Notes on a site visit to operations 27th February to 3rd March 2023 by A. Golding, B.Sc. Hons Geology 400036/96, Pr. Nat. Sci., M.S.A.I.E.G., FGSL, FGSSA.

Introduction.

At the invitation of the Directors of Edenville International (Tanzania) (EIT) a second site visit was made to operations near Sumbangwa, south-west Tanzania. Since the previous visit production at the mine has declined the recovery rate of washed coal remained below target.

This extended visit also allowed a much better appreciation of the geology at the mine and the overall wash plant operations and suggestions are given as to improving operations.

Mr Darwesh Gamdusi. (Assistant General Manager) accompanied me during the visit and I had the opportunity to interact with Mr Jafari Said (Site Manager/Geologist) and Mr. Emmanuel Evarist (Mining Engineer). All staff members co-operated fully with me during the visit and provided valuable insights into the operations at the mine and the wash plant.

The visit focussed on four aspects of the operations at the mine.

- Operations at the opencut (Cut 2)
- Potential to expand the opencut
- Operations at the Wash Plant.
- General operational and logistical aspects

Geological Structure of the site.

From the exposures at the two Cuts the dip of the strata (i.e. coal seams) is on the high side being approximately 24 degrees to the south east, as mentioned in the Geological Modelling and Resource Estimate Report by SMS of 2013. This has a significant impact on opencast mining because the ratio of overburden to coal increases rapidly as mining moves downdip.

The same report mentions “the extent to which faulting affects the orebody is not well understood, but there are clear indications of southwest-northeast trending faults having broken the body along its strike. The area also has northwest-southeast trending faults as can be identified by the water course trending northwest-southeast to the east of the outcrop.”

What is noteworthy that when the North-east outlines of the Cuts are compared they align very well indicating that the coal strata is not, apparently, disturbed by significant normal faulting. (A normal fault is one in that the strata is displaced vertically either side of the fault line).

What was observed from the first site visit is that in the north-western corner of Cut 2, where operations are being currently undertaken, there appears, in the high wall, to be some sort of structural disturbance which was interpret as a minor fold (like a crease in towel!) which has doubled the thickness of the coal seam in that area.

Operations at the opencut (Cut 2)

Mining Lease outlines, outlines of the workings Pit 1 (now closed) and Pit 2 (operational) had previously been supplied by Mr Said and borehole position co-ordinates were taken from the original Geological Modelling and Resource Estimate Report by SMS have now been compiled into a single plan with has been overlain onto a satellite image of the area, see overleaf, Figure 1.

Since the previous visit mining has been undertaken at the north western area of Cut 2 but no significant change to the pit outline was noted.

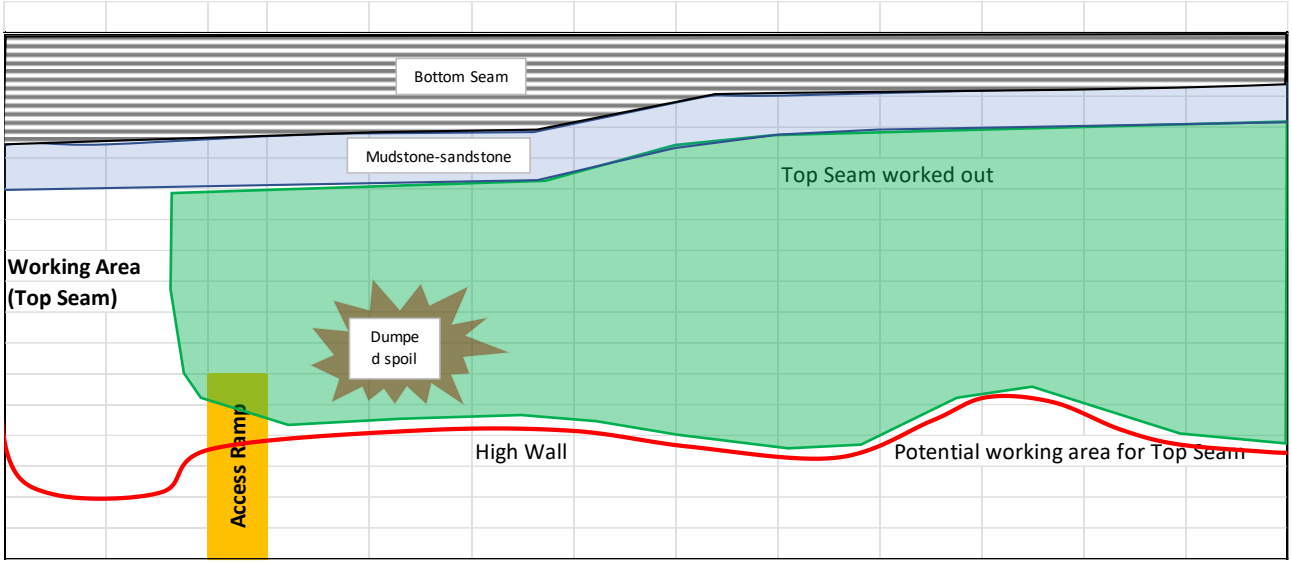
As previous discussed the nature of the coal seams had previously been described as bar coded i.e. general thin alternations of coal, carbonaceous mudstones, shale and possibly mudstones. This type of coal “seam” is typically poor quality because of the banded nature of coal and other rocks. This leads to very poor recovery of coal (i.e. 20%) from the mined material.

