12. TECHNICAL-ECONOMIC PARAMETERS

12.1 Introduction

The following section includes discussion and comment on the technical-economic aspects of the LoM Plans associated with the Material Properties. Specifically, table are provided with details of planned sales, operating costs and capital expenditures. These have been compiled into TEPs on an annual basis to derive the revenue and cost inputs necessary to generate the FMs.

A discussion of general risks and opportunities is included under the heading Special Factors in this section of the report.

12.1.1 Basis of Valuation and Technical – Economic Parameters

The valuation of the Material Properties as presented herein, has, *inter alia,* been based on the LoM Plans and resulting production profiles and associated revenue streams from saleable products operating costs and capital expenditure profiles (collectively referred to herein as TEPs) as provided to SRK by Kumba and Eyesizwe, reviewed and adjusted where appropriate by SRK. The generation of a LoM Plan requires substantial technical input and detailed analysis and is critically dependent upon assumptions of the long-term commodity prices and their impact on: cut-off grades; potential expansion or contraction of the Mineral Resource and Mineral Reserve Base and the return on capital expenditure programmes.

The basis of forward projections of operating costs for mature mining operations generally include an inflation adjusted cost, based on the previous financial year's performance, with certain modifications for projected improvements in productivity and other cost-reduction initiatives. In the case of development projects, TEPs are invariably based on recently completed feasibility studies and modified where appropriate by detailed engineering.

Where warranted from their independent review SRK has, following discussions with Kumba and Eyesizwe, adjusted the assumed operating costs to assumed future operating conditions (i.e. tonnage contribution from various ore sources and mining methods, mineability and closure of mining assets) and the estimates of improved productivity initiatives.

Unless otherwise stated operating costs assumptions quoted below include the following:

– **Cash operating cost components**: namely direct mining costs, direct processing costs, direct general and administration costs, consulting fees, management fees, distribution and transportation costs, charges and non-production related sundry income;
– **Total cash costs:** the incremental components, including royalties (refer to Table 12.1 below) but excluding taxes paid, required to yield;
– **Total working costs:** the incremental components, including separation, reclamation and mine closure costs (the net difference of the total environmental liability and the current trust fund provision) but excluding non-cash items such as depreciation, depletion and amortisation, required together with cash operating costs and total cash costs to yield; and
– **Total costs**: the sum of total working costs, net movement in working capital and capital expenditure.

Table 12.1 Royalty Assumptions

	Royalty Assumptions – effective 1 May 2009
Iron Ore	2% on revenue, South Africa.
Coal	2% on export sales and 1% on local sales, South Africa.
Heavy Minerals	3% on ilmenite and rutile sales, 1% on zircon sales, South Africa.
Base Metals	2% on revenue, South Africa. 8% on first 5Mt Reserve at Rosh Pinah, Namibia.
Industrial Minerals	Exempt from any royalty, South Africa.

In anticipation of royalties proposed in the draft Minerals and Petroleum Royalty Bill, which had not been promulgated at the date of publication of this report, SRK have used the royalty assumptions indicated in Table 12.1 in the FMs, assuming royalties payable to the State from 1 May 2009.

Additional costs required to reflect the assumed expenditures as represented by the historical operating statistics in Section 2 are the projections of capital costs as given in Section 8. In addition to long-term capital projects, the LoM capital expenditure programmes generally include significant detail based on approved expenditure programmes (typically five years). Where warranted, SRK has made provision over and above

these expenditures, specifically, for example, where no detail is available beyond this five-year period for additional infrastructure. On-going capital provisioning is discontinued two years prior to the projected closure dates.

Environmental costs have been included in the operating costs and are not quoted separately as they are confirmed as necessary contributions to the environmental fund. Over the LoM periods, however, it is likely that no significant expenditures will be incurred prior to cessation of operations. Consequently all closure costs are expended in the year of final production. Further, SRK considers that there will be potential opportunities to realise salvage values on closure, although owing to the indeterminate nature of estimating such values these have been excluded from the LoM projections included herein.

For certain Material Properties components of the total working costs are based either on revenues sourced from saleable products, Net Smelter Returns and/or equivalent components. In general these vary between 0% and 3% of the stated working costs. Consequently on the basis of materiality these have not been separately detailed in the TEPs and are referred to by means of a note to the relevant tables.

A separation cost equal to 2% of the annual employment cost times the number of years in the LoM is included in the last year of the LoM.

12.1.2 Technical – Economic Parameters

The TEPs which have been provided to Kumba for inclusion in the FMs for deriving cash flow projections, include:

- saleable products;
- operating cost profiles (representing the total working costs as previously defined); and
- capital expenditure profiles.

These are detailed in Tables 12.2 to 12.26 for the Material Properties. All expenditures are stated in financial years and in 1 January 2006 money terms.

In accordance with their scope of work, SRK has been informed that there are no significant commodity hedging programmes currently in place at the Material Properties. Kumba has some zinc hedges in place, details of which are provided in Section 14.

