B DEVELOPMENT PROJECT

5 KINSENDA COPPER PROJECT

5.1 Introduction

[SR1.5A(i)]

KICC, a private limited liability company registered in the DRC, holds mining title to the Kinsenda Cu Project. CRC, a 100% owned subsidiary of Metorex, has a 72.15% interest in KICC, with Metorex holding a direct 4.85% in KICC. The remaining 23% of KICC is held by Sodimico, a state owned mining company registered in the DRC.

Kinsenda is a brownfields underground mining project, located 5 km from the border of Zambia, near the town of Kasumbalesa, in the Pedicle region of southern Katanga Province of the DRC. The Kinsenda project is a mixed copper sulphide/oxide orebody. The decision to proceed to development and construction of the project has been taken, subject to satisfactory results from the control budget estimate ("**CBE**").

5.2 Location, Climate, Access and Infrastructure

[SR1.4A, SR1.5A(i), SR1.6, SV2.3]

The Kinsenda Mine is located at latitude 12°15'S and longitude 27°58'E, 18 km east of Kasumbalesa (see Figure 5.1) and 90 km by road southeast of Lubumbashi. Kinsenda is a brownfields site within 5 km of the border between the DRC and Zambia, with surface infrastructure, consisting of three incline shafts, one vertical shaft (Figure 5.2), supporting engineering and administrative infrastructure and a mine village.

Access to the Kinsenda mine is via a good paved road branching off the main Lubumbashi to Kasumbalesa road, which has recently been upgraded. A dirt airstrip exists at Kinsenda that requires refurbishment and could be used in the future. At present all personnel, emergency equipment plus spare parts are flown in to Lubumbashi. Bulk equipment and non-essential spares are trucked in to the mine.

Because the Kinsenda Mine was historically a production facility, it has considerable industrial and social infrastructure. Power is supplied via the Kasumbalesa sub-station through an 110 kV power line, forming part of the national SNEL grid system. The substation will require upgrading once the Kinsenda mine is redeveloped. The mine has two 2.5 MVA backup diesel generators and sufficient fuel storage capacity for 52 hours of operation. The generators have been well maintained, but suffer from a lack of spare parts due to their age.

The main rail link between DRC and Zambia passes through the Tshinsenda rail siding 6 km south of Kinsenda Mine. Adequate potable and industrial water is available at Kinsenda from springs and mine dewatering. Rail infrastructure and rolling stock owned by SNCC is in poor condition and it is anticipated that all stores and reagents coming in to the mine and concentrate leaving the plant area would need to be moved by road transport.

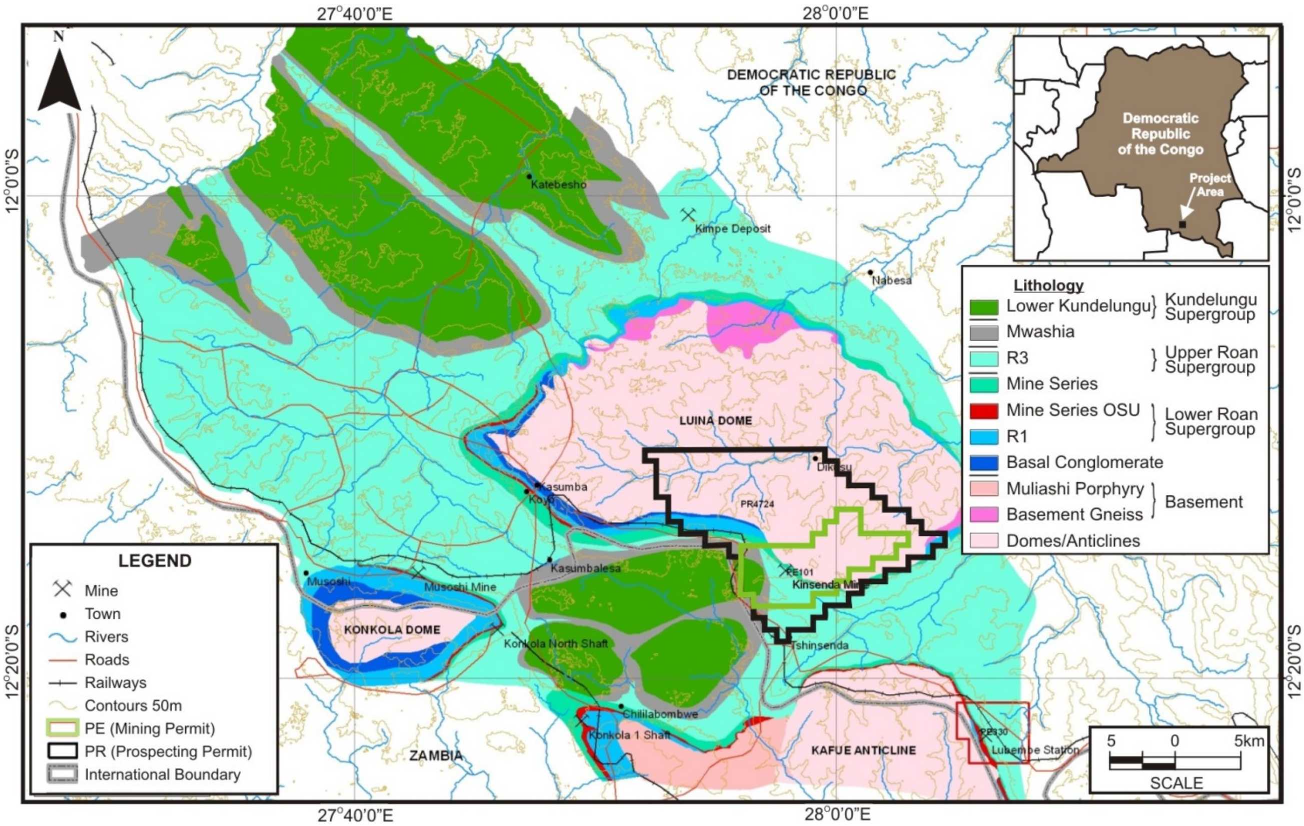
For purposes of the CBE, sulphide concentrate produced at Kinsenda will be treated at CCS in Zambia owned by CNM (~60 km by road). Oxide concentrate from Kinsenda will be treated at Ruashi's SX/EW plant.

The Zambia-DRC border forms a regional watershed between streams flowing into the Kafue River and ultimately to the Zambezi River in the south, and rivers flowing toward the Lualaba and Congo River in the north. The Kinsenda project area is located on gently undulating topography at an altitude of 1 280 m to 1 320 m amsl.

The Copperbelt region is sub-tropical and is characterised by distinct wet and dry seasons. The wet season is from November to March with annual rainfall varying between 1 000 mm to 1 500 mm. Between December and April, most field work is restricted to areas served by good roads, effectively limiting exploration to the dry season.

The average air temperature remains fairly constant at between 17°C and 24°C throughout the year and there is no distinct winter and summer temperature regime. Average temperatures peak during September and October at 32°C. The coldest month is July with an average daily minimum of 6°C.

The vegetation in the area is deciduous tropical woodland generally referred to as Miombo Woodland. Trees seldom grow to heights exceeding 20 m, with the majority less than 8 m high. The vegetation immediately adjacent to the Kinsenda Mine has been affected by nearly 40 years of human habitation and mining activities.



srk consulting	**Metorex** Kinsenda – regional locality, geology and extent of mining licence (PE101) and prospecting permit (PR4724)	Project No. 453459

Figure 5.1: Kinsenda – regional locality, geology and extent of mining licence (PE101) and prospecting permit (PR4724)

srk consulting	**Metorex** Kinsenda Mine – vertical shaft headgear and one of the incline shafts	Project No. 453459

Figure 5.2: Kinsenda Mine – vertical shaft headgear and one of incline shafts

5.3 Mining History

5.3.1 Historical Development of Kinsenda Mine

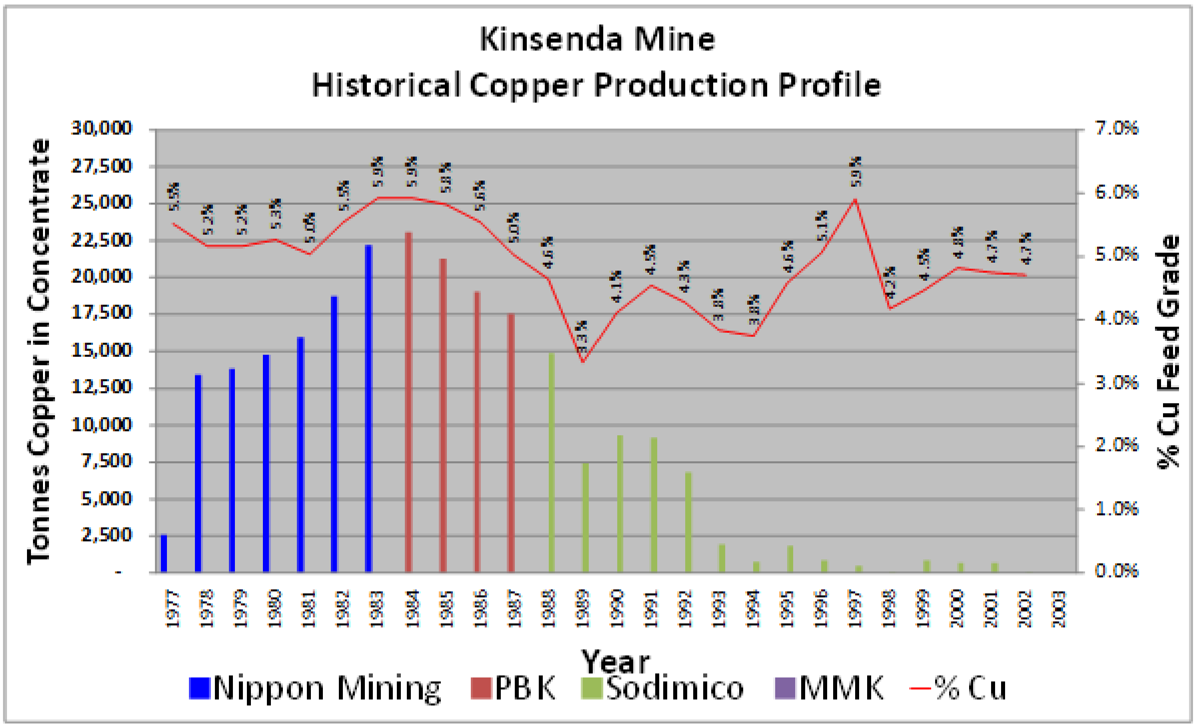
[SR1.3, SR1.4, SR1.5A(ii), SV2.4]

The historical development of Kinsenda Mine is summarised in Table 5.1.

5.3.2 Historical Production

[SR1.3, SV2.17]

The production history for Kinsenda Mine is shown in Figure 5.3.



srk consulting	**Metorex** Kinsenda Mine – Production History from 1977 to 2003	Project No. 453459

Figure 5.3: Kinsenda Mine – Production History from 1977 to 2003

5.4 Title and Rights

[SR1.7A, SR5.1A, SV2.3]

Prior to the Title Revisitation Process (the "Revisitation Process") that the Government of the DRC introduced in 2008, CRC had a 75% interest in MMK, Metorex held a direct interest of 5% in MMK with Sodimico holding the remaining 20% of the shares.

Up to that stage, MMK held exploitation rights to the Kinsenda Mine ("PE101"), the Musoshi Mine ("PE102"), the Lubembe mineral deposit ("PE330"), and exploration rights to the areas surrounding the Kinsenda ("PR4724") and Musoshi ("PR4874", "PR4875" and "PR4723") properties.

Table 5.1: Kinsenda Mine – Historical Development

Date	Activity	Comments
1930	UMHK discovers Kinsenda deposit	
1969	Sodimico created as a consortium, owned 80% by Nippon Mining Company of Japan and 20% by Congolese State. Sodimico granted the right to exploit the Musoshi and Kinsenda deposits.	Granted extensive mining & prospecting concession over large part of the DRC Pedicle area. Progressively reduced.
1970s	Development of Kinsenda commenced.	
1977	Production at Kinsenda commenced.	Ore mined at Kinsenda and transported 20 km to Musoshi, where a sulphide Cu concentrate produced.
June 1983	Nippon Mining withdrew from the DRC	
November 1983	Nippon Mining's shares transferred to a Canadian Company, Phillips Barratt Kaiser ("**PBK**").	
April 1987	Association with PBK terminated, Sodimico went into receivership and effectively became a Gécamines subsidiary.	
Ca. 1990	Production dropped dramatically.	
1997	Operation placed on care and maintenance due to flooding of mine	Water table stabilised at 124 m below surface.
Early 2000s	Production reduced to a minimum due to severe capital constraints and low Cu price.	Between 1977 and 2003, 4.2 Mt of ore at 5.12% TCu was extracted from the mine, producing ca. 240 kt of Cu metal (see Figure 6.3).
December 2002	Sodimico signed a memorandum of understanding ("**MoU**") with Enterprise Groupé Malta Forrest ("**EGMF**" or "Forrest Group")	Agree to undertake a feasibility study to resume mining activities at Musoshi and Kinsenda
2003	Miniére de Musoshi et Kinsenda sarl ('**MMK'**) was formed as a limited liability company (Sodimico - 20%, EGMF - 80%).	Company incorporated by presidential decree No 067/2003 in April 2003.
2003	Sodimico reported "mining reserve" of 10 Mt at 5% Cu, using manual polygonal estimate (assumed 72% extraction rate and 6.5% dilution).	Non-SAMREC compliant.
2003	EGMF compiles digital estimate for Kinsenda using SURPAC, reported mineral resource of 15.9 Mt at 5.3% Cu.	Used inverse distance squared interpolation of grades and a cut-off grade of 2% Cu. Non-SAMREC compliant.
September 2005	CRC took controlling interest in MMK. EGMF dilutes interest in MMK to 5% in exchange for 38.7% stake in CRC.	
February 2006	Installation and refurbishment of pumping operations of the mine.	
2006	FinOre Pty Ltd of Perth, Australia complete review and re-estimation of mineral resource for CRC, reported a remaining mineral resource of 17.1 Mt at 5.1% Cu.	JORC compliant.
December 2006	Feasibility study completed by Mineral Engineering Technical Services Pty Ltd ("**METS**") of Perth, Australia.	Never fully accepted by Metorex, due to concerns regarding mine design and engineering design of concentrator plant.
September 2007	Metorex acquires EGMF's stake in CRC, also acquires EGMF's stake in KICC	
May 2008	Metorex had increased its stake in CRC to 50.3%.	
2007 - 2009	Dewatering of the mine continued	
February 2009	Part of project finance facility provided by Metorex converted to shares in CRC – Metorex holds 87% interest.	Metorex's economic interest in CRC is however 99.9% as CRC shares held by Central African Mining and Exploration Company Plc ("**CAMEC**") were disenfranchised.
March 2009	Metorex gains control of Kinsenda Mine	Series of transactions and DRC mining licence review process completed. As part of settlement, MMK retained the Musoshi Mine.
2009	Mine placed on care and maintenance to reduce cash outflows from CRC and Metorex.	Linked to collapse of global commodity markets in 2008.
July 2009	Name of operating company changed from MMK to KICC	
2010	Surface drilling programme of 26 holes (7 790 m) completed, to verify mineral resources below 285 m level and improved confidence in geological interpretation.	
2012	Drilling of additional 45 holes (12 013 m) to finalise feasibility study. Mine design and concentrator plant undergo engineering review.	

The Revisitation Process announced on 6 February 2009 resulted in:

- Interests in MMK were held by Sodimico (23%), CRC (72.15%) and Metorex (4.85%);
- CRC was required to pay a mineral content fee to Sodimico and the Government of the DRC totalling USD3 million. This has been paid in full;
- MMK required to pay to Sodimico and the Government a combined royalty fee of 2.5% of gross revenue;
- The Musoshi mine surface and underground infrastructure, and Exploitation (PE102) and Exploration (PR4874, PR4875 and PR4723) Permits were returned to Sodimico together with certain equipment that had been transferred to Kinsenda Mine but not used;
- Compensation was to be paid by MMK on a fair value basis for any equipment that had been removed from Musoshi mine and applied to the Kinsenda mining operations. This has been paid in full; and
- MMK would finance any upgrade required to the Kasumbalesa power station once full scale development of the Kinsenda Mine had commenced. The cost of the upgrade would be recovered from Sodimico who are the owners of the power station. KICC installed a new 40 MVA transformer at a cost of USD2.4 million. KICC is in discussions with Sodimico about the cost recovery as 20 MVA is dedicated to Kinsenda and 20 MVA is dedicated to Sodimico, so Sodimico is of the opinion that they should not be paying for the full capital cost. Once the recovery cost is determined, Kinsenda will invoice Sodimico for the agreed amount.

Subsequent to the settlement terms set out above it was agreed to change the name of MMK to KICC which more appropriately described the activity interests of the restructured company.

KICC holds the exploitation permits as set out in Table 5.2.

Table 5.2: Kinsenda – details of Mineral Licences

Licence	Type of title	Area (ha)	Valid From	Expiry Date	Commodity
PE101	Exploitation Permit	4 928	6 Oct 2006	5 Oct 2021	Cu, Co, Pb, Ni, Pd, W
PE12548 (1)	Exploitation Permit	5 695	10 Mar 2012	9 Mar 2042	Cu, Co, Ag, Ni, Pt, Au

1 PE12548 has been converted from the prospecting permit PR4274, where part of the PR4274 was relinquished. While KICC has received confirmation that such permit has been converted, the ministerial order of granting such conversion has not been obtained.

5.5 Geology

[SR1.2, SR1.3, SR2.5A/B/C, SR4.1A(i), SV2.5]

5.5.1 Exploration History of the Project Area

The Kinsenda deposit was discovered by UMHK in 1930.

UMHK and Sodimico drilled a total of 231 diamond drill holes totalling 66 000 m in the period between 1944 and 1990.

Following the flooding of the mine in 1997 and minimal production up to 2003 (see Figure 5.3), EGMF compiled a digital estimate for Kinsenda using SURPAC.

A feasibility study completed in 2006 was never fully accepted by Metorex, due to concerns regarding the mine design and engineering design of the concentrator plant.

Metorex undertook four drilling campaigns between 2010 and 2012. The first campaign completed in 2010 was aimed at establishing a robust QA/QC twin sampling and infill drilling programme, which comprised 26 holes (7 790 m). A second phase of drilling comprising 16 drill holes (6 159 m) was completed in 2011 to provide further infill drilling and raise the proportion of indicated resources. A third phase of drilling comprising 13 drill holes (4 193 m) was completed by September 2011. The fourth and final phase of drilling comprising 13 geotechnical and 3 exploration drill holes (1 661 m) was completed in September 2012.

In February 2010, 27 of the historical drill hole collars were accurately resurveyed by Integrated Mapping Solutions ("**IMS**") in UTM WGS84 using a DGPS system. In July 2011, SD Geomatique reliably identified 180 historical drill hole collar positions and these were resurveyed in UTM coordinates using a DGPS. All drill holes completed by Metorex were surveyed by DGPS.

5.5.2 Regional Geology

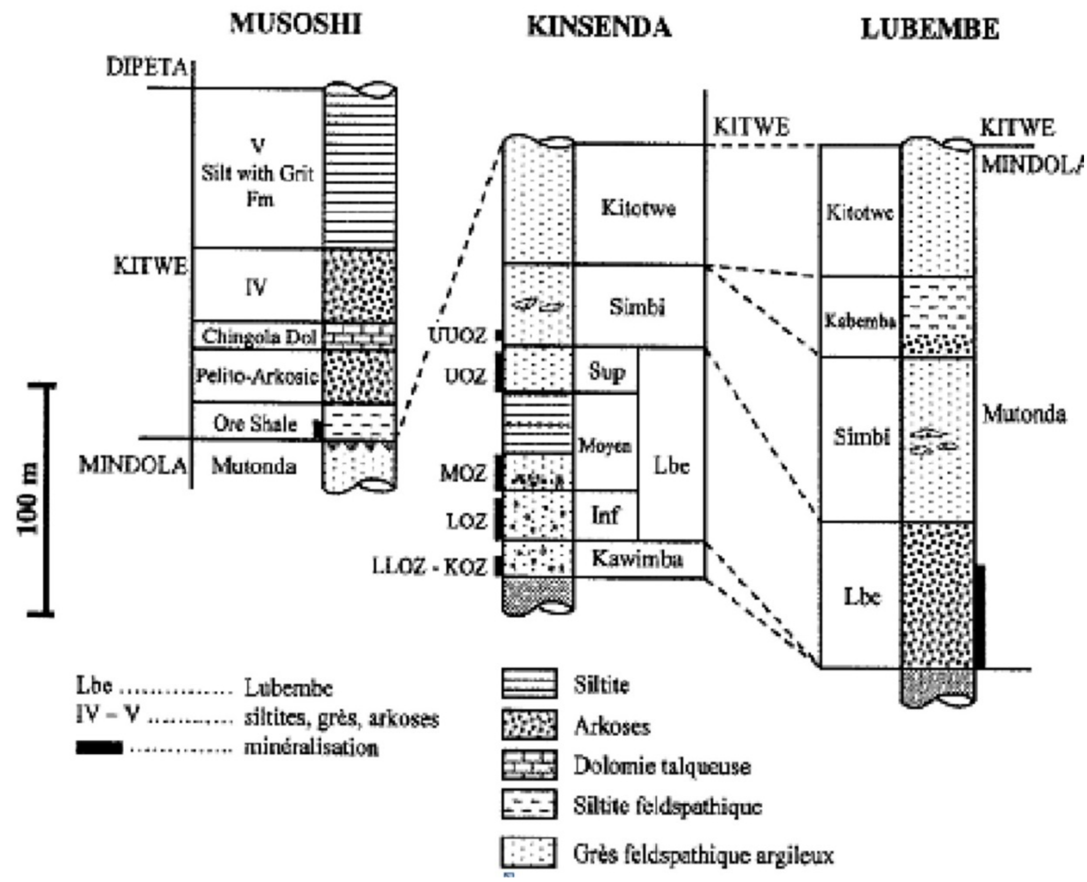
The reader is referred to the discussion in Section 3.5.2.

5.5.3 Local Geology and Mineralisation

The Kinsenda deposit is more typical of the Zambian Copperbelt deposits and is geologically similar to the Mufulira, Chambishi and Chibuluma South mines in Zambia. The Kinsenda deposit marks the transition between the two sub-types of the Copperbelt, with deposits to the north of the Luina dome showing a strong dolomitic character with associated HG oxides close to surface.

The Kinsenda ore body is hosted in a thick sequence of coarse to fine-grained sandstones, siltstones and shales of the Lower Roan Group in the footwall of the Ore Shale Member, and is generically referred to as a "footwall orebody". Figure 5.4 illustrates the local formation naming convention and correlation with the Musoshi succession, which is typical of the Zambian Copperbelt stratigraphy.

The deposition of the Kinsenda deposit occurred in a fault-controlled, active rift environment. In the Kinsenda project area (see Figure 5.1), the Mindola Group rocks of the Lower Roan show local thickness and facies variations corresponding to pulses of sedimentation progressing from conglomerates at the base to siltstones and dirty sandstones at the top of the hosting sediment package.



srk consulting	Metorex Kinsenda Mine – local stratigraphic subdivision on the Kinsenda and Lubembe deposits	Project No. 453459

Figure 5.4: Kinsenda Mine – local stratigraphic subdivision on the Kinsenda and Lubembe deposits

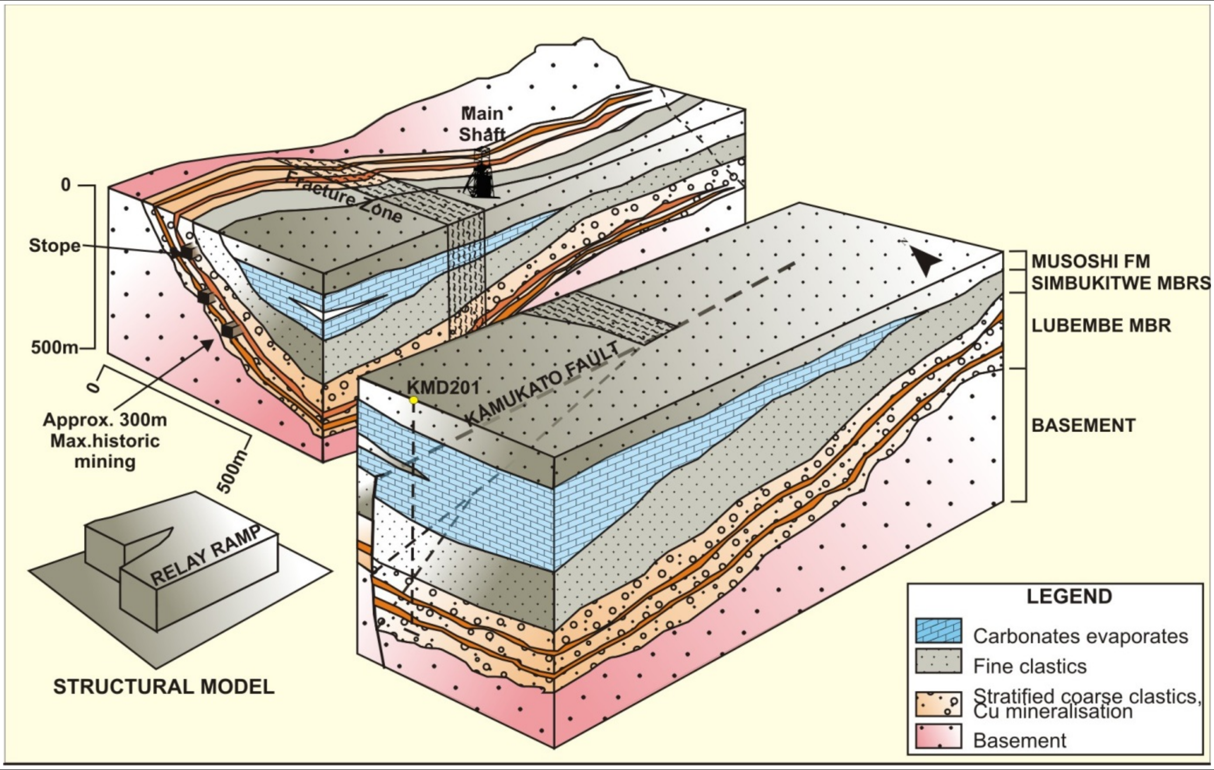
Sub parallel horst (highs) and graben (depressions) features in the pre-deposition basement are suggested by rapid variations in the thickness of the basal units of the Lower Roan both along strike and down dip. There is a strong correlation between the position of the Kinsenda deposit and the basement granite paleotopography, very similar to that of the Chibuluma South deposit.

