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Tailings Storage Facility Update

China First Coal Project – Galilee Basin

November 2012

Waratah Coal Pty Ltd • GPO BOX 1538, Brisbane Q 4001 • www.waratahcoal.com

Contents

Glossary

ad	Air dried
AEP	Annual Exceedence Probability
ANC	Acid Neutralising Capacity
ar	As received
ARI	Average recurrence interval
AWBM	Australian Water Base Model
BOM	Bureau of Meteorology
CHPP	Coal Handling and Preparation Plant
DERM	Department of Environment and Resource Management (QLD)
DMC	Dense Medium Cyclones
DME	Department of Mining and Energy
DSA	Design storage allowance
EC	Electrical Conductivity
EIS	Environmental Impact Statement
EM	Environment Management
FOS	Factor of Safety
Ha	Hectares
K	Hydraulic conductivity
kg	Kilogram
km	Kilometre
LD	Large diameter
m^2	Metres squared
m^3	Metres cubed
MLA	Mining lease application
ML/yr	Megalitres per year
mm	Millimetres
mm/a	Millimetres per annum
m/s	Metres per second
Mtpa	Million tonnes per annum
NAF	Non-acid forming
OMC	Optimum moisture content
PAF-LC	Potentially acid forming – Low capacity
TDS	Total dissolved solids
tph	Tonnes per hour
TSF	Tailings storage facility

Executive Summary

The China First Coal Project will mine 56 million tonnes of coal per annum (Mtpa) from the B, C and D Seams of the Permian Bandanna Formation in the Galilee Basin. The annual production of rejects and tailings will be 10.7Mtpa and 5.3Mtpa respectively.

Comprehensive geotechnical hydrological, hydrogeological and geotechnical studies have been completed to ascertain the best method for rejects and tailings disposal. The important aims of these studies were to ensure geotechnical stability of containment structures, encase all rejects and tailings in impervious clay blankets and prevent any seepage of groundwater into the environment.

Physical and chemical testing to date indicates that the rejects and tailings will be benign. No oxidisable pyrite has been detected in any cores. Coarse and fine rejects are to be placed in layers and track compacted using a dozer, to significantly reduce permeability and prevent oxidisation.

Options for the tailings storage facility which have been investigated include trucking dry tailings, in-pit disposal of dry tailings, conventional thickener and tailings dam, and thickened tailings disposal. The preferred option from a tailings methodology evaluation matrix is trucking tailings dry paste and rejects to disposal cells. A water balance flow chart has been prepared for this method.

Cells are to be designed and constructed in box cut and in pit spoil piles. A life of mine tailings emplacement strategy has been developed. Although testing to date indicates that tailings and rejects are benign, blanket encasement will prevent any oxidisation or seepage. Clay blankets will be properly engineered. Analyses have been completed for geotechnical stability of all cell batters.

Filter pressing is required to obtain a transportable tailings paste. Phoenix belt presses are proposed. Tailings and rejects will be trucked to the cells, dumped and then spread and track compacted by a dozer to reduce permeability and prevent oxidisation.

Monitoring techniques will include the use of piezometers, routine groundwater testing and survey monuments to ensure adequacy of the disposal cells. All cells will have the required design storage allowance and on completion of infilling they will be capped with impervious, compacted fill, topsoiled and seeded.

Thorough and extensive rehabilitation is required to ensure that the post-mining landform is of the same standard as the pre-mining condition. All effort will be made to promote vegetation regrowth which allows for a stable, natural ecosystem. A detailed study of grasses, trees and shrubs has been completed to ensure sustainable, viable and aesthetic post-mining rehabilitation.

1. Introduction

1.1 Location

The proposed Tailings Storage Facility (TSF) for the Galilee Coal Project (which is also known as, and hereafter referred to, as the China First Coal Project) will be encapsulated in cells developed within the box cut and spoil pile areas. The location of the initial cells will be adjacent to the lox lines of the initial box cut, approximately 2km to 5km from the Coal Handling Preparation Plant (CHPP). The area can be generally described as flat terrain with alluvial clay soil profiles. Refer to Figure 1 and Appendix 1 for an overall site layout.

Waratah Coal Pty Ltd proposes to develop the China First Coal Project within the Galilee Basin, 35km north-west of the township of Alpha. The China First Coal Project is an integrated project developing new coal mines and a high capacity rail system, and using future or existing coal export facilities at the Port of Abbot Point and the Abbot Point State Development Area to export high quality thermal coal to international markets.

The new coal mining project consists of two open-cut operations producing 20Mtpa and four underground longwall operations producing 36Mtpa. The two open-cut operations have a combined strike length of approximately 26km. The open-cut spoil pile areas are to be utilised for TSF.

The coal mine will be contained within the exploration permit for coal tenements 1040 and part of 1079 and mining lease application (MLA) 70454. These tenures occur in a broad strike valley draining to the north, with the Great Dividing Range to the west and the Drummond Range to the east. Tallarenha Creek flows along the eastern side of the mine site and converges with Beta Creek to form Lagoon Creek, which then drains to the north of the mine site. Lagoon Creek will require diversion into Saltbush Creek.

The report assesses the main features and characteristics of the China First Coal Project TSF and its impacts on surface topography, surface drainage and below ground seepage.

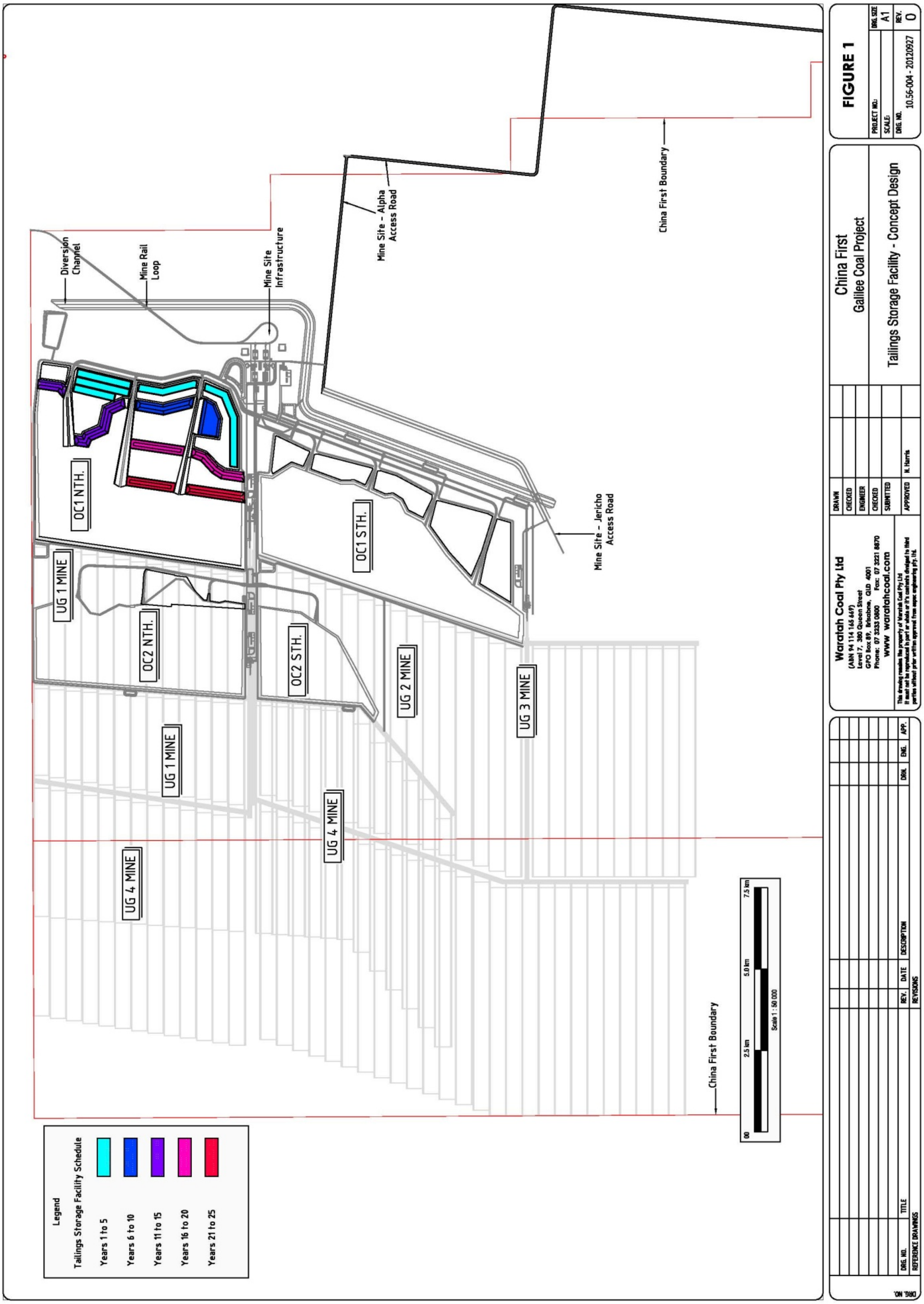

Figure 1: Overall site layout

1.2 Site Geology / Hydrology

The proposed TSF is located to the immediate east of the ‘D’ and ‘C’ seam sub-crops. The stratigraphy in the vicinity of the TSF can be generally described as Quaternary alluvials and Tertiary sands, clays and laterites which unconformably overlie the distinctive grey-greenish Triassic mudstones and claystones of the Rewan Formation. The Rewan Formation, in turn, conformably overlies the Late Permian shales, siltstones, sandstones and coal seams of the Bandanna Formation. The ‘D’ and ‘C’ seams, which are known aquifers, are found within the Bandanna Formation. This stratigraphic section is shown in Figure 2.

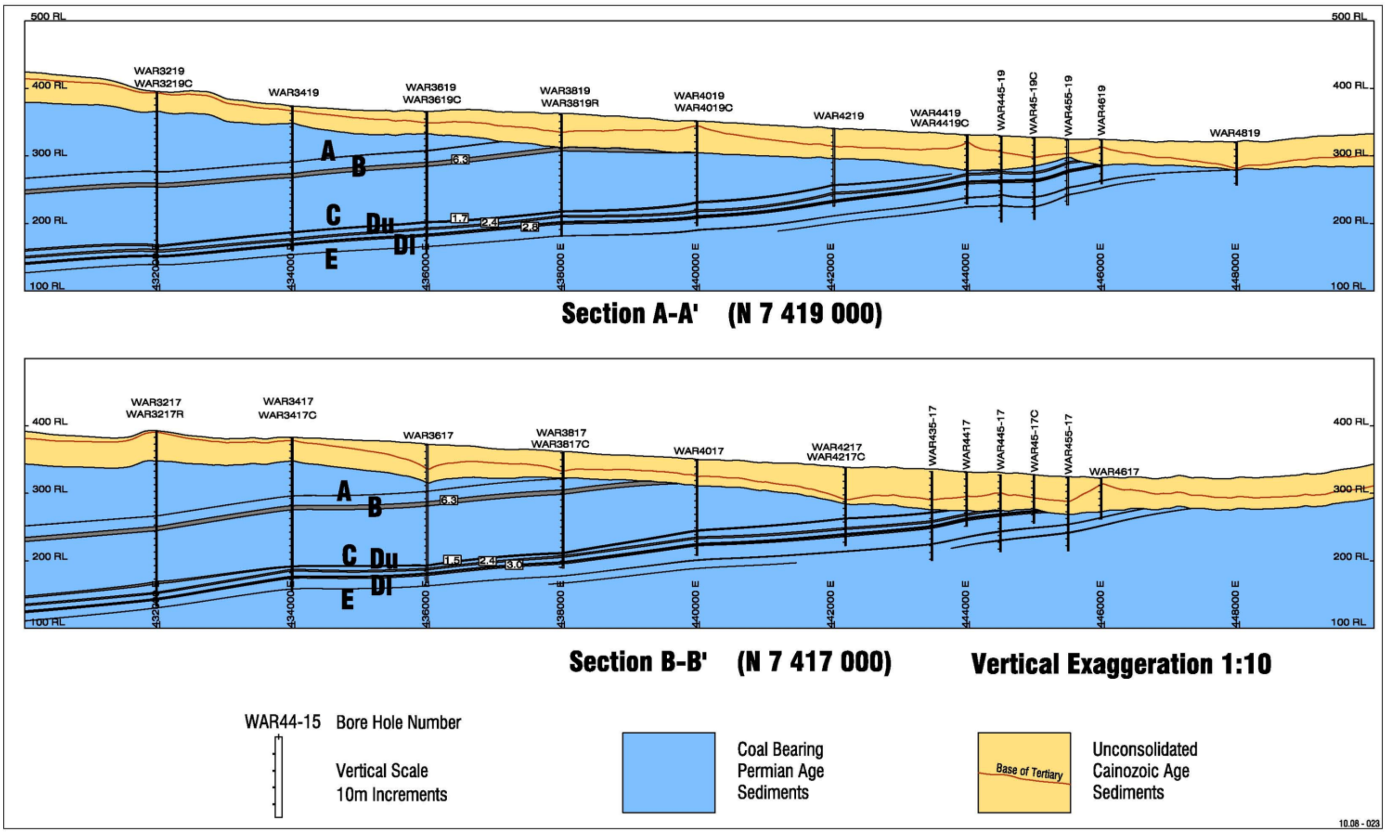

Figure 2: Stratigraphic Section

1.2.1 Cainozoic-Tertiary Cover

Unconsolidated Cainozoic and Tertiary sediments dominate surface lithology of the project area. Unconsolidated sands, silts and clay, lateritised in part, form an extensive blanket over the project area, with a thickness of up to 90m in eastern and central sections. The Permian does not outcrop in the project tenements. There is a variety of Recent and Quaternary sediments within the Cainozoic which post-dates Tertiary blanket. In the east of the tenements, the Tertiary sediments sit directly on the Permian. This contact is unconformable and represents an extensive time gap. The contact is erosional in part.

The Cainozoic tends to thin in the west and Waratah's drilling and previous exploration show the Triassic Rewan Formation rarely at outcrop or shallow depth in this region. The Rewan Formation is conformable on the Permian strata and consists of the greenish sandstones and siltstones well known in association with the Rangal Coal Measures in the Bowen Basin to the east. The contact between the Rewan and Permian sits generally 20m to 40m above the A seam.

