Appendix E – Cost Estimates

Appendix E1 – Yallourn Cost Estimate Rehabilitation Measures

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Appendix E8 – Loy Yang Cost Estimate Pit Lake

Appendix E9 – Loy Yang Cost Estimate Partial Backfill Below the Water Table

Appendix E1 – Yallourn Cost Estimate Rehabilitation Measures

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Ref	Measure	Description	Unit Rate	UoM	Notes	Assumptions
1	**Bunding**	Bunding constructed around perimeter of mine pit to 2 m height and 5m wide at based (top of bund 2 m wide), bund setback 100 m. Specific gravity 1.8 assumed (1.55 if bulked) Max distance from stockpile 2 km.	56.38	m	Loy Yang- bunding already in place around majority of boundary, 2km alongside creek already exists.	*Overarching:* Clay composition (i.e SG 1.8) uniform across all sites. *Overarching:* External contractors will be utilised for rehab/ earthworks.
2A	**Material placement - Inpit (Bucket wheel activity to stockpile only).**	Utilising existing bucket wheel, material spread but not contoured or reshaped.	2.50	m3		2A, 2B occur together as do 9A and 9B
2B	**Material placement - Inpit (Inpit haulage only)**	Specific gravity of 1.8. In-pit haulage from stockpile, then truck and shovel, assumed to n.e 5km each way.	5.97; 5.93	m3	Rate quantity dependant	2A, 2B occur together as do 9A and 9B
3	**Pit Backfill - Expit and Inpit haulage (onsite)**	Material spread but not contoured or reshaped. Specific gravity of 1.8. Ex-pit haulage assumed to n.e 5 km each way, 0% gradient out of pit, 5km in pit haulage with 5% gradient.	N/A	m3		
4	**Internal dump removal**	In-pit haulage of overburden dump to buttress batters. Specific gravity of 1.8. In-pit haulage assumed to n.e. 2km each way.	4.03	m3		
5	**Reshaping - Pit edge**	Earthworks reshaping utilizing dozer. Likely angle 180 degrees.	3,199.38	ha		
6	**Reshaping - Pit wall**	Earthworks reshaping utilizing dozer. Likely angle 37 degrees to 20 degree design slope. Average bench height 18m. Material pushed down gradient.	1.06	m3		
7	**Reshaping - Pit floor**	Earthworks reshaping utilizing dozer. Likely angle 180 degrees (i.e flat)	3,199.38	ha		
8	**Ripping and Seeding**	All rehabilitated areas will be deep ripped along contour (1m depth at 1m spacing) and seeded at a rate of 10 kg/ha ($5,000/Ha for seed).	6,314.98	ha		
9A	**Long Haul Cut to Fill**	Winning of material from stockpile, with haulage distance n.e 25 km each way on public roads. Average specific gravity of 1.8 assumed.	N/A	m3		Loy Yang - no road, triples to be utilised during haulage. 2A, 2B occur together as do 9A and 9B
9B	**Pit Backfill - Expit and Inpit haulage (onsite)**	Material spread but not contoured or reshaped. Specific gravity of 1.8. Ex-pit haulage assumed to n.e 5 km each way, 0% gradient out of pit, 5km in pit haulage with 5% gradient.	N/A	m3	Rate quantity dependant	2A, 2B occur together as do 9A and 9B
10	**Long Haul Cut to Fill**	Winning of material from stockpile, with haulage distance n.e 25 km each way on mine haul road. Material will be spread but not contoured or reshaped. Average specific gravity of 1.8 assumed. 5km in pit haulage.	38.85	m3		Yallourn to Hazelwood existing haul road can be utilised.
11	**Topsoiling**	Winning of material from stockpile, with haulage distance n.e 10km each way. Topsoil spread to a depth of 200 mm . Specific gravity of 1.0 assumed.	12,215.82	ha		Sufficient topsoil quantities are available.
12	**Slope Battering**	To design slope (20 degrees) from angle of repose (37 degrees). Average bench height of 18 m assumed. Material pushed down gradient. Specific gravity of 1.8 assumed. Slope battering of exposed coal face only.	1.06	m3	Benches on site range from 12-24m in height. Median taken. GHD report suggests, covering a 50m deep batter of exposed coal with 2m cover, would required approx. 320,000 m3/km of batter length.	
13	**Management and Maintenance**	Management and maintenance of infrastructure (includes servicing, monitoring?). Assume a fixed cost p/yr.	39,000.00	p/yr		Allowance of one person 30% of the year
14	**Pumps and Pipework Installation**	Relocation of pump to a level above final water level and relocation of exisitng pump station and pipework.	1,000,000.00	Item		Fixed Cost
15	**Buttressing**	Clay material placed against a section of the pit wall to prevent continued movement or propagation of wall failure. Specific gravity of 1.8. In-pit haulage assumed to n.e 5km each way.	15.40	m3		
16	**Pressure relief well installation**	Installation of horizontals wells into pit wall to length of 100m, at intervals of 100m. 6m of PVC pushed in to protect outlet.	35.00	m	Approx. cost. $2,000 for drill set-up. $35 p/m of drilling. French drain system an option.	
17	**Drainage diversion**	Installation of permanent drainage diversions.Assume excavation of a 5m wide, 2m deep. Length 1.5 x perimeter of pit crest with a 20m set back channel. Material placed down slope side, and compacted/ smoothed out.	6.44	m3		
18	**Levee construction**	Winning of material from borrow pit, with haulage distance n.e. 10km each way and placement. Construction of levee 5m high, 25m at base 5m at top, 150m setback from pit.	17.29	m3		
19	**Water Treatment System**	Existing water treatment station upgraded/ modified to cope with discharge of treated water in to creeks and pit.	5,000,000.00	Item		Existing on site water treatment/ processing plants can be utilised.
20	**Fencing**	Construction of 2m high security fence around perimeter of an open void. Fence setback of a minimum of 150m from earthworks.	70.00	m	Minor fencing likely to be required.	Sufficient fencing already in place around current mining leases for all sites.
21	**Recontouring**	Recontouring of areas, outside of pit, <1m above natural relief to remove impediments to run-off and maximise drainage.	1,791.82	ha		
22	**Fertilising (Material cost only)**	Application of fertiliser or gypsum over selected areas following seeding. To be undertaken concurrently with seeding, however purchase of specific quantities of fertiliser will need to be accounted for. Material cost only 50kg/Ha @ $410/t	20.50	ha		
24	**Compaction**	Ground surface treatment. Moisture condition and compact existing surface	16,100.00	ha		
25	**Fire break**	Mown fuel break, i.e grasslands. Spreading of topsoil and use of grass seed applied at 10kg/ha ($5,000/Ha seed). Fire breaks 10 m wide every 100 m of rehabbed/revegetated land in mining lease/ buffer zone. Haul topsoil 10km each way, rip and seed 90% of area (fire break 100 x 10 in 100 x 100m area)	18,530.00	ha	Incorporation of wet zone may need to be considered	Mowing of fuel break not required, sheep/farming will maintain grass length.
26	**Rip-Rap**	Crushed concrete materials (availble free issue) utilised for armouring of pit lake edge. Ex-pit Haulage assumed to n.e 5 km each way. (0.5m thick rip rap)	31.70	m3	Sourced from road making materials.	
27	**Semi Permeable Cover Placement**	Excavation and pushing of available semi-permeable material from pit edge down pit wall to 2m depth, for entire pit depth	3.00	m3	Nominal provision, factored from slope battering rate	

Appendix E2 – Yallourn Cost Estimate Pit Lake

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				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									310,464	23,313,266	3,510,000	27,133,730
	Groundwater									-	8,159,162	3,510,000	11,669,162
	Surfacewater									-	14,768,271	1,170,000	15,938,271
	Biodiversity									-	3,077,528	-	3,077,528
	Fire Risk									13,515,965	6,858,080	2,360,418	22,734,464
RISK ISSUE	LANDFORM STABILITY (COLLAPSE)												
	Mobilisation, demobilisation, site establishment									14,784	1,110,156	-	1,124,940
Design Control	Placement of overburden (mine waste material), interseam materials and fill over batters to contribute to weight balance.												
Activity	Overburden (mine waste material) placement.		Assumed operational activity										
Pricing Item											-	-	
Activity	Utilizing available mine waste material, which will be spread as uniformly as practical and as low as possible across the pit floor. Can only be implemented once mine has reached depth.		Assumed operational activity										
Pricing Item											-	-	-
Design Control	Controlled repressurisation of the aquifer to achieve weight balance												
Activity	Sequential cessation of dewatering		Assumed operational activity										
Pricing Item										-	-	-	-
Design Control	Design and construction of slopes to suitable gradient												
Activity	Reshaping of selected batters for a safe and stable outcome.												
Pricing Item	Reshaping - Pit wall	Short Term	Assumes whole area of AWT final sloped pit walls	92	92			ha	3,200.00	295,680	-	-	295,680
	Slope battering	Short Term	Assumed operational activity								-	-	
Design Control	Water management (water addition) to achieve weight balance.												
Activity	Surface water injection from flooding (i.e. diverting flood waters)												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	Required as all different sources of SW for injection	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Activity	Surface water injection from water entitlement (i.e. neighbouring rivers, power station)												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	Required as all different sources of SW for injection	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Activity	Water injection from dewatering.												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	Required as all different sources of SW for injection	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Design Control	Buttressing of selected high risk batters prior to pit filling.												
Activity	Buttressing selected batters to maintain safe and stable landform.		Assumed operational activity										
Pricing Item								m3	15.40	-	-	-	
Design Control	Installation of pressure relief wells / horizontal drains in high risk areas of pit cut back												
Activity	Pressure relief wells												
Pricing Item	Pressure relief well installation	Medium Term	Assuming to 100m depth of horizontal drilling. At 100m intervals. Across pit face- horizontally (not to depth) near surface, i.e around perimter. 101 bores required.	10,100		10,100		m	35.00	-	353,500	-	353,500
Design Control	Source additional overburden, interseam and fill materials off site from other mite sites												
Activity	Additional overburden sourcing		Assumed operational activity										

Appendix E2 – Yallourn Cost Estimate Pit Lake

JACOBS

				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									310,464	23,313,266	3,510,000	27,133,730
	Groundwater									-	8,159,162	3,510,000	11,669,162
	Surfacewater									-	14,768,271	1,170,000	15,938,271
	Biodiversity									-	3,077,528	-	3,077,528
	Fire Risk									13,515,965	6,858,080	2,360,418	22,734,464
Pricing Item										-	-	-	-
Design Control	Design of drainage diversion and control on above water level batters												
Activity	Construction of levees and Drainage diversion to specific ARI.												
Pricing Item	Drainage diversion	Medium Term	Assume 5m wide, 2m deep. Length 1.5 x perimeter of pit crest with a 20m set back. With 20m set back from pit edge	152,895		152,895		m3	6.44	-	984,644	-	984,644
	Levee construction	Medium Term	Levee 5m high. At setback of 150m from pit. 5m height at top, 25m at base.	825,675		825,675		m3	17.29	-	14,275,921	-	14,275,921
	Compaction	Medium Term	Compaction of pit edge	158		158		ha	16,100.00	-	2,543,800	-	2,543,800
	Slope Battering	Medium Term	Battering of levee only. Height 5m. To 20 degrees from angle repose.	44,792		44,792		m3	1.06	-	47,480	-	47,480
	Ripping and Seeding	Medium Term	Pit edge only	158		158		ha	6,314.98	-	997,767	-	997,767
Design Control	Infiltration control.												
Activity	Low perm materials placed on uppermost surface batters to avoid water entering.		Assumed Fire Risk controls sufficient										
Pricing Item													
	SUB-TOTAL (LANDFORM STABILITY)									310,464	23,313,266	3,510,000	27,133,730
RISK ISSUE	GROUNDWATER												
	Mobilisation, demobilisation, site establishment									-	388,532	-	388,532
Design Control	Diversion of the shallow GW or SW prior to entering the pit, and treatment of it.												
Activity	Construction of horizontal drains and collection system with pumping. Bunding for SW.												
Pricing Item	Pressure relief well installation	Medium Term	Assume landform stability control sufficient							-	-	-	-
	Pumps and Pipe Network Installation	Medium Term	Inpit	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
										-	-	-	-
Design Control	Treatment of water either prior to entering pit, or acidic water.												
Activity	Water treatment to required standard for either offsite discharge or onsite retention.												
Pricing Item	Water treatment system	Medium Term	Assumes upgrade of existing infrastructure sufficient to cover SW and GW										
				1		1		Fixed Cost: Item	5,000,000.00	-	5,000,000	-	5,000,000
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Design Control	Maintain appropriate salinity for end landuse.												
Activity	Install and maintain pumping system to control salinity.												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	Expit	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Design Control	Treatment of the pit lake water or restore and maintain appropriate WQ												
Activity	Installation of water treatment plant.		Above design control WTS assumed sufficient.										
Pricing Item													
Design Control	Regulate and limit landuse adjacent to the pit, i.e. nothing that may introduce critical contaminants.												
Activity	Buffer zone establishment												
Pricing Item	Fencing	Medium Term	150 m setback	11,009		11,009		m	70.00	-	770,630	-	770,630

