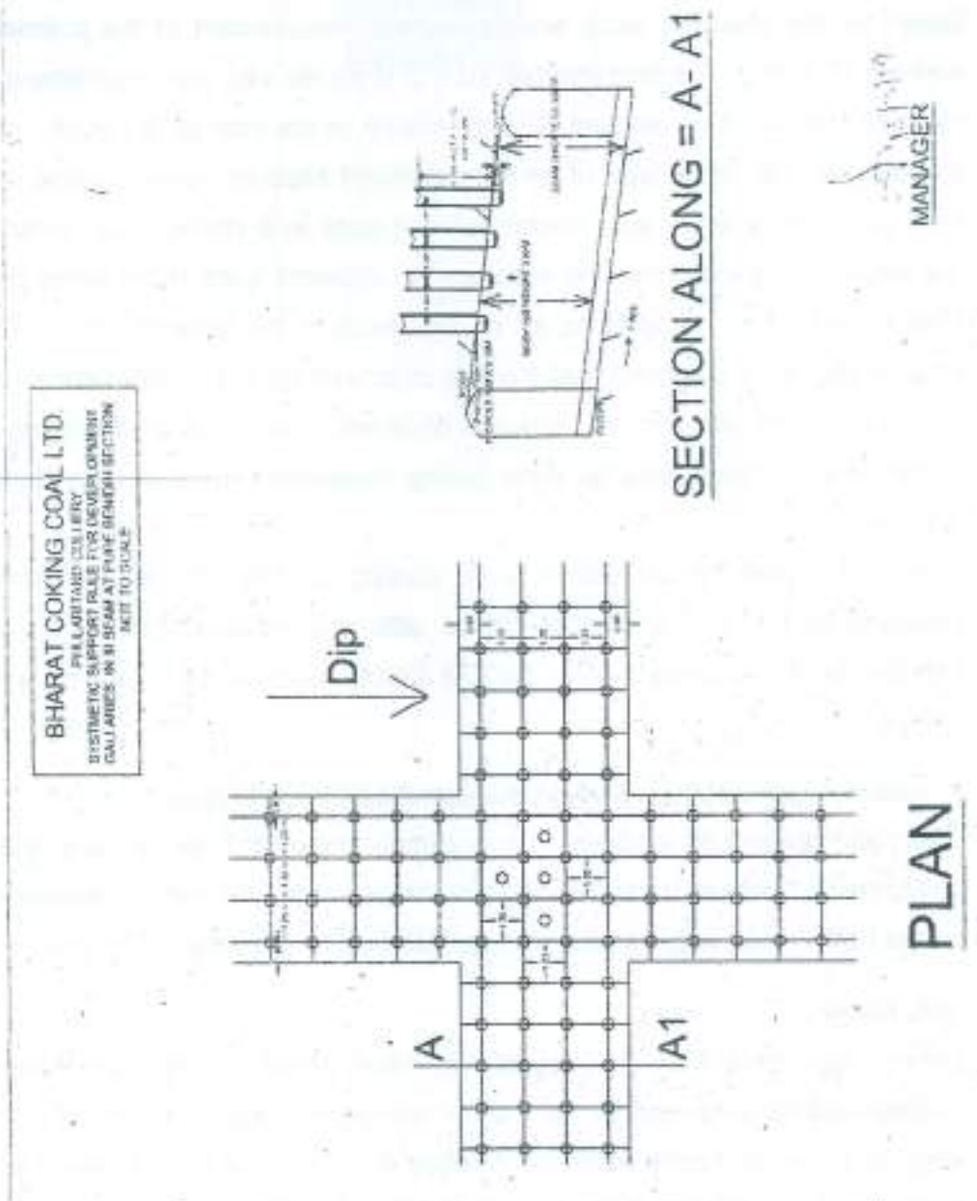

Existing Support system in Panel of Seam-III

Fig no.7

Proposed Support Plan for Panels of Seam-III & I-

Keeping in view of nature of roof & floor of the seam, the mine management should evolve a suitable support design in consultation with expert agencies and DGMS. The proposed support plan will be based on the result of the scientific study conducted by some expert agency for assessing the requirement of the support for working of Seam-I at Phularitand UG Mine.

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Based on the scientific study and operational requirement of the proposed method of mining (i.e unsupported cut-out distance etc) the requirement of the roof bolts will be assessed. The dimension of the roof bolts (length, dia., threading length, etc.), type of grouting (cement capsule, resin capsule with their setting time detail etc), number of roof bolts in a row/spacing distance (between the adjacent row and between the adjacent bolts in the same row) shall be judiciously decided based on the result of the scientific study. The support plan thus prepared shall be duly approved by the DGMS prior to the execution of the same in the workings of Seam-I. Continuous Monitoring of strata behavior shall also be done during development as well as during depillaring.

The support plan for the district to be worked by SDL and for the district proposed to be worked by CM will be different. However, based on the experience, the support system for CM District and for SDL District is as follows:

Proposed Support system during Development and Depillaring-

After development of galleries upto a certain distance from the coal touch point, the RMR value are to be ascertain through scientific agency and based on the RMR value, support plan is to be designed for workings of Seam-I.

SDL Panel-

During development of galleries of five heading panel, the development galleries will be supported by full column cement grouted roof bolts of 1.8 m long, 22 m dia. roof bolts would be installed at 1.2m x 1.2 m grid pattern with 4 bolts in a row leaving 0.6m from each side of coal edges. W-straps and wire mesh will be used in conjunction with roof bolts as and when required in the area where immediate roof is disturbed. The above figure depends on the RMR value of immediate roof rock and total rock loads.

In a depillaring panel, it is proposed to reinforce support in the extraction area upto two pillars ahead of the goaf edge line.

a) Support at the junction-

Junction is proposed to be supported by installing additional roof bolts. In addition to this, wire mesh and W-straps will also be used as and when required.

b) Support at goaf edge-

Goaf edges are proposed to be supported by erecting a row of cogs as shown below-

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A typical support pattern in a SDL panel for pillar size 26m x 26m and 36m x 36m has been shown below in Fig.No.8 & Fig. No.9 respectively -