1.2.2 Permian

The Permian consists of competent sandstones, siltstones, mudstones and claystones with intercollated coal seams. The Permian dips gently to the west at <1˚ dip and appears to be free of significant structure. The coal seams names are currently allocated from the selection process of alphabetical sequence used by previous explorers on the area. The A and B seams are in the Bandanna Formation and the sequence for C downwards are in the Colinlea Sandstone. It is acknowledged that the E and F seams may belong to a lower formation again.

1.2.3 Geotechnical Data

Geotechnical drilling completed in the project area indicated that the site is underlain by low permeability sediments ranging in thickness from 20m to 50m. The Tertiary clay is stiff or plastic and is effectively impervious. In situ, open end permeability testing has been completed in geotechnical drillholes. Permeability values range from 1.2×10^{-7} m/sec to 2.1×10^{-8} m/sec. Packer permeability testing of the strata underlying the TSF gave values ranging from 2.5×10^{-7} m/sec to 4.2×10^{-9} m/sec.

Figure 3 shows the location of the TSF superimposed on the underlying regional geology.

The average shear strength of Tertiary claystone and extremely weathered to highly weathered Permian claystone is friction (ϕ) = 24°, cohesion © = 39kPa. Average uniaxial compressive strength is 27.6Mpa for fresh Permian sandstone, 15.7Mpa for fresh Permian siltstone and 12.5Mpa for fresh coal. These values are similar to strengths in the Rangal Coal Measures of the Bowen Basin.

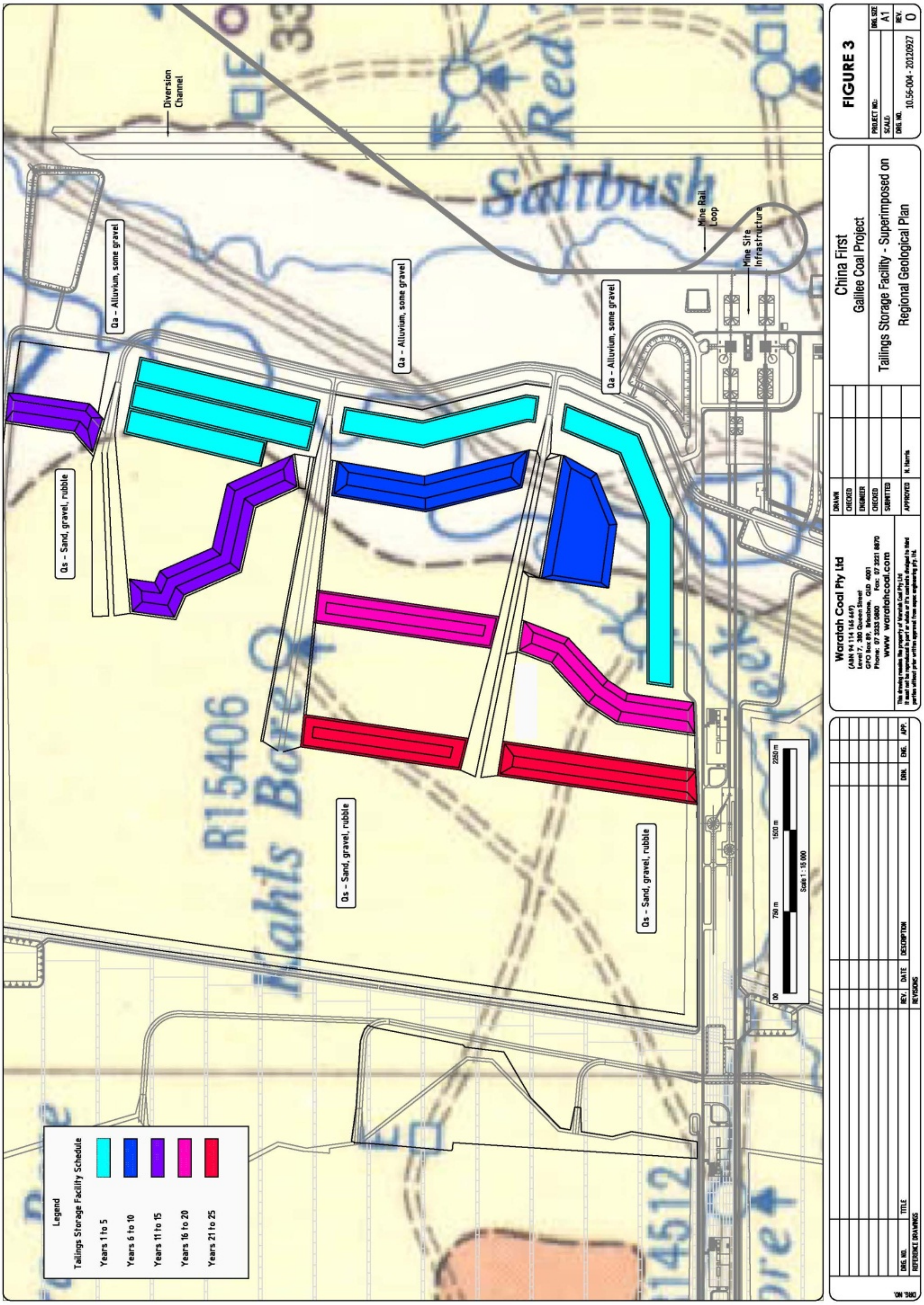

Figure 3: TSF superimposed on regional geological map

1.2.4 Hydrogeology

Details of the five aquifers in the proposed mining area are included in Table 1.

Table 1: Descriptions of Aquifers

Aquifer	Extent	Thickness (m)	Quality (Total Dissolved Salts, ppm)
Base of Tertiary	Unknown	Not available	Not available
A to B Sandstone	Unknown	Not available	Not available
C to D Sandstone	Extensive	12	750 to 1750
D to E Sandstone	Extensive	12	750 to 1750
Sub E Sandstone	Extensive	Not available	260 to 390

Figure 4 is a typical geological profile of the project area.

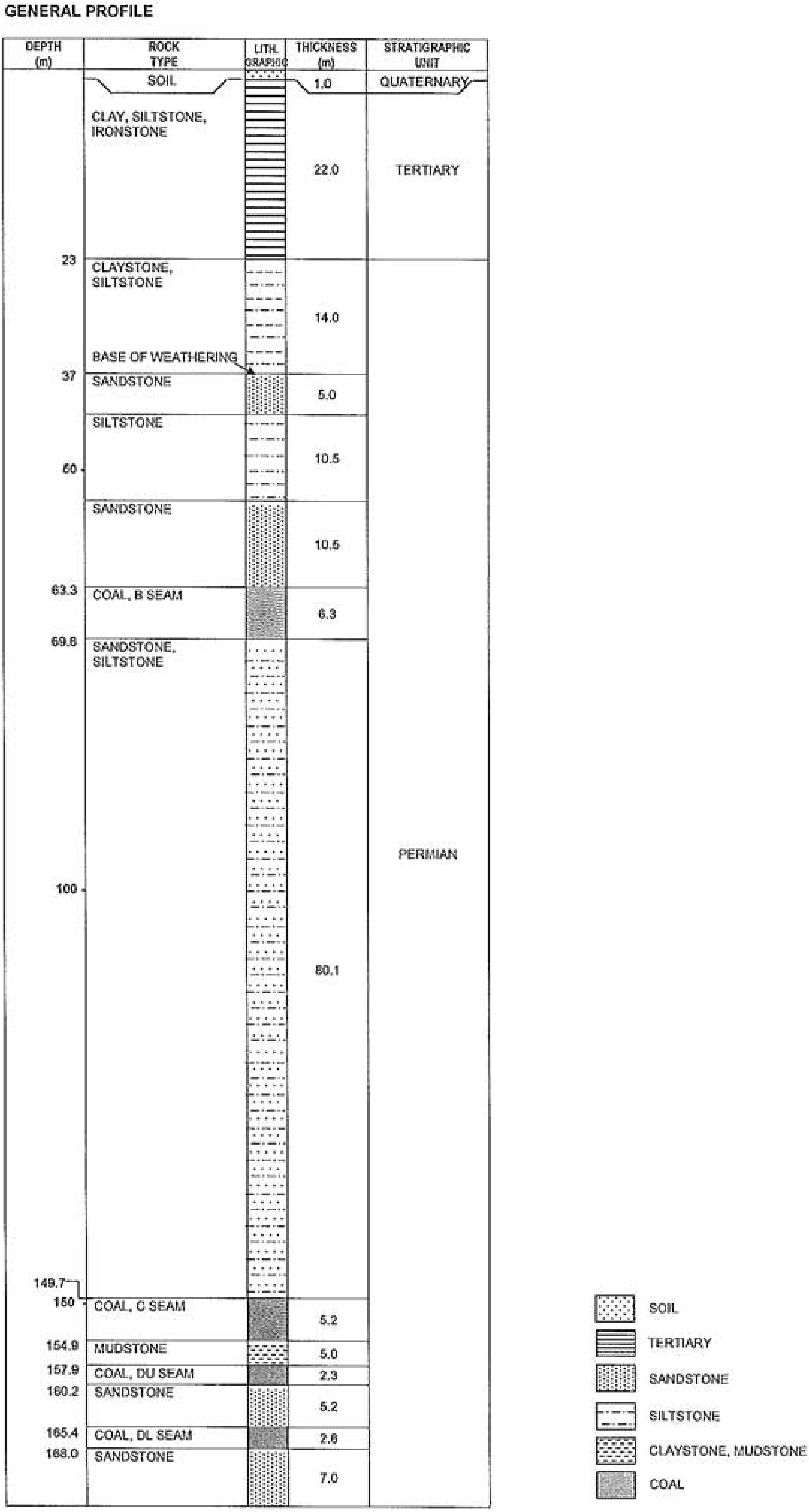

Figure 4: Typical Geological Profile

Although the Base of the Tertiary and A to B Sandstone aquifers are considered to be insignificant, air-lift pumpout tests are required to determine the extent of these aquifers and flow rates.

Hydraulic parameters for the C to D Sandstone aquifer and the D to E Sandstone aquifer have been calculated and are summarised in Table 2

Table 2: Hydraulic Parameters for Aquifers

Aquifers with thickness (m)	Transmissivity (m^3/sec/m)	Hydraulic Conductivity (m/sec)	Storativity
C to D Sandstone (12)	7×10^{-5}	6×10^{-6}	1×10^{-3}
D to E Sandstone* (21)	20×10^{-5}	8×10^{-6}	4.1×10^{-5}

*Average for three tests

No specific yield calculations were completed. Hydraulic conductivity (permeability) is calculated by dividing transmissivity by aquifer thickness in metres. The above C to D Sandstone has a calculated permeability of 5.83×10^{-6} m/sec.

Recent V-notch weir flow rates are included in Figure 5. These results are summarised in Table 3

Table 3: Summary of Recent V-Notch Weir Flow Rates

Aquifer	Average Flow Rate (L/s)
A to B	1.3
B to C, Upper Aquifer	1.3
B to C, Lower Aquifer	3.0
C to D	3.3

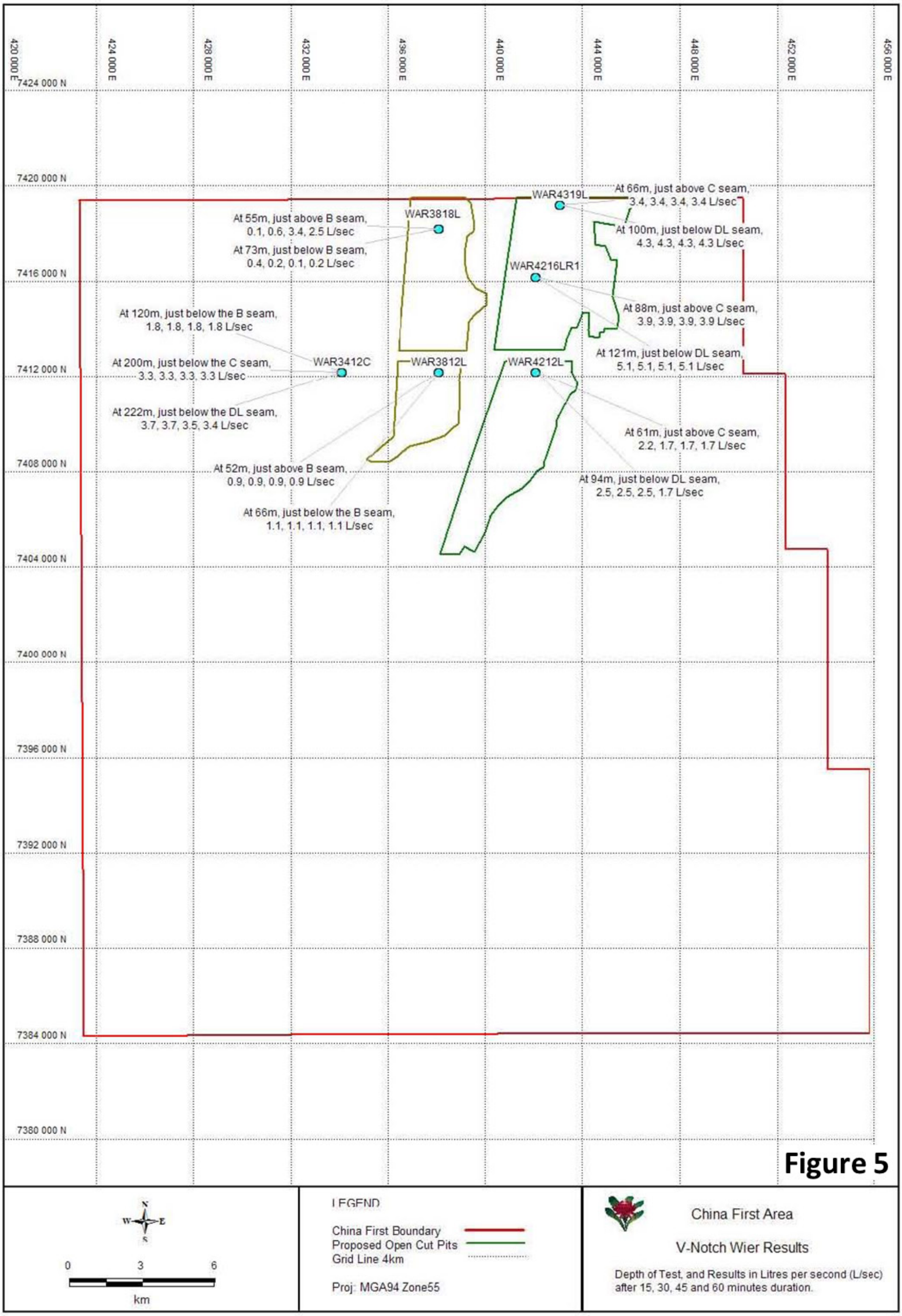

Figure 5: V-Notch Weir Flow Rates

1.3 Hydrological information

1.3.1 Climate Data

Details of the annual rainfall for the nominated SILO Data Drill location of the period 1900 to 2008 are shown in Figure 6.