Appendix E2 – Yallourn Cost Estimate Pit Lake

JACOBS

				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									310,464	23,313,266	3,510,000	27,133,730
	Groundwater									-	8,159,162	3,510,000	11,669,162
	Surfacewater									-	14,768,271	1,170,000	15,938,271
	Biodiversity									-	3,077,528	-	3,077,528
	Fire Risk									13,515,965	6,858,080	2,360,418	22,734,464
Design Control	Appropriate allocations maintained for GW during pit filling.												
Activity	Regional regulation of GW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Appropriate allocations maintained for GW post pit filling.												
Activity	Regional regulation of GW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Ensure that fundamental design parameters involving other water elements are robust enough to cope with variability/ changes.												
Activity	Base initial designs on climate change prediction data (allow for future ppt and evap demand)												
Pricing Item										-	-	-	-
	SUB-TOTAL (GROUNDWATER)									-	8,159,162	3,510,000	11,669,162
RISK ISSUE	SURFACEWATER												
	Mobilisation, demobilisation, site establishment									-	703,251	-	703,251
Design Control	Maintenance of good water quality in the pit lake for discharge.												
Activity	Water treatment		Assumed GW system sufficient										
Pricing Item			Assumed GW system sufficient							-	-	-	-
Design Control	Maintenance of good surface water quality in the lake for landuses.												
Activity	Installation of water treatment plant.		Assumed GW system sufficient										
Pricing Item													
Design Control	Design of surface water management facilities around the pit which drain away from pit.												
Activity	Construction of horizontal drains and collection system with pumping.		Assume GW provisions sufficient										
Pricing Item													
Activity	Bunding for SW.		Assume levee sufficient										
Pricing Item													
Design Control	Bunding around pit and running pit with freeboard.												
Activity	Bunding		Assume levee sufficient										
Pricing Item													
Design Control	Management of excess water between available storage areas i.e. other pits.												
Activity	Establishment and maintain existing distribution system between the pits.												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	Expit. Assumes additional to GW infrastructure	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Long Term	Expit. Assumes additional to GW infrastructure	30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Design Control	Appropriate allocations maintained for SW during pit filling.												
Activity	Regional regulation of SW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Appropriate allocations maintained for SW post pit filling.												
Activity	Regional regulation of SW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Ensure that fundamental design parameters involving other water elements are robust enough to cope with variability/ changes.												
Activity	Base initial designs on climate change prediction data (allow for future ppt and evap demand)												
Pricing Item										-	-	-	-

Appendix E2 – Yallourn Cost Estimate Pit Lake

JACOBS

				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									310,464	23,313,266	3,510,000	27,133,730
	Groundwater									-	8,159,162	3,510,000	11,669,162
	Surfacewater									-	14,768,271	1,170,000	15,938,271
	Biodiversity									-	3,077,528	-	3,077,528
	Fire Risk									13,515,965	6,858,080	2,360,418	22,734,464
Design Control	Minimise the area that is lost to the surrounding catchments, i.e. external areas surrounding pit reshaped rehabbed, to minimise lake catchment. Create a controlled system.												
Activity	Reshaping and establishment of drainage, in the buffer zone and lease area.												
Pricing Item	Reshaping - Pit edge	Medium Term		158		158		ha	3,200.00	-	505,600	-	505,600
	Recontouring	Medium Term		158		158		ha	1,790.00	-	282,820	-	282,820
Design Control	Import material for reshaping												
Activity	Additional overburden sourcing												
Pricing Item	Long haul cut to fill	Medium Term	Assume nominal 0.2m depth at pit edge	316,000		316,000		m3	38.85	-	12,276,600	-	12,276,600
	SUB-TOTAL (SURFACEWATER)									-	14,768,271	1,170,000	15,938,271
RISK ISSUE	BIODIVERSITY												
	Mobilisation, demobilisation, site establishment									-	146,549	-	146,549
Design Control	Revegetation planning commensurate with final landuse and stability/ GW requirements.												
Activity	Revegetation												
Pricing Item	Topsoiling	Medium Term	Assume 150m buffer area only	158		158		ha	12,215.00	-	1,929,970	-	1,929,970
	Ripping and Seeding	Medium Term	Assume 150m buffer area only	158		158		ha	6,315.00	-	997,770	-	997,770
Design Control	Consider using natural soil improvement agents to improve the soil microbial condition and nutrient load												
Activity	Soil treatment												
Pricing Item	Addition of Fertiliser (material only)	Medium Term	Assume pit edge requires only	158		158		ha	20.50	-	3,239	-	3,239
	SUB-TOTAL (BIODIVERSITY)									-	3,077,528	-	3,077,528
RISK ISSUE	FIRE RISK												
	Mobilisation, demobilisation, site establishment									643,617	326,575	972	971,165
Design Control	Coal face must be covered or capped to prevent exposure												
Activity	Overburden placement		Assumed 2m clay layer sufficient to mitigate fire risk										
Pricing Item										-	-	-	
Activity	Those below final water table should be stabilised and covered for duration of pit filling.		Assumed butressing stability control sufficient										
Pricing Item											-	-	
Activity	Layer compacted with low perm material to prevent aeration (spontaneous combustion)												
	Semi Permeable Cover Placement	Short Term	2m semi-permeable layer. Assumes available from pit edge. AWT batters and BWT faces	3,383,816	3,383,816			m3	3.00	10,151,448	-	-	10,151,448
	Compaction	Short Term	AWT and BWT slopes	169	169			ha	16,100.00	2,720,900	-	-	2,720,900
Design Control	Programmed maintenance of the cover/ capping, including: monitoring, top up of the cover.												
Activity	Cover maintenance												
Pricing Item	Long Haul cut to fill	Long Term	Assume 0.5% cover requires maintenance per year. Based on total AWT semi-perm layer	462			462	m3	38.85	-	-	17,966	17,966
	Reshaping - Pit wall	Long Term	Assume 0.5% walls exposed require maintenance Based on AWT portion of semi-perm layer	0.46			0.46	ha	3,200.00	-	-	1,480	1,480
Design Control	Use of shallow rooted species for vegetation to prevent breach of the cover.												
Activity	Lake edge revegetation												
Pricing Item	Topsoiling	Medium Term	Assumes AWT slopes only	92		92		ha	12,215.00	-	1,129,762	-	1,129,762
	Ripping and Seeding	Medium Term	Assumes AWT slopes only	92		92		ha	6,315.00	-	584,073	-	584,073
Design Control	Erosion prevention to avoid cover breach.												
Activity	Design of a shallower slope and use of erosion prevention measures. Battering of coal slope prior to placement of cover to achieve consistent (minimum) level of cover.												
Pricing Item	Slope battering	Short Term	Assumed part of operations for stability control										

Appendix E2 – Yallourn Cost Estimate Pit Lake

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				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									310,464	23,313,266	3,510,000	27,133,730
	Groundwater									-	8,159,162	3,510,000	11,669,162
	Surfacewater									-	14,768,271	1,170,000	15,938,271
	Biodiversity									-	3,077,528	-	3,077,528
	Fire Risk									13,515,965	6,858,080	2,360,418	22,734,464
	Rip-Rap	Medium Term	Assume pit edge only. Assume around pit perimiter, to 0.5m thickness to 10m depth.	110,786		110,786		m3	31.70	-	3,511,925	-	3,511,925
Design Control	Consideration of alternate fire control measures , possibly spraying exposed coal surfaces with fire retardant materials or chemicals.												
Activity	Fire retardant spraying		Assume other control sufficient										
Design Control	Control activities e.g. vehicle use in areas where there are coal seams or public access to rehabbed (high risk) areas												
Activity	Buffer zone establishment		Assume captured by fencing control for GW										
Pricing Item										-	-	-	-
Design Control	Include (and maintain) fire breaks in revegetation design												
Activity	Fire breaks												
Pricing Item	Fire break	Medium Term	(150x10) per break. 110 breaks required.	17		17		ha	18,530.00	-	305,745	-	305,745
Design Control	Cover with water (i.e. fill lake to maximum extent)												
Activity	Aquifer repressurisation												
Pricing Item	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Activity	Surface water injection												
Pricing Item	Pumps and Pipe Network Installation	Medium Term		1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Design Control	Fill pit faster with surface water addition												
Activity	Surface water addition		Assume surface water injecttion activitiy sufficient										
Pricing Item													
Design Control	Maintenance of water level using controlled surface water addition												
Activity	Surface water addition		Assume surface water injecttion activitiy sufficient										
Pricing Item													
	SUB-TOTAL (FIRE RISK)									13,515,965	6,858,080	2,360,418	22,734,464

Appendix E3 – Yallourn Cost Estimate Partial Backfill Below the Water Table

JACOBS

				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									1,246,899.53	23,311,951.18	3,510,000.00	28,068,850.71
	Groundwater									-	8,159,161.50	3,510,000.00	11,669,161.50
	Surfacewater									-	14,768,271.00	1,170,000.00	15,938,271.00
	Biodiversity									-	3,077,527.95	-	3,077,527.95
	Fire Risk									13,515,965.30	6,858,079.98	2,360,418.27	22,734,463.55
RISK ISSUE	LANDFORM STABILITY (COLLAPSE)												
	Mobilisation, demobilisation, site establishment									59,376	1,110,093	-	1,169,469
Design Control	Placement of overburden (mine waste material), interseam materials and fill over batters to contribute to weight balance.												
Activity	Overburden (mine waste material) placement.		Assumed operational activity										
Pricing Item										-	-	-	-
										-	-	-	-
Activity	Differential backfilling across floor and batters to create multi-level in-pit landform with some AWT and some BWT areas such that AWT batters are sloped as shallow as possible												
Pricing Item	Internal dump removal	Short Term	Assumed operational activity							-	-	-	-
	Reshaping - Pit edge	Short Term	Addressed in surface water control measures							-	-	-	-
	Reshaping - Pit wall	Short Term	Assumed total BWT pit wall area. Assumed outside the scope of operations	77	77			ha	3,200.00	245,443.36	-	-	245,443.36
	Reshaping - Pit floor	Short Term	Assumed outside the scope of operations	202	202			ha	3,200.00	646,400.00	-	-	646,400.00
Design Control	Controlled repressurisation of the aquifer to achieve weight balance												
Activity	Sequential cessation of dewatering		Assumed operational activity										
Pricing Item										-	-		
Design Control	Design and construction of slopes to suitable gradient												
Activity	Reshaping of selected batters for a safe and stable outcome.												
Pricing Item	Reshaping - Pit wall	Short Term	Assumes whole area of AWT final sloped pit walls	92	92			ha	3,200.00	295,680.00	-	-	295,680.00
	Slope Battering	Short Term	Assumed operational activity							-	-	-	-
Activity	Use of buffer zone material to achieve shallower slopes on upper overburden and coal batters		Assumed covered by slope battering activities										
Pricing Item										-	-	-	-
Design Control	Water management (water addition) to achieve weight balance.												
Activity	Surface water injection from flooding (i.e. diverting flood waters)												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	All required as different SW sources.	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000.00	1,170,000.00
Activity	Surface water injection from water entitlement (i.e. neighbouring rivers, power station)												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	All required as different SW sources.	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000.00	1,170,000.00
Activity	Water injection from dewatering.												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	All required as different SW sources.	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00			1,170,000.00	1,170,000.00
Design Control	Buttressing of selected high risk batters prior to pit filling.												
Activity	Buttressing selected batters to maintain safe and stable landform.		Assumed operational activity										
Pricing Item										-	-	-	-
Design Control	Installation of pressure relief wells / horizontal drains in high risk areas of pit cut back												
Activity	Pressure relief wells												
Pricing Item	**Pressure relief well installation**	Medium Term	Assuming to 100m depth of horizontal drilling. At 100m intervals. Across pit face- horizontally (not to depth) near surface, i.e around perimter. 101 bores required.	10,100		10,100		m	35.00	-	353,500.00	-	353,500.00
Design Control	Source additional overburden, interseam and fill materials off site from other mite sites												
Activity	Additional overburden sourcing		Assumed operational activity										
Pricing Item										-	-	-	-
Design Control	Design of drainage diversion and control on above water level batters												
Activity	Construction of levees and Drainage diversion to specific ARI.												
Pricing Item	Drainage diversion	Medium Term	Assume 5m wide, 2m deep. Length 1.5 x perimeter of pit crest with a 20m set back. With 20m set back	152,700		152,700		m3	6.44	-	983,388.00	-	983,388.00
	Levee construction	Medium Term	Levee 5m high. At setback of 150m from pit. 5m height at top, 25m at base.	825,675		825,675		m3	17.29	-	14,275,920.75	-	14,275,920.75
	Compaction	Medium Term	Compaction of pit edge only.	158		158		ha	16,100.00	-	2,543,800.00	-	2,543,800.00
	Slope Battering	Medium Term	Battering of levee only. Height 5m. To 20 degrees from angle repose.	44,792		44,792		m3	1.06	-	47,479.52	-	47,479.52
	Ripping and Seeding	Medium Term	Pit edge only.	158		158		ha	6,315.00	-	997,770.00	-	997,770.00
Design Control	Infiltration control.												
Activity	Low perm materials placed on uppermost surface batters to avoid water entering.		Assumed Fire Risk controls sufficient										

Appendix E3 – Yallourn Cost Estimate Partial Backfill Below the Water Table

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				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									1,246,899.53	23,311,951.18	3,510,000.00	28,068,850.71
	Groundwater									-	8,159,161.50	3,510,000.00	11,669,161.50
	Surfacewater									-	14,768,271.00	1,170,000.00	15,938,271.00
	Biodiversity									-	3,077,527.95	-	3,077,527.95
	Fire Risk									13,515,965.30	6,858,079.98	2,360,418.27	22,734,463.55
Pricing Item													
	SUB-TOTAL (LANDFORM STABILITY)									1,246,900	23,311,951.18	3,510,000.00	28,068,850.71
RISK ISSUE	GROUNDWATER												
	Mobilisation, demobilisation, site establishment									-	388,532	-	388,532
Design Control	Diversion of the shallow GW or SW prior to entering the pit, and treatment of it..												
Activity	Construction of horizontal drains and collection system with pumping.												
Pricing Item	Pumps and pipework installation	Medium Term	Assume Landform Stability control sufficient							-	-	-	-
	Pressure relief well installation	Medium Term	Inpit	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000.00	1,170,000.00
Activity	Bunding for SW.		Assume levee sufficient										
Pricing Item											-	-	-
Design Control	Treatment of water either prior to entering pit, or acidic water..												
Activity	Water treatment to required standard for either offsite discharge or onsite retention.												
Pricing Item	Water treatment system	Medium Term	Assumes upgrade of existing infrastructure sufficient to cover SW and GW	1		1		Fixed Cost: Item	5,000,000.00	-	5,000,000.00	-	5,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00			1,170,000.00	1,170,000.00
Design Control	Maintain appropriate salinity for end landuse..												
Activity	Install and maintain pumping system to control salinity.												
Pricing Item	Pumps and pipework installation	Medium Term	Expit	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000.00	1,170,000.00
Design Control	Treatment of the pit lake water or restore and maintain appropriate WQ												
Activity	Installation of water treatment plant.		Above design control WTS assumed sufficient.										
Pricing Item													
Design Control	Regulate and limit landuse adjacent to the pit, i.e. nothing that may introduce critical contaminants..												
Activity	Buffer zone establishment												
Pricing Item	Fencing	Medium Term	150m setback	11,009		11,009		m	70.00	-	770,630.00	-	770,630.00
Design Control	Appropriate allocations maintained for GW during pit filling..												
Activity	Regional regulation of GW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Appropriate allocations maintained for GW post pit filling..												
Activity	Regional regulation of GW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Ensure that fundamental design parameters involving other water elements are robust enough to cope with variability/ changes..												
Activity	Base initial designs on climate change prediction data (allow for future ppt and evap demand)												
Pricing Item										-	-	-	-
	SUB-TOTAL (GROUNDWATER)									-	8,159,161.50	3,510,000.00	11,669,161.50
RISK ISSUE	SURFACEWATER												
	Mobilisation, demobilisation, site establishment									-	703,251	-	703,251
Design Control	Maintenance of good water quality in the pit lake for discharge..												
Activity	Water treatment		Assume GW provisions sufficient										
Pricing Item											-	-	-
Design Control	Maintenance of good surface water quality in the lake for landuses..												
Activity	Installation of water treatment plant.												
Pricing Item													
Design Control	Design of surface water management facilities around the pit which drain away from pit..												
Activity	Construction of horizontal drains and collection system with pumping.		Assume GW provisions sufficient										
Pricing Item										-	-	-	-
Activity	Bunding for SW.		Assume levee sufficient										
Pricing Item										-	-	-	-
Design Control	Bunding around pit and running pit with freeboard..												