12.2 Iron Ore – Sishen Mine

Table 12.2 Sishen Mine: Projected TEPs – Scenario I

From	To	Saleable Products						Real Expenditures		
		Lump (Mt)	DRS (Mt)	DR (Mt)	Fine (Mt)	Coarse Sinter (Mt)	Total Sales (Mt)	Cash Cost (ZARm)	Capex (ZARm)	Total (ZARm)
2006	2006	14.7	1.2	1.7	8.4	3.0	29.0	2,708	1,718	4,426
2007	2007	15.9	1.2	1.7	9.2	3.0	31.0	2,897	2,117	5,015
2008	2008	20.2	1.2	1.7	12.1	3.0	38.2	3,434	505	3,939
2009	2009	20.8	1.2	1.7	12.4	3.0	39.0	3,492	358	3,849
2010	2010	20.8	1.1	1.7	12.4	3.0	39.0	3,446	822	4,269
2011	2015	106.4	5.8	8.6	63.8	15.0	199.6	18,368	3,185	21,553
2016	2020	112.7	5.8	8.6	68.0	15.0	210.0	19,316	1,374	20,690
2021	2025	98.5	5.2	7.8	59.2	13.5	184.2	16,783	903	17,686
Total		**410.0**	**22.4**	**33.6**	**245.5**	**58.5**	**770.0**	**70,445**	**10,982**	**81,427**

Table 12.3 Sishen Mine: Projected TEPs – Scenario II

From	To	Saleable Products						Real Expenditures		
		Lump (Mt)	DRS (Mt)	DR (Mt)	Fine (Mt)	Coarse Sinter (Mt)	Total Sales (Mt)	Cash Cost (ZARm)	Capex (ZARm)	Total (ZARm)
2006	2006	14.7	1.2	1.7	8.4	3.0	29.0	2,708	1,718	4,426
2007	2007	15.9	1.2	1.7	9.2	3.0	31.0	2,897	2,117	5,015
2008	2008	20.2	1.2	1.7	12.1	3.0	38.2	3,434	505	3,939
2009	2009	20.8	1.2	1.7	12.4	3.0	39.0	3,492	358	3,849
2010	2010	20.8	1.1	1.7	12.4	3.0	39.0	3,446	822	4,269
2011	2015	106.4	5.8	8.6	63.8	15.0	199.6	18,368	3,185	21,553
2016	2020	112.7	5.8	8.6	68.0	15.0	210.0	19,316	1,374	20,690
2021	2025	109.4	5.8	8.6	65.8	15.0	204.6	18,534	903	19,437
2026	2029	38.9	1.7	2.6	23.8	4.4	71.4	5,209		5,209
Total		**459.8**	**24.7**	**37.1**	**275.8**	**64.5**	**861.9**	**77,405**	**10,982**	**88,387**

12.3 Iron Ore – Sishen South Project

Table 12.4 Sishen South Project: Projected TEPs

From	To	Saleable Products			Real Expenditures		
		Lump (Mt)	Fine (Mt)	Total Sales (Mt)	Cash Cost (ZARm)	Capex (ZARm)	Total (ZARm)
2006	2006					491	491
2007	2007	0.3	0.2	0.6	142	324	466
2008	2008	1.8	1.2	3.0	357	46	403
2009	2009	1.8	1.2	3.0	333	2	335
2010	2010	1.8	1.2	3.0	341		341
2011	2015	9.0	6.0	15.0	1,701	99	1,800
2016	2020	9.0	6.0	15.0	1,702	85	1,787
2021	2025	9.2	5.8	15.0	1,687	101	1,787
2026	2030	6.3	3.9	10.2	1,133		1,133
Total		**39.3**	**25.5**	**64.7**	**7,396**	**1,148**	**8,544**

12.4 Iron Ore – Thabazimbi Mine

Table 12.5 Thabazimbi Mine: Projected TEPs

From	To	Saleable Products			Real Expenditures		
		Lump (Mt)	Fine (Mt)	Total Sales (Mt)	Cash Cost (ZARm)	Capex (ZARm)	Total (ZARm)
2006	2006	1.1	1.4	2.5	358	28	386
2007	2007	1.1	1.4	2.5	315	21	336
2008	2008	1.1	1.4	2.5	278	17	295
2009	2009	1.1	1.5	2.5	291	3	295
2010	2010	0.8	1.2	2.0	235		235
Total		**5.2**	**6.9**	**12.1**	**1,477**	**69**	**1,547**

