Technical Assessment Report of CNMC's Copper Properties in Copperbelt Province, Republic of Zambia

Report Prepared for

China Nonferrous Metals Mining (Group) Co., Ltd

Report Prepared by

srk consulting

SRK Consulting (China) Ltd

March 30, 2012

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For

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EXECUTIVE SUMMARY

China Nonferrous Metals Mining (Group) Co., Ltd ("CNMC", "the Company", or "the Client") commissioned SRK Consulting China Limited ("SRK") to undertake an independent assessment of all relevant technical aspects of CNMC's four subsidiary companies' operating properties in Zambia including the Chambishi and Luanshya copper deposits and associated ore processing plants, leaching plants and smelter, and projects under construction, including ore processing plants and leaching plants. The SRK Independent Technical Review Report ("ITR") was required for inclusion in documents for a proposed listing ("Proposed Listing") on the Main Board of the Stock Exchange of Hong Kong Limited ("HKEx").

The work program for this project consisted of review of data provided, a site visit and inspection of operations in April to May 2011, discussions with the Company employees and relevant geological brigades professionals and consultants who conducted the geological exploration and feasibility study, supervision on the quality assurance and quality control ("QA/QC") on the Chambishi Southeast Mine between June and July 2011 and updated in February 2011, data verification in May and June 2011, and resource estimation of the Chambishi SE mine in July 2011, review on production records provided by CNMC in February 2012, analysis of the data provided the Company and generated by SRK, and preparation of this report.

Results

Overall

The reviewed projects are owned by CNMC's four Zambia-based subsidiary companies. NFC Africa Mining PLC ("NFCA") which is 85% owned by CNMC, has three large-scale mining licenses covering three copper mines including Chambishi Main, Chambishi West and Chambishi Southeast, and one processing plant in the Chambishi area. These mining licenses were transferred from Zambia Consolidated Copper Mines Ltd ("ZCCM") to NFCA in 1998. The Chambishi Main and Chambishi West Mines and the processing plant have been in operation under the control of NFCA since 2003. Sino-Metals Leach Zambia Ltd ("SML") which is 55% owned by CNMC has one prospecting license in Mwambashi and some resources of tailings and residues in the Chambishi area. CNMC Luanshya Copper Mines PLC ("CLM") which is 80% owned by CNMC has seven mining licenses and one processing plant in the Luanshya Area. The Baluba Center Mine has been actively mined since 2009. CNMC holds an 80% equity interests in the Chambishi Copper Smelter Ltd ("CCS"). The detail is listed in the following table.

Company/Mine and Plant	Production	Design Capacity (t/a)	2011 Production (t)	Status
NFC Africa Mining PLC				
Chambishi Main Mine	Raw Ore - sulfide	2,145,000	1,028,306	Production
Chambishi West Mine	Raw Ore - mixed	990,000	487,123	Production
Chambishi Southeast Mine[1]	Raw Ore	3,300,000		Construction
Chambishi Processing Plant	Cu Concentrate	86,000	61,119	Production
Chambishi SE Processing Plant[2]	Cu Concentrate	261,030		Designed
Sino-Metals Leach Zambia Ltd				
Chambishi Processing Plant	Cu Concentrate	8,150	2,094	Production
Chambishi Leach Plant	Cu Cathode	7,000	7,003	Production
Mwambashi Processing Plant[3]	Cu Concentrate			Planned
Kakoso Leach Plant[4]	Cu Cathode	3,000		Designed
CNMC Huachin (Congo) Leach Plant[5]	Cu Cathode	10,000		Production
Mabende Project[6]	Cu Cathode	20,000		Construction