Figure 1: Borehole distribution, Mining Lease outlines and Cut 1 and 2 outlines

Legend Blue C1=Cut 1, C2=Cut 2; Green Mining Lease outline, Green Strike of coal outcrop

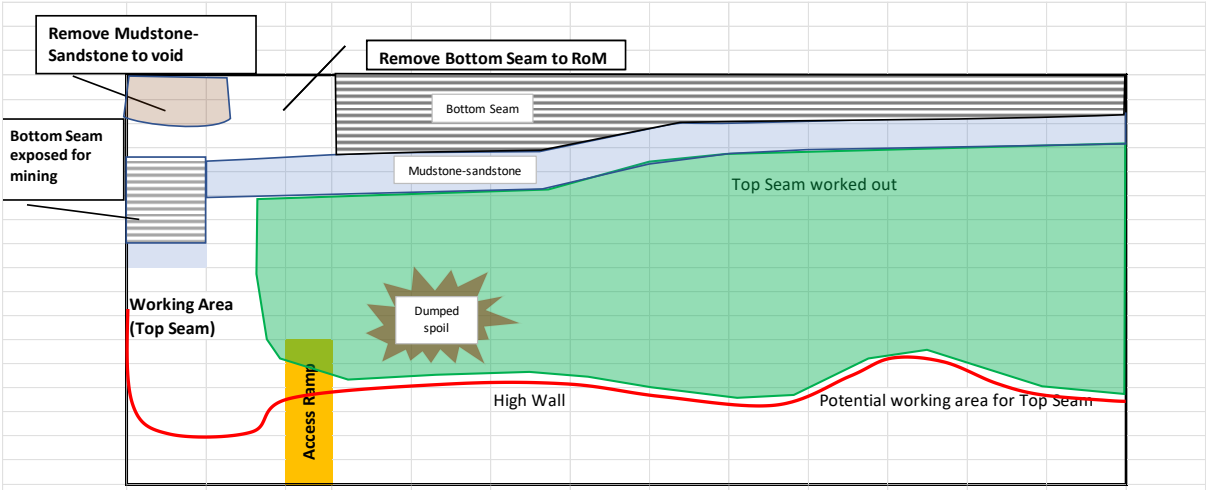
However, in the area being currently being mined this is a misleading because there are in fact two seams separated by a mudstone bed which had not been previously been describe to me. The “top” seam (currently being mined) is some 6-7m in thickness is separated from the “Bottom” seam (4-5m in thickness) by 3-4m of mudstone, sandstone and carbonaceous mudstone (Inter-burden). The Top Seam is considered to be of better quality than the Bottom Seam which has some carbonaceous mudstone partings. It was previously noted that the Resource Statement does not give any thickness values for the coal zones

Figure 2 Current Working situation March 2023 (Plan)



One of the reasons for the focusing on the Top Seam is that the Inter-burden between the seams is very hard to remove using the excavator but in the pit floor it is possible to walk along the exposed Inter-burden and Bottom Seam. See Figures 2, 3, 4 and 5 overleaf. It has been suggested to the Site staff that the working plan indicated in these Figures would allow for extraction of coal without any immediate need for overburden removal. It also allows for the simultaneous mining of Top and Bottom seams so the mine does not “High grade” its resources.

Figure 3 Working situation and suggested mining plan (Plan)



Mine Bottom and Top Seam simultaneously, and "mix" on RoM stockpile				
Production target:	**640 tpd**	4 trucks per hour @20t each 8 hours day, 24 day month	**16,000 tmp**	
	800 tpd	5 trucks per hour @20t each 8 hours day, 24 day month	**20,000 tmp**	

Figure 4 Current situation and suggested mining plan (Section)

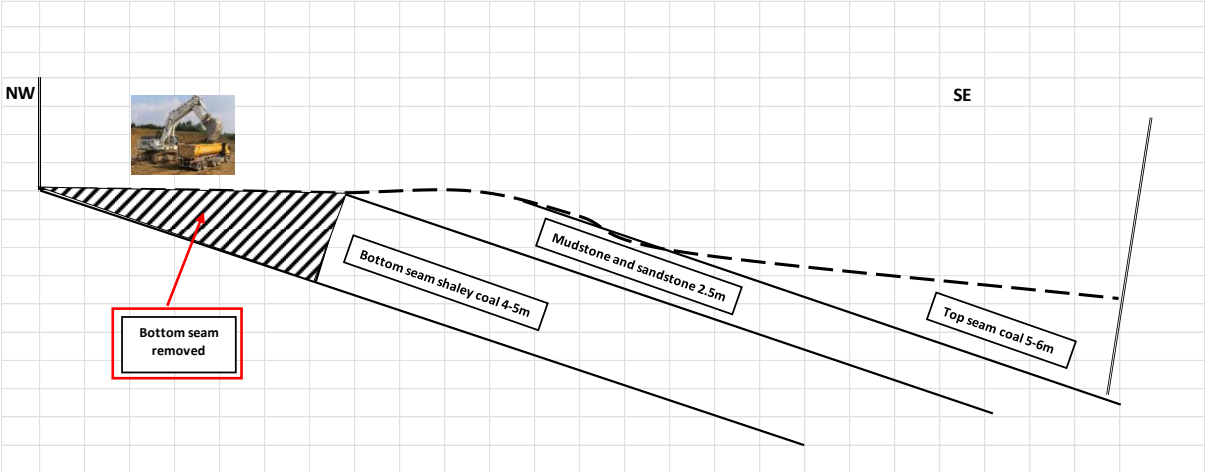
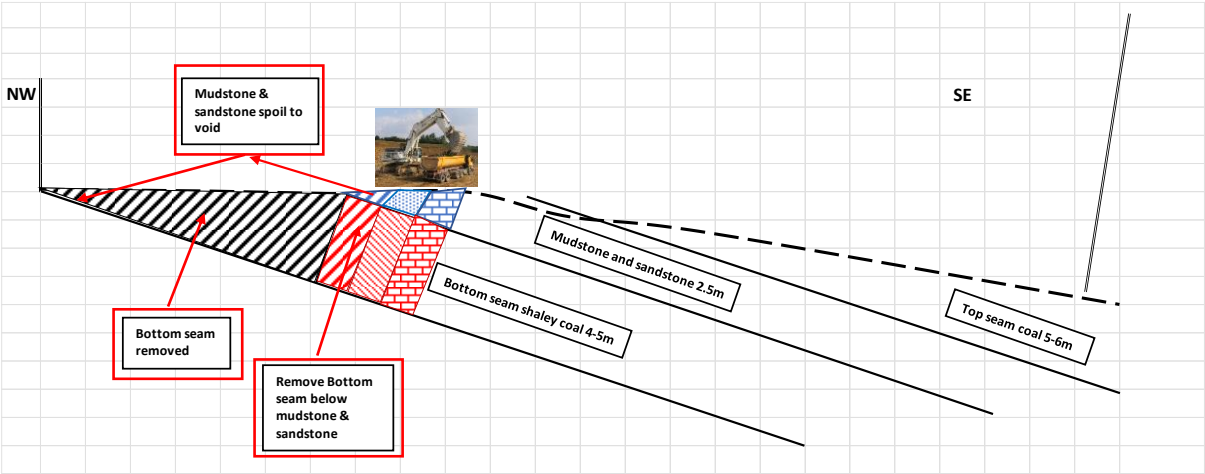