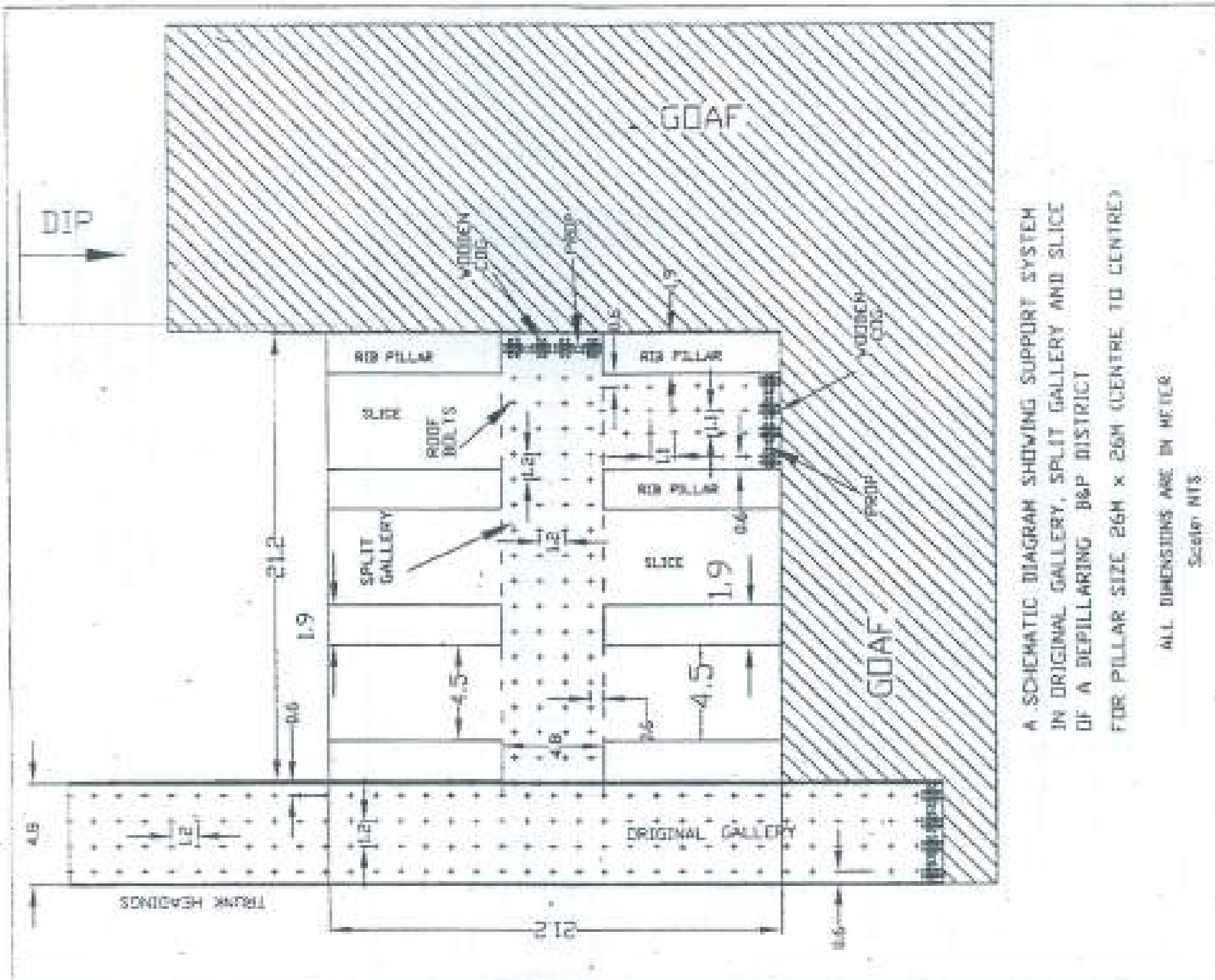

Fig No. 8

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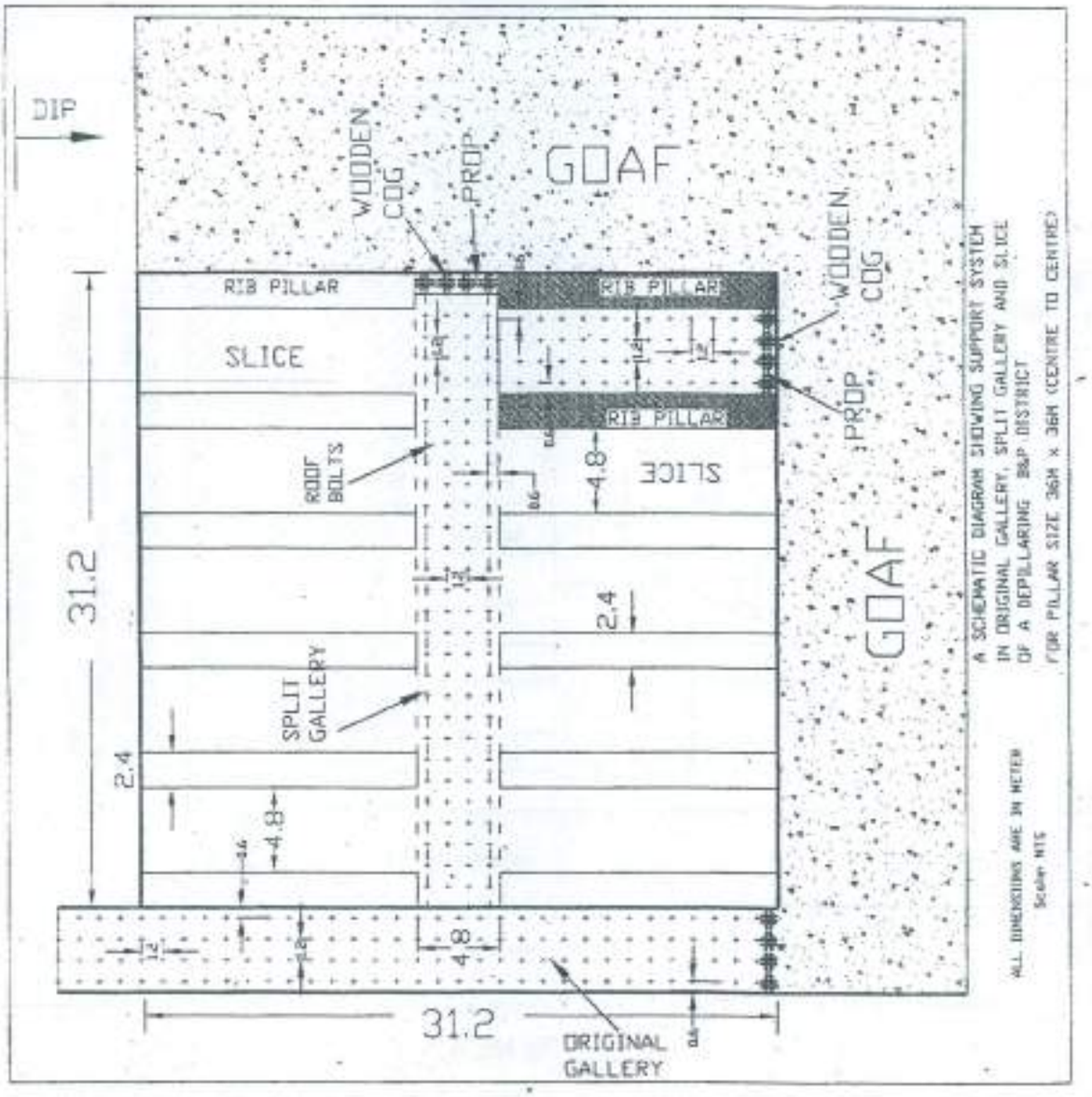

All dimensions are in Meters

Fig No. 9

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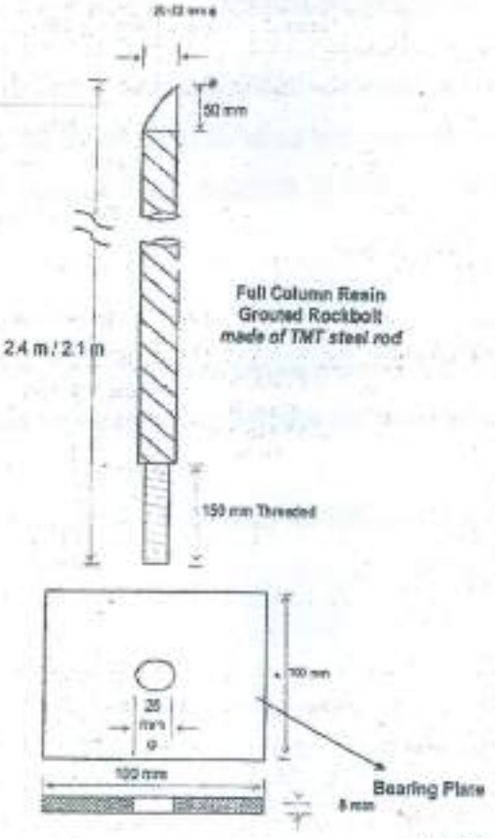
Continuous Miner District-

Development galleries will be supported by full column resin grouted roof bolts of 2.4m long, 22 mm dia. Roof bolts would be installed at 1.0 m x 1.0 m grid pattern with 4 bolts in a row leaving 0.9 m from each side of coal edges. The roof bolts are made of 22 mm diameter TMT steel of higher strength and are cold rolled threaded.



NOT TO SCALE

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SUPPORT DURING DEPILLARING-

CM District

a) Support of the Split Galleries-

Split galleries would be supported with full column grouted resin bolts, 1.8 m long, 22 mm diameter at 1.65 m x 1.65 m grid pattern.

b) Support at the mouth of slice (Breaker line Support)-

Additional 4 bolts are put in between the bolts already installed in the last row of the split. One more additional row of bolt (7 bolts) is put between the last two rows of prop in the split gallery.

c) Goaf edge Support

Goaf edges are supported in the same manner as support at the mouth of the slice. Additionally a few timber props shall be erected to indicate the convergence visually.