12.5 Coal – Grootegeluk Mine

Table 12.6 Grootegeluk Mine: Projected TEPs – Scenario I

From	To	Saleable Products				Real Expenditures		
		Eskom Coal (Mt)	Coking Coal (Mt)	Steam/ Other coal (Mt)	Total Sales (Mt)	Cash Cost (ZARm)	Capital Allowance (ZARm)	Total (ZARm)
2006	2006	14.6	2.6	1.5	18.8	1,120	296	1,416
2007	2007	14.5	3.3	1.7	19.5	1,254	282	1,535
2008	2008	14.5	3.3	1.7	19.5	1,106	145	1,251
2009	2009	14.5	3.1	1.7	19.3	1,016	196	1,213
2010	2010	14.6	3.1	1.7	19.3	1,039	175	1,213
2011	2015	72.7	15.4	8.5	96.6	5,225	623	5,849
2016	2020	72.1	16.5	8.6	97.3	5,471	698	6,169
2021	2024	56.9	13.8	6.9	77.6	4,482	706	5,187
Total		**274.4**	**61.2**	**32.3**	**367.9**	**20,712**	**3,121**	**23,833**

Table 12.7 Grootegeluk Mine: Projected TEPs – Scenario II

From	To	Saleable Products				Real Expenditures		
		Eskom Coal (Mt)	Coking Coal (Mt)	Steam/ Other coal (Mt)	Total Sales (Mt)	Cash Cost (ZARm)	Capital Allowance (ZARm)	Total (ZARm)
2006	2006	14.6	2.6	1.5	18.8	1,120	296	1,416
2007	2007	14.5	3.3	1.7	19.5	1,254	282	1,535
2008	2008	14.5	3.3	1.7	19.5	1,106	145	1,251
2009	2009	14.5	3.1	1.7	19.3	1,016	196	1,213
2010	2010	14.6	3.1	1.7	19.3	1,039	175	1,213
2011	2015	72.7	15.4	8.5	96.6	5,225	623	5,849
2016	2020	72.1	16.5	8.6	97.3	5,471	698	6,169
2021	2025	71.2	17.2	8.6	97.0	5,597	771	6,368
2026	2030	69.6	17.7	8.7	96.1	5,927	561	6,488
2031	2035	69.3	16.0	8.8	94.1	5,685	638	6,323
2036	2040	70.7	14.6	8.7	94.1	5,356	551	5,907
2041	2045	71.1	15.0	7.8	93.9	5,497	238	5,735
Total		**569.4**	**128.0**	**68.2**	**765.6**	**44,292**	**5,174**	**49,467**

12.6 Coal – Leeuwpan Mine

Table 12.8 Leeuwpan Mine: Projected TEPs

From	To	Saleable Products			Real Expenditures		
		Steam Coal (Mt)	Metallurgical/ Export Coal (Mt)	Total Sales (Mt)	Cash Cost (ZARm)	Capital Allowance (ZARm)	Total (ZARm)
2006	2006	1.2	1.9	3.1	166	61	227
2007	2007	1.2	1.9	3.1	161	43	203
2008	2008	1.2	2.0	3.2	200	33	233
2009	2009	1.2	2.0	3.2	201	42	242
2010	2010	1.2	2.0	3.2	218	19	238
2011	2015	5.9	10.0	15.9	1,140	143	1,283
2016	2020	6.0	9.6	15.6	909	119	1,028
2021	2025	6.0	9.6	15.6	909	139	1,048
2026	2030	5.4	8.7	14.0	977	118	1,095
2031	2035	5.5	8.7	14.2	1,165	58	1,223
Total		**34.7**	**56.4**	**91.0**	**6,045**	**776**	**6,821**

12.7 Coal – Tshikondeni Mine

The residual values of process plant and equipment at Tshikondeni Mine as at 31 December 2005 for the Material Properties related to the unbundling of Kumba from Iscor (now Mittal Steel) were ZAR266m. This amount is repaid by Mittal Steel to Tshikondeni Mine over an agreed period as an annual depreciation charge. The price received by Tshikondeni Mine for coking coal supplied to Mittal Steel is calculated as the total cost of production including depreciation, plus a management fee of 3%.

Table 12.9 Tshikondeni Mine: Projected TEPs

From	To	Saleable Products	Real Expenditures		
		Coking Coal (kt)	Cash Cost (ZARm)	Capital Allowance (ZARm)	Total (ZARm)
2006	2006	400	253	55	308
2007	2007	393	241	33	274
2008	2008	396	242	26	267
2009	2009	377	241	28	268
2010	2010	418	252	41	293
2011	2011	438	254	27	281
2012	2012	424	253		253
2013	2013	308	235		235
2014	2014	93	112		112
Total		**3,246**	**2,081**	**210**	**2,290**

12.8 Coal – Arnot Colliery

Arnot Colliery is an Eskom tied colliery – all environmental rehabilitation costs and capital expenditure costs are borne by Eskom.

Table 12.10 Arnot Colliery: Projected TEPs

From	To	Saleable Products		Real Expenditures		
		Eskom Coal (Mt)	Eskom contractual costs (ZARm)	Working costs (ZARm)	Capex (ZARm)	Total (ZARm)
2006	2006	5.0	42.1	407	61	468
2007	2007	5.0	41.5	392	30	422
2008	2008	5.0	41.2	389	66	455
2009	2009	5.2	43.5	401	62	463
2010	2010	5.4	45.1	416	18	434
2011	2015	27.0	224.6	2,080	228	2,308
2016	2020	14.5	138.8	1,172	25	1,197
Total		**67.1**	**576.7**	**5,257**	**491**	**5,747**

12.9 Coal – Matla Colliery

Matla Colliery is an Eskom tied colliery – all environmental rehabilitation costs and capital expenditure costs are borne by Eskom.