Company	Mine and Plant	Production	Design Capacity (t/a)	2011 Production (t)	Status
Chambishi Copper Smelter Ltd					
	Chambishi Copper Smelter	Blister Copper	150,000	150,863	Production
CNMC Luanshya Copper Mines PLC					
	Baluba Center Mine	Raw Ore - sulfide	1,500,000	1,224,068	Production
	Baluba East Mine[7]	Raw Ore - oxide	900,000		Planned
	Muliashi North Mine	Raw Ore - oxide	4,500,000	Stripping	Production
	Mashiba Mine[8]	Raw Ore - sulfide			Planned
	Muliashi South Mine[9]	Raw Ore - oxide			Planned
	Baluba Center Processing Plant	Cu Concentrate	86,000	63,015	Production
	Muliashi Leach Plant	Cu Cathode	40,000		Production

Notes:

1 NFCA-Chambishi Southeast Mine is under construction and is expected to commence production in 2016
2 NFCA-Chambishi Southeast Processing Plant is expected to be constructed in 2013 and to commence production in 2016
3 SML-Mwambashi Processing Plant is planned and construction is expected to commence in 2012
4 SML-Kakoso Leach Plant is planned and is expected to be constructed in 2012
5 SML-Mabende Project (Leach Plant) is under construction and is expected to commence production in 2014
6 SML-CNMC Huachin (Congo) Leach Plant commenced production in March 2012
7 CLM-Baluba East Mine is planned and is expected to be constructed in 2017
8 CLM-Mashiba Mine is planned and is expected to be constructed in 2014
9 CLM-Muliashi South Mine is planned and is expected to be constructed in 2014

The mines and associated plants operated by the subsidiary companies of CNMC in the Copperbelt Province of the Republic of Zambia are well integrated and well managed operations. The operating standards at all sites are generally following the Zambian national and/or international industrial practices. The plants under construction and those designed will continue to apply the same or more advanced technology and should achieve similar or better results to those achieved historically.

As of December 31, 2011, the JORC Code-compliant Measured, Indicated and Inferred Mineral Resources for NFCA's three mines were 11.31Mt at an average grade of 2.13% total copper content ("TCu"), 66.29Mt at an average grade of 2.16% TCu and 151.02Mt at an average grade of 1.88% TCu, respectively. For SML's projects, the Measured, Indicated and Inferred Mineral Resources were 0.82Mt at an average grade of 2.22% TCu with 0.91% oxidized Cu ("Ox-Cu"), 8.38Mt at an average grade of 2.00% TCu with 0.75% Ox-Cu, and 12.42Mt at an average grade of 0.91% TCu with 0.52% Ox-Cu, respectively. The Measured, Indicated and Inferred Mineral Resources for CLM were estimated at 49.14Mt at an average grade of 1.30% TCu with 0.68% Ox-Cu, 71.35Mt at an average grade of 1.26% TCu with 0.34% Ox-Cu, and 36.54Mt at an average grade of 1.38% TCu with 0.33% Ox-Cu, respectively, as shown in the following table.

		Measured Resource				Indicated Resource				Inferred Resource			
		Ore	Average Grade (%)			Ore	Average Grade (%)			Ore	Average Grade (%)		
Company	Deposit/Project	(Mt)	TCu	Ox-Cu	Co	(Mt)	TCu	Ox-Cu	Co	(Mt)	TCu	Ox-Cu	Co
NFCA													
	Chambishi Main	5.12	2.50			5.61	2.49			8.14	2.42		
	Chambishi West	6.19	1.83			25.25	1.88			17.32	2.09		
	Chambishi Southeast					35.43	2.30		0.12	125.56	1.82		0.10
	Sub-total	**11.31**	**2.13**			**66.29**	**2.16**			**151.02**	**1.88**		
SML													
	Mwambashi	0.82	2.22	0.91		8.38	2.00	0.75		1.77	2.10	0.26	
	Kakoso Tailing									9.08	0.60	0.47	
	Chambishi Tailing & Ore Pile									1.57	1.33	1.08	0.02
	Subtotal	**0.82**	**2.22**	**0.91**		**8.38**	**2.00**	**0.75**		**12.42**	**0.91**	**0.52**	
CLM													
	Baluba Center Sulfide	0.70	2.33	0.06	0.17	15.91	2.25	0.08	0.15	3.88	1.91	0.10	0.12
	Muliashi North	38.87	1.14	0.67	0.06	22.13	0.98	0.59	0.07	20.02	1.18	0.41	0.05
	Muliashi South Oxide									4.40	1.73		
	Mashiba	3.17	1.89	0.24		5.67	1.96	0.22		4.97	1.67	0.43	
	Baluba East	6.40	1.90	1.00	0.02	27.64	0.77	0.31	0.03	3.27	1.03	0.37	0.04
	Subtotal	**49.14**	**1.30**	**0.68**		**71.35**	**1.26**	**0.34**		**36.54**	**1.38**	**0.33**	