A typical support pattern in a CM panel for pillar size 26m x 26m and 36m x 36m has been shown below in Fig.No.10 -

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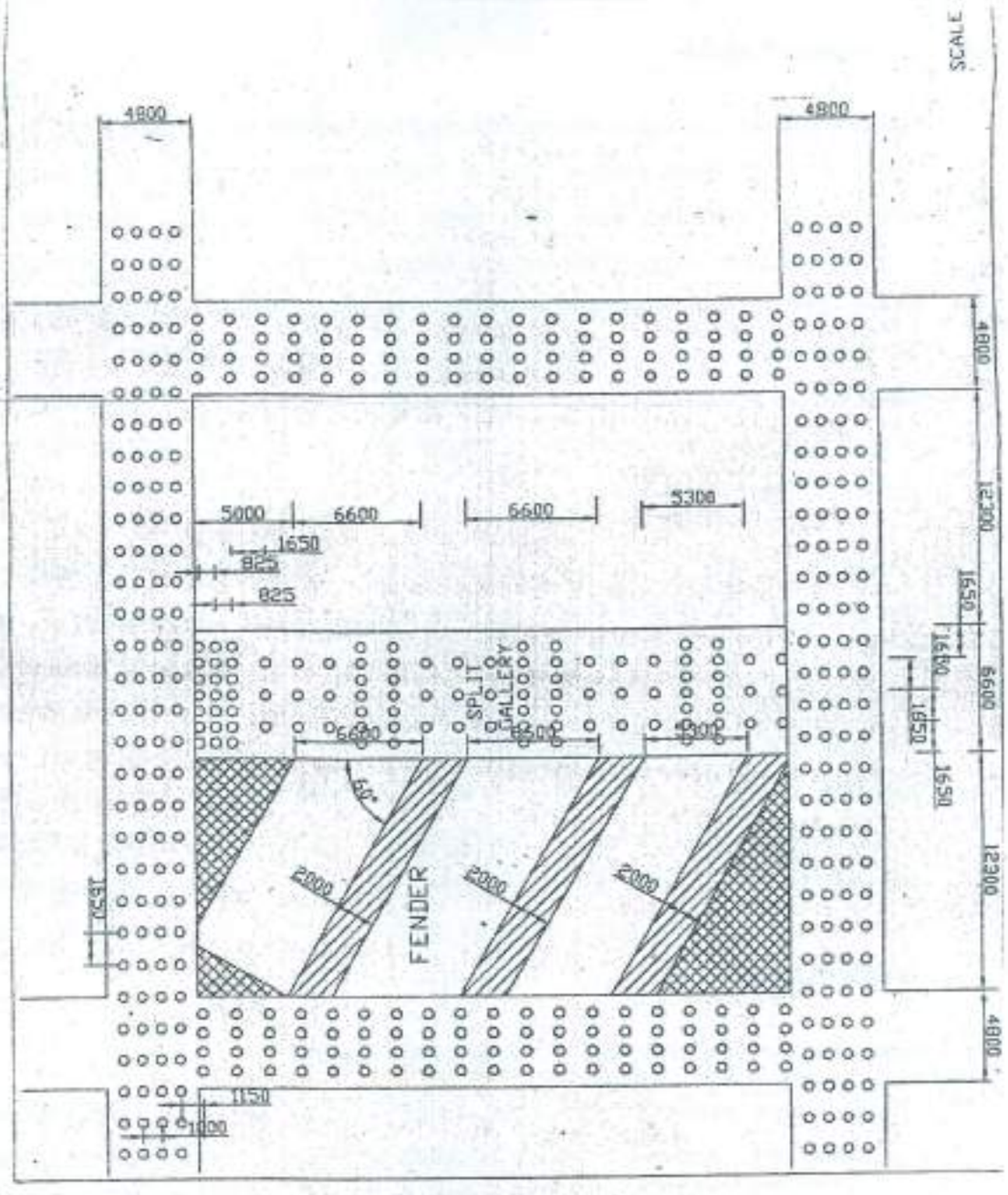
Diagarm showing showing Support system in depillaring Panel by Continuous Miner



All dimensions are in mm

Fig.no.10

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5.22.1 Ventilation System-

Existing Ventilation system-

5.22.1.2 Longwall Project-

For this project, Contactor has constructed two inclines and an Air Shaft at the designated site. Both inclines (Main & Auxiliary) has touched coal of Seam-III whereas Air Shaft has been sunk partly. Fan drift has also been made for installation of Fan. Work at the site has been suspended by the Contractor since 01.06.2016. Both Inclines have proposed to be used for Main Intake airways and Air shaft will be used for Return airway. The Location of Return air shaft has been shifted towards dip side from the earlier location as proposed in the DPR due to constraint of acquisition of private land and safety point of view with respect of Khodo Nala.

As per the Supplementary note, new location of Return air shaft is selected on the old over dump and Contractor has already sunk upto a depth of 11m (approx.) from the top of OB dump. The total depth of the vertical air shaft will be 125m upto the bottom of the coal seam-I. The Return Air shaft has finished diameter of 6.0m and completely lined by concrete. The location of the air shaft has been made in such a manner so that it is above the elevation of high flood level. The location of the inclines has been selected in such a manner to prevent the entry of the polluted air through the main air intake. Sufficient distance will be maintained from the location of the air shaft and the CHP which are the main source of polluted air.

Proposed ventilation system for Longwall Project-

Exhaust type ventilation has been considered as mode of ventilation for ventilating the Longwall workings of Muraidih Colliery because the exhaust ventilation system makes the shaft under negative pressure, and even when the main fan is under break down, the natural ventilating pressure maintains the ventilation flow of air and continues to reduce the gas emission. Thus majority of large coal mines prefers exhaust ventilation mode.

Ventilation will be provided by main mechanical ventilator having a capacity of either 45-80 m3/sec at a pressure of 120-50mm of water gauge .or 40-200 m3/sec at a pressure of 131-40mm of water gauge. Another main mechanical ventilator of the same capacity will be installed for use as a stand bye to ensure that ventilation of the mine is not stopped in the event of breakdown of the main

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mechanical ventilator. Electric power of the both main mechanical ventilators will be provided from two different or independent sources which will be provided by BCCL.

The main incline (for coal transportation) and auxiliary incline (for material transportation) will be used as main intakes and air shaft will be used as main return for this project. Considering the area of the Muraidih underground mine, the underground working faces have very limited area & the mine will not be extensive. Moreover it has been proposed that there will be one depillaring district with the use of powered support longwall equipment & another development district of gate roadways development by Bolter miner. It is also proposed that one seam will be worked at a time. This will make the ventilation layout plan simpler and easier. Mine resistance of the ventilation system is only related to the distance of the working faces from the main intake roadway and its cross section.

At the beginning of mining operation in coal seam III, the ventilation is easier due to low mine resistance and with the increase of mining operation mine resistance will change.

Air quantity Requirement-

a) **Man power basis** - The total air quantity of the mine shall not be less than 6m3 /min per person engaged in the largest shift. Considering 200 persons in largest shift, quantity assed as 1846 m3/min i.e 30.76 m3/s. Ventilation coefficient of mine, taking into consideration of air leakage inside the mine and uneven distribution etc, 65% (0.65) is selected by the Contractor.

b) **Output basis-** As per the Seam thickness and equipment specification, contractor has considered maximum production on a day from Long wall face may reach upto 10000 tonne. So the quantity of air requirement on output basis will be 25000m3/min or 417m3/Sec considering the stipulation of CMR as 2.5 m3/min. Taking V.E.Q as 65%, the requirement of air quantity will be 641m3/sec. In this mining plan, average production from Longwall face is considered as 6500 tonne per day. So the quantity of air requirement on output basis will be 271 m3/Sec and with V.E.Q as 65%,the quantity will be 416 m3/Sec, which is too high, as considering a cross section of intake air ways for gate roadways and effective cross-section at face are as 20.8 m2 and 16.237 m2 respectively .The air velocity along the gate road and in the face will be 20 m/sec and 26 m/sec respectively. The maximum permissible air velocity in haulage road ways is 8 m /sec and in the conveyor roadways as 4 m/sec. So it is not considered.

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From the above, it is concluded that the requirement of ventilation as per the stipulation in the CMR under standard of ventilation, can not be satisfied, either it is too less to diffuse the gas and to maintain physical comfort of workmen or too high which will create not only inconvenience to the workmen working in the underground but also will cause more environmental problem. As such a realistic approach has been taken based on the air velocity which are being commonly considered while designing the most mechanised and high production underground mine all over the world. CMR has also stipulated the requirement of ventilation based on the velocity of air current.

Degree of Gassiness-

The Muraidih Mine is likely to be a degree I mine considering the workings in same seam of adjacent mine and requirement of velocity of air current as per statue is 30 m/min.

If we consider this velocity, it will not satisfy the permissible concentration of Methane in the return. As such Contactor has designed the ventilation parameter which will be realistic and will take care the environmental as well as the physical comfort of the people working in the mine.