Table 12.11 Matla Colliery: Projected TEPs

From	To	Saleable Products		Real Expenditures		
		Eskom Coal (Mt)	Eskom contractual costs (ZARm)	Working costs (ZARm)	Capex (ZARm)	Total (ZARm)
2006	2006	13.1	112.2	664	276	940
2007	2007	13.2	110.3	659	205	864
2008	2008	13.7	110.3	674	118	792
2009	2009	13.4	107.6	681	105	786
2010	2010	13.5	106.2	686	102	788
2011	2015	68.1	507.0	3,468	561	4,029
2016	2020	70.9	480.8	3,682	394	4,076
2021	2025	51.5	386.6	3,176	192	3,368
2026	2030	30.2	399.5	2,242	229	2,471
2031	2032	2.1	177.4	249		249
Total		**289.8**	**2,498.0**	**16,181**	**2,183**	**18,363**

12.10 Coal – New Clydesdale Colliery

Table 12.12 New Clydesdale Colliery: Projected TEPs

From	To	Saleable Products				Real Expenditures		
		Export A grade (Mt)	Inland A grade (Mt)	Inland D grade (Mt)	Total Sales (Mt)	Working costs (ZARm)	Capex (ZARm)	Total (ZARm)
2006	2006	1.1		0.7	1.8	293	24	317
2007	2007	1.1		0.7	1.7	273	55	328
2008	2008	1.0		0.5	1.5	224	16	241
2009	2009	1.2	0.1		1.3	191	14	204
2010	2010	1.2	0.1		1.3	197	17	213
2011	2011	1.2	0.1		1.3	209	6	215
2012	2012	1.2	0.1		1.3	198	6	203
Total		**7.8**	**0.5**	**1.9**	**10.2**	**1,585**	**137**	**1,722**

12.11 Coal – North Block Complex

Table 12.13 North Block Complex: Projected TEPs

From	To	Saleable Products			Real Expenditures		
		Eskom Coal (Mt)	Metallurgical Coal (Mt)	Total Sales (Mt)	Working costs (ZARm)	Capex (ZARm)	Total (ZARm)
2006	2006	1.78	0.32	2.10	149	7	156
2007	2007	1.47	0.37	1.84	128	6	134
2008	2008	0.93	0.04	0.97	81	4	85
2009	2009	0.99		0.99	66	3	69
2010	2010	0.99		0.99	66	12	78
2011	2011	0.73		0.73	56		56
Total		**6.90**	**0.73**	**7.63**	**547**	**32**	**580**

12.12 Coal – Sintel Char Project

Table 12.14 Sintel Char Project: Projected TEPs

From	To	Saleable Products		Real Expenditures		
		Lumpy Char (kt)	Char (<20mm) (kt)	Working costs (ZARm)	Capex (ZARm)	Total (ZARm)
2006	2006			3	93	96
2007	2007	30.8	2.5	33	73	107
2008	2008	118.7	9.6	99	15	114
2009	2009	138.2	11.1	103		103
2010	2010	138.5	11.2	103		103
2011	2015	690.2	55.7	515	5	520
2016	2020	696.3	56.2	516	5	521
2021	2025	693.5	55.9	518	5	523
Total		**2,506.2**	**202.1**	**1,890**	**195**	**2,085**

12.13 Coal – Inyanda Project

Table 12.15 Inyanda Project: Projected TEPs

From	To	Saleable Products	Real Expenditures		
		Export Steam (Mt)	Working costs (ZARm)	Capex (ZARm)	Total (ZARm)
2006	2006			46	46
2007	2007	0.7	116	158	273
2008	2008	1.0	166	13	178
2009	2009	1.0	164	15	179
2010	2010	1.0	162	14	176
2011	2015	5.0	812	12	824
2016	2018	1.8	302		302
Total		**10**	**1,721**	**257**	**1,979**

12.14 Coal – Mafube JV Phase II Project

Table 12.16 Mafube JV Phase II Project: Projected TEPs – Scenario I

From	To	Saleable Products			Real Expenditures		
		Export Steam (Mt)	Eskom Midlings (Mt)	Total Sales (Mt)	Cash Cost (ZARm)	Capex (ZARm)	Total (ZARm)
2006	2006					295	295
2007	2007	0.7	0.5	1.2	218	1,119	1,337
2008	2008	2.7	1.9	4.6	470	365	835
2009	2009	2.8	1.8	4.5	494	1	495
2010	2010	2.9	1.9	4.8	526	1	527
2011	2015	15.0	9.1	24.1	2,692	374	3,066
2016	2021	16.1	17.1	33.1	3,409	33	3,344
Total		**40**	**32**	**72.3**	**7,810**	**2,188**	**9,998**