Appendix E3 – Yallourn Cost Estimate Partial Backfill Below the Water Table

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				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									1,246,899.53	23,311,951.18	3,510,000.00	28,068,850.71
	Groundwater									-	8,159,161.50	3,510,000.00	11,669,161.50
	Surfacewater									-	14,768,271.00	1,170,000.00	15,938,271.00
	Biodiversity									-	3,077,527.95	-	3,077,527.95
	Fire Risk									13,515,965.30	6,858,079.98	2,360,418.27	22,734,463.55
Activity	Bunding		Assume levee sufficient										
Pricing Item													
Design Control	Management of excess water between available storage areas i.e. other pits.												
Activity	Establishment and maintain existing distribution system between the pits.												
Pricing Item	Pumps and Pipework Installation	Medium Term	Expit. Assumes additional to GW infrastructure	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term	Expit. Assumes additional to GW infrastructure	30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000.00	1,170,000.00
Design Control	Appropriate allocations maintained for SW during pit filling.												
Activity	Regional regulation of SW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Appropriate allocations maintained for SW post pit filling.												
Activity	Regional regulation of SW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Ensure that fundamental design parameters involving other water elements are robust enough to cope with variability/ changes.												
Activity	Base initial designs on climate change prediction data (allow for future ppt and evap demand)												
Pricing Item										-	-	-	-
Design Control	Minimise the area that is lost to the surrounding catchments, i.e. external areas surrounding pit reshaped rehabbed, to minimise lake catchment. Create a controlled system.												
Activity	Reshaping and establishment of drainage, in the buffer zone and lease area.												
Pricing Item	Reshaping - pit edge	Medium Term		158		158		ha	3,200.00	-	505,600.00	-	505,600.00
	Recountouring	Medium Term		158		158		ha	1,790.00	-	282,820.00	-	282,820.00
Design Control	Import material for reshaping												
Activity	Additional overburden sourcing												
Pricing Item	Long haul cut to fill	Medium Term	Assume nominal 0.2m depth at pit edge	316,000		316,000		m3	38.85	-	12,276,600.00	-	12,276,600.00
	SUB-TOTAL (SURFACEWATER)									-	14,768,271.00	1,170,000.00	15,938,271.00
RISK ISSUE	BIODIVERSITY												
	Mobilisation, demobilisation, site establishment									-	146,549	-	146,549
Design Control	Revegetation planning commensurate with final landuse and stability/ GW requirements.												
Activity	Revegetation												
Pricing Item	Topsoiling	Medium Term	Assume pit edge requires only	158		158		ha	12,215.00	-	1,929,970.00	-	1,929,970.00
	Ripping and Seeding	Medium Term	Assume pit edge requires only	158		158		ha	6,315.00	-	997,770.00	-	997,770.00
Design Control	Consider using natural soil improvement agents to improve the soil microbial condition and nutrient load												
Activity	Soil treatment												
Pricing Item	Addition of fertiliser (material only)	Medium Term	Assume pit edge requires only	158		158		ha	20.50	-	3,239.00	-	3,239.00
	SUB-TOTAL (BIODIVERSITY)									-	3,077,527.95	-	3,077,527.95
RISK ISSUE	FIRE RISK												
	Mobilisation, demobilisation, site establishment									643,617	326,575	972	971,165
Design Control	Coal face must be covered or capped to prevent exposure.												
Activity	Overburden placement		Assumed 2m clay layer sufficient to mitigate fire risk										
Pricing Item													
Activity	Those below final water table should be stabilised and covered for duration of pit filling.		Assumed butressing stability control sufficient										
Pricing Item										-	-	-	-
Activity	Layer compacted with low perm material to prevent aeration (spontaneous combustion)												
Pricing Item	Semi Permeable Cover Placement	Short Term	2m semi-permeable layer. Assumes available from pit edge. AWT batters and BWT faces	3,383,816	3,383,816			m3	3.00	10,151,447.91	-	-	10,151,447.91
	Compaction	Short Term	AWT and BWT slopes	169	169			ha	16,100.00	2,720,900.00	-	-	2,720,900.00
Design Control	Programmed maintenance of the cover/ capping, including: monitoring, top up of the cover.												
Activity	Cover maintenance												
Pricing Item	Long Haul cut to fill	Long Term	Assume 0.5% cover requires maintenance per year. Based on total AWT semi-perm layer	462			462	m3	38.85	-	-	17,966.13	17,966.13
	Reshaping - Pit wall	Long Term	Assume 0.5% walls exposed require maintenance Based on AWT portion of semi-perm layer	0.46			0	ha	3,200.00	-	-	1,479.84	1,479.84

Appendix E3 – Yallourn Cost Estimate Partial Backfill Below the Water Table

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				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									1,246,899.53	23,311,951.18	3,510,000.00	28,068,850.71
	Groundwater									-	8,159,161.50	3,510,000.00	11,669,161.50
	Surfacewater									-	14,768,271.00	1,170,000.00	15,938,271.00
	Biodiversity									-	3,077,527.95	-	3,077,527.95
	Fire Risk									13,515,965.30	6,858,079.98	2,360,418.27	22,734,463.55
Design Control	Use of shallow rooted species for vegetation to prevent breach of the cover.												
Activity	Lake edge revegetation												
Pricing Item	Topsoiling	Medium Term	Assumes AWT slopes only	92		92		ha	12,215.00	-	1,129,762.28	-	1,129,762.28
	Ripping and Seeding	Medium Term	Assumes AWT slopes only	92		92		ha	6,315.00	-	584,072.76	-	584,072.76
Design Control	Erosion prevention to avoid cover breach.												
Activity	Design of a shallower slope and use of erosion prevention measures. Battering of coal slope prior to placement of cover to achieve consistent (minimum) level of cover.												
Pricing Item	Slope battering	Short Term	Assumed part of operations for stability control							-	-	-	-
	Rip-rap	Medium Term	Assume pit edge only. Assume around pit perimiter, to 0.5m thickness and 20m depth i.e to where water table lies.	110,786		110,786		m3	31.70	-	3,511,924.71	-	3,511,924.71
Design Control	Consideration of alternate fire control measures , possibly spraying exposed coal surfaces with fire retardant materials or chemicals.												
Activity	Fire retardant spraying		Assume other controls sufficient										
Design Control	Control activities e.g. vehicle use in areas where there are coal seams or public access to rehabbed (high risk) areas												
Activity	Buffer zone establishment		Assume captured by fencing control for GW										
Pricing Item										-	-	-	-
Design Control	Include (and maintain) fire breaks in revegetation design												
Activity	Fire breaks												
Pricing Item	Fire break	Medium Term	(150x10) per break. 110 breaks required.	17		17		ha	18,530.00	-	305,745.00	-	305,745.00
Design Control	Cover with water (i.e. fill lake to maximum extent)												
Activity	Aquifer repressurisation												
Pricing Item	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000.00	1,170,000.00
Activity	Surface water injection												
Pricing Item	Pumps and Pipe Network Installation	Medium Term		1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000.00	1,170,000.00
Design Control	Fill pit faster with surface water addition												
Activity	Surface water addition		Assume surface water injecttion activitiy sufficient										
Pricing Item													
Design Control	Maintenance of water level using controlled surface water addition												
Activity	Surface water addition		Assume surface water injecttion activitiy sufficient										
Pricing Item													
	SUB-TOTAL (FIRE RISK)									13,515,965	6,858,079.98	2,360,418.27	22,734,463.55

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Appendix E4 – Hazelwood Cost Estimate Rehabilitation Measures

Ref	Measure	Description	Unit Rate	UoM	Notes	Assumptions
1	**Bunding**	Bunding constructed around perimeter of mine pit to 2 m height and 5m wide at based (top of bund 2 m wide), bund setback 100 m. Specific gravity 1.8 assumed (1.55 if bulked) Max distance from stockpile 2 km.	56.38	m	Loy Yang- bunding already in place around majority of boundary, 2km alongside creek already exists.	*Overarching:* Clay composition (i.e SG 1.8) uniform across all sites. *Overarching:* External contractors will be utilised for rehab/ earthworks.
2A	**Material placement - Inpit (Bucket wheel activity to stockpile only).**	Utilising existing bucket wheel, material spread but not contoured or reshaped.	2.50	m3		2A, 2B occur together as do 9A and 9B
2B	**Material placement - Inpit (Inpit haulage only)**	Specific gravity of 1.8. In-pit haulage from stockpile, then truck and shovel, assumed to n.e 5km each way.	5.97; 5.89	m3	Rate quantity dependant	2A, 2B occur together as do 9A and 9B
3	**Pit Backfill - Expit and Inpit haulage (onsite)**	Material spread but not contoured or reshaped. Specific gravity of 1.8. Ex-pit haulage assumed to n.e 5 km each way, 0% gradient out of pit, 5km in pit haulage with 5% gradient.	6.23; 6.31	m3		
4	**Internal dump removal**	In-pit haulage of overburden dump to buttress batters. Specific gravity of 1.8. In-pit haulage assumed to n.e. 2km each way.	3.85	m3		
5	**Reshaping - Pit edge**	Earthworks reshaping utilizing dozer. Likely angle 180 degrees.	3,199.38	ha		
6	**Reshaping - Pit wall**	Earthworks reshaping utilizing dozer. Likely angle 37 degrees to 20 degree design slope. Average bench height 18m. Material pushed down gradient.	1.06	m3		
7	**Reshaping - Pit floor**	Earthworks reshaping utilizing dozer. Likely angle 180 degrees (i.e flat)	3,199.38	ha		
8	**Ripping and Seeding**	All rehabilitated areas will be deep ripped along contour (1m depth at 1m spacing) and seeded at a rate of 10 kg/ha ($5,000/Ha for seed).	6,314.98	ha		
9A	**Long Haul Cut to Fill**	Winning of material from stockpile, with haulage distance n.e 25 km each way on public roads. Average specific gravity of 1.8 assumed.	N/A	m3		Loy Yang - no road, triples to be utilised during haulage. 2A, 2B occur together as do 9A and 9B
9B	**Pit Backfill - Expit and Inpit haulage (onsite)**	Material spread but not contoured or reshaped. Specific gravity of 1.8. Ex-pit haulage assumed to n.e 5 km each way, 0% gradient out of pit, 5km in pit haulage with 5% gradient.	N/A	m3	Rate quantity dependant	2A, 2B occur together as do 9A and 9B
10	**Long Haul Cut to Fill**	Winning of material from stockpile, with haulage distance n.e 25 km each way on mine haul road. Material will be spread but not contoured or reshaped. Average specific gravity of 1.8 assumed. 5km in pit haulage.	38.85	m3		Yallourn to Hazelwood existing haul road can be utilised.
11	**Topsoiling**	Winning of material from stockpile, with haulage distance n.e 10km each way. Topsoil spread to a depth of 200 mm . Specific gravity of 1.0 assumed.	12,215.82	ha		Sufficient topsoil quantities are available.
12	**Slope Battering**	To design slope (20 degrees) from angle of repose (37 degrees). Average bench height of 18 m assumed. Material pushed down gradient. Specific gravity of 1.8 assumed. Slope battering of exposed coal face only.	1.06	m3	Benches on site range from 12-24m in height. Median taken. GHD report suggests, covering a 50m deep batter of exposed coal with 2m cover, would required approx. 320,000 m3/km of batter length.	
13	**Management and Maintenance**	Management and maintenance of infrastructure (includes servicing, monitoring?). Assume a fixed cost p/yr.	39,000.00	p/yr		Allowance of one person 30% of the year
14	**Pumps and Pipework Installation**	Relocation of pump to a level above final water level and relocation of exisitng pump station and pipework.	1,000,000.00	Item		Fixed Cost
15	**Buttressing**	Clay material placed against a section of the pit wall to prevent continued movement or propagation of wall failure. Specific gravity of 1.8. In-pit haulage assumed to n.e 5km each way.	15.40	m3		
16	**Pressure relief well installation**	Installation of horizontals wells into pit wall to length of 100m, at intervals of 100m. 6m of PVC pushed in to protect outlet.	35.00	m	Approx. cost. $2,000 for drill set-up. $35 p/m of drilling. French drain system an option.	
17	**Drainage diversion**	Installation of permanent drainage diversions.Assume excavation of a 5m wide, 2m deep. Length 1.5 x perimeter of pit crest with a 20m set back channel. Material placed down slope side, and compacted/ smoothed out.	6.44	m3		
18	**Levee construction**	Winning of material from borrow pit, with haulage distance n.e. 10km each way and placement. Construction of levee 5m high, 25m at base 5m at top, 150m setback from pit.	17.29	m3		
19	**Water Treatment System**	Existing water treatment station upgraded/ modified to cope with discharge of treated water in to creeks and pit.	10,000,000.00	Item		Existing on site water treatment/ processing plants can be utilised.
20	**Fencing**	Construction of 2m high security fence around perimeter of an open void. Fence setback of a minimum of 150m from earthworks.	70.00	m	Minor fencing likely to be required.	Sufficient fencing already in place around current mining leases for all sites.
21	**Recontouring**	Recontouring of areas, outside of pit, <1m above natural relief to remove impediments to run-off and maximise drainage.	1,791.82	ha		
22	**Fertilising (Material cost only)**	Application of fertiliser or gypsum over selected areas following seeding. To be undertaken concurrently with seeding, however purchase of specific quantities of fertiliser will need to be accounted for. Material cost only 50kg/Ha @ $410/t	20.50	ha		
24	**Compaction**	Ground surface treatment. Moisture condition and compact existing surface	16,100.00	ha		
25	**Fire break**	Mown fuel break, i.e grasslands. Spreading of topsoil and use of grass seed applied at 10kg/ha ($5,000/Ha seed). Fire breaks 10 m wide every 100 m of rehabbed/revegetated land in mining lease/ buffer zone. Haul topsoil 10km each way, rip and seed 90% of area (fire break 100 x 10 in 100 x 100m area)	18,530.00	ha	Incorporation of wet zone may need to be considered	Mowing of fuel break not required, sheep/farming will maintain grass length.
26	**Rip-Rap**	Crushed concrete materials (availble free issue) utilised for armouring of pit lake edge. Ex-pit Haulage assumed to n.e 5 km each way. (0.5m thick rip rap)	31.70	m3	Sourced from road making materials.	
27	**Semi Permeable Cover Placement**	Excavation and pushing of available semi-permeable material from pit edge down pit wall to 2m depth, for entire pit depth	3.00	m3	Nominal provision, factored from slope battering rate	