Requirement of maximum air quantity of the mine-

Muraidih mine will operate simultaneously one mechanized longwall face, one mechanized roadways development district, main pumps and other auxiliary district like stone drifting. So the maximum air quantity requirement for the longwall mining, gate road ways, pump house and other areas can be calculated as under-

Total Air Quantity Requirement-

Description	Name of the district	Air Quantity(m^3/s)
1. LW Face	Longwall face operating	24.35
	Longwall face installation	12.175
	Sub-total	**36.525**
2. Bolter Miner Face (Gate Road)	Fully-mechanized development face of coal seam	20.8
	Sub-total	**20.8**
3. Pump house	Pump rooms (UG)	10
4. Rock drivage	Fault Crossings	10.4
5. Others	15% of above total	11.658
Total of (1 to5)		89.38
Total (at V.E.Q 65%)		137.5 m^3/s

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According to ventilation design, the air quantity for one underground fully mechanized coal face is 24.35 m^3/s (spare for fully mechanized coal face is the half of working face: 12.175m^3/s), the air quantity for one BM drivage face is 20.8m^3, the air quantity for one rock drivage face is 10.4m^3/s, air quantity for sump is 10m^3/s, air quantity for others is 15% of above air quantity, so as 65% of ventilation efficiency for calculation, the total air quantity = 1.15×(24.35+12.175+20.8+10.4+10)÷65%=137.5m^3/s.

In the initial period of operation, Longwall installation face will not be prepared which is omitted. The air quantity for BM drivage face, rock drivage face,sump and others is =1.15×(24.35+20.8+10.4+10)÷65%
= 116.0m^3/s.

Thus the minimum air quantity of mine is 116.0m m3/s, and the normal air quantity is 137.5 m^3/s.

Determination of the percentage of gas present in the general body of return air as per the stipulation of CMR:-

As per the gas test conducted by MINOP on the additional core coal sample, test sample of coal seam III desorbed gas release during testing period is 0.03ml/g, while residential gas content 0.27ml/g and the test sample of coal seam I desorbed gas release during testing period is 0.007ml/g & residential gas content 0.12ml/g. Thus the absolute gas emission rate for seam III and seam I are 0.3 ml/g (0.3 m^3/tonne) and 0.127 ml/gm (0.127 m^3/tonne) respectively.

The Contractor has considered the gas emission rate as estimated based on the Chinese formula which is generally being considered while designing the requirement of air quantity for mine ventilation. As per Chinese design standard , the estimated absolute gas emission rate from the longwall faces for seam no III and seam no I are 0.275 m^3/tonne and 0.136 m^3/tonne respectively. The gas emission rate from bolter miner district 0.341 m^3/tonne. The gas emission rate for the whole mine is 0.36 m^3/ tonne.

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Gas emission rate from coal seams:

Seams		Average gas emission rate (m^3/te)	
		As per laboratory test m^3/te	As per Chinese formula m^3/te
Seam no. III	Longwall	0.30	0.275
	Development heading	0.3	0.341
	Complete mine	**0.3**	**0.36**
Seam no. I	Longwall	0.127	0.136
	Development heading	0.127	

For determining the percentage of gas in the general body of air in the return , the maximum gas emission rate has been considered which is the higher value amongst the two gas emission rate i.e. for longwall 0.3m^3/tonne, for development 0.341 m^3/tonne and for the whole mine 0.36 m^3/tone.

Gas content in the return of PSLW face when seam III is operated:-

Maximum production from PSLW face per hour 1000 tph i.e.0.27 te/sec
Gas emission per sec 0.27 * 0.36 = 0.097 m^3/sec
Air flow in the PSLW face 24.35m^3/sec
% gas in the free body 0.097 * 100/24.35 = 0.398%

This is well within the specified limit as per CMR i.e. 0.75 % in the district return.

Gas content in the return of the of gate road development:-

Maximum production from Bolter miner face per hour 400 tph i.e.0.11 t/sec
Gas emission per sec 0.341X 0.11 =0.0375 m^3/sec
Air flow in the development face 20.8 m^3/sec
% gas in the free body 0.0375 X 100/20.8 = 0.18%

This is well within the specified limit as per CMR i.e. 0.75 % in the district return.

Gas content in the main return:-

Maximum production from mine per hour 1400 tph i.e.0.38 t/sec
Gas emission per sec 0.36 * 0.38 =0.136 m3/sec
Air flow in the main return 137.5 m3/sec
% gas in the free body 0.136 * 100/ 137.5 = 0.098%

This is well within the specified limit as per CMR i.e. 0.75 % in the district return.

For the purpose of calculation gas percentage in return, BHEC/MINOP has considered the maximum hourly capacity of the equipment to arrive at a realistic value for ensuring the safety.

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5.22.1.3 Ventilation system in Continuous Miner/SDL Project at Phularitand Colliery and its annexed part of amalgamated Muraidih Colliery-

Degree of gassiness-

The seam-III & Seam-I has been considered for exploitation in Phularitand and in its annexed property. Seam-III is under development whereas Seam-I/II & Seam-I is virgin. As per the data supplied by area authority, Seam-III is declared as Degree-I gassy mine. Seam-I/II & Seam-I is virgin and the degree of gassiness of this seam is not known. However, this seam was worked in past in adjoining Jogidih Mine (on the east side) and the seam was of Degree-I gassiness. Therefore it is assumed that Seam I/II comb. and I seams are of Degree-I gassiness. As soon as the seam-I/II & Seam-I are touched or advances certain distance from touch point, gas emission test should be carried out and also it should be carried out at regular interval as the mine progresses.

Existing Ventilation System for Seam-III workings-

Out of two existing inclines, presently Incline No.1 as act Main Return airway for development workings of Seam-III and Incline No.2 act as Main Intake airway. An exhaust fan PV-160 is installed at the mouth of the Incline no.1 The total air quantity being circulated by the existing fan is 3000 m3/min at 12mm of Water gauge.

Proposed Ventilation Layout: -

Two Inclines already exist. Two drifts from floor of Seam-III to Seam-I/II combined is proposed to make entries for workings of Seam-I/I combined and Seam-I. An air shaft is also proposed to sunk upto Seam-I/II combined.

As stated earlier that Incline No.1 & No. 2 will also act as Main intake for this seam and Air shaft will act as main return for the workings of both seams i.e Seam-III and Seam-I/II combined & Seam-I.

Out of five headings maindip or mainrise of both seams, three headings will act as intakes and two headings will act as return. Intakes and returns airways will be separated by erection of ventilation stoppings. Air Crossings will be made to separate intakes and returns of maindip/mainrise headings with intakes and returns of panel headings.

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In a Panel, out of 5 headings, three headings will act as Intake air way and two headings will act as return. Sufficient number of Air Crossings has to be made tc establish adequate ventilation system within the mine.

On northern side property, mainrise of both seams have to cross fault F4F4 to approach other side of the fault. It has been proposed to drive three nos. of drift in both seams to cross the fault F4-F4. Out of three drifts in a seam, two drifts will act as Intake and third one will act as return. Proposed Ventilation Layout Plan has been shown in Plate no. XXV and Plate no. XXVI for workings of Seam-III and Seam- respectively.

Estimation of Air Quantity Requirement

a) **On the basis of production**

Sl No.	Paramter	Unit	value
1	Maximum daily production from CM district.	TPD	1500
2	Maximum daily production from two SDL panels	TPD	500
2	Air requirement at LVC as per CMR – 1957.	m^3/min/tonne	2.5
5	Total quantity requirement for two districts.	m^3/min	5000
6	Quantity of air requirement for pumping and other services.	m^3/min	750
7	Total quantity requirement in working area	m^3/min	5750
8	VEQ	%	60%
9	Quantity of air in fan drift		9584

b) **On the basis of manpower deployed in largest shift considering three panels**

Sl No.	Parameter	Unit	value
1	Maximum persons deployed in largest shift.	No.	380
2	Air requirement per as per CMR – 1957.	m^3/min/person	6
3	Total quantity of air requirement working area	m^3/min	2100
4	VEQ	%	60
5	Quantity of air in fan drift	m^3/min	3800

Thus, the maximum quantity of air requirement comes on the basis of the daily production i.e.9584 m^3/min or 160 m^3/sec.

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It is, therefore, proposed to install a main mechanical ventilator of suitable capacity (Q=60-280m3/s, WG=125-40mm) that will be able to cater the ventilation requirement of the proposed mining area. It will be prudent that ventilation survey should be conducted considering the existing and proposed mine layout along with development schedule as proposed through a scientific agency.