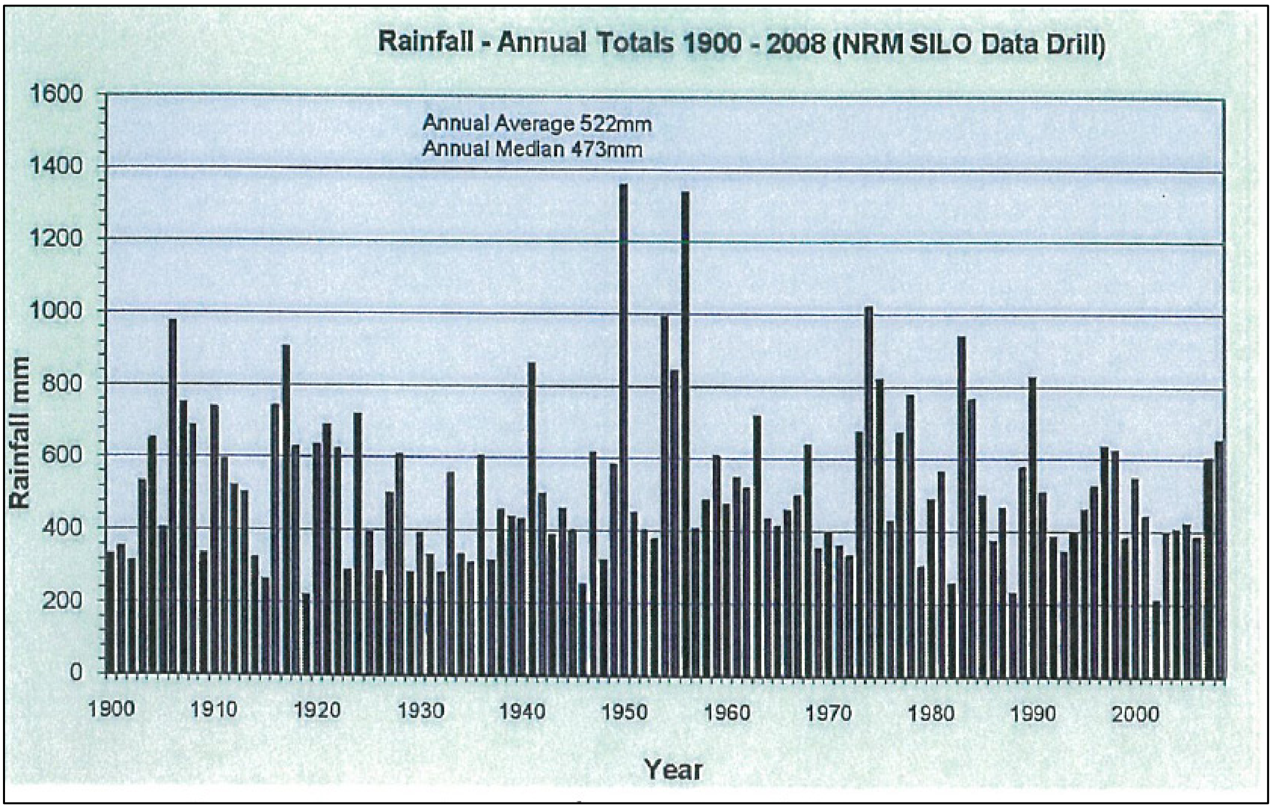

Figure 6: Annual Rainfall Totals

A daily evaporation and evapotranspiration database has been generated from the SILO Data Drill rainfall location. Daily runoff data has been generated from the catchment rainfall and evapotranspiration data using the AWBM (Australian Water Base Model) Catchment Model. The model has been calibrated as an ungauged surface flow model using an average surface storage capacity.

Daily runoff from the catchments has been generated using a catchment water balance model, AWBM, which uses the site daily rainfall and evapotranspiration data to generate the runoff database.

The model has been calibrated as an un-gauged surface run-off model. The average surface storage parameter is determined for various assumed soil parameters (moisture, type and drainage properties) and together with evapotranspiration data are used in the AWBM model to convert rainfall into runoff. The average surface storage capacity of the AWBM model is sufficiently akin to the 'S' parameter of the SFB model that the accumulated information from tests of the SFB model can be used to estimate the average surface storage capacity required by the AWBM model. The results from the SFB calibrations suggest a median value of 120mm for average surface storage capacity on Australian catchments. This has been adopted for the calibration in this report. The larger the average surface storage used, the less catchment runoff and vice versa.

1.3.2 Annual Exceedence Probability of Rainfall

High hazard category storages are designed to an Annual Exceedence Probability (AEP) of 1% which equates to an event with an average recurrence interval (ARI) of 1 in 100 years event. The critical wet period rainfall for this event is 1220mm.

The historical three month critical wet period rainfall is included in Figure 7.

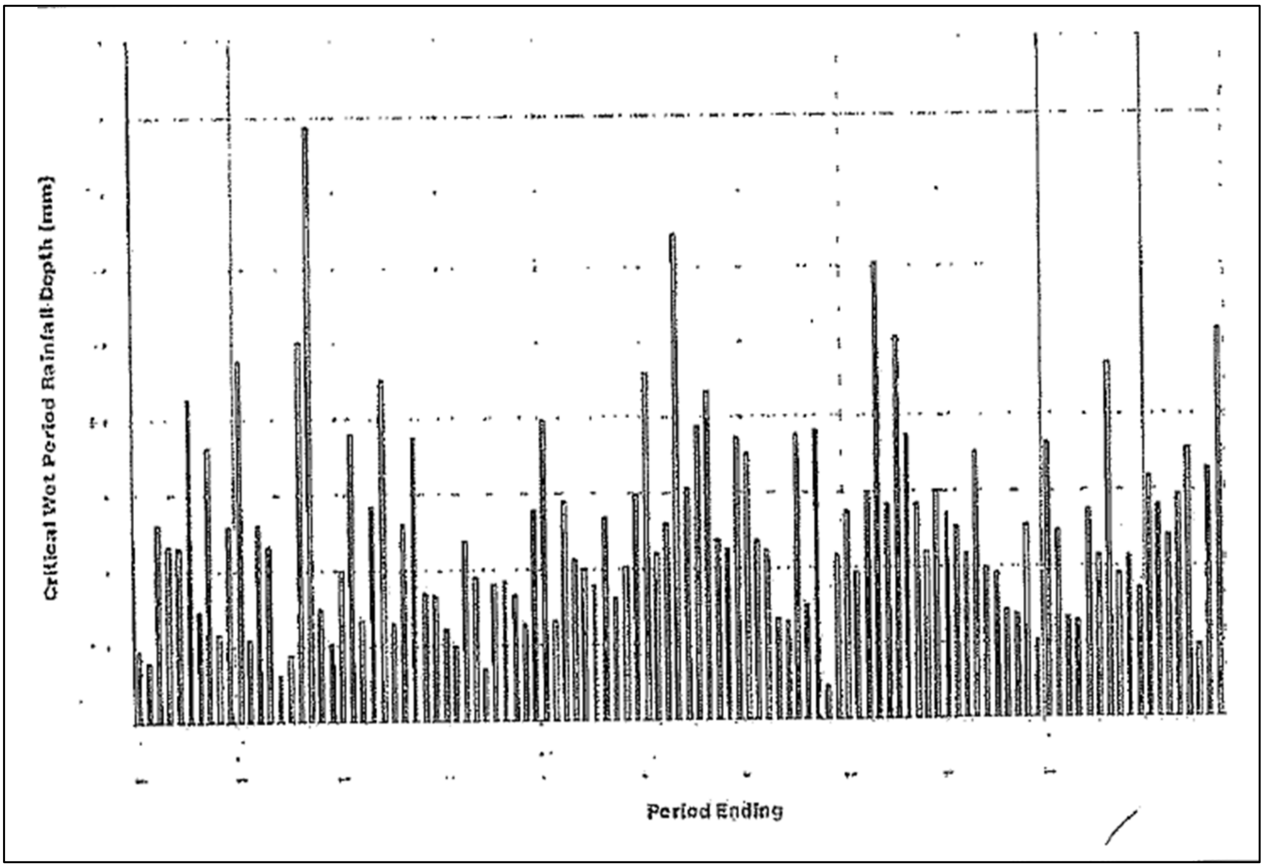

Figure 7: Historical Three Month Critical Wet Period Rainfall (NRM SILO Data Drill)

2. Properties of Rejects and Tailings

The annual production of rejects and tailings will be 10.7Mtpa and 5.3Mtpa respectively. Using the size envelope data, the expected splits to the Dense Medium Cyclone (DMC) and spirals circuits and to tailings is as follows:

Table 4: Process Circuit Splits

Estimated Circuit Splits from Process Size Envelope			
Circuit/Stream	**Nominal%**	**Fine%**	**Coarse%**
DMC (+ 2.0mm)	69.0	59.9	78.1
Spirals (-2.0 - +0.125mm)	22.0	25.1	17.4
Tailings	9.0	14.9	4.5
Total	100.0	100.0	100.0

2.1 Physical Properties

Tailings typical average properties are expected to be:

- Solids Content: 30% solids by weight
- Sizing: Coarse coal +2mm, fine coal -2 - +0.125mm
- Solid Density: 1.68
- Slurry Density: 1.30
- Sizing: Tailings sub -0.125mm

The grading of the tailings will be that of a fine silty sand. Rejects sizing will be -50mm.

Coarse and fine rejects are to be placed in layers and track compacted using a dozer. Permeability values for compacted rejects and tailings are listed in AMEC (2000) and are summarised in Table 5. These values are representative of values of Queensland coal mines.

Table 5: Summary of Permeability Values for Plant Rejects and Spoil from German Creek and Oaky Creek Mines

Material	Standard Compaction* (%)	Permeability (m/sec)	Comments
Plant Rejects (German Creek)	95	3.73×10^{-8}	Laboratory test (Reference 1)
Plant Rejects (German Creek)	91	1.42×10^{-6}	Laboratory test (Reference 1)
Plant Rejects (Talagai Pit, Oaky Creek)	95	10^{-6} to 10^{-8}	Field test (Reference 1)
Weathered Permian Spoil (Pit E, German Creek)	89 95	1.5×10^{-8} 1×10^{-9}	Laboratory test (Reference 1)
Fresh Permian Spoil (Pit E, German Creek)	90 96	1.5×10^{-6} 6×10^{-9}	Laboratory test (Reference 1)
Fresh Permian Spoil (Pit F, German Creek)	91 to 102	10^{-7} to 10^{-9}	Field test (Reference 1)
Tailings (German Creek)	Subaqueous deposition	4×10^{-8}	Laboratory test (Reference 1)

*AS1289

Table 6 summarises shear strength values for plant rejects and tailings samples obtained from German Creek Mines, which are representative of QLD coal mines.

Table 6: Summary of Shear Strength Data for Plant Rejects and Tailings, German Creek Mines

Material	Description	Shear Strength	
		Degrees	kPa
Plant Rejects (German Creek)	Black, sandy gravel	34 to 45	0
Tailings (German Creek)	Fine, silty sand	32	0

2.2 Geochemical Properties

The geochemical properties of tailings and rejects have been determined by examination and testing of drill cores. Based on these results, the tailings rejects will have a low capacity to be potentially acid forming. The totally sulphur content is average (Refer to Tables 7 and 8) and no oxidisable pyrite has been detected in any core.

Table 7: Weighted Average Full Seam CF1.50 Product Coal Properties

Seam			B	C	DU	DL1	DL2
CF1.50 Yield (a.d.)	%	**Average**	51.2	85.4	71.0	82.9	71.6
		Standard Deviation	12.7	8.0	12.9	8.1	22.4
Moisture (a.d.)	%	**Average**	7.7	7.4	7.3	7.0	7.2
		Standard Deviation	0.4	0.5	0.5	0.4	0.6
Ash (d.b.)	%	**Average**	19.6	10.0	11.1	7.9	7.8
		Standard Deviation	1.4	1.6	3.8	2.7	1.2
Volatile Matter (d.b.)	%	**Average**	32.8	38.2	38.2	37.8	38.0
		Standard Deviation	0.4	0.8	3.9	2.1	2.4
Volatile Matter (d.a.f.)	%	**Average**	40.9	42.4	42.9	41.0	41.2
		Standard Deviation	0.9	1.0	3.3	1.5	2.7
Total Sulfur (a.d.)	%	**Average**	0.40	0.63	0.54	0.48	0.49
		Standard Deviation	0.03	0.25	0.08	0.14	0.07
Calorific Value (d.b.)	MJ/kg	**Average**	25.39	28.97	28.34	29.86	29.81
		Standard Deviation	0.47	0.56	1.37	1.02	0.63
Calorific Value (a.r.) at 15% Product Moisture	kcal	**Average**	5155	5885	5755	6065	6055
		Standard Deviation	100	115	280	210	130

Salinity levels in the tailings will be low as indicated by the groundwater salinities in Table 1.