Figure 5 Working situation and suggested mining plan (Section)



Coal quality

From the detailed laboratory test work and Wash Curves (Yield versus the density) of the exploration programme from the Geological Modelling and Resource Estimate Report it is indicated that at an RD of 1.70 only approximately of 20% of coal will be extracted from the mining operation with a CV of 20MJ (4776kcal/kg) and a high Sulphur content, approximately 3- 4%. Under these circumstances the processing/wash plant reliability and efficiency is critical to the operation.

However the current production area is producing, we understand good quality coal, >6000kcal/kg (25.1Mj/kg) , which was not, to our knowledge, located during the exploration programme.

Based on limited information the following alternative explanations for the recovery of significantly higher quality coal than found during the exploration programme are suggested:

1. The slightly erratic borehole spacing missed this area but further research is required to understand this occurrence.
2. The presentation of the Wash Curves (Yield versus the density) of the exploration data focused on optimizing coal volume/tonnage and included the inter-burden in the Wash Curves hence the low yield.

If either Item (1 or 2) is correct then this presents a significant opportunity to increase the yield from the current operations by increasing the RD that the Wash Plant operates at and allowing the CV to drop to say 22Mj/kg (5300 kcal/kg). To my knowledge the cement plants have never complained about the coal calorific value and do not appear to for Sulphur content.

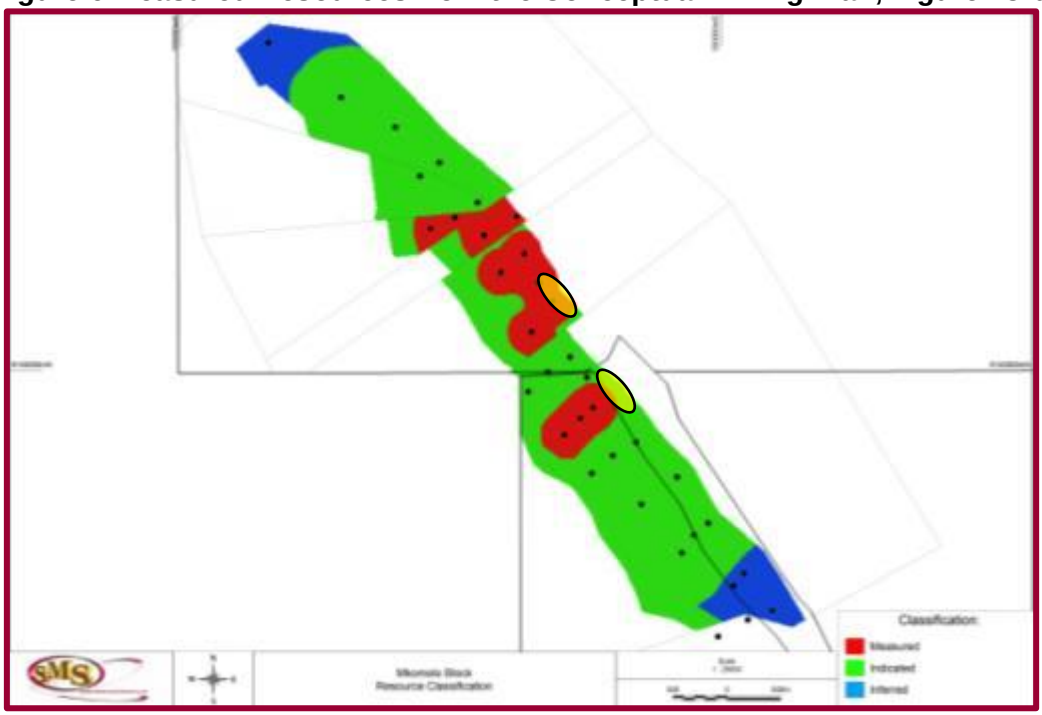
At the current time the onsite laboratory cannot perform the full suite of coal quality testing due to a lack of reagents and this particularly includes the determination of CV. If this exercise is to be undertaken, increasing the operating RD of the wash plant, it is important to fully understand the consequences to coal quality and this unit at the site must be brought back into use. There is a significant backlog of samples which could then be analyzed to provide a base line for the historical value of the CV.

Potential to expand the opencut (Cut 2)

Following the initial visit in September 2022 it was indicated that they will be shortly constrained to the NW by a water course but the area the SE could be expanded for approximately 100m to another water course and beyond. Reviewing maps, see Figure 6 below, it became apparent that by extrapolating the alignment of the Low Wall of Cuts 1 and 2, which form a straight line, that there was a likelihood that coal would sub-or outcrop between the two Cuts beyond the previously mentioned stream. Physical inspection of the Cut 2 operations in its south west corner indicated that it only terminates at a track running NNW-SSE and all parties (AG/JS/EE/DG) agreed that there was no reason not to continue mining in a SE direction and provide a diversion for the track.