The host rocks occur as valley fill sediments in the down-faulted graben structures adjacent to growth faults that were active during sedimentation. The basement growth faults are oriented in a roughly ENE alignment and have a well-defined magnetic signature that can be traced into the basement rocks of the Luina Dome to the north of the Kinsenda deposit. While not a primary indicator of mineralisation, this is a key geophysical signature for future exploration on the Kinsenda exploration permit area.

5.5.4 Project Geology

Kinsenda is a copper-only sulphide orebody consisting of predominantly chalcocite, bornite and chalcopyrite mineralisation hosted in detrital conglomerates, sandstones and argillaceous siltstones of the Lower Roan Group. The orebody consists of a number of vertically stacked, tabular mineralised zones varying in width from 1 m to 20 m, and generally occurring in the more porous, conglomerate rich zones directly below thick, less permeable siltstone rich zones as illustrated in Figure 5.5 and Figure 5.6.

The combined orebody occurs over a strike of approximately 2 000 m, dipping moderately at 25° to 30°. In plan view, the mineralised lenses form a series of partially overlapping, wedge shaped tabular bodies with a northwest-southeast strike orientation (see Figure 5.6), which form laterally continuous lenses referred to as the upper upper ore zone ("**UUOZ**"), upper ore zone ("**UOZ**"), middle ore zone (**MOZ**"), lower ore zone ("**LOZ**") and the basal lower lower ore zone ("**LLOZ"**).



srk consulting	**Metorex** Kinsenda Mine – geological block model of the Kinsenda deposit	Project No. 453459

Figure 5.5: Kinsenda Mine – geological block model of the Kinsenda deposit

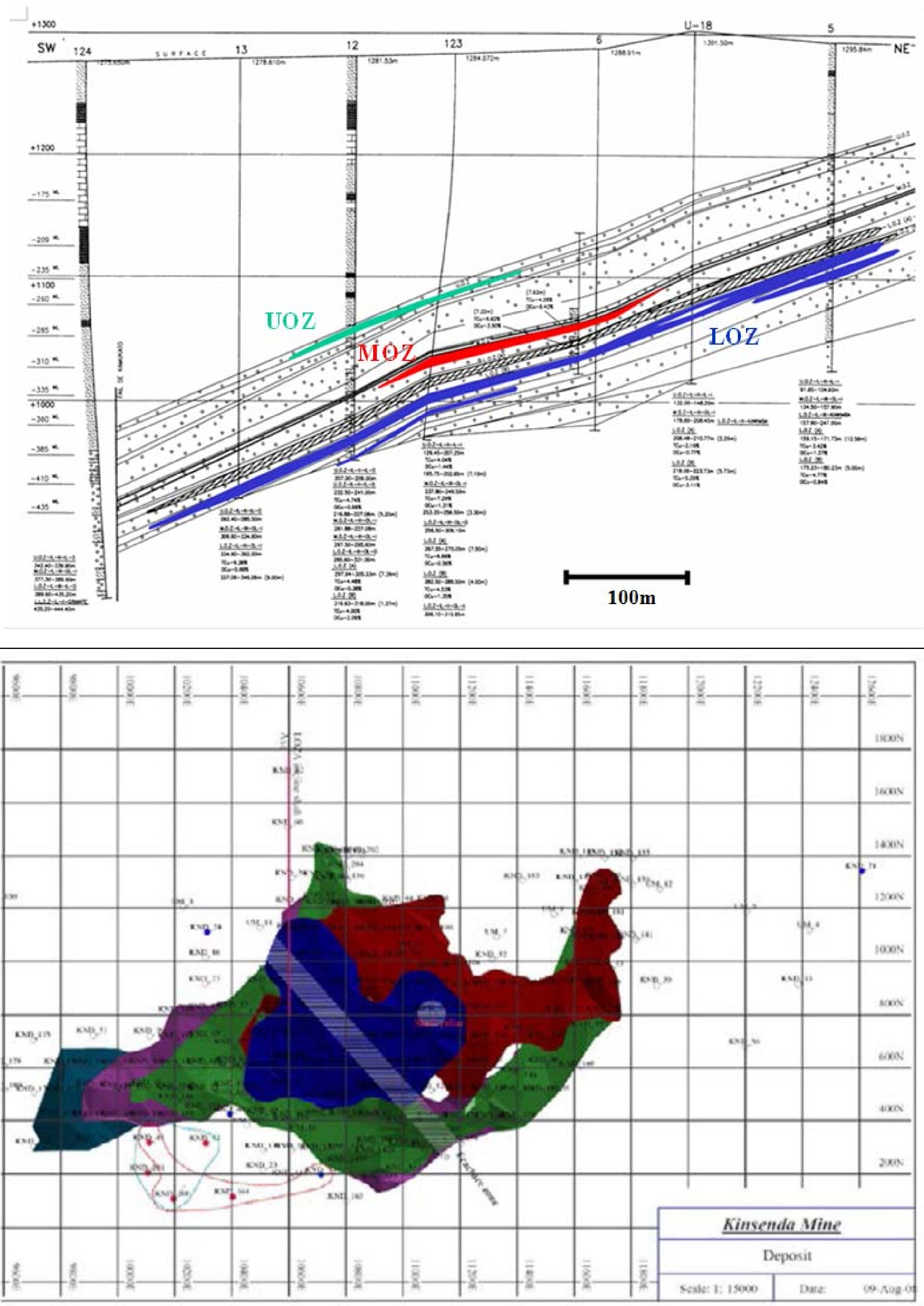
The UUOZ and UOZ occur above the 285mL (285 m below surface) and have been largely mined out. The UOZ is separated from the MOZ by a low grade (less than 2% Cu) zone of approximately 40 m thickness. The waste separation between the other lenses is generally in the order of only a few metres. The LOZ is laterally discontinuous and is divided into multiple zones which can split and coalesce over relatively short distances, with two main components termed LOZA and LOZB.

The MOZ is the most extensively developed and has a maximum strike length of approximately 2 000 m, while the UUOZ has the shortest strike length of 250 m. On dip, the maximum length of the ore bodies can be up to 800 m, with ore thickness ranging from 1 m in peripheral areas to 22 m in the central portions. At least 60% of the mineralisation occurs in zones between 4 m and 12 m wide with an average width of all lenses of 5.9 m. The LOZA and LOZB zones have the highest grade and also constitute 64% of total mineral resource tonnage.

The mineralisation occurs predominantly as interstitial sulphides filling pore spaces in the coarse sediments. Copper oxides represent a maximum of 20% of the mineralisation with the proportion of oxides decreasing with depth. Cobalt minerals are rare and largely restricted to cobaltiferous pyrite.

5.5.5 Exploration Programme and Budget

No details of any further exploration on the Kinsenda permit were provided to SRK. SRK has therefore assumed that future exploration work will be linked to the underground operations, either as part of grade control or tracing extensions to the orebodies. As such, SRK has assumed these costs are included in the mine operating costs.



	Metorex Kinsenda Mine – drill cross section 10,500E (top) and plan view of the orebody showing stacked nature of mineralised zones (bottom)	Project No. 453459

Figure 5.6: Kinsenda Mine – drill cross section 10,500E (top) and plan view of the orebody showing stacked nature of mineralised zones (bottom)

5.6 Mineral Resources and Mineral Reserves

[SR1.1A(iii), SR2.5A/B/C, SR7B, SR9A/B/C, SV2.6]

5.6.1 Data Quality and Quantity

[SR3.1, SR4.1]

The Kinsenda database contains a total of 269 drill holes collected over a period spanning almost 100 years. However a total of 226 drill holes were used in this evaluation. Some drill holes were excluded from this exercise because they had missing collar, assay and/or geology information.

Two distinct phases of drilling have been carried out on the Kinsenda project:

- A historical phase by UMHK and Sodimico; and
- Four campaigns by Metorex (2010 to 2012).

Metorex reports that historically, a total of 231 diamond drill holes totalling 66 000 m were drilled by UMHK and Sodimico in the Kinsenda area. Exploration at Kinsenda began with about 205 surface drill holes drilled by Nippon Mining (33 000 m) and Sodimico (18 000 m) on a 100 m centre drilling grid. In the early 2000s, four drill holes were drilled to test for near-surface open pittable resources with negative results.

The first Metorex campaign completed in 2010 was aimed at establishing a robust QA/QC twin sampling and infill drilling programme, which comprised 26 holes (7 790 m). The programme focussed on a portion of the LOZ to the west of the fracture zone. Some holes were pre-collared using RC drilling to a depth of between 80 m and 130 m. All diamond drill holes were cored at NQ size through the mineralised stratigraphies. The drill holes were laid out on an approximate 100 m by 100 m grid, infilling the historical drill hole pattern and thus bringing the effective drill spacing down to approximately 75 m by 75 m in a portion of the Kinsenda West area. Of the 26 holes drilled in 2010, four of the holes were twinned on historical drill holes, four were inclined at 70° towards the northeast as geotechnical holes and one was drilled as a metallurgical drill hole (and so was not sampled and therefore not used for grade estimation). No deflections were drilled.

Responsibility for drilling management, core logging, core sampling and dispatch to the analytical laboratory was managed by GeoQuest Ltd ("**GeoQuest**") based in Lusaka, Zambia.

Following the completion of the Kinsenda West mineral resource estimation by Snowden Mining Consultants (Pty) Ltd ("**Snowden**") in February 2011, a second phase of drilling was recommended to provide further infill drilling on the West section to raise the proportion of Indicated resources. The Phase 2 drilling programme, consisting of 18 drill holes (6 159 m), targeted the LOZ and basal LLOZ orebodies, to the south and west of the Phase 1 drilling area.

In February 2010, 27 of the historical drill hole collars were accurately using DGPS. In July 2011, 180 historical drill hole collar positions were resurveyed in UTM coordinates using a DGPS. All drill holes completed by Metorex were surveyed by DGPS.

Down-hole deviation surveys were undertaken for most historical diamond drill holes using a down-hole survey camera. All drill holes were started as vertical holes with minimal downhole deviations according to the down-hole survey data. Surveys were taken approximately every 50 m from the bottom to the top of the hole.

Downhole surveys were conducted on the 2010 drill holes with a Reflex Multishot instrument. Some anomalous deviations were noted in the survey results for the inclined drill holes and it was found that these drill holes had been surveyed while the casing was in the hole. Five of the 2010 drill holes, MKD005, MKD009, MKD016, MKD019 and MKD020, had no downhole survey as a result of drill hole collapse prior to downhole survey.

The third phase of drilling comprising 13 drill holes (4 193 m) was completed by September 2011.

The fourth and final phase of drilling was carried out from August to September 2012. 13 geotechnical holes (4 193 m) were drilled to test the rock mass for the planned mining infrastructure and 3 exploration holes (544 m) were drilled to delineate the extent of mineralisation.

5.6.2 Sampling Method and Approach

[SR3.2, SR3.3]

All recent prospecting activities carried out by KICC since 2007 have been guided by the Metorex Geological Standard Procedures manual which was prepared and implemented by IGS. This document sets out the minimum standards required for collecting and handling of all samples to ensure SAMREC Code compliance.

Sampling and dispatch was done by GeoQuest. Lithological contacts were marked on the core using "china marker". Mineralisation was marked using a different colour. Sampling was carried out on half core using 0.5 m intervals through mineralised zones and 1 m intervals through un-mineralised zones. Sample intervals honoured lithological contacts as well. The procedure followed was to split the core once per metre marking using a diamond saw cutter. Once the core was split, the sample intervals were marked up. Sampling continued to 2.5 m above and below the visible mineralisation, with 0.5 m samples through the mineralised zone from 0.5 m above the first visually identified mineralisation. When a second mineralised zone fell within the 2.5 m basal sampling then sampling was continuous at 0.5 m intervals through both zones including the parting to incorporate such mineralisation, unless there was at least a 10 m barren gap in which case the interval was sampled separately but again bracketed by samples above and below.

Pre-printed sample ticket counter-foils were filled in with drill hole number, depth "from" & "to", sample length and the date recorded. The 0.5 m half core sample was placed in a plastic sample bag and the tear-off sample number ticket folded over into the bag closure and fastened with a cable tie. The sample number was also written onto the outside of the bag.

5.6.3 Sample Analytical Methods

[SR3.3, SR3.4]

The Metorex report indicates that all Kinsenda samples obtained during the drilling programmes were sent to ALS Chemex in Johannesburg for sample processing and analyses by means of four acid digestion (method ME-OG62). Initially 2 batches of samples were analysed by Robinson Laboratory, in Lubumbashi (in 2010). However, due to high failure rates of the CRMs, the pulps from both these batches were retrieved and re-submitted for re-analysis to ALS Chemex. ALS Chemex is accredited in South Africa to ISO 17025 and the ISO 9001:2000 Standards Council of Canada accreditation is incorporated into ISO 17025.

According to the Metorex report, all the samples (RC & DDH) went through a preparation method at the laboratory Prep31 that involved the following:

- Crushing: 70% of the crushed sample passes through a 2 mm screen;
- Split off 250 g; and
- Ringing (pulverizing): 85% of the ring pulverised sample passes through a 75 μm screen (Tyler 200 mesh).

5.6.4 Quality Assurance and Quality Control

[SR2.1, SR3.1, SR3.2, SR4.1]

QA/QC for the programme and drill hole database management was reviewed and signed-off by IGS and implemented by GeoQuest in 2010. According to the Metorex report, there are no QA/QC data available for the Kinsenda Mine historical drill hole database, other than the check sampling carried out by FinOre in 2005.

QA/QC programme undertaken by Metorex in 2010 included the following:

- Certified standards and blank Standards used were AMIS0051 (oxide), AMIS0031 (oxide) AMIS0071 (sulphide), AMIS0072 (sulphide), and AMIS00120 (sulphide), which are within the ranges of the anticipated analyses. The standards were all derived from Lonshi ore in the DRC, with the exception of AMIS0120 which was derived from Kansanshi in Zambia;
- CRMs and blanks (of acid washed swimming pool filter sand) were inserted into the sampling stream at 1:20 intervals or at least three standards and blanks per;
- Unique sample numbers were used for each sample;
- The internal blanks reported by ALS Chemex were all either at or very close to the detection limit of the assay method. There were not any TCu values report higher than 0.002% TCu, or 0.002% TCo ;
- CRMs of oxide and sulphide material were submitted with the oxide and sulphide samples respectively;
- The CRM failure rate was 10% for TCu;
- No blind duplicates were submitted. However, the laboratory carried out its own internal lab duplicate analysis. Generally the laboratory duplicates for Cu showed an acceptable level of repeat precision, without any discernible bias.

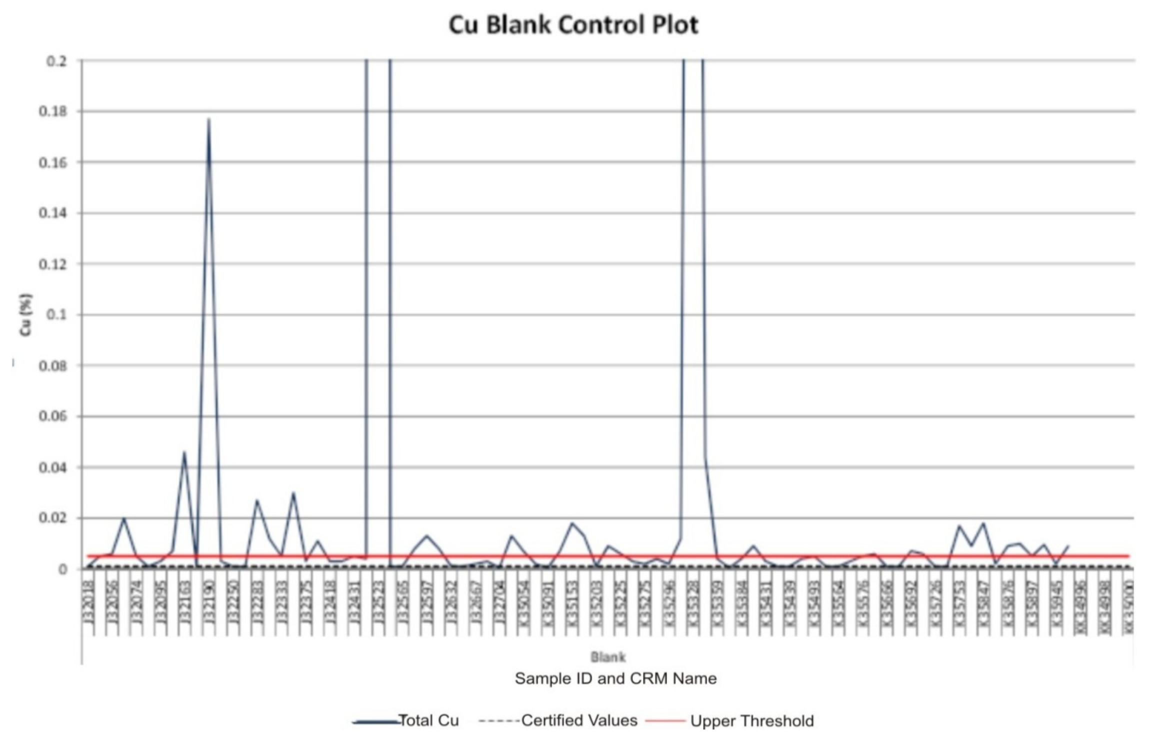
The QA/QC program showed an acceptable level of assay precision and accuracy and hence the data collection methods employed by GeoQuest were complaint with the requirements and guidelines of the SAMREC Code as reported by IGS.

Snowden also reviewed the 2010 QA/QC procedures and findings reported by IGS and considered the assay QA/QC results to be acceptable.

SRK had analysed the QA/QC results from the 2010 drilling programme in April 2011, with the following observations:

- **Blanks** - the blank sample analytical results were plotted in sample number sequence, along with the lower detection limit, and a line representing five times the lower detection limit. Figure 5.7 shows that 62% of the results were below the five times detection limit threshold. There were two instances of significant error (values of approximately 16% and 2% TCu) which was interpreted to be swapped samples.

  This indicates that there is probably regular sample cross contamination in the sample preparation. The level of contamination is low, and is unlikely to have a material impact on any of the analyses used in the resource estimation.



srk consulting	**Metorex** Kinsenda Mine – control plot of blank analyses for Metorex 2010 data	Project No. 453459

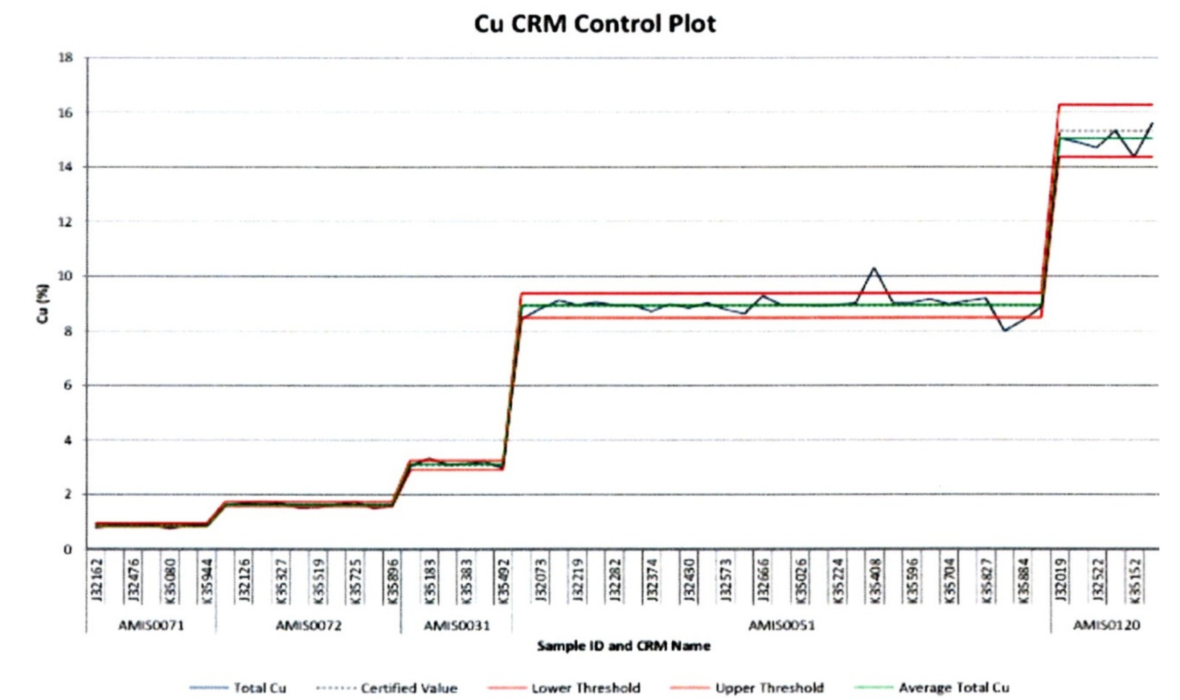
Figure 5.7: Kinsenda Mine – control plot of blank analyses for Metorex 2010 data

- **CRMs** – Five CRMs were submitted to the laboratory as part of the normal sample stream, ranging in value from 0.88% TCu to 15.32% TCu. Statistics of the analyses for each CRM are presented in Table 5.3. None of the CRM results in Table 5.3 meet the expected criterion of 95% of results within compliance limits (two Standard Deviation limits).

Table 5.3: Kinsenda – statistics of Metorex TCu CRM analyses

CRM	Number of analyses	Certified Value (%TCu)	Mean of analyses (%TCu)	% Difference	Within compliance	% Compliance
AMIS0071	7	0.887	0.85	-4.4%	5	71%
AMIS0072	10	1.65	1.63	-1.4%	7	70%
AMIS0031	6	3.084	3.13	1.5%	5	83%
AMIS0051	30	8.929	8.94	0.1%	26	87%
AMIS0120	8	15.32	15.04	-1.9%	6	75%

The CRM assay results were plotted against the certified values and certified limits, and the mean of the analyses for each CRM are presented in Figure 5.8. However as is shown in Table 5.4 and Figure 5.9, there is no indication of a material bias in any of the results. SRK considered the result acceptable, but stated that the precision of the analyses could be improved.



srk consulting	**Metorex** Kinsenda Mine – control plot of %TCu CRM analyses for Metorex 2010 data	Project No. 453459

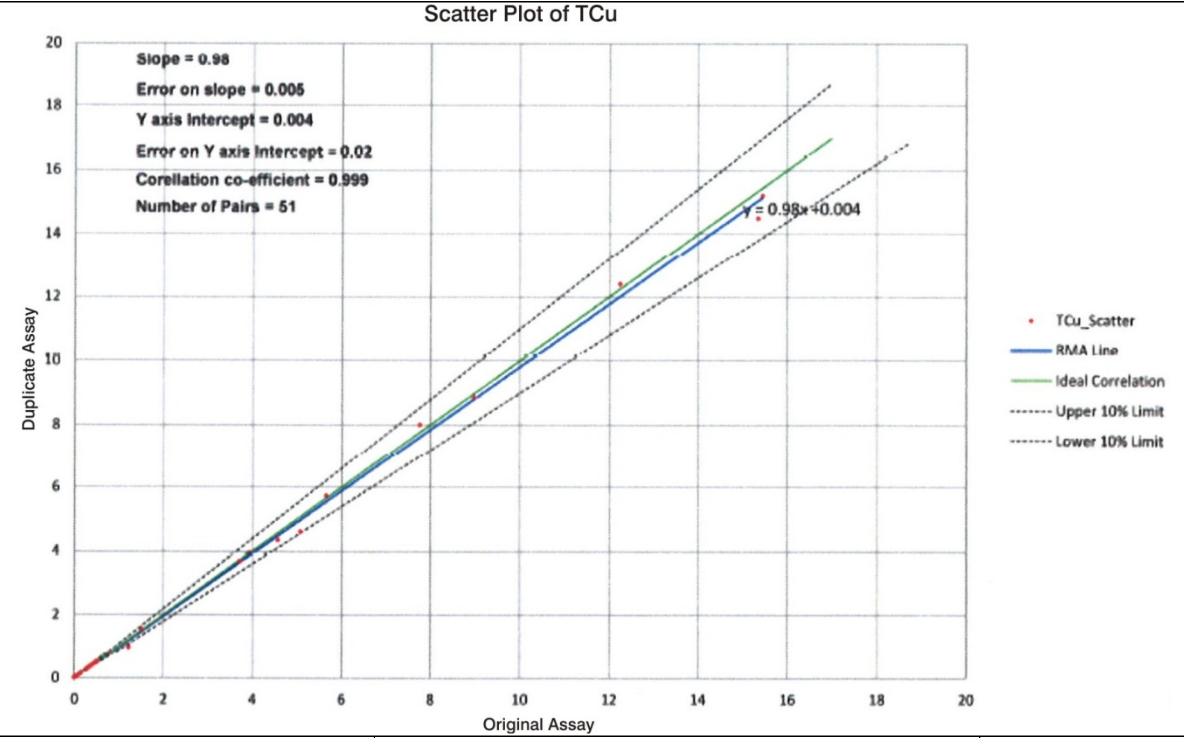
Figure 5.8: Kinsenda Mine – control plot of %TCu CRM analyses for Metorex 2010 data

- **Duplicates** – SRK also analysed 51 duplicate analyses included in the Metorex database for the %TCu through various statistics and graphical tools. The statistics of the analyses are presented in Table 5.4 and selected plots in Figure 5.9 and Figure 5.10. The correlation coefficients in Table 5.4 indicate good precision in the repeat analyses. The Root Mean Square Error statistic value of 8.6% is within acceptable limits, and the univariate statistics indicate very similar populations of data. In the scatter plot in Figure 5.9, the majority of the data fall within the 10% error lines around the ideal correlation line (representing where the analyses are equal). The linear trend line (RMA line) indicates that there is no material bias between the results, as is expected for within laboratory duplicates.