Table 8: Weighted Average Full Seam Raw Coal Properties

Seam			B	C	DU	DL1	DL2
Thickness	**m**	**Average**	5.98	2.30	2.09	1.02	1.87
		Standard Deviation	0.73	1.31	0.72	0.49	0.62
Moisture (a.d.)	**%**	**Average**	10.4	9.5	9.7	8.7	8.5
		Standard Deviation	1.9	1.7	1.6	1.7	2.2
Ash (d.b.)	**%**	**Average**	47.3	29.8	21.6	22.1	24.4
		Standard Deviation	2.3	13.5	9.3	10.5	13.9
Total Sulfur (a.d.)	**%**	**Average**	0.38	0.94	0.67	0.53	0.55
		Standard Deviation	0.07	0.70	0.28	0.14	0.26
Calorific Value (d.b.)	**MJ/kg**	**Average**	15.41	22.04	25.10	24.95	24.04
		Standard Deviation	0.89	4.96	3.63	3.94	5.18
Relative Density (a.d.)	**g/cm^3**	**Average**	1.68	1.54	1.47	1.48	1.51
		Standard Deviation	0.06	0.14	0.09	0.13	0.21

No metal enrichment will occur in the tailings or rejects. Expected pH range is 6 to 8.5. Because the tailings and rejects will be encased in a properly constructed clay blanket, there will be no possibility of oxidisation occurring.

3. Proposed Method of Disposal

3.1 CHPP Tailings Production and Transport

The China First Project is designed to process 56 million tonnes per annum (Mtpa) as received (ar) at a rate of 8000 tonnes per hour (tph). There will be two CHPP's each having four modules rated at 1000tph. The CHPP's are a conventional set up producing product coal, rejects (coarse and fine) and tailings, operating for a nominal 7000 hours per annum. The nominal split of these products is;

- 56Mtpa (ar) ROM feed
- 40Mtpa (ar) product coal
- 10.7Mtpa coarse and fine rejects
- 5.3Mtpa tailings

The tailings will be dewatered using Phoenix filter press conveyors. The tailings paste and rejects will be trucked to cells in the spoil piles.

3.2 Coal Handling Preparation Plant Water Balance

The quantity of water required to wash 56Mtpa of coal is 11,200 ML/year. Water will be entrained in the product coal, rejects and tailings paste streams with water generated in the filter pressing of tailings returned to the Return Water Dam. A water balance for the CHPPs is shown in Figure 8 and indicates that with a filter pressed tailings system the CHPPs will generate 1,070 ML/year of excess water. Excess water from the CHPPs will be transferred to other mine affected water storages for re-use and disposal.

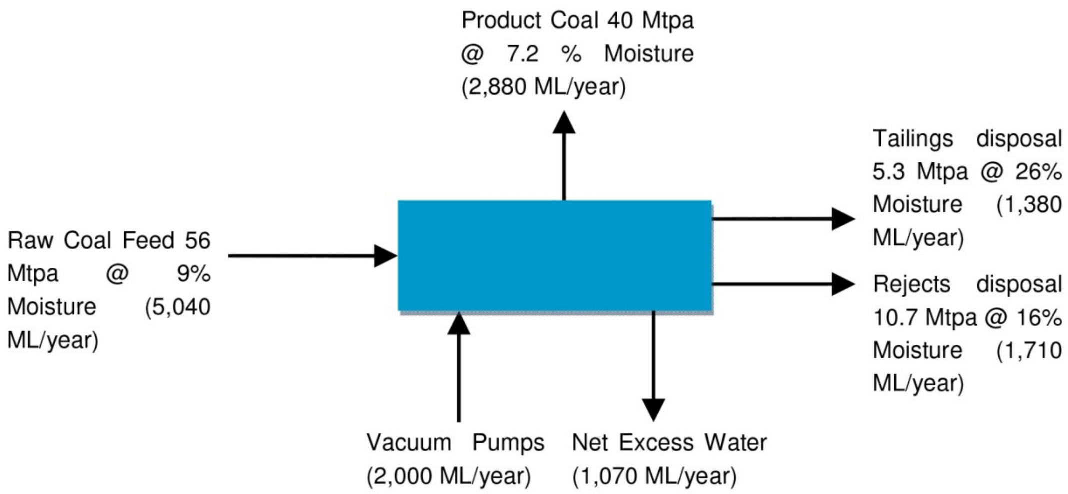

Figure 8: Water Balance of CHPP

3.3 Tailings Storage Facility Location

Positioning of the TSF takes into consideration aspects of site features and the mine layout. The mine landscape features and mine layout infrastructure such as open-cut location, waste dump location and CHPP locality were considered when siting the TSF.

Site features include the gentle slope of the land trending from west to east away from the open-cut box cut, providing for a stable foundation and minimal catchment runoff. The nearest creek system Tallarenha Creek will be moved 3km further east by construction of a diversion channel.

The TSF will be initially located within the box cut spoil adjacent to the initial box cut lox line. The initial cells will be placed as close as practical to CHPP and within initial box cut waste areas.

Mine infrastructure such as haul roads, power lines and light vehicle access roads are positioned for operational requirements, but will be utilised as part of the TSF layout.

The location of the TSF cells is seen as the best location, utilising the waste spoil area foot print, waste spoil material to form cell walls and close proximity to CHPP and other related mine infrastructure.

3.4 Tailings Emplacement Strategy

It is proposed to truck tailings and rejects to properly engineered containment cells constructed in spoil piles. The coarse and fine rejects are to be enveloped in an impervious clay blanket.

Geochemical testing indicates that coarse and fine rejects are benign and will remain so if they are encapsulated in an impervious clay blanket, to prevent oxidisation.

The construction of these cells will be as follows:

- Out of Pit Tailings Storage – Year 1 to Year 5
  - Design storage capacity for 57,967,256m^3 for first five years of production.
  - Areas within the proposed footprint of overburden waste will be stripped of topsoil and earth embankments made from overburden waste materials will be placed to form TSF cells. The cell embankments and floors will be further lined with an impervious blanket of clay encapsulating the tailings and rejects.
  - The TSF wall embankment will initially be 10m high and will be increased by lifts of 10m.
  - When the cell capacity of the storage area is nearing full capacity with allowable contingency, the cell wall will be further raise by another 10m. This process will continue to cater for the design capacity of 80Mt for 5 years.
  - Refer to Figure 9 for a schematic of the out of pit tailings facility

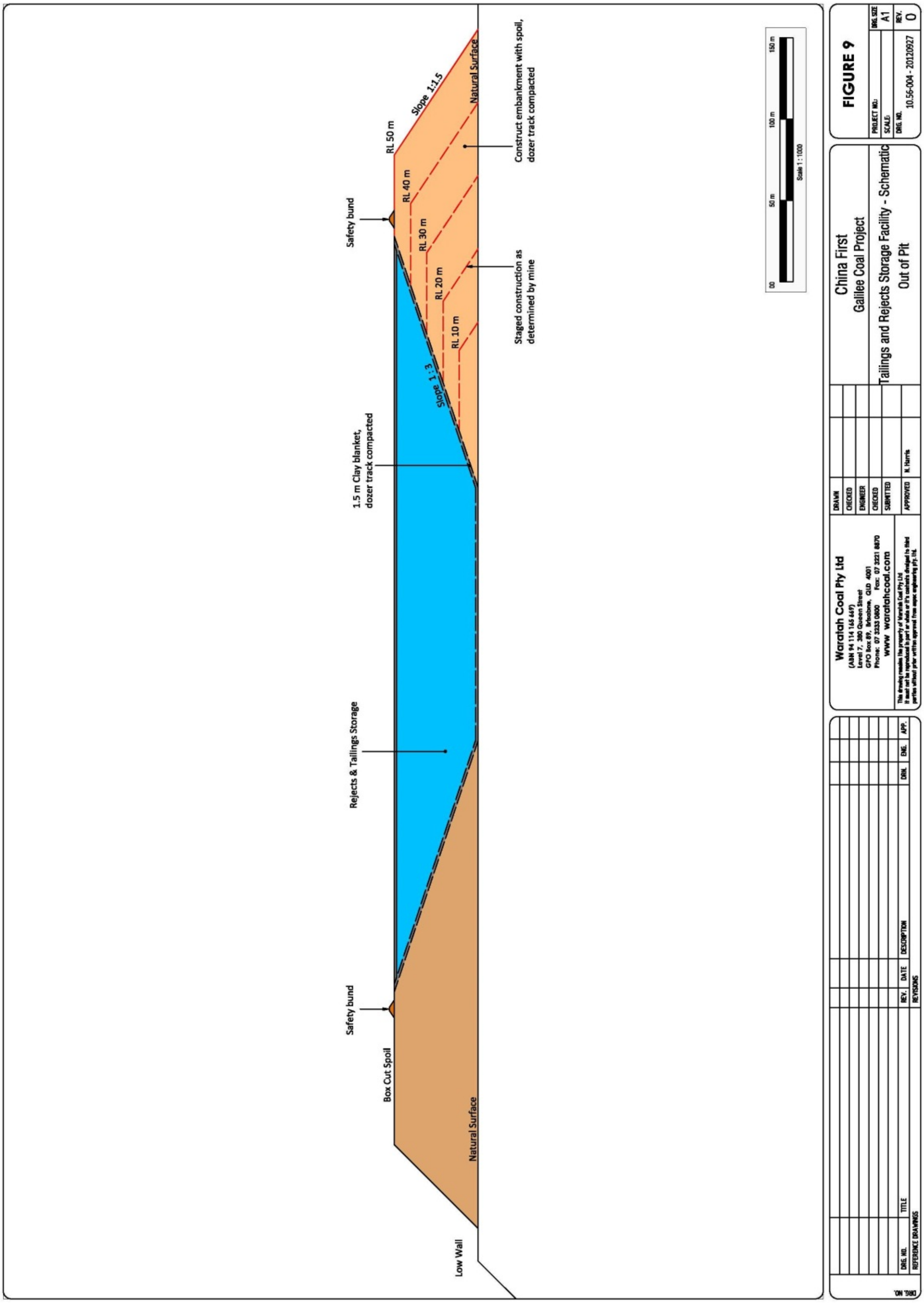

Figure 9: Schematic of out of pit tailings facility

- In Pit Tailings Storage - Year 6 to Year 25
  - Design storage capacity for 271,303,033m^3 for operational years 6 to 25.
  - Several in pit and in spoil TSF cells will be developed to cater for operational tailings for years 6 to 25.
  - Each cell will cater for approximately 5 years of operations with a capacity of 67,825,758m^3.
  - The initial in pit cell will be placed in a designed void left by original boxcut by strategically placing spoil to form cell embankments and protect down dip mining operations.
  - The existing low wall will be a natural clay face, or where not, lined with compacted clay with a design grade of 1 vertical to 3 horizontal.
  - Both end walls and high wall spoil embankments will be lined with compacted clay on batter slopes of 1 vertical to 3 horizontal.
  - The in pit cell wall embankment will have a depth of 40m and will trend down to 80m in the southern mining areas.
  - Tailings and rejects will then be trucked to the cell, dumped and track compacted by dozer.
  - When the cell capacity of the storage area is nearing full capacity with allowable contingency, the dam wall will be further raise by increments of 5m. This process will continue to cater for the design capacity of 67,825,758m^3 for 5 years.
  - Refer to Figure 10 for a schematic of in pit tailings facility

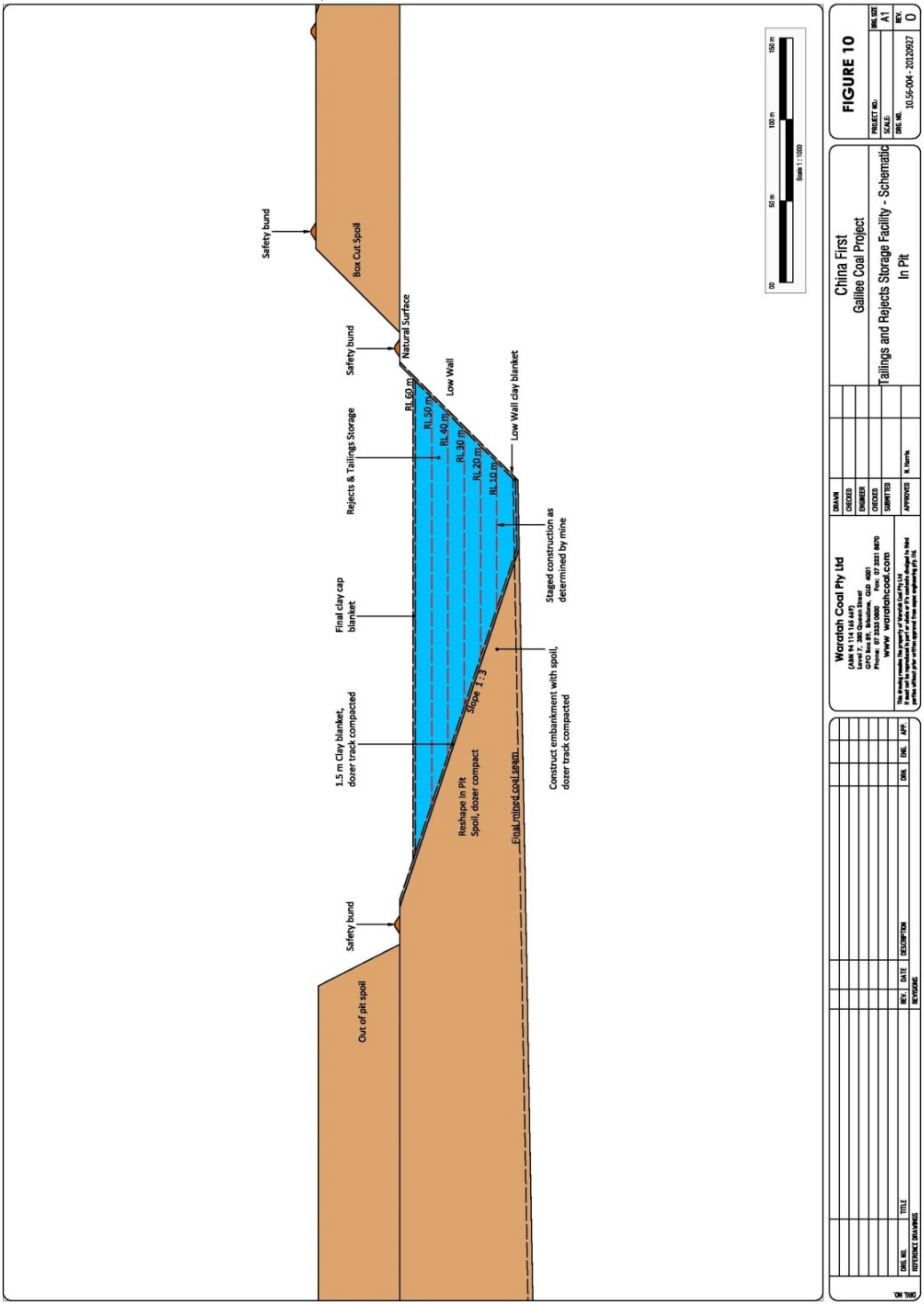

Figure 10: Schematic of in pit tailings facility

4. Tailings and Rejects Waste Quantity Produced

4.1 Tailings and Rejects Schedule

The quantity of tailings and rejects has been calculated based on the ramp up period being three years before full production of 56Mtpa of raw coal occurs. Table 5 indicates the tailings and rejects schedule.