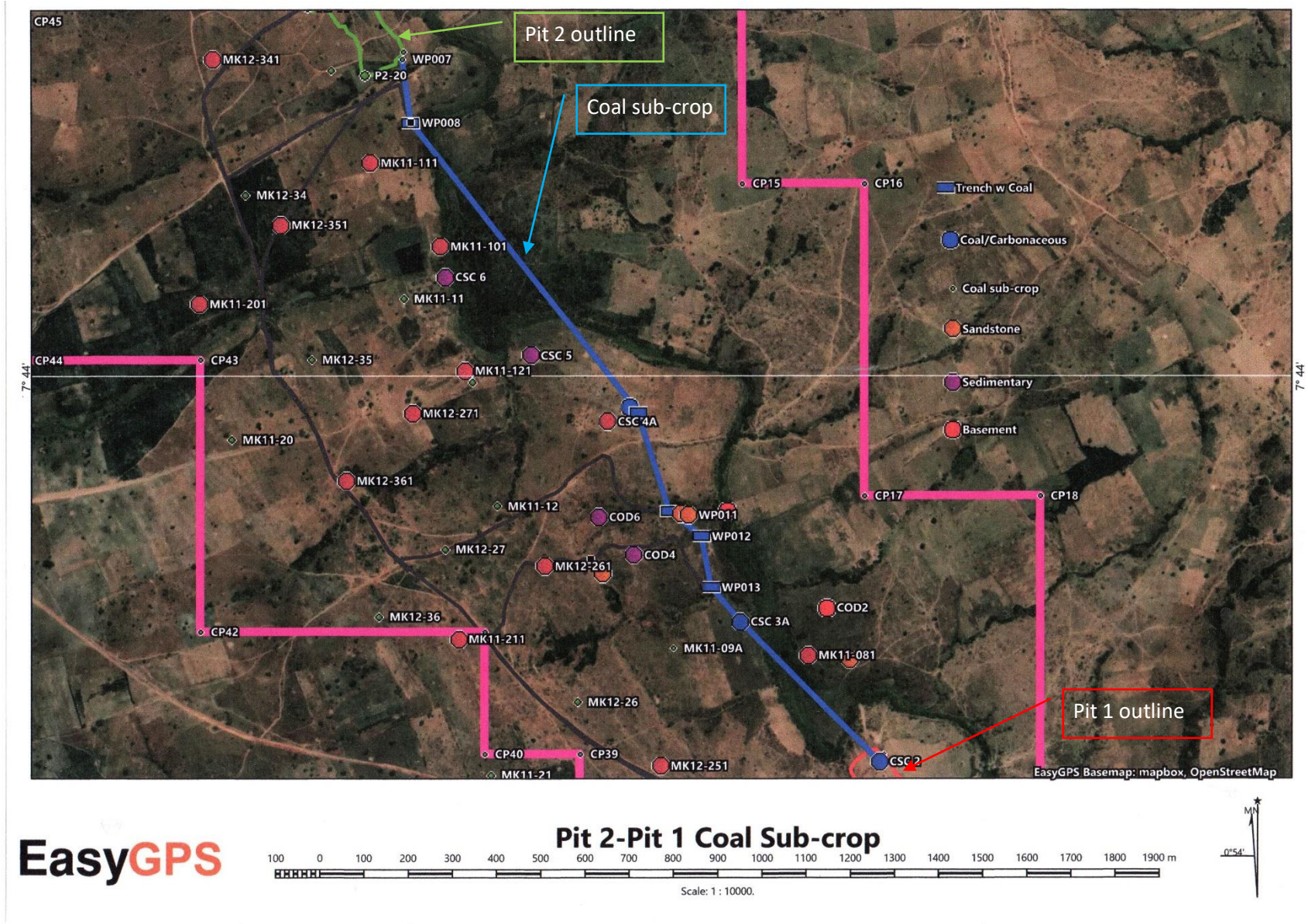
Following the September visit, and working with Geologist Said, the data from the boreholes between Cut 1 and 2 was extrapolated to surface using the observed dip of 24 degrees. Mapping and trial pitting was undertaken at or around these locations. This exposed multiple coal sub-crops in trial pits and historical trial pits with coal. See Figure 7 overleaf.

Figure 6 Measured Resources from the Conceptual Mining Plan, Figure 23 by SMS



Red-Measured; Green Indicated; Blue Inferred; Yellow Cuts 1 and 2

Figure 7 Locations of coal sub-crops between Pits 2 and 1



Operations at the Wash Plant

Prior to the visit using information supplied by the Site Manager a breakdown of production and days lost was compiled a reproduced below in Figure 8.

Figure 8 Mine and Wash Plant Production

Mine and Wash Plant Production				Note in this summary there is a cross over between Production delays and Wash plant delays											
Month/Year	RoM MT	Washed coal MT	% Recovery	Days worked	%	Breakdown Maintenance	%	No RoM	%	Diesel or Water Issue	%	Weather	%	Total	Comments
Aug-22	5,466.94	592.08	10.83	10	41.67	1	4.17	0	0.00	0.00	0.00	0.00	0.00	45.83	
Sep-22	1,642.68	283.70	17.27	3.5	14.58	12.5	52.08	8	33.33	0.00	0.00	0.00	0.00	100.00	
Oct-22	9,828.64	1,060.03	10.79	16.5	63.46	8	30.77	0	0.00	1.50	5.77	0.00	0.00	100.00	Two Sundays worked
Nov-22*	7,500.00	NA		11.0	45.83	2	8.33	0	0.00	10.50	43.75	0.50	2.08	100.00	
Dec-22*	1,020.00	NA		2.0	13.79	0	0.00	0	0.00	5.75	39.66	6.75	46.55	100.00	Holiday close down days not stated
Jan-23	2,499.74	267.50	10.70	5.75	22.55	5.25	20.59	0	0.00	3.50	13.73	11.00	43.14	100.00	Public holidays?, one Sunday worked
Average	***4,659.7***	***550.8***	***12.4***	***8.1***	***33.6***	***4.8***	***19.3***	***1.3***	***5.6***	***3.5***	***17.1***	***3.0***	***15.3***		
Production Figures*															
Nov-22	7,500.00														
Dec-22	1,020.00														
Jan-23	4,740.00														

During this visit the Wash Plant was only operational for one day and was under repair (piping elbow had corroded and was patched). Time was spent becoming acquainted with the various processes at and supporting the Wash Plant i.e. hoppers, screening, water supply and settling ponds etc. The process is summarised overleaf in Figure 9. Constraints to the system, as noted on site and described by staff are indicated in Figure 10.

Following our observations at the wash plant the following issues were noted

The production reporting was note comprehensive enough and failed to mentioned, for example, no Wash Plant production due to non-availability of magnetite. Subsequently (Whilst we were on site) the Site Manager has produced a more comprehensive production reports which, at the time of writing, we have not had time to incorporate into Figure 8.