Table 5.4: Kinsenda – statistics of %TCu duplicate analyses from the Metorex data

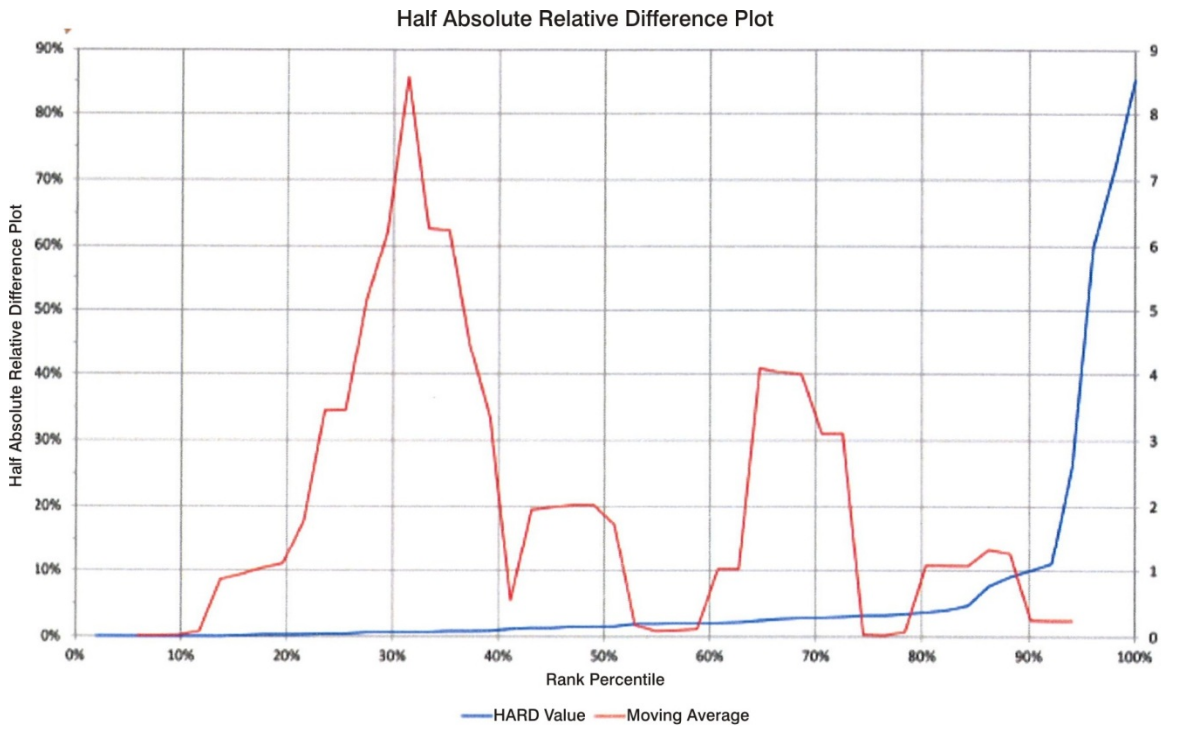
Correlation Coefficient:		0.999
Slope of RMA Line (Reduced Major Axis):		0.98
Error on the slope of RMA Line:		0.005
Rank Correlation Coefficient:		0.989
Root Mean Square Error (RMSE):		8.61%
	Original Assay	**Duplicate Assay**
Count	51	51
Arithmetic Mean	1.78	1.75
Minimum	0.0005	0.0005
Maximum	15.45	15.2
Standard Deviation	3.79	3.71
Coefficient of Variation	2.13	2.12

The HARD plot in Figure 5.10 shows that approximately 90% of the pairs of data have HARD values of less than 10%, which is within the benchmarks applied by SRK. The moving average line indicates that the majority of the most significant errors are for very low values, close to the detection limits.



srk consulting	**Metorex** Kinsenda Mine – scatter plot of TCu duplicate analyses from Metorex 2010 data	Project No. 453459

Figure 5.9: Kinsenda Mine – scatter plot of TCu duplicate analyses from Metorex 2010 data



srk consulting	**Metorex** Kinsenda Mine – HARD plot of TCu duplicate analyses from Metorex 2010 data	Project No. 453459

Figure 5.10: Kinsenda Mine – HARD plot of TCu duplicate analyses from Metorex 2010 data

The sample data is too exhaustive to be included in the CPVR. The tables of statistics are included to show the range of values intersected within the samples selected for resource estimation.

SRK considered that the duplicate analyses demonstrate acceptable precision in the sample preparation and analyses. Overall, SRK commented that in the general, the QA/QC control samples demonstrate adequate precision and accuracy in the 2010 analytical results.

5.6.5 Bulk Density and Bulk tonnage data

[SR2.4]

Density measurements for the Metorex 2010 drilling programmes were carried out on the half core remaining after sample submission using the Archimedes principle. Core was thoroughly dried before weighing in air and was wrapped in plastic before weighing in water. Scales were calibrated using known weights on a regular basis but calibration measurements were not recorded.

Metorex reported that Sodimico carried out bulk density on core and determined an overall bulk density of 2.5 t/m³ for material greater than 2% Cu, and 2.4 t/m³ for material below 2% Cu. SG measurements were obtained from full core samples using a cradle to weigh the dry weight and then the wet weight after being submerged in a bucket of water. The cradle weight was then subtracted from each measurement. The core was not waxed, however the core was competent and there were no minor voids and in most cases no fracture zones within the core that would bias the determination. There were however no records of test measurements available to verify the results of this procedure.

SG values were interpolated into the updated resource model where the data is relatively closely spaced in the area of recent drilling. Average SG values from the 2010 drilling programme were used within specific stratigraphic domains (e.g. UOZ, MOZ, LOZ) where recent data does not exist.

5.6.6 Geological Modelling and Mineralisation

[SR4.1A(ii)(iv), SR4.1A/B, SR4.2A, SR4.2B]

The geological model and orezone domaining was constructed in Leapfrog™software as reported in the Resource Update, November 2011 report compiled by CCIC MineRes ("**CCIC**"). Leapfrog is an implicit 3D modelling engine that works off a Radial Basis Function. The modelling methodology differs from the traditional way of digitising out the ore zones along section lines, then stitching them together to create a 3D wireframe representing the ore zone. Leapfrog is based on an algorithm that uses all the data points in 3D space, together with geological constraints and parameters to automatically generate volumes of interest.

Mineralisation within specific stratigraphic units is often controlled by sedimentary cycles, commencing with conglomerates or sandstones at the base and fining upwards to a capping of argillaceous shale or siltstone. Significant mineralisation tends to be concentrated in the more permeable conglomerates or sandstones. This is particularly relevant for the LOZ unit, which is the thickest and contains the most abundant mineralisation. Hence prior to ore zonation, each stratigraphical unit was interpreted and modelled separately so as to act as a constraint for mineralisation within them. The LOZ was further sub-divided into the individual upward fining sedimentary cycles, namely LOZo, LOZi, LOZii and LOZiii. Eight litho-stratigraphic units were modelled, being the 4 LOZ cycles, together with the UOZ, MOZ, LLOZ and KOZ (the Kawimba Ore Zone).

SRK reviewed the litho-stratigraphic model done for Kinsenda using Datamine software and found the modelling to be acceptable. Figure 5.11 shows the drill hole location plan and section lines and a cross section along "sect 5".

5.6.7 Resource Estimation

[SR4.2]

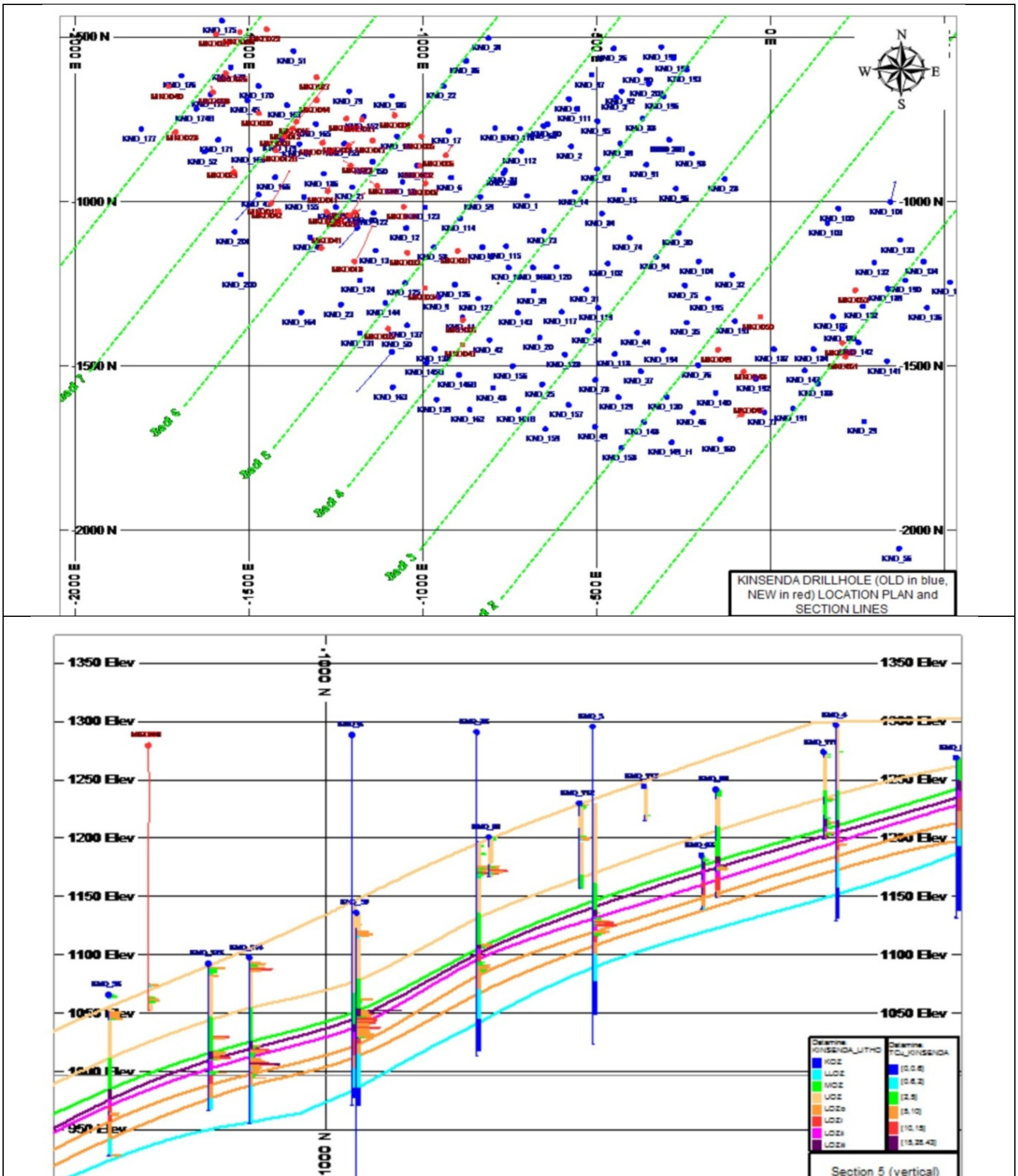
Litho-stratigraphic modelling was done using Leapfrog software, with the envelopes later exported into Datamine Studio software for resource domaining and estimations.

Orezones were domained on %TCu grades into:

- "Waste" representing all material below 0.6% TCu grade;
- "Low Grade" representing that part of the deposit containing between 0.6% TCu and 2.0% TCu grades;
- "High Grade" representing material with greater than 2.0% TCu grade.

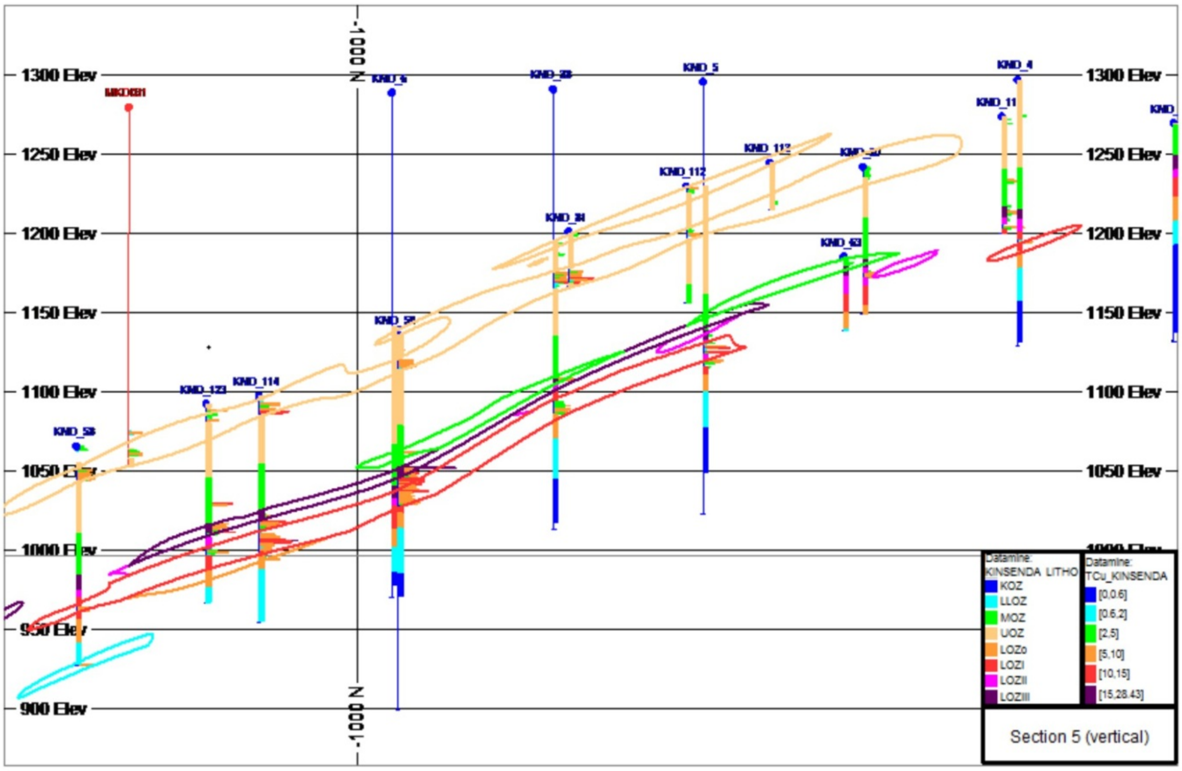
Orezones are considered to be within the sulphide zone. A steeply dipping fracture zone trending north-south in the central regions of the study area was observed during underground mining. CCIC excluded the fracture zone plus a 15 m buffer around from the resource statement.

CCIC generated 0.6% TCu and 2.0% TCu ore grade envelopes using Leapfrog to represent Low and High grade zones respectively (Figure 5.12). All material outside of these was considered as "waste". Because drill hole sampling protocols focussed on visually mineralised zones, intervals of un-sampled core were deemed to be barren and were therefore set to trace by CCIC. Care was taken to ensure that drill holes not sampled at all, were maintained as un-sampled/absent.



srk consulting	**Metorex** Kinsenda Mine – drill hole location plot and section lines (top) and Section 5 (bottom) through litho-stratigraphic model	Project No. 453459

Figure 5.11: Kinsenda Mine – drill hole location plot and section lines (top) and Section 5 (bottom) through litho-stratigraphic model



srk consulting	**Metorex** Kinsenda Mine –%TCu ore grade envelopes on Section 5	Project No. 453459

Figure 5.12: Kinsenda Mine – 0%TCu ore grade envelopes on Section 5

Figure 5.12 shows the ore grade envelopes that were generated using Leapfrog. SRK plotted the provided wireframes using Datamine and observed that the generated wireframes do not honour the dataset as reported in some cases. Figure 5.13 shows that the ore envelope for UOZ is over extended on drill hole KND_80 and drill hole KND_4 in the LOZ ore envelopes.

Estimation and Modelling Techniques

For resource estimation, drill holes were coded according to the stratigraphy and the mineralised envelope. Data from each domain was then selected inside each of the orebody envelopes and assigned a mineralisation code. The coded drill hole samples were then composited downhole to 1 m lengths within each mineralised envelope using the mineralised code, because the predominant sampling interval was between 0.5 m to 1.0 m. Any samples less than 0.5 m after compositing were excluded.

Composite statistics were derived for TCu for each of the ore zones. It was found that the Coefficient of Variation ("**CoV**") values of the grade envelopes were mostly less than 1.0%, hence Ordinary Kriging would provide excellent estimates for the domains.

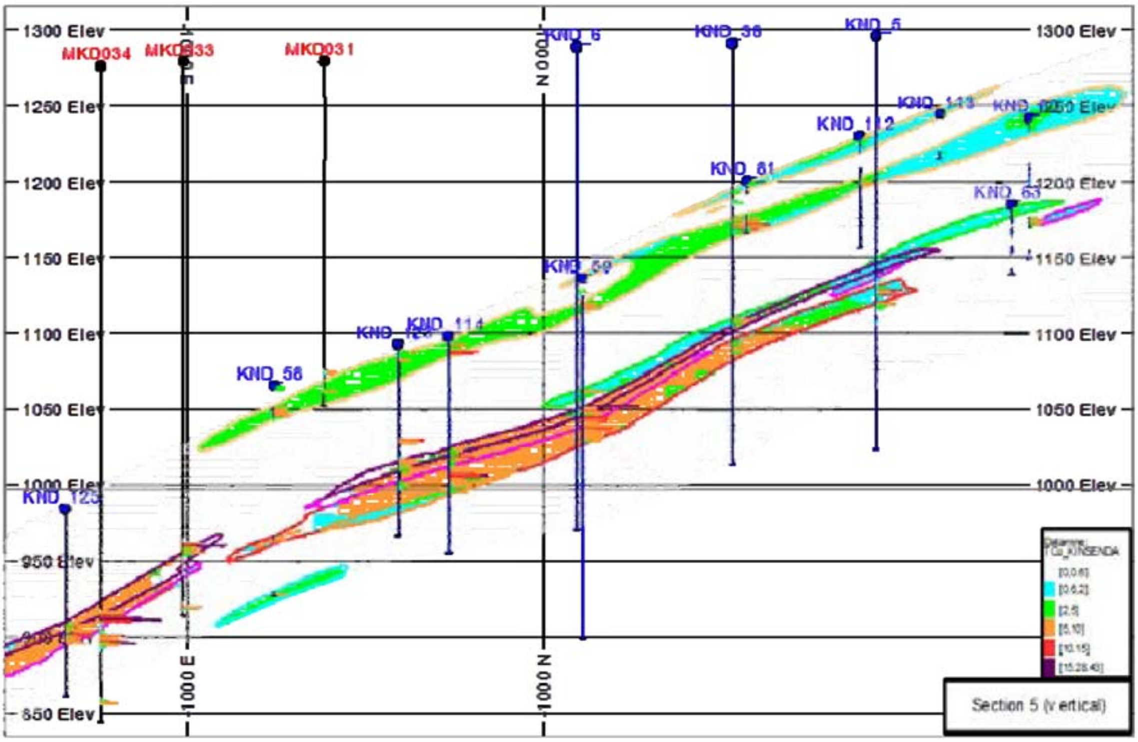
Variogram analysis and modelling was done using Datamine Studio. The semi-variograms generated were derived from 1 m composites from all stratigraphic units together, grouped into HG and low grade zones in order to increase the number of sample pairs and improve the variogram models. Variogram models were generated for %TCu for Low Grade, %TCu for HG, ASCu/TCu ratio for Low Grade and ASCu/TCu ratio for HG. This was done for the downhole semi-variograms together with their respective Isotropic models.

SRK has reviewed the variogram plots presented in this report and makes the following comments:

- Low grade domains, % TCu – variograms are not well developed with an almost pure nugget effect. The semi variogram isotropic model has been affected by a lot of noise and also has high second range of 99 m;
- HG domains, % TCu – similar to the low grade domains, downhole variogram seems acceptable but across strike variogram is almost pure nugget effect and the model is forced onto the variogram;
- Low grade, % AsCu – well-structured variograms with very high nugget effect for the strike variograms. The nugget variance between the downhole and the strike variograms are mismatched;

- HG, % AsCu – well-structured variograms with very high nugget effect for the strike variograms.

The modelling of the short range structures adequately reflects the continuity seen in the experimental data, and the longer ranges modelled will have little impact on the quality of the resource estimates.



srk consulting	**Metorex** Kinsenda Mine – %TCu grade block model superimposed on litho-stratigraphical model on Section 5	Project No. 453459

Figure 5.13: Kinsenda Mine – %TCu grade block model superimposed on litho-stratigraphical model on Section 5

Grade Estimation Method

Ordinary Kriging was used as the interpolator to inform the blocks, and SRK considers this to be an appropriate technique given the quality of the semi-variograms and the spacing of the data. Density was estimated using Inverse Power of Distance with a Power equal to 2. The search parameters used in the estimate are considered reasonable.

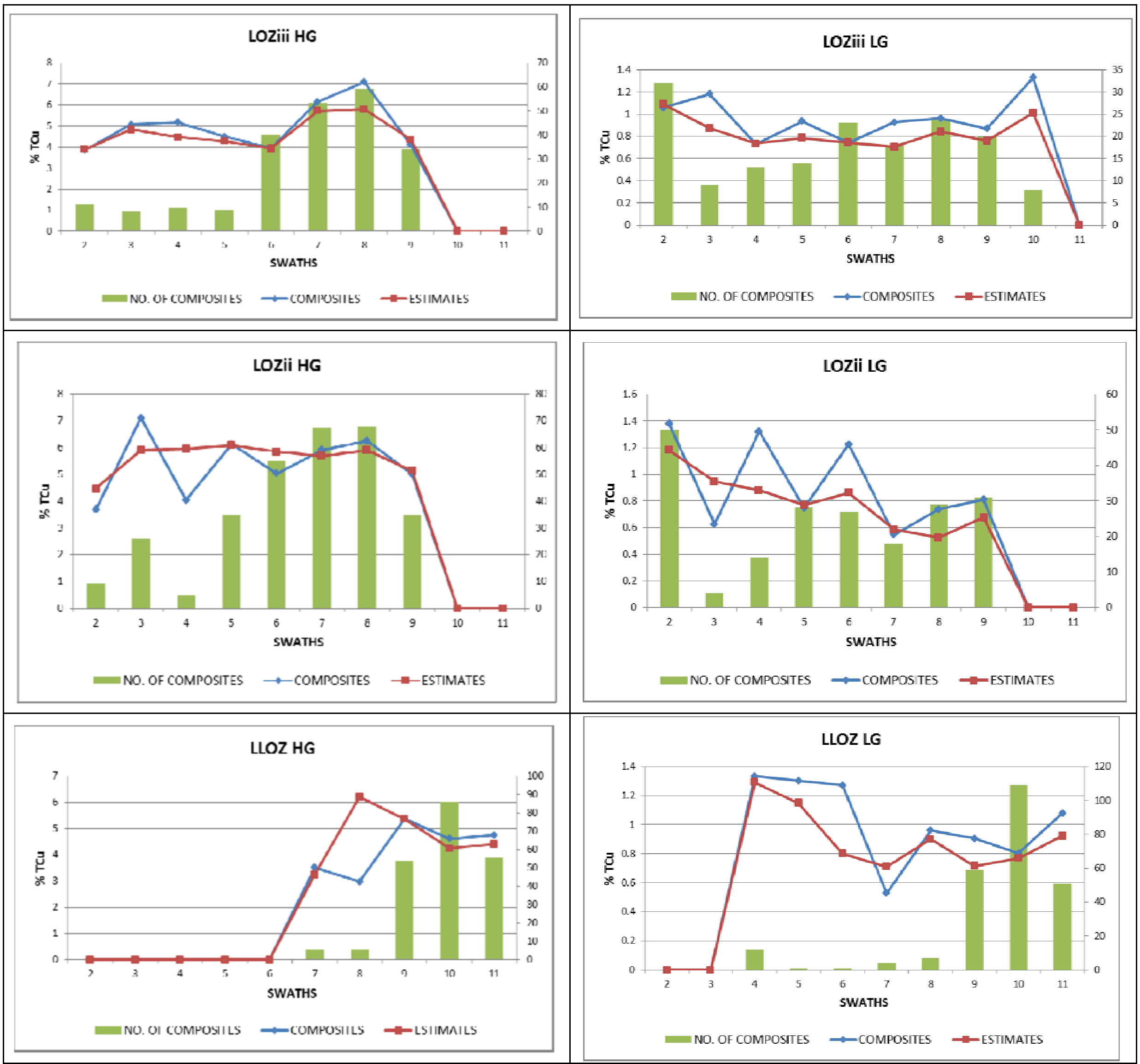
A block model was constructed using a parent size of 40 m x 40 m x 5 m in the X, Y and Z directions and sub-cell splitting was allowed to ensure that the volumes of the ore are correctly represented. A section illustrating the block model colour coded on %TCu is shown in Figure 5.13.