The Chambishi Main and West Mines are underground operations accessed by shafts. The main shaft development combined with decline access has been utilized, and cut-and-fill and local sublevel open-stoping and sublevel caving mining methods are used with an average ore loss of 38% and a mining dilution of 30%. The Chambishi Southeast Mine is also an underground mine which is in construction stage. The main shaft development combined with decline access has been utilized, and cut-and-fill, sublevel open-stoping and post-pillar cut-and-fill mining methods are employed with designed ore loss of 18.6% and the mining dilution of 17.4%.

The Baluba Center Mine is an underground mine. Shaft and decline access have been utilized and the sublevel caving method is used with an average ore loss of 40% and a mining dilution of 38%. Both the Muliashi North and Baluba East (southern portion) mines are designed as open pit mining areas. The designed mining recovery rates and mining dilution are 97% and 3% for Muliashi North Mine, and 95% and 5% for the Baluba East Mine. The designed stripping ratios are 3.44 for Muliashi North Mine and 4.04 for the Baluba East Mine, respectively.

A conventional ore process flow sheet including crushing, milling, flotation and dewatering is used in the ore processing plants to produce copper concentrates. In 2010 the ore processing plants achieved good recovery rates of 94.89% Cu for the NFCA Chambishi Processing Plant and 93.5% for Cu and 67.7% Co at the CLM Baluba Processing Plant.

The technologies used in the SML Chambishi Leach Plant and CCS Chambishi Copper Smelter are of international industry standards. The plant and smelter are both well managed and consistently produce high quality products of Cu cathode (>99.95% Cu) and blister Cu (99.08% Cu). The average copper recovery rates in 2010 were 85.36% and 96.28%, respectively.

As of December 31, 2011, the total workforce number at CNMC's four subsidiary companies was 10,716, which includes subcontractors' employees, who constitute approximately 40% of total workforce. This figure includes 3,433 for NFCA, 399 for SML, 1,995 for CCS and 4,889 for CLM. The number for each company includes the management and technical staff, and workers in mining, processing, safety, production maintenance, and sale and supply departments. Annual staff turnover is estimated at 8% of the workforce. Based on past experiences, there have been no problems with sourcing skilled workers. SRK considers that the workforce numbers can completely meet the Company's current production capacity.

A number of the Company's technical management personnel have worked at the mines for more than three years. They have a thorough knowledge of the geology and mining conditions in the mine, and can employ suitable techniques and experience from a range of mines, plants and smelter. However, SRK recommends that more technical personnel be employed to manage the operating mines efficiently.

The Company has committed and prepared relevant measures to a greening program at the mines and plants with improvements in dust control, waste water and sewage treatment. Once implemented, these practices will demonstrate the Company's responsible approach towards environmental protection.

Operational Permits

CNMC's copper mining projects in Zambia are operated by four subsidiary companies, namely NFCA, CLM, CCS and SML, and all the subsidiaries have the necessary business licenses including *Certificate of Incorporation of a Public Company and Certificate of Share Capital*, mining licenses and safety licenses (the *annual operating permit*), which are in compliance with the related Zambian laws and regulations.

Geology and Mineralogy

The Copperbelt of Zambia is located in the heart of Africa, south of the Equator, in the vicinity of latitude 13ºS and longitude 28ºE. The Copperbelt is enriched in copper and cobalt, has a Northwest strike and extends from Ndola, the capital city of Copperbelt Province in Zambia, to Katanga Province in the Democratic Republic of the Congo.