One item that was noted that, we believe that has been mis-reported, is the throughput of the Wash Plant. The Run of Mine (RoM) is loaded into the Hopper and then the oversize is screened to one side for recycling back into the Hopper. Similarly the RoM fines are screened off and are placed into a RoM Fines stockpile.

Our understanding is that the recovery was measured against the total number of Front End Loader (FEL) buckets emptied into the Hopper. (This in itself has lead to errors because different FEL buckets have a different capacity)

For example, over an observed two hour period 26 buckets were placed into the hopper. Of these 4 buckets were RoM Fines (discarded) and 2 buckets of oversize material which were later feed back into the Hopper. Effectively only 20 buckets were feed into the Wash Plant and 3 buckets of washed coal were recovered, =15%. However using 3/26 this =11.5%. On this basis recovery has been under reported since August 2022.

In addition, over the same period, it was noted that the Wash Plant was operating an RD of 1.60 not 1.7 which means recovery was significantly lower than should have been expected.

We made the point to the Assistant General Manager and Site Manager that the Wash Plant must never operate at 1.6 but it is better to start operations at say 1.8 and bring the RD down rather that vice-versa. See also our comments regarding the use of a high RD to improve recovery.

Figure 9: Wash Plant Flow Chart

FLOW CHART BENEFICIATION PROCESS

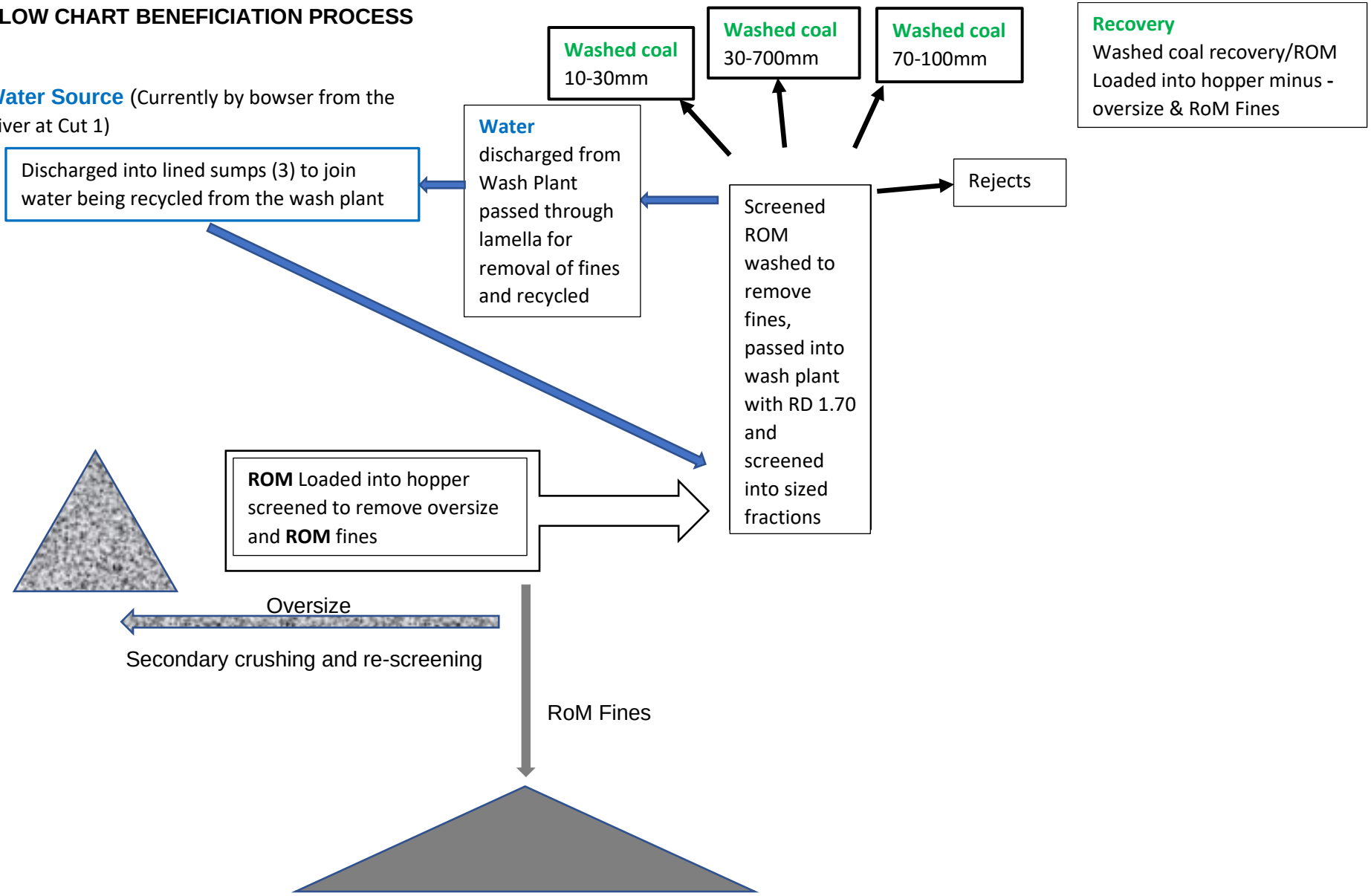


Figure 10: Wash Plant Flow Chart with Constraints (In red)