Appendix E5 – Hazelwood Cost Estimate Pit Lake

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				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									968,884	34,914,831	3,510,000	39,393,715
	Groundwater									-	13,874,564	3,510,000	17,384,564
	Surfacewater									-	22,408,827	1,170,000	23,578,827
	Biodiversity									-	4,791,594	-	4,791,594
	Fire Risk									30,590,326	11,813,993	3,521,130	45,925,449
RISK ISSUE	LANDFORM STABILITY (COLLAPSE)												
	Mobilisation, demobilisation, site establishment									46,137	1,662,611	-	1,708,748
Design Control	Placement of overburden (mine waste material), interseam materials and fill over batters to contribute to weight balance.												
Activity	Overburden (mine waste material) placement.		Assumed operational activity										
Pricing Item											-	-	
Activity	Utilizing available mine waste material, which will be spread as uniformly as practical and as low as possible across the pit floor. Can only be implemented once mine has reached depth.		Assumed operational activity										
Pricing Item											-	-	-
Design Control	Controlled repressurisation of the aquifer to achieve weight balance												
Activity	Sequential cessation of dewatering		Assumed operational activity										
Pricing Item										-	-	-	-
Design Control	Design and construction of slopes to suitable gradient												
Activity	Reshaping of selected batters for a safe and stable outcome.												
Pricing Item	Reshaping - Pit wall	Short Term	Assumes whole area of AWT final sloped pit walls	288	288			ha	3,200.00	922,746	-	-	922,746
	Slope battering	Short Term	Assumed operational activity								-	-	
Design Control	Water management (water addition) to achieve weight balance.												
Activity	Surface water injection from flooding (i.e. diverting flood waters)												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	Required as all different sources of SW for injection	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Activity	Surface water injection from water entitlement (i.e. neighbouring rivers, power station)												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	Required as all different sources of SW for injection	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Activity	Water injection from dewatering.												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	Required as all different sources of SW for injection	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Ongoing		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Design Control	Buttressing of selected high risk batters prior to pit filling.												
Activity	Buttressing selected batters to maintain safe and stable landform.		Assumed operational activity										
Pricing Item								m3	15.40	-	-	-	
Design Control	Installation of pressure relief wells / horizontal drains in high risk areas of pit cut back												
Activity	Pressure relief wells												
Pricing Item	Pressure relief well installation	Medium Term	Assuming to 100m depth of horizontal drilling. At 100m intervals. Across pit face- horizontally (not to depth) near surface, i.e around perimter pit 16400m. 164 bores required.	16,400		16,400		m	35.00	-	574,000	-	574,000
Design Control	Source additional overburden, interseam and fill materials off site from other mite sites												
Activity	Additional overburden sourcing		Assumed operational activity										

Appendix E5 – Hazelwood Cost Estimate Pit Lake

JACOBS

Item	Item Description	Phase	Assumptions	Quantities				UoM	Rate	Costs			
				Total	*Short Term*	*Medium Term*	*Long Term*			*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									968,884	34,914,831	3,510,000	39,393,715
	Groundwater									-	13,874,564	3,510,000	17,384,564
	Surfacewater									-	22,408,827	1,170,000	23,578,827
	Biodiversity									-	4,791,594	-	4,791,594
	Fire Risk									30,590,326	11,813,993	3,521,130	45,925,449
Pricing Item										-	-	-	-
Design Control	Design of drainage diversion and control on above water level batters												
Activity	Construction of levees and Drainage diversion to specific ARI.												
Pricing Item	Drainage diversion	Medium Term	Assume 5m wide, 2m deep. Length 1.5 x perimeter of pit crest with a 20m set back. With 20m set back from pit edge	247,875		247,875		m3	6.44	-	1,596,315	-	1,596,315
	Levee construction	Medium Term	Levee 5m high. At setback of 150m from pit. 5m height at top, 25m at base.	1,300,575		1,300,575		m3	17.29	-	22,486,942	-	22,486,942
	Compaction	Medium Term	Compaction of pit edge	246		246		ha	16,100.00	-	3,960,600	-	3,960,600
	Slope Battering	Medium Term	Battering of levee only. Height 5m. To 20 degrees from angle repose.	76,300		76,300		m3	1.06	-	80,878	-	80,878
	Ripping and Seeding	Medium Term	Pit edge only	246		246		ha	6,314.98	-	1,553,485	-	1,553,485
Design Control	Infiltration control.												
Activity	Low perm materials placed on uppermost surface batters to avoid water entering.		Assumed fire risk activities sufficient										
Pricing Item													
	SUB-TOTAL (LANDFORM STABILITY)									968,884	34,914,831	3,510,000	39,393,715
RISK ISSUE	GROUNDWATER												
	Mobilisation, demobilisation, site establishment									-	660,694	-	660,694
Design Control	Diversion of the shallow GW or SW prior to entering the pit, and treatment of it.												
Activity	Construction of horizontal drains and collection system with pumping. Bunding for SW.												
Pricing Item	Pressure relief well installation	Medium Term	Assume Landform Stability control sufficient							-	-	-	-
	Pumps and Pipe Network Installation	Medium Term	Inpit	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Long Term	Inpit	30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
										-	-	-	-
Design Control	Treatment of water either prior to entering pit, or acidic water.												
Activity	Water treatment to required standard for either offsite discharge or onsite retention.												
Pricing Item	Water treatment system	Medium Term	Assumes upgrade of existing infrastructure sufficient to cover SW and GW										
				1		1		Fixed Cost: Item	10,000,000.00	-	10,000,000	-	10,000,000
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Design Control	Maintain appropriate salinity for end landuse.												
Activity	Install and maintain pumping system to control salinity.												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	Expit	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Design Control	Treatment of the pit lake water or restore and maintain appropriate WQ												
Activity	Installation of water treatment plant.												
Pricing Item			Above design control WTS assumed sufficient.										
Design Control	Regulate and limit landuse adjacent to the pit, i.e. nothing that may introduce critical contaminants.												
Activity	Buffer zone establishment												
Pricing Item	Fencing	Medium Term	150 m setback	17,341		17,341		m	70.00	-	1,213,870	-	1,213,870

Appendix E5 – Hazelwood Cost Estimate Pit Lake

JACOBS

Item	Item Description	Phase	Assumptions	Quantities				UoM	Rate	Costs			
				Total	*Short Term*	*Medium Term*	*Long Term*			*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									968,884	34,914,831	3,510,000	39,393,715
	Groundwater									-	13,874,564	3,510,000	17,384,564
	Surfacewater									-	22,408,827	1,170,000	23,578,827
	Biodiversity									-	4,791,594	-	4,791,594
	Fire Risk									30,590,326	11,813,993	3,521,130	45,925,449
Design Control	Appropriate allocations maintained for GW during pit filling.												
Activity	Regional regulation of GW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Appropriate allocations maintained for GW post pit filling.												
Activity	Regional regulation of GW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Ensure that fundamental design parameters involving other water elements are robust enough to cope with variability/ changes.												
Activity	Base initial designs on climate change prediction data (allow for future ppt and evap demand)												
Pricing Item										-	-	-	-
	SUB-TOTAL (GROUNDWATER)									-	13,874,564	3,510,000	17,384,564
RISK ISSUE	SURFACEWATER												
	Mobilisation, demobilisation, site establishment									-	1,067,087	-	1,067,087
Design Control	Maintenance of good water quality in the pit lake for discharge.												
Activity	Water treatment		Assumed GW system sufficient										
Pricing Item			Assumed GW system sufficient							-	-	-	-
Design Control	Maintenance of good surface water quality in the lake for landuses.												
Activity	Installation of water treatment plant.		Assumed GW system sufficient										
Pricing Item													
Design Control	Design of surface water management facilities around the pit which drain away from pit.												
Activity	Construction of horizontal drains and collection system with pumping.		Assume GW provisions sufficient										
Pricing Item													
Activity	Bunding for SW.		Assume levee sufficient										
Pricing Item													
Design Control	Bunding around pit and running pit with freeboard.												
Activity	Bunding		Assume levee sufficient										
Pricing Item													
Design Control	Management of excess water between available storage areas i.e. other pits.												
Activity	Establishment and maintain existing distribution system between the pits.												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	Expit. Assumes additional to GW infrastructure	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Long Term	Expit. Assumes additional to GW infrastructure	30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Design Control	Appropriate allocations maintained for SW during pit filling.												
Activity	Regional regulation of SW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Appropriate allocations maintained for SW post pit filling.												
Activity	Regional regulation of SW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Ensure that fundamental design parameters involving other water elements are robust enough to cope with variability/ changes.												
Activity	Base initial designs on climate change prediction data (allow for future ppt and evap demand)												
Pricing Item										-	-	-	-

Appendix E5 – Hazelwood Cost Estimate Pit Lake

JACOBS

Item	Item Description	Phase	Assumptions	Quantities				UoM	Rate	Costs			
				Total	*Short Term*	*Medium Term*	*Long Term*			*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									968,884	34,914,831	3,510,000	39,393,715
	Groundwater									-	13,874,564	3,510,000	17,384,564
	Surfacewater									-	22,408,827	1,170,000	23,578,827
	Biodiversity									-	4,791,594	-	4,791,594
	Fire Risk									30,590,326	11,813,993	3,521,130	45,925,449
Design Control	Minimise the area that is lost to the surrounding catchments, i.e. external areas surrounding pit reshaped rehabbed, to minimise lake catchment. Create a controlled system.												
Activity	Reshaping and establishment of drainage, in the buffer zone and lease area.												
Pricing Item	Reshaping - Pit edge	Medium Term		246		246		ha	3,200.00	-	787,200	-	787,200
	Recontouring	Medium Term		246		246		ha	1,790.00	-	440,340	-	440,340
Design Control	Import material for reshaping												
Activity	Additional overburden sourcing												
Pricing Item	Long haul cut to fill	Medium Term	Assume nominal 0.2m depth at pit edge	492,000		492,000		m3	38.85	-	19,114,200	-	19,114,200
	SUB-TOTAL (SURFACEWATER)									-	22,408,827	1,170,000	23,578,827
RISK ISSUE	BIODIVERSITY												
	Mobilisation, demobilisation, site establishment									-	228,171	-	228,171
Design Control	Revegetation planning commensurate with final landuse and stability/ GW requirements.												
Activity	Revegetation												
Pricing Item	Topsoiling	Medium Term	Assume 150m buffer area only	246		246		ha	12,215.00	-	3,004,890	-	3,004,890
	Ripping and Seeding	Medium Term	Assume 150m buffer area only	246		246		ha	6,315.00	-	1,553,490	-	1,553,490
Design Control	Consider using natural soil improvement agents to improve the soil microbial condition and nutrient load												
Activity	Soil treatment												
Pricing Item	Addition of Fertiliser (material only)	Medium Term	Assume pit edge requires only	246		246		ha	20.50	-	5,043	-	5,043
	SUB-TOTAL (BIODIVERSITY)									-	4,791,594	-	4,791,594
RISK ISSUE	FIRE RISK												
	Mobilisation, demobilisation, site establishment									1,456,682	562,571	56,244	2,075,498
Design Control	Coal face must be covered or capped to prevent exposure												
Activity	Overburden placement		Assumed 2m clay layer sufficient to mitigate fire risk										
Pricing Item										-	-	-	
Activity	Those below final water table should be stabilised and covered for duration of pit filling.		Assumed butressing stability control sufficient										
Pricing Item											-	-	
Activity	Layer compacted with low perm material to prevent aeration (spontaneous combustion)												
	Semi Permeable Cover Placement	Short Term	2m semi-permeable layer. Assumes available from pit edge. AWT batters and BWT faces	7,656,674	7,656,674			m3	3.00	22,970,022	-	-	22,970,022
	Compaction	Short Term	AWT and BWT slopes	383	383			ha	16,100.00	6,163,623	-	-	6,163,623
Design Control	Programmed maintenance of the cover/ capping, including: monitoring, top up of the cover.												
Activity	Cover maintenance												
Pricing Item	Long Haul cut to fill	Long Term	Assume 0.5% cover requires maintenance per year. Based on total AWT semi-perm layer	28,836			28,836	m3	38.85	-	-	1,120,272	1,120,272
	Reshaping - Pit wall	Long Term	Assume 0.5% walls exposed require maintenance Based on AWT portion of semi-perm layer	1.44			1.44	ha	3,200.00	-	-	4,614	4,614
Design Control	Use of shallow rooted species for vegetation to prevent breach of the cover.												
Activity	Lake edge revegetation												
Pricing Item	Topsoiling	Short Term	Assumes AWT slopes only	288		288		ha	12,215.00	-	3,522,296	-	3,522,296
	Ripping and Seeding	Short Term	Assumes AWT slopes only	288		288		ha	6,315.00	-	1,820,982	-	1,820,982
Design Control	Erosion prevention to avoid cover breach.												
Activity	Design of a shallower slope and use of erosion prevention measures. Battering of coal slope prior to placement of cover to achieve consistent (minimum) level of cover.												
Pricing Item	Slope battering		Assumed part of operations for stability control										
	Rip-Rap	Medium Term	Assume around pit perimiter, to 0.5m thickness to 10m depth.	139,633		139,633		m3	31.70	-	4,426,364	-	4,426,364