5.6.8 Validation of estimates

SRK conducted checks on the estimates, by comparing the estimated grades with the grades of the composites used in the estimate. These were done as a series of swath analysis plots, examples of which are presented in swath analysis plots in Figure 5.14.

Block values with each swath were compared with the corresponding composite file. Although there is an expected degree of smoothing evident in the grade estimate, the estimate generally matches the grade of the composite in the slice relatively well.

The %TCu mean values for the block estimates were compared against the %TCu values for the composites and the results summarized in Table 5.5. The mean of the samples was weighted by length, while the mean of the model estimates was weighted by volume. Except for the MOZ domain, statistical means of the grades for the samples and model estimates compare fairly well, and the grades have not been over estimated.



srk consulting | **Metorex** Kinsenda Mine – swath analysis plots of block model files vs composite file | Project No. 453459

Figure 5.14: Kinsenda Mine – swath analysis plots of block model files vs composite file

Table 5.5: Kinsenda – comparison of composite and block estimate %TCu mean values

CODE	NSAMP	COMP MEAN	BLK_EST MEAN	DIFFERENCE	% DIFFERENCE
UOZLG	91	1.24	1.22	-0.02	-1.64
UOZHG	224	3.73	3.26	-0.47	-14.42
MOZLG	224	1.11	1.39	0.28	20.14
MOZHG	340	4.19	4.98	0.79	15.86
LOZiiiLG	163	0.95	0.69	-0.26	-37.68
LOZiiiHG	227	5.41	5.69	0.28	4.92
LOZiiLG	202	1.00	0.49	-0.51	-104.08
LOZiiHG	303	5.75	6.03	0.28	4.64
LOZiLG	215	1.09	0.91	-0.18	-19.78
LOZiHG	340	6.21	6.16	-0.05	-0.81
LOZOLG	152	1.07	0.97	-0.10	-10.31
LOZOHG	79	5.43	4.11	-1.32	-32.12
LLOZLG	244	0.92	0.82	-0.10	-12.20
LLOZHG	208	4.77	5.08	0.31	6.10
KOZLG	78	1.12	1.03	-0.09	-8.74
KOZHG	71	4.14	3.02	-1.12	-37.09

5.6.9 Cut-off grade determination for 2012 Mineral Resource Estimates

[SR5.7B(ii), SR5.7C(iii)]

The parameters used for the grade cut-off determination for reporting of Mineral Resources at Kinsenda are set out in Table 5.6.

Table 5.6: Kinsenda – parameters for cut-off determination for mineral resources

Parameter	Units	Values for Cu cut-off
Unit costs		
Mining	(USD/t)	41.50
Concentrator	(USD/t)	18.00
Admin / overheads	(USD/t)	17.00
Off mine	(USD/t)	48.00
Mine call factor	(%)	95.0%
Dilution	(%)	15.0%
Concentrate recovery	(%)	93.0%
Smelter recovery	(%)	95.0%
Revenue	(USD/t)	12 000
Royalty	(%)	2.5%

A cut-off grade of 1.49% Cu results from these parameters.

The method used to determine the cut-off grades is consistent with industry practice and the cut-off grades thus determined are seen to be reasonable.

5.6.10 SRK Comments

IGS reported that the QA/QC program showed an acceptable level of assay precision and accuracy and hence the data collection methods employed by GeoQuest were compliant with the requirements and guidelines of the SAMREC Code. Snowden also reviewed the 2010 QA/QC procedures and findings reported by IGS and considered the assay QA/QC results to be acceptable.

From its analysis of the QA/QC results from the 2010 drilling programme in April 2011, SRK observed that:

- there were instances of significant errors in duplicate assays, interpreted to be swapped samples. This indicates that sample cross contamination may have occurred in the sample preparation. The level of contamination is low, and is unlikely to have a material impact on any of the analyses used in the resource estimation;
- although many of the CRM results did not satisfy the 95% compliance limit of two standard deviations, there is no indication of a material bias in any of the results. SRK considered the result acceptable, but stated that the precision of the analyses could be improved.
- the moving average line in the HARD plot in Figure 6.10 indicates that the majority of the most significant errors are for very low values, close to the detection limits.

Metorex confirmed that these QA/QC issues will be addressed in future drilling.

The ore grade wireframes in some cases do not honour the dataset as reported and are over extended.

Swath analysis plots of the estimated grades generally match the grades of the composite in the slice relatively well. Except for the MOZ domain, statistical means of the grades for the samples and model estimates compare fairly well, and the grades have not been over estimated.

5.6.11 Audited Mineral Resources and Mineral Reserves

[SR5.7B, SR7, SR9]

SRK's audited classification and statement of Mineral Resources and Mineral Reserves for Kinsenda at 30 June 2013 is presented in Table 5.7.

The Mineral Resources are quoted inclusive of the Mineral Reserves. The discussion on the conversion of resources to reserves and the mine modifying factors used in the conversion is given in Section 5.9.

Table 5.7: Kinsenda – SRK Audited Mineral Resources and Mineral Reserves at 31 December 2012

	Mineral Resources (1.5% Cu cut-off)				Mineral Reserves (@ 3.5% Cu cut-off)		
Classification	**Tonnes (Mt)**	**Cu grade (%)**	**Copper (kt)**	**Classification**	**Tonnes (Mt)**	**Cu grade (%)**	**Copper (kt)**
Kinsenda High grade				Kinsenda High grade			
Measured	0.0	0.00	0.0	Proved			
Indicated	13.4	5.30	708.3	Probable	6.1	4.80	293.1
Inferred	7.4	6.03	443.7				
Kinsenda Low grade				Kinsenda Low grade			
Measured	0.0	0.00	0.0	Proved			
Indicated	0.2	1.66	2.8	Probable			
Inferred	0.1	1.64	1.9				
Total Kinsenda	**21.0**	**5.51**	**1 156.6**	**Total Kinsenda**	**6.1**	**4.80**	**293.1**

5.6.12 Reconciliation of Mineral Resources and Reserves

[SR8B(iv), SR8C(vi)]

The previous Mineral Resource and Reserves statement for Kinsenda was published by Metorex in its Annual Report for 2011. The Mineral Resources and Reserves at 31 December 2011 and at 30 June 2013 for Kinsenda are compared in Table 5.8.

Table 5.8: Kinsenda – Mineral Resources and Reserves Reconciliation - 31 December 2011 to 30 June 2013

Item	**At Dec 2012**		**At Dec 2011**	
	Tonnes (Mt)	**Contained Metal Cu (kt)**	**Tonnes (Mt)**	**Contained Metal Cu (kt)**
Mineral Reserves				
Proved				
Probable	6.1	293.1	9.1	412.0
Total Min. Reserves	6.1	293.1	9.1	412.0
Mineral Resources				
Measured	0.0	0.0	0.0	0.0
Indicated	13.5	711.1	29.7	905.2
Inferred	7.5	445.6	17.2	564.2
Total Min. Resources	21.0	1 156.6	46.9	1 469.4

The reliability of the geological data and resource estimates is reflected in the assigned classifications.

The mine design for Kinsenda draws the design parameters and modifying factors from actual results at Chibuluma, as set out in Section 5.9.

The changes in the Mineral Resourcesand Reserves for Kinsenda from 2011 to 2012 are attributed to:

- Reinterpretation of the drillhole database resulted in the extent of the mineralised zones being reduced;
- A different cut-off grade was applied.

It should be noted that there were some 2.4 Mt of Inferred Resources that had been included in the initial LoM plan for Kinsenda. As this is a material percentage of the LoM tonnage and the HKSE does not permit the valuation of Inferred Resources, the LoM plan was redone to be based on Indicated Resources only.

5.7 Rock Engineering

[SR5.4]

5.7.1 Geotechnical Investigation

Geology

The Kinsenda orebody consists of a number of laterally extensive, tabular mineralized zones which vary in thickness from 1m to 20m and dip in a general southerly direction at an average angle of 25°. There are areas in the ore body where the dip both steepens and flattens. A narrow but extensive north-south oriented zone of fractured rock is located immediately west of the Main shaft.

An interpretation of the fracture zone and an east-west striking, dip orientated clockwise rotational fault (see Figure 5.5) in relation to the orebody is shown in Figure 5.6. It is reported that extensive weathering is associated with the fracture zone and it is suspected that it contains water. Future development through this zone is planned to take place in underlying unweathered granite to avoid intersecting this water bearing structure. The down dip extent of the planned mining is truncated by the Kamukato fault, which throws the orebody down towards the south.

During the site visit in October 2012, SRK was unable to visit any stoping areas. Conditions observed in footwall development were considered to be good despite the occurrence of a significant amount of seepage water. Extensive leaching of copper ore was visible in many old excavations confirming that seepage had been present for a considerable time. In general howeverl, rock conditions observed were good.

A detailed understanding of the geological sequence forms a critical basis for geotechnical design of key mining elements, in particular:

- Siting access excavations (footwall haulages; shafts, shaft access cross cuts);
- Designing mining layouts (dip/thickness combinations; dilution estimates);
- Designing support systems (development and intra-stope excavations).

Although a geotechnical interpretation in terms of rock mass classification is provided, a recent geotechnical investigation by Snowden does not present geological descriptions, geological sections or stratigraphic columns against which to evaluate this interpretation. In SRK's opinion, additional investigations are required with particular reference to:

- Granite/weathered granite/conglomerate transition (regularity of the granite palaeosurface) with regard to footwall and infrastructure layout and development;
- LLOZ Footwall series with regard to layout and development of footwall drives and stope access cross cuts;
- Ore body sequences (HW; OB and FW of each unit) with regard to stope wall dilution stope back support and pillar stability related to the grade cut-off.

It is noted that stoping limits for mine design and reserve estimation purposes have been set at a cut-off grade of 3.5%T Cu. This implies that there will be a grade cut-off rather than cut-off along a distinct geological interface. This situation is common in most Zambian and DRC copper mining operations. In addition, the level of cut-off grade will restrict the number of LLOZ stopes which are economically attractive.

Thickness distribution isopach plans provided for LOZ and LLOZ ore bodies and partings are summarized in Table 5.9. In SRK's opinion, ore body sections should also be constructed to assist in visualizing thickness distributions, in formulating mining methods and in assessing inter stope interaction.

Table 5.9: Kinsenda – Summary thicknesses of units and middlings

Material Zone	Thickness (m)	
	Average	Standard Deviation
LOZa hangingwall	n/a	n/a
LOZa	8.63	5.34
LOZb hangingwall (middling to LOZa)	8.52	4.06
LOZb	9.97	5.13
LLOZ hangingwall (middling to LOZb)	10.38	4.52
LLOZ	4.26	1.55
Weathered granite	4.35	1.87
Fresh granite	n/a	n/a

The geological package consisting of alternating ore zones and waste partings presents a number of mining challenges which include:

- Control of the stope hanging. A trade-off study between shorter spans using rock bolt support and (possibly) post pillars against longer spans incorporating cable anchors is warranted;
- Sequence of mining individual ore bodies to avoid adverse interaction and potential ore loss;
- Siting of strike orientated access development to minimize waste dilution; maximize ore recovery and maintain stability on both hanging and footwall strata. Common practice in Zambian and DRC copper mines is to site ore body drives on the footwall contact and will this be considered at Kinsenda.

During the site visit, intense corrosion of support units (both tendons and steel sets) was observed. If further extraction of previously worked areas is contemplated, it is recommended that a comprehensive evaluation of the stability of existing access development and stoping is undertaken prior to the removal and replacement of any support. SRK understands that appropriate operating procedures are in place.

Structure

The north-south orientated fracture zone has been encountered during previous phases of mining at Kinsenda. It is reported that access development through the fracture zone within MOZ workings has remained intact despite the perceived poor quality rock, limited support and having been exposed to cycles of flooding and drainage. Although no further stoping of MOZ is contemplated in the mine plan, these observations provide an indication of conditions that are likely to be encountered and also provide the means of controlling them.

In SRK's opinion, a thorough investigation of the fracture zone is essential in order to quantify the geotechnical risk to future planned development together with the risk associated with ground water inflow.

The down dip extent of the orebody is truncated by the normal, east west striking Kamukato fault which downthrows towards the south. As far as SRK is aware, no information describing the characteristics of this fault zone or immediately adjacent strata is available. In SRK's opinion, the presence of the fault will have very little impact on the proposed mining plan.

Stress and seismicity

Snowden has suggested that a general north-east to south-west trend prevails based on data presented in the World Stress Map. It should be noted that confidence in this assessment is considered to be low as measurement locations and details are not presented.

In SRK's experience from other shallow depth (<500 m) mining operations in the Zambian and DRC Copperbelt, the major stress is likely to be vertical (or normal to bedding). Where weathering occurs, any significant horizontal concentrations are likely to have been dissipated and the tensor $\sigma_2 = \sigma_3 = 0.3*\sigma_1$ is likely to prevail. In more competent rock which has been subjected to tectonic activity, stress orientations and magnitudes can vary widely with the horizontal stress magnitude component exceeding the vertical component. In SRK's opinion, over the depth range contemplated at Kinsenda, it is unlikely that the magnitude of stress will be sufficiently great to induce significant damage in mining excavations. Should future mining be planned down dip of the Kamukato fault, it is recommended that prevailing stress conditions should be determined.

SRK notes however that a fine grained grey sandstone horizon is recorded by Snowden with a reported Uniaxial Compressive Strength ("**UCS**") of 238 MPa. This value is between 3 and 4 times greater than that of the surrounding rock and is equivalent to that of Witwatersrand quartzite. In SRK's opinion, the strength measurement is exceptionally high and should be checked. However, should this material be found to have an exceptionally high UCS, the possibility of it acting as a stress concentrator within the geological sequence must be recognised and appropriate layout and support strategies employed.

In SRK's experience, no significant natural seismicity has been experienced in Zambian and DRC Copperbelt operations, although tremors from distant (Rift Valley) events have been felt. Mining induced seismicity has been experienced in competent sandstones and quartzites at Mufulira, Konkola and Kamoto (Kolwezi).

Rock Mass Characterization

Twenty six holes have been used to provide geotechnical information on the Kinsenda mining sequence. Logging was carried out by GeoQuest and overseen by Middindi Consulting. No drill hole logs or rock mass classification information has been provided to permit SRK to undertake an independent evaluation of geotechnical information presented. No Quality Assurance records have been provided to demonstrate control during the geotechnical logging process.

A total of 121 samples were tested to provide geotechnical design parameters. It is noted that most tests were conducted on samples with the height to width ratio approximately equal to 2, with 20% of the samples being less than 2. The ISRM standard recommends a height to width ratio greater than 2 and preferably closer to 2.5. The test results therefore lie on lower bound of acceptability. Notwithstanding, in SRK's opinion, the UCS values obtained lie in the expected range of those encountered in Zambian and DRC Copperbelt sequences.

A considerable effort has been expended to obtain both orientated and un-orientated joint direction and spacing information. It is not clear from the Snowden report whether or not this data has been used in any kinematic analysis to determine support requirements. It is recommended that an UNWEDGE or similar analysis is carried out using this data to provide information for:

- Support design in access drives and stopes;
- Dilution estimates.

Snowden presented Rock Mass Rating ("**RMR**") values according to the Bieniawski Rock Mass Classification as plan projections for individual strata units. The RMR values range between 40 and 60, with only a small difference in value between rock types and with depth (to 375 mbs), and minimal lateral variability within stratigraphic units. These values reflect what SRK would expect for these rock conditions, and suggest that there should be no difficulties with the planned stoping and support.

The "Q" values for the different stratigraphic units according to the Barton Rock Mass Characterization system range from 0.50 to 6.83, with the higher values associated with the ore zones. "Q" values are of use in providing guidelines for the stand up time for unsupported excavations, support requirements in access development and stopes and also stable stope spans during preliminary mine studies. Where mine workings exist, design recommendations derived from "Q" values should be calibrated against actual excavation dimensions and ground conditions to create a site specific data base and improve confidence in future design criteria.

There exists a general relationship between RMR and Q values which is not supported by the results presented. The reasons for this anomaly should be determined. Nevertheless, in SRK's opinion, the values lie within an acceptable range..

Geohydrology

It is noted that pumping operations have managed to lower the water level to 295 mbs where it has stabilised. There is no intention to lower the water table in the immediate future. It was reported during the site visit in 2012 that the current pumping rate of 50 Ml/day is sufficient to maintain underground water at its present level. A second, back up pump station has been completed.

Geohydrological information is based on information from a KLMCS report dated 2010. In this report, it is stated that 11 aquifers are presentely with the main acquifers lying in the ore body and the weathered contact of the granite basement. No information regarding possible ground water contributions from the fracture zone or the Kamukato fault is provided.

In Zambian and DRC operations, highly porous and completely weathered zones can extend to considerable depths, often apparently randomly (as at Lubembe), but also associated with structures in arkosic sandstones and conglomerates. Current work by SRK at Musonoi is attempting to correlate geotechnical properties with geological parameters such as acid soluble copper content and bulk density as a means of predicting ground conditions in stopes and, by inference, areas potentially containing greater amounts of free water. It is recommended that a similar study is carried out at Kinsenda to assist with future planning.

In SRK's experience, it is unlikely that water pressure will contribute significantly to excavation instability at Kinsenda but highly weathered ground conditions will certainly require specific support strategies.

The presence of water adjacent to mining excavations will impact on:

- Explosive choice;
- Choice of ground support elements for long life excavations.

With short lived access and stoping excavations, significant loss of performance due to corrosion should not occur and support elements can be selected accordingly.

Dewatering will take place initially from a hanging wall drive on 209 mL, with water pumped from 312 mm diameter downward inclined holes 30 m apart. This system is planned to facilitate early access for stoping below 209 mL and will continue to 340mL after which it will be superceded by a gravity driven system. It is noted that the system is exposed to the double risks of power availability and drill hole pump reliability.

5.7.2 Mine Design

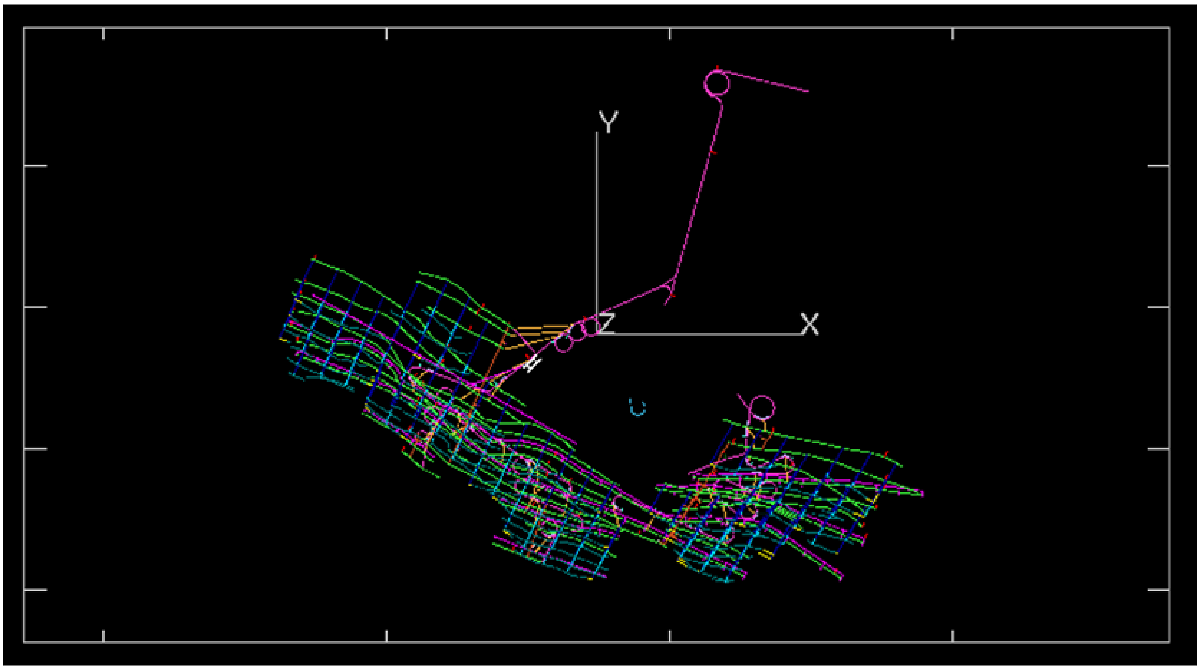
Access

The planned development layout is illustrated in Figure 5.15. In SRK's opinion, the layout appears acceptable but should be reviewed in relation to the footwall geological sequence to identify possible risk areas, particularly those associated with the weathered granite palaeosurface.

Stoping

The stoping methods are not described in detail and the report would benefit from method description with anticipated excavation dimensions shown. The variation in ore body width means that different methods will be practised in different ore bodies. It is likely that the choice will include Longitudinal Cut and Fill over the complete ore body width, Transverse Cut and Fill with longitudinal retreat, Post Pillar Cut and Fill in wide ore body areas and Long Hole Stoping with Fill in very thick ore body areas.

- Snowden have used the Matthews – Potvin method to estimate stoping dimensions. In SRK's opinion, there is a lack of clarity in the calculations whichmay give rise to conservative dimensions. There therefore exists an upside potential to increase overall recovery.



srk consulting	**Metorex** Kinsenda Mine – planned development layout	Project No. 453459

Figure 5.15: Kinsenda Mine – planned development layout

The mining layout proposed by DRA incorporates regional support in the form of strike orientated buttress pillars, initially located on 260 mL and at 90m vertical spacing thereafter. Empirical analysis followed by numerical modelling by Snowden indicates that the vertical pillar width should not be less than 10 m.

DRA has indicated that a total of 16% of the resource is locked up in regional support pillars with a further 18% in stope pillars (based on 3 m wide dip pillars located at 90 m intervals together with other in-stope pillars). The total ore loss in pillars amounts to 31%. There may be additional ore loss, particularly in wide stopes, if a Post Pillar Mining method is employed.

Backfill

The Snowden report states that "backfill must be used to fill mined out voids to assist in maintaining stability….." It should be noted that backfill will be required as an integral part of the mining method to provide a working surface and support for stope walls and pillars. Backfill specifications should be provided to ensure that these requirements are satisfied.

Golder Associates carried out a backfill mass balance exercise as part of a cemented hydraulic fill design project for a production rate of 400 ktpa. A summary of this study is presented in Table 4. It is concluded that sufficient fill will be available to meet production requirements. Subsequent to this study, a decision has been made by Metorex to implement a Cyclone Classified Tailings ("**CCT**") system. It appears that this decision is based on experience from Chibuluma together with information from other Copperbelt operations. It is presumed that a proportion of the primary fill will be derived from waste generated by access development and any shortfall will be made up from CCT.

SRK understands that the +40 µm will be used by the CCT system, whereas the -40 µm will be disposed at the TSF. As only a portion of the tailings production will be suitable for CCT fill, SRK understands that a study is in progress for this system in order to determine fill plant capacity, backfill system specifications and costs with particular reference to storage requirements, underground reticulation, and placement practice and bulkhead design. The study will also need to consider the implications for the operability of the TSF, given that there will be minimal coarse material for wall building and the beaching/drainage characteristics of the very fine material disposed of on the TSF will need to be understood.

Box Cut and decline shaft

SRK understands that development of the pox cut has commenced.

5.7.3 SRK Comments

Despite the inconsistencies between the RMR and Q values, and possible errors in the application of the Mathews-Potvin HR method, the final geotechnical designs for Kinsenda are considered to be valid.

SRK has highlighted a number of areas where additional investigations should be undertaken to improve the confidence in the geotechnical designs, as follows:

- The impact on footwall and infrastructure development of granite/weathered granite/conglomerate transition, LLOZ footwall series and orebody sequences;
- Ore body sections should also be constructed to assist in visualizing thickness distributions, in formulating mining methods and in assessing inter stope interaction;
- A comprehensive evaluation of the stability of existing access development and stoping is undertaken;
- Kinematic analysis is conducted to using information gathered by Snowden to validate stope design and dilution estimates;
- The backfill mass balance exercise is required for this system in order to determine fill plant capacity, backfill system specifications and costs with particular reference to storage requirements, underground reticulation, and placement practice and bulkhead design should be undertaken as early as possible in the mine design process;
- A calibration exercise is carried out in MOZ workings to improve confidence in the design guidelines;
- In SRK's opinion, the initial dewatering system is exposed to the double risks of power availability and drill hole pump reliability. It is noted that implementation of a gravity driven drainage system has been included in the project implementation plan;

5.8 Hydrogeology and Hydrology

[SR5.4]

The comments which follow are based on a review of a feasibility study report compiled by Metorex in March 2012 for the Kinsenda project ("**Kinsenda FS**"), plus additional hydrogeological data made available to SRK. This review also aims to identify the most significant risks to ground and surface water, given the available data. No site visit was conducted as part of the hydrogeological review.

5.8.1 Baseline Description

Topography and Climate

The project area has a moderate topography with gentle sloping river valleys and elevations ranging from 1 350 m to 1 275 m above mean sea level (amsl). Perennial rivers are evident in the project area and are usually associated with wetland areas in their headwaters. Non-perennial rivers are also present, but mainly flow during periods of heavy rain.

The topography of the mine site will be altered, some changes temporary and some permanent (e.g. tailings dam).

Surface Water

The site falls within the upper reaches of the Congo River Basin, with the major drainage lines being the Kinsenda, Kitotwe and Tshinsenda Rivers. These are located to the east and south of the Kinsenda Village.

- **Storm water control** - It is stated in the Kinsenda FS report that clean stormwater from catchments upstream of the project will be diverted away from mine infrastructure. Dirty water will be fed into the mine's return water dam and used in the concentrator plant process.

Groundwater

The groundwater was investigated and assessed in 2011 by KLMCS.