Auxiliary Ventilation-

For coursing of fresh air in faces beyond the last ventilation connections, auxiliary fans with suitable ducting have been proposed. In Continuous Miner panel, 3 nos. of auxiliary fans with suitable ducting has been proposed to course adequate quantity of air at different faces. For two SDL panels, total 4 nos. of auxiliary fans with suitable ducting has been proposed. For ventilation of drifts during drivage stage, auxiliary fans have been proposed to ventilate the blind headings.

Ventilation System Design-

A main mechanical ventilator of suitable capacity (Q=60-280m3/s, WG=125-40mm has been proposed. However, prior to take any decision, it is advised to undertake a ventilation network study by some expert agency to assess the ultimate ventilation requirement at final stage. Based on the abqve study, decision for procurement of the Main mechanical Ventilator should be purchased.

5.23 Pumping and drainage-.

5.23.1 Existing-

Longwall Project-

The Contractor has made two Inclines and drift drivages upto the floor of Seam-III whereas Air shaft along has been partly sunk. The fan drift has been made and connected with the existing part of the shaft.

Due to suspension of any type of work by the Contractor at the incline sites, both inclines are presently filled with water upto the inclines mouth. Hence, before commencing of work, these inclines have to be de-watered.

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Continuous Miner /SDL Project at Phularitand Colliery-

At present, development is going on in 17 level, 4 dip of Seam-III towards southern side. As per the existing pumping layout, 3 nos. of Face Pumps (RM-70) pumps accumulated water to the temporary sump maintained at 15 level,2 dip. From this sump, a Pump (120 HP), 100m head, 400 GPM discharges water in another sump maintained at 6 level, 0 dip. The accumulated water in this sump is being discharged to surface through Incline mouth no.1 by the pump having specification of 120 HP, 100m head, 600 GPM

Accumulated water on dip side is pumped to surface through pipe lines laid along the galleries and level which ultimately discharges in water reservoir / settling tank at surface. ERW/GI pipes of dia. 150mm and 100mm diameter are being in use. The above exiting pumps and pipes will be utilized in future. A single line diagram of existing underground pumping layout has been shown in next page.

Pumping arrangement in existing Phularitand Hired patch-OC-

A hired patch open cast with V/VI/VIII seam as base is in operation within the proposed project boundary. At present, two number of surface pumps are in operation to keep the open cast face free of water.

Existing underground Pumping layout in Phularitand Colliery has been shown in next page-

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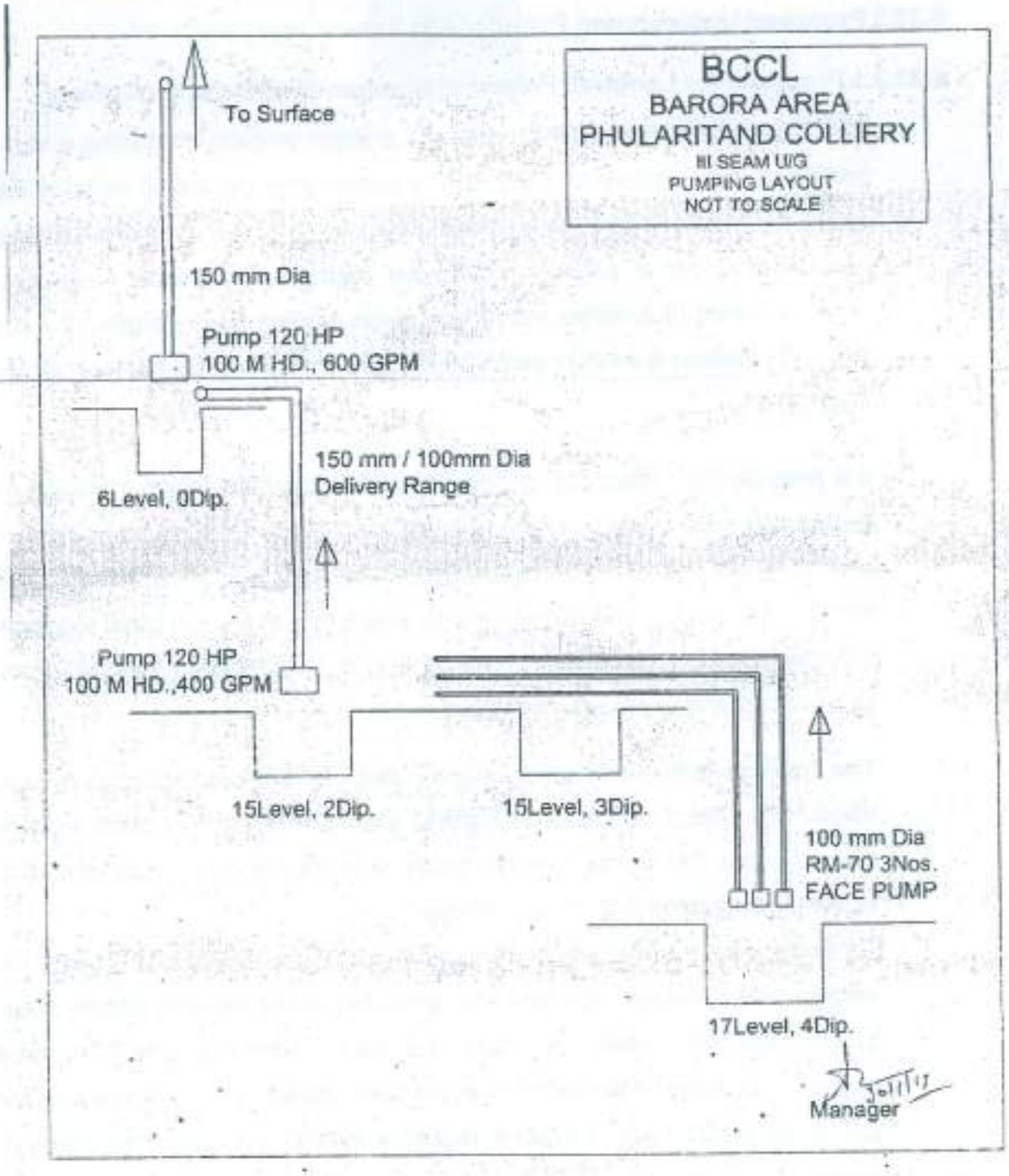

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5.23.2 Proposed Underground Pumping System-

5.23.2.1 Proposed for Longwall Project at amalgamated Muraidih Colliery-

The Seam-III and Seam-I/II & Seam-I is a virgin property excepting a very small portion on the north-eastern side of the property on the incrop edge of Seam-III where B&P working was carried out in past, which is presently discontinued after partial extraction of pillars by opencast method. Considering adjacent mine working, Seam III & below seam have been worked by underground means on the north eastern & eastern side of the boundary by Jogidih mine of "Govindpur" area.

It is proposed to extract coal of Seam-III and Seam-I/II & Seam-I by caving in the designated area of amalgamated Muraidih Colliery by mechanized Longwall as well as by bord & pillar with bolter miner. The proposed area has an undulating topography with a gentle slope towards east to south. The original topography of the area has been severely obliterated due to large scale mining activities both by opencast and underground method.

The drainage of the surface area surrounding the OCPs is controlled by seasonal Khodo nala. The nala flows from north to east in northern part of the property and then changes its course towards south & limits the eastern boundary of the existing amalgamated Muraidih Colliery.

On Surface plan it has been shown that the eastern side quarry edge of existing amalgamated Muraidih Colliery has been extended beyond Khodo Nala, i.e., quarry edge has crossed the Khodo nala. As per Mine Authority, after extraction of coal, the course of the nala has again been restored & maintained by filling of OB, stone pitching, etc to avoid inrush of water into the quarry especially during monsoon season. As per hydrogeological study it has stated the presence of the aquifers and it's likely affect at the time of undertaking the underground mining operations hydrogeological chapter (IIB) of approved DPR.

Source of Water-

Considering the hydrogeological factor of Muraidih mine & status of water make up in the adjoining mines from working in seam III & below, it also presumed that

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the source of the underground water will be mainly from rain water, strata percolation & spraying water in this longwall underground workings.

It is also presumed that the following activities during the life of the proposed underground mine is to be done by mines officials of BCCL, as is being done presently.