Table 5: Tailings Schedule

Years	Cell Number	Stage Number	Crest RL	Storage Capacity	Cumulative	Life of Mine
				000 (m^3)	Capacity	
					000 (m^3)	
1 to 5	1	1	10	6457533	6457533	1
	1	2	20	10926811	17384344	2
	1	3	30	13452609	30836953	3
	1	4	40	13565152	44402105	4
	1	5	50	13565152	57967256	5
6 to 10	2	1	10	13565152	71532408	6
	2	2	20	13565152	85097560	7
	2	3	30	13565152	98662711	8
	2	4	40	13565152	112227863	9
	2	5	50	13565152	125793015	10
11 to 15	3	1	10	13565152	139358166	11
	3	2	20	13565152	152923318	12
	3	3	30	13565152	166488470	13
	3	4	40	13565152	180053621	14
	3	5	50	13565152	193618773	15
16 to 20	4	1	10	13565152	207183925	16
	4	2	20	13565152	220749076	17
	4	3	30	13565152	234314228	18
	4	4	40	13565152	247879380	19
	4	5	50	13565152	261444531	20
21 to 25	5	1	10	13565152	275009683	21
	5	2	20	13565152	288574835	22
	5	3	30	13565152	302139986	23
	5	4	40	13565152	315705138	24
	5	5	50	13565152	329270290	25

The TSF will be designed to receive and store tailings produced by the CHPP for the nominal 25 years mine life. Tailings, paste and rejects will be trucked to dedicated TSF cells within the box cut and other spoil areas. Table 6 lists tailings storage capacity required for the life of the mine.

Table 6: Tailings and Rejects Storage Capacity for the Life of the Mine

Life of mine	Raw coal	Solid rejects	Rejects moisture	Solid tailings	Tailings moisture	Stored	Cumulative	TSF Stage	Five year stage
Year	000 tonnes	000 tonnes 19%	16.00%	000 tonnes 9.5%	26%	tailings and rejects	tailings and rejects		
			Ml/yr	Ml/yr	Ml/yr	m^3/yr	m^3		m^3
Construction 1	0								
Construction 2	0								
Construction 3	0								
1	26681	5096	815	2535	659	6457533	6457533		
2	45147	8623	1380	4289	1115	10926811	17384344		
3	55583	10616	1699	5280	1373	13452609	30836953		
4	56048	10705	1713	5325	1384	13565152	44402105		
5	56048	10705	1713	5325	1384	13565152	57967256	Stage 1 - Out of Pit	57967256
6	56048	10705	1713	5325	1384	13565152	71532408		
7	56048	10705	1713	5325	1384	13565152	85097560		
8	56048	10705	1713	5325	1384	13565152	98662711		
9	56048	10705	1713	5325	1384	13565152	112227863		
10	56048	10705	1713	5325	1384	13565152	125793015	Stage 2 - In pit	67825758
11	56048	10705	1713	5325	1384	13565152	139358166		
12	56048	10705	1713	5325	1384	13565152	152923318		
13	56048	10705	1713	5325	1384	13565152	166488470		
14	56048	10705	1713	5325	1384	13565152	180053621		
15	56048	10705	1713	5325	1384	13565152	193618773	Stage 3 - In pit	67825758
16	56048	10705	1713	5325	1384	13565152	207183925		
17	56048	10705	1713	5325	1384	13565152	220749076		
18	56048	10705	1713	5325	1384	13565152	234314228		
19	56048	10705	1713	5325	1384	13565152	247879380		
20	56048	10705	1713	5325	1384	13565152	261444531	Stage 4 - In pit	67825758
21	56048	10705	1713	5325	1384	13565152	275009683		
22	56048	10705	1713	5325	1384	13565152	288574835		
23	56048	10705	1713	5325	1384	13565152	302139986		
24	56048	10705	1713	5325	1384	13565152	315705138		
25	56048	10705	1713	5325	1384	13565152	329270290	Stage 5 - In pit	67825758

The methodology for staging of tailings disposal is indicated schematically in Figure 11, and tabulated in Table 6.

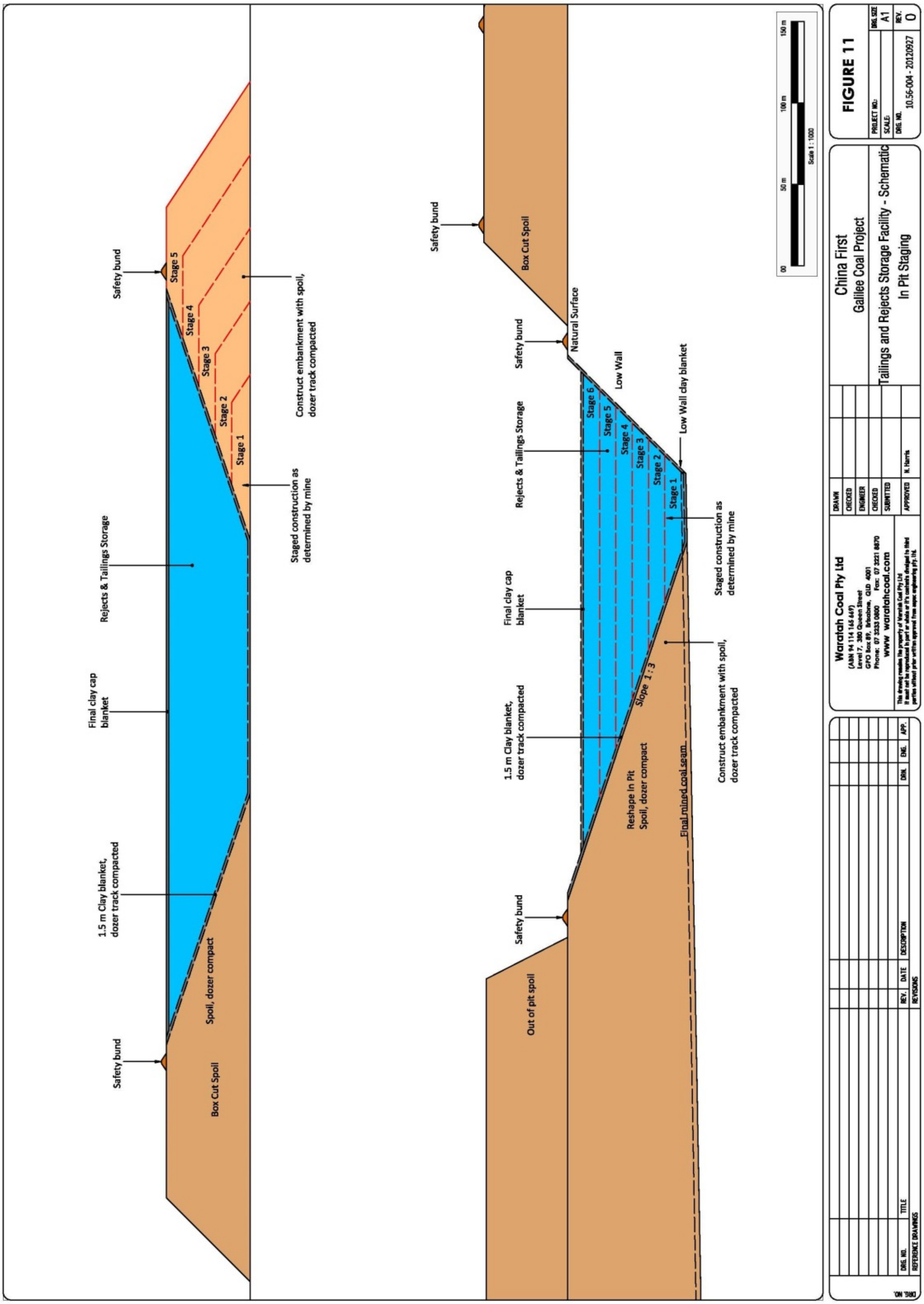

Figure 11: Sectional view of TSF development cell staging

5. Tailings Storage Facility Alternative Options

Several TSF options were reviewed before a decision was made to use the solution of trucking tailings paste and rejects to dedicated cells over the life of the mine. The various tailings facility options reviewed include dry tailings, conventional thickener/tailings dam, co-disposal and thickened tailings disposal.

5.1 Dry Tailings

This method takes tailings from the thickener and utilises filter presses to dewater the tailings to produce tailings paste. The paste is then trucked to a dedicated disposal site along with rejects.

- Advantages
  - High water recovery, with filter press
  - Smaller footprint imposed on environment
  - Disposal sites are available for rehabilitation earlier
  - Becoming an industry accepted method
- Disadvantages
  - The method is capital intensive
  - Filters may have low availability, if not maintained correctly
  - Clay blankets are require to be constructed to prevent runoff and seepage at the disposal site

5.2 In-pit Disposal of Dry Tailings

This method utilises voids within the open-cut pits created by the mining open-cut stripping operations. The TSF do not require retaining walls, reducing risks associated with embankment instability.

- Advantages
  - Tailings to be stored below ground
  - Less capital required to construct TSF
  - Less land taken and disturbed for the TSF footprint
  - All other advantages per the 'dry tailings'

- Disadvantages
  - Extensive tailings haulage distances
  - Mine planning needs to accommodate voids
  - Interface with mine infrastructure
  - All other disadvantages per the ‘’dry tailings’

5.3 Conventional Thickener / Tailings Dam

This method is used extensively throughout the Bowen Basin with coal. The process flocculates tailings which are pumped at approximately 30% solids. The solids settle within the dam reservoir. The water is decanted and is then recycled back to the CHPP. On average, 60% of the water pumped from the CHPP will be recycled while 10% will evaporate. The remainder stays entrained in the tailings

Advantages and disadvantages of the methodology are given below:

- Advantages
  - Used extensively within the coal industry with proven methodology
  - Ease of operations
  - Low capital and operating costs
- Disadvantages
  - Comparatively lower recycled water
  - Potential for dam seepage is greater
  - Delay in rehabilitation due to extended dewatering time
  - Potential ground water interference
  - High rehabilitation costs

5.4 Co-disposal

The Co-disposal method involves pumping a mixture of tailings and coarse rejects together. This is pumped to a co-disposal dam at about 40% to 45% solids. The solids and water are piped into the dam at variable locations with clean water being decanted into a downstream clean water dam for reuse in the CHPP.

- Advantages
  - Simpler coarse rejects handling, requiring no trucks
  - Potential for greater percentage of recycle water to CHPP
  - Potential to rehabilitate dam quicker, due to the dam drying out at a faster rate
- Disadvantages
  - Pumping limitations require dam site to be positioned close to CHPP
  - High wear rate and pumping and pipeline costs
  - Significantly larger dam size footprint required for both coarse rejects and tailings
  - Frequent pipe blockage, causes operational issues
  - Management of dam facilities and infrastructure required for operations of tailings and coarse rejects placements

5.5 Thickened Tailings Disposal

This involves the further thickening of tailings up to approximately 45% to 60% solids.

5.5.1 Paste Disposal

Typically, thickener underflow (30% solids) is pumped as per conventional tailings disposal to the tailings dam (or cell) site. The finer particles of the paste act as a coating to the inside of the pump/pipe which reduces the friction during movement and allows coarse fragments to be displaced. The tailings are further thickened (about 50% solids) until the paste does not separate when it is no longer in motion, before disposal into a dam or a series of elongated cells. Water is recycled from both thickeners and from the paste disposal site.

- Advantages
  - Potentially higher water recovery than a conventional tailings dam
  - Smaller disposal footprint site, due to higher solids content
- Disadvantages
  - Rehabilitation is difficult as the paste is difficult to further dewater
  - Paste is verging on thixotropic, requiring positive displacement pumps working at pressure

- Paste thickening of coal tailings is difficult because of the comparatively low specific gravity of the tailings materials

5.5.2 Super Flocculation

Tailings are thickened using super flocculation. With this method, tailings are further flocculated just before discharge into the tailings dam. The further flocculation increases the solids content to 40% to 50%. The effectiveness of super flocculation will vary with material type.

- Advantages
    - At the point of discharge this method avoids the problems associated with paste pumping
    - Potentially higher water recovery than a conventional tailings dam
    - Smaller disposal footprint site, due to higher solids content
- Disadvantages
    - Rehabilitation is difficult as the thickened tailings are difficult to further dewater
    - Effectiveness is tailings specific
    - Very high flocculent consumption

5.6 Experience at Other Queensland Coal Mines

Historically, mines throughout QLD have adopted conventional TSF above ground and later with in pit voids. With a ground swell of public concerns of TSF and their impacts to the environments, coal mines are now adopting TSF's and methods which are water efficient and have a lesser footprint imposition to the environment.

Mines throughout the Bowen Basin are retrofitting the dry paste tailings option now that the technology has improved. Mines such as Carborough Downs, Millennium and BMA mines now look to utilise this method.

5.7 Selection of Preferred Option

The preferred TSF was selected by way of an options assessments process. Using a weighted evaluation matrix, each option was assessed against criteria such as:

- Impact to environment
- Time lag of rehabilitation
- Percentage of retrievable return water
- Proven tailings operational process
- Capital expenditure
- Operational costs

The results from the matrix evaluation are displayed in Table 8.