Regionally, the reviewed projects are located at the southeast part of the Lufilian Fold belt. The Chambishi and Mwambashi projects are on the west limb of the Kafue Anticline, while the Luanshya project is situated on south-eastern edge of the Kafue Anticline. The Kafue Anticline, i.e. the Basement Complex, was overlain by Neoproterozoic Katanga Supergroup. The widespread Katanga System is subdivided into the Lower Roan (RL), Upper Roan (RU) and Mwashia Groups. The copper and cobalt mineralization is generally associated with the sedimentary rocks of Lower Roan (RL) Group.

Faults are not well developed in the Copperbelt region. The gabbro intrusive intruded during the Lufulian Orogeny event, and it is almost entirely confined to the Upper Roan Group.

Chambishi Main, West and Southeast Mines

The Chambishi mining license (No. 7069-HQ-LML) covers an area of 107 square kilometers (km^2); it includes the Chambishi Main Mine, Chambishi West Mine and Chambishi Southeast Mine. The three copper mines are situated on the northeast limb of the Chambishi Basin which is a northwest plunging synclinal basin with a strike in the north-western direction. The three mines share similar geological and structural features which are common within the Copperbelt of Zambia.

The three mines are of typical stratabound copper deposits which are hosted in the Lower Roan Group of the Katanga Supergroup within the Chambishi Basin. The main mineralized bodies occur in the Ore Shale Formation of the Lower Roan. Several minor occurrences of low grade sulfide mineralization were found in argillite and quartzite above the Ore Shale Formation and in the conglomerate below the Ore Shale Formation.

Chambishi Main Mine has one orebody ("Chambishi Main orebody"). It strikes east-westerly and dips to the north with dip angles of 15° to 75°. The Chambishi Main orebody is about 2,280m long and 2.1 to 18.2m thick with an average thickness of 8.0m. The down-dip extension of the orebody defined by boreholes is about 900m from the surface. The average grade of the Chambishi Main orebody is 2.51% TCu.

Chambishi West Mine has one orebody ("Chambishi West orebody"). It strikes north-westerly and dips to south with an average dip angle of 30º. It is about 1,400 to 2,100m long and 2.0 to 17.0m thick with an average thickness of 8.0m. The down-dip extension of the orebody defined by boreholes is about 600m from the surface. The average grade of the Chambishi West orebody is 2.15% TCu.

Chambishi Southeast Mine has two ore bodies, which is the north orebody and the south ore body. The characteristics of these ore bodies are detailed below.

The north ore body trends Southeast (SE) — Northwest and dips to Northwest (NW) with dip angles of 5º to 15º. The ore body is about 4,500m along the strike. The width of the body varies from 569 to 1,237m. The thickness varies from 1.38m up to 22.92m with an averaging thickness around 10.00m. Under the cut-off grade TCu of 0.80%, the average grades of TCu and TCo (Total Cobalt Content) are 2.02% and 0.074%, respectively.

The south ore body is located at the south of north ore body. It extends 3,540m along the SE-NW trending. The width varies from 800m to 1,600m. Under the cut-off grade TCu of 0.80%, the average grade of TCu and TCo are 1.66% and 0.125%.

These mineralized bodies are situated below the weathered zone. The primary minerals are predominantly chalcopyrite, pyrite, pyrrhotite, carrollite, skutterudite, linnaeite and bornite. The ore texture range from disseminated, veinlets to massive.

Mwambashi Copper Deposit

The prospecting license (No. 15201-HQ-LPL/1) of the Mwambashi Copper Deposit was transferred from Edgeway Business Solutions Limited to Sino-Metals Leach Zambia Limited on January 6, 2011.