- Maintenance of surface slope over huge over burden dump towards the nala passing through this property
- Continuations of Pumping installations on the Floor of the combined Seam
- Protection of embankment against inrush of water from the nala which becomes at time violent during monsoon

Rainfall-

For the purpose of calculation of average rainfall to assess the pumping capacity, M/s Minop/ BHEC has considered as 1278 mm.

As per the NIT, the total area within the leasehold boundary is 4.76 km2. The perculation to U/G will depend largely on the surface area, which are broken due to mining activities. The U/G mining operation will be undertaken in two phases. The phase -I will cover the operation of first 5 years and the phase- II will be the ultimate pump capacity. For the purpose of assessing the mining area in phase-I, it has been considered the area where longwall operation will be undertaken and it works out to be around 2.5 km2. For phase-II the mining area has been considered 4.5 km2.

The basic data considered by Contractor-

- Monsoon season (July to October) – 120 days
- Percolation of rain water into the mine through strata – 1/3 of Rain water
- Seepage from strata water 10% of inflow of water due to rain fall
- Hydrogeological co-efficient of water flow: 1.3 m3/Te
- Efficiency of pumping – 90%

Pumping Capacity-

The Contractor has assessed pumping capacity as follows-

For phase-I	=	127 Lps
For phase –II	=	230 Lps

Considering addition of water arriving out of spraying & other use at all the three districts (450 Lpm for Long wall + 250 Lpm for Bolter Miner +250 Lpm for spraying trunk Conveyors) which comes to approximately 16 Lps. In order to provide a

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safety cushion of pumping to meet any emergency, a safety factor of 30% more capacity has been provided while assessing the total capacity of the pump.

Pumping capacity for phase-I	=	186 Lps
Pumping capacity for phase-II	=	319.8 Lps Say 320 Lps

Selected Pumping Equipment-

Total of 6 numbers of pumps including 2 standby having capacity of 80Lps, 180 to 220m head, 220-250 kW power have been proposed for longwall project by the contractor. Since the main sump will be at the main intake, all the electrical of main pump considered as Non-FLP type.

Additional 4 nos. of intermediate pumps of capacity 38Lps, 120-150m head and 100-132 kW FLP motor have been envisaged. There will be 2nos of compressor including 1 standby each having the capacity 500CFT/Min, and pressure 7Kg/cm2 for supplying compressed air to underground. Additional pumps for intermediate sumps as projected above will take care of accumulation of water in the depressions. However some places may not be self-draining and to deal with such situation pneumatically operated face pump has been proposed.

Delivery pipe line-

It has been proposed that there will be 6 no. of main pump each of 80 lps capacity in the final stage. Initially there will be three pumps each of 80 lps and subsequently with the expansion of the mining activity the no. of pumps will be increased to 6 nos. It has been proposed there will be three numbers 8 inch diameter delivery line from the main sump to the surface. The delivery range will be laid along the return airway and ultimately through the ventilation shaft.

The water will be discharged to the nearby Khodo Nala. Two pumps will be connected with each delivery line.

In addition to the main pump it has been proposed to install four numbers of intermediate pumps each having a capacity of 38lps at the final stage of the operation of the mines. There will be two numbers 4 inch delivery for the intermediate sump.

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Dewatering of the old working-

A small patch of Seam no III of Muraidih mine was worked in the past by underground mining. This old working is now water logged. The adjacent Jogidih mine has also been worked by Underground Mining and the portion of the old working is water logged.

The pumping operation of Jogidih has to be continued and the water level is maintained at such reduce level (RL) which is beyond the stipulated danger area. However while laying the panels, adequate care has been taken by the contractor to leave barrier as stipulated in CMR.

Old working of seam III at Muraidih is on the rise most side. Seam I exists below the Seam III as such it would be necessary to dewater(if it is not extracted by opencast) the old workings of Seam III of Muraidih before extraction of panel no. 306 of Seam III and panel no. 107 of Seam I. It is proposed that at later stage a submersible pump will be installed in the old workings and the water in water logged area will be dewatered.

In this mining plan, it has been proposed to excavate the underground B&P working of Seam-III by opencast method. It has been proposed to continue opencast working in this area with floor of V/VI/VI seam as base. Hence, BCCL will continue the operation of pumping at the floor of the quarry bed has to be kept free of water logging in this area. Due to the operation of longwall retreating with caving method, the subsidence will come upto the floor of V/VI/VII combined seam while extracting seam III and seam I. It is suggested by the Contractor that BCCL will doze the surface of the OB dump so that the rain water can be guided to the natural course and prevent accumulation of water in the quarry bed in future.

Sump-

It is proposed to establish two main sumps, one at seam III & one at seam I on the dip most point of the mine as shown in the Longwall panel layout plan of Seam-III and Seam-I. However, temporary intermediate sumps will be there till main sumps are developed and establish. It is proposed to establish intermediate sump initially, at B&P Panel No:II in seam III Subsequently after development of B&P Panel No:III anD sma for the Seam-I.

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Sump capacity-

Generally 48 Hrs. of water inflow are considered for establishing a Sump when sumps are located in the deep most point and seams are flat. The Contractor has considered the sumps capacity to hold 2 days of water inflow.

Thus, Sump capacity of main Sump will be, 320 lps x (48 x 3600) = 55296 litres (say 56 KL)

5.23.2.2 Proposed for Continuous Miner/SDL Project at Phularitand Colliery-

Proposed Pumping System-

Coal production has been proposed to start from III seam and then from I/II seams and it split section i.e Seam-I. At present seam III is partly developed. Initially accumulated water of this seam will be dewatered through incline mouth. A main dip is proposed in this seam keeping in mind the floor gradient of the seam and located on southern side of drift coal touch point i.e in panel P3-1. In this area, partly development has been made. After development of main dip in seam III, auxiliary/ intermediate sump will be made at the dip most part of the main dip i.e in Panel P3-15. This Intermediate sump has to be maintained till the underlying seam-I is completely extracted from safety point of view. Otherwise, during depillaring of seam I, accumulated water in auxiliary sump of seam III has to be brought down to seam I intermediate sump through bore holes driven from seam I to seam III.

It has been proposed that accumulated water from Auxiliary /Intermediate sump will be pumped to Main sump through pipe lines to be laid along one of the headings of maindip. From Maindip it will be pumped to surface through bore holes.

Seam-III will be extracted first and then underlying Seam-I. Development layout of Seam-I/II & Seam-I will be same as proposed in Seam-III. For construction of strata bunker in parting between Seam-III and Seam-I/II, development of Seam-I/II is to be made at initial period in this seam keeping superimposition of galleries with galleries of Seam-III. To pump accumulated water during this period, a temporary sump will be made on southern side of coal touch point in this seam by drift made from floor of Seam-III ti Seam-I/II combined. This sump will be used as main sump for workings of Seam-I/II & Seam-I. An auxiliary/

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intermediate sump has also been proposed in this seam in the dip most point maindip of this seam i.e in panel P1-15.

It is proposed to gravitate seepage & spray water from all the panels / workings into the auxiliary sump in respective seams. The accumulated water from auxiliary sumps are proposed to be taken to the main sump through main trunk heading. Similarly, pumping water from main sump is proposed to be taken to surface through bore hole. During extraction of Seam-I/II & Seam-I, it is proposed to bring down the accumulated water in main sump of Seam-III to main sump of Seam-I/II and pumped to surface through boreholes from this sump.

Sources of Water-

Considering the location and the status of the proposed mining activity, the various possibilities of source of water during rainy season has been estimated as follows:

- Precipitation of direct rainfall into the proposed mining area.
- Seepage from overlying strata.
- Ground water.
- Water accumulation by spraying of water during cutting operation by Continuous Miner in panel and also water used spraying for dust suppression at coal dust generation places and transfer points.

General Considerations-

- Mine water is neither acidic nor basic.
- Pumping capacity for dewatering has been provided to pump out the entire make of water in 1 day with 20 effective hours in a day.
- Annual average rainfall in year : 1400 mm
- Mineable area at Phularitand Colliery and its annexed part : 3.41Sq. km

Make of Water-

Annual percolation of rain water into ground		397833m^3 / year
Maximum inflow of water (Q_1)		6631 m^3/day i.e. 1013 gpm
Seepage water (Q_2)	:	210 gpm
Ground water (Q_3)		320 gpm
Spraying water for CM (Q_4)	:	150 gpm
Total make of water ($Q_1 + Q_2 + Q_3 + Q_4$)	:	**1693 gpm**

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Pumping Capacity :-

Total Make of water (Q) = 1693 gpm

Let, Pumping hours per day = 20
Pumping capacity with 10% factor in wear in service -
= 1.1 x (Q x 24 / 20) gpm
= 2300 gpm (Say 2500 gpm)

Stand-bye pumping capacity = 1500 gpm

Selection of Pumps and Pumping System-

As per calculation the total make of water for this project has been estimated at 2300 gpm. To deal with this make to water a pumping capacity of 2500 gpm and stand-bye capacity of 1500 gpm has been proposed.