- **Hydrogeological Units** - KLMCS describes the aquifer system on the site as comprising an upper shallow weathered granite aquifer, a dolomite aquifer and the deep Roan aquifer. A siltstone/shale aquitard underlies the dolomite. Of significance to groundwater is the Kamukato Fault to the south of the mine, striking WNW-ESE.

  According to KLMCS, the fault structure could either be a groundwater flow barrier or a groundwater conduit, or both, depending on its contact with other structures. The behaviour of the fault has different impacts on the groundwater balance of the mine and test pumping of drill holes drilled into and beside the fault would be required to determine its specific impact on inflows. Also, monitoring drill holes placed either side of the fault can show the impact of the mine pumping on either side of the fault

- **Groundwater Use** – the KLMCS investigations included a hydrocensus over the site from which they concluded the following:
  - The baseline water quality varies, but is generally good;
  - A number of springs were identified on site;
  - Water levels in the area vary from between 50 and 150 m below ground level; and
  - Existing drill holes in the area are used for domestic water supply.

- **Groundwater levels and flow direction -** According to KLMCS, there was no data on regional piezometry within the Kinsenda mining concession area and that available hydrochemistry and groundwater level monitoring data was minimal. Based on available data, they calculated contours on what they conclude as the three major hydrogeological flow systems.

  This includes "Shallow aquifer groundwater flow regime-weathered and fractured granite aquifer to the north, and weathered Roan Supergroup aquifer to the south of the water divide. The flow regime within the granite aquifer is discharged as baseflow within streams flowing to the north, northeast and east" and "aquifer groundwater flow regime-Roan super group aquifer. Due to pumping from the mine within this aquifer, water levels have been lowered to below 100 m. Multiple aquifers have been identified with the deep aquifer flow regime. The elevated groundwater levels are interpreted as showing an upper aquifer defined by the Dolomite lithology. This is further supported by the presence of a groundwater spring at the head of Kinsenda River, which deposits a white precipitate at the discharge point, indicating dissolution of $CaCO_3$ and circulation of groundwater within the dolomite aquifer" (KLMCS, 2012).

- **Recharge -** The KLMCS report states that no values on groundwater recharge are available. Recharge rates are expected to be high, up to 240 mm/yr for Kinsenda, given the high mean annual rainfall of approximately 1 200 mm/yr and the highly weathered overburden. A recharge rate of 180 mm/year was calibrated against the modelled hydraulic conductivity (KLMCS, 2012).

- **Water use and supply -** The Kinsenda FS states in the section "1.5 Infrastructure" that "water is sourced from underground water". It further states that up to 22% of surrounding communities utilises unprotected surface water and would therefore be susceptible to pollution of the surface water.

Water Quality

- **Surface water -** baseline surface water quality was obtained from a number of sites across the project area and indications are that the water is relatively clean, but pollution in the form of copper and E. coli was detected in a range of samples.

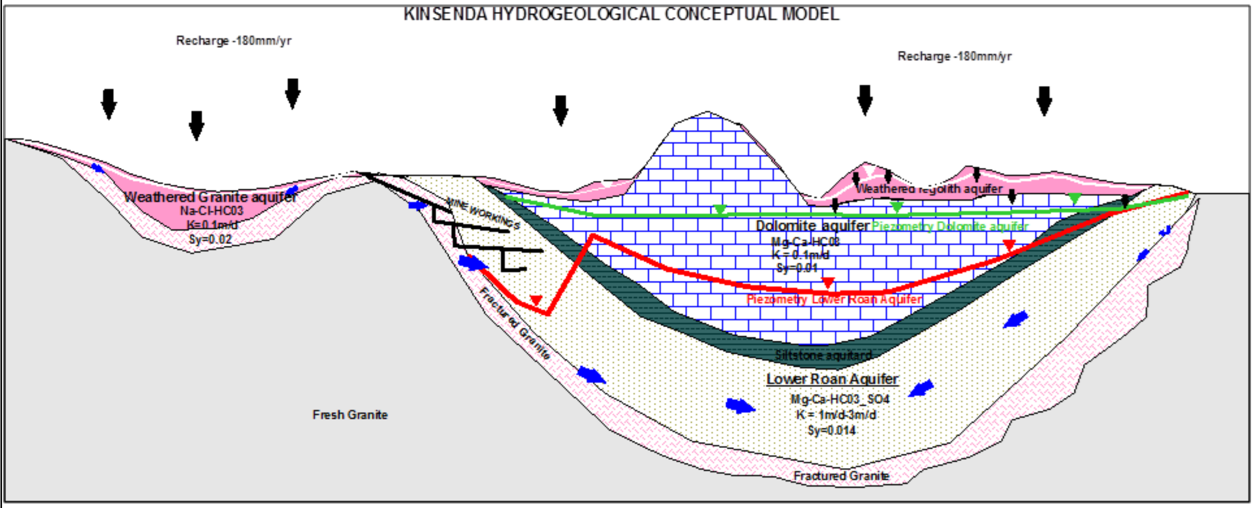
- **Groundwater -** KLMCS collected background water groundwater quality data during three field visits in 2010 and nearly 2011, to assess groundwater impacts based on hydrochemical constituents which included copper, cobalt, sulphate, chloride and TDS. The emphasis was placed on the area around TSF, probably as the potential for contamination was seen as being the highest.

  From the groundwater model, KLMCS concluded the following:
  - Contamination of the weathered and shallow groundwater aquifer is likely to be instant;
  - The plume migration is dominantly down-gradient of the groundwater flow direction towards the streams;
  - The plume migration will not cross into the Roan aquifers, which hosts the mineralization;

- o No contamination is expected to take place within the ore body from the TSF;
- o Background chemical concentrations within the dolomite aquifer will remain constant;
- o The lower Roan aquifer displays a slight reduction in concentration levels for Cu, Co and Sulphate during life of mine. This is attributed to vertical exchange of groundwater from the upper dolomite aquifer, which has lower concentrations of Cu, Co and Sulphate than the mineralised lower Roan aquifer where groundwater abstraction is taking place;
- o The solute transport model reveals that the ore body is not at risk of mineral sterilization should groundwater pollution occur below the TSF.

5.8.2 Conceptual Groundwater Model

A conceptual hydrogeological model compiled by KLMCS in 2012 is shown in Figure 5.16.



srk consulting	Metorex Kinsenda Mine – Conceptual Hydrogeological Model (KLMCS 2012)	Project No. 453459

Figure 5.16: Kinsenda Mine – Conceptual Hydrogeological Model (KLMCS 2012)

5.8.3 Numerical Groundwater Model

A numerical model was developed by KLMCS based on a multilayered aquifer with a siltstone horizon forming an aquitard and separating the upper dolomite aquifer from the lower sandstone, conglomerate, quartzitic sandstone and granite basement aquifers (KLMCS, 2012).

The steady state groundwater model was calibrated using observed water levels taken in January 2010 and abstraction volumes from daily pumping records to simulate groundwater flow gradients, directions and abstraction rates from the mine dewatering drill holes and sumps, the plant water drill holes and the camp drill holes. Thirty four (34) observation drill holes were used as control data to calibrate the model (KLMCS, 2012).

The model calibration estimates high recharge rates into the Roan aquifer, which recharge rates of at least 200 mm/yr and as high as 600 mm/yr. Modelled hydraulic conductivity for the Roan aquifer was 4 m/d, translating to a transmissivity of 800 m^2/d, assuming an aquifer thickness of 200 m. Initial estimates from the preliminary test pumping at BH3-39 gave transmissivity values of 530 m^2/d to 1 400 m^2/d (KLMCS, 2012).

Long-term water level monitoring graphs show rising water levels during the wet season (October/November – March) due to rainfall recharge and falling water levels in the dry season when there is no recharge. Groundwater level rises are shown in the pits during the wet season despite pumping, indicating recharge inflow is higher than abstraction rates and increased pumping is required (KLMCS, 2012).

5.8.4 Surface and Groundwater Monitoring

KLMCS found that available hydrochemistry and groundwater level monitoring data is minimal, but used long-term water level monitoring data from 2009 to 2011 from the mine to estimate aquifer hydraulic parameters." It therefore seems that although some groundwater monitoring data exists, there is currently no formal groundwater monitoring program in place. According to the Kinsenda FS there are 13 monitoring drill holes.

The Kinsenda FS acknowledged the fact that dewatering may impact surrounding groundwater use and further stated that "careful monitoring will be undertaken to understand the complexity of this issue during the operational phase of the mine". The Kinsenda FS further stated that "a groundwater monitoring programme will be established for the mine" which will "assist in the early identification of potential issues to ensure that the mine has a minimal impact on groundwater resources and surrounding users".
No evidence of surface water monitoring could be found.

5.8.5 Legal Framework

An EIA / EMP report for the Kinsenda project was undertaken by Metago during 2010-11. The Kinsenda FS further states that, being an international company, Metorex complies with "in-country" environmental legislation, the Equator Principles ("**EP2**") and the International Finance Corporations ("**IFC**") principles and performance standards.

No data are available to assess the status of environmental performance reviews.

5.8.6 Hydrogeological and Hydrological Risks

Risks to Surface and Groundwater

KLMCS concluded that "to accurately estimate mine inflows and groundwater pollution risks and characteristics, additional data collection is imperative in the form of groundwater monitoring and environmental monitoring drill holes" (KLMCS, 2012). Key aspects arising from KLMCS' conclusions are:

- Mine inflow volumes for Kinsenda will rise from the current 43 000 m^3/d to 70 000 m^3/d or even 100 000 m^3/d for LoM. Mine inflows will increase when mine development crosses the Kamukato fault to the south where the aquifer is thicker and deeper;
- Modelled maximum Cu concentrations predict values of 1 mg/l which are close to the maximum allowable limit of 1.5 mg/l in terms of DRC regulations. There is a potential risk of exceeding these values during mining (also predicted by Metago) Sampling results up to June 2013 (streams, boreholes) indicate Cu values still below 1.5 mg/;
- The numerical groundwater model and solute transport model has shown that Kinsenda spring, which is a source of drinking water for Tshinsenda village, the mine and surrounding villages is not at risk from contamination by the TSF or depletion from mine dewatering. Metorex reports that there are no communities located within the TSF areaor immediately downstream thereof;
- Groundwater abstraction for LoM for Kinsenda mine for 19 years will not have severe negative impacts for future groundwater users, as the model simulation revealed rapid aquifer rebound with 99% of groundwater level recovery achieved within 5 years of cessation of pumping;
- The solute transport model predicts that the concentrations of most of the chemical constituents from the TSF will be minimal, and within maximum allowable limits. Concentrations in the groundwater will be altered and increased by >10 times to 50 times more than background values but over a limited area;
- The solute transport model assumes an unlined floor for the TSF. With an initial estimate of only 0.00025% of the total floor area expected to be defective, (Golder 2011), the risk of significant groundwater pollution from the TSF is minimal.

Based on their investigations, KLMCS recommended the following:

- Set up a monitoring system to forewarn of pollution risks and thus protect the groundwater resources for the community.
- Expand the groundwater monitoring network for future groundwater modelling and hydrogeological investigations, which will enable the cone of drawdown created by active mine pumping to be plotted.
- Install monitoring drill holes around the TSF and undertake groundwater quality and groundwater level monitoring before mining starts.
- Collect hydrogeological data (hydraulic parameters, water levels, water balance) in the shallow weathered aquifer to increase level of confidence on the solute transport model.
- Regular (3 months) sampling of ground water quality.

Metorex confirmed that Kinsenda monitors the discharge every fortnight and analysis of these samples shows compliance with DRC discharge regulations. Ground water level is monitored in boreholes of surrounding communities on a monthly basis. No significant lowering of the water table has been detected. The ground water monitoring network has been expanded to include boreholes drilled as part of the geotechnical investigation.

Expanding of Drawdown

The KLMCS report states that dewatering from the mining zone is likely to result in the lowering of groundwater levels in the shallower aquifer where the community drill holes are located and could potentially reduce the availability of water to surrounding groundwater users.

The KLMCS numerical model predicts that "The longitudinal axis of the drawdown cone will spread in a NW-SE direction due to the local tectonic stresses, the strike of the watershed divide, as well as the strike of the Kamukato fault. The radius of influence (i.e. 3 m drawdown) will be approximately 10km in the north-south and 20km in the E-W direction".

5.8.7 SRK Comments

From the available data, and placing reliance on the Kinsenda FS and KLMCS, the following conclusions are drawn:

Ground water and surface water impact

The community in Kinsenda village is supplied with water by KICC but there is a risk that they may also use untreated surface water and hence they are more vulnerable to water contamination.

The drinking / use of untreated surface water by neighbouring communities is not recommended, especially if contamination of such water from the mine can be expected. This issue should be taken up with the local authorities and preventative measures should be put in place by Kinsenda mine to prevent contamination.

SRK has been appraised by Metorex that the design of storm water trenches and berms should contain run-off from industrial areas and reduce the probability of contamination of surface water. Kinsenda will supply potable water to the neighbouring communities.

Ground and surface water monitoring

Discharge water from underground has been monitored by external consultants since December 2011. Surface water is monitored monthly and samples analysed externally. The EMP includes requirements for this and Metorex reports that the programme will be implemented during the construction phase. Additional monitoring drill holes will have to be drilled and incorporated into the groundwater monitoring network.

Despite the finding of KLMCS that the numerical model predicts insignificant impact on the dolomitic aquifer from dewatering in the Roan aquifer, concerns about the structural integrity of the dolomites during dewatering are raised in the Kinsenda FS report.

5.9 Mining

[SR5.4]

5.9.1 Introduction

This section includes discussion and comments on the mining aspects of the Kinsenda Project mining study.

Snowden was commissioned by Metorex to update a previous Snowden study that was completed in August 2011. SRK was provided with a draft update Snowden report dated April 2012 (the "**Snowden Report**") in 2012. Metorex has since requested DRA to update the study. DRA submitted a draft Document entitled "Mine Design Criteria" (Document Number DRAM-M1332-DC-0014-C, issued on 31-10-2012 and revised on 30 January 2013) (the "**DRA Report**"), which SRK has used as the basis for this review.

5.9.2 Description

The mine is a brown-fields project, having been previously operated between 1977 and 2002. At the time it was in a pillar recovery phase in accessible areas, following flooding in 1997. The main mining method was conventional Room and Pillar.

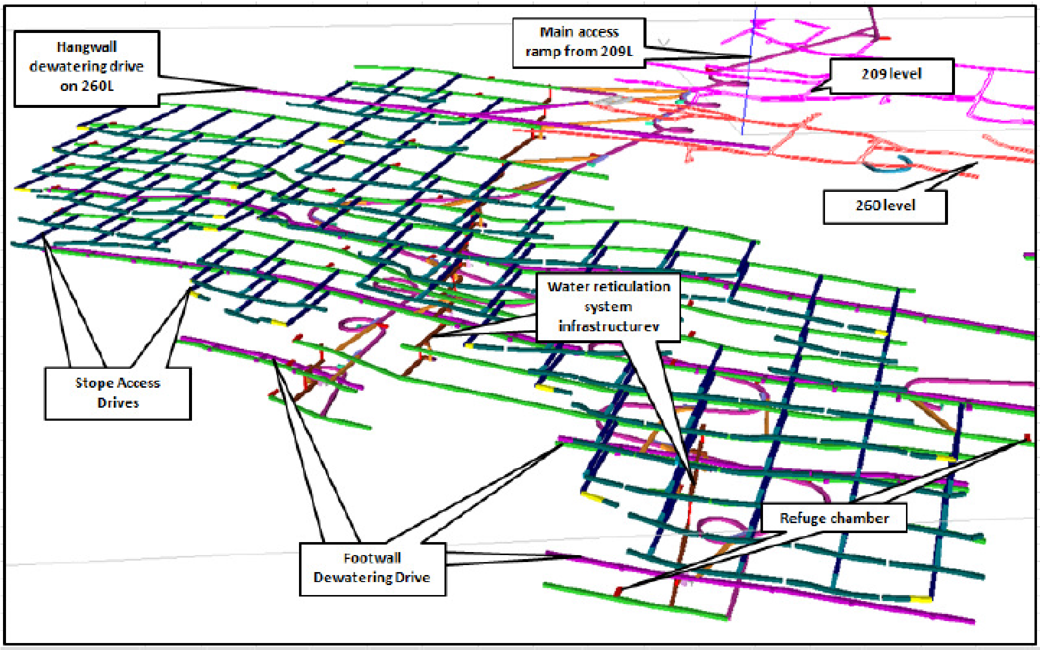
The Kinsenda orebody dips at 25-30° and varies in width from 2 to 20 m, with the average width being 6 m. Three zones are present, termed UOZ, MOZ and LOZ, which pinch and swell and merge in places.

The mine is divided into two distinct areas, the Western Mine (Figure 6.17) and the Eastern Mine, with the eastern portion being regarded as a greenfields project.

5.9.3 Access

Three declines from surface were used previously to access the orebody. The DRA Report states that two of these, the UOZ and LOZ (A), could be rehabilitated to use as access ways. A fourth sub-incline, the LOZ (B), reaches the two deepest levels but is currently flooded and yet to be dewatered. A vertical shaft from surface, equipped with only one cage, serves 209L and 285L.

Sinking of a decline is from surface to 209L of the existing underground infrastructure has recomended (Figure 5.17). The intention is to use this for ore transport and it will be inclined at 8%, which SRK considers to be sound practice. Figure 5.18 shows the progress on the boxcut in early July 2013.



srk consulting	**Metorex** Kinsenda Mine – western mine development layout (source: DRA)	Project No. 453459

Figure 5.17: Kinsenda Mine – western mine development layout

srk consulting	**Metorex** Kinsenda Mine – western mine development layout (source: DRA)	Project No. 453459

Figure 5.18: Kinsenda Mine – western mine development layout

5.9.4 Mining Method

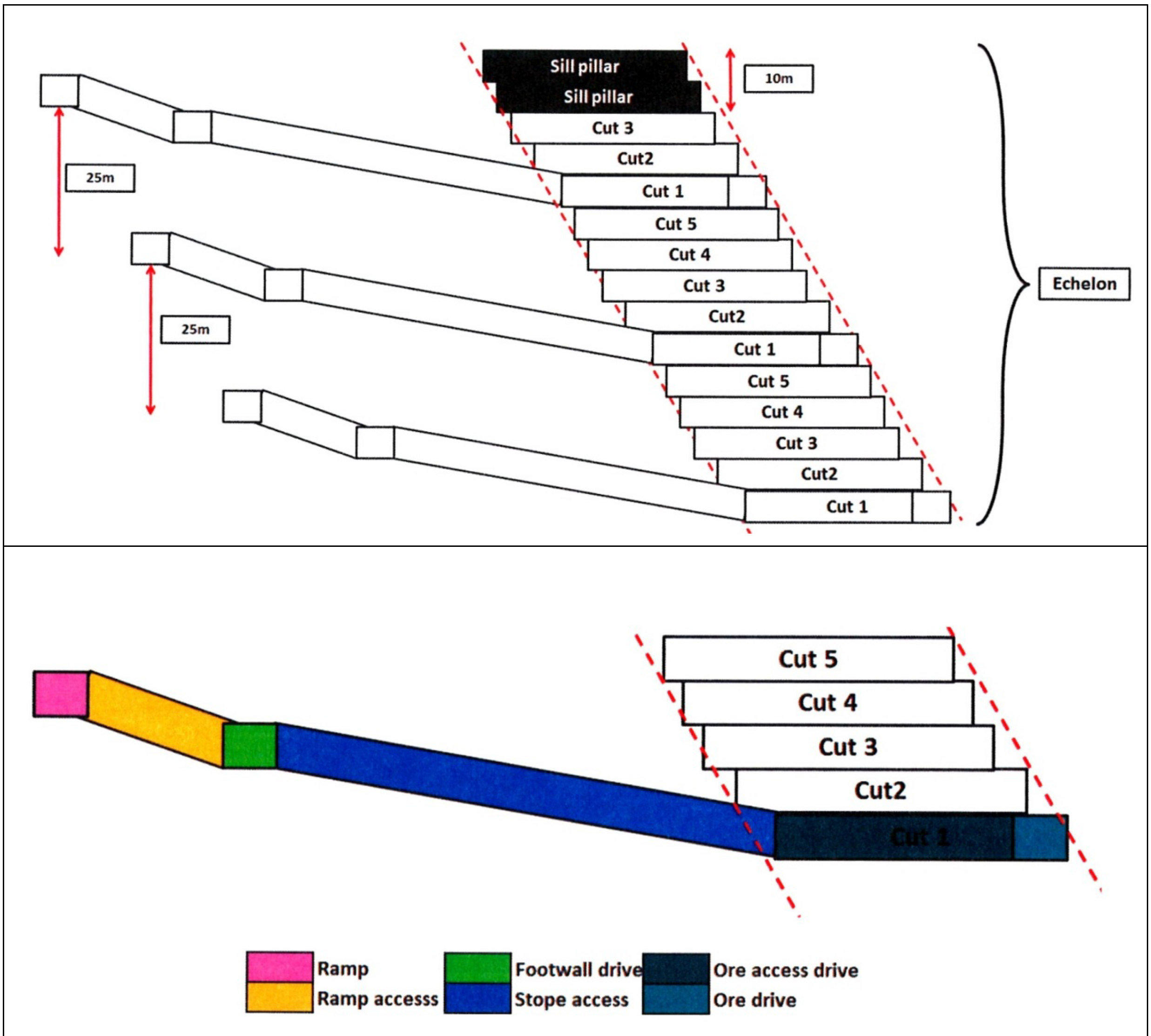
Conventional room and pillar was practised previously using labour intensive methods. DRA undertook a mining method selection study, which compared long hole open stoping (previously studied) with longitudinal and transverse drift-and-fill and re-evaluated them based on current more recent geotechnical knowledge.

The mining method proposed in the DRA Report is called both mechanised cut and fill and longitudinal drift-and-fill (in the narrow orebody areas). It is essentially very similar to what is referred to as transverse drift-and-fill in the Snowden Report. There are only minor differences in the respective layouts proposed by Snowden and by DRA and SRK considers the method to be an appropriate one given the orebody geometry and geotechnical characteristics (see Section 5.7).

For the wider areas, DRA states that transverse post-pillar drift-and-fill will be used.

The mining method recovers the ore in horizontal slices, starting from the bottom slice advancing upwards. Pillars are left inside the stope to support the roof. The mined out stope is then back filled with waste rock, hydraulic tailings and the next slice mined working from the fill surface. DRA states that conventional mining will be practised in areas not suitable for trackless mining.

Main levels will be spaced at 25 m intervals (Figure 5.19) and connected to the main access via a ramp system that will be linked to current underground infrastructure.



srk consulting	**Metorex** Kinsenda Mine – stoping layout showing mining sequence (top) and ore access methodology (bottom) (source: DRA)	Project No. 453459

Figure 5.19: Kinsenda Mine – stoping layout showing mining sequence (top) and ore access methodology (bottom)

Access to the orebody will be achieved via a ramp access tunnel leading from the ramp, to the footwall drive that is developed on strike and on the same elevation as the third cut of the stope.

A strike access is developed in the footwall on each main level parallel to the orebody on the same elevation as the third mining cut, in order to gain access to the first cut of the stoping panel. From the footwall, a stope access tunnel is developed in the direction of the orebody at an angle of not more than -9°, an angle which allows all mechanical equipment to operate in that drive (Figure 5.19). SRK concurs with the philosophy.

It is proposed that the mine be divided into sets of three levels, called echelons, which are separated by 10 m thick sill pillars (top diagram in Figure 5.19).

Each stoping panel is 90 m long and consists of 6 panels.

5.9.5 Rock Handling

Ore and waste rock will be loaded by LHDs, which will tip the material into trucks for transport to surface, with some waste during the early stages of the mine being hoisted to surface in the vertical shaft. Once stoping commences, waste rock will be used as fill material. SRK could not find any reference as to whether the cage in the shaft would be replaced by a skip to facilitate this.

Personnel will be transported using specialized trackless utility vehicles via the main ramp.

Material will be transported in utility vehicles with interchangeable buckets (cassettes) designed for each purpose. Additional service fleet items will be scissor lifts, lube vehicles, graders, a compactor, scaler, etc.

The equipment described above is standard for this type of operation and SRK concurs with the philosophy.

5.9.6 Backfill

This is discussed in Section 5.7.2.

5.9.7 Service infrastructure (ventilation, rock transport, men and material access)

The following has been proposed by DRA to achieve the design tonnage of 50 ktpm:

- The establishment of a permanent pump station on 285L to handle all the underground water;
- The development of a proper dewatering and water reticulation system that will be capable of handling the proposed 80 kℓ per day, clean as well as dirty water;
- Rehabilitation of the LOZ (A) decline;
- Installation of an underground crusher station to feed the conveyor belt on 285L. [It is not clear from the documentation what purpose the conveyor will serve];
- Developing a new decline from surface that will connect to 209L that will act as main egress and ingress for all men and material, as well as rock transport
- Development of two ventilation shafts: one on the east side and one on the west side of the mine from 285L to surface.
- Establishment of a Backfill Plant to facilitate backfilling operations.

SRK has not had sight of the ventilation study so cannot pass comment on that aspect.