Table 8: Tailings Methodology Evaluation Matrix

Criteria	Wt	Dry		Tailings Dam		Tailings Dam		Co-disposal		Paste		Super Floc	
	%			Out of pit		In pit							
		Score	Wtd Score	Score	Wtd Score	Score	Wtd Score	Score	Wtd Score	Score	Wtd Score	Score	Wtd Score
Env Impact	20	8	1.6	7	1.4	7	1.4	6	1.2	8	1.6	6	1.2
Rehab	15	8	1.2	6	0.9	6	0.9	7	1.05	7	1.05	7	1.05
Recycle	10	9	0.9	4	0.4	6	0.6	7	0.7	7	0.7	7	0.7
Tech Risk	10	6	0.6	8	0.8	8	0.8	7	0.7	5	0.5	7	0.7
Operations	15	6	0.6	8	0.8	7	0.7	7	0.7	6	0.6	6	0.6
Capex	10	5	0.5	8	0.8	8	0.8	6	0.6	5	0.5	6	0.6
Opex	20	6	0.6	8	0.8	7	0.7	6	0.6	5	0.5	5	0.5
Total	**100**		**6**		**5.9**		**5.9**		**5.55**		**5.45**		**5.35**
Ranking			**6**		**1**		**2**		**3**		**4**		**5**

Scoring: 10 = Low, 5 = Medium, 0 = High

Based on the evaluation matrix, the preferred tailings disposal methodology is dry paste disposal. The TSF will be captured within the box cut spoil footprint followed by TSF being placed within the in pit void and progressive spoil zone.

6. Construction of Facility

The project will design, build, operate and rehabilitate TSFs which align with the following criteria:

- Mine design life of 25 years
- Design storage allowance to prevent discharge from the cells to the environment
- Priority to efficient water use
- Secure rehabilitation plan
- Cells designed to accepted industry guidelines and standards.

6.1 Groundwater Considerations

The project will need to consider potential seepage of the TSF. With the current out of pit cell design, the foundation material comprises low permeability Tertiary Clay and weathered Permian strata. Seepage water cannot permeate through these materials to any underlying aquifers. A clay blanket will be installed to prevent any lateral seepage.

With in-pit TSF, clay blanket lining will prevent escape of seepage water. In the unlikely event of any seepage water escaping, it would flow down the pit floor/spoil contact to the pit void, from where pit water is pumped to a dirty water dam.

6.2 Seepage Control

The control of seepage from TSP will be designed for and managed. Seepage and its prevention will be managed through the following:

- Providing a clay liner to prevent seepage
- Compaction of existing soils for out of pit and in-pit areas
- Doze and track compact dumped tailings and rejects.

6.3 Embankment Design

6.3.1 Design Criteria

The geotechnical requirements for the tailings and the reject cells are that the rejects are enveloped in clay blankets that are effectively impervious and that the batters of the cells are geotechnically stable. Recommended batter slope is 1 (vertical) on 3 (horizontal).

Rejects comprise fresh sandstone, siltstone and claystone fragments less than 50mm in diameter. Tailings grain size varies from 0.030mm to 0.25mm. The definitions of rock, soil and degrees of chemical weathering are included in Table 9.

The clay blanket is to be placed on track compacted Permian spoil in 300mm layers. The blanket true thickness is 1.5 m. Minimum required dry density ratio is 98% standard compaction at optimum moisture content (OMC) plus 2% for cohesive soils. The maximum dry density shall be determined in accordance with Test No 5.1.1. (Standard Compaction) of AS 1289 for cohesive material.

Good quality non-dispersive, clay is required for the blankets. The material shall be a well graded sandy/silty clay as defined below:

Liquid Limit W_L	30% to 60%
Plasticity Index I_p	15% to 45%

Emerson dispersion testing as described in Table 10 is required to ensure that non-dispersive blanket clay is used.

TABLE 9: DEFINITIONS OF ROCK, SOIL, AND DEGREES OF CHEMICAL WEATHERING

(A) GENERAL DEFINITIONS – ROCK AND SOIL

ROCK In engineering usage, rock is a natural aggregate of minerals connected by strong and permanent cohesive forces.

Note: Since 'strong' and 'permanent' are subject to different interpretations, the boundary between rock and soil is necessarily an arbitrary one.

SOIL In engineering usage, soil is a natural aggregate of mineral grains which can be separated by such gentle mechanical means as agitation in water.

The two principal classes of soil are:

(a) Residual soils – soils which have been formed in-situ by the chemical weathering of parent rock. Residual soil may retain evidence of the original rock texture or fabric or, when mature, the original rock texture may be destroyed.

(b) Transported soils – soils which have been moved from their places of origin and deposited elsewhere. The principal agents of erosion, transport and deposition are water, wind, ice and gravity. Two important types of transported soil in engineering geology and materials investigation are:

(c) Slopewash – a soil, often including angular rock fragments and boulders, which has been transported downslope predominantly under the action of gravity assisted by water. The principal forming process is that of soil creep in which the soil moves after it has been weakened by saturation. It may be water borne for short distances.

(d) Alluvium – a soil which has been transported and deposited by running water. The larger particles (sand and gravel size) are water worn.

(B) ROCK WEATHERING DEFINITIONS

COMPLETELY WEATHERED ROCK (CW)	Rock which retains most of the original rock texture (fabric) but the bond between its mineral constituents is weakened by chemical weathering to the extent that the rock will disintegrate when immersed and gently shaken in water. In engineering usage this is a soil.
HIGHLY WEATHERED ROCK (HW)	Rock which is weakened by chemical weathering to the extent that dry pieces about the size of 50mm diameter drill core can be broken by hand across the rock fabric. Highly weathered rock does not readily disintegrate when immersed in water.
MODERATELY WEATHERED ROCK (MW)	Rock which exhibits considerable evidence of chemical weathering, such as discolouration and loss of strength but which has sufficient remaining strength to prevent dry pieces about the size of 50mm diameter drill core (of inherently hard rock) being broken by hand across the rock fabric. Moderately weathered rock does not ring when struck with a hammer.
SLIGHTLY WEATHERED ROCK (SW)	Rock which exhibits some evidence of chemical weathering, such as discolouration, but which has suffered little reduction in strength. Except for some inherently soft rocks, slightly weathered rock rings when struck with a hammer.
FRESH WITH LIMONITE STAINED JOINTS (Fr St)	Joint faces coated or stained with limonite but the blocks between joints are unweathered.
FRESH ROCK (Fr)	Rock which exhibits no evidence of chemical weathering. Joint faces may be clean or coated with clay, calcite, chlorite or other minerals.

The degrees of rock weathering may be gradational. Intermediate stages are described by dual symbols with the predominant degree of weathering first (eg. CW-HW).

The various degrees of weathering are not absolute strength parameters as some rocks are weak, even when fresh, to the extent that they can be broken by hand across the fabric.

Fresh drill cores of some rock types, mainly shale, siltstone, and silty or tuffaceous sandstone may disintegrate after exposure to the atmosphere due to slaking, desiccation, expansion or contraction, stress relief or a combination of any of these factors.

Table 10: Emerson Dispersion Classification

Class	Description
Class 1	Slaking and complete dispersion before remoulding
Class 2	Slaking and some dispersion before remoulding
Class 3	Slaking and no dispersion before remoulding, dispersion after remoulding
Class 4	Slaking and no dispersion before remoulding, no dispersion after remoulding, calcite or gypsum present
Class 5	Slaking and no dispersion before remoulding, no dispersion after remoulding, no calcite or gypsum present, dispersion after shaking in a 1:5 soil / water suspension
Class 6	Slaking and no dispersion before remoulding, no dispersion after remoulding, no calcite or gypsum present, flocculation after shaking in a 1:5 soil / water suspension
Class 7	No slaking, swelling occurs
Class 8	No slaking, swelling does not occur

It is important to ensure proper compaction standards at the required moisture content (OMC, plus 2%).

The first 1,000mm placed in contact with natural foundations or track compacted spoil shall have a minimum of 20% passing the 75 µm sieve.

Tailings and rejects are to be placed in layers and track compacted using a dozer.

Design parameters used for TSF include:

to the detailed design include:

- Embankment slope stability, factor of safety of 1.5
- Short term construction stability factor of safety of 1.2
- A factor of safety of 1.1 under seismic loading conditions
- An allowance for freeboard of 0.5m plus 0.8m for DSA requirement
- Seismic coefficient of 0.04 g for horizontal force.

6.3.2 Stability Analyses

Tailings and rejects cells have been designed with safety factors greater than 1.5. Shear strength values are summarised in Table 11.

Table 11: Shear Strength Values

Material	Unit Weight (kN/m³)	Friction Angle (°)	Cohesion c' (kPa)
Embankment Clay Fill, Clay Blanket	19	30	5
Fresh Spoil	20	34	0
Tailings	17	25	0
Rejects	20	34 to 40	0
Foundation	25	40	0

All cells batters will have slopes of 1 (vertical) to 3 (horizontal) which is equal to an angle of 18.4°, resulting in safety factors greater than 1.5.

6.4 Surface Water Management

Catchment areas for all cells will only consist of the surfaces exposed to rainfall. All cells will have the required design storage allowance (DSA). At the completion of cell infill, an impervious, compacted cap will be constructed followed by topsoiling and seeding.

6.5 Safeguards

There will always be open-cut voids down dip off spoil pile cells. In the unlikely event of seepage, all contaminated water would be captured in voids and then pumped to the dirty water dams.

6.6 Construction Methodology

All construction works to do with TSF will be performed by a reputable civil contractor with prior experience constructing similar structures. The civil design engineer and the geotechnical design engineer will be engaged through the construction period to ensure works are constructed in accordance with the specification and design parameters. An independent geotechnical consultant will be engaged to undertake confirmation testing including compaction, permeability, dispersion testing to further ensure the facility is constructed in accordance with requirements.

6.7 Regulatory Category

A hazard assessment study will be carried out at the design stage to assess the hazard category of this tailings storage facility. This study will be based on the current DEHP guidelines for TSF design.

The following sources of risk will be analysed:

- Embankment failure
- Leakage from TSF
- Groundwater seepage.

7. Monitoring Requirements

The following monitoring requirements are to be implemented.

7.1 Tailings Chemical Analysis

The tailings solids will be monitored to determine the geochemical characteristics of pH, electrical conductivity (EC), acidity, alkalinity, sulphur species (total, organic, sulphide and sulphate) and acid neutralising capacity (ANC) on a monthly basis until such time as the variability of the geochemical characteristics of the tailings solids is well defined (estimated to be 12 months). A less frequent testing regime will then be used with testing frequencies at least annually.

Pit water downdip of cells will also be monitored on a monthly basis and tested for pH, EC, total dissolved solids (TDS), acidity and alkalinity. Major anions (sulphate, chloride, fluoride), major cations (calcium, magnesium, sodium and potassium) and trace metals (aluminium, arsenic, antimony, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, selenium, silver, uranium, vanadium and zinc) will be included in the range of analytes tested in these water samples, initially on a quarterly basis (for 12 months) and then on an annual basis throughout the life of the mine.

7.2 Groundwater Monitoring

Groundwater level and quality will be monitored over the duration of the tailings disposal operations as well as after the closure of the mine and infrastructure, as part of an on-going closure plan. Groundwater monitoring bores will be installed and strategically positioned adjacent to disposal areas.

7.3 Tailings Cells Monitoring

Embankment monitoring instrumentation would be installed within the TSF containment embankments to monitor performance. This information is essential for on-going assessment of the stability of the embankments during operations and embankment raising. Piezometers will be installed to check groundwater levels.

Survey monuments would be installed along each embankment. These monuments would be surveyed on a regular basis to detect any embankment movements. The information derived from both piezometers and monuments will be used to assess the overall stability of the embankments.

A meteorological station will be installed near the TSF to monitor and record rainfall and evaporation data.

8. Rehabilitation and Closure Strategy of Facility

8.1 Objectives

The objectives of rehabilitating disturbed land from the construction and operation of the mine and associated infrastructure are as follows:

- **Achievement of acceptable post-disturbance land use suitability** – Mining and rehabilitation will aim to create a stable landform with land use capability and/or suitability similar to that prior to disturbance, unless other alternative beneficial land uses are pre-determined and agreed. This will be achieved through the establishment of clear rehabilitation success criteria and outlining the monitoring requirements necessary to establish the extent to which each criterion is being achieved.
- **Creation of stable post-disturbance landform** - Mine wastes and disturbed land will be rehabilitated to a condition that is safe to humans and native fauna / domestic livestock, self-sustaining, or alternatively to a condition where maintenance requirements are consistent with an agreed post-mining land use.
- **Preservation of downstream water quality** – Surface and groundwaters that leave the mining lease should not be degraded to a significant extent. Current and future water quality should be maintained at levels that are acceptable for users downstream of the site.

8.2 Rehabilitation Strategy

All areas which are significantly disturbed by mining activities will be rehabilitated to a safe and stable landform with a self-sustaining vegetation cover. Rehabilitation of disturbed land will typically proceed within two years of the areas becoming available for rehabilitation. In some situations however, the commencement of progressive rehabilitation activities may not be possible because the area may be effectively integrated with areas nearby that are unavailable for rehabilitation. To achieve the objectives above, rehabilitation will be conducted so that:

- Suitable species of vegetation are planted and established to achieve a matrix of pasture, grassland and bushland post-mine land uses.
- Landscaping and rehabilitation works will, where practicable, include endemic native species of local provenance, and where suitable will also make use of conservation of significant flora species or species that can provide habitat opportunities for conservation of significant fauna.
- Potential for erosion is minimised, including likelihood of environmental impacts being caused by the release of dust.

- The quality of surface water and seepage released from the site is such that releases of contaminants are unlikely to result in environmental harm and impacts to beneficial users of the resource.
- The water quality of any residual water bodies meets criteria for subsequent uses and does not have the potential to cause environmental harm.
- The final landform is safe to humans and native fauna / domestic stock, stable and not subject to slumping or erosion which will result in the agreed post-mining landform being maintained.

A Rehabilitation Management Plan will be developed to incorporate the control strategies and monitoring programs identified in the EM Plan.

8.3 Landform Design and Planning

Rehabilitation planning will ensure the total area of disturbance at any one time is minimised to reduce the potential for wind-blown dust, visual impacts and increased sediment-laden run-off.

Rehabilitation will be designed to achieve a safe and stable final landform compatible where practicable and possible with the surrounding environment. This will involve the reshaping of the majority of overburden emplacement slopes to $<10^{o}$. Where slopes are $>10^{o}$, additional drainage and revegetation works will be carried out to achieve the necessary erosion / sediment control and groundcover establishment.