Appendix E5 – Hazelwood Cost Estimate Pit Lake

JACOBS

Item	Item Description	Phase	Assumptions	Quantities				UoM	Rate	Costs			
				Total	*Short Term*	*Medium Term*	*Long Term*			*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									968,884	34,914,831	3,510,000	39,393,715
	Groundwater									-	13,874,564	3,510,000	17,384,564
	Surfacewater									-	22,408,827	1,170,000	23,578,827
	Biodiversity									-	4,791,594	-	4,791,594
	Fire Risk									30,590,326	11,813,993	3,521,130	45,925,449
Design Control	Consideration of alternate fire control measures , possibly spraying exposed coal surfaces with fire retardant materials or chemicals												
Activity	Fire retardant spraying		Assumed other fire risk controls sufficient										
Activity	Buffer zone establishment		Assume captured by fencing control for GW										
Pricing Item										-	-	-	-
Design Control	Include (and maintain) fire breaks in revegetation design												
Activity	Fire breaks												
Pricing Item	Fire break	Medium Term	(150x10) per break. 173 breaks required.	26		26		ha	18,530.00	-	481,780	-	481,780
Design Control	Cover with water (i.e. fill lake to maximum extent)												
Activity	Aquifer repressurisation												
Pricing Item	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Activity	Surface water injection												
Pricing Item	Pumps and Pipe Network Installation	Medium Term		1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Design Control	Fill pit faster with surface water addition												
Activity	Surface water addition		Assume surface water injecttion activitiy sufficient										
Pricing Item													
Design Control	Maintenance of water level using controlled surface water addition												
Activity	Surface water addition		Assume surface water injecttion activitiy sufficient										
Pricing Item													
	SUB-TOTAL (FIRE RISK)									30,590,326	11,813,993	3,521,130	45,925,449

Appendix E6 – Hazelwood Cost Estimate Partial Backfill Below the Water Table

JACOBS

Item	Item Description	Phase	Assumptions	Quantities				UoM	Rate	Costs			
				Total	*Short Term*	*Medium Term*	*Long Term*			*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									4,095,281.22	34,914,836.43	3,510,000.00	42,520,117.65
	Groundwater									-	13,874,563.50	3,510,000.00	17,384,563.50
	Surfacewater									-	22,408,827.00	1,170,000.00	23,578,827.00
	Biodiversity									-	4,791,594.15	-	4,791,594.15
	Fire Risk									30,590,326.46	11,813,020.31	3,522,716.95	45,924,476.53
RISK ISSUE	LANDFORM STABILITY (COLLAPSE)												
	Mobilisation, demobilisation, site establishment									195,013	1,662,611	-	1,857,625
Design Control	Placement of overburden (mine waste material), interseam materials and fill over batters to contribute to weight balance.												
Activity	Overburden (mine waste material) placement.	Short Term	Assumed operational activity										
Pricing Item										-	-	-	-
										-	-	-	-
Activity	Differential backfilling across floor and batters to create multi-level in-pit landform with some AWT and some BWT areas such that AWT batters are sloped as shallow as possible												
Pricing Item	Internal dump removal	Short Term	Assumed operational activity							-	-	-	-
	Reshaping - Pit edge	Short Term	Addressed in surface water control measures							-	-	-	-
	Reshaping - Pit wall	Short Term	Assumed total BWT pit wall area. Assumed outside the scope of operations	94	94			ha	3,200.00	302,321.47	-	-	302,321.47
	Reshaping - Pit floor	Short Term	Assumed outside the scope of operations	836	836			ha	3,200.00	2,675,200.00	-	-	2,675,200.00
Design Control	Controlled repressurisation of the aquifer to achieve weight balance												
Activity	Sequential cessation of dewatering		Assumed operational activity										
Pricing Item										-	-		
Design Control	Design and construction of slopes to suitable gradient												
Activity	Reshaping of selected batters for a safe and stable outcome.												
Pricing Item	Reshaping - Pit wall	Short Term	Assumes whole area of AWT final sloped pit walls	288	288			ha	3,200.00	922,746.36	-	-	922,746.36
	Slope Battering	Short Term	Assumed operational activity							-	-	-	-
Activity	Use of buffer zone material to achieve shallower slopes on upper overburden and coal batters		Assumed covered by slope battering activities										
Pricing Item										-	-	-	-
Design Control	Water management (water addition) to achieve weight balance.												
Activity	Surface water injection from flooding (i.e. diverting flood waters)												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	All required as different SW sources.	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000.00	1,170,000.00
Activity	Surface water injection from water entitlement (i.e. neighbouring rivers, power station)												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	All required as different SW sources.	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000.00	1,170,000.00
Activity	Water injection from dewatering.												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	All required as different SW sources.	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00			1,170,000.00	1,170,000.00
Design Control	Buttressing of selected high risk batters prior to pit filling.												
Activity	Buttressing selected batters to maintain safe and stable landform.		Assumed operational activity										
Pricing Item										-	-	-	-
Design Control	Installation of pressure relief wells / horizontal drains in high risk areas of pit cut back												
Activity	Pressure relief wells												
Pricing Item	**Pressure relief well installation**	Medium Term	Assuming to 100m depth of horizontal drilling. At 100m intervals. Across pit face- horizontally (not to depth) near surface, i.e around perimter. 164 bores required.	16,400		16,400		m	35.00	-	574,000.00	-	574,000.00
Design Control	Source additional overburden, interseam and fill materials off site from other mite sites												
Activity	Additional overburden sourcing		Assumed operational activity										
Pricing Item										-	-	-	-
Design Control	Design of drainage diversion and control on above water level batters												
Activity	Construction of levees and Drainage diversion to specific ARI.												
Pricing Item	Drainage diversion	Medium Term	Assume 5m wide, 2m deep. Length 1.5 x perimeter of pit crest with a 20m set back. With 20m set back	247,875		247,875		m3	6.44	-	1,596,315.00	-	1,596,315.00
	Levee construction	Medium Term	Levee 5m high. At setback of 150m from pit. 5m height at top, 25m at base.	1,300,575		1,300,575		m3	17.29	-	22,486,941.75	-	22,486,941.75
	Compaction	Medium Term	Compaction of pit edge only.	246		246		ha	16,100.00	-	3,960,600.00	-	3,960,600.00
	Slope Battering	Medium Term	Battering of levee only. Height 5m. To 20 degrees from angle repose.	76,300		76,300		m3	1.06	-	80,878.42	-	80,878.42
	Ripping and Seeding	Medium Term	Pit edge only.	246		246		ha	6,315.00	-	1,553,490.00	-	1,553,490.00
Design Control	Infiltration control.												
Activity	Low perm materials placed on uppermost surface batters to avoid water entering.		Assumed Fire Risk controls sufficient										

Appendix E6 – Hazelwood Cost Estimate Partial Backfill Below the Water Table

JACOBS

				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									4,095,281.22	34,914,836.43	3,510,000.00	42,520,117.65
	Groundwater									-	13,874,563.50	3,510,000.00	17,384,563.50
	Surfacewater									-	22,408,827.00	1,170,000.00	23,578,827.00
	Biodiversity									-	4,791,594.15	-	4,791,594.15
	Fire Risk									30,590,326.46	11,813,020.31	3,522,716.95	45,924,476.53
Pricing Item													
	SUB-TOTAL (LANDFORM STABILITY)									4,095,281	34,914,836.43	3,510,000.00	42,520,117.65
RISK ISSUE	GROUNDWATER												
	Mobilisation, demobilisation, site establishment									-	660,694	-	660,694
Design Control	Diversion of the shallow GW or SW prior to entering the pit, and treatment of it.												
Activity	Construction of horizontal drains and collection system with pumping.												
Pricing Item	Pumps and pipework installation	Medium Term	Assume Landform Stability control sufficient							-	-	-	-
	Pressure relief well installation	Medium Term	Inpit	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000.00	1,170,000.00
Activity	Bunding for SW.		Assume levee sufficient										
Pricing Item											-	-	-
Design Control	Treatment of water either prior to entering pit, or acidic water.												
Activity	Water treatment to required standard for either offsite discharge or onsite retention.												
Pricing Item	Water treatment system	Medium Term	Assumes upgrade of existing infrastructure sufficient to cover SW and GW	1		1		Fixed Cost: Item	10,000,000.00	-	10,000,000.00	-	10,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00			1,170,000.00	1,170,000.00
Design Control	Maintain appropriate salinity for end landuse.												
Activity	Install and maintain pumping system to control salinity.												
Pricing Item	Pumps and pipework installation	Medium Term	Expit	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000.00	1,170,000.00
Design Control	Treatment of the pit lake water or restore and maintain appropriate WQ												
Activity	Installation of water treatment plant.												
Pricing Item	Water treatment system	Medium Term	Assume above WTS sufficient to address this control										
	Management and Maintenance	Long Term											
Design Control	Regulate and limit landuse adjacent to the pit, i.e. nothing that may introduce critical contaminants.												
Activity	Buffer zone establishment												
Pricing Item	Fencing	Medium Term	150m setback	17,341		17,341		m	70.00	-	1,213,870.00	-	1,213,870.00
Design Control	Appropriate allocations maintained for GW during pit filling.												
Activity	Regional regulation of GW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Appropriate allocations maintained for GW post pit filling.												
Activity	Regional regulation of GW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Ensure that fundamental design parameters involving other water elements are robust enough to cope with variability/ changes.												
Activity	Base initial designs on climate change prediction data (allow for future ppt and evap demand)												
Pricing Item										-	-	-	-
	SUB-TOTAL (GROUNDWATER)									-	13,874,563.50	3,510,000.00	17,384,563.50
RISK ISSUE	SURFACEWATER												
	Mobilisation, demobilisation, site establishment									-	1,067,087	-	1,067,087
Design Control	Maintenance of good water quality in the pit lake for discharge.												
Activity	Water treatment		Assume GW provisions sufficient										
Pricing Item											-	-	-
Design Control	Maintenance of good surface water quality in the lake for landuses.												
Activity	Installation of water treatment plant.												
Pricing Item													
Design Control	Design of surface water management facilities around the pit which drain away from pit.												
Activity	Construction of horizontal drains and collection system with pumping.		Assume GW provisions sufficient										
Pricing Item										-	-	-	-
Activity	Bunding for SW.		Assume levee sufficient										
Pricing Item										-	-	-	-
Design Control	Bunding around pit and running pit with freeboard.												

Appendix E6 – Hazelwood Cost Estimate Partial Backfill Below the Water Table

JACOBS

				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									4,095,281.22	34,914,836.43	3,510,000.00	42,520,117.65
	Groundwater									-	13,874,563.50	3,510,000.00	17,384,563.50
	Surfacewater									-	22,408,827.00	1,170,000.00	23,578,827.00
	Biodiversity									-	4,791,594.15	-	4,791,594.15
	Fire Risk									30,590,326.46	11,813,020.31	3,522,716.95	45,924,476.53
Activity	Bunding		Assume levee sufficient										
Pricing Item		Medium Term											
Design Control	Management of excess water between available storage areas i.e. other pits.												
Activity	Establishment and maintain existing distribution system between the pits.												
Pricing Item	Pumps and Pipework Installation	Medium Term	Expit	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000.00	1,170,000.00
Design Control	Appropriate allocations maintained for SW during pit filling.												
Activity	Regional regulation of SW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Appropriate allocations maintained for SW post pit filling.												
Activity	Regional regulation of SW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Ensure that fundamental design parameters involving other water elements are robust enough to cope with variability/ changes.												
Activity	Base initial designs on climate change prediction data (allow for future ppt and evap demand)												
Pricing Item										-	-	-	-
Design Control	Minimise the area that is lost to the surrounding catchments, i.e. external areas surrounding pit reshaped, rehabbed, to minimise lake catchment. Create a controlled system.												
Activity	Reshaping and establishment of drainage, in the buffer zone and lease area.												
Pricing Item	Reshaping - pit edge	Medium Term		246		246		ha	3,200.00	-	787,200.00	-	787,200.00
	Recountouring	Medium Term		246		246		ha	1,790.00	-	440,340.00	-	440,340.00
Design Control	Import material for reshaping												
Activity	Additional overburden sourcing												
Pricing Item	Long haul cut to fill	Medium Term	Assume nominal 0.2m depth at pit edge	492,000		492,000		m3	38.85	-	19,114,200.00	-	19,114,200.00
	SUB-TOTAL (SURFACEWATER)									-	22,408,827.00	1,170,000.00	23,578,827.00
RISK ISSUE	BIODIVERSITY												
	Mobilisation, demobilisation, site establishment									-	228,171	-	228,171
Design Control	Revegetation planning commensurate with final landuse and stability/ GW requirements.												
Activity	Revegetation												
Pricing Item	Topsoiling	Medium Term	Assume pit edge requires only	246		246		ha	12,215.00	-	3,004,890.00	-	3,004,890.00
	Ripping and Seeding	Medium Term	Assume pit edge requires only	246		246		ha	6,315.00	-	1,553,490.00	-	1,553,490.00
Design Control	Consider using natural soil improvement agents to improve the soil microbial condition and nutrient load												
Activity	Soil treatment												
Pricing Item	Addition of fertiliser (material only)	Medium Term	Assume pit edge requires only	246		246		ha	20.50	-	5,043.00	-	5,043.00
	SUB-TOTAL (BIODIVERSITY)									-	4,791,594.15	-	4,791,594.15
RISK ISSUE	FIRE RISK												
	Mobilisation, demobilisation, site establishment									1,456,682	562,525	56,320	2,075,451
Design Control	Coal face must be covered or capped to prevent exposure												
Activity	Overburden placement		Assumed 2m clay layer sufficient to mitigate fire risk										
Pricing Item													
Activity	Those below final water table should be stabilised and covered for duration of pit filling.		Assumed butressing stability control sufficient										
Pricing Item										-	-	-	-
Activity	Layer compacted with low perm material to prevent aeration (spontaneous combustion)												
Pricing Item	Semi Permeable Cover Placement	Short Term	2m semi-permeable layer. Assumes available from pit edge. AWT batters and BWT faces	7,656,674	7,656,674			m3	3.00	22,970,021.74	-	-	22,970,021.74
	Compaction	Short Term	AWT and BWT slopes	383	383			ha	16,100.00	6,163,622.50	-	-	6,163,622.50
Design Control	Programmed maintenance of the cover/ capping, including: monitoring, top up of the cover.												
Activity	Cover maintenance												
Pricing Item	Long Haul cut to fill	Long Term	Assume 0.5% cover requires maintenance per year. Based on total AWT semi-perm layer	28,836			28,836	m3	38.85	-	-	1,120,271.75	1,120,271.75