5.9.8 Development and production schedule

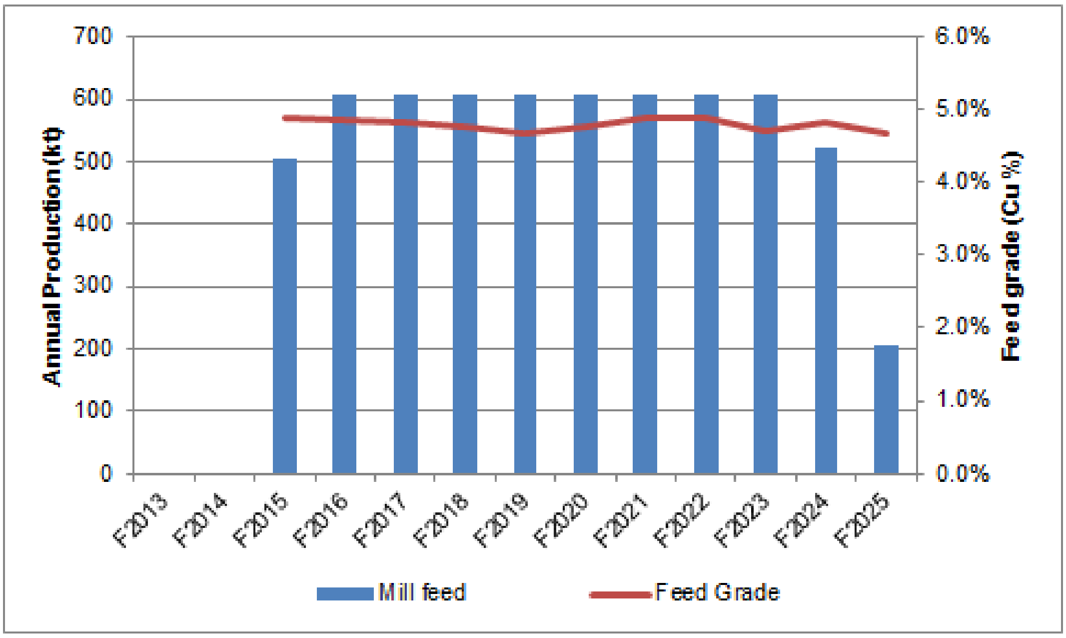
The planning parameters used in the production schedule as advised by DRA at a meeting held at Metorex's offices on 14 February 2013 were:

- Mining loss 4.5%;
- Backfill dilution 10%;
- Planned dilution 7.5%;
- Unplanned dilution 2.92%;
- Extraction 69%.

Drill rig blast rates, LHD cycle times, cleaning cycles, support rates, etc have been determined from first principles. The development advance rate determination for a drill rig has been presented in a table and determined to be 190 m per month, which SRK considers to be on the high side. The table also provides an "Effective system advance rate" of 75 m per month for the East mine and 120 m per month for the West but it is not clear which of these figures is used in the mine scheduling work going forward.

The production schedule was generated by DRA using Mine2-4D and XPac mine planning software. The planning parameters used in the production schedule as set out above are seen by SRK to be reasonable.

It should be noted that there were some 2.4 Mt of Inferred Resources that had been included in the initial LoM plan for Kinsenda. As this is a material percentage of the LoM tonnage and the HKSE does not permit the valuation of Inferred Resources, the LoM plan was redone by DRA to be based on Indicated Resources only. The resultant production schedule of plant feed tonnage and grade for the Kinsenda project is shown in Figure 5.20. The production schedule supports a mine life of 10.5 years.



srk consulting	**Metorex** Kinsenda Mine – production schedule	Project No. 453459

Figure 5.20: Kinsenda Mine – stoping layout showing mining sequence (top) and ore access methodology (bottom)

5.9.9 Manpower

Manpower schedules for mining and development were presented on a monthly basis for the first three years of the mine's life.

The total manpower complement for the Kinsenda mine according to the completed feasibility study is estimated at 640, with mining and MRM at 105 and 20 respectively.

5.9.10 Capital and Operating Costs

Operating Costs

Mining productivities and operating cost parameters from Chibuluma were used extensively by Metorex in developing the mining operating costs for Kinsenda.

The estimated mining costs for Kinsenda for F2013 to F2018 are set out in Table 5.10.

Table 5.10: Kinsenda – Mining Operating Cost for F2013 to F2018

Item	Units	F2013	F2014	F2015	F2016	F2017	F2018
Salaries & wages	(USDm)	0.0	0.2	4.5	4.5	4.5	4.5
Trucking	(USDm)	0.0	0.0	1.7	1.9	1.9	2.0
Loading	(USDm)	0.0	0.0	1.5	1.8	1.8	1.9
Development - drill & blast	(USDm)	0.0	0.0	1.8	1.6	1.4	2.1
Production - drill & blast	(USDm)	0.0	0.0	0.0	0.5	1.2	1.4
Mining services	(USDm)	0.0	0.0	1.7	2.1	2.1	2.2
Engineering	(USDm)	0.0	0.0	3.0	3.0	3.0	3.0
Power	(USDm)	0.0	0.0	9.3	9.3	9.3	9.3
Support equipment	(USDm)	0.0	0.0	0.9	1.6	1.6	1.9
Sundry	(USDm)	0.1	2.5	1.1	0.9	0.2	0.0
Total Mining Opex	**(USDm)**	**0.1**	**2.7**	**25.6**	**27.2**	**27.1**	**28.3**
Unit mining cost	USD/t RoM			50.50	44.66	44.53	46.62

Capital Costs

The capital cost estimate in real terms for the mining operations at Kinsenda excluding contingencies as provided to SRK is set out in Table 5.11. The costs were compiled by DRA in South African Rand and converted to US Dollars at the exchange rate of ZAR8.55 = USD1.00.

Table 5.11: Kinsenda – mining capital cost

Component	Capital (USDm)				
	Total Project	Spent H1-F2013	H2-F2013	F2014	F2105
LOZ - A DECLINE					
Earthworks	0.49				
Buildings	0.64				
Materials Handling	4.25				
Services	2.14				
General	0.12				
Mining (backfill)	0.86				
Ventilation	1.20				
P&G's	2.30				
Sub-total LOZ A	**12.00**		**8.52**	**3.48**	**0.00**
WEST MINE					
Earthworks	3.21				
Buildings	0.00				
Services	10.03				
Ventilation	0.02				
General	0.08				
Mining Fleet	7.25				
Mining - declines	17.82				
Mining - development	1.15				
P&G's	4.60				
Sub-total West Mine	**44.15**	**2.30**	**8.74**	**26.49**	**6.62**
Equipment for stoping in old areas	3.74		3.74		

DRA added engineering inaccuracy allowances ranging between 5% and 20% to the capital estimates, as well as a contingency to cover import duties and sundry surface civils.

SRK has reviewed the capital estimates to the extent possible according to the level of detail provided and considers the mining capital estimates to be reasonable at the Effective Date of this CPVR. According to information provided by Metorex, USD12.3 million of the F2013 capital was expended during H1-F2013. There is however insufficient detail to identify on which specific items this amount has been spent, so the capital in Table 5.11 reflects the total for H1-F2013 and the remaining balance for H2-F2013. The H2-F2013 figures are incorporated in the financial model output in Section 5.18.

The capital projections through to the end of the LoM cater for regular replacement of the mining fleet.

5.9.11 SRK Comments

A new decline to be used for ore transport is proposed to be sunk from surface to 209L at 8% inclination, which SRK considers to be sound practice.

SRK considers the mechanised cut and fill and longitudinal drift-and-fill mining method to be appropriate given the orebody geometry and geotechnical characteristics.

The stope access tunnel will be developed in the direction of the orebody at an angle of not more than -9°, an angle which allows all mechanical equipment to operate in that drive. SRK concurs with the philosophy.

Some waste during the early stages of the mine will be hoisted to surface in the vertical shaft. SRK could not find any reference as to whether the cage in the shaft would be replaced by a skip to facilitate this. Metorex confirmed that limited amounts of waste (less than 2 ktpm) will be hoisted to surface using hoppers inside the existing cage. No skip will be installed.

SRK is satisfied that the mining equipment is standard for this type of operation.

SRK has reviewed the capital estimates to the extent possible according to the level of detail provided and considers the mining capital estimates to be reasonable at the Effective Date of this CPVR.

The capital projections through to the end of the LoM cater for regular replacement of the mining fleet.

5.10 Mineral Processing

[SR5.5]

The design of the Kinsenda concentrator plant is based on a production rate of 50 ktpm and assumes the construction of a new concentrator plant at the Kinsenda site that will produce a sulphide concentrate which will be sold to a nearby smelter in Zambia and an oxide concentrate which will be transported to Lubumbashi for processing at the Ruashi SX/EW processing facility.

The latest metallurgical plant design is based on semi-autogenous (SAG) milling and flotation circuit. The plant design was conducted by MDM Engineering ("**MDM**") to typical feasibility study engineering standards for the purpose of estimating the capital and operating cost estimates to an acceptable level of accuracy. This design was reviewed and optimised by DRA.

The metallurgical test work was conducted at Mintek laboratory in Johannesburg, South Africa. The test work focussed on establishing the optimal conditions for flotation and the concentrate grade and recovery factors. Most of the test work was conducted on the LOZ composite sample (made up of sub-samples from 20 drill holes). Limited test work was conducted on a LLOZ composite sample (made up of sub-samples from 4 drill holes) and a MOZ composite sample from 5 drill holes.

5.10.1 Mineralogical and Metallurgical Testwork

The Kinsenda mineralization consists mainly of sulphides (75 - 80%) and copper oxides which are encountered in decreasing proportions as the depth below surface increases.

The variability of the mineralization is illustrated by the fact that Cu head grades vary from 0.5% to 2%TCu over the distance of one metre in the lower grade peripheral zone and up to 10%TCu in the higher grade zone. The relative abundance of the various sulphide minerals differed between the LOZ and LLOZ samples (Table 5.12), and will affect the grade of the flotation concentrate that can be produced.

Table 5.12: Relative abundance of the sulphide minerals in LOZ and LLOZ samples

Sulphide Mineral	Distribution of Sulphide Minerals	
	LOZ	LLOZ
Chalcocite	70%	47%
Chalcopyrite	3%	37%
Covellite	18%	12%
Bornite	4%	1%
Native Cu	5%	3%

The copper oxide minerals, which include mainly malachite and to a lesser extent azurite and cuprite, represent on average 24% of the cupriferous mineralization in the LOZ, 19% in the LLOZ and 39% in the MOZ. The relative amount of oxide minerals reduces as the ore body deepens. Compared to sulphide minerals, the oxide minerals are more difficult to recover by flotation, and hence, their presence negatively affects the overall copper recovery and concentrate grade. Fortunately, the presence of the more difficult to float copper oxide minerals such as pseudomalachite and chrysocolla was not observed.

Cobalt minerals are reported to be rare.

The geological interpretation indicates that although the copper grade to the plant will be fairly continuous around the 4.5%TCu level, the mineralogy of ore feed will be variable. Flotation tests indicated the variability in metallurgical behaviour across each of the ore zones.

The LOZ and LLOZ ore zones behaved differently under flotation test conditions. The LOZ composite sample produced a concentrate containing 49%Cu whilst the LLOZ composite sample produced a concentrate containing only 39%Cu. The difference in the concentrate grades can be attributed mainly to the different proportions of chalcocite and chalcopyrite in the feeds. The recoveries from the LOZ and LLOZ composite samples were similar due to the similar proportion of oxide minerals in the feed.

The variable mineralogy suggests that the design of the concentrator plant must incorporate design safety margins and flexibility in order to maximise recovery from both sulphide and oxide ore types. More specifically, the design of the sulphide and oxide flotation circuits incorporates sufficient variability in the sulphide/oxide split – the plant design has been designed to cater for the sulphide/oxide feed ratio to range from 90:10 to 60:40.

The metallurgical flow-sheet comprises Semi-Autogenous ("**SAG**") milling followed by flotation of sulphide and oxide copper minerals to produce both sulphide and oxide copper concentrates. The production of separate concentrates for the copper sulphide and oxide minerals allows for flexibility in terms of marketing and maximises revenues for the project.

The source ore types and Mintek test results are summarised in Table 5.13.

Table 5.13: Source ore types and Mintek Test Results

Ore Type	Head Grade (% Cu)	Sulphide:Oxide Ratio	% Recovery		% Cu in Concentrate	
			Sulphide	Oxide	Sulphide	Oxide
LOZ	4.5	76 : 24	93	72	49	28
LLOZ	4.5	81 : 19	98	56	39	10
MOZ	4.5	61 : 39	61	14	50	14
Average			93	63	46	22

The LoM production schedule for Kinsenda exploits only LOZ and LLOZ ore types. The weighted recoveries for sulphide and oxide minerals applied to the financial model are 96% and 63.3% respectively, for an overall recovery of 88%, with the sulphide concentrate grade averaging 49% Cu and the oxide concentrate grade averaging 28% Cu.

Due to a lack of pyro-metallurgical process plants in the DRC, it is assumed that the sulphide concentrates will be exported to Zambia for smelting and further refining.

The oxide concentrate will be trucked to Ruashi where it will be treated through the SX/EW process to produce LME A-Grade cathodes at a Cu purity of 99.99%.

5.10.2 Process Plant Flowsheet

The Kinsenda concentrator is designed to recover copper from a Cu sulphide/oxide ore body at a treatment rate of 50 ktpm at an average feed grade of 4.5% Cu over the LoM. The proposed Kinsenda concentrator design is based on well understood and proven technology. The process plant design criteria are based on the results of the suite of metallurgical tests carried out at Mintek. MDM did the plant design and it was completed in March 2011. Subsequently DRA was requested to finalize and optimize the design.

The simplified process plant flow sheet for Kinsenda is described in the following section and shown in Figure 5.21.

The process plant comprises three-stage crushing (primary jaw crusher, semi autogenous ("**SAG**") mill and pebble cone crusher), flash flotation, thickener, filter press and tailings backfill cyclone and plant.

The RoM stockpile will have a capacity of 100 kt. This will be utilized at the beginning of the operation before the concentrator is commissioned. The intention is to keep the ore in this stockpile at a minimum once the whole operation is commissioned in order to reduce the process pipeline time.

The mill feed will be sourced from a 24-hour live stockpile with 4 apron feeders in an attempt to keep the feed as homogeneous as possible. As the stockpile runs down, a front-end loader will be used to push in the side walls. A mill feed silo was not considered due to cost implications.

The SAG mill is a second hand mill sourced from one of the gold mines in South Africa. The mill shell will be shortened to suit the requirement of 50 ktpm.

A pebble cone crusher was included due to the rock hardness of 17 kWh/t. This feature might not operate as envisaged because cast iron steel balls must be used to enable magnetic separation of the mill steel balls. Chrome steel balls proved to be more cost effective but the balls are then not magnetic. The scats and pebbles proved in other operations to be of a lower grade and can be discarded or mixed in with the feed as a circulating load.

The flotation cells selected are self-aspirating cells and as such a compressor for creating air froth is not required. This is the principle used by Wemco Flotation Cells. SRK understands that new flotation cells have been designed for Kinsenda to optimise recovery of both sulphide and oxide copper minerals.

The flotation cell design allows for the last 4 cells in the sulphide float to be used as oxide float cells and the first two in the oxide float as sulphide float cells should the ore ratio change beyond what is envisaged.

There will be two concentrate storage tanks and filter presses. With the tonnage envisaged this should be sufficient.

The tailings thickener was deleted and as such a cyclone overflow product will be pumped to the tailings dam. With the back-fill plant off line the whole tailings stream will go to the dam. The intention is to use the water as pumped by the mine as process water. There will be large volumes coming up from underground in order to maintain the water level underground.

5.10.3 Metallurgical Balance

The metallurgical balance as sourced from the Kinsenda feasibility study is summarised in Table 5.14. The 88% Cu recovery was derived from a weighted calculation based on the test work recoveries reported by Mintek and the ore resource model. With the uncertain feed composition (sulphide/oxide), exclusion of the ball mill and reduction of flotation residence time, this recovery will have to be proved in practice.

Table 5.14: Kinsenda – metallurgical balance

Process	Units	Value
Ore feed	(tpm)	50 000
Feed grade	(% Cu)	4.5
Cu content in Feed	(tpm)	2 250
Metal Recovery	(%)	88
Recovered Cu	(tpm)	1 980
Concentrate grade		
Sulphide concentrate	(% Cu)	46
Oxide concentrate	(% Cu)	22

From data seen at the Musoshi Concentrator, the average Cu recovery recorded was 86.5%. This was with a feed grade of 2.0% Cu and very old equipment. The recovery of 88% used in the financial model can thus be supported.

The concentrate grades appear to be reasonable.

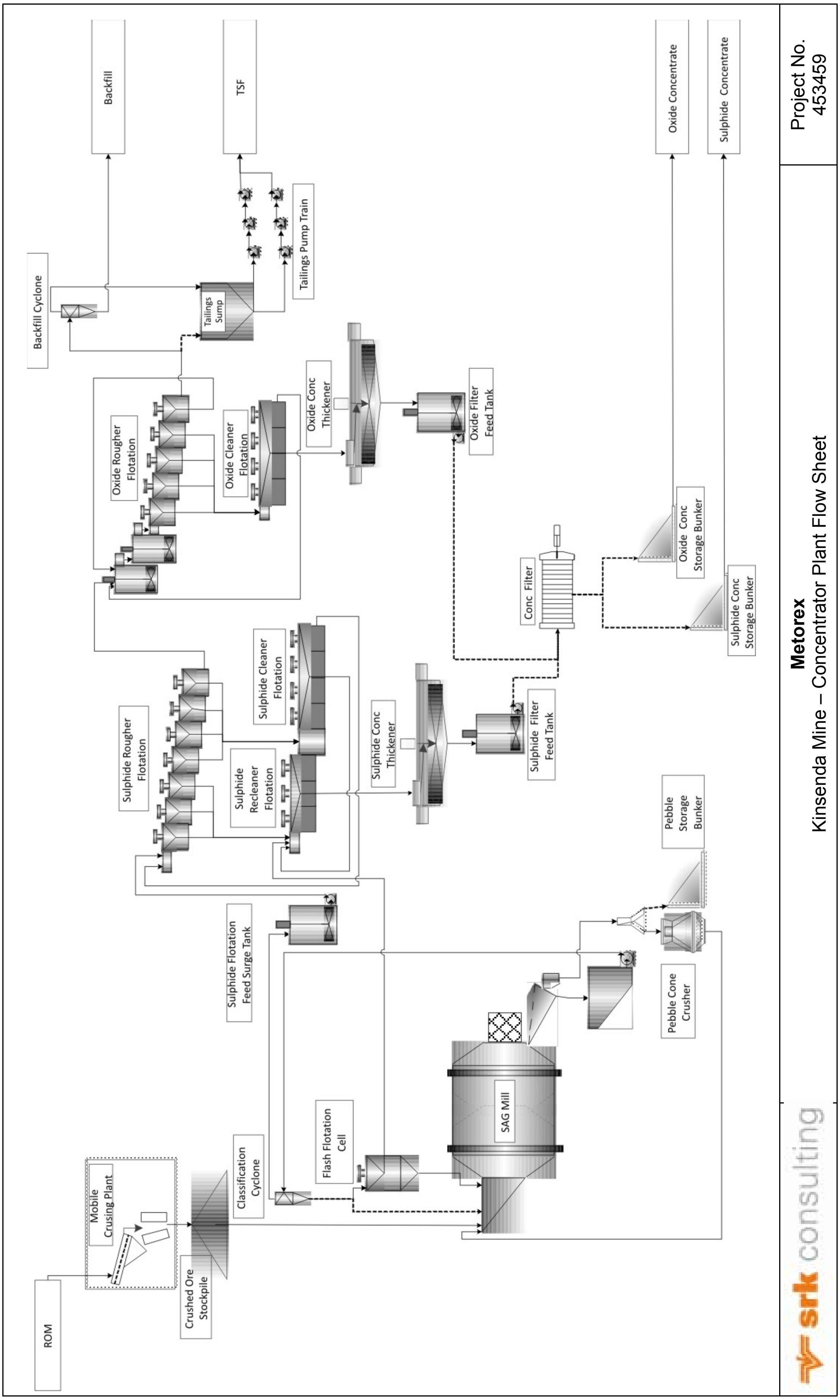


Figure 5.21: Kinsenda Mine – Concentrator Plant Flow Sheet

5.10.4 Capital and Operating Costs

Capital Costs

The capital cost for the Kinsenda concentrator including contingencies as provided to SRK is set out in Table 5.15.

Table 5.15: Kinsenda – capital cost for concentrator

Component	Cost (USDm)				
	Total Project	Spent H1-F2013	H2-F2013	F2014	F2015
Concentrator plant	49.97				
Infrastructure	6.01				
Indirect costs	17.94				
Sub total	73.92				
Backfill plant	1.27				
Tailings dam	11.16				
Total Concentrator	**86.35**	**0.20**	**19.66**	**62.18**	**4.32**

According to information provided by Metorex, USD12.3 million of the F2013 capital was expended during H1-F2013. There is however insufficient detail to identify on which specific items this amount has been spent, so the capital in Table 5.11 reflects the total for H1-F2013 and the remaining balance for H2-F2013. The H2-F2013 figures are incorporated in the financial model output in Section 5.18.

The total capital cost estimate in Table 5.15 of USD86.35 million was compiled by DRA in February 2013 and represents a plant design which has been reduced by DRA to the basic essentials relative to what had originally been provided by MDM, plus a number of additional cost saving measures introduced by Metorex, as follows:

- Mill feed stockpile reduced to 24 hour live capacity;
- Second hand SAG mill sourced from a gold mine in South Africa;
- Pebble crusher circuit replaced ball mill;
- Flotation cell residence time reduced, but allowance made for cross-over usage;
- Height of flotation cell structures decreased;
- Service water, reagent make-up and fire water sourced from a single tank;
- No tailings thickener;
- Mobile cranes will be used instead of a tower crane.

Reference is made to additional capital expenditure of USD8.0 million, although not included in the capital estimate in Table 5.15, to cover the following:

- Water treatment plant for underground water (USD1.0 million);
- Fixed primary crusher station (USD5.0 million);
- Second filter press (USD1.5 million); and
- Process water pond (USD0.5 million).

There is a risk that the capital cost for the construction of the plant may be higher than shown in Table 5.15.

Operating Costs

From a presentation to SRK, the financial model based on DRA's CBE Revision 11 and Metorex's revisions at June 2013, the budgeted plant operating cost for Kinsenda is set out in Table 5.16.

Table 5.16: Kinsenda – plant operating cost

Component	Cost (USD/t treated)	Plant cost (USDm)		
		F2015	F2016	F2017
Electrical power	4.67	2.36	2.84	2.84
Reagent cost	4.97	2.51	3.02	3.02
Maintenance cost	2.06	1.04	1.25	1.25
SAG mill liners	1.34	0.68	0.82	0.82
Grinding media	1.18	0.60	0.72	0.72
Tailings dam cost	0.47	0.24	0.29	0.29
Analytical cost	0.17	0.08	0.10	0.10
Variable costs	14.86	7.52	9.04	9.04
Manpower cost	2.42	1.47	1.47	1.47
Total	17.28	8.99	10.51	10.51

SRK has accepted the estimated variable plant operating cost of USD14.86/t treated for the Kinsenda plant.

Off-mine costs

There are different off-mine charges for the sulphide- and oxide concentrates. KICC plans to send the sulphide concentrates to the Chambishi smelter in Zambia, whereas the oxide concentrates will be treated at the Ruashi SX/EW plant. The off mine / realisation costs comprise transport, clearing costs, smelting, refining, and realisation charges. The transport and clearing costs are applied to the wet concentrate tonnage, whereas smelting costs are applied to the dry concentrate tonnage. The refining cost and realisation charge is calculated on the payable copper after smelting.

An order signed by the DRC Minister of Mines in April 2013 banned the export of Cu/Co concentrates. Permission was obtained from the DRC Government to export the sulphide concentrates across the border to Zambia. The current export tax is USD60/t and this will increase to USD100/t as a result of the permission granted. This increase has been included in the operating cost estimate.

The off-mine / realisation costs for sulphide and oxide concentrates produced at Kinsenda for F2013 to F2018 are shown in Table 5.17.

Table 5.17: Kinsenda Mine – Off-mine / realisation costs for F2013 to F2018

Item	Units	H2-F2013	F2014	F2015	F2016	F2017	F2018
Sulphide concentrate							
Transport costs	(USDm)			5.5	6.6	6.4	6.4
Clearing costs	(USDm)			8.7	10.4	10.1	10.1
Smelting/refining/realisation costs	(USDm)			13.2	15.8	15.5	15.4
Total sulphide off-mine costs	(USDm)			27.4	32.8	32.1	31.9
Oxide concentrate	**(USDm)**						
Transport costs	(USDm)			1.3	1.6	1.6	1.6
Clearing costs	(USDm)			0.5	0.6	0.6	0.6
Treatment/realisation costs	(USDm)			3.4	4.2	4.2	4.1
Total off-mine/realisation costs	(USDm)			5.2	6.3	6.4	6.2

The average off-mine costs over the LoM for the sulphide and oxide concentrates are approximately USD53/t and USD10/t plant feed respectively.

5.10.5 SRK Comments

The metallurgical balance can be accepted provided the feed grade of 4.5% copper and sulphide/oxide ratios as stated can be achieved. The overall copper recovery of 88% is consistent with the laboratory test work, but this will need to be confirmed in practice.

SRK has accepted the estimated variable plant operating cost of USD14.86/t treated for the Kinsenda plant as estimated by DRA.

The capital cost estimate allows for a concentrator plant that contains all the essential items required to produce the results as predicted in the metallurgical test work. A number of manual tasks were thus assumed – mobile primary crusher, front-end loader for stockpile, mobile plant crane, single units etc. The estimated capital cost can be accepted.

The metallurgical test work reviewed by SRK was performed on 20 LOZ, 4 LLOZ and 1 MOZ drill hole samples by Mintek. It appears this was used to assess the variability of the metallurgical characteristics of the ores and not to inform the plant design. Metorex confirmed that the test work was designed to test the variability of the ore, whereas the plant design was based on designs of a number of operating mines in the Copperbelt.

The further metallurgical test work to establish the correct milling and flotation design parameters conducted by Mintek confirmed the earlier findings and envisaged plant design.

5.11 Tailings Storage Facilities

[SR5.6]

Golder and Associates were appointed to carry out a tailings storage facility site selection study, followed by a design and capital cost estimate to an accuracy acceptable for feasibility evaluation purposes.