The use of natural re-contouring will be incorporated in rehabilitation design and construction and treed vegetation will be retained where possible along the toe of rehabilitation areas. Where ever possible, vegetation will be retained unless an unacceptable safety or erosion risk remains.

Waterways and diversions on the project site will be rehabilitated to a pre-determined post-mining standard. This will include the use of endemic native trees, shrubs and grasses where suitable.

The conceptual final landform for the entire site will be determined through consultation with relevant Government agencies and the local community. Once a conceptual design is finalised, a detailed Landscape Rehabilitation Plan, based on the desired post-mining landform will be developed and submitted to Government for consideration.

8.4 Rehabilitation Methods

8.4.1 Progressive Rehabilitation

Rehabilitation will typically be undertaken on areas that cease to be used for mining or mine-related activities within two years of becoming available. This will reduce the amount of disturbed land at any one time. Results of progressive rehabilitation and vegetation trials (if appropriate) will be used to refine rehabilitation methods for future application such as the selection of appropriate drainage measures and plant species for re-establishment. Areas available for progressive rehabilitation and the types of disturbance at those sites will be detailed in the Plan of Operations.

8.4.2 Revegetation

Revegetation activities will typically commence at the completion of reshaping, re-topsoiling and drainage works. The timing of these works will ideally be scheduled to enable a preferred seasonal sowing of pasture and tree seed. Where surfaces have been prepared, selected tree, shrub and pasture species will be sown using seed stock and/or planted depending on the species, slope gradients and area to be revegetated. Rehabilitation will utilise tree and shrub species at a density and richness consistent with the desired post-mine landform.

Plant selection for areas to be returned to a bushland landform will be based on the following criteria:

- The species will successfully establish on the available growth medium
- The species will bind the soil
- The species diversity will result in a variety of structure and food / habitat resources.

Native flora used for rehabilitation will ideally be locally endemic and will be established through a combination of direct seeding or planting of tube stock / nursery-raised stock from local propagules. Seed will be collected from site where possible and treated if necessary to ensure it is adapted to environmental conditions in the area. Tree and shrub establishment on site will be dominated by the direct seeding method, currently being used at the majority of coal mines in the Bowen Basin. An initial tree and shrub mix, based on the species list from the terrestrial ecology assessment is provided in Table 12, and will be reviewed periodically depending on changes in best practice, technology and rehabilitation monitoring results.

Table 12: Tree and Shrub Species

Common Name	Scientific Name	Woodland	Grassland	Riparian Zone
Acacia cambagei	Gidgee	X		
Acacia coriacea sub sp. *Seriocophylla*	Desert Oak	X		
Acacia excels	Ironwood	X		
Acacia harpophylla	Brigalow	X		
Acacia holosericea	Soap Bush	X		
Acacia Lazaridis	Lazarides Wattle	X		
Acacia oswaldii	Milijee	X		
Acacia salicina	Sally Wattle	X		
Acacia shirleyi	Lancewood	X		
Aeschynomene indica	Budda Pea	X		
Alphitonia excels	Red Ash	X		
Aristida bigandulosa	Dark Wiregrass	X		
Aristida calycina	Dark Wiregrass	X		
Aristida inaequiglumis	Feathertop Three-awn			X
Artistida latfolia	Feathertop Wiregrass	X		X
Astrebla elymoides	Hoop Mitchell Grass		X	
Astrebla pectinata	Barley Mitchell Grass		X	
Astrebla squarrosa	Bull Mitchell Grass		X	
Atalaya hemiglauca	Whitewood	X		X
Bothriochloa ewartiana	Desert Bluegrass	X		
Brachychiton populneus	Kurrajong	X		X
Callitris glaucophylla	White Cypress Pine	X		
Carissa ovate	Currant Bush	X		
Calytrix microcoma	Desert Star Flower	X		
Chloris divaricate	Slender Chloris	X		X
Chyrsopogon fallax	Golden Beard Grass	X		
Corymbia dallachiana	Dallachy's Gum	X		X
Corymbia setosa	Rough-leaved Bloodwood	X		
Dactyloctenium radulans	Button Grass	X		
Dichanthium sericeum sub sp. *Sericeum*	Bluegrass	X	X	
Digitaria brownii	Cotton Panic Grass	X		
Dodonaea lanceolata var. lanceolata	Hopbush	X		
Enchylaena tomentosa	Ruby Saltbush	X		X
Eragrostis elongate	Clustered Lovegrass	X		X
Eragrostis lacunaria	Purple Lovegrass			X
Eragrostis parviflora	Weeping Lovegrass	X		X
Eremophila latrobei	Crimson Turkey Bush	X		
Eremophila mitchelli	False Sandalwood	X		
Erythrina vespertilio	Bat's Wing Coral Tree	X		
Eucalyptus brownie	Reid River Box	X		
Eucalyptus camaldulensis	Red River Gum	X		X
Eucalytpus cambageana	Dawson Gum	X		X
Eucalyptus coolabah	Coolabah	X		X
Eucalyptus melanophloia	Silver-leaved ironbark	X		X
Eucalyptus populnea	Poplar Box	X		
Eucalyptus similis	Queensland Yellowjacket	X		
Eucalyptus tessellaris	Moreton Bay Ash	X		X
Eucalyptus thozetiana	Thozet's Box	X		
Heteropogon contortus	Black Speargrass	X		X
Lysiphyllum carronii	Red Bauhinia	X		X
Melaleuca tamariscina	Weeping Bottlebrush	X		

Common Name	Scientific Name	Woodland	Grassland	Riparian Zone
Panicum decompositum	Native Millet	X	X	
Paspalidium caespitosum	Brigalow Grass	X		X
Pennisetum cillare	Buffel Grass	X		
Petalostigma pubescens	Quinine Bush	X		
Setaria surgens	Annual Pigeon Grass	X		
Sporobolus caroli	Fairy Grass		X	X
Themeda triandra	Kangaroo Grass	X	X	X
Triodia mitchelli	Soft Spinifex	X	X	
Triodia pungens	Soft Spinifex	X	X	

A combination of native and introduced pasture species will be used to ensure the establishment of a groundcover and thereby, reduce the likelihood of erosion. Legumes may also be selected to assist in the supply of bio-available nitrogen to the soil. If the use of introduced grasses and / or legumes is deemed necessary for erosion control in the bushland areas, pasture seed and fertiliser will be applied at a lower rate than for pasture outcomes to reduce competition with tree seed and / or seedlings.

Native and exotic pasture species will be sown where the risk of erosion is less and on the more protected aspects of landforms. Introduced grass species such as Rhodes Grass (*Chloris gayana*) and Indian Couch (*Bothriochloa pertusa*) will be used on the steeper slopes (>10°) as their growth habit provides more extensive coverage in a shorter time. Aerial sowing and ground broadcasting will be conducted for pasture seed as the preferred sowing methods and grazing will be restricted whilst the vegetation is establishing.

Weed species have the potential to have a major impact during rehabilitation activities. Weed management will be a critical component of mine rehabilitation with the use of a combination of control measures including:

- Herbicide spraying or scalping of weeds off soil dumps
- Washdown and cleaning of high risk equipment prior to entering the site
- Monitoring and control of existing weed populations and weed populations over the mine life.

All weed control will be undertaken in a manner which minimises soil disturbance. Declared weeds will be controlled in accordance with the *Land Protection Pest and Stock Route Management Act 2002* (LP Act). A detailed Weed Management Plan will be developed for the Project to ensure management of weeds in accordance with the requirements of the LP Act.

8.4.3 Rehabilitation and Decommissioning

Rehabilitation will be monitored regularly in accordance with the monitoring program identified below. Monitoring results will be compared against the nominated success criteria to track the progress of rehabilitation towards the objective of a self-sustaining ecosystem. Rehabilitation techniques will be continually developed and refined over the life of mine through an ongoing process of monitoring at the site and recognition of other industry experiences.

A corrective action program will be implemented to address areas of failed rehabilitation and periodic and final rehabilitation reports will be submitted to the DEHP as detailed in the Rehabilitation Management Plan.

8.5 Success Criteria

Preliminary success criteria (or closure criteria) for the rehabilitation of the main mine areas have been proposed in Table 14. The success criteria are performance objectives or standards against which rehabilitation success in achieving a sustainable system for the proposed post-mine land use is demonstrated. Satisfaction and maintenance of the success criteria (as indicated by monitoring results) will demonstrate that the rehabilitated landscape is ready to be relinquished from the mine's financial assurance and handed back to stakeholders in a productive and sustainable condition.

The success criteria have been developed to comprise indicators for vegetation, fauna, soil, stability, land use and safety on a landform-type basis that reflects the nominated post-mine land use of bushland and grassland. For each element, standards that define rehabilitation success at mine closure are provided.

Based on the generic indicators in Table 14, each criterion will be further developed to be specific, measurable, achievable, realistic and outcome based, and to reflect the principle of sustainable development. The further development of each criterion will be based on results of research, monitoring of progressive rehabilitation areas and risk assessments. The success criteria will be reviewed every three to five years with stakeholder participation to ensure the criteria remain realistic and achievable.

8.6 Commitments

- At closure, the mine will achieve the agreed rehabilitation success criteria
- Progressive rehabilitation of the disturbed areas will be undertaken on an availability basis
- An ongoing rehabilitation monitoring program will be undertaken against the agreed criteria
- Prior to closure information to support final void configuration will be developed
- The final voids will be designed to render them safe, stable and sustainable

Table 13: Success Criteria

Rehabilitation element	Indicator	Criteria
1. In-pit and out-of-pit spoil dumps and dragline spoil areas		
Landform stability	Slope gradient	No less than 75% of the area has slopes <10° and up to 25% of the area has slopes >10°. Where reject layers are present and exposed, the landform is capped.
	Erosion control	Erosion control structures are installed commensurate with the slope of the landform.
	Surface water drainage	Use of contour banks and diversion drains to direct water into stable areas or sediment control basins.
Water quality		Ensure receiving waters affected by surface water runoff have contaminant limits of electrical conductivity maximum of 1,500 µS/cm and pH range of 5.5 to 9.5, or as determined to be sustainable subject to future investigations and setting water quality objectives
Water Storages, Creek Diversions		Clean water storages and diversions to be stabilised and left as required. Dirty water storages to be cleaned out and rehabilitated to a stable non-polluting condition.
Topsoil	Salinity (electrical conductivity)	Soil salinity content is <0.6 dS/m.
	pH	Soil pH is between 5.5 and 8.5.
	Sodium content	Soil Exchange Sodium Percentage (ESP) is <15%.
	Nutrient cycling	Nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts. Adequate macro and micro-nutrients are present.
Vegetation	Land use	Area accomplishes and remains as a healthy working bushland ecosystem.
	Surface cover	Minimum of 70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present). No bare surfaces >20 m^2 in area or >10m in length down slope.
	Species composition	Comprise a mixture of native trees, shrubs and grasses representative of regionally occurring woodland to open forest where possible.
	Community Structure	Groundcover, understorey and overstorey structure similar to that of appropriate reference site(s)*.
	Resilience to disturbance	Established species survive and/or regenerate after disturbance. Weeds do not dominate native species after disturbance or after rain. Pests do not occur in substantial numbers or visibly affect the development of native plant species.
	Sustainability	Species are capable of setting viable seed, flowering or otherwise reproducing. Evidence of second generation of tree/shrub species. Vegetation develops and maintains a litter layer evidenced by a consistent mass and depth of litter over subsequent seasons. More than 75% of shrubs and/or trees are healthy when ranked healthy, sick or dead.
Fauna	Vertebrate species	Representation of a range of species characteristics (e.g. activity pattern, habitat usage, diet, dispersal character etc. from each faunal assemblage group (e.g. reptiles, birds, mammals), present in the ecosystem type, based on pre-mine fauna lists and sighted within the three-year period preceding mine closure. Sighting of species of conservation significance or indicators of the presence of species of conservation significance (e.g. tracks) likely to be present in the established ecosystem type within the three-year period preceding mine closure (assuming non-mine related disturbance has not eliminated local populations thereby removing the colonising source). The number of vertebrate species does not decrease by more than 25% in the successive seasons prior to mine closure or by more than 40% over the two successive seasons prior to mine closure.

Rehabilitation element	Indicator	Criteria
	Invertebrate species	Presence of representatives of a broad range of functional indicator groups involved in different ecological processes (including termites for soil structure, Collembola for decomposition, Hemiptera for herbivory and predatory groups such as arachnids, centipedes, earwigs, cockroaches and ants as indicators of a range of other processes.
	Habitat structure	Typical food, shelter and water sources required by the majority of vertebrate and invertebrate inhabitants of that ecosystem type are present, including: a variety of food plants; evidence of active use of habitat provided during rehabilitation such as nest boxes, stags and logs and signs of natural generation of shelter sources including leaf litter.
Safety		Risk assessment has been undertaken in accordance with relevant guidelines and Australian Standards and risks reduced to levels agreed with the stakeholders.
2. Final Voids (including Ramps)		
Landform stability	Slope gradient	Highwall faces exhibit long-term geotechnical stability and a geotechnical report has been completed. Competent rock Highwall to have slope of <65°. Incompetent rock highwall to have slope of <17°. Low wall to have slope of <17°. Ramp walls not backfilled exhibit long-term geotechnical stability and a geotechnical report has been completed. In-pit rejects and spoil slope gradients can exceed 15%.
	Erosion control	Erosion mitigation measures have been applied to ensure slope stability
	Surface water drainage	Use of contour banks and diversion drains to direct water into stable areas or sediment control basins.
Water quality		Electrical conductivity of any void water may exceed 1,500 µS/cm if an ecological assessment shows the long-term ecological stability and groundwater quality is not adversely affected.
Water Storages, Creek Diversions		As for 1.
Topsoil		As for 1.
Vegetation	Land use	Where ramps and in-pit spoil design allow, area accomplishes and remains as a healthy working bushland ecosystem (although naturalised grasses may be used).
	Surface cover	Minimum of 70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present). No bare surfaces >20 m^2 in area or >10m in length down slope.
	Species composition	Comprise a mixture grasses, shrubs and trees (where possible) suitable for establishment on steeper slopes.
	Community Structure	Groundcover and understorey structure to that of appropriate reference site(s)*.
	Resilience to disturbance	Established species survive and/or regenerate after disturbance. Weeds do not dominate native species after disturbance or after rain. Pests do not occur in substantial numbers or visibly affect the development of native plant species.
	Sustainability	More than 75% of individual grasses and shrubs are healthy when ranked healthy, sick or dead.
Safety		Risk assessment has been completed and risk mitigation measures have been implemented. Where risk mitigation measures include bunds, safety fences and warning signs, these have been erected generally in accordance with relevant guidelines and Australian Standards.
3. Reject dumps		
Landform stability	Slope gradient	Final slope of 1V:6H (9.5°).
	Erosion control	Reject emplacements have been capped to a depth of 1.5m of inert material. Erosion mitigation measures have been applied.
	Surface water drainage	Drainage control measures are installed.