Table 12.17 Mafube JV Phase II Project: Assumed TEPs – Scenario II

From	To	Saleable Products			Real Expenditures		
		Export Steam (Mt)	Eskom Midlings (Mt)	Total Sales (Mt)	Cash Cost (ZARm)	Capex (ZARm)	Total (ZARm)
2006	2006					525	525
2007	2007	0.7	0.5	1.2	205	756	961
2008	2008	2.7	1.9	4.6	465	408	873
2009	2009	2.8	1.8	4.5	489	1	490
2010	2010	2.9	1.9	4.8	520	1	520
2011	2015	15.0	9.1	24.1	2,657	374	3,032
2016	2020	15.0	16.1	33.1	3,210	112	3,322
2021	2026	17.6	18.9	36.5	3,836	19	3,854
Total		**57**	**50**	**107**	**11,382**	**2,195**	**13,578**

12.15 Coal – Belfast Project

Table 12.18 Belfast Project: Projected TEPs

From	To	Saleable Products			Real Expenditures		
		Export Steam (Mt)	Eskom Midlings (Mt)	Total Sales (Mt)	Cash Cost (ZARm)	Capex (ZARm)	Total (ZARm)
2006	2006						
2007	2007						
2008	2008	0.1	0.1	0.2	39	122	160
2009	2009	0.4	0.3	0.7	101	4	104
2010	2010	1.0	0.6	1.7	226	4	230
2011	2015	5.9	3.6	9.6	1,281	18	1,299
2016	2020	4.8	2.9	7.7	1,017	15	1,032
2021	2025	7.1	4.4	11.5	1,517	22	1,539
2026	2030	3.7	2.2	5.9	783	4	787
2031	2035	2.5	1.5	4.0	533		533
Total		**25.7**	**15.7**	**41.3**	**5,497**	**188**	**5,685**

12.16 Coal – Ingcambu Project

Table 12.19 Ingcambu Project: Projected TEPs

From	To	Saleable Products		Real Expenditures		
		Export Steam (kt)	Eskom Midlings (kt)	Working costs (ZARm)	Capex (ZARm)	Total (ZARm)
2006	2006	245.5	371.5	81		81
Total		**245.5**	**371.5**	**81**	**–**	**81**

12.17 Heavy Minerals – Hillendale Mine and Fairbreeze Project

Table 12.20 Hillendale Mine and Fairbreeze Project: Projected TEPs

From	To	Heavy Mineral Concentrate					Real Expenditures		
		Ilmenite (kt)	Rutile (kt)	Zircon (kt)	Leucoxene (kt)	Total Products (kt)	Working costs (ZARm)	Capex (ZARm)	Total (ZARm)
2006	2006	358.5	21.0	47.9	7.3	434.8	277	116	393
2007	2007	267.5	15.9	35.2	4.3	322.9	367	408	775
2008	2008	446.9	23.0	59.2	4.8	533.9	327	229	556
2009	2009	567.3	27.1	74.4	6.4	675.3	336	248	584
2010	2010	473.5	21.4	61.8	6.0	562.7	390	465	855
2011	2011	339.5	15.1	43.5	4.8	403.0	376	29	405
2012	2012	350.4	15.2	42.2	5.7	413.5	376	26	401
2013	2013	284.4	13.2	35.1	4.1	336.8	391	21	413
2014	2014	274.0	12.8	34.3	4.2	325.3	376	27	403
2015	2015	259.0	12.5	32.1	4.1	307.6	398	26	424
2016	2016	240.0	11.1	30.9	3.0	284.9	556	25	582
2017	2017	33.9	1.8	4.2	1.1	41.0	585	27	613
Total		**3,894.9**	**190.0**	**500.9**	**56.0**	**4,641.8**	**4,755**	**1,649**	**6,555**

12.18 Heavy Minerals – Ticor Smelter

Table 12.21 Ticor Smelter: Projected TEPs

From	To	Saleable Products					Real Expenditures		
		Chloride Grade Slag (kt)	Slag Fines (kt)	LMPI production (kt)	Offspec Iron Production (kt)	Total Products (kt)	Working costs (ZARm)	Capex (ZARm)	Total (ZARm)
2006	2006	149.3	22.3	89.9	6.0	267.5	566	110	676
2007	2007	207.4	31.0	128.5	5.4	372.3	712	52	763
2008	2008	210.4	28.7	128.5	5.4	372.9	713	49	762
2009	2009	185.4	25.3	110.7	7.3	328.7	684	66	751
2010	2010	242.2	26.9	145.0	6.0	420.2	838	58	896
2011	2015	1,262.5	140.3	755.6	31.5	2,189.9	4,451	373	4,826
2016	2020	1,304.8	145.0	778.1	32.4	2,260.2	4,500	338	4,838
2021	2025	1,305.0	145.0	779.4	32.5	2,261.9	4,479	338	4,817
2026	2030	1,269.2	141.0	757.5	31.6	2,199.3	4,347	338	4,685
2031	2035	1,302.1	144.7	777.6	32.4	2,256.8	4,601	338	4,940
Total		**7,438.3**	**850.1**	**4,450.8**	**190.4**	**12,929.7**	**25,891**	**2,062**	**27,952**