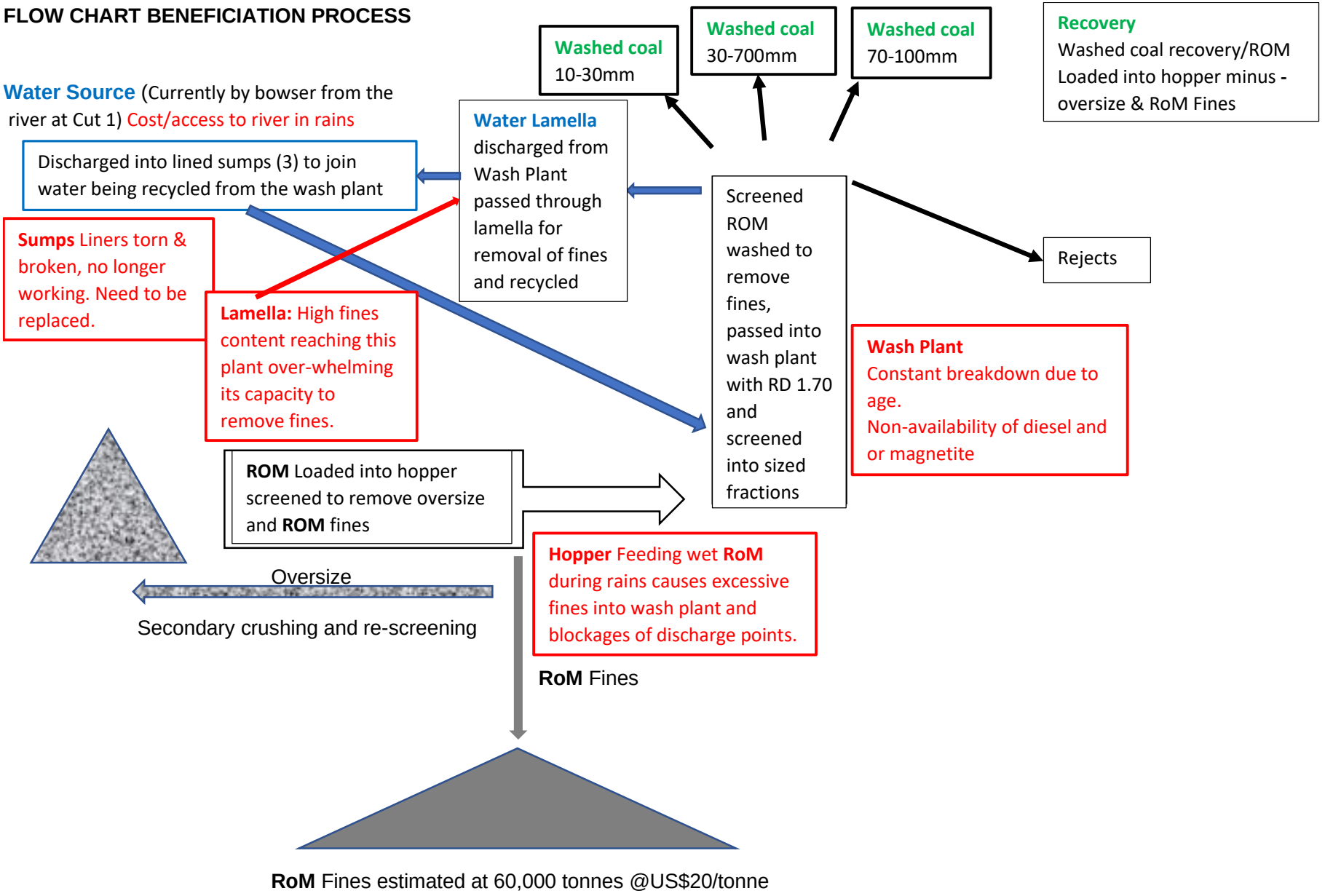


Figure 9 and 10 indicate the constraints on the Wash Plant which are fundamentally age, lack of key material, i.e. diesel, magnetite and occasionally water.

In the latter case there was an attempt some years ago to construct a pipeline from the water source at the river directly to feed the Settling Ponds from which the water is re-cycled back into the Wash Plant. The supply of water is a critical aspect of the Washing Plant and it is currently supplied by a water bowser at some expense. We tried to obtain clarity as to why the pipeline did not work and understand that water did not issue from the pipe at the Settlement Ponds. A brief conversation with a colleague in the water supply industry regarding this implies that an inadequate pump may have been the cause (the water has to be raised approximately 40m from the river to the ponds).

General operational and logistical aspects

Comments in this section are based on observations and conversation with site staff and do not reflect any input from Head Office in Dar es Salaam or London.

Staffing

It was pointed out the certain staff members were historically having better pay and conditions and in another case responsible for multiple breakdown on the heavy trucks they were driving. It was also noted that there tends to be a two teams mentality (promoted by the two persons mention above - Mine/Wash Plant) which is counterproductive. However, subsequent to our visit, the contracts for these two persons have been terminated and the matter has, in effect, been closed.

The retention of the Laboratory technician is questionable if no effort is made to operate the laboratory. However, we are of the opinion that the laboratory could serve an extremely useful function in monitoring quality and the effectiveness of the Wash Plant and should be retained and brought back into operation.

The Assistant General Manager (D) and his hands on approach and his appreciation of how to address operational challenges in this remote area is essential. However, the lack of experience of running a mining operation by D and other professional staff needs to be improved

Sub-Contractors

It has been mention, and we understand being actioned, that the on-site security is significantly more expensive than other service suppliers.

As mentioned above we understand that the cost of the supply of water via the bowsering set up is maybe not as cost effective as pumping and would suggest that alternatives be considered.

Essential Supplies

There seems to be a philosophy of “Just in Time” for certain key essentials i.e. diesel and magnetite, when a better approach would be “Stock and Order” to ensure down time is minimised

Non-essential Supplies

We are very mindful of the current cash flow constraints on this project and the need to minimize expenditure until production can be raised to a reasonable level. However, as we

understand the situation, certain economies are costing the company more than the cost of the repair; i.e. cost of the 20t trucks to transport staff and security staff to and from Mpanda (3-4 trips per day) and the associated cost of the diesel vis repairing the gearbox of the “tired” Land Cruiser (second hand spare located).

The are currently three vehicles on site, which are awaiting repair, the Land Cruiser (as mention above, Ford Ranger (needs new turbo) should be repaired and sold, Volvo FEL Injectors (needs new blade failure to replace will cause irreparable damage to the bucket).

The use of an 20t truck, which is non-compliant with on-road regulations, to drive to Sumwabanga to collect 600l of diesel, the current arrangement (Plus the cost of the traffic fine at the police road blocks) seems very cost in-effective.

Lack of First Aid kit on site.

Need for basic spares to minimize downtime, puncture repair facilities, location of local suppliers and engineering firms rather than sourcing from Dar es Salaam which may be cheaper maybe a false economic if down time is considered.