Seven sites were identified for tailings disposal, and the preferred site, which was inspected and discussed at the time of SRK's site visit, was selected based on technical, environmental and economic criteria. Subsequent to the site visit, SRK has been made aware that it is possible that the site will have to be moved as a result of a bigger area being required. No decision has yet been made in this respect and the new site selection process has yet to be finalised.

The tailings storage facility has been designed to store 6 Mt, with the balance of the tailings being used as underground backfill. The deposition strategy selected is impoundment with open ended deposition, which is acceptable for typical copper tailings disposal.

The tailings storage facility is to be developed in 3 distinct phases and will receive the cyclone overflow tailings (1.28 t/m^3 at 35% solids by mass) during underground backfill operations and the total tailings stream (1.52 t/m^3 at 55% solids by mass) when underground backfill is not being practised.

A comprehensive test program has confirmed the tailings characteristics, while the preliminary geotechnical investigation concludes that the underlying soils, once the topsoil and upper transported soils have been removed, should be suitable for construction of the proposed tailings storage facility embankments.

Test work undertaken for the Kinsenda tailings to date indicates that an unlined TSF will be acceptable for the operation in terms of water quality. Acid Mine Drainage from this material is not anticipated. Further testwork is underway in a final leachate test work programme and the results of this study may influence the final design. If this results in a lined facility being required, which appears unlikely in the light of test work undertaken to date. the capital cost of the TSF would have to be increased.

5.12 Infrastructure and Bulk Services

[SR5.6]

5.12.1 Mine Headgear and winding plant

The headgear (Figure 5.22) supports a single drum winder, which is equipped with a single deck man and materials cage, the cage is on four guide ropes and operates at a speed of 4 m/s. The four guide ropes and the cage rope were well greased. SRK was informed that all ropes get greased monthly as part of the shaft maintenance schedule. The shaft examination is carried out daily between 6am and 7am.

A recently conducted feasibility study has concluded that the original headgear was a sinking headgear, and it will need an additional centre tower to strengthen the headgear sufficiently to allow ore hoisting to be carried out safely.

The cage rope attachment was not acceptable from a safety standards stand point. The winding rope was attached to the cage and anchored using "bull dog clamp" attachments. Such winding operation would not be legal in South Africa. SRK is very concerned with this as it is a serious safety risk to persons and equipment.

The winder and headgear should be equipped with the following safety devices, to enhance the safety of persons in an overwind situation:

- The rope attachment to the top of the cage bridle should be by a humble hook that will automatically release the rope in an ultimate overwind situation;
- The rope termination should be "'reliance" clamp or by an internationally recognised rope splice such as Long or Bordeaux splice;

- The headgear must be fitted with a crash/spectacle plate, which initiates the separation of the winder drive from the cage by the activation of the humble hook detachment device;
- The headgear should be suitably equipped with "Jack catch" type cage arresting devices, the cage needs also to be fitted with "jack catch" engagement sections. This equipment will safely hold the overwound conveyance in the headgear-if the humble hook has detached the winding rope after hitting the crash plate. The secondary means of egress is presently by a "Cat" type ladder system. Given that the shaft is sunk to a depth of 285 m below collar, this is not an ideal situation. Due consideration should be given to equipping the shaft with a small "Mary Anne" type service cage, that would normally convey approx. 6 people.
- SRK has been informed that all of the above safety equipment has been allowed for in the capital plan, with efforts presently underway to purchase and install the above equipment. In addition to the above, Winder Controls of South Africa has recently upgraded the winder electrical safety devices and controls.
- Two new cages complete with Jack catches have been ordered and are now on site.

srk consulting	**Metorex** Kinsenda Mine – shaft headgear	Project No. 453459

Figure 5.22: Kinsenda Mine – shaft headgear

5.12.2 Electricity

The infrastructure required comprises power from the 110 kV SNEL network, whereby the SNEL Kinsenda 110 kV sub-station is supplied from the SNEL 'Kasembulesa' 110 kV sub-station, via a single overhead transmission line 26 km away.

The existing Kinsenda 110kV sub-station feeds the site plus a number of rural farms and villages via a single 10 MVA 110 kV to 3.3 kV step-down transformer, which was installed circa 1965 and in need of replacement, this coupled with the aging switchgear and no power factor correction equipment, means that the sub-station is in need of upgrading. This is particularly necessary, to support the planned increase in Maximum demand at the Kinsenda mining operations. The feeders from the Kinsenda sub-station are of very long length across the mine site, this causes a high level of voltage losses, and this coupled with the rural grid supply being unstable-results in the Mine suffering from an unstable, unreliable site supply. SRK was advised that on average, the mine suffers 45 power supply interruptions each month due to unstable supplies or power shedding on the part of the power provider.

There are presently two 2.5 MVA diesel powered emergency generator units installed at the mine to cover key drives and pumps but this is a limited amount and the diesel generators are old units.

Whilst KICC has concluded a Power Purchase Agreement with SNEL in which the agreed tariff for power is USD0.042/kWhr, the reliability of the SNEL network has deteriorated significantly over the past 2 years.

To address the power outages anticipated at Kinsenda, there are plans in place to extend the diesel generating capacity to 10 MVA in F2030/31 to support the peak installed power rating of 16 MVA that is planned for in F2031-F2035.

Table 5.18 illustrates the site build up for back-up generator and site load requirements.

Table 5.18: Electrical demand versus standby generator capacity for the life of mine

Financial year	Installed stand by Generators(MVA)	Mining demand (MVA)	Concentrator demand (MVA)	Site Maximum demand (MVA)
2013	2.5	1.25	1.25	2.5
2015	4.75	8.0	4.0	12.0
2016	5.75	9.0	4.0	13.0
2020	7.5	11.0	4.0	15.0
2026	8.0	11.5	40	15.5
2031	10.0	12.0	4.0	16.0

SRK has reviewed the planned upgrades and is satisfied with the design criteria used. SRK is satisfied that the provision of upgraded electrical services will improve the supply reliability in future. However, the level of reliability from the grid supply is still relatively poor. Hopefully, the additional systems planned to be installed, should mitigate against any future production losses. The following upgrades are planned:

- The SNEL Kinsenda 110 kV sub-station will supply the Mine main consumer sub-station with a dual supply via two 20 MVA 110 kV to 11 kV step down transformers. An additional 11 kV to 3.3 kV has been provided to continue to supply the rural areas with a 3.3 kV supply;
- The main consumer sub-station bus-bars are fitted with suitable bus couplers that will allow the mine to maintain power, if one of the two supplies becomes unavailable;
- The main consumer substation will be equipped with 5 MVAR power factor correction on both sides of the bus-bar sections (i.e. both incoming supplies);
- A new 10 MVA Generator plant will be built, which consists of four 2.5 MVA units, which are prime rated (continuous generating rated);
- The generator plant, will be equipped with automatic start up and synchronisation controls, which will allow the mine to be temporarily supplied from diesel generators, if the SNEL grid-power goes off for whatever reason;
- SCADA communications have been allowed for the control room operations to monitor the situation prevailing with the power supply and generator operations: and
- All switchgear will consist of vacuum breakers.

SRK suggests that KICC looks at installing alternative solar-voltaic/diesel hybrid back-up generators to drastically reduce the diesel consumption on site. The latest hybrid systems installed in S. African mines have reported payback periods of less than 4 years and an operational life of at least 25 years.

The communication network is reasonable with cellular telephone operators, Vodacom and Celtel, having extensive coverage in the area. Voice over IP, fibre optics and leaky feeders have been provided for operational communications on surface and underground. SRK is satisfied with the level of communications provided in the project.

5.12.3 Water bulk supply

The bulk water supplies required for mining and processing will mainly come from the large dewatering system, whereby up to 80 Ml/day are planned for dewatering.

A treatment plant has been provided to treat the nearby spring water, situated to the South East on the mining area. This is necessary, as water testing has revealed that e-coli was present in the spring water.

5.12.4 Underground dewatering

Present pumping situation

SRK would describe the present pumping system as a temporary arrangement on 209 and 285 levels, which utilises existing pipes in the main shaft, the LOZ decline. The pipes generally are badly corroded and many welded repairs could be seen on both 650 mm pumping columns. The two 650 mm pipe columns will have to be replaced as part of the pumping upgrades, SRK was advised that new pipes had been provided for in the project.

- Pumping presently takes place from 285 L to 209 L pump station by three Sulzer 3-stage pumps fitted with 900 kW drive motors. The 209 pumps were inspected and found to consist of three Sulzer 3-stage pumps fitted with 900 kW motors. One of the pumps was out of order with a drive motor bearing failure. The new pump rooms being constructed on 285m level will have horizontal settlers that will settle out the fines and supply the clear water Sulzer pumps. The horizontal settler sumps on 285 level do not provide enough positive suction (<2 m actual versus 8 m required), to ensure that the Sulzer pumps do not cavitate. This will be extremely detrimental to the pump lives, due to increased wear from the impact of cavitation. SRK strongly suggests that 30 m vertical settlers are blasted and equipped to feed the new pumps being installed on 285m level and minimum of 8 m positive suction designed into the pump supply system.
- SRK is also concerned that the water from the horizontal settlers will not be clear, as no mud pumping has been provided for. This will impact dramatically on pump wear, reducing the pump lives markedly. SRK advises that vertical settlers and mud pumps should be provided for.
- The above short comings are being addressed with the commissioning of three vertical 30 m settlers and one clear water vertical dam, 30 m high to ensure a flooded suction to the Sulzer clear water pumps. Additional provision has been made to install three off mud pumps, to control the level of mud in each dirty water settler. SRK fully supports this design upgrade as it addresses the present situation.

The clear water pumps are handling dewatering from four drill hole systems, equipped to dewater the mining areas.

Proposed pumping system

The existing system will be extended as the mine deepens, the project plans to install six Sulzer multi-stage clear water pumps, fitted with 1 MW motors on 430 level. As with the existing system 30 m long vertical settlers need to be made available to facilitate the shortcomings outlined earlier. Also mud pumping will also required to ensure that mud is pumped separately to the settler overflows reporting to the Sulzer storage dam for clear water.

5.12.5 Capital and Operating Costs

Operating Costs

Operating cost estimates for Kinsenda for salaries and wages (total mine) and administration at steady state are as follows:

- Salaries and wages USD14.14 million;
- Administration USD4.08 million.

Capital Costs

The capital cost estimates for infrastructure and engineering for Kinsenda are set out in Table 5.19.

Table 5.19: Kinsenda – infrastructure and engineering capital cost estimates

	Capital (USDm)				
	Total Project	**Spent H1-F2013**	**H2-F2013**	**F2014**	**F2015**
Central Area					
Earthworks	0.46				
Buildings	4.12				
Services	3.88				
Power supply	7.99				
General	1.57				
Transport Vehicles					
Ventilation - civils	0.32				
P&G's	4.45				
Sub-total Central Area	**22.79**	5.00	0.24	16.41	1.14
Kinsenda Puits					
Earthworks	0.17				
Buildings	0.00				
Materials handling	0.72				
Services	2.25				
General	0.01				
P&G's	0.55				
Sub-total Kinsenda Puits	**3.70**		2.62	1.07	0.00
EPCM costs	43.91		10.10	31.62	2.20
Estimating Inaccuracy / contingencies	28.68		6.60	20.65	1.43
Owners' costs	40.00	4.80	11.20	20.00	5.00
Ongoing capital costs	24.44				18.33
Community Development	5.00		0.30	0.30	0.30
Commissioning, ramp-up	4.80				3.60

According to information provided by Metorex, USD12.3 million of the F2013 capital was expended during H1-F2013. There is however insufficient detail to identify on which specific items this amount has been spent, so the capital in Table 5.11 reflects the total for H1-F2013 and the remaining balance for H2-F2013. The H2-F2013 figures are incorporated in the financial model output in Section 5.18.

5.12.6 SRK Comments

SRK is concerned with the safety standards on the cage rope attachment in the vertical shaft. On inspection of the capital budget, SRK noted that the additional safety devices for the cage have been included in the capital budget. The upgraded cages have been ordered and delivered and the Headgear strengthening work is presently underway.

SRK is satisfied with the design criteria and planned upgrade of electrical services. The level of reliability from the grid supply is still relatively poor. A number of upgrades are planned, including the installation of four 2.5 MVA diesel generators which should enable power supply to be more stable.

SRK suggests that KICC looks at installing alternative solar-voltaic/diesel hybrid back-up generators to drastically reduce the diesel consumption on site. Metorex indicated that such studies are underway.

The cellular communication network is reasonable and SRK is satisfied with the level of communications provided in the project.

The present dewatering system should be viewed as a temporary arrangement, as the pipe columns are badly corroded and many welded repairs could be seen. SRK was advised that new pipes had been provided for in the project capital.

The above short comings are being addressed with the commissioning of three vertical 30 m settlers and one clear water vertical dam, 30 m high to ensure a flooded suction to the Sulzer clear water pumps. Additional provision has been made to install three off mud pumps, to control the level of mud in each dirty water settler. SRK fully supports this design upgrade as it addresses the present situation.

The existing system will be extended as the mine deepens, but only allows for dirty water pumping, which tends to suggest that no mud pumping is taking place. SRK is concerned that the quality of the water feeding into the Sulzers will not be clean and this will have a negative impact on pump life.

5.13 Logistics

[SR5.6]

The Kinsenda study assumed that 65% of power required during Year 1-5 of operation will be supplied by SNEL, with the balance being generated on site using diesel powered generator sets. From Year 6-20 of operation, 85% of power required will be supplied by SNEL, with 15% being generated on site using diesel power generator sets. The large volume of diesel required will need to be road hauled in from Zambia - the congestion and long waiting periods to cross the DRC-Zambian border will subject the mine to operational risk.

It was stated that concentrate produced by the mine would possibly be road hauled, under third party contract, to the Ruashi Mine metallurgical plant in Lubumbashi. Currently, the majority of the road between the Kinsenda Mine and Ruashi Mine is blacktopped and in reasonably good condition, there are certain areas that require rehabilitation, but presently this does not pose a significant risk to the operations.

The road transport system is in a moderate state and Metorex intends fixing certain aspects of the road network as part of the project capital programme.

5.14 Human Resources

[SR5.3, SR5.4C, SR5.5C]

5.14.1 Operating Structure

Under steady state operations, approximately 656 people will be permanently employed at Kinsenda (Table 5.20). Of the permanent employees, 16 will be expatriates and the balance will be drawn from the existing pool of manpower in the area.

The distribution of the permanent employees within the different departments is shown in Table 5.20.

5.14.2 Mine Complement

Accommodation for skilled and unskilled personnel is reasonably available in the adjacent villages of Tshinsenda, Kinsenda, Koyo and Kasumbalesa.

Table 5.20: Kinsenda – Manpower complement

Area		Complement
Process plant		142
Mining		105
Engineering		122
Finance		35
MRM		20
Services		217
Expatriates		16
TOTAL		656
Productivity indices:		
RoM ore	t/TEC/month	77.2
Cu produced	t/TEC/month	2.6

5.14.3 Productivity Assumptions

The productivity statistics for Kinsenda are estimated at 77 tonnes processed per TEC per month and 2.6 tonnes of copper cathode per TEC per month (see Table 5.19).

5.14.4 Termination Benefits

Metorex stated that it had assumed a 12 month obligation at the end of the LoM, but the USD4.1 million provided in the financial model is not consistent with the annual salary bill of USD14.1 million. SRK has provided a 6 month obligation of USD7.1 million, on a similar basis as that applied for Ruashi (see Section 3.14). SRK considers this to be reasonable given the available information.

Metorex confirmed that benefits have been conservatively estimated and will be reviewed on an annual basis to ensure that adequate provision and funding is in place.

5.14.5 SRK Comments

The current LoM plan includes an allowance for the potential terminal benefits liability which may be incurred on closure. The risk that this may be understated is considered to be low.

5.15 Occupational Health and Safety

The discussion on SHEC Policy and group-wide safety statistics is set out in Sections 3.15.1 and 3.15.2 earlier in this CPVR.

5.15.1 Quarterly SHEC Reports

Safety

To gauge how successfully the SHEC policy and systems have been implemented, the safety performance statistics for Kinsenda for F2010 to H1-F2013 are shown in Table 5.21.

Table 5.21: Kinsenda Project – Safety Indicator Statistics F2010 to H1-F2013

Safety indicator	Total F2010	Total F2011	Total F2012	Total H1-2013
PTO	441	707	557	364
NLTI	1	3	6	0
LTI	1	0	3	0
TRI	2	3	9	0
RI	0	0	1	0
LD	17	0	124	0
F	0	0	0	0
LTIFR (No / mmh)	0.8	0.0	2.9	0

Legend to safety indicator descriptions:

PTO planned task observations carried out;
NLTI non-lost time injuries (accidents);
LTI lost time injuries;
TRI total recordable injuries;
RI reportable injuries (>14 days off work);
LD lost days due to accidents, not able to return to work
F fatality

The number of planned task observations increased in H1-F2013, compared to F2012. The safety statistics have deteriorated during F2012 entirely as a result of one off-site motor vehicle accident in which 3 employees were injured. This single accident resulted in the major increase in the number of days lost during F2012. During the SRK site visits, no operators were seen to be working unsafely or working without the necessary equipment and PPE. In contrast to the 2012 safety performance, the first half of 2013 has seen a marked improvement in safety performance with no lost time or non lost time accidents report to date.

Management and supervisors need to continue to concentrate their efforts on raising safety awareness in the work place. Engineering and mining needs to be more pro-active and increase the number of work place audits / PTOs, as the mine returns to production in the coming years.

SRK has reviewed the last two quarterly reports of F2012 for Kinsenda, and the following points were noted:

- PPE has been extensively introduced into the work place;
- In Q3/2012, a 25 ton crane offloading shipping containers suffered a lifting rope failure. Inspection of the photographs in the quarterly SHEC report suggests that the hoist lifting rope was not lubricated and was in a poor condition. Metorex advised SRK that the lifting rope was new, but failed due to reasons unknown. Mine management should ensure that equipment which is in a poor condition is not allowed to operate on the mine property;
- In October 2012, three hoppers and a guard's van derailed in the LOZ decline. On inspection it was found that the rails were badly worn (old second hand rails) and poorly installed, levelled and secured. The decline hoist has not got slack rope detection and protection fitted, whereby the slack rope will trip out the hoist and notify the driver of a slack rope occurring. The decline is not fitted with Marshalling derailment wires down the decline, which trips out the hoist and notifies the driver of a derailment in the decline. SRK believes this is not acceptable and these devices are critical to ensure the safety of people travelling in the decline;
- In November 2012, a contractor security vehicle overturned on a bend of a gravel road. It would appear that the driver was speeding, however, the vehicle was not serviceable as it had worn out tyres. The vehicle had seven passengers and two occupants were thrown out of the vehicle. On inspection it was found that the

seat belts were unserviceable. It is clear that the driver was not aware of the hazards associated with driving an unserviceable vehicle at speed on a gravel road;

- Planned task observations have increased relative to the numbers carried out in 2011 and 2012. The negative trend seen in 2012 has been improved on.

Health

Table 5.22 shows Kinsenda health statistics.

Table 5.22: Kinsenda Project – Health Statistics F2010 to H1-F2013

Safety indicator	Total F2011	F2012					F2013		
		Q1	Q2	Q3	Q4	Total	Q1	Q2	Total
Medical Examinations	4004	1377	1270	1049	1163	4859	1221	1166	2387
Sick Leave Days	574	129	106	222	419	876	126	213	339
New TB cases	14	0	0	0	0	0	2	2	4
New HIV/Aids cases	4	1	4	1	3	9	1	9	10
VCT	71	21	30	25	69	145	17	154	171
Malaria cases	1336	366	318	221	246	1151	257	269	522

Sick leave has decreased in F2013 when compared to F2012, but has increased when compared to F2011. It is concerning that most of the statistics have deteriorated since 2012.

Environment

Water quality from underground has improved and is largely within DRC water quality standards.

Community

Relationships with the local community remain good.

5.15.2 Site visit observations

The mine equipment generally appeared to be well maintained, however, there were a number of concerns raised during the surface and underground visits:

- The winding and headgear shortcomings detailed in section 6.14 need to be addressed with some urgency;
- The 10 MVA main consumer substation is old and in need of replacement, the power factor is low for the site and power supply is unstable and unreliable;
- The LOZ decline construction, rails and sleepers are worn and need to be replaced; the winder needs slack rope detection and protection systems. The decline rails need Marshalling derailment wires run along the length of the decline that will trip the winder and notify the winding engine driver that a derailment has occurred in the decline;
- The clear water pumping columns need to be replaced in the main shaft in the LOZ decline and on the levels, as the potential of flooding exists due to worn pipes.
- The clear water pumping short comings are being ddressed with the commissioning of three vertical 30 m settlers and one clear water vertical dam, 30 m high to ensure a flooded suction to the Sulzer clear water pumps. Additional provision has been made to install three off mud pumps, to control the level of mud in each dirty water settler. SRK fully supports this design upgrade as it addresses the present situation.

5.15.3 SRK Comments

Kinsenda mine has improved its overall safety performance in H1-F2013, when compared to F2012. The safety statistics supplied reflect the standards of safety, maintenance, repairs and operations seen on site. The performance was poor in F2012 but has improved in H1-F2013 due to zero accidents in the year to date. The level of lost time accidents and non lost time accidents has reduced dramatically when compared to F2012.

The safe operating condition of equipment in certain areas is not up to standard and management needs to make efforts to address the equipment shortcomings detailed in this safety report. Inspection schedules when managed properly will not allow the continued use of poorly maintained equipment. All contractor equipment should be inspected and passed out as safe to operate on the mine;

SRK advises that capital needs to be made available to address the shortcomings of the Winding plants, the decline winder and the underground pipework, to reduce the risks of injuries to persons;

SRK recommends that management continue to concentrate their efforts on employees' behavioural aspects towards safety and health in the work place. This needs to include more safety awareness and risk awareness in the work place. This particular aspect could form part of the work based auditing and planned task observation processes currently carried out by management and supervisors.

SRK has been appraised by Metorex that policies and management systems to educate employees on workplace health and safety have been put in place.

Metorex reported that the mine has implemented a comprehensive Health and Safety plan in order to improve the compliance to Health and Safety standards. A number of procedures governing the behaviours of staff and contractors have been formalised and these were implemented to improve the safety culture and to improve the management of contractors. The mechanical shortcomings identified as contributors to safety incidents have been prioritised and will be addressed as part of the approved Kinsenda project. The level of expatriate staffing is increasing with the project mobilisation and upskilling of the labour force is being undertaken.

5.16 Environmental

[SR5.2B/C]

Discussions were held during the site visit with Mr Derek Olivier. Following the site visit, further discussions were held with Mr Trevor Faber and Ms Colleen Perkins (telephonic only) of Metorex, Mr Alkie Marais of GCS Consulting (telephonic only) and Mr Hylton Allison (SLR Consulting).

5.16.1 Regional Setting

Kinsenda is a brownfield site located in the Katanga Province of the RDC, some 5 km from the Zambian border, near the town of Kasumbalesa. The mine operates in the specified area according to PE101, which is within the much larger exploration rights area known as PR4724.

5.16.2 Project Description

KICC is proposing to expand and upgrade its current surface and underground operations at the mine from a care and maintenance state to a fully operational mine. The main components of the expansion project include:

- An increased rate of mine de-watering,
- Phased tailings dam establishment,
- A backfill plant,
- A mine workshop,
- A temporary construction camp,
- Additional power supply.
- A concentrator plant,
- A new portal to the underground workings
- Additional support infrastructure and services.

5.16.3 General Observations Regarding Environmental Management

Tailings Disposal

In addition to a planned TSF, there is provision for a tailings backfilling plant but this is also subject to further investigation and assessment of the geochemical characteristics of the tailings, to be included in an updated geohydrological model.

Water management

The site has a positive water balance. A water balance model was used to develop the solute transport model and the EMP makes provision in several instances to update the water balance to reduce existing uncertainties. Dewatering of the existing underground workings has been identified as a potential issue in terms of ecological impacts.

- **Ground water**

  The possibility of impacts associated with dewatering is real but from information reviewed likely to be manageable, with water treatment prior to discharge of effluent recognised as possibly being necessary. The need for treatment can, however, be minimised by separating clean and dirty water to the extent that this possible. Planned pumping therefore separates that water into two streams, Aquifer Water and Mining Water.

  Aquifer Water is pumped to surface and discharged into the surface water system, or used for irrigation. This is an acceptable approach if the water quality is acceptable, which is borne out by the Q3 and Q4 SHEC reports which indicates reducing Cu concentrations. It has however been acknowledged that certainty with respect to the interception of clean water, to prevent it flowing into the mine, has not yet been obtained. Some doubt as to the effectiveness of the separation of clean and dirty water must therefore be assumed.

  The process and mine water balance is currently being developed by DRA, while SLR will incorporate water discharges and the use of water for irrigation into the overall water balance. Water treatment is not envisaged unless IFC effluent conditions are not met. A contingency has been included in the budget for this.

  The inflow rate was estimated at 1 800 m^3/h or some 43 Ml/day in the current EIA . The 2011 study by KLMCS indicates that this will increase to more than 70 Ml/ day over the life of the mine. In discussion with GCS Consulting a figure of up to 100 Ml/day was mentioned. The effect of this de-watering the deeper the mine extends will be to cause a cone of depression to occur around the mine in all directions. The specialists determined that the most significant zone of impact where third party drill holes could potentially dry up is in an approximate 20 km radius around the mine. The mine dewatering from the Roan aquifer in the south of the site is unlikely to impact third party drill holes as these are limited to start and are typically confined to the fractured aquifer. In terms of current planning, communities are not expected to be affected by the dewatering. This depends to some extent on people moving away from potentially affected areas to more favourable farming areas. This approach will be encouraged by Metorex

  Metorex has indicated that test results show the aquifer water will meet discharge requirements and can therefore be discharged to the environment. Water used for mining and processing will be contaminated and treated for re-use on site. Metorex reported that from experience post flooding of the mine in 1997, the natural level of the aquifer water reverts to approximately 120m below the surface and therefore decant to surface is highly unlikely.