12.19 Heavy Minerals – Tiwest JV

Table 12.22 Tiwest JV: Projected TEPs

From	To	Heavy Mineral Concentrate						Real Expenditures		
		Ilmenite (kt)	Zircon (kt)	Rutile (kt)	Leucoxene (kt)	Pigment (kt)	Total Products (kt)	Working costs (AUDm)	Capex (AUDm)	Total (AUDm)
2006	2006	477.7	67.1	30.3	18.3	111.8	705.3	307	29	336
2007	2007	514.5	76.2	32.1	19.4	116.5	758.7	315	55	370
2008	2008	376.0	53.9	24.0	14.0	125.9	593.9	286	33	320
2009	2009	387.8	54.4	22.8	16.3	131.3	612.6	288	64	353
2010	2010	526.2	71.2	34.2	94.9	135.1	861.7	333	35	368
2011	2015	2,182.2	253.7	129.4	69.8	717.0	3,352.1	1,552	215	1,766
2016	2020	1,336.5	188.2	87.8	45.5	661.9	2,319.8	1,310	120	1,430
2021	2025	1,256.9	197.0	80.0	9.2	661.2	2,204.2	1,172	111	1,283
2026	2026	168.1	26.0	11.6	5.7	95.8	307.3	206	19	225
Total		**7,225.9**	**987.8**	**452.3**	**293.0**	**2,756.6**	**11,715.5**	**5,770**	**681**	**6,451**

12.20 Base Metals – Rosh Pinah

Table 12.23 Rosh Pinah: Projected TEPs

From	To	Saleable Products		Real Expenditures		
		Zinc Metal in Concentrate (kt)	Lead Metal in Concentrate (kt)	Cash Cost (NADm)	Capex (NADm)	Total (NADm)
2006	2006	68.4	17.0	307	11	318
2007	2007	74.8	13.4	306	12	318
2008	2008	71.7	18.7	293	11	304
2009	2009	64.6	15.3	295		295
2010	2010	66.8	14.2	209		209
Total		**346.2**	**78.5**	**1,410**	**34**	**1,444**

12.21 Base Metals – Zincor

Table 12.24 Zincor: Projected TEPs

From	To	Saleable Products		Real Expenditures		
		Zinc (kt)	Sulphuric Acid (kt)	Working costs (ZARm)	Capex (ZARm)	Total (ZARm)
2006	2006	111.0	154.6	880	39	918
2007	2007	111.0	149.7	933	28	961
2008	2008	111.0	149.7	828	36	864
2009	2009	110.0	149.7	861	46	908
2010	2010	110.1	149.7	945	49	994
2011	2015	550.6	748.5	5,073	246	5,320
2016	2020	550.6	748.5	5,134	246	5,380
2021	2025	550.6	748.5	5,156	246	5,402
2026	2030	550.6	748.5	5,153	246	5,400
2031	2033	330.3	449.1	3,284	148	3,432
Total		**3,085.7**	**4,196.5**	**28,246**	**1,332**	**29,578**

12.22 Base Metals – Chifeng

Table 12.25 Chifeng: Projected TEPs

From	To	Saleable Products		Real Expenditures		
		Zinc (kt)	Sulphuric Acid (kt)	Working Costs (RMBm)	Capex (RMBm)	Total (RMBm)
2006	2006	47.5	79.0	763	297	1,060
2007	2007	68.9	113.7	1,101	19	1,120
2008	2008	99.9	164.0	994	19	1,013
2009	2009	99.9	164.0	825	19	843
2010	2010	99.9	164.0	736	18	754
2011	2015	499.5	819.9	3,527	86	3,613
2016	2020	499.5	819.9	3,302	78	3,380
2021	2025	499.5	819.9	2,786	71	2,857
2026	2030	499.5	819.9	2,468	64	2,532
2031	2034	299.7	491.9	1,357	15	1,372
Total		**2,713.8**	**4,456.2**	**17,857**	**686**	**18,543**

12.23 Industrial Minerals – Glen Douglas

Table 12.26 Glen Douglas: Projected TEPs

From	To	Saleable Products				Real Expenditures		
		Aggregates (kt)	Metallurgical Dolomite (kt)	Agricultural Lime (kt)	Total Sales (kt)	Cash Cost (ZARm)	Capex (ZARm)	Total (ZARm)
2006	2006	680	720	46	1,446	70	13	83
2007	2007	680	720	46	1,446	71	10	81
2008	2008	680	720	46	1,446	71	14	85
2009	2009	680	720	46	1,446	72	15	88
2010	2010	680	720	46	1,446	72	11	83
2011	2015	3,403	3,601	230	7,234	374	59	434
2016	2020	3,400	3,600	230	7,230	374	56	430
2020	2025	3,400	3,600	230	7,230	329	48	377
2026	2030	3,400	3,600	230	7,230	331	57	387
2031	2035	3,124	3,600	230	6,954	363	24	387
Total		**20,127**	**21,601**	**1,379**	**43,107**	**2,125**	**310**	**2,435**