Appendix E6 – Hazelwood Cost Estimate Partial Backfill Below the Water Table

JACOBS

				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									4,095,281.22	34,914,836.43	3,510,000.00	42,520,117.65
	Groundwater									-	13,874,563.50	3,510,000.00	17,384,563.50
	Surfacewater									-	22,408,827.00	1,170,000.00	23,578,827.00
	Biodiversity									-	4,791,594.15	-	4,791,594.15
	Fire Risk									30,590,326.46	11,813,020.31	3,522,716.95	45,924,476.53
	Reshaping - Pit wall	Long Term	Assume 0.5% walls exposed require maintenance Based on AWT portion of semi-perm layer	1.44			1.91	ha	3,200.00	-	-	6,125.34	4,613.73
Design Control	Use of shallow rooted species for vegetation to prevent breach of the cover.												
Activity	Lake edge revegetation												
Pricing Item	Topsoiling	Medium Term	Assumes AWT slopes only	288		288		ha	12,215.00	-	3,522,295.87	-	3,522,295.87
	Ripping and Seeding	Medium Term	Assumes AWT slopes only	288		288		ha	6,315.00	-	1,820,982.27	-	1,820,982.27
Design Control	Erosion prevention to avoid cover breach.												
Activity	Design of a shallower slope and use of erosion prevention measures. Battering of coal slope prior to placement of cover to achieve consistent (minimum) level of cover.												
Pricing Item	Slope battering	Short Term	Assumed part of operations for stability control							-	-	-	-
	Rip-rap	Medium Term	Assume pit edge only. Assume around pit perimiter, to 0.5m thickness and 20m depth i.e to where water table lies.	139,633		139,633		m3	31.70	-	4,426,363.89	-	4,426,363.89
Design Control	Consideration of alternate fire control measures , possibly spraying exposed coal surfaces with fire retardant materials or chemicals.												
Activity	Fire retardant spraying		Assumed other fire risk controls sufficient										
Design Control	Control activities e.g. vehicle use in areas where there are coal seams or public access to rehabbed (high risk) areas												
Activity	Buffer zone establishment		Assume captured by fencing control for GW										
Pricing Item										-	-	-	-
Design Control	Include (and maintain) fire breaks in revegetation design												
Activity	Fire breaks												
Pricing Item	Fire break	Medium Term	(150x10) per break. 173 breaks required.	26		26		ha	18,530.00	-	480,853.50	-	480,853.50
Design Control	Cover with water (i.e. fill lake to maximum extent)												
Activity	Aquifer repressurisation												
Pricing Item	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000.00	1,170,000.00
Activity	Surface water injection												
Pricing Item	Pumps and Pipe Network Installation	Medium Term		1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000.00	1,170,000.00
Design Control	Fill pit faster with surface water addition												
Activity	Surface water addition		Assume surface water injecttion activitiy sufficient										
Pricing Item													
Design Control	Maintenance of water level using controlled surface water addition												
Activity	Surface water addition		Assume surface water injecttion activitiy sufficient										
Pricing Item													
	SUB-TOTAL (FIRE RISK)									30,590,326	11,813,020.31	3,522,716.95	45,924,476.53

Appendix E7 – Loy Yang Cost Estimate Rehabilitation Measures

JACOBS

Ref	Measure	Description	Unit Rate	UoM	Notes	Assumptions
1	**Bunding**	Bunding constructed around perimeter of mine pit to 2 m height and 5m wide at based (top of bund 2 m wide), bund setback 100 m. Specific gravity 1.8 assumed (1.55 if bulked) Max distance from stockpile 2 km.	56.38	m	Loy Yang- bunding already in place around majority of boundary, 2km alongside creek already exists.	*Overarching:* Clay composition (i.e SG 1.8) uniform across all sites. *Overarching:* External contractors will be utilised for rehab/ earthworks.
2A	**Material placement - Inpit (Bucket wheel activity to stockpile only).**	Utilising existing bucket wheel, material spread but not contoured or reshaped.	2.50	m3		2A, 2B occur together as do 9A and 9B
2B	**Material placement - Inpit (Inpit haulage only)**	Specific gravity of 1.8. In-pit haulage from stockpile, then truck and shovel, assumed to n.e 5km each	5.97; 5.89	m3	Rate quantity dependant	2A, 2B occur together as do 9A and 9B
3	**Pit Backfill - Expit and Inpit haulage (onsite)**	Material spread but not contoured or reshaped. Specific gravity of 1.8. Ex-pit haulage assumed to n.e 5 km each way, 0% gradient out of pit, 5km in pit haulage with 5% gradient.	6.23; 6.31; 6.64	m3		
4	**Internal dump removal**	In-pit haulage of overburden dump to buttress batters. Specific gravity of 1.8. In-pit haulage assumed to n.e. 2km each way.	4.03	m3		
5	**Reshaping - Pit edge**	Earthworks reshaping utilizing dozer. Likely angle 180 degrees.	3,199.38	ha		
6	**Reshaping - Pit wall**	Earthworks reshaping utilizing dozer. Likely angle 37 degrees to 20 degree design slope. Average bench height 18m. Material pushed down gradient.	1.06	m3		
7	**Reshaping - Pit floor**	Earthworks reshaping utilizing dozer. Likely angle 180 degrees (i.e flat)	3,199.38	ha		
8	**Ripping and Seeding**	All rehabilitated areas will be deep ripped along contour (1m depth at 1m spacing) and seeded at a rate of 10 kg/ha ($5,000/Ha for seed).	6,314.98	ha		
9A	**Long Haul Cut to Fill**	Winning of material from stockpile, with haulage distance n.e 25 km each way on public roads. Average specific gravity of 1.8 assumed.	12.92	m3		Loy Yang - no road, triples to be utilised during haulage. 2A, 2B occur together as do 9A and 9B
9B	**Pit Backfill - Expit and Inpit haulage (onsite)**	Material spread but not contoured or reshaped. Specific gravity of 1.8. Ex-pit haulage assumed to n.e 5 km each way, 0% gradient out of pit, 5km in pit haulage with 5% gradient.	6.23; 6.31; 6.64	m3	Rate quantity dependant	2A, 2B occur together as do 9A and 9B
11	**Topsoiling**	Winning of material from stockpile, with haulage distance n.e 10km each way. Topsoil spread to a depth of 200 mm . Specific gravity of 1.0 assumed.	12,215.82	ha		Sufficient topsoil quantities are available.
12	**Slope Battering**	To design slope (20 degrees) from angle of repose (37 degrees). Average bench height of 18 m assumed. Material pushed down gradient. Specific gravity of 1.8 assumed. Slope battering of exposed coal face only.	1.06	m3	Benches on site range from 12-24m in height. Median taken. GHD report suggests, covering a 50m deep batter of exposed coal with 2m cover, would required approx. 320,000 m3/km of batter length.	
13	**Management and Maintenance**	Management and maintenance of infrastructure (includes servicing, monitoring?). Assume a fixed cost p/yr.	39,000.00	p/yr		Allowance of one person 30% of the year
14	**Pumps and Pipework Installation**	Relocation of pump to a level above final water level and relocation of exisitng pump station and pipework.	1,000,000.00	Item		Fixed Cost
15	**Buttressing**	Clay material placed against a section of the pit wall to prevent continued movement or propagation of wall failure. Specific gravity of 1.8. In-pit haulage assumed to n.e 5km each way.	15.40	m3		
16	**Pressure relief well installation**	Installation of horizontals wells into pit wall to length of 100m, at intervals of 100m. 6m of PVC pushed in to protect outlet.	35.00	m	Approx. cost. $2,000 for drill set-up. $35 p/m of drilling. French drain system an option.	
17	**Drainage diversion**	Installation of permanent drainage diversions.Assume excavation of a 5m wide, 2m deep. Length 1.5 x perimeter of pit crest with a 20m set back channel. Material placed down slope side, and compacted/ smoothed out.	6.44	m3		
18	**Levee construction**	Winning of material from borrow pit, with haulage distance n.e. 10km each way and placement. Construction of levee 5m high, 25m at base 5m at top, 150m setback from pit.	17.29	m3		
19	**Water Treatment System**	Existing water treatment station upgraded/ modified to cope with discharge of treated water in to creeks and pit.	10,000,000.00	Item		Existing on site water treatment/ processing plants can be utilised.
20	**Fencing**	Construction of 2m high security fence around perimeter of an open void. Fence setback of a minimum of 150m from earthworks.	70.00	m	Minor fencing likely to be required.	Sufficient fencing already in place around current mining leases for all sites.
21	**Recontouring**	Recontouring of areas, outside of pit, <1m above natural relief to remove impediments to run-off and maximise drainage.	1,791.82	ha		
22	**Fertilising (Material cost only)**	Application of fertiliser or gypsum over selected areas following seeding. To be undertaken concurrently with seeding, however purchase of specific quantities of fertiliser will need to be accounted for. Material cost only 50kg/Ha @ $410/t	20.50	ha		
24	**Compaction**	Ground surface treatment. Moisture condition and compact existing surface	16,100.00	ha		
25	**Fire break**	Mown fuel break, i.e grasslands. Spreading of topsoil and use of grass seed applied at 10kg/ha ($5,000/Ha seed). Fire breaks 10 m wide every 100 m of rehabbed/revegetated land in mining lease/ buffer zone. Haul topsoil 10km each way, rip and seed 90% of area (fire break 100 x 10 in 100 x 100m area)	18,530.00	ha	Incorporation of wet zone may need to be considered	Mowing of fuel break not required, sheep/farming will maintain grass length.
26	**Rip-Rap**	Crushed concrete materials (availble free issue) utilised for armouring of pit lake edge. Ex-pit Haulage assumed to n.e 5 km each way. (0.5m thick rip rap)	31.70	m3	Sourced from road making materials.	
27	**Semi Permeable Cover Placement**	Excavation and pushing of available semi-permeable material from pit edge down pit wall to 2m depth, for entire pit depth	3.00	m3	Nominal provision, factored from slope battering rate	

Appendix E8 – Loy Yang Cost Estimate Pit Lake

JACOBS

				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									417,637	29,752,531	3,510,000	33,680,169
	Groundwater									-	13,676,040	3,510,000	17,186,040
	Surfacewater									-	10,676,348	1,170,000	11,846,348
	Biodiversity									-	4,109,863	-	4,109,863
	Fire Risk									43,052,176	13,307,200	3,183,883	59,543,259
RISK ISSUE	LANDFORM STABILITY (COLLAPSE)												
	Mobilisation, demobilisation, site establishment									19,887	1,416,787	-	1,436,675
Design Control	Placement of overburden (mine waste material), interseam materials and fill over batters to contribute to weight balance.												
Activity	Overburden (mine waste material) placement.		Assumed operational activity										
Pricing Item											-	-	
Activity	Utilizing available mine waste material, which will be spread as uniformly as practical and as low as possible across the pit floor. Can only be implemented once mine has reached depth.		Assumed operational activity										
Pricing Item											-	-	-
Design Control	Controlled repressurisation of the aquifer to achieve weight balance												
Activity	Sequential cessation of dewatering		Assumed operational activity										
Pricing Item										-	-	-	-
Design Control	Design and construction of slopes to suitable gradient, i.e. 1.5 FoS for static and approx. 1.05 (dynamic or seismic case)												
Activity	Reshaping of selected batters for a safe and stable outcome.												
Pricing Item	Reshaping - Pit wall	Short Term	Assumes whole area of AWT final sloped pit walls	124	124			ha	3,200.00	397,750	-	-	397,750
	Slope battering	Short Term	Assumed operational activity								-	-	
Design Control	Water management (water addition) to achieve weight balance.												
Activity	Surface water injection from flooding (i.e. diverting flood waters)												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	Required as all different sources of SW for injection	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Activity	Surface water injection from water entitlement (i.e. neighbouring rivers, power station)												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	Required as all different sources of SW for injection	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Activity	Water injection from dewatering.												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	Required as all different sources of SW for injection	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Design Control	Buttressing of selected high risk batters prior to pit filling.												
Activity	Buttressing selected batters to maintain safe and stable landform.		Assumed operational activity										
Pricing Item								m3	15.40	-	-	-	
Design Control	Installation of pressure relief wells / horizontal drains in high risk areas of pit cut back												
Activity	Pressure relief wells												
Pricing Item	Pressure relief well installation	Medium Term	Assuming to 100m depth of horizontal drilling. At 100m intervals. Across pit face- horizontally (not to depth) near surface, i.e around 4 x 2.5km pit. 130 bores required.	13,000		13,000		m	35.00	-	455,000	-	455,000
Design Control	Source additional overburden, interseam and fill materials off site from other mite sites												
Activity	Additional overburden sourcing		Assumed operational activity										