Rehabilitation element	Indicator	Criteria
Landform stability	Slope gradient	No less than 75% of the area has slopes <10° and up to 25% of the area has slopes >10°. Where reject layers are present and exposed, the landform is capped.
	Erosion control	Erosion control structures are installed commensurate with the slope of the landform.
	Surface water drainage	Use of contour banks and diversion drains to direct water into stable areas or sediment control basins.
Water quality		Ensure receiving waters affected by surface water runoff have contaminant limits of electrical conductivity maximum of 1,500 µS/cm and pH range of 5.5 to 9.5, or as determined to be sustainable subject to future investigations and setting water quality objectives
Water Storages, Creek Diversions		Clean water storages and diversions to be stabilised and left as required. Dirty water storages to be cleaned out and rehabilitated to a stable non-polluting condition.
Topsoil	Salinity (electrical conductivity)	Soil salinity content is <0.6 dS/m.
	pH	Soil pH is between 5.5 and 8.5.
	Sodium content	Soil Exchange Sodium Percentage (ESP) is <15%.
	Nutrient cycling	Nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts. Adequate macro and micro-nutrients are present.
Vegetation	Land use	Area accomplishes and remains as a healthy working bushland ecosystem.
	Surface cover	Minimum of 70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present). No bare surfaces >20 m^2 in area or >10m in length down slope.
	Species composition	Comprise a mixture of native trees, shrubs and grasses representative of regionally occurring woodland to open forest where possible.
	Community Structure	Groundcover, understorey and overstorey structure similar to that of appropriate reference site(s)*.
	Resilience to disturbance	Established species survive and/or regenerate after disturbance. Weeds do not dominate native species after disturbance or after rain. Pests do not occur in substantial numbers or visibly affect the development of native plant species.
	Sustainability	Species are capable of setting viable seed, flowering or otherwise reproducing. Evidence of second generation of tree/shrub species. Vegetation develops and maintains a litter layer evidenced by a consistent mass and depth of litter over subsequent seasons. More than 75% of shrubs and/or trees are healthy when ranked healthy, sick or dead.
Fauna	Vertebrate species	Where capping allows for tree establishment, representation of a range of species characteristics (e.g. activity pattern, habitat usage, diet, dispersal character etc from each faunal assemblage group (e.g. reptiles, birds, mammals), present in the ecosystem type, based on pre-mine fauna lists and sighted within the three-year period preceding mine closure. Sighting of species of conservation significance or indicators of the presence of species of conservation significance (e.g. tracks) likely to be present in the established ecosystem type within the three-year period preceding mine closure (assuming non-mine related disturbance has not eliminated local populations thereby removing the colonising source). The number of vertebrate species does not decrease by more than 25% in the successive seasons prior to mine closure or by more than 40% over the two successive seasons prior to mine closure.
	Invertebrate species	Presence of representatives of a broad range of functional indicator groups involved in different ecological processes (including termites for soil structure, Collembola for decomposition, Hemiptera for herbivory and predatory groups such as arachnids, centipedes, earwigs, cockroaches and ants as indicators of a range of other processes.
	Habitat structure	Typical food, shelter and water sources required by the majority of vertebrate and invertebrate inhabitants of that ecosystem

Rehabilitation element	Indicator	Criteria
		type are present, including: a variety of food plants; evidence of active use of habitat provided during rehabilitation such as nest boxes, stags and logs and signs of natural generation of shelter sources including leaf litter.
Safety		Risk assessment has been undertaken in accordance with relevant guidelines and Australian Standards and risks reduced to levels agreed with the stakeholders.
4. Mine Plant/Industrial Areas		
Landform stability	Slope gradient	Area has gradient of <2°.
	Erosion control	Erosion mitigation measures have been applied.
	Surface water drainage	Use of contour banks and diversion drains to direct water into stable areas or sediment control basins.
Water quality		Ensure receiving waters affected by surface water runoff have contaminant limits of electrical conductivity maximum of 1,500 µS/cm and pH range of 5.5 to 9.5, or as determined to be sustainable subject to future investigations and setting water quality objectives
Water Storages, Creek Diversions		Clean water storages and diversions to be stabilised and left as required. Dirty water storages to be cleaned out and rehabilitated to a stable non-polluting condition.
Topsoil	Salinity (electrical conductivity)	Soil salinity content is <0.6 dS/m.
	pH	Soil pH is between 5.5 and 8.5.
	Sodium content	Soil Exchange Sodium Percentage (ESP) is <15%.
	Nutrient cycling	Nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts. Adequate macro and micro-nutrients are present.
Vegetation	Land use	Buildings, water storage, roads (except those used by the public) and other infrastructure have been removed unless stakeholders have entered into formal written agreements for their retention. Areas are readily accessible and conducive to safe cattle management activities. Predicted economics and /or benefits have been defined and agreed by the stakeholders.
	Surface cover	Minimum of 70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present). No bare surfaces >20 m^2 in area or >10m in length down slope.
	Species composition	Palatable, nutritious pasture grass species are present.
	Community Structure	Desirable grass species comprise at least 60% of total grass cover. Tree density and height of >25 stems per 5 ha each being >2m in height.
	Resilience to disturbance	Established species survive and/or regenerate after disturbance. Weeds do not dominate native species after disturbance or after rain. Pests do not occur in substantial numbers or visibly affect the development of native plant species.
	Sustainability	Nitrogen fixing grass species present. More than 75% of shrubs and/or trees are healthy when ranked healthy, sick or dead.
Fauna	Vertebrate species	Representation of a range of species characteristics (e.g. activity pattern, habitat usage, diet, dispersal character etc) from each faunal assemblage group (e.g. reptiles, birds, mammals), present in the grassland ecosystem type, based on pre-mine fauna lists and sighted within the three-year period preceding mine closure. The number of vertebrate species does not decrease by more than 25% in the successive seasons prior to mine closure or by more than 40% over the two successive seasons prior to mine closure.
	Invertebrate species	Presence of representatives of a broad range of functional indicator groups involved in different pastoral ecological processes (including termites for soil structure, Collembola for decomposition, Hemiptera for herbivory and predatory groups such as arachnids, centipedes, earwigs, cockroaches and ants as indicators of a range of other processes.

Rehabilitation element	Indicator	Criteria
	Habitat structure	Typical food, shelter and water sources required by the majority of vertebrate and invertebrate inhabitants of pastoral ecosystem type are present, including: a variety of food plants and signs of natural generation of shelter sources including leaf litter.
Safety		Risk assessment has been undertaken in accordance with relevant guidelines and Australian Standards and risks reduced to levels agreed with the stakeholders. Closure documentation includes the contaminated sites register which identifies contaminated sites and the treatment applied.

Note: * Reference sites are still to be confirmed.

8.7 Monitoring Program

Regular monitoring of the rehabilitation will be required during the vegetation establishment period, to demonstrate whether the objectives of the rehabilitation strategy are being achieved and whether a sustainable landform has been provided. In addition to rehabilitated areas, reference sites will be identified and monitored to allow a comparison of the development and success of the rehabilitation against a control.

Reference sites indicate the condition of surrounding un-mined areas, or areas successfully rehabilitated, that the mine sites must replicate. In the absence of any currently operating Galilee Basin Mines the rehabilitation at the Peak Downs Mine in the Bowen Basin will be reviewed to determine if any areas would provide suitable reference sites for the project.

Monitoring will be conducted periodically by independent, suitably skilled and qualified persons at locations which will be representative of the range of conditions on the rehabilitating areas. Annual reviews will be conducted of monitoring data to assess trends and monitoring program effectiveness. Monitoring of the rehabilitated areas will broadly involve the following:

- Ongoing chemical analysis of topsoil
- Comparison of soil erosion rates and rill and gully dimensions with measurements taken from reference sites
- Comparison of vegetation measurements with measurements taken from reference sites
- Ongoing analysis of water quality parameters in accordance with the development consent and environmental protection licence conditions from data collected monthly at water storages, ramps and pits, sediment basins and sewage effluent outfalls on-site, and from creeks (upstream and downstream of mine)
- Visual surveillance including the use of digital photogrammetry / low level oblique or vertical aerial photography to monitor changes over time in the rehabilitation (e.g. changes in vegetation structure, erosion rates and landform drainage).

More specifically, monitoring of the elements in Table 15 will be undertaken to determine the level of achievement of success criteria.

Table 14: Monitoring Elements

Rehabilitation aspect	**Element to be monitored**
Ecosystem establishment	
Groundcover	Percentage of ground covered by vegetation, rocks, logs and other obstructions. Obstruction lengths and widths (indicates the amount of ground cover that is present to collect, hold and disseminate available resources necessary for ecosystem function) for use in Landscape Function Analysis (LFA). Fetch lengths (measure of distances of soil surface that is bare of matter that could slow water velocity) for use in LFA.
Community structure and composition	Species composition. Number and form of ground cover and understorey species per plot. Density, height, canopy cover and DBH of tree and large shrub species. Numbers, heights and species identity (where able to be determined) of any seedlings. Evidence of reproduction/regeneration (e.g. flower heads, fruits/seeds, germination of seedlings etc). Assessment of individual plant health (healthy, sick or dead).
Habitat	Availability and variety of food sources (e.g. flowering/fruiting trees, presence of invertebrates etc). Availability and variety of shelter (e.g. depth of leaf litter, presence of logs, hollows etc). Presence/absence of free water.
Fauna	Presence and approximate abundance and distribution of functional indicator invertebrate species. General observations of vertebrate species (including species of conservation significance). Detailed fauna surveys including presence and approximate abundance and distribution of vertebrate species (focussing on species of conservation significance).
Weeds and pests	Species identity. Approximate numbers/level of infestation. Observations of impact on rehabilitation (if any).
Erosion Monitoring and Soil Characteristics	
Soil	Stability, infiltration and nutrient cycling undertaken according to LFA procedure. Electrical Conductivity, as a measure of salinity. pH. Soil exchangeable Na potential.
Erosion	Location and extent of sheet wash. Location and extent of rill and gully erosion including measurements of depth, width and length. Extent of bare areas with potential to erode. Sediment movement and runoff.
Geotechnical Stability	
	Stability of batter and surface settlements, in particular where these features could impact on the performance of any surface water management system.

	Surface integrity of landform cover/capping (measurement of extent of integrity failure). Landform slumping (distance of material movement and extent).
Surface and Groundwater	
	Groundwater quality and depth. Efficiency of landform surface water drainage systems. Presence and quality of any surface water and seepage at selected locations at the lower part of potentially acid producing landforms such as reject dumps. Water quality including pH, EC and total suspended solids of water in water storages, ramps and pits, sediment basins and sewage effluent outfalls onsite. Water quality including pH, salinity and turbidity of water entering creek/river systems on site.
Creeks and Diversions	
	Vegetation density, diversity and vigour. Structural stability of channel. Water quality including pH, salinity and turbidity of water entering creek/river systems on site.

8.8 Maintenance

Maintenance of rehabilitated areas will be undertaken where necessary and in response to results of the monitoring program, to ensure success criteria are met, or in the case of progressive rehabilitation, are projected to be met at the time of mine closure. Depending on the criteria to be achieved, examples of maintenance works include re-seeding or planting of tube stock of tree and / or shrub species to meet required revegetation parameters and implementation of erosion protection measures to reduce erosion rates.

Responsibility for the maintenance of rehabilitation will lie with Waratah Coal, as owner / operator of the project. As extensive areas of disturbed land will not be available for progressive rehabilitation, much of the rehabilitation work will be required to be carried out at the end of mine life. Post-mining surveys of the rehabilitation will be undertaken across the site to determine whether the site meets the success criteria and whether this result is being maintained over time. Once this occurs and the site is relinquished, the land will be returned to the relevant stakeholders and maintenance of the rehabilitation will no longer be required.

9. Conclusions

1. Comprehensive geotechnical hydrological, hydrogeological and geotechnical studies have been completed to ascertain the best method for rejects and tailings disposal.

2. Options for the tailings storage facility which have been investigated include trucking dry tailings, in-pit disposal of dry tailings, conventional thickener and tailings dam, and thickened tailings disposal. The preferred option is trucking tailings dry paste and rejects to disposal cells. A water balance flow chart has been prepared for this method.

3. Cells are to be designed and constructed in box cut and in pit spoil piles. Properly engineered clay blankets will be constructed to encase all tailings and rejects. Although testing to date indicates that tailings and rejects are benign blanket encasement will prevent any oxidisation or seepage.

4. Analyses have been completed for geotechnical stability of all cell batters.

5. Filter pressing is required to obtain a transportable tailings paste. Phoenix belt presses are proposed. Tailings and rejects will be dumped into cells, then spread and track compacted by dozer.

6. Monitoring techniques will include the use of piezometers, routine groundwater testing and survey monuments to ensure adequacy of the disposal cells. All cells will have the required design storage allowance and on completion of infilling, they will be capped with impervious, compacted fill, topsoiled and seeded.

7. Thorough and extensive rehabilitation is required to ensure that the post-mining landform is of the same standard as the pre-mining condition. All effort will be made to promote vegetation regrowth which allows for a stable, natural ecosystem.

10. References

Australian Mining Engineering Consultants (AMEC) 2000. *The Influence of Subsidence Cracking on Longwall Extraction Beneath Water Courses, Aquifers, Open-cut Voids and Spoil Piles*. ACARP Report Project Number C5016.

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