Proposed Main Pumps-

Total 5 nos. of main pumps (3 working + 2 stand-bye) has been proposed the main sump for dewatering accumulated water in the main sump. Details have been showr in table given below-

Proposed Auxiliary Pumps

Total 5 nos. of auxiliary pumps (3 working + 2 stand-bye) has been proposed in the auxiliary sump for pumping accumulated water in the auxiliary sump to main sump Details has been shown in table given below-

Proposed Face Pumps

In each district a total of 3 nos. of face pumps will be installed. Thus in three districts, total 9 no. pumps shall be deployed.

The specification of face pumps are as under:

Rated head	-	30 m
Rated discharge	-	200 gpm
Operating power	-	9.3 kW, FLP

The specification of the above pumps is as under:-

Sl. No.	Description of pump	Quantity (wrkg+s-bye)	Cap. in gpm	Location
1	Main pumps 250m head x 280 kW x 3.3kV	2+1 = 3	1000	Main sump
2	Main pumps 250 m head x 150kW x 3.3kV	1+1 = 2	500	Main sump
3	Aux. pumps 150m head x 200 kW x 3.3kV	2+1 = 3	1000	Aux. sump
4	Aux. pumps 150m head x 90 kW x 550V	1+1 = 2	500	Aux. sump
5	Face pumps 30 m head x9.3 kW x 550V	7+2 = 9	200	District

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The above pumps are to be replaced with the existing pumps presently being in use in this mine.

Delivery Ranges

Suitable length of delivery ranges of of M.S. black pipe of dia. 200/100/50 mm has been provided for the above pumps.

Proposed Sumps-

Auxiliary sump - Water from auxiliary sumps will be discharged to main sump through auxiliary pumps.

Main Sump- Water of the whole project collected in the main sump will be pumped out to surface through bore hole.

Sump capacity -

Rate of flow in m^3 / min	Capacity of Sump
More than 10	Not less than 7800 m^3

5.23.3 Opencast Mine Pumping Arrangement-

Existing -

The following pumps exist at Muraidih colliery to pump out water from mine.

Summary of existing Pumping

Sl.No	PUMP	Head (m)	Power (kW)	Year of purchase/Life	Existing place
1	4000 GPM	150	700 KW, 6.6 KV	NA	SOCP Chitahi Patch
2	2000 GPM	120	250 KW, 3.3 KV	NA	SOCP Chitahi Patch
3	2000 GPM	90	220 KW, 3.3 KV	NA	SOCP Coal Face
4	4000 GPM	150	700 KW, 6.6 KV	NA	MOCP Coal Face Sump
5	4000 GPM	150	700 KW, 6.6 KW	NA	Pumping under repairing & motor is idle
6	2000 GPM	150		NA	B/D(Burnt)
7	1000 GPM			NA	B/D(Burnt)

The above exiting pumps will be utilized as on when required or may be transferred to other mines upto their life.

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5.23.3.1 Proposed Pumping arrangement-

Following basic data considered for calculating make of water:

Life of the OC shall be 10 years.

Total OC area shall be approx. (A) 5.15 sq.km.

Maximum exposed area at any point of time A1 (33% of A): 1.70 sq.km, Area beyond excavation A2 (5% of A): 0.26 sq.km for, Internal dump area A3: 4.39 sq.km, Assumed Run-off co-efficients: For catchment area n1 = 0.60, for area beyond excavation n2 = 0.15, for internal dump area n3 = 0.10.

Seepage / inflow of water into the mine=10% of accumulated water.
Maximum rainfall in a day has been assumed 180 mm.

Pump Capacity-

Peak make of water has been taken as 286904 cum per day which will be dewatered in 5 days at the rate of 20 hours pumping per day. Pumping capacity per day thus worked out as 53 cum per minute i.e. 11600 gallons per minute (Say 12000 gpm). Considering 25% as reserved capacity, pumping requirement has been envisaged as 15000 gpm.

Selection of Pumps-

Provision of 15 nos. (12 working+3 stand-bye) of main pumps of 1000 gpm x 200m x 225 kW x 6.6 kV has been made on the basis of requirement of water accumulation in the quarry.

6 no. of auxiliary/face pumps of 145 gpm x 33 m x 7.5 kW x 440 V has been proposed to pump out accumulated water from faces and from other places of the quarry.

In addition, 1 no. of diesel pumps having capacity of 1000 gpm, 80 m head, 120 kW motor power have been proposed to deliver water directly to main sump. This diesel pump will operate at the quarry floor where power may not be available. Active face as far as possible should be kept dry.

It has been proposed to create main sumps at two different locations within the proposed amalgamated area. One Main Sump will be located towards south-eastern corner of the proposed area and accumulated water will be discharge in to the Khodo

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River flowing north-south direction. Another Main sump will be maintained at the south-western corner of the property as shown in plate no. XXVII. The accumulated water in this sump will also be pumped in to the Khodo River through pipe lines which is proposed to be laid along the southern boundary. It is to be kept in mind that underground mining operations will be carried out below these sump areas and has to be kept dry till the underground mining continues.

5.24 Power Supply –

5.24.1 Opencast-

a) Amalgamated Muraidih Open Cast Project:

I. Power Supply :

At present, the Colliery is receiving power at 11 KV from Madhuband DG Sub-station through one No. 11 KV O/H Line.

II. Existing Power Supply System :

At present, there is 01 No. main Substation for Power Supply to SOCP Patch of Muraidih Colliery. Power supply is being provided by three(3) Main Transformers :

1. Transformer. No. 1 : 1 MVA , 11 KV / 3.3 KV
2. Transformer. No. 2 : 1 MVA , 11 KV / 3.3 KV
3. Transformer.. No. 3 : 2.5 MVA , 11 KV / 6.6 KV

Transformer No.1 is primarily supplying Power to following Equipment :-

1. 2 Nos. Shovels of 3.3 KV, 255 KW Motors each.
2. 10 KVA 3.3 KV / 220 V Transformer for Face Lighting.
3. 500 KVA 3.3 KV / 440 V Transformer for Workshop.

Transformer No. 2 is supplying Power to following Equipment :-

1. 500 KVA 3.3 KV / 440 V Mobile Lighting Transformer for Chitahibasti Colony.
2. 10 KVA 3.3 KV / 220 V Transformer for Face Lighting.

Transformer No. 3 is being used for supplying power to following Machines :

1. 1 No. Shovel of 6.6 KV, 700 KW.
2. 1 No. HT Pump of 6.6 KV, 700 KW.

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III. Existing Electrically Operated HEMM Equipment in Muraidih Colliery :

A. SHOVELS :

1. EKG 5.0 Shovels – 5 Cu. m. : 02 Nos.
2. 182 M Shovel – 10 Cu. m. : 01 No.

B. DRILLS :

1. RELC 650 : 01 No.
2. IDM 30 : 01 No.
3. IDM 31 : 01 No.

IV. **Proposed Power Supply System :**

Power Supply to the above mentioned equipment, may be provided from the existing Feeder Nos. 11, which are coming from Madhuband DG Sub-Station.

b) Phularitand Open Cast (Hired HEMM Patch) Project:

The existing Mine is being operated on Outsource Basis by M/s. Deco. There are no electrical Equipment, presently being used for OB & Coal Extraction. All machineries used in this outsourced patch are diesel operated.