- **Surface Water**

  Adequate surface water management is generally achievable with sufficient planning, but the impact on surface water is rated in the EIA as being of High to Medium significance in the post mitigation scenario, which suggests the need for attention to this aspect of environmental management.

  Metorex indicated that berms and channels have been incorporated into the surface water management design, which will prevent contamination of the surface water with industrial water.

Other Environmental Concerns

In addition to the impacts on water resources discussed above, the EIA undertaken in 2012 identifies the following potential environmental impacts:

- Hazardous structures, including excavations, infrastructure or land forms (i.e. waste rock dumps or subsided areas).
- Loss of soil resources and associated natural land capabilities.
- Physical destruction and general disturbance of biodiversity. The proposed project will be located within areas ranging from very low to high conservation importance/sensitivity. The effluent discharge and the anthropocentric impacts on the Kitotwe Stream and the tributary of the Kinsenda River are already having a significant impact on the riparian and aquatic biodiversity in this area in the unmitigated scenario, in the mitigated scenario the situation is likely to improve.
- Contribution to air pollution.(Mainly PM10s), noting that the area is subject to temperature inversions which will prohibit the dispersion of pollutants in the atmosphere.
- Contribution to disturbing noise levels.
- Visual impacts.
- Destruction and disturbance of heritage resources (sites and landscapes of archaeological, cultural or historical importance have been identified on the site).

These impacts are manageable in terms of well understood technologies.

5.16.4 Potentially Material Social Risks

The Social Impact Assessment concludes that overall, the Project will result in no unacceptable impacts. However, several of the mitigatable impacts have the potential to become unacceptable if poorly managed.

It is proposed that the availability of excess water, which can be used for irrigation, can be made available in suitable agricultural areas, thereby enticing people away from the tailings dam area.

Metorex has undertaken to compile and implement a formal Relocation Action Plan should the need arise.

5.16.5 Legal Compliance

The approved Environmental Impact Assessment ("EIA") compiled by SLR has taken local legislation and international requirements into account. It is SRK's view that provided the mine adheres to the remedial measures and obligations of the EIA, there should be no reason that would prevent the project from going ahead. This report does not constitute a legal review and SRK does not make any claim or state any opinion as to the ability of the mine to obtain or renew the necessary permits. It must also be noted that this view by SRK does not imply that the mine is in strict compliance with all the requirements of the EIA or other permits.

5.16.6 Mine Closure Planning and Financial Provision

[SR5.2C]

Closure costs, in present day terms, were assessed by SLR as follows:

Infrastructure Currently on site	USD0.43 million;
Infrastructure as at 31 December 2012 (commencement of mining)	USD4.84 million;
Infrastructure at end of LoM	USD13.21 million.

These closure costs are not based on a definitive closure plan and hence may change as closure objectives are identified and/or more information becomes available. SLR used guidelines developed by the South African Department of Mineral Resources ("DMR") to check the SLR closure cost estimates. The DMR rates were escalated to account for inflation (DMR rates were last updated in 2004) and also increased by 50% to account for working outside of South Africa. On this basis, SRK did not identify any reason to change the cost estimate for demolition and rehabilitation, but notes that no allowance was made for post closure decant of contaminated water. This is regarded as a risk which may, however be regarded as relatively low in the light of the fact that no evidence of decant has been noted. In this respect Metorex has a group-wide provision for post-closure water treatment of around USD5million. In SRK's experience, this figure is likely to be considerably more. In the absence of any proper evaluation of the extent (quantities) and severity (pH or TDS) of water to be treated, SRK has for evaluation purposes increased this provision for post closure water treatment to USD25 million of which USD5 million has been allocated to Kinsenda.

Adding this provision to the closure cost estimate by SLR increases the estimate to USD18.21 million.

5.17 Material Contracts

5.17.1 Concentrate Sale Agreement

[SR5.8]

Kinsenda plans to sell its sulphide copper concentrate to CCS. SRK understands that Kinsenda still has to enter into such an agreement with CCS.

SRK expects that the terms of such an agreement would be similar to those of the agreement between Chibuluma and CCS (see section 4.17.1).

5.17.2 Power Supply

[SR5.6]

Kinsenda will receive it power from SNEL in terms of an H.V. electricity agreement. The copy of the agreement provided to SRK had not been signed.

Electrical energy is to be provided with 3-phase 50 Hz alternating current at a nominal voltage of 220 kV at point of supply.

The supply agreement provided for the subscribed demand to increase in a step-wise fashion from 5.1 MW (2012) to 8 MW (January to June 2013) to 15 MW from July 2013 onwards. The duration of the supply agreement is not stated.

KICC has to notify SNEL each year of its projected energy requirements for the next 5-year period. If SNEL is unable to meet the notified 5-year power demand, Ruashi Mining is "free to supply his demand from his own generation". The agreement allows SNEL to interrupt supply to carry out maintenance and emergency repairs, up to a maximum of 10 hours per calendar year. The price payable is made up of two components, a demand fee and a usage fee, which are adjusted annually by a factor linked to consumer price index ("**CPI**") in October of each year as published by the US Department of Economic Affairs. A sliding scale of penalties applies when the power factor drops below 90%. Similarly, a sliding scale of penalties, which acts as a discount to the invoiced amount, is based on the aggregate supply interruptions recorded during any month.

KICC operates the Kasumbalesa HV substation which feeds in addition to the Kinsenda mine other clients of SNEL.

5.18 Financial Model

[SR5.7, SR5.8]

5.18.1 Financial model summary

The key TEPs from the Kinsenda FM are summarised in this section.

5.18.2 Financial / Economic Criteria

Incorporated into the Kinsenda FM are the following financial / economic criteria:

- There are no hedging contracts in place for LoM;
- Depreciation allowance for tax purposes is 60% of capital expenditure in a given year plus 15% of the accumulated unredeemed capital expenditure, which excludes the 40% of that year's capital spent;
- Metallurgical recoveries are set at 96% and 63.3% for LoM for sulphide and oxide ores respectively;
- Sulphide and oxide concentrates are treated at CCS and Ruashi respectively;
- The revised contract terms for export / clearing of the Cu and Co final products are applied with effect from 1 January 2013;
- Terminal benefits based on a 6-month provision at end of LoM;
- A 2.5% royalty payment on gross sales.

5.18.3 Financial model summary

The key TEPs for the revised LoM FM for Kinsenda are summarised in Table 5.23.

The production schedule is as estimated by Metorex as part of the feasibility study and audited by SRK.

The process recoveries are supported by metallurgical testwork.

The cost components for Kinsenda are based on the feasibility study. The mining costs applied are the actual costs incurred by Chibuluma for F2012. The plant costs for Kinsenda are as estimated by DRA. SRK has reviewed these costs for reasonableness. Where deemed necessary, SRK has adjusted the forecast costs as used in the financial models.

The capital expenditures are as per the feasibility supplied by Metorex and reviewed by SRK. Based on its review, SRK has added capital amounts as deemed necessary.

SRK reviewed the terms of the toll trating arrangement for the oxide concentrates and confirmed these were correctly incorporated into the Kinsenda LoM FM. Metorex applied the same off-take terms for the treatment of the sulphide concentrates as those that apply to the Chibuluma concentrates. SRK confirmed this was correctly incorporated into the Kinsenda FM.

Table 5.23: Kinsenda Mine – summary of post-tax pre-finance cash flow model

Item	Units	Total / Average	H2-F2013	F2014	F2015	F2016	F2017	F2018	F2019	F2020	F2021	F2022	F2023	F2024	F2025
Production															
ROM mined	(kt)	6 101	0	0	506	608	608	608	608	608	608	608	608	524	207
Ore milled	(kt)	6 101	0	0	506	608	608	608	608	608	608	608	608	524	207
Cu feed grade	(%)	52.78%	0.00%	0.00%	4.88%	4.87%	4.83%	4.76%	4.67%	4.77%	4.89%	4.89%	4.72%	4.81%	4.68%
Total contained Cu	(kt)	293.1	0.0	0.0	24.7	29.6	29.3	29.0	28.4	29.0	29.8	29.8	28.7	25.2	9.7
Percent sulphide in mill feed	(%)	73%	0%	0%	73%	73%	72%	73%	73%	74%	74%	74%	72%	71%	71%
Processing															
Metallurgical recovery Cu sulphide	(%)	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%
Metallurgical recovery Cu oxide	(%)	63.3%	63.3%	63.3%	63.3%	63.3%	63.3%	63.3%	63.3%	63.3%	63.3%	63.3%	63.3%	63.3%	63.3%
Payability - Cu in sulphides	(%)	96.5%	96.5%	96.5%	96.5%	96.5%	96.5%	96.5%	96.5%	96.5%	96.5%	96.5%	96.5%	96.5%	96.5%
Payability - Cu in oxides	(%)	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%
Payable Cu	(kt)	244.7	0.0	0.0	20.6	24.7	24.4	24.2	23.7	24.3	25.0	25.0	23.8	20.9	8.0
Commodity sales															
Cu sales - LME grade	(kt)		0.0	0.0	20.6	24.7	24.4	24.2	23.7	24.3	25.0	25.0	23.8	20.9	8.0
Commodity prices															
Average Cu LME	(USD/t)	8 171	8 171	8 171	8 171	8 171	8 171	8 171	8 171	8 171	8 171	8 171	8 171	8 171	8 171
Revenue Real	(USDm)	1 999.1	0.0	0.0	168.6	202.0	199.5	197.4	193.6	198.4	204.3	204.2	194.8	170.7	65.5
Copper sales	(USDm)	1 999.1	0.0	0.0	168.6	202.0	199.5	197.4	193.6	198.4	204.3	204.2	194.8	170.7	65.5
Operating expenditure	**(USDm)**	(976.2)	(0.1)	(3.5)	(83.0)	(93.3)	(92.6)	(93.5)	(93.1)	(94.2)	(94.9)	(92.0)	(88.1)	(82.1)	(65.8)
Mining (excl salaries)	(USDm)	(234.7)	(0.1)	(2.5)	(21.1)	(22.7)	(22.6)	(23.9)	(24.4)	(24.4)	(23.7)	(20.8)	(19.1)	(17.8)	(11.5)
Processing (excluding salaries)	(USDm)	(90.7)	0.0	0.0	(7.5)	(9.0)	(9.0)	(9.0)	(9.0)	(9.0)	(9.0)	(9.0)	(9.0)	(7.8)	(3.1)
Engineering (excluding salaries)	(USDm)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Administration (incl salaries)	(USDm)	(196.9)	0.0	(1.0)	(18.2)	(18.2)	(18.2)	(18.2)	(18.2)	(18.2)	(18.2)	(18.2)	(18.2)	(18.2)	(13.7)
Environmental / closure	(USDm)	(13.2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	(13.2)
Post-closure water treatment	(USDm)	(5.0)													(5.0)
Management fees	(USDm)	0.0													
Realisation / off-mine costs - sulphides	(USDm)	(325.9)	0.0	0.0	(27.6)	(33.0)	(32.3)	(32.1)	(31.6)	(32.6)	(33.8)	(33.8)	(31.4)	(27.3)	(10.5)
Realisation / off-mine costs - oxides	(USDm)	(62.6)	0.0	0.0	(5.2)	(6.3)	(6.4)	(6.2)	(6.1)	(6.0)	(6.0)	(6.0)	(6.4)	(5.8)	(2.2)
Royalties	(USDm)	(40.3)	0.0	0.0	(3.4)	(4.1)	(4.0)	(4.0)	(3.9)	(4.0)	(4.1)	(4.1)	(3.9)	(3.4)	(1.3)
Terminal benefits	(USDm)	(7.1)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	(1.8)	(5.3)
Operating Profit	**(USDm)**	1 022.9	(0.1)	(3.5)	85.6	108.7	106.9	104.0	100.5	104.2	109.4	112.3	106.7	88.6	(0.3)
Capital Expenditure	**(USDm)**	(390.0)	(70.5)	(182.2)	(46.7)	(11.4)	(11.8)	(13.7)	(4.1)	(11.8)	(4.2)	(4.6)	(14.2)	(12.1)	(2.8)
Project capital	(USDm)	(307.1)	(70.5)	(182.2)	(42.9)	(7.6)	(0.3)	(0.3)	(0.3)	(0.3)	(0.5)	(0.8)	(0.8)	(0.6)	0.0
Sustaining capital	(USDm)	(82.9)	0.0	0.0	(3.8)	(3.8)	(11.5)	(13.4)	(3.8)	(11.5)	(3.8)	(3.8)	(13.4)	(11.5)	(2.8)

Item	Units	Total / Average	H2-F2013	F2014	F2015	F2016	F2017	F2018	F2019	F2020	F2021	F2022	F2023	F2024	F2025
Working capital movements	(USDm)	7.5	17.3	5.5	(22.9)	(6.3)	0.2	0.5	(0.9)	0.6	(1.4)	(0.3)	1.6	1.1	12.3
Company taxation	(USDm)	(149.8)	0.0	0.0	0.0	0.0	0.0	0.0	(18.2)	(25.1)	(28.4)	(29.7)	(26.7)	(21.8)	0.0
Free cash before debt service	**(USDm)**	490.6	(53.2)	(180.1)	16.0	91.1	95.3	90.8	77.4	67.9	75.3	77.7	67.5	55.7	9.2
Reporting Statistics															
Cash Operating cost	(USc/lb Cu produced)	101			103	92	93	96	99	96	93	87	88	99	265
Total working cost	(USc/lb Cu produced)	181	0	0	183	171	172	175	178	176	172	167	168	178	372

5.18.4 WACC

The parameters used to generate the WACC for Kinsenda are the same as those set out in Section 3.18.4.

At a 45 / 55 debt / equity ratio, the real WACC for Kinsenda is 10.43%.

5.18.5 Sensitivities

The following tables present the NPVs of the real post-tax pre-finance cash flows as determined from the Kinsenda FM using mid-year discounting. In summary they include the following:

- The variation in real NPV with discount factors (Table 5.24);
- The variation in real NPV based on twin (revenue and operating expenditure) sensitivities (Table 5.25);
- The variation in real NPV based on changes to the Cu price (Table 5.26).

Table 5.24: Kinsenda Mine – variation in Real NPV with discount factors

Discount rate	NPV (mid-year) (USDm)
6.00%	276.2
7.00%	249.8
8.00%	225.5
9.00%	203.1
10.00%	182.4
10.43%	174.0
11.00%	163.2
12.00%	145.5
13.00%	129.0
15.00%	99.5

Table 5.25: Kinsenda Mine – variation in Real NPV based on twin parameter sensitivities

		Revenue Sensitivity						
		70%	80%	90%	100%	110%	120%	130%
Opex Sensitivity	70.0%	49.4	128.1	204.6	280.0	354.6	429.0	503.3
	80.0%	11.7	91.6	168.9	244.7	319.9	394.3	468.6
	90.0%	(27.0)	54.7	133.1	209.5	284.9	359.5	433.9
	100.0%	(73.3)	17.2	96.8	174.0	249.7	324.8	399.1
	110.0%	(121.6)	(21.3)	60.0	138.2	214.5	289.9	364.4
	120.0%	(169.9)	(65.9)	22.6	102.0	179.0	254.7	329.7
	130.0%	(218.3)	(114.3)	(15.7)	65.3	143.2	219.5	294.8

Table 5.26: Kinsenda Mine – variation in Real NPV based on Cu price sensitivity

		Copper Price Sensitivity						
Discount Rate	USC/lb	257	294	331	368	404	441	478
	USD/t	5 672	6 482	7 293	8 103	8 913	9 724	10 534
7.00%	58%	(32.9)	80.1	179.1	276.2	372.1	467.6	562.6
8.00%	67%	(43.4)	63.8	157.9	249.8	340.6	430.8	520.5
9.00%	77%	(53.1)	48.8	138.3	225.5	311.5	396.9	481.6
10.00%	86%	(61.9)	35.0	120.2	203.1	284.6	365.6	445.8
10.43%	96%	(81.5)	4.1	79.6	152.6	224.1	294.9	364.9
11.00%	100%	(73.3)	17.2	96.8	174.0	249.7	324.8	399.1
12.00%	105%	(77.4)	10.6	88.1	163.2	236.8	309.8	381.9
13.00%	115%	(84.2)	(0.2)	73.9	145.5	215.5	284.9	353.4
15.00%	125%	(90.4)	(10.2)	60.7	129.0	195.8	261.8	327.0

5.19 Summary of Key Risks

[SV2.10]

A summary of the key risks identified for Kinsenda is provided here. Metorex advised SRK that it has a comprehensive risk management process in place which is aimed at identifying and ranking risks across all of the group's operations to determine an overall risk profile for the group. The risks identified by SRK have broadly been incorporated into the overall group risk management process and are being addressed through this.

5.19.1 Tenure

There do not appear to be any risks to Kinsenda from a tenure perspective.

5.19.2 Mineral Resources

There were instances of significant errors in duplicate assays, interpreted to be swapped samples. This indicates that sample cross contamination may have occurred in the sample preparation. The level of contamination is low, and is unlikely to have a material impact on any of the analyses used in the resource estimation

Although many of the CRM results did not satisfy the 95% compliance limit of two standard deviations, there is no indication of a material bias in any of the results. The precision of the analyses could be improved. Metorex stated that the CRM material was certified for TCu only – many of the differences noted were for AsCu for which there is no certified material.

The majority of the most significant errors are for very low values, close to the detection limits. This is unlikely to pose a risk to Kinsenda.

The ore grade wireframes in some cases do not honour the dataset as reported and are over extended.

Except for the MOZ domain, statistical means of the grades for the samples and model estimates compare fairly well, and the grades have not been over estimated. As MOZ ore is not included in the LoM plan, there is minimal risk to Kinsenda.

5.19.3 Rock Engineering

Despite the inconsistencies between the RMR and Q values, and possible errors in the application of the Mathews-Potvin HR method, the final geotechnical designs for Kinsenda are considered to be valid.

SRK has highlighted a number of areas where additional investigations should be undertaken to improve the confidence in the geotechnical designs.

In SRK's opinion, the proposed dewatering system is exposed to the double risks of power availability and drill hole pump reliability. It is noted that implementation of a gravity driven drainage system has been included in the project implementation plan.

There is a risk associated with the deposition of the -40 µm tailings on the TSF, that it will be too fine to drain and will be inadequate for wall building. However, as only 40% of the total tailings material will be used as fill underground, Metorex believes that there will be sufficient coarse material available to provide more stability. In addition the available free board should provide adequate time for fines to settle.

5.19.4 Hydrogeology

The risk to surrounding groundwater users from both a water quality aspect (contamination) and water supply has been identified. In this respect, it is noted that the possible measures discussed in Section 5.16.3 refer to potential prevention / mitigation measures only and hence are not regarded by SRK as sufficient to address the risks identified in this section. The surrounding communities are currently using untreated surface water and hence they are more vulnerable to water contamination.

No clear indication is given in the Kinsenda FS report on proposed preventative / mitigation measures to reduce / prevent groundwater or surface water contamination.

The groundwater and surface monitoring programme still needs to be developed and implemented. There is a risk that Kinsenda will not have sufficient data to disprove any claims for contamination of water. Metorex maintains that the monitoring programme will provide sufficient base line information to refute any claims.

Concerns about the structural integrity of the dolomites during dewatering in the Roan aquifer are raised in the Kinsenda FS report. Metorex has advised that this will be investigated during H2-F2013.

5.19.5 Mining

The mine design uses standard mining methods and mining equipment that are suitable to the methods selected. From the information provided, the design parameters used are in line with industry standards.

SRK is therefore of the opinion that other than normal operational difficulties, the risk associated with the mine design and achievability of the LoM plan is minimal.

5.19.6 Metallurgical Processing

The capital cost estimate allows for a concentrator plant that contains all the essential items required to produce the results as predicted in the metallurgical test work. There are certain additional items identified, but not included in the capital estimate. There is a risk that the capital provided for the construction of the plant is too low. Metorex believes that the capital estimate is adequate, as it was developed by DRA to a high level of accuracy, includes contingencies and is in line with industry benchmarks.

The overall copper recovery of 88% is consistent with the laboratory test work, but this will need to be confirmed in practice.

The metallurgical test work was performed on 29 drill core samples, at laboratory scale. This is a very limited exposure on which to base a plant design. The scalability of metallurgical results from laboratory scale to full-scale plant is always problematic, and there is a risk that the recoveries may be overstated and plant operating parameters such as consumption rates may be too low. Metorex reported that additional testwork had been conducted on Kinsenda drill hole cores at Mintek and Ammtec in Australia, which confirmed the earlier findings and envisaged plant design.

An order signed by the DRC Minister of Mines in April 2013 banned the export of Cu/Co concentrates. Permission was obtained from the DRC Government to export the sulphide concentrates across the border to Zambia, subject to paying an increased export tax of USD100/t. Communiques from the DRC Government suggest that the export tax could be even higher. To mitigate against the ban and increased export taxes, Metorex has initiated an investigation into a central roasting plant to produce a calcined product that would be leachable in a conventional SX-EW plant such as that at Ruashi Mine.

5.19.7 Tailings

SRK is aware that the selected site for the TSF may have to be moved as a result of a bigger area being required. No decision has yet been made in this respect and the new site selection process has yet to be finalised. There is thus a risk that an area sufficiently large cannot be located. If only 60% of the tailings volumes report to the TSF, Metorex maintains that the area for the TSF should be sufficient.

The preliminary geotechnical investigation concludes that the underlying soils, once the topsoil and upper transported soils have been removed, should be suitable for construction of the proposed tailings storage facility embankments. This will have to be confirmed prior to construction.

Test work undertaken for the Kinsenda tailings to date indicates that an unlined TSF will be acceptable for the operation in terms of water quality as AMD is not anticipated. Further testwork is underway in a final leachate test work programme. If the results require that a lined facility has to be constructed, the capital cost of the TSF would have to be increased. It appears in the light of test work undertaken to date that this will be unlikely.

5.19.8 Engineering and Surface Infrastructure

SRK is concerned with the safety standards on the cage rope attachment in the vertical shaft. SRK noted that the additional safety devices for the cage have been included in the capital budget. On inspection of the capital budget, SRK noted that the additional safety devices for the cage have been included in the capital budget. The upgraded cages have been ordered and delivered and the Headgear strengthening work is presently underway.

The design of the proposed dewatering system has been revised to incorporate three 30 m vertical settlers and one 30 m high clear water dam, to ensure a flooded suction to the Sulzer clear water pumps. Additional provision has been made to install three mud pumps, to control the level of mud in each dirty water settler. SRK fully supports this design upgrade.

The existing system will be extended as the mine deepens, but only allows for dirty water pumping, which tends to suggest that no mud pumping is taking place. SRK is concerned that the quality of the water feeding into the Sulzers will not be clean and this will have a negative impact on pump life.

5.19.9 Logistics

The large volume of diesel required for the diesel powered generator sets will need to be road hauled in from Zambia. The congestion and long waiting periods to cross the DRC Zambian border will subject the mine to operational risk. The logistics risk of securing sufficient diesel to power the diesel generators will be managed by the operational team.

5.19.10 Human Resources

There is a risk that the termination benefit at closure which has been set equal to a 6 month obligation may be understated. Metorex confirmed that benefits have been conservatively estimated and will be reviewed on an annual basis to ensure that adequate provision and funding is in place.

5.19.11 Occupational Health and Safety

Kinsenda mine has improved its overall safety performance in H1-F2013, when compared to F2012. The safety statistics supplied reflect the standards of safety, maintenance, repairs and operations seen on site.

The safe operating condition of equipment in certain areas is not up to standard and management needs to make efforts to address the equipment shortcomings detailed. All contractor equipment should be inspected and passed out as safe to operate on the mine.

The shortcomings of the winding plants, the decline winder and the underground pipework, unless remedied, represent possible risk of injuries to persons. The mechanical shortcomings identified as contributors to safety incidents have been prioritised and will be addressed as part of the approved Kinsenda project.

In SRK's opinion, the operational teams may have a safety behavioural problem.

SRK recommends that management continue to concentrate their efforts on employees' behavioural aspects towards safety and health in the work place. Metorex reported that the mine has implemented a comprehensive Health and Safety plan in order to improve the compliance to Health and Safety standards. A number of procedures governing the behaviour of staff and contractors have been formalised and these were implemented to improve the safety culture and the management of contractors.

5.19.12 Environmental

The Social Impact Assessment concludes that overall, the Project will result in no unacceptable impacts. However, several of the mitigatable impacts have the potential to become unacceptable if poorly managed.

Kinsenda has investigated the possibility to remove the HDPE liner in the TSF, placing reliance instead on a ferricrete layer in the TSF footprint. Should material for the construction of the wall have to be imported, transport costs could be significant.

It is proposed that the availability of excess water, which can be used for irrigation, can be made available in suitable agricultural areas, thereby enticing people away from the tailings dam area. This approach is being adopted in the absence of final identification of affected households and lands, which would be required for an acceptable RAP. Metorex has subsequently responded, however, that there is no intention to resettle anyone in the area. It is also reported that a Community Development Plan has been compiled and presented to the community to address some of the development issues in the area.

The closure costs are not based on a definitive closure plan and hence may change as closure objectives are identified and/or more information becomes available. SRK notes that no allowance was made for post closure decant of contaminated water. This is regarded as a risk which may, however be regarded as relatively low in the light of the fact that no evidence of decant has been noted.

Metorex has a group-wide provision for post-closure water treatment of around USD5million. SRK has in agreement with Metorex increased this provision for post closure water treatment to USD25 million for evaluation purposes, of which USD5 million has been allocated to Kinsenda.