

## **CALCULATION OF THE CURRENT AND FUTURE FINANCIAL CLOSURE LIABILITIES FOR THE PROPOSED MOKALA MANGANESE MINE AS AT AUGUST 2015**

### **1. INTRODUCTION**

These financial closure liability calculations are initial estimates that have been prepared by SLR Consulting (Pty) Ltd and submitted as part of the EIA/EMP Report for the proposed Mokala Manganese Mine (see SLR report, *Environmental Impact Assessment and Environmental Management Programme Report for the Development of the Proposed Mokala Manganese Mine*, Project Reference 720.09012.00001, prepared for Mokala Manganese (Pty) Ltd).

These financial closure liability calculations have been calculated as per the *Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine* as originally published by the Department of Minerals and Energy (DME)<sup>1</sup>, dated January 2005.

### **2. INPUT TO THE FINANCIAL CLOSURE LIABILITY CALCULATION**

The DMR procedure for calculating financial closure liability is summarised as follows:

- Step 1: Determine the primary mineral and saleable mineral by-products.
- Step 2: Determine the risk class of the mine.
- Step 3: Determine the area sensitivity in which the mine is located.
- Step 4.1: Determine the level of information available for calculating the financial liability.
- Step 4.2: Determine the closure components associated with the mine.
- Step 4.3: Determine the unit rates for the associated closure components.
- Step 4.4: Determine and apply various weighting factors (site specific).
- Step 4.5: Identify the areas of disturbance.
- Step 4.6: Identify any specialist studies required.
- Step 4.7: Calculate the closure liability using the DMR template provided.

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<sup>1</sup> The DME is now known as the Department of Mineral Resources (DMR).

The areas shaded in grey in the following sub-chapters are the values/information used in the calculation of the financial closure liability associated with the proposed Mokala Manganese Mine.

### 2.1. STEP 1: MINE TYPE AND SALEABLE MINERAL BY-PRODUCT

DMR require that the type of mineral mined (or processed) and the saleable mineral by-products (not trace elements) be identified.

<b>Mine/Process type</b>	Manganese Mine – Opencast pit
<b>Saleable mineral by-product</b>	Manganese ore (oxide)

### 2.2. STEP 2: RISK RANKING

According to the DMR guideline, the proposed Mokala Manganese Mine (due to its minerals mined (manganese oxide) and tonnages greater than 10,000 tonnes per month) will be classified as a Class C – Low risk facility.

The risk ranking class is used later to determine the multiplication factors applied to the master rate (see Step 4.3).

<b>Primary risk ranking</b>	Class C <sup>2</sup> – Low risk (Large mine, greater than 10,000 tonnes per month)
<b>Revised risk ranking</b>	N/A <sup>3</sup>

### 2.3. STEP 3: ENVIRONMENTAL SENSITIVITY OF THE MINE AREA

The proposed Mokala Manganese Mine is classified as having a Medium environmental sensitivity based on the classification criteria below:

- A medium biophysical sensitivity (based on the pre-mining environment of the proposed project area).
- A medium social sensitivity (based on the proximity of the proposed project area to local communities).
- A medium economic sensitivity (based on the area's existing economic activity).

The environmental sensitivity ranking is used later to determine the multiplication factors applied to the master rate (see Step 4.3).

<sup>2</sup> Class C – Low risk = A low probability of occurrence of an impact with a negligible consequence.

<sup>3</sup> Revised risk ranking will change to Class B (medium risk) in the event of underground mining.

Sensitivity	Sensitivity Criteria		
	Biophysical	Social	Economic
<b>Low</b>	<ul style="list-style-type: none"> <li>• Largely disturbed from natural state,</li> <li>• Limited natural fauna and flora remains,</li> <li>• Exotic plant species evident,</li> <li>• Unplanned development,</li> <li>• Water resources disturbed and impaired.</li> </ul>	<ul style="list-style-type: none"> <li>• The local communities are not within sighting distance of the mining operation,</li> <li>• Lightly inhabited area (rural).</li> </ul>	<ul style="list-style-type: none"> <li>• The area is insensitive to development,</li> <li>• The area is not a major source of income to the local communities.</li> </ul>
<b>Medium</b>	<ul style="list-style-type: none"> <li>• Mix of natural and exotic fauna and flora,</li> <li>• Development is a mix of disturbed and undisturbed areas, within an overall planned framework,</li> <li>• Water resources are well controlled.</li> </ul>	<ul style="list-style-type: none"> <li>• The local communities are in proximity of the mining operation (within sighting distance),</li> <li>• Peri-urban area with density aligned with a development framework,</li> <li>• Area developed with an established infrastructure.</li> </ul>	<ul style="list-style-type: none"> <li>• The area has a balanced economic development where a degree of income for the local communities is derived from the area,</li> <li>• The economic activity could be influenced by indiscriminate development.</li> </ul>
<b>High</b>	<ul style="list-style-type: none"> <li>• Largely in natural state,</li> <li>• Vibrant fauna and flora, with species diversity and abundance matching the nature of the area,</li> <li>• Well planned development,</li> <li>• Area forms part of an overall ecological regime of conservation value,</li> <li>• Water resources emulate their original state.</li> </ul>	<ul style="list-style-type: none"> <li>• The local communities are in close proximity of the mining operation (on the boundary of the mine),</li> <li>• Densely inhabited area (urban/dense settlements),</li> <li>• Developed and well-established communities.</li> </ul>	<ul style="list-style-type: none"> <li>• The local communities derive the bulk of their income directly from the area,</li> <li>• The area is sensitive to development that could compromise the existing economic activity.</li> </ul>

#### 2.4. STEP 4.1: LEVEL OF INFORMATION AVAILABLE

The level of information available allows DMR to either accept (and/or independently review) the financial closure liability submitted, otherwise follow the 'rule-based' approach.

<b>Extensive</b>	Information available must include the following: <ul style="list-style-type: none"> <li>• An Approved EMP, or in the process of being approved,</li> <li>• A detailed Closure Plan based on the EMP,</li> <li>• A detailed breakdown of costs envisaged for rehabilitation and closure.</li> </ul>
<b>Limited</b> <sup>4</sup>	Information available is less comprehensive than that given above

Since no detailed Closure Plan for the proposed Mokala Manganese Mine has been developed and/or approved by the relevant Authorities, and hence no detailed breakdown of costs prepared and sufficiently motivated, the step-by-step 'rule-based' DMR approach for calculating closure liability should be followed.

<sup>4</sup> Limited information available requires that DMR follow the 'rule-based' approach (see Step 4.3).

## 2.5. STEP 4.2: CLOSURE COMPONENTS TO BE USED

The closure components relevant to the proposed Mokala Manganese Mine are identified from the list below.

No.	Description of Closure Components <sup>5</sup>	Applicable
1	Dismantling of processing plant & related structures (incl. overland conveyors & power lines)	Yes
2 (A)	Demolition of steel buildings & structures	Yes
2 (B)	Demolition of reinforced concrete buildings & structures	Yes
3	Rehabilitation of access roads	Yes
4 (A)	Demolition & rehabilitation of electrified railway lines	No
4 (B)	Demolition & rehabilitation of non electrified railway lines	No
5	Demolition of housing &/or administration facilities	No
6	Opencast rehabilitation including final voids & ramps	Yes
7	Sealing of shafts, adits & inclines	No
8 (A)	Rehabilitation of overburden & spoils	Yes
8 (B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	No
8 (C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	No
9	Rehabilitation of subsided areas	No
10	General surface rehabilitation	Yes
11	River diversions <sup>6</sup>	No
12	Fencing (i.e. high level security perimeter fencing)	Yes
13	Water management	No
14	2 to 3 years of maintenance & aftercare	Yes

It is important to note that Item 6 – Opencast rehabilitation (including final voids and ramps) does not allow for backfilling of the pit voids, but only makes provision for perimeter berms and/or the sloping of the pit walls to 1V:3H i.e. making the pit voids safe for humans and domestic/wild animals. The backfilling of any remaining pit voids (as listed under Item 6) has therefore not been costed in these financial closure liability estimates.

Details of the DMR specified closure components are summarised in Appendix C. Chapter 2.6 of Appendix C provides further explanation with regard to opencast pit rehabilitation.

<sup>5</sup> The Closure Components selected (except Item 6 – Opencast rehabilitation) are in-line with the decommissioning and closure objectives detailed in the *Environmental Impact Assessment and Environmental Management Programme Report for the Development of the Proposed Mokala Manganese Mine* (Project Reference 720.09012.00001) prepared for Mokala Manganese (Pty) Ltd.

<sup>6</sup> Any river realignment is presumed to remain post closure.

## 2.6. STEP 4.3: UNIT RATES FOR CLOSURE COMPONENTS

The unit (Master) rates for each closure component is taken from the DMR guideline (and inflated by the Consumer Price Index (CPI) to account for escalation since January 2005) and a Multiplication Factor applied depending on the Risk Ranking and the Environmental Sensitivity.

The average annual percentage change in the CPI as provided by Statistics South Africa is:

January to December										
2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015 <sup>7</sup>
3.4%	4.6%	7.2%	11.5%	7.1%	4.3%	5.0%	5.6%	5.7%	6.1%	2.6%

i.e. a total of 84.2% since January 2005 (i.e. 1.034 x 1.046 x 1.072 ... etc.).

No.	Description	Unit	Master Rate (at August 2015)	Multiplication Factor <sup>8</sup>
1	Dismantling of process plant & related structures (incl. overland conveyors & power lines)	m <sup>3</sup>	R 12.56	1.00
2 (A)	Demolition of steel buildings & structures	m <sup>2</sup>	R 175.01	1.00
2 (B)	Demolition of reinforced concrete buildings & structures	m <sup>2</sup>	R 257.92	1.00
3	Rehabilitation of access roads	m <sup>2</sup>	R 31.32	1.00
4 (A)	Demolition & rehabilitation of electrified railway lines	m	R 303.97	1.00
4 (B)	Demolition & rehabilitation of non electrified railway lines	m	R 165.80	1.00
5	Demolition of housing &/or administration facilities	m <sup>2</sup>	R 350.03	1.00
6	Opencast rehabilitation including final voids & ramps	Ha	R 178,146.71	0.52
7	Sealing of shafts, adits & inclines	m <sup>3</sup>	R 93.96	1.00
8 (A)	Rehabilitation of overburden & spoils	Ha	R 122,326.18	1.00
8 (B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	Ha	R 152,355.04	1.00
8 (C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	Ha	R 442,511.27	0.66
9	Rehabilitation of subsided areas	Ha	R 102,429.75	1.00
10	General surface rehabilitation	Ha	R 96,902.97	1.00
11	River diversions	Ha	R 96,902.97	1.00
12	Fencing	m	R 110.54	1.00
13	Water management	Ha	R 36,845.23	0.25
14	2 to 3 years of maintenance & aftercare	Ha	R 12,895.83	1.00

<sup>7</sup> CPI for January to July only.