5.24.2 Underground Power Distribution-

i) Muraidih U/G Longwall Project :

The Proposed Longwall arrangement for Muraidih U/G, as given by M/s. Minop Innovative Technologies Pvt. Ltd., includes the following equipment :

i) Surface & Underground Loads at 6.6 KV:

A. Surface Loads :

Sl. No.	Equipment Description	Power Rating (KW)	Voltage Rating (KV)
1.	Main Fan	500	6.6 KV
2.	Compressor	450	
3.	Trunk Belt	800	
4.	Main Surface Haulage	150	
5.	CHP	225	
6.	Workshop	125	
7.	Office / Cap Lamp / Light	100	
8.	Filter Plant	150	

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B. Underground Loads :

Sl. No.	Equipment Description	Power Rating (KW)	Voltage Rating (KV)
1.	Longwall Gate Belt	500	6.6 KV
2.	Main Pump	1500	
3.	Aux Pump	396	
4.	UG Direct Haulage	150	
5.	Trunk Belt 2	500	

C. Longwall Face :

Sl. No.	Equipment Description	Power Rating (KW)	Voltage Rating (KV)
1.	Shearer	1180	6.6 KV
2.	AFC	1050	
3.	BSL	375	
4.	Crusher	250	
5.	Power Pack	750	

D. Surface Loads :

Sl. No.	Equipment Description	Power Rating (KW)	Voltage Rating (KV)
1.	Spray Pump	75	6.6 KV
2.	Endless Haulage	75	

ii) There are Surface & Underground Loads at 3.3 KV also :

a) Surface Loads :

Sl. No.	Equipment Description	Power Rating (KW)	Voltage Rating (KV)
1.	Main Fan	500	3.3 KV
2.	Compressor	450	
3.	Trunk Belt 1	800	
4.	Main Surface Haulage	150	

b) Underground Loads :

Sl. No.	Equipment Description	Power Rating (KW)	Voltage Rating (KV)
1.	Trunk Belt 2	500	3.3 KV
2.	Longwall Gate Belt	500	
3.	Main Pump	1500	
4.	Aux Pump	396	
5.	U/G Direct Haulage	150	

As per the supplementary note submitted by M/s Minop, the layout of trunk headings will be changed from the layout as proposed in the final DPR. Hence in

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actual condition, there will be little bit changes regarding transport system including belt conveyors. As per the supplementary note, there will be no changes in longwall panel /Gate road layout, proposed equipment specification, its operation etc except slight increase in length due to change of trunk headings. At present, the work is suspended by the Contractor since 01.06.2016 due to financial dispute with M/s Minop Consortium and BCCL.

Proposed-

Since the present power distribution system will continue to feed power to the existing system & there is no surplus capacity of transformers to cater the need of the proposed Muraidih underground-mechanized global bid project. Hence, to meet the additional requirement of power, it will be necessary to construct new substations for the proposed Muraidih underground mine.

Taking above into consideration, it is planned for a new power supply systems which will meet the requirement of the Muraidih underground mine. This, however, will not take care of the Power Supply to the colony as well as the pumps which will be installed and maintained by BCCL in the open cast mine & power supply to their existing projects.

The total connected load will be substantially high; there will be very high capacity equipment like Shearer, Bolter Miner, AFC, belt conveyor, etc. In order to ensure voltage regulation within the permitted operational limit, it has been planned to provide two (2) independent feeders of 33 KV from Madhuband DG substation or DVC Chandrapura or any other nearby substation of BCCL which will be reliable and meet the stable requirement of power demand of Muraidih underground mine. These two independent feeders will be terminated at the proposed surface substation to be constructed near the changed location "Y" as mentioned in the Supplementary note on approved DPR submitted by Ms/ Minop consortium.

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iii) Continuous Miner / SDL project at Phularitand Colliery :

Source of Power Supply-

Power Supply to the following equipment, may be provided from the existing Feeder No.12, which is also coming from Madhuband DG Sub-Station.

There will be three (3) nos. of operating Panels. Out of which one is mechanised Continuous Miner panel and another two is SDL panels.

Equipment proposed in Continuous Miner Panel-

Sl. No.	Description of Equipment	Unit Power Ratings (KW)	Quantity (Nos.)
1	Continuous Miner	621	1
2	Shuttle Car	219	2
3	Load Haul Dumper	48	1
4	Twin Roof Bolter	74	1
5	Feeder Breaker	112	1
6	Auxiliary Fan	22.5	3
7	Face Pump	7.5	3
8	Endless Haulage	22	1

Following equipment are proposed to be installed in Standard height & low height SDL Panels:

Sl. No.	Description of Equipment	Unit Power Ratings (KW)	Quantity (Nos.)
1	SDL , Standard Height	48	3
2	SDL , Extra Low Height	48	2
3	Hand Held Drill Machine	1.1	1
4	Face Pump	7.5	1
5	Aux. Fan	15	1

In addition to the above equipment, following Belt Conveyors are proposed to be installed in underground and surface / Incline drivage:

Sl. No.	Location	Belt Conveyor	Unit Power Ratings (KW)	Voltage (KV)
1	In Maindip/ Mainrise trunk heading of Seam-III and then it will be shifted to Seam-I/II & Seam-I	C-1	2 x 150	3.3
2		C-2	2 x 150	3.3
3		C-3	1 x 55	0.550
4		C-3 A	1 x 75	0.550
5		C-4	1 x 75	0.550
6		C-5	1 x 55	0.550
7		C-6	1 x 55	0.550
8	In incline/drift drivage	C-7	1 x 90	0.550
9		C-8	2 x 150	3.3
10	In Panels of CM and SDLs	GBC -1	2 x 90	0.550
11		GBC-2	1 x 55	0.550
12		GBC-3	1 x 55	0.550
13		GBC-4	1 x 75	0.550
14		GBC-5	1 x 55	0.550
15	Pony Conveyor in SDL Panel		1 x 22	0.550

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5.25 Workshop-

5.25.1 Existing-

Longwall Project-

The Contractor has suspended work at the proposed working site identified by them since 01.06.2016. Before suspension of work, they have made a shed near the incline site and presently it is unused. There is no construction activities is going on at the surface.

Longwall Project at amalgamated Muraidih Colliery-

ContinuousMiner/SDL Project at Phularitand Colliery-

At present, the phularitand Colliery is producing coal of about 300 tpd from underground by using SDL and transport of coal by series of haulages. A small workshop in temporary is maintained at the surface near existing inclines of Phularitand Colliery for day to day maintenance. For any major breakdown, repair work is done from area regional workshop.

5.25.2 Proposed-

Longwall Project-

As per the supplementary note on approved DPR, construction of different civil infra-structures will be made at three different locations due to land constraint. This locations are "X", "Y" and "Z"as per the revised surface plan .MRD/RVSD/SUR/01. It has been proposed to construct the repair cum workshop at "X" location.

Repair cum Workshop:

This facility is envisaged to cater to all repair and working needs for the plants and equipment associated with the mining activity. This will be a steel building of about 33 meter x 17.5 meter plan dimension. Height to eaves will be 9 meter arrived at with due consideration of a 20te crane operation. The crane will be electrically operated with pendent control from floor level. The crane will run over crane girder made at the top. The crane girder will be supported over crane legs.

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In this workshop, 6 bays of the shed are ear marked for different distinct activities as listed below starting from the entrance of the shed:-

i) Cleaning
ii) Heavy Machine Dismantling
iii) Welding
iv) Heavy Machine Repair
v) Machine Shop
vi) Electrical Repair
vii) Hydraulic Repair
viii) Hydraulic Testing
ix) Supervisor Bay
x) Store.

ContinuousMiner/SDL Project at Phularitand Colliery-

It has been proposed to enhance underground production by deploying Continuous Miner package equipment in one panel in this Colliery. Moreover, additional two number of SDLs is proposed in this Colliery.

Considering the above mining machineries, one small workshop having adequate maintenance facilities has been proposed for this project which is to be located near the Inclines of this mine.

This workshop will have following shops:

1.	Machine Shop	:	110 m2
2.	Store	:	80 m2
3.	Auto Shop	:	70 m2
4.	Washing Platform	:	30 m2
5.	Structural Shop	:	75 m2
6.	Smithy Shop	:	40 m2
7.	Carpentry	:	30 m2
8.	Electric Repair Shop	:	75 m2
9.	Mechanical Shop	:	75 m2
10.	Machining & Fabrication Shop	:	75 m2
11.	Office	:	60 m2
12	Common road for shops	:	120 m2
	Total	:	840 m2

Besides the above mentioned shops, the entire workshop has been proposed to be fenced with barbed wire covering an area 40 m x 25 m. Provision of security room at the entrance and common toilet have also been proposed as per requirement. This workshop will look after daily maintenance of the machine proposed for this mine. Provision of all tools and tackles are made for taking up the job of minor maintenance/overhauling of equipment proposed in this project. For any major repair work, it can be sent to regional workshop maintained at area level.

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