12.24 Industrial Minerals – Kumba FerroAlloys

Table 12.27 Kumba FerroAlloys: Projected TEPs

From	To	Saleable Products				Real Expenditures		
		Course (kt)	Fine (kt)	Super Fine (kt)	Total Sales (kt)	Cash Cost (ZARm)	Capex (ZARm)	Total (ZARm)
2006	2006	4.0	2.3		6	37	2	39
2007	2007	4.0	2.3	0.1	6	37	1	38
2008	2008	4.0	2.3	0.1	6	37	1	38
2009	2009	4.0	2.3	0.1	6	38	1	39
2010	2010	4.0	2.3	0.1	6	37	2	38
2011	2015	20.1	11.5	0.5	32	184	8	192
2016	2020	20.1	11.5	0.5	32	184	8	192
2020	2025	20.1	11.5	0.5	32	184	8	192
2026	2030	20.1	11.5	0.6	32	184	8	192
2031	2035	20.1	11.5	0.6	32	196	8	204
Total		**120.3**	**69.0**	**3.0**	**192**	**1,116**	**48**	**1,165**

12.25 Special Factors

12.25.1 General Risks and Opportunities

SRK has included its view on the achievement of the LoM Plans and the appropriateness of the Mineral Reserve statements when presenting technical and financial data in this CPR. As of the Effective Date stated in this CPR, SRK considers these projections to be achievable.

In all likelihood many of the identified risks and/or opportunities will have an impact on the cash flows as presented in Section 14, some positive and some negative. The impact of one or a combination of risks and opportunities occurring cannot be specifically quantified to present a meaningful assessment. SRK has however provided sensitivity tables for single and twin parameters.

The sensitivity range covers the anticipated range of accuracy in respect of commodity prices, operating expenditures and capital expenditure projections. In this way the general risks are, with the aid of sensitivity tables, adequately covered.

The Material Properties are subject to certain inherent risks associated with mining operations, which apply to some degree to all participants of the industry. These include:

Commodity Price Fluctuations: Changes in the market price for commodities which may be influenced, *inter alia*, by market supply and demand;

Exchange Rate Fluctuations: Specifically related to the relative strength of the USD, the currency in which commodity prices are generally quoted;

Inflation Rate Fluctuations: Specifically related to the macro economic policies of the individual countries;

Country Risk: Specific country risk including political and economic stability in the longer term as indicated by the International Country Risk Grade ("ICRG");

Legislative Risk: Specifically changes to future legislation (tenure, mining activity, labour, health and safety and environmental) within South Africa, Australia and Namibia;

Exploration Risk: Resulting from the elapsed time between discovery of deposits, development of economic feasibility studies to bankable standards and associated uncertainty of outcome;

Environmental Liability Risk: The inability of the Material Properties to fund the balance of their environmental liabilities from estimated operating cashflows, should operations cease prior to that stated in the LoM. This would result in an outstanding liability since the estimated rehabilitation expenditure exceeds the amounts available in the respective rehabilitation trust funds (ZAR265m) as at 1 January 2006. As at 1 January 2006 the total outstanding liability remaining to be funded is estimated between ZAR1,065 – ZAR1,432m;

Occupational Health Risk: The medium and longer-term impact of the HIV/AIDS pandemic given the high rate of infection in South Africa (30%);

Mining Risks: Specifically Ore Reserve estimate risks, uninsured risks, industrial accidents, labour disputes, unanticipated ground water conditions, human resource management and safety performance;

Project Risks: Specifically technical risks associated with projects for which Feasibility Studies have been completed but for which construction, development and production has not commenced; and

Inferred Mineral Resources in LoM Plan: The risk associated with inclusion of Inferred Mineral Resources in the LoM Plans.

In addition to those stated above, the Material Properties are subject to certain specific risks and opportunities, which independently may not be classified to have material impact (i.e. likely to affect more than 10% of the Material Properties' annual pre-tax profits), but in combination may do so.

12.25.2 Operational Specific Risks and Opportunities

In addition to those stated above, the Material Properties are subject to certain specific risks and opportunities, which independently may not be have a material impact (i.e. likely to affect more than 5% of the Material Properties annual pre-tax profits), but in combination may do so.