Conclusions

a. It is believed that the mine operations have, by extending south eastwards from Cut 2, have reserves to continue for some years at the rate of production of 4000tpm of washed coal.
b. This area is approximately 600x100m
c. Production of 4000tpm of washed coal with a 20% recovery requires the production of 20,000tpm of Raw coal. This approximates to a volume of approximately 11,111m^3. Assuming a mined coal thickness of 9.0m (Top and Bottom seams) this in turn equates to an area of approximately 1,235m^2 is being extracted, i.e. 100 x 12.5m pm. i.e. approximately 48 months production.
d. By extending to the south-east bring the extraction closer to the current wash plant location.
e. It is believed that the 20% recovery rate can be improved by more selective mining and increasing the RD used in the wash plant without a negative effect on sales.
f. Ensure a proper mining methodology is implemented so that inter-burden and overburden are dumped into the void created by mining and not transported out of the void and dumped beyond the Highwall
g. More rigorous Stock and Order procedures for essential items that could halt production.

Alan Golding

22nd March 2023

Cut 2 North western end of the face working area. Note folded strata

Cut 2 North western end of the face working area folded strata. Top Seam

Cut 2 North western end of the face working area. Top Seam

Cut 2 Standing on Top Seam looking NE towards mudstone sandstone band an Low Wall

Looking SE through workings

Contact Base of Top Seam and Mudstone-Sandstone Band

Bottom Seam Interbedded coal and mudstone

Roof of Mudstone-sandstone Band (Floor of Top Seam)

SE corner of working, extension area

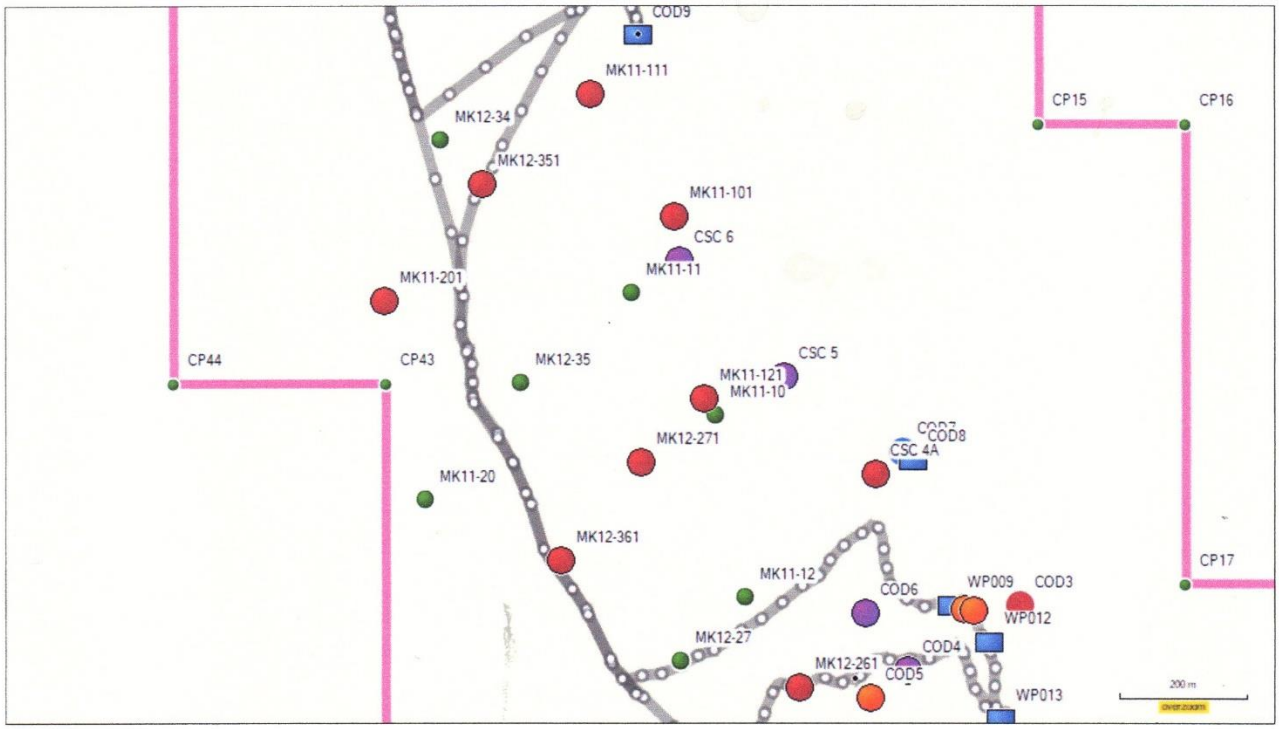
Looking from SE to NW

Cut 2 Looking south east, coal sub-crop Sept 2022

Cut 2 looking SE towards extension see exploration Section which follows Sept 2022