Appendix E8 – Loy Yang Cost Estimate Pit Lake

JACOBS

				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									417,637	29,752,531	3,510,000	33,680,169
	Groundwater									-	13,676,040	3,510,000	17,186,040
	Surfacewater									-	10,676,348	1,170,000	11,846,348
	Biodiversity									-	4,109,863	-	4,109,863
	Fire Risk									43,052,176	13,307,200	3,183,883	59,543,259
Pricing Item										-	-	-	-
Design Control	Design of drainage diversion and control on above water level batters												
Activity	Construction of levees and Drainage diversion to specific ARI.												
Pricing Item	Drainage diversion	Medium Term	Assume 5m wide, 2m deep. Length 1.5 x perimeter of pit crest with a 20m set back. With 20m set back from pit edge	206,720		206,720		m3	6.44	-	1,331,277	-	1,331,277
	Levee construction	Medium Term	Levee 5m high. At setback of 150m from pit. 5m height at top, 25m at base.	1,084,500		1,084,500		m3	17.29	-	18,751,005	-	18,751,005
	Compaction	Medium Term	Compaction of pit edge	211		211		ha	16,100.00	-	3,397,100	-	3,397,100
	Slope Battering	Medium Term	Battering of levee only. Height 5m. To 20 degrees from angle repose.	65,002		65,002		m3	1.06	-	68,902	-	68,902
	Ripping and Seeding	Medium Term	Pit edge only	211		211		ha	6,314.98	-	1,332,461	-	1,332,461
Design Control	Infiltration control.												
Activity	Low perm materials placed on uppermost surface batters to avoid water entering.		Assumed fire risk activities sufficient										
Pricing Item													
	SUB-TOTAL (LANDFORM STABILITY)									417,637	29,752,531	3,510,000	33,680,169
RISK ISSUE	GROUNDWATER												
	Mobilisation, demobilisation, site establishment									-	651,240	-	651,240
Design Control	Diversion of the shallow GW or SW prior to entering the pit, and treatment of it.												
Activity	Construction of horizontal drains and collection system with pumping. Bunding for SW.												
Pricing Item	Pressure relief well installation	Medium Term	Assume Landform Stability control sufficient							-	-	-	-
	Pumps and Pipe Network Installation	Medium Term	Inpit	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Long Term	Inpit	30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
										-	-	-	-
Design Control	Treatment of water either prior to entering pit, or acidic water.												
Activity	Water treatment to required standard for either offsite discharge or onsite retention.												
Pricing Item	Water treatment system	Medium Term	Assumes upgrade of existing infrastructure sufficient to cover SW and GW										
				1		1		Fixed Cost: Item	10,000,000.00	-	10,000,000	-	10,000,000
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Design Control	Maintain appropriate salinity for end landuse.												
Activity	Install and maintain pumping system to control salinity.												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	Expit	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Design Control	Treatment of the pit lake water or restore and maintain appropriate WQ												
Activity	Installation of water treatment plant.		Above design control WTS assumed sufficient.										
Pricing Item													
Design Control	Regulate and limit landuse adjacent to the pit, i.e. nothing that may introduce critical contaminants.												
Activity	Buffer zone establishment												
Pricing Item	Fencing	Medium Term	150 m setback	14,640		14,640		m	70.00	-	1,024,800	-	1,024,800

Appendix E8 – Loy Yang Cost Estimate Pit Lake

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Item	Item Description	Phase	Assumptions	Quantities				UoM	Rate	Costs			
				Total	*Short Term*	*Medium Term*	*Long Term*			*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									417,637	29,752,531	3,510,000	33,680,169
	Groundwater									-	13,676,040	3,510,000	17,186,040
	Surfacewater									-	10,676,348	1,170,000	11,846,348
	Biodiversity									-	4,109,863	-	4,109,863
	Fire Risk									43,052,176	13,307,200	3,183,883	59,543,259
Design Control	Appropriate allocations maintained for GW during pit filling.												
Activity	Regional regulation of GW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Appropriate allocations maintained for GW post pit filling.												
Activity	Regional regulation of GW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Ensure that fundamental design parameters involving other water elements are robust enough to cope with variability/ changes.												
Activity	Base initial designs on climate change prediction data (allow for future ppt and evap demand)												
Pricing Item										-	-	-	-
	SUB-TOTAL (GROUNDWATER)									-	13,676,040	3,510,000	17,186,040
RISK ISSUE	SURFACEWATER												
	Mobilisation, demobilisation, site establishment									-	508,398	-	508,398
Design Control	Maintenance of good water quality in the pit lake for discharge.												
Activity	Water treatment		Assumed GW system sufficient										
Pricing Item										-	-	-	-
Design Control	Maintenance of good surface water quality in the lake for landuses.												
Activity	Installation of water treatment plant.		Assumed GW system sufficient										
Pricing Item													
Design Control	Design of surface water management facilities around the pit which drain away from pit.												
Activity	Construction of horizontal drains and collection system with pumping.		Assume GW provisions sufficient										
Pricing Item													
Activity	Bunding for SW.		Assume levee sufficient										
Pricing Item													
Design Control	Bunding around pit and running pit with freeboard.												
Activity	Bunding		Assume levee sufficient										
Pricing Item													
Design Control	Management of excess water between available storage areas i.e. other pits.												
Activity	Establishment and maintain existing distribution system between the pits.												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	Expit. Assumes additional to GW infrastructure	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Long Term	Expit. Assumes additional to GW infrastructure	30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Design Control	Appropriate allocations maintained for SW during pit filling.												
Activity	Regional regulation of SW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Appropriate allocations maintained for SW post pit filling.												
Activity	Regional regulation of SW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Ensure that fundamental design parameters involving other water elements are robust enough to cope with variability/ changes.												
Activity	Base initial designs on climate change prediction data (allow for future ppt and evap demand)												
Pricing Item										-	-	-	-

Appendix E8 – Loy Yang Cost Estimate Pit Lake

JACOBS

				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									417,637	29,752,531	3,510,000	33,680,169
	Groundwater									-	13,676,040	3,510,000	17,186,040
	Surfacewater									-	10,676,348	1,170,000	11,846,348
	Biodiversity									-	4,109,863	-	4,109,863
	Fire Risk									43,052,176	13,307,200	3,183,883	59,543,259
Design Control	Minimise the area that is lost to the surrounding catchments, i.e. external areas surrounding pit reshaped rehabbed, to minimise lake catchment. Create a controlled system.												
Activity	Reshaping and establishment of drainage, in the buffer zone and lease area.												
Pricing Item	Reshaping - Pit edge	Medium Term		211		211		ha	3,200.00	-	675,200	-	675,200
	Recontouring	Medium Term		211		211		ha	1,790.00	-	377,690	-	377,690
Design Control	Import material for reshaping												
Activity	Additional overburden sourcing												
Pricing Item	Long haul cut to fill	Medium Term	Assume nominal 0.2m depth at pit edge	422,000		422,000		m3	12.92	-	5,452,240	-	5,452,240
	Material placement- expit	Medium Term	Assume nominal 0.2m depth at pit edge	422,000		422,000		m3	6.31	-	2,662,820	-	2,662,820
	SUB-TOTAL (SURFACEWATER)									-	10,676,348	1,170,000	11,846,348
RISK ISSUE	BIODIVERSITY												
	Mobilisation, demobilisation, site establishment									-	195,708	-	195,708
Design Control	Revegetation planning commensurate with final landuse and stability/ GW requirements.												
Activity	Revegetation												
Pricing Item	Topsoiling	Medium Term	Assume 150m buffer area only	211		211		ha	12,215.00	-	2,577,365	-	2,577,365
	Ripping and Seeding	Medium Term	Assume 150m buffer area only	211		211		ha	6,315.00	-	1,332,465	-	1,332,465
Design Control	Consider using natural soil improvement agents to improve the soil microbial condition and nutrient load												
Activity	Soil treatment												
Pricing Item	Addition of Fertiliser (material only)	Medium Term	Assume pit edge requires only	211		211		ha	20.50	-	4,326	-	4,326
	SUB-TOTAL (BIODIVERSITY)									-	4,109,863	-	4,109,863
RISK ISSUE	FIRE RISK												
	Mobilisation, demobilisation, site establishment									2,050,104	633,676	40,185	2,723,965
Design Control	Coal face must be covered or capped to prevent exposure												
Activity	Overburden placement		Assumed 2m clay layer sufficient to mitigate fire risk										
Pricing Item										-	-	-	
Activity	Those below final water table should be stabilised and covered for duration of pit filling.		Assumed butressing stability control sufficient										
Pricing Item											-	-	
Activity	Layer compacted with low perm material to prevent aeration (spontaneous combustion)												
	Semi Permeable Cover Placement	Short Term	2m semi-permeable layer. Assumes available from pit edge. AWT batters and BWT faces	10,775,840	10,775,840			m3	3.00	32,327,521	-	-	32,327,521
	Compaction	Short Term	AWT and BWT slopes	539	539			ha	16,100.00	8,674,551	-	-	8,674,551
Design Control	Programmed maintenance of the cover/ capping, including: monitoring, top up of the cover.												
Activity	Cover maintenance												
Pricing Item	Long Haul cut to fill	Long Term	Assume 0.5% cover requires maintenance per year. Based on total AWT semi-perm layer	41,450			41,450	m3	12.92	-	-	535,528	535,528
	Material placement- expit	Long Term	Assume 0.5% cover requires maintenance per year. Based on total AWT semi-perm layer	41,450			41,450	m3	6.31	-	-	261,546	261,546
	Reshaping - Pit wall	Long Term	Assume 0.5% walls exposed require maintenance Based on AWT portion of semi-perm layer	2			2	ha	3,200.00	-	-	6,624	6,624
Design Control	Use of shallow rooted species for vegetation to prevent breach of the cover.												
Activity	Lake edge revegetation												
Pricing Item	Topsoiling	Medium Term	Assumes AWT slopes only	414		414		ha	12,215.00	-	5,057,010	-	5,057,010
	Ripping and Seeding	Medium Term	Assumes AWT slopes only	414		414		ha	6,315.00	-	2,614,410	-	2,614,410
Design Control	Erosion prevention to avoid cover breach.												
Activity	Design of a shallower slope and use of erosion prevention measures. Battering of coal slope prior to placement of cover to achieve consistent (minimum) level of cover.												

Appendix E8 – Loy Yang Cost Estimate Pit Lake

JACOBS

				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									417,637	29,752,531	3,510,000	33,680,169
	Groundwater									-	13,676,040	3,510,000	17,186,040
	Surfacewater									-	10,676,348	1,170,000	11,846,348
	Biodiversity									-	4,109,863	-	4,109,863
	Fire Risk									43,052,176	13,307,200	3,183,883	59,543,259
Pricing Item	Slope battering	Short Term	Assumed part of operations for stability control										
	Rip-Rap	Medium Term	Assume around pit perimiter, to 0.5m thickness to 10m depth.	113,389		113,389		m3	31.70	-	3,594,443	-	3,594,443
Design Control	Consideration of alternate fire control measures , possibly spraying exposed coal surfaces with fire retardant materials or chemicals.												
Activity	Fire retardant spraying		Not required										
Design Control	Control activities e.g. vehicle use in areas where there are coal seams or public access to rehabbed (high risk) areas												
Activity	Buffer zone establishment		Assume captured by fencing control for GW										
Pricing Item										-	-	-	-
Design Control	Include (and maintain) fire breaks in revegetation design												
Activity	Fire breaks												
Pricing Item	Fire break	Medium Term	(150x10) per break. 146 breaks required.	22		22		ha	18,530.00	-	407,660	-	407,660
Design Control	Cover with water (i.e. fill lake to maximum extent)												
Activity	Aquifer repressurisation												
Pricing Item	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Activity	Surface water injection												
Pricing Item	Pumps and Pipe Network Installation	Medium Term		1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000	-	1,000,000
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000	1,170,000
Design Control	Fill pit faster with surface water addition												
Activity	Surface water addition		Assume surface water injecttion activitiy sufficient										
Pricing Item													
Design Control	Maintenance of water level using controlled surface water addition												
Activity	Surface water addition		Assume surface water injecttion activitiy sufficient										
Pricing Item													
	SUB-TOTAL (FIRE RISK)									43,052,176	13,307,200	3,183,883	59,543,259

Appendix E9 – Loy Yang Cost Estimate Partial Backfill Below the Water Table

JACOBS

				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									2,641,957.42	29,752,535.92	3,510,000.00	35,904,493.34
	Groundwater									-	14,846,040.00	2,340,000.00	17,186,040.00
	Surfacewater									-	10,676,347.50	1,170,000.00	11,846,347.50
	Biodiversity									-	4,109,863.28	-	4,109,863.28
	Fire Risk									43,052,176.16	13,307,199.66	3,183,883.11	59,543,258.93
RISK ISSUE	LANDFORM STABILITY (COLLAPSE)												
	Mobilisation, demobilisation, site establishment									125,807	1,416,787	-	1,542,595
Design Control	Placement of overburden (mine waste material), interseam materials and fill over batters to contribute to weight balance.												
Activity	Overburden (mine waste material) placement.	Short Term	Assumed operational activity										
Pricing Item										-	-	-	-
										-	-	-	-
Activity	Differential backfilling across floor and batters to create multi-level in-pit landform with some AWT and some BWT areas such that AWT batters are sloped as shallow as possible												
Pricing Item	Internal dump removal	Short Term	Assumed operational activity							-	-	-	-
	Reshaping - Pit edge	Short Term	Addressed in surface water control measures							-	-	-	-
	Reshaping - Pit wall	Short Term	Assumed total BWT pit wall area. Assumed outside the scope of operations	124	124			ha	3,200.00	397,749.92	-	-	397,749.92
	Reshaping - Pit floor	Short Term	Assumed outside the scope of operations	248	248			ha	3,200.00	793,600.00	-	-	793,600.00
Design Control	Controlled repressurisation of the aquifer to achieve weight balance												
Activity	Sequential cessation of dewatering		Assumed operational activity										
Pricing Item										-	-		
Design Control	Design and construction of slopes to suitable gradient												
Activity	Reshaping of selected batters for a safe and stable outcome.												
Pricing Item	Reshaping - Pit wall	Short Term	Assumes whole area of AWT final sloped pit walls	414	414			ha	3,200.00	1,324,800.00	-	-	1,324,800.00
	Slope Battering	Short Term	Assumed operational activity							-	-	-	-
Activity	Use of buffer zone material to achieve shallower slopes on upper overburden and coal batters		Assumed covered by slope battering activities										
Pricing Item										-	-	-	-
Design Control	Water management (water addition) to achieve weight balance.												
Activity	Surface water injection from flooding (i.e. diverting flood waters)												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	All required as different SW sources.	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000.00	1,170,000.00
Activity	Surface water injection from water entitlement (i.e. neighbouring rivers, power station)												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	All required as different SW sources.	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000.00	1,170,000.00
Activity	Water injection from dewatering.												
Pricing Item	Pumps and Pipe Network Installation	Medium Term	All required as different SW sources.	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00			1,170,000.00	1,170,000.00
Design Control	Buttressing of selected high risk batters prior to pit filling.												
Activity	Buttressing selected batters to maintain safe and stable landform.		Assumed operational activity										
Pricing Item										-	-	-	-
Design Control	Installation of pressure relief wells / horizontal drains in high risk areas of pit cut back												
Activity	Pressure relief wells												
Pricing Item	**Pressure relief well installation**	Medium Term	Assuming to 100m depth of horizontal drilling. At 100m intervals. Across pit face- horizontally (not to depth) near surface, i.e around 4 x 2.5km pit. 130 bores required.	13,000		13,000		m	35.00	-	455,000.00	-	455,000.00
Design Control	Source additional overburden, interseam and fill materials off site from other mite sites												
Activity	Additional overburden sourcing		Assumed operational activity										
Pricing Item										-	-	-	-
Design Control	Design of drainage diversion and control on above water level batters												
Activity	Construction of levees and Drainage diversion to specific ARI.												
Pricing Item	Drainage diversion	Medium Term	Assume 5m wide, 2m deep. Length 1.5 x perimeter of pit crest with a 20m set back. With 20m set back	206,720		206,720		m3	6.44	-	1,331,276.80	-	1,331,276.80
	Levee construction	Medium Term	Levee 5m high. At setback of 150m from pit. 5m height at top, 25m at base.	1,084,500		1,084,500		m3	17.29	-	18,751,005.00	-	18,751,005.00
	Compaction	Medium Term	Compaction of pit edge only.	211		211		ha	16,100.00	-	3,397,100.00	-	3,397,100.00
	Slope Battering	Medium Term	Battering of levee only. Height 5m. To 20 degrees from angle repose.	65,002		65,002		m3	1.06	-	68,901.70	-	68,901.70
	Ripping and Seeding	Medium Term	Pit edge only.	211		211		ha	6,315.00	-	1,332,465.00	-	1,332,465.00
Design Control	Infiltration control.												
Activity	Low perm materials placed on uppermost surface batters to avoid water entering.		Assumed Fire Risk controls sufficient										