The following **operational specific risks** have been identified:

- A degree of risk associated with the non-achievement of production targets as compared to historical performance. Broadly the impact of non-achievement can be assessed by consideration of the valuation sensitivity tables as presented in Section 14. In this instance SRK consider that the –10% reduction in revenue (production) and the +5% increase in operating expenditures reflects this risk;
- A degree of risk associated with the assumption that mining costs as incurred at the South African assets during 2005 are not reliable as a base for forward projection. SRK has used the costs achieved during 2005 as the base for forward projection. In this regard SRK consider that the +10% on cost sensitivity best reflects this situation;
- The risk for Sishen South Project and the SEP project that Transnet may not meet the additional capacity requirements on the Sishen–Saldanha railway line. Should the additional capacity not materialise this may result in reduced sales;
- The risk that projected Eskom price increases do not maintain parity with the South African Producer Price Index. Some 60% of revenues at Grootegeluk Mine and 100% of revenues at Arnot Colliery and Matla Colliery are derived from Eskom Sales. Should this materialise this may result in a reduction in the operating profit;
- The risk that The Matimba Power Station may not renew its contract with Grootegeluk Mine beyond 2025, which may create revenue uncertainty beyond 2025 as Grootegeluk Mine has a LoM of 40 years up to 2045;
- The risk that Leeuwpan Mine may not achieve productivity improvements incorporated into budget forecasts, which may affect future financial performance;
- The risk that Tshikondeni Mine may not be able to mine 20% of Goni shaft due to 20% of the shaft lying outside the lease area;
- The risk to Tshikondeni Mine that Mittal Steel will secure an alternative and cheaper source of supply. Should this materialise then this may result in the cessation of operations at Tshikondeni Mine;

- The risk that Zincor will not be able to source zinc concentrate at competitive prices once operations at Rosh Pinah and Black Mountain are discontinued;
- The risk of higher closure costs at Zincor and Glen Douglas. Both operations have no closure plan; and
- The risk that Eyesizwe's Material Properties will not meet production targets.

The following **operational specific opportunities** have been identified:

- The potential to increase iron ore exports should the capacity of the Sishen–Saldanha line be expanded;
- The potential to increase iron ore resources by 2.9 billion tonnes by including SEP <60%Fe material and iron ore reserves by 1.0 billion tonnes by re-optimising pits to include SEP material <60%Fe;
- The potential to increase iron ore resources and reserves by completing pre-feasibility and feasibility studies on Phoenix Project (+60Mt) and Sishen South Phase II (+103Mt);
- The potential to reduce operating expenditure by considering synergies between Sishen Mine and Sishen South Project and the potential to reduce capital expenditure by maximising synergy between Sishen South Project and SEP infrastructure;
- The potential for Grootegeluk Mine to realise significant productivity improvements from the addition of the Sintel Char Plant;
- The potential for Grootegeluk Mine to increase export sales due to an increased allocation from the Richards Bay Coal Terminal;
- The potential for Grootegeluk Mine to increase efficiencies by changing haul routes and making waste disposal more efficient;
- The potential for Leeuwpan Mine to reduce costs and washing plant yields further by optimising the use of the jig during processing;
- The potential for Leeuwpan Mine to realise improved efficiencies in mining from replacing old trucks/loaders, productivity improvement initiatives and optimising the haul road layout;
- The potential for Tshikondeni Mine to share cost and productivity gains with Mittal Steel;
- The potential for Grootegeluk Mine, Arnot Colliery and Matla Colliery to increase their respective LoMs by extending the lives of the The Matimba Power Station, Arnot and Matla power stations;
- The potential for Arnot Colliery to increase revenue by reducing contamination;
- The potential for North Block Complex to exploit the contiguous underground reserves (2Mt);
- The potential for North Block Complex to increase coal resources and reserves from Belfast, Eerstelingsfontein and Strathrae;
- The potential for Rosh Pinah to prove up a 10-year Mineral Reserve; and
- The potential for Zincor to import zinc concentrate.

13. MACRO-ECONOMICS AND COMMODITY PRICES

13.1 Introduction

This section includes discussion and comment on the commodity market analyses for the Iron Ore, Coal, Heavy Minerals, Zinc and Industrial Minerals markets. Specifically, comments are given on the macro-economic environment, commodity supply and demand and long-term price projections.

13.2 Macro-economic Environment

13.2.1 Short-term Outlook – twelve months

Following on strong world GDP growth of 4% in 2004, economic expansion proved to be remarkably resilient in 2005, growing at about 3.5%. This, despite record-high oil prices and the impact of major natural disasters, such as the December 2004 Asian tsunamis and some of the worst hurricanes on record in the USA during the second half of the year.

The US and China remained the engines of growth of the world economy, but global growth has broadened significantly since the middle of 2005, with, for example, economic expansion increasing in Japan and Europe due to greater domestic demand strength. Despite significant monetary tightening by some of the major central banks, global monetary conditions remained accommodative, with relatively low real interest rates.

Given the broader base of economic expansion, together with the fact that the pace of growth in the USA and China is expected to decline only moderately, above-trend global economic growth of some 3.4% can again be expected in 2006. Leading economic indicators and surveys of purchasing managers from around the world confirm the view that the global growth momentum will continue in 2006.