Photographs of Exploration works

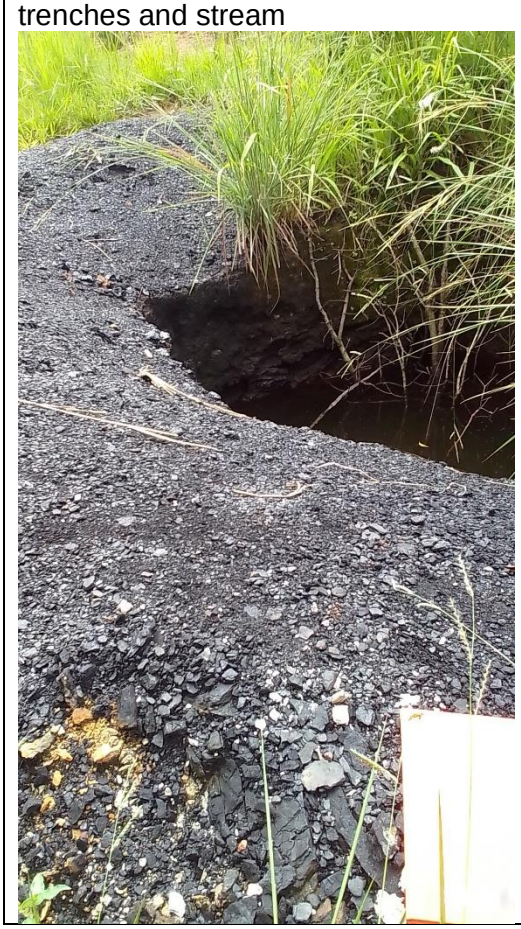
Locations



Trial pit with coal at base, approx. 100m SE of current workings COD9 on Map

Spoil from trial pit

Old TP with coal (WP009 on map) Also two trenches and stream



Multiple trial pits around WP009

WP010 Old trench “T” shaped. No coal near WP009

WP012, same area 2m deep variegated mudstone w carb mudstone

WP011 Same area, 3m deep, sandstone no coal, down dip of other trial pits

WP013 4th trench approx. 5m deep. Coal at 2.0m. Maybe roof of Top Coal

Stock pile

Wash Plant Area

Loading Hopper

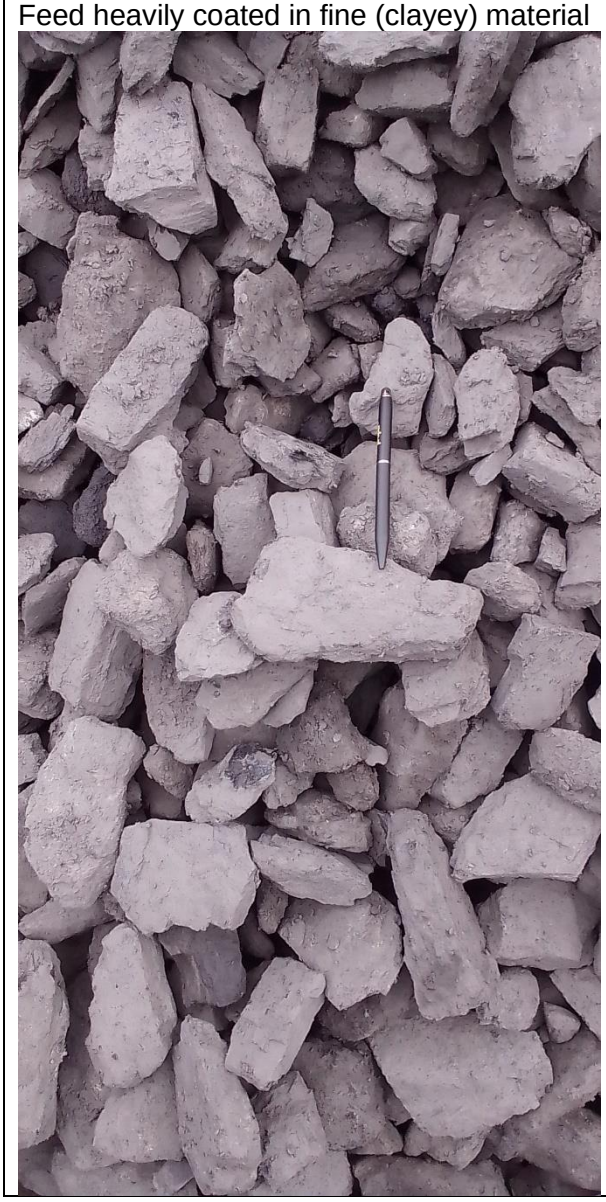
Oversize screened out

RD measuring device

Washed Coal output

Washed Coal output

Feed heavily coated in fine (clayey) material



Water collection point

Water delivery (Note condition of liners in settlement ponds)

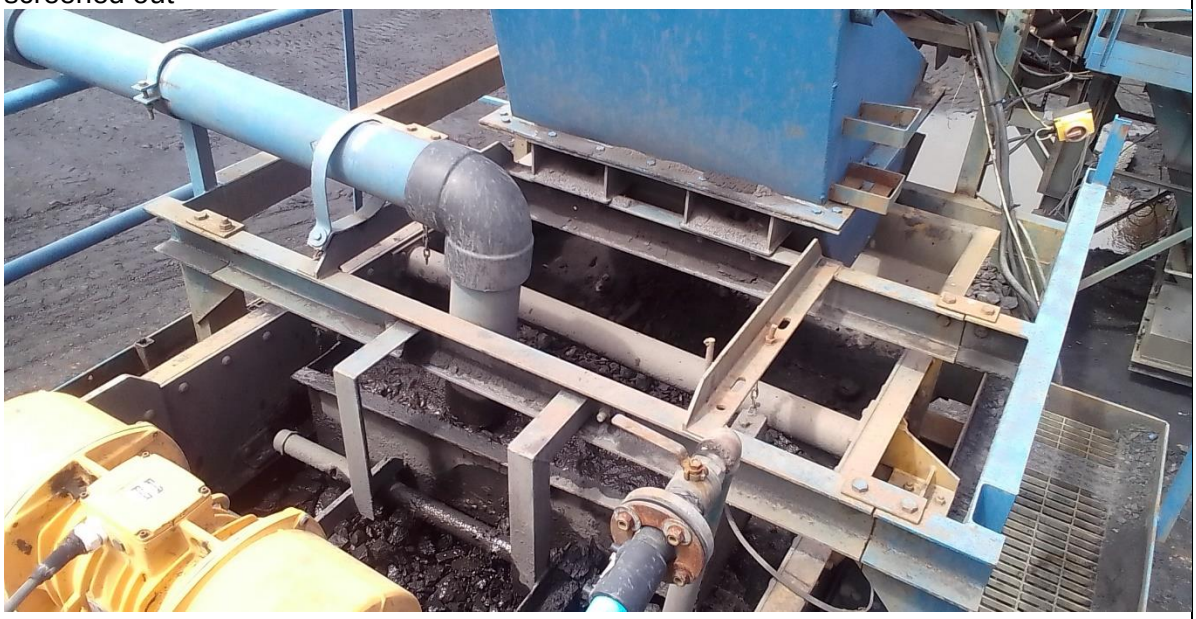
Settlement ponds

Lamella Plant – removal of fines

Mixing of chemical for the clarifier

Lamella vanes - High coated in fines

Feed into Wash Plant, very clayey as wet conditions are not allowing the fines to be screened out



Oversize to be returned to the Hopper

RoM Fines

Name Plate on Wash plant

Discarded pipes from failed pumping system

Discarded pump from pipeline	

Rain on production site