Appendix E9 – Loy Yang Cost Estimate Partial Backfill Below the Water Table

JACOBS

				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									2,641,957.42	29,752,535.92	3,510,000.00	35,904,493.34
	Groundwater									-	14,846,040.00	2,340,000.00	17,186,040.00
	Surfacewater									-	10,676,347.50	1,170,000.00	11,846,347.50
	Biodiversity									-	4,109,863.28	-	4,109,863.28
	Fire Risk									43,052,176.16	13,307,199.66	3,183,883.11	59,543,258.93
Pricing Item													
	SUB-TOTAL (LANDFORM STABILITY)									2,641,957	29,752,535.92	3,510,000.00	35,904,493.34
RISK ISSUE	GROUNDWATER												
	Mobilisation, demobilisation, site establishment									-	651,240	-	651,240
Design Control	Diversion of the shallow GW or SW prior to entering the pit, and treatment of it.												
Activity	Construction of horizontal drains and collection system with pumping.												
Pricing Item	Pumps and pipework installation	Medium Term	Assume Landform Stability control sufficient							-	-	-	-
	Pressure relief well installation	Medium Term	Inpit	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term		30		30		Fixed cost p/yr	39,000.00	-	1,170,000.00	-	1,170,000.00
Activity	Bunding for SW.		Assume levee sufficient										
Pricing Item											-	-	-
Design Control	Treatment of water either prior to entering pit, or acidic water.												
Activity	Water treatment to required standard for either offsite discharge or onsite retention.												
Pricing Item	Water treatment system	Medium Term	Assumes upgrade of existing infrastructure sufficient to cover SW and GW	1		1		Fixed Cost: Item	10,000,000.00	-	10,000,000.00	-	10,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00			1,170,000.00	1,170,000.00
Design Control	Maintain appropriate salinity for end landuse.												
Activity	Install and maintain pumping system to control salinity.												
Pricing Item	Pumps and pipework installation	Medium Term	Expit	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000.00	1,170,000.00
Design Control	Treatment of the pit lake water or restore and maintain appropriate WQ												
Activity	Installation of water treatment plant.		Assume above WTS sufficient to address this control										
Pricing Item													
Design Control	Regulate and limit landuse adjacent to the pit, i.e. nothing that may introduce critical contaminants.												
Activity	Buffer zone establishment												
Pricing Item	Fencing	Medium Term	150m setback	14,640		14,640		m	70.00	-	1,024,800.00	-	1,024,800.00
Design Control	Appropriate allocations maintained for GW during pit filling.												
Activity	Regional regulation of GW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Appropriate allocations maintained for GW post pit filling.												
Activity	Regional regulation of GW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Ensure that fundamental design parameters involving other water elements are robust enough to cope with variability/ changes.												
Activity	Base initial designs on climate change prediction data (allow for future ppt and evap demand)												
Pricing Item										-	-	-	-
	SUB-TOTAL (GROUNDWATER)									-	14,846,040.00	2,340,000.00	17,186,040.00
RISK ISSUE	SURFACEWATER												
	Mobilisation, demobilisation, site establishment									-	508,398	-	508,398
Design Control	Maintenance of good water quality in the pit lake for discharge.												
Activity	Water treatment		Assume GW provisions sufficient										
Pricing Item										-	-	-	-
Design Control	Maintenance of good surface water quality in the lake for landuses.												
Activity	Installation of water treatment plant.												
Pricing Item													
Design Control	Design of surface water management facilities around the pit which drain away from pit.												
Activity	Construction of horizontal drains and collection system with pumping.		Assume GW provisions sufficient										
Pricing Item										-	-	-	-
Activity	Bunding for SW.		Assume levee sufficient										
Pricing Item										-	-	-	-
Design Control	Bunding around pit and running pit with freeboard.												

Appendix E9 – Loy Yang Cost Estimate Partial Backfill Below the Water Table

JACOBS

				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									2,641,957.42	29,752,535.92	3,510,000.00	35,904,493.34
	Groundwater									-	14,846,040.00	2,340,000.00	17,186,040.00
	Surfacewater									-	10,676,347.50	1,170,000.00	11,846,347.50
	Biodiversity									-	4,109,863.28	-	4,109,863.28
	Fire Risk									43,052,176.16	13,307,199.66	3,183,883.11	59,543,258.93
Activity	Bunding		Assume levee sufficient										
Pricing Item													
Design Control	Management of excess water between available storage areas i.e. other pits.												
Activity	Establishment and maintain existing distribution system between the pits.												
Pricing Item	Pumps and Pipework Installation	Medium Term	Expit. Assumes additional to GW infrastructure	1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term	Expit. Assumes additional to GW infrastructure	30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000.00	1,170,000.00
Design Control	Appropriate allocations maintained for SW during pit filling.												
Activity	Regional regulation of SW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Appropriate allocations maintained for SW post pit filling.												
Activity	Regional regulation of SW allocations in accordance with pit lake requirements.												
Pricing Item										-	-	-	-
Design Control	Ensure that fundamental design parameters involving other water elements are robust enough to cope with variability/ changes.												
Activity	Base initial designs on climate change prediction data (allow for future ppt and evap demand)												
Pricing Item										-	-	-	-
Design Control	Minimise the area that is lost to the surrounding catchments, i.e. external areas surrounding pit reshaped rehabbed, to minimise lake catchment. Create a controlled system.												
Activity	Reshaping and establishment of drainage, in the buffer zone and lease area.												
Pricing Item	Reshaping - pit edge	Medium Term		211		211		ha	3,200.00	-	675,200.00	-	675,200.00
	Recountouring	Medium Term		211		211		ha	1,790.00	-	377,690.00	-	377,690.00
Design Control	Import material for reshaping												
Activity	Additional overburden sourcing												
Pricing Item	Long haul cut to fill	Medium Term	Assume nominal 0.2m depth at pit edge	422,000		422,000		m3	12.92	-	5,452,240.00	-	5,452,240.00
	Material placement- expit	Medium Term	Assume nominal 0.2m depth at pit edge	422,000		422,000		m3	6.31	-	2,662,820.00	-	2,662,820.00
	SUB-TOTAL (SURFACEWATER)									-	10,676,347.50	1,170,000.00	11,846,347.50
RISK ISSUE	BIODIVERSITY												
	Mobilisation, demobilisation, site establishment									-	195,708	-	195,708
Design Control	Revegetation planning commensurate with final landuse and stability/ GW requirements.												
Activity	Revegetation												
Pricing Item	Topsoiling	Medium Term	Assume pit edge requires only	211		211		ha	12,215.00	-	2,577,365.00	-	2,577,365.00
	Ripping and Seeding	Medium Term	Assume pit edge requires only	211		211		ha	6,315.00	-	1,332,465.00	-	1,332,465.00
Design Control	Consider using natural soil improvement agents to improve the soil microbial condition and nutrient load												
Activity	Soil treatment												
Pricing Item	Addition of fertiliser (material only)	Medium Term	Assume pit edge requires only	211		211		ha	20.50	-	4,325.50	-	4,325.50
	SUB-TOTAL (BIODIVERSITY)									-	4,109,863.28	-	4,109,863.28
RISK ISSUE	FIRE RISK												
	Mobilisation, demobilisation, site establishment									2,050,104	633,676	40,185	2,723,965
Design Control	Coal face must be covered or capped to prevent exposure												
Activity	Overburden placement		Assumed 2m clay layer sufficient to mitigate fire risk										
Pricing Item													
Activity	Those below final water table should be stabilised and covered for duration of pit filling.		Assumed butressing stability control sufficient										
Pricing Item										-	-	-	-
Activity	Layer compacted with low perm material to prevent aeration (spontaneous combustion)												
Pricing Item	Semi Permeable Cover Placement	Short Term	2m semi-permeable layer. Assumes available from pit edge. AWT batters and BWT faces	10,775,840	10,775,840			m3	3.00	32,327,521.05	-	-	32,327,521.05
	Compaction	Short Term	AWT and BWT slopes	539	539			ha	16,100.00	8,674,551.48	-	-	8,674,551.48
Design Control	Programmed maintenance of the cover/ capping, including: monitoring, top up of the cover.												
Activity	Cover maintenance												
Pricing Item	Long Haul cut to fill	Long Term	Assume 0.5% cover requires maintenance per year. Based on total AWT semi-perm layer	41,450			41,450	m3	12.92	-	-	535,527.75	535,527.75

Appendix E9 – Loy Yang Cost Estimate Partial Backfill Below the Water Table

JACOBS

				Quantities						Costs			
Item	Item Description	Phase	Assumptions	Total	*Short Term*	*Medium Term*	*Long Term*	UoM	Rate	*Short Term*	*Medium Term*	*Long Term*	TOTAL
	Summary												
	Landform Stability (Collapse)									2,641,957.42	29,752,535.92	3,510,000.00	35,904,493.34
	Groundwater									-	14,846,040.00	2,340,000.00	17,186,040.00
	Surfacewater									-	10,676,347.50	1,170,000.00	11,846,347.50
	Biodiversity									-	4,109,863.28	-	4,109,863.28
	Fire Risk									43,052,176.16	13,307,199.66	3,183,883.11	59,543,258.93
	Material placement- expit	Long Term	Assume 0.5% cover requires maintenance per year. Based on total AWT semi-perm layer	41,450			41,450	m3	6.31			261,546.45	261,546.45
	Reshaping - Pit wall	Long Term	Assume 0.5% walls exposed require maintenance Based on AWT portion of semi-perm layer	2			2	ha	3,200.00	-	-	6,624.00	6,624.00
Design Control	Use of shallow rooted species for vegetation to prevent breach of the cover.												
Activity	Lake edge revegetation												
Pricing Item	Topsoiling	Medium Term	Assumes AWT slopes only	414		414		ha	12,215.00	-	5,057,010.00	-	5,057,010.00
	Ripping and Seeding	Medium Term	Assumes AWT slopes only	414		414		ha	6,315.00	-	2,614,410.00	-	2,614,410.00
Design Control	Erosion prevention to avoid cover breach.												
Activity	Design of a shallower slope and use of erosion prevention measures. Battering of coal slope prior to placement of cover to achieve consistent (minimum) level of cover.												
Pricing Item	Slope battering	Short Term	Assumed part of operations for stability control							-	-	-	-
	Rip-rap	Medium Term	Assume pit edge only. Assume around pit perimiter, to 0.5m thickness and 20m depth i.e to where water table lies.	113,389		113,389		m3	31.70	-	3,594,443.49	-	3,594,443.49
Design Control	Consideration of alternate fire control measures , possibly spraying exposed coal surfaces with fire retardant materials or chemicals.												
Activity	Fire retardant spraying		Assumed other fire risk controls sufficient										
Design Control	Control activities e.g. vehicle use in areas where there are coal seams or public access to rehabbed (high risk) areas												
Activity	Buffer zone establishment		Assume captured by fencing control for GW										
Pricing Item										-	-	-	-
Design Control	Include (and maintain) fire breaks in revegetation design												
Activity	Fire breaks												
Pricing Item	Fire break	Medium Term	(150x10) per break. 146 breaks required.	22		22		ha	18,530.00	-	407,660.00	-	407,660.00
Design Control	Cover with water (i.e. fill lake to maximum extent)												
Activity	Aquifer repressurisation												
Pricing Item	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000.00	1,170,000.00
Activity	Surface water injection												
Pricing Item	Pumps and Pipe Network Installation	Medium Term		1		1		Fixed Cost: Item	1,000,000.00	-	1,000,000.00	-	1,000,000.00
	Management and Maintenance	Long Term		30			30	Fixed cost p/yr	39,000.00	-	-	1,170,000.00	1,170,000.00
Design Control	Fill pit faster with surface water addition												
Activity	Surface water addition		Assume surface water injecttion activitiy sufficient										
Pricing Item													
Design Control	Maintenance of water level using controlled surface water addition												
Activity	Surface water addition		Assume surface water injecttion activitiy sufficient										
Pricing Item													
	SUB-TOTAL (FIRE RISK)									43,052,176	13,307,199.66	3,183,883.11	59,543,258.93