The Mwambashi Copper Deposit has the same geological and mineralogical characteristics as the Chambishi Main, West and Southeast Mines. The Mwambashi Copper Deposit is also a stratabound-type deposit; its mineralized body shows a stratiform shape and is hosted by sandy sediments in the Lower Roan. The thickness of mineralization varies from 30m in the shallower region to less than 1.0m at depth with average thickness of 15m. The mineralized body is about 600m long and continues to approximately 250m below the surface. It is still open at depth.

This mineralized body shows a vertical zonation from oxidized zone to sulfide zone. Below the overburden, the first 15 to 20m of the mineralized body is predominantly oxidized mineralization which consists mainly of malachite and subordinate chrysocolla and pseudomalachite. The mixed sulfide-oxide mineralization zone has ratios of oxide and sulfide varying from 80:20 to 20:80 from top to the bottom within the mixed zone. The sulfide mineralization zone contains predominantly chalcopyrite, bornite and chalcocite. Ore minerals are mainly malachite, chalcocite, chalcopyrite, chrysocolla and pseudomalachite with minor bornite and trace of cuprite and native copper.

Kakoso Tailings Development Project

SML holds an 88% share of the Kakoso Tailings Development Project. This tailing dam is located about 78km northwest of Kitwe, 4km south of Chililabombwo at approximately latitude 12°37'S and longitude 28°01'E.

The Kakoso Tailing Dam includes the main dam with an area of 388,700m^2 and the subsidiary dam with an area of 320,500m^2. In 2010, SML conducted prospecting work in the Kakoso Tailing Dam. A total of 13 and 10 auger boreholes were carried out on the main tailing dam and the subsidiary dam with an exploration grid of 200m × 200m. The average depth of tailing in the main dam is 11.4m, and 5.1m in the subsidiary dam. A total of 78 samples were collected from the Kakoso Tailings Development Project and returned an average grade of 0.60% TCu and 0.47% acid soluble copper.

Chambishi Tailings Development Project

The Chambishi Copper Mine has nine tailing dams including 6th, 7th, 7Ath, 8th, 9th, Luano, Musahashi, Wener Dam and New Dam, and an acidic leaching residue stockpile named 10th. All of the tailing dams are located within the mining license of Chambishi Copper Mine. In June 2001, Chambishi Copper Mine carried out some prospecting work in those tailing dams and leaching residues for resource estimate. A total of 73 samples were collected for analysis of Cu and Co. In 2008, a sampling program was conducted at the Luano tailing (16th), and a total of 62 samples were collected. The bulk density of 1.6t/m^3 was used for the resource estimation completed by NFCA in 2011.

There were three oxidized ore piles in the Chambishi Copper Mine located nearby the open pit. In July 2003, NFCA carried out sampling work on the oxidized ore piles named 3-1#, 3-2# and 4#. A total of 79 samples were collected from shallow pits along the exploration line with grid spacing of 10m × 10-15m. The bulk density of 2.70t/m^3 was applied for mineral resource estimates.

SRK has carefully reviewed the sampling method and resource estimation by NFCA, and also reviewed the historical production records of SML. According to the production records, SRK believes that it is reasonable to use the average feed grade instead of the average grade of tailings and the oxidized ore piles for resource estimate.

Baluba Center Mine

The mineralized units within the Baluba syncline are recognized as extending for about 3km along the east trending strike and approximately 1.5km along dip. Economical copper mineralization is largely confined to the RL6 argillite and a thin zone near the upper contact of the RL7 Formation. The Baluba Center Mine oxidized cap exists above the oxide-sulfide interface roughly assumed to be 60m below surface. The oxidized mineral contents increase upwards towards the surface while the sulfide minerals increase with depth and become predominant at about 60m below the surface.

The outcrop of the oxidized cap is distributed on the north limb of the Baluba Syncline, extending approximately 3,000m from west to east with a thickness of 10m and a depth of 110m below surface.

The Baluba Center sulfide orebody strikes about 3,600m and is distributed on both limbs of the Baluba Syncline. The width (along dip) of the orebody reaches about 1,500m and the thickness varies from several meters up to dozens of meters averaging at 10