<sup>8</sup> Multiplication factor based on Risk Ranking = Class C and Environmental Sensitivity = Medium.

## 2.7. STEP 4.4: WEIGHTING FACTORS TO BE USED

Weighting Factors based on the specific mine location are selected from the tables below.

Nature of the terrain/accessibility	Flat – Generally flat over the mine area	Undulating - A mix of sloped and undulating areas within the mine area	Rugged – Steep natural ground slopes (greater than 1:6) over the majority of the mine area
Weighting Factor 1	1.00	1.10	1.20

Proximity to urban area where goods and services are supplied	Urban – Within a developed urban area	Peri-urban – Less than 150 km from a developed urban area	Remote – Greater than 150 km from a developed urban area
Weighting Factor 2	1.00	1.05	1.10

## 2.8. STEP 4.5: AREAS OF DISTURBANCE

The proposed areas of disturbance (shown in Appendix A) consist of the following:

- Opencast pit area
- Overburden and topsoil stockpile area
- Plant area (including crushers, screening plant, control room, stockpile areas and loading facilities)
- Workshop, change house, stores and fuel storage
- Admin block (with offices, kitchen, canteen, training centre, clinic/emergency room)
- Water treatment plant, sewage treatment plant, water tanks and recycle ponds
- Access roads, haul roads and weigh bridge
- Topsoil and overburden berms
- River realignment and provincial road realignment

The closure liability calculations are based on the following assumptions:

- No allowance for salvage and recycled/scrap material has been considered.
- All infrastructure will be demolished and no handover of any facilities (for post closure use) has been allowed for.

## 2.9. STEP 4.6: IDENTIFY CLOSURE COSTS FROM SPECIALIST STUDIES

The risk ranking identifies what type of specialist studies should be carried out to ensure successful closure of the mine and/or process operation.

Risk Ranking	Specialist Studies
Class A (High risk)	<ul style="list-style-type: none"> <li>• Water pollution potential studies</li> <li>• Overall quantified risk assessment</li> </ul>
Class B (Medium risk)	<ul style="list-style-type: none"> <li>• Screening level risk assessment</li> </ul>
Class C (Low risk)	

### 3. STEP 4.7: CALCULATE THE CLOSURE LIABILITY

The financial closure liability associated with the proposed Mokala Manganese Mine (as at life of mine, LOM, or approximately December 2032) is R 19,286,474 (including VAT). All amounts calculated are at Current Value (CV) as at August 2015. The liability calculations are provided in Appendix B.

The increase in financial liability over the life of mine is due to the increasing disturbed footprint associated with the opencast pit, and is summarised in the table below.

Date	Year	Progressive Financial Liability (CV incl. VAT)	Financial Liability incurred during the year (CV incl. VAT)	Progressive Liability as a % of LOM liability
Dec '18	1	R 15 341 645	R 15 341 645	79.5%
Dec '19	2	R 1 397 572	R 16 739 217	86.8%
Dec '20	3	R 1 379 654	R 18 118 871	93.9%
Dec '21	4	R 146 892	R 18 265 763	94.7%
Dec '22	5	R 145 009	R 18 410 772	95.5%
Dec '23	6	R 146 892	R 18 557 664	96.2%
Dec '24	7	R 145 009	R 18 702 673	97.0%
Dec '25	8	R 146 892	R 18 849 565	97.7%
Dec '26	9	R 145 008	R 18 994 573	98.5%
Dec '27	10	R 146 892	R 19 141 465	99.2%
Dec '32	LOM	R 145 009	R 19 286 474	100.0%

The financial liabilities are considered to be Class 1 estimates (with an accuracy between +25% and -15%) based on the overall generic approach as stipulated by the DMR Guideline Document.

### 4. CONCLUSION

- 1) The financial closure liability associated with the Mokala Manganese Mine, as at approximately December 2032 (LOM) has been calculated to be R 19,286,474 (CV incl. VAT) as per the *Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine* as published by the Department of Mineral Resources (DMR).
- 2) The closure liability calculations assume that all infrastructure will be demolished and no handover of any facilities for post closure use has been allowed for. Furthermore, the mine infrastructure is assumed to have zero salvage value.
- 3) The calculated liability is considered to be Class 1 estimate (with an accuracy between +25% and -15%) based on the overall generic approach as stipulated by the DMR Guideline Document.

- 4) Mokala have committed to start backfilling the opencast pit void when rollover mining becomes feasible (expected within the second or third year of operations). The rehabilitation (i.e. revegetation) of backfilled areas has not been costed in these financial closure liability estimates. Provision for rehabilitation of backfilled areas must therefore be accounted for by Mokala Manganese in the operations expenditure of the proposed mine.
- 5) The backfilling and rehabilitation of the remaining pit void (at LOM, or in the event of premature closure) has not been costed in these financial closure liability estimates. Provision for backfilling and rehabilitation of the remaining pit void must therefore be accounted for by Mokala Manganese in the operations expenditure of the proposed mine.
- 6) The financial closure liabilities only consider the routine costs associated with decommissioning of plant and infrastructure, the restoration of any environmental damage caused predominantly at the pre-production stage, the surface rehabilitation (shaping and vegetation) of waste deposits and material stockpiles, making the remaining open pit void safe, and the maintenance and aftercare of all the rehabilitated sites.
- 7) Site specific aspects such as surface and groundwater remediation have not been costed at this stage – the likelihood of such remediation would only be identified during the ongoing operation of the mine through surface and groundwater monitoring and/or by carrying out risk assessment and water pollution potential studies.
- 8) The financial closure liabilities do not make allowance for the development of a detailed closure plan, final groundwater modelling, drafting of engineering drawings and specifications, procurement of specialist work, and any administration and site supervision costs. These expenses should therefore be accounted for by Mokala Manganese in the operations expenditure of the proposed mine.

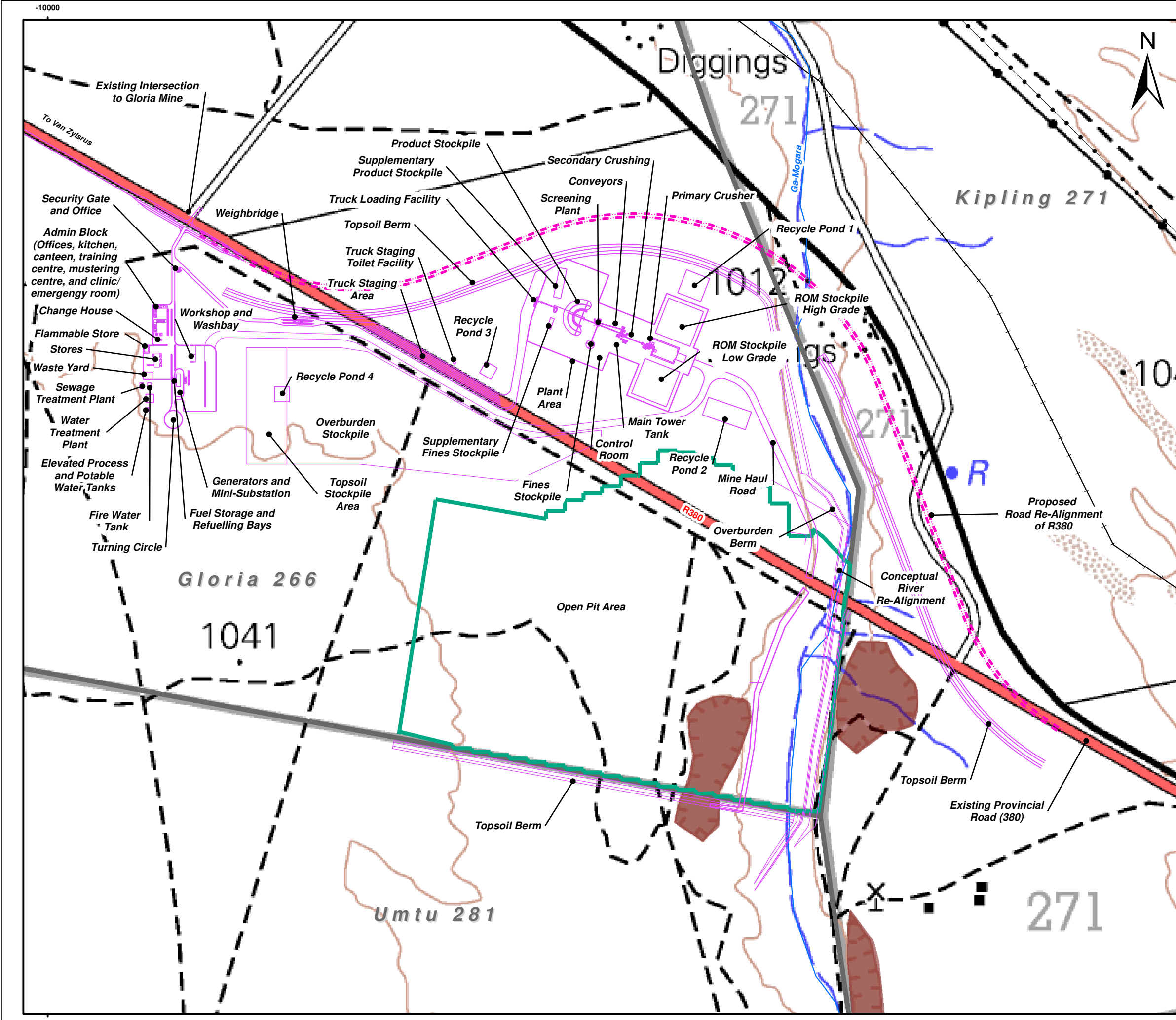


**Stephen van Niekerk (Pr Eng)**

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**APPENDIX A: Areas of Disturbance for the proposed Mokala Manganese Mine**



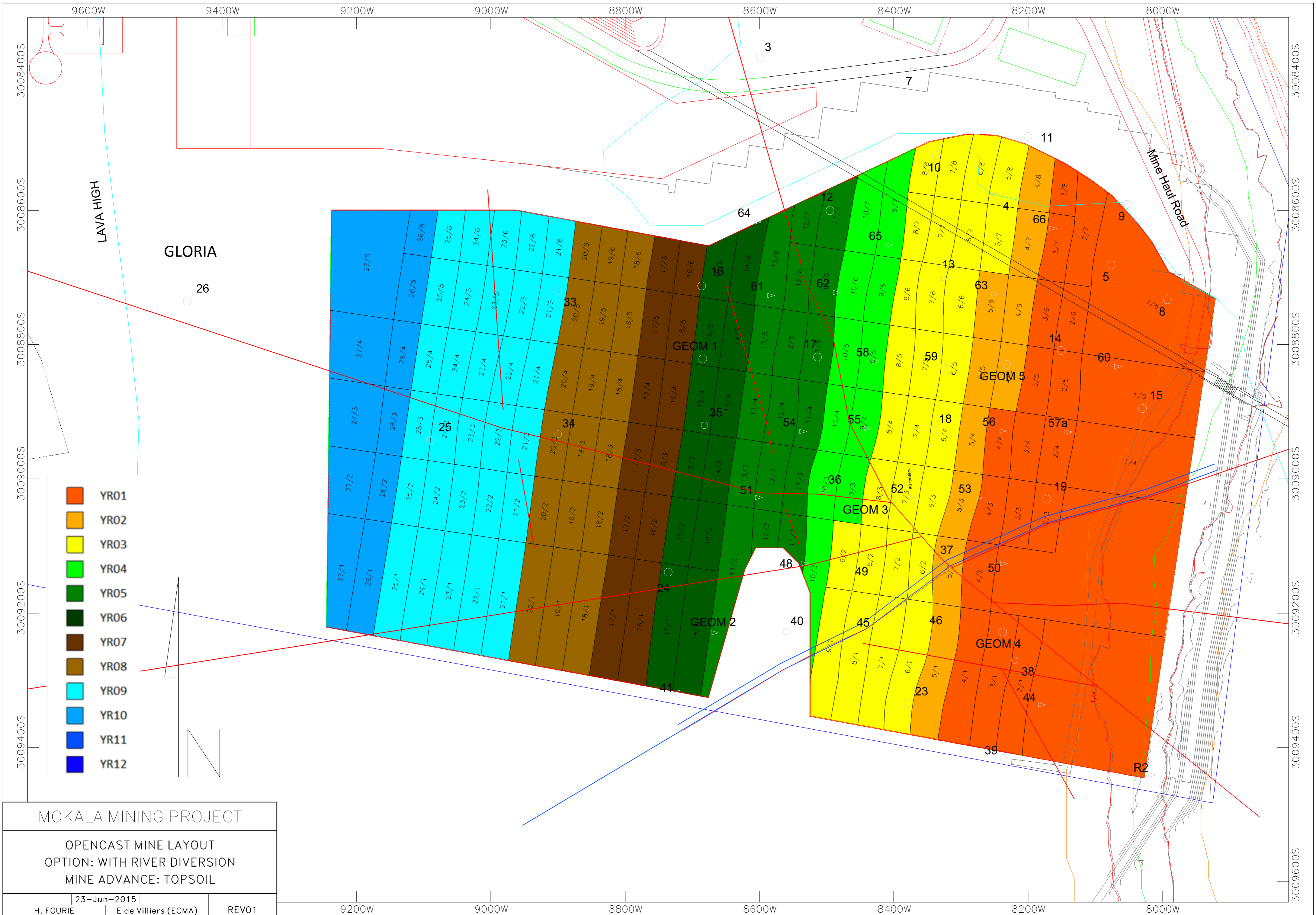
- Legend**
- Proposed Infrastructure
  - - - Proposed Road Re-Alignment of R380
  - Proposed Open Pit Area
  - Farm Boundaries
  - Rivers
  - Powerlines
  - +— Railway
  - - - Tracks/Paths
  - Historical Borrow Pits

0 200 400 Meters  
 Scale: 1:10 000 @ A3  
 Projection: Transverse Mercator  
 Datum: Hartbeeshoek, Lo 23

MOKALA MANGANESE (PTY) LTD

**Figure 4**  
**Mine Layout**

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- YR08
- YR09
- YR10
- YR11
- YR12



<b>MOKALA MINING PROJECT</b>		
OPENCAST MINE LAYOUT OPTION: WITH RIVER DIVERSION MINE ADVANCE: TOPSOIL		
23-Jun-2015	H. FOURIE	REV01
E de Villiers (ECMA)		

**APPENDIX B: Financial Closure Liability Calculations for the  
proposed Mokala Manganese Mine (as at August 2015)**

CALCULATION OF THE QUANTUM								
Area	Closure Liability Update - Mokala, end of 1st year (August 2015 rates)							
No.	Description:	Unit:	Operational Area	A Quantity	B Master rate	C Multiplication factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
				Step 4.5	Step 4.3	Step 4.3	Step 4.4	
1	Dismantling of processing plant & related structures (incl. overland conveyors & power lines)	m <sup>3</sup>	Process plant area	15 195	R 12.56	1	1	R 190 913.40
2 (A)	Demolition of steel buildings & structures	m <sup>2</sup>	Admin, stores and workshop area	2 744	R 175.01	1	1	R 480 240.79
2 (B)	Demolition of reinforced concrete buildings & structures	m <sup>2</sup>	Process plant area	295	R 257.92	1	1	R 76 085.41
3	Rehabilitation of access roads	m <sup>2</sup>	Access roads near admin, stores and workshop area	4 617	R 31.32	1	1	R 144 597.28
		m <sup>2</sup>	Access roads near process plant area	17 669	R 31.32	1	1	R 553 365.68
		m <sup>2</sup>	Haul roads	57 000	R 31.32	1	1	R 1 785 151.61
4 (A)	Demolition & rehabilitation of electrified railway lines	m	n/a	0	R 303.97	1	1	R 0.00
4 (B)	Demolition & rehabilitation of non electrified railway lines	m	n/a	0	R 165.80	1	1	R 0.00
5	Demolition of housing &/or administration facilities	m <sup>2</sup>	n/a	0	R 350.03	1	1	R 0.00
6	Opencast rehabilitation including final voids & ramps	ha	Pit void	15.500	R 178 146.71	0.52	1	R 1 435 862.47
7	Sealing of shafts, adits & inclines	m <sup>3</sup>	n/a	0	R 93.96	1	1	R 0.00
8 (A)	Rehabilitation of overburden & spoils	ha	Overburden stockpile	16.635	R 122 326.18	1	1	R 2 034 895.98
8 (B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	ha	n/a	0.000	R 152 355.04	1	1	R 0.00
8 (C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	n/a	0	R 442 511.27	0.66	1	R 0.00
9	Rehabilitation of subsided areas	ha	n/a	0	R 102 429.75	1	1	R 0.00
10	General surface rehabilitation, including grassing of all denuded areas	ha	Admin, stores and workshop area	2.890	R 96 902.97	1	1	R 280 049.57
		ha	Process plant area	9.188	R 96 902.97	1	1	R 890 344.46
		ha	Recycle ponds	1.165	R 96 902.97	1	1	R 112 891.96
		ha	Pit advance/roll over area	0.000	R 96 902.97	1	1	R 0.00
		ha	Topsoil berms & stockpile	9.335	R 96 902.97	1	1	R 904 589.19
ha	Overburden berms	2.340	R 96 902.97	1	1	R 226 752.94		
11	River diversions (to be decommissioned)	ha	n/a	0	R 96 902.97	1	1	R 0.00
12	Fencing	m	Plant, admin and pond areas	3 635	R 110.54	1	1	R 401 797.28
13	Water management	ha	n/a	0.00	R 36 845.23	0.25	1	R 0.00
14	2 to 3 years of active maintenance & aftercare	ha	All disturbed areas (excluding Pit area)	49.48	R 12 895.83	1	1	R 638 106.40
		ha	Pit area	15.50	R 12 895.83	1	1	R 199 885.40
15	Specialist study (Screening level risk assessment)	SUM	Screening level risk assessment	1.00	R 150 000.00	1	1	R 150 000.00
<b>Subtotal 1</b> (Sum of items 1 to 15 Above)								R 10 505 529.82
16	Multiply Subtotal 1 by Weighting factor 2 (step 4.4)	<b>Weighting factor 2, WF 2 (step 4.4)</b>			1.05	<b>Subtotal 2</b> (Subtotal 1 x WF 2)		R 11 030 806.31
17	Preliminary and General	12.0% of Subtotal 2						R 1 323 696.76
18	Contingency	10.0% of Subtotal 2						R 1 103 080.63
<b>Subtotal 3</b> (Subtotal 2 plus P&G's and contingency)								R 13 457 583.70
19	VAT	14.0% of Subtotal 3						R 1 884 061.72
<b>GRAND TOTAL</b> (Subtotal 3 plus VAT)								R 15 341 645.42

CALCULATION OF THE QUANTUM								
Area	Closure Liability Update - Mokala, end of 2nd year (August 2015 rates)							
No.	Description:	Unit:	Operational Area	A Quantity	B Master rate	C Multiplication factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
				Step 4.5	Step 4.3	Step 4.3	Step 4.4	
1	Dismantling of processing plant & related structures (incl. overland conveyors & power lines)	m <sup>3</sup>	Process plant area	15 195	R 12.56	1	1	R 190 913.40
2 (A)	Demolition of steel buildings & structures	m <sup>2</sup>	Admin, stores and workshop area	2 744	R 175.01	1	1	R 480 240.79
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3	Rehabilitation of access roads	m <sup>2</sup>	Access roads near admin, stores and workshop area	4 617	R 31.32	1	1	R 144 597.28
		m <sup>2</sup>	Access roads near process plant area	17 669	R 31.32	1	1	R 553 365.68
		m <sup>2</sup>	Haul roads	57 000	R 31.32	1	1	R 1 785 151.61
4 (A)	Demolition & rehabilitation of electrified railway lines	m	n/a	0	R 303.97	1	1	R 0.00
4 (B)	Demolition & rehabilitation of non electrified railway lines	m	n/a	0	R 165.80	1	1	R 0.00
5	Demolition of housing &/or administration facilities	m <sup>2</sup>	n/a	0	R 350.03	1	1	R 0.00
6	Opencast rehabilitation including final voids & ramps	ha	Pit void	15.500	R 178 146.71	0.52	1	R 1 435 862.47
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9	Rehabilitation of subsided areas	ha	n/a	0	R 102 429.75	1	1	R 0.00
10	General surface rehabilitation, including grassing of all denuded areas	ha	Admin, stores and workshop area	2.890	R 96 902.97	1	1	R 280 049.57
		ha	Process plant area	9.188	R 96 902.97	1	1	R 890 344.46
		ha	Recycle ponds	1.165	R 96 902.97	1	1	R 112 891.96
		ha	Pit advance/roll over area	7.800	R 96 902.97	1	1	R 755 843.14
		ha	Topsoil berms & stockpile	9.335	R 96 902.97	1	1	R 904 589.19
		ha	Overburden berms	2.340	R 96 902.97	1	1	R 226 752.94
11	River diversions (to be decommissioned)	ha	n/a	0	R 96 902.97	1	1	R 0.00
12	Fencing	m	Plant, admin and pond areas	3 635	R 110.54	1	1	R 401 797.28
13	Water management	ha	n/a	0.00	R 36 845.23	0.25	1	R 0.00
14	2 to 3 years of active maintenance & aftercare	ha	All disturbed areas (excluding Pit area)	57.28	R 12 895.83	1	1	R 738 693.89
		ha	Pit area	23.30	R 12 895.83	1	1	R 300 472.89
15	Specialist study (Screening level risk assessment)	SUM	Screening level risk assessment	1.00	R 150 000.00	1	1	R 150 000.00
<b>Subtotal 1</b> (Sum of items 1 to 15 Above)								R 11 462 547.94
16	Multiply Subtotal 1 by Weighting factor 2 (step 4.4)	<b>Weighting factor 2, WF 2 (step 4.4)</b>			1.05	<b>Subtotal 2</b> (Subtotal 1 x WF 2)		R 12 035 675.34
17	Preliminary and General	12.0% of Subtotal 2						R 1 444 281.04
18	Contingency	10.0% of Subtotal 2						R 1 203 567.53
<b>Subtotal 3</b> (Subtotal 2 plus P&G's and contingency)								R 14 683 523.92
19	VAT	14.0% of Subtotal 3						R 2 055 693.35
<b>GRAND TOTAL</b> (Subtotal 3 plus VAT)								R 16 739 217.26

CALCULATION OF THE QUANTUM								
Area	Closure Liability Update - Mokala, end of 3rd year (August 2015 rates)							
No.	Description:	Unit:	Operational Area	A Quantity	B Master rate	C Multiplication factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
				Step 4.5	Step 4.3	Step 4.3	Step 4.4	
1	Dismantling of processing plant & related structures (incl. overland conveyors & power lines)	m <sup>3</sup>	Process plant area	15 195	R 12.56	1	1	R 190 913.40
2 (A)	Demolition of steel buildings & structures	m <sup>2</sup>	Admin, stores and workshop area	2 744	R 175.01	1	1	R 480 240.79
2 (B)	Demolition of reinforced concrete buildings & structures	m <sup>2</sup>	Process plant area	295	R 257.92	1	1	R 76 085.41
3	Rehabilitation of access roads	m <sup>2</sup>	Access roads near admin, stores and workshop area	4 617	R 31.32	1	1	R 144 597.28
		m <sup>2</sup>	Access roads near process plant area	17 669	R 31.32	1	1	R 553 365.68
		m <sup>2</sup>	Haul roads	57 000	R 31.32	1	1	R 1 785 151.61
4 (A)	Demolition & rehabilitation of electrified railway lines	m	n/a	0	R 303.97	1	1	R 0.00
4 (B)	Demolition & rehabilitation of non electrified railway lines	m	n/a	0	R 165.80	1	1	R 0.00
5	Demolition of housing &/or administration facilities	m <sup>2</sup>	n/a	0	R 350.03	1	1	R 0.00
6	Opencast rehabilitation including final voids & ramps	ha	Pit void	15.500	R 178 146.71	0.52	1	R 1 435 862.47
7	Sealing of shafts, adits & inclines	m <sup>3</sup>	n/a	0	R 93.96	1	1	R 0.00
8 (A)	Rehabilitation of overburden & spoils	ha	Overburden stockpile	16.635	R 122 326.18	1	1	R 2 034 895.98
8 (B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	ha	n/a	0.000	R 152 355.04	1	1	R 0.00
8 (C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	n/a	0	R 442 511.27	0.66	1	R 0.00
9	Rehabilitation of subsided areas	ha	n/a	0	R 102 429.75	1	1	R 0.00
10	General surface rehabilitation, including grassing of all denuded areas	ha	Admin, stores and workshop area	2.890	R 96 902.97	1	1	R 280 049.57
		ha	Process plant area	9.188	R 96 902.97	1	1	R 890 344.46
		ha	Recycle ponds	1.165	R 96 902.97	1	1	R 112 891.96
		ha	Pit advance/roll over area	15.500	R 96 902.97	1	1	R 1 501 995.98
		ha	Topsoil berms & stockpile	9.335	R 96 902.97	1	1	R 904 589.19
		ha	Overburden berms	2.340	R 96 902.97	1	1	R 226 752.94
11	River diversions (to be decommissioned)	ha	n/a	0	R 96 902.97	1	1	R 0.00
12	Fencing	m	Plant, admin and pond areas	3 635	R 110.54	1	1	R 401 797.28
13	Water management	ha	n/a	0.00	R 36 845.23	0.25	1	R 0.00
14	2 to 3 years of active maintenance & aftercare	ha	All disturbed areas (excluding Pit area)	64.98	R 12 895.83	1	1	R 837 991.80
		ha	Pit area	31.00	R 12 895.83	1	1	R 399 770.79
15	Specialist study (Screening level risk assessment)	SUM	Screening level risk assessment	1.00	R 150 000.00	1	1	R 150 000.00
<b>Subtotal 1</b> (Sum of items 1 to 15 Above)								R 12 407 296.60
16	Multiply Subtotal 1 by Weighting factor 2 (step 4.4)	<b>Weighting factor 2, WF 2 (step 4.4)</b>			1.05	<b>Subtotal 2</b> (Subtotal 1 x WF 2)		R 13 027 661.43
17	Preliminary and General	12.0% of Subtotal 2						R 1 563 319.37
18	Contingency	10.0% of Subtotal 2						R 1 302 766.14
<b>Subtotal 3</b> (Subtotal 2 plus P&G's and contingency)								R 15 893 746.95
19	VAT	14.0% of Subtotal 3						R 2 225 124.57
<b>GRAND TOTAL</b> (Subtotal 3 plus VAT)								R 18 118 871.52

CALCULATION OF THE QUANTUM								
Area	Closure Liability Update - Mokala, end of 4th year (August 2015 rates)							
No.	Description:	Unit:	Operational Area	A Quantity	B Master rate	C Multiplication factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
				Step 4.5	Step 4.3	Step 4.3	Step 4.4	
1	Dismantling of processing plant & related structures (incl. overland conveyors & power lines)	m <sup>3</sup>	Process plant area	15 195	R 12.56	1	1	R 190 913.40
2 (A)	Demolition of steel buildings & structures	m <sup>2</sup>	Admin, stores and workshop area	2 744	R 175.01	1	1	R 480 240.79
2 (B)	Demolition of reinforced concrete buildings & structures	m <sup>2</sup>	Process plant area	295	R 257.92	1	1	R 76 085.41
3	Rehabilitation of access roads	m <sup>2</sup>	Access roads near admin, stores and workshop area	4 617	R 31.32	1	1	R 144 597.28
		m <sup>2</sup>	Access roads near process plant area	17 669	R 31.32	1	1	R 553 365.68
		m <sup>2</sup>	Haul roads	57 000	R 31.32	1	1	R 1 785 151.61
4 (A)	Demolition & rehabilitation of electrified railway lines	m	n/a	0	R 303.97	1	1	R 0.00
4 (B)	Demolition & rehabilitation of non electrified railway lines	m	n/a	0	R 165.80	1	1	R 0.00
5	Demolition of housing &/or administration facilities	m <sup>2</sup>	n/a	0	R 350.03	1	1	R 0.00
6	Opencast rehabilitation including final voids & ramps	ha	Pit void	15.500	R 178 146.71	0.52	1	R 1 435 862.47
7	Sealing of shafts, adits & inclines	m <sup>3</sup>	n/a	0	R 93.96	1	1	R 0.00
8 (A)	Rehabilitation of overburden & spoils	ha	Overburden stockpile	16.635	R 122 326.18	1	1	R 2 034 895.98
8 (B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	ha	n/a	0.000	R 152 355.04	1	1	R 0.00
8 (C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	n/a	0	R 442 511.27	0.66	1	R 0.00
9	Rehabilitation of subsided areas	ha	n/a	0	R 102 429.75	1	1	R 0.00
10	General surface rehabilitation, including grassing of all denuded areas	ha	Admin, stores and workshop area	2.890	R 96 902.97	1	1	R 280 049.57
		ha	Process plant area	9.188	R 96 902.97	1	1	R 890 344.46
		ha	Recycle ponds	1.165	R 96 902.97	1	1	R 112 891.96
		ha	Pit advance/roll over area	15.500	R 96 902.97	1	1	R 1 501 995.98
		ha	Topsoil berms & stockpile	9.335	R 96 902.97	1	1	R 904 589.19
		ha	Overburden berms	2.340	R 96 902.97	1	1	R 226 752.94
11	River diversions (to be decommissioned)	ha	n/a	0	R 96 902.97	1	1	R 0.00
12	Fencing	m	Plant, admin and pond areas	3 635	R 110.54	1	1	R 401 797.28
13	Water management	ha	n/a	0.00	R 36 845.23	0.25	1	R 0.00
14	2 to 3 years of active maintenance & aftercare	ha	All disturbed areas (excluding Pit area)	64.98	R 12 895.83	1	1	R 837 991.80
		ha	Pit area	38.80	R 12 895.83	1	1	R 500 358.28
15	Specialist study (Screening level risk assessment)	SUM	Screening level risk assessment	1.00	R 150 000.00	1	1	R 150 000.00
<b>Subtotal 1</b> (Sum of items 1 to 15 Above)								R 12 507 884.09
16	Multiply Subtotal 1 by Weighting factor 2 (step 4.4)	<b>Weighting factor 2, WF 2 (step 4.4)</b>			1.05	<b>Subtotal 2</b> (Subtotal 1 x WF 2)		R 13 133 278.30
17	Preliminary and General	12.0% of Subtotal 2						R 1 575 993.40
18	Contingency	10.0% of Subtotal 2						R 1 313 327.83
<b>Subtotal 3</b> (Subtotal 2 plus P&G's and contingency)								R 16 022 599.52
19	VAT	14.0% of Subtotal 3						R 2 243 163.93
<b>GRAND TOTAL</b> (Subtotal 3 plus VAT)								R 18 265 763.45



CALCULATION OF THE QUANTUM								
Area	Closure Liability Update - Mokala, end of 5th year (August 2015 rates)							
No.	Description:	Unit:	Operational Area	A Quantity	B Master rate	C Multiplication factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
				Step 4.5	Step 4.3	Step 4.3	Step 4.4	
1	Dismantling of processing plant & related structures (incl. overland conveyors & power lines)	m <sup>3</sup>	Process plant area	15 195	R 12.56	1	1	R 190 913.40
2 (A)	Demolition of steel buildings & structures	m <sup>2</sup>	Admin, stores and workshop area	2 744	R 175.01	1	1	R 480 240.79
2 (B)	Demolition of reinforced concrete buildings & structures	m <sup>2</sup>	Process plant area	295	R 257.92	1	1	R 76 085.41
3	Rehabilitation of access roads	m <sup>2</sup>	Access roads near admin, stores and workshop area	4 617	R 31.32	1	1	R 144 597.28
		m <sup>2</sup>	Access roads near process plant area	17 669	R 31.32	1	1	R 553 365.68
		m <sup>2</sup>	Haul roads	57 000	R 31.32	1	1	R 1 785 151.61
4 (A)	Demolition & rehabilitation of electrified railway lines	m	n/a	0	R 303.97	1	1	R 0.00
4 (B)	Demolition & rehabilitation of non electrified railway lines	m	n/a	0	R 165.80	1	1	R 0.00
5	Demolition of housing &/or administration facilities	m <sup>2</sup>	n/a	0	R 350.03	1	1	R 0.00
6	Opencast rehabilitation including final voids & ramps	ha	Pit void	15.500	R 178 146.71	0.52	1	R 1 435 862.47
7	Sealing of shafts, adits & inclines	m <sup>3</sup>	n/a	0	R 93.96	1	1	R 0.00
8 (A)	Rehabilitation of overburden & spoils	ha	Overburden stockpile	16.635	R 122 326.18	1	1	R 2 034 895.98
8 (B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	ha	n/a	0.000	R 152 355.04	1	1	R 0.00
8 (C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	n/a	0	R 442 511.27	0.66	1	R 0.00
9	Rehabilitation of subsided areas	ha	n/a	0	R 102 429.75	1	1	R 0.00
10	General surface rehabilitation, including grassing of all denuded areas	ha	Admin, stores and workshop area	2.890	R 96 902.97	1	1	R 280 049.57
		ha	Process plant area	9.188	R 96 902.97	1	1	R 890 344.46
		ha	Recycle ponds	1.165	R 96 902.97	1	1	R 112 891.96
		ha	Pit advance/roll over area	15.500	R 96 902.97	1	1	R 1 501 995.98
		ha	Topsoil berms & stockpile	9.335	R 96 902.97	1	1	R 904 589.19
		ha	Overburden berms	2.340	R 96 902.97	1	1	R 226 752.94
11	River diversions (to be decommissioned)	ha	n/a	0	R 96 902.97	1	1	R 0.00
12	Fencing	m	Plant, admin and pond areas	3 635	R 110.54	1	1	R 401 797.28
13	Water management	ha	n/a	0.00	R 36 845.23	0.25	1	R 0.00
14	2 to 3 years of active maintenance & aftercare	ha	All disturbed areas (excluding Pit area)	64.98	R 12 895.83	1	1	R 837 991.80
		ha	Pit area	46.50	R 12 895.83	1	1	R 599 656.19
15	Specialist study (Screening level risk assessment)	SUM	Screening level risk assessment	1.00	R 150 000.00	1	1	R 150 000.00
<b>Subtotal 1</b> (Sum of items 1 to 15 Above)								R 12 607 182.00
16	Multiply Subtotal 1 by Weighting factor 2 (step 4.4)	<b>Weighting factor 2, WF 2 (step 4.4)</b>			1.05	<b>Subtotal 2</b> (Subtotal 1 x WF 2)		R 13 237 541.10
17	Preliminary and General	12.0% of Subtotal 2						R 1 588 504.93
18	Contingency	10.0% of Subtotal 2						R 1 323 754.11
<b>Subtotal 3</b> (Subtotal 2 plus P&G's and contingency)								R 16 149 800.14
19	VAT	14.0% of Subtotal 3						R 2 260 972.02
<b>GRAND TOTAL</b> (Subtotal 3 plus VAT)								R 18 410 772.16

CALCULATION OF THE QUANTUM								
Area	Closure Liability Update - Mokala, end of 6th year (August 2015 rates)							
No.	Description:	Unit:	Operational Area	A Quantity	B Master rate	C Multiplication factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
				Step 4.5	Step 4.3	Step 4.3	Step 4.4	
1	Dismantling of processing plant & related structures (incl. overland conveyors & power lines)	m <sup>3</sup>	Process plant area	15 195	R 12.56	1	1	R 190 913.40
2 (A)	Demolition of steel buildings & structures	m <sup>2</sup>	Admin, stores and workshop area	2 744	R 175.01	1	1	R 480 240.79
2 (B)	Demolition of reinforced concrete buildings & structures	m <sup>2</sup>	Process plant area	295	R 257.92	1	1	R 76 085.41
3	Rehabilitation of access roads	m <sup>2</sup>	Access roads near admin, stores and workshop area	4 617	R 31.32	1	1	R 144 597.28
		m <sup>2</sup>	Access roads near process plant area	17 669	R 31.32	1	1	R 553 365.68
		m <sup>2</sup>	Haul roads	57 000	R 31.32	1	1	R 1 785 151.61
4 (A)	Demolition & rehabilitation of electrified railway lines	m	n/a	0	R 303.97	1	1	R 0.00
4 (B)	Demolition & rehabilitation of non electrified railway lines	m	n/a	0	R 165.80	1	1	R 0.00
5	Demolition of housing &/or administration facilities	m <sup>2</sup>	n/a	0	R 350.03	1	1	R 0.00
6	Opencast rehabilitation including final voids & ramps	ha	Pit void	15.500	R 178 146.71	0.52	1	R 1 435 862.47
7	Sealing of shafts, adits & inclines	m <sup>3</sup>	n/a	0	R 93.96	1	1	R 0.00
8 (A)	Rehabilitation of overburden & spoils	ha	Overburden stockpile	16.635	R 122 326.18	1	1	R 2 034 895.98
8 (B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	ha	n/a	0.000	R 152 355.04	1	1	R 0.00
8 (C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	n/a	0	R 442 511.27	0.66	1	R 0.00
9	Rehabilitation of subsided areas	ha	n/a	0	R 102 429.75	1	1	R 0.00
10	General surface rehabilitation, including grassing of all denuded areas	ha	Admin, stores and workshop area	2.890	R 96 902.97	1	1	R 280 049.57
		ha	Process plant area	9.188	R 96 902.97	1	1	R 890 344.46
		ha	Recycle ponds	1.165	R 96 902.97	1	1	R 112 891.96
		ha	Pit advance/roll over area	15.500	R 96 902.97	1	1	R 1 501 995.98
		ha	Topsoil berms & stockpile	9.335	R 96 902.97	1	1	R 904 589.19
		ha	Overburden berms	2.340	R 96 902.97	1	1	R 226 752.94
11	River diversions (to be decommissioned)	ha	n/a	0	R 96 902.97	1	1	R 0.00
12	Fencing	m	Plant, admin and pond areas	3 635	R 110.54	1	1	R 401 797.28
13	Water management	ha	n/a	0.00	R 36 845.23	0.25	1	R 0.00
14	2 to 3 years of active maintenance & aftercare	ha	All disturbed areas (excluding Pit area)	64.98	R 12 895.83	1	1	R 837 991.80
		ha	Pit area	54.30	R 12 895.83	1	1	R 700 243.68
15	Specialist study (Screening level risk assessment)	SUM	Screening level risk assessment	1.00	R 150 000.00	1	1	R 150 000.00
<b>Subtotal 1</b> (Sum of items 1 to 15 Above)								R 12 707 769.49
16	Multiply Subtotal 1 by Weighting factor 2 (step 4.4)	<b>Weighting factor 2, WF 2 (step 4.4)</b>			1.05	<b>Subtotal 2</b> (Subtotal 1 x WF 2)		R 13 343 157.96
17	Preliminary and General	12.0% of Subtotal 2						R 1 601 178.96
18	Contingency	10.0% of Subtotal 2						R 1 334 315.80
<b>Subtotal 3</b> (Subtotal 2 plus P&G's and contingency)								R 16 278 652.71
19	VAT	14.0% of Subtotal 3						R 2 279 011.38
<b>GRAND TOTAL</b> (Subtotal 3 plus VAT)								R 18 557 664.10

CALCULATION OF THE QUANTUM								
Area Closure Liability Update - Mokala, end of 7th year (August 2015 rates)								
No.	Description:	Unit:	Operational Area	A Quantity	B Master rate	C Multiplication factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
				Step 4.5	Step 4.3	Step 4.3	Step 4.4	
1	Dismantling of processing plant & related structures (incl. overland conveyors & power lines)	m <sup>3</sup>	Process plant area	15 195	R 12.56	1	1	R 190 913.40
2 (A)	Demolition of steel buildings & structures	m <sup>2</sup>	Admin, stores and workshop area	2 744	R 175.01	1	1	R 480 240.79
2 (B)	Demolition of reinforced concrete buildings & structures	m <sup>2</sup>	Process plant area	295	R 257.92	1	1	R 76 085.41
3	Rehabilitation of access roads	m <sup>2</sup>	Access roads near admin, stores and workshop area	4 617	R 31.32	1	1	R 144 597.28
		m <sup>2</sup>	Access roads near process plant area	17 669	R 31.32	1	1	R 553 365.68
		m <sup>2</sup>	Haul roads	57 000	R 31.32	1	1	R 1 785 151.61
4 (A)	Demolition & rehabilitation of electrified railway lines	m	n/a	0	R 303.97	1	1	R 0.00
4 (B)	Demolition & rehabilitation of non electrified railway lines	m	n/a	0	R 165.80	1	1	R 0.00
5	Demolition of housing &/or administration facilities	m <sup>2</sup>	n/a	0	R 350.03	1	1	R 0.00
6	Opencast rehabilitation including final voids & ramps	ha	Pit void	15.500	R 178 146.71	0.52	1	R 1 435 862.47
7	Sealing of shafts, adits & inclines	m <sup>3</sup>	n/a	0	R 93.96	1	1	R 0.00
8 (A)	Rehabilitation of overburden & spoils	ha	Overburden stockpile	16.635	R 122 326.18	1	1	R 2 034 895.98
8 (B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	ha	n/a	0.000	R 152 355.04	1	1	R 0.00
8 (C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	n/a	0	R 442 511.27	0.66	1	R 0.00
9	Rehabilitation of subsided areas	ha	n/a	0	R 102 429.75	1	1	R 0.00
10	General surface rehabilitation, including grassing of all denuded areas	ha	Admin, stores and workshop area	2.890	R 96 902.97	1	1	R 280 049.57
		ha	Process plant area	9.188	R 96 902.97	1	1	R 890 344.46
		ha	Recycle ponds	1.165	R 96 902.97	1	1	R 112 891.96
		ha	Pit advance/roll over area	15.500	R 96 902.97	1	1	R 1 501 995.98
		ha	Topsoil berms & stockpile	9.335	R 96 902.97	1	1	R 904 589.19
		ha	Overburden berms	2.340	R 96 902.97	1	1	R 226 752.94
11	River diversions (to be decommissioned)	ha	n/a	0	R 96 902.97	1	1	R 0.00
12	Fencing	m	Plant, admin and pond areas	3 635	R 110.54	1	1	R 401 797.28
13	Water management	ha	n/a	0.00	R 36 845.23	0.25	1	R 0.00
14	2 to 3 years of active maintenance & aftercare	ha	All disturbed areas (excluding Pit area)	64.98	R 12 895.83	1	1	R 837 991.80
		ha	Pit area	62.00	R 12 895.83	1	1	R 799 541.59
15	Specialist study (Screening level risk assessment)	SUM	Screening level risk assessment	1.00	R 150 000.00	1	1	R 150 000.00
<b>Subtotal 1</b> (Sum of items 1 to 15 Above)								R 12 807 067.40
16	Multiply Subtotal 1 by Weighting factor 2 (step 4.4)	<b>Weighting factor 2, WF 2 (step 4.4)</b>			1.05	<b>Subtotal 2</b> (Subtotal 1 x WF 2)		R 13 447 420.77
17	Preliminary and General	12.0% of Subtotal 2						R 1 613 690.49
18	Contingency	10.0% of Subtotal 2						R 1 344 742.08
<b>Subtotal 3</b> (Subtotal 2 plus P&G's and contingency)								R 16 405 853.33
19	VAT	14.0% of Subtotal 3						R 2 296 819.47
<b>GRAND TOTAL</b> (Subtotal 3 plus VAT)								R 18 702 672.80

CALCULATION OF THE QUANTUM								
Area	Closure Liability Update - Mokala, end of 8th year (August 2015 rates)							
No.	Description:	Unit:	Operational Area	A Quantity	B Master rate	C Multiplication factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
				Step 4.5	Step 4.3	Step 4.3	Step 4.4	
1	Dismantling of processing plant & related structures (incl. overland conveyors & power lines)	m <sup>3</sup>	Process plant area	15 195	R 12.56	1	1	R 190 913.40
2 (A)	Demolition of steel buildings & structures	m <sup>2</sup>	Admin, stores and workshop area	2 744	R 175.01	1	1	R 480 240.79
2 (B)	Demolition of reinforced concrete buildings & structures	m <sup>2</sup>	Process plant area	295	R 257.92	1	1	R 76 085.41
3	Rehabilitation of access roads	m <sup>2</sup>	Access roads near admin, stores and workshop area	4 617	R 31.32	1	1	R 144 597.28
		m <sup>2</sup>	Access roads near process plant area	17 669	R 31.32	1	1	R 553 365.68
		m <sup>2</sup>	Haul roads	57 000	R 31.32	1	1	R 1 785 151.61
4 (A)	Demolition & rehabilitation of electrified railway lines	m	n/a	0	R 303.97	1	1	R 0.00
4 (B)	Demolition & rehabilitation of non electrified railway lines	m	n/a	0	R 165.80	1	1	R 0.00
5	Demolition of housing &/or administration facilities	m <sup>2</sup>	n/a	0	R 350.03	1	1	R 0.00
6	Opencast rehabilitation including final voids & ramps	ha	Pit void	15.500	R 178 146.71	0.52	1	R 1 435 862.47
7	Sealing of shafts, adits & inclines	m <sup>3</sup>	n/a	0	R 93.96	1	1	R 0.00
8 (A)	Rehabilitation of overburden & spoils	ha	Overburden stockpile	16.635	R 122 326.18	1	1	R 2 034 895.98
8 (B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	ha	n/a	0.000	R 152 355.04	1	1	R 0.00
8 (C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	n/a	0	R 442 511.27	0.66	1	R 0.00
9	Rehabilitation of subsided areas	ha	n/a	0	R 102 429.75	1	1	R 0.00
10	General surface rehabilitation, including grassing of all denuded areas	ha	Admin, stores and workshop area	2.890	R 96 902.97	1	1	R 280 049.57
		ha	Process plant area	9.188	R 96 902.97	1	1	R 890 344.46
		ha	Recycle ponds	1.165	R 96 902.97	1	1	R 112 891.96
		ha	Pit advance/roll over area	15.500	R 96 902.97	1	1	R 1 501 995.98
		ha	Topsoil berms & stockpile	9.335	R 96 902.97	1	1	R 904 589.19
		ha	Overburden berms	2.340	R 96 902.97	1	1	R 226 752.94
11	River diversions (to be decommissioned)	ha	n/a	0	R 96 902.97	1	1	R 0.00
12	Fencing	m	Plant, admin and pond areas	3 635	R 110.54	1	1	R 401 797.28
13	Water management	ha	n/a	0.00	R 36 845.23	0.25	1	R 0.00
14	2 to 3 years of active maintenance & aftercare	ha	All disturbed areas (excluding Pit area)	64.98	R 12 895.83	1	1	R 837 991.80
		ha	Pit area	69.80	R 12 895.83	1	1	R 900 129.08
15	Specialist study (Screening level risk assessment)	SUM	Screening level risk assessment	1.00	R 150 000.00	1	1	R 150 000.00
<b>Subtotal 1</b> (Sum of items 1 to 15 Above)								R 12 907 654.89
16	Multiply Subtotal 1 by Weighting factor 2 (step 4.4)	<b>Weighting factor 2, WF 2 (step 4.4)</b>			1.05	<b>Subtotal 2</b> (Subtotal 1 x WF 2)		R 13 553 037.63
17	Preliminary and General	12.0% of Subtotal 2						R 1 626 364.52
18	Contingency	10.0% of Subtotal 2						R 1 355 303.76
<b>Subtotal 3</b> (Subtotal 2 plus P&G's and contingency)								R 16 534 705.91
19	VAT	14.0% of Subtotal 3						R 2 314 858.83
<b>GRAND TOTAL</b> (Subtotal 3 plus VAT)								R 18 849 564.74

CALCULATION OF THE QUANTUM								
Area	Closure Liability Update - Mokala, end of 9th year (August 2015 rates)							
No.	Description:	Unit:	Operational Area	A Quantity	B Master rate	C Multiplication factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
				Step 4.5	Step 4.3	Step 4.3	Step 4.4	
1	Dismantling of processing plant & related structures (incl. overland conveyors & power lines)	m <sup>3</sup>	Process plant area	15 195	R 12.56	1	1	R 190 913.40
2 (A)	Demolition of steel buildings & structures	m <sup>2</sup>	Admin, stores and workshop area	2 744	R 175.01	1	1	R 480 240.79
2 (B)	Demolition of reinforced concrete buildings & structures	m <sup>2</sup>	Process plant area	295	R 257.92	1	1	R 76 085.41
3	Rehabilitation of access roads	m <sup>2</sup>	Access roads near admin, stores and workshop area	4 617	R 31.32	1	1	R 144 597.28
		m <sup>2</sup>	Access roads near process plant area	17 669	R 31.32	1	1	R 553 365.68
		m <sup>2</sup>	Haul roads	57 000	R 31.32	1	1	R 1 785 151.61
4 (A)	Demolition & rehabilitation of electrified railway lines	m	n/a	0	R 303.97	1	1	R 0.00
4 (B)	Demolition & rehabilitation of non electrified railway lines	m	n/a	0	R 165.80	1	1	R 0.00
5	Demolition of housing &/or administration facilities	m <sup>2</sup>	n/a	0	R 350.03	1	1	R 0.00
6	Opencast rehabilitation including final voids & ramps	ha	Pit void	15.500	R 178 146.71	0.52	1	R 1 435 862.47
7	Sealing of shafts, adits & inclines	m <sup>3</sup>	n/a	0	R 93.96	1	1	R 0.00
8 (A)	Rehabilitation of overburden & spoils	ha	Overburden stockpile	16.635	R 122 326.18	1	1	R 2 034 895.98
8 (B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	ha	n/a	0.000	R 152 355.04	1	1	R 0.00
8 (C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	n/a	0	R 442 511.27	0.66	1	R 0.00
9	Rehabilitation of subsided areas	ha	n/a	0	R 102 429.75	1	1	R 0.00
10	General surface rehabilitation, including grassing of all denuded areas	ha	Admin, stores and workshop area	2.890	R 96 902.97	1	1	R 280 049.57
		ha	Process plant area	9.188	R 96 902.97	1	1	R 890 344.46
		ha	Recycle ponds	1.165	R 96 902.97	1	1	R 112 891.96
		ha	Pit advance/roll over area	15.500	R 96 902.97	1	1	R 1 501 995.98
		ha	Topsoil berms & stockpile	9.335	R 96 902.97	1	1	R 904 589.19
		ha	Overburden berms	2.340	R 96 902.97	1	1	R 226 752.94
11	River diversions (to be decommissioned)	ha	n/a	0	R 96 902.97	1	1	R 0.00
12	Fencing	m	Plant, admin and pond areas	3 635	R 110.54	1	1	R 401 797.28
13	Water management	ha	n/a	0.00	R 36 845.23	0.25	1	R 0.00
14	2 to 3 years of active maintenance & aftercare	ha	All disturbed areas (excluding Pit area)	64.98	R 12 895.83	1	1	R 837 991.80
		ha	Pit area	77.50	R 12 895.83	1	1	R 999 426.99
15	Specialist study (Screening level risk assessment)	SUM	Screening level risk assessment	1.00	R 150 000.00	1	1	R 150 000.00
<b>Subtotal 1</b> (Sum of items 1 to 15 Above)								R 13 006 952.79
16	Multiply Subtotal 1 by Weighting factor 2 (step 4.4)	<b>Weighting factor 2, WF 2 (step 4.4)</b>			1.05	<b>Subtotal 2</b> (Subtotal 1 x WF 2)		R 13 657 300.43
17	Preliminary and General	12.0% of Subtotal 2						R 1 638 876.05
18	Contingency	10.0% of Subtotal 2						R 1 365 730.04
<b>Subtotal 3</b> (Subtotal 2 plus P&G's and contingency)								R 16 661 906.53
19	VAT	14.0% of Subtotal 3						R 2 332 666.91
<b>GRAND TOTAL</b> (Subtotal 3 plus VAT)								R 18 994 573.44

CALCULATION OF THE QUANTUM								
Area	Closure Liability Update - Mokala, end of 10th year (August 2015 rates)							
No.	Description:	Unit:	Operational Area	A Quantity	B Master rate	C Multiplication factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
				Step 4.5	Step 4.3	Step 4.3	Step 4.4	
1	Dismantling of processing plant & related structures (incl. overland conveyors & power lines)	m <sup>3</sup>	Process plant area	15 195	R 12.56	1	1	R 190 913.40
2 (A)	Demolition of steel buildings & structures	m <sup>2</sup>	Admin, stores and workshop area	2 744	R 175.01	1	1	R 480 240.79
2 (B)	Demolition of reinforced concrete buildings & structures	m <sup>2</sup>	Process plant area	295	R 257.92	1	1	R 76 085.41
3	Rehabilitation of access roads	m <sup>2</sup>	Access roads near admin, stores and workshop area	4 617	R 31.32	1	1	R 144 597.28
		m <sup>2</sup>	Access roads near process plant area	17 669	R 31.32	1	1	R 553 365.68
		m <sup>2</sup>	Haul roads	57 000	R 31.32	1	1	R 1 785 151.61
4 (A)	Demolition & rehabilitation of electrified railway lines	m	n/a	0	R 303.97	1	1	R 0.00
4 (B)	Demolition & rehabilitation of non electrified railway lines	m	n/a	0	R 165.80	1	1	R 0.00
5	Demolition of housing &/or administration facilities	m <sup>2</sup>	n/a	0	R 350.03	1	1	R 0.00
6	Opencast rehabilitation including final voids & ramps	ha	Pit void	15.500	R 178 146.71	0.52	1	R 1 435 862.47
7	Sealing of shafts, adits & inclines	m <sup>3</sup>	n/a	0	R 93.96	1	1	R 0.00
8 (A)	Rehabilitation of overburden & spoils	ha	Overburden stockpile	16.635	R 122 326.18	1	1	R 2 034 895.98
8 (B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	ha	n/a	0.000	R 152 355.04	1	1	R 0.00
8 (C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	n/a	0	R 442 511.27	0.66	1	R 0.00
9	Rehabilitation of subsided areas	ha	n/a	0	R 102 429.75	1	1	R 0.00
10	General surface rehabilitation, including grassing of all denuded areas	ha	Admin, stores and workshop area	2.890	R 96 902.97	1	1	R 280 049.57
		ha	Process plant area	9.188	R 96 902.97	1	1	R 890 344.46
		ha	Recycle ponds	1.165	R 96 902.97	1	1	R 112 891.96
		ha	Pit advance/roll over area	15.500	R 96 902.97	1	1	R 1 501 995.98
		ha	Topsoil berms & stockpile	9.335	R 96 902.97	1	1	R 904 589.19
		ha	Overburden berms	2.340	R 96 902.97	1	1	R 226 752.94
11	River diversions (to be decommissioned)	ha	n/a	0	R 96 902.97	1	1	R 0.00
12	Fencing	m	Plant, admin and pond areas	3 635	R 110.54	1	1	R 401 797.28
13	Water management	ha	n/a	0.00	R 36 845.23	0.25	1	R 0.00
14	2 to 3 years of active maintenance & aftercare	ha	All disturbed areas (excluding Pit area)	64.98	R 12 895.83	1	1	R 837 991.80
		ha	Pit area	85.30	R 12 895.83	1	1	R 1 100 014.48
15	Specialist study (Screening level risk assessment)	SUM	Screening level risk assessment	1.00	R 150 000.00	1	1	R 150 000.00
<b>Subtotal 1</b> (Sum of items 1 to 15 Above)								R 13 107 540.28
16	Multiply Subtotal 1 by Weighting factor 2 (step 4.4)	<b>Weighting factor 2, WF 2 (step 4.4)</b>			1.05	<b>Subtotal 2</b> (Subtotal 1 x WF 2)		R 13 762 917.30
17	Preliminary and General	12.0% of Subtotal 2						R 1 651 550.08
18	Contingency	10.0% of Subtotal 2						R 1 376 291.73
<b>Subtotal 3</b> (Subtotal 2 plus P&G's and contingency)								R 16 790 759.10
19	VAT	14.0% of Subtotal 3						R 2 350 706.27
<b>GRAND TOTAL</b> (Subtotal 3 plus VAT)								R 19 141 465.38

CALCULATION OF THE QUANTUM								
Area	Closure Liability Update - Mokala, at LOM (August 2015 rates)							
No.	Description:	Unit:	Operational Area	A Quantity	B Master rate	C Multiplication factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
				Step 4.5	Step 4.3	Step 4.3	Step 4.4	
1	Dismantling of processing plant & related structures (incl. overland conveyors & power lines)	m <sup>3</sup>	Process plant area	15 195	R 12.56	1	1	R 190 913.40
2 (A)	Demolition of steel buildings & structures	m <sup>2</sup>	Admin, stores and workshop area	2 744	R 175.01	1	1	R 480 240.79
2 (B)	Demolition of reinforced concrete buildings & structures	m <sup>2</sup>	Process plant area	295	R 257.92	1	1	R 76 085.41
3	Rehabilitation of access roads	m <sup>2</sup>	Access roads near admin, stores and workshop area	4 617	R 31.32	1	1	R 144 597.28
		m <sup>2</sup>	Access roads near process plant area	17 669	R 31.32	1	1	R 553 365.68
		m <sup>2</sup>	Haul roads	57 000	R 31.32	1	1	R 1 785 151.61
4 (A)	Demolition & rehabilitation of electrified railway lines	m	n/a	0	R 303.97	1	1	R 0.00
4 (B)	Demolition & rehabilitation of non electrified railway lines	m	n/a	0	R 165.80	1	1	R 0.00
5	Demolition of housing &/or administration facilities	m <sup>2</sup>	n/a	0	R 350.03	1	1	R 0.00
6	Opencast rehabilitation including final voids & ramps	ha	Pit void	15.500	R 178 146.71	0.52	1	R 1 435 862.47
7	Sealing of shafts, adits & inclines	m <sup>3</sup>	n/a	0	R 93.96	1	1	R 0.00
8 (A)	Rehabilitation of overburden & spoils	ha	Overburden stockpile	16.635	R 122 326.18	1	1	R 2 034 895.98
8 (B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	ha	n/a	0.000	R 152 355.04	1	1	R 0.00
8 (C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	n/a	0	R 442 511.27	0.66	1	R 0.00
9	Rehabilitation of subsided areas	ha	n/a	0	R 102 429.75	1	1	R 0.00
10	General surface rehabilitation, including grassing of all denuded areas	ha	Admin, stores and workshop area	2.890	R 96 902.97	1	1	R 280 049.57
		ha	Process plant area	9.188	R 96 902.97	1	1	R 890 344.46
		ha	Recycle ponds	1.165	R 96 902.97	1	1	R 112 891.96
		ha	Pit advance/roll over area	15.500	R 96 902.97	1	1	R 1 501 995.98
		ha	Topsoil berms & stockpile	9.335	R 96 902.97	1	1	R 904 589.19
		ha	Overburden berms	2.340	R 96 902.97	1	1	R 226 752.94
11	River diversions (to be decommissioned)	ha	n/a	0	R 96 902.97	1	1	R 0.00
12	Fencing	m	Plant, admin and pond areas	3 635	R 110.54	1	1	R 401 797.28
13	Water management	ha	n/a	0.00	R 36 845.23	0.25	1	R 0.00
14	2 to 3 years of active maintenance & aftercare	ha	All disturbed areas (excluding Pit area)	64.98	R 12 895.83	1	1	R 837 991.80
		ha	Pit area	93.00	R 12 895.83	1	1	R 1 199 312.38
15	Specialist study (Screening level risk assessment)	SUM	Screening level risk assessment	1.00	R 150 000.00	1	1	R 150 000.00
<b>Subtotal 1</b> (Sum of items 1 to 15 Above)								R 13 206 838.19
16	Multiply Subtotal 1 by Weighting factor 2 (step 4.4)	<b>Weighting factor 2, WF 2 (step 4.4)</b>			1.05	<b>Subtotal 2</b> (Subtotal 1 x WF 2)		R 13 867 180.10
17	Preliminary and General	12.0% of Subtotal 2						R 1 664 061.61
18	Contingency	10.0% of Subtotal 2						R 1 386 718.01
<b>Subtotal 3</b> (Subtotal 2 plus P&G's and contingency)								R 16 917 959.72
19	VAT	14.0% of Subtotal 3						R 2 368 514.36
<b>GRAND TOTAL</b> (Subtotal 3 plus VAT)								R 19 286 474.08

**APPENDIX C: Details of DMR Closure Components**



## 1. INTRODUCTION

Generally accepted closure methods, based on experience in the field, have been used as the basis for determining the Master rates for the various closure components in the DMR “rules-based” approach.

The details enclosed in the approved EMP will however take precedence over these generally accepted closure methods.

## 2. GENERALLY ACCEPTED CLOSURE METHODS USED TO DETERMINE THE DMR MASTER RATE

### 2.1. COMPONENT 1: PROCESSING PLANT

The common method of valuation to determine the Master rate for processing plants is that:

- All infrastructure and concrete buildings should be broken down to natural ground and buried adjacent to the plant site,
- Foundations, structures and conveyors should be broken down to natural ground level,
- The areas are to be covered with 1,0m subsoil, top soiled with 300mm of topsoil and vegetation established, or as noted in the relevant EMP,
- The monitoring and maintenance of these areas has been costed under the appropriate areas,
- Top soiling and vegetation for the areas are included under general surface rehabilitation,
- No credits are allowed for scrap steel and equipment that can be re-used or sold.

### 2.2. COMPONENTS 2(A) AND 2 (B): STEEL AND REINFORCED CONCRETE BUILDINGS AND STRUCTURES

The common method of valuation to determine the Master rate for steel and reinforced concrete buildings and structures is that:

- All structures should be demolished to 1m below ground level,
- The rubble is to be buried adjacent to the sites, provided this adheres to the National Waste Management Strategy,
- Silos should be imploded and buried,
- The areas should be shaped, top soiled with 300mm of topsoil and vegetated or as stated in the relevant EMP document,
- Monitoring and maintenance is costed in the relevant areas,

### 2.3. COMPONENT 3: ACCESS ROADS

(No details provided in DMR guideline)

## 2.4. COMPONENT 4 (A) AND 4 (B): RAILWAYS

The valuation of the removal of railway lines is based on:-

- The removal of the ballast, sleepers and rail,
- All culverts, bridges and structures are to remain,
- No rehabilitation to the general earthworks, neither cut nor fill,
- Removal of the electrification of the railway lines, including sub-stations and signalling,
- General clean up and making certain of adequate drainage,
- No credit is allowed for second-hand rail and ballast.

## 2.5. COMPONENT 5: HOUSING AND ADMINISTRATION FACILITIES

Same as for Component 2(A) and 2(B): Steel and Reinforced Concrete Buildings and Structures

## 2.6. COMPONENT 6: OPENCAST REHABILITATION

Some form of beneficial land use is desirable after mining. Hence, in-filling of opencast pits is advocated in order to facilitate post-mining beneficial land use. In-filling normally constitutes the following modes of action:

- Concurrent in-filling and subsequent spoils rehabilitation as routinely conducted for opencast pits on collieries.
- In-filling by obtaining material from adjacent opencast pits and/or other parts of the same opencast pit as routinely conducted on iron ore mines.

Difficulties could be experienced with concurrent infilling in those cases where the ore body is limited to a single opencast pit and various grades of ore need to be sourced from the pit. This requires access to the full pit and in-filling could sterilise ore reserves. In these cases rehabilitation should be facilitated as follows:

- Excess material from the opencast pit is deposited in close proximity to the pit for in-filling of the opencast pit once the ore body has been removed.
- Excess material is deposited in such a manner in relation to the opencast pit that mine residue deposit rehabilitation can be conducted with respect to this material. In this case the opencast pit perimeter walls must still be rendered safe for humans and domestic animals. This is normally achieved by means of the following:
  - Sloping the perimeter walls of the opencast pit at 1:3 (18°) to the pit floor or to the stable groundwater level that could establish within a reasonable period within the opencast pit.
  - Providing enviro berms along the opencast pit perimeter when perimeter wall flattening is not feasible as in those cases where opencast mining has been conducted on steep mountain sides.

Notwithstanding the above, owing to removal of the mined product off-site, notably less material remains on site for pit in-filling than was originally removed from the opencast pit. This could be despite bulking of the removed material. Hence final voids with respect to most opencast pits would be unavoidable. These voids should be addressed in the same manner as making the opencast pit safe as described above.

## **2.7. COMPONENT 7: SEALING OF SHAFTS, ADITS AND INCLINES**

The sealing of vertical and incline shafts are primarily a safety consideration and this should be conducted in such a manner that potential safety risks are largely obviated.

Normally, inert building rubble arising from the demolition of surface infrastructure should be deposited into the shafts. A mass concrete cap of 1 000 mm thickness is placed onto the building rubble deposited into the shaft. It should be noted that, in specific circumstances, dedicated engineering design and specification of these caps could be required.

Allowance should also be made for methane venting of the underground mine workings with a methane formation potential by means of strategically placed venting boreholes.

## **2.8. COMPONENTS 8 (A), 8 (B) AND 8 (C): OVERBURDEN AND SPOILS, PROCESS PLANT WASTE: BASIC, SALT-PRODUCING AND PROCESS PLANT WASTE: ACIDIC, METAL-RICH.**

### **2.8.1. Component 8A: Overburden and spoils**

Overburden and spoils normally have a low pollution potential and hence only need to be shaped to create a stable landform. The Master rate thus includes shaping and grassing/vegetation of the overburden and spoils.

### **2.8.2. Component 8B: Process plant waste: basic, salt-producing**

The Master rate for basic, salt-producing process plant waste includes shaping and grassing/vegetation of the dumps as well as establishing an armoured cover on the reshaped surface of the dump.

### **2.8.3. Component 8C: Process plant waste: acidic, metal-rich**

The Generally accepted closure methods for acidic, metal-rich plant waste are primarily aimed at the following:

- Limiting seepage of contaminants from the processing waste deposit
- Prevention of contaminated seepage entering local surface and groundwater sources.

The Master rate includes allowances for slope modification, armouring and evaporative covers, lined pollution control dams and lined cut-off trenches.

#### 2.8.4. Closure elements specific to 8 (A), 8 (B) or 8 (C)

Generally, average modified outer slopes of 1:3 (18°) are required. Although not specifically stated, benches at regular intervals are also required. This should ensure that the modified outer slopes between benches do not exceed 35 to 40 m in order to curb stormwater flow velocities on the outer slopes. Benches should be at least 5 m wide, sloping inwards at a slope of about 1:10.

Current generally accepted closure methods allows for a dedicated cover to be provided on the modified outer slopes of the residue deposit. The cover has to fulfil the following primary functions:

- Protection of the integrity/stability of the modified outer slope.
- Limiting the ingress of air and water into residue material that has the potential to contaminate local groundwater by means of contaminated seepage arising from the footprint area of the deposit.
- Separation of the deposited residue from uncontaminated surface runoff arising from the outer slopes of the residue deposit.
- Contribution to the aesthetic appeal of the rehabilitated residue deposit.

Covers fulfilling the above functions could be of varying nature, comprising of natural and/or synthetic material. If natural materials are to be used, current practice allows for an evaporative cover, varying in thickness between 750 and 1 000 mm, with an outer cover layer of 300 mm thickness of armouring or topsoil with vegetation. The armouring also requires vegetation, but this is not essential for the long-term integrity of the outer cover layer. Depending on the nature of the deposited material covered, capillary breaker layers between the evaporative cover and the deposited material could also be required.

Current generally accepted closure methods indicates that operational pollution control dams are properly lined to prevent the migration of the contaminated water impounded in the dam to the shallow groundwater or the nearby receiving surface water environment. Mostly, synthetic (HDPE) liners are provided for this purpose. However, these liners have a finite life and eventual failure of these liners would result in the salts and other contaminants that accumulated in the pollution control dam(s) over the years to be dissipated into the receiving water environment. Hence, from a holistic view the provision of a pollution control dam served a limited function, only postponing the release of contaminants into the receiving water environment. However, contaminant release has been spread-out over a period of about 50 years, starting from mine residue deposit rehabilitation to final disintegration of the liner in the pollution control dam(s). This situation would most likely allow for an acceptable residual impact, with salt/contaminant release into the receiving water environment at a rate that does not exceed the “natural” assimilative capacity of the receiving water resource. The only exception could be extremely sensitive water resources.

Stormwater runoff arising from the upper and outer slopes of the rehabilitated residue deposit should be managed for the following primary reasons:

- Prevention of uncontrolled runoff from the residue deposit, thereby creating surface erosion and resultant damage to the cover and under extreme cases exposing the deposited material.
- Routing of the runoff arising from the rehabilitated residue deposit into the surrounding surface water drainage regime in a manner that would limit the creation of secondary erosion in the receiving surface water environment and/or possible damage to downstream surface infrastructure.
- Allowing for the control routing of the runoff collected on the rehabilitated residue deposit across cut-off, seepage or solution trenches provided to handle excess contaminated seepage from the residue deposit.

In addition to the above, upslope stormwater diversion measures could also be required to route upslope runoff past the residue deposit to prevent possible cover damage and other specific local drainage requirements. Toe paddocks could also be required along the outer perimeter toe of the rehabilitated residue deposit to capture sediment arising from the cover material whilst vegetation on the cover is still in the process of establishment.

Current practice allows for two broad approaches to handle runoff arising from the rehabilitated residue deposit. These are as follows:

- Collection of the runoff arising from the benches in chutes to route this water to the toe of the residue deposit. Chutes must be constructed from concrete or other suitable material to cater for the high flow velocities that could be encountered.
- Collection of runoff arising from the modified outer slopes on the benches itself and allowing this water to evaporate on the benches. Under these circumstances bench width could be wider than the normal 5 m width, with parapet walls provided on the outer edges of the benches. These walls must be designed for at least the 1:200 year rainfall events. The residue deposit material must also be suitable for this type of stormwater contaminant and must not be susceptible to slumping under saturated conditions.

In very sensitive environmental situations and/or where the seepage from the residue deposit could be highly contaminated, a cut-off drain around the perimeter of the residue deposit may be required. Abstraction of the seepage collected in the cut-off drain by means of pumps at predetermined spacing would be required. The collected seepage has to be routed to a pollution control dam for disposal.

## **2.9. COMPONENT 9: SUBSIDED AREAS**

(No details provided in DMR guideline, but presumed to be similar to Component 10: General Surface Rehabilitation)

## **2.10. COMPONENT 10: GENERAL SURFACE REHABILITATION**

Final surface rehabilitation of areas disturbed by mining and related activities should be aligned to the selected final land use.

Irrespective of the final land use, general surface rehabilitation normally should ensure the following:

- Surface topography that emulates the surrounding areas and aligned to the general landscape character. Steep slopes in excess of 6 percent should also be avoided if possible.
- Landscaping that would facilitate surface runoff and result in free draining areas. If possible, the drainage lines should be reinstated.
- An area without unnecessary remnants of structures and surface infrastructure to give the rehabilitated area a “neat” appearance. Special attention must be given to shape and/or removal of heaps of excess material being the legacy of prolonged mining and related activity.
- An area suitable for revegetation.

The unit cost for general rehabilitation allows for shaping and landscaping of disturbed areas. The Master rate allows for the shaping of material to a depth/thickness of about 500 mm. An extra over allowance in the unit cost of 50 percent has been made to cover the removal and/or destruction of surface infrastructure remnants and/or other undesirable objects such as trees, foundations, concrete slabs, etc.

## **2.11. COMPONENT 11: RIVER DIVERSIONS**

Although not desirable, river diversions are unavoidable in some cases to allow mining, especially opencast mining, to proceed.

Wetland areas are normally associated with river diversions and during the operational period some form of riparian habitat could most likely have established within the stream diversion area. Hence considerations should be given whether a stream diversion should be changed at mine closure. This could require dedicated assessments to guide decision-making in this regard. Moreover, removal of stream diversions could result in stream flow over mined areas that could result in undesirable water quality effects.

In the event that river diversions should be removed at closure, the Master rate is the same as for general surface rehabilitation.

## **2.12. COMPONENT 12: FENCING**

(No details provided in DMR guideline)

## **2.13. COMPONENT 13: WATER MANAGEMENT**

Current practice is to provide in-pit evaporation dams for opencast pits. Ideally these dams should coincide with pit final voids. The dams should be sized that groundwater inflow into the pit plus rehabilitated spoils recharge can be evaporated from the dam. The dam perimeter as in the case of opencast pits must be shaped to render it safe. The same approach as for opencast pits is generally followed.

Underground mine workings has the potential to eventually fill up with water and decant. Depending on the decant mode and the type of product mined, this water could be of a poor quality. Hence provision should be made to collect and handle this water to limit degradation of water resources in the vicinity of potential decant. Collection and neutralisation (with associated metal removal) is an established management practice to deal with this water. However, the elevated salt content normally associated with this water is still a matter of concern. Hence, advanced treatment such as desalination of this water is currently considered and in some cases pilot plants have been established to assess feasibility. Treatment technologies not producing brine are currently favoured. However, this is not possible with all types of excess mine water.

It should be noted that the filling of a mine could involve a notable period of time and the required treatment capacity to handle the excess mine water could only be required decades after mine closure. Hence the future implementation of these plants most likely by third parties should also receive consideration.

Note: Costs associated with brine producing treatment technologies were also assessed. Although the capital costs associated with these technologies could be lower than for non-brine producing technologies, the operating and maintenance costs are notably higher. Hence the overall costs for water management and treatment in the guideline document are not notably different, based on the water treatment method, to warrant distinction.

#### **2.14. COMPONENT 14: MAINTENANCE AND AFTERCARE**

Maintenance and aftercare is planned for 2 to 3 years after mine production ceases, and covers:

- Annually fertilising of rehabilitated areas,
- Monitoring of surface and subsurface water quality surface,
- Control of wattle and all other alien plants,
- General maintenance, including rehabilitation of cracks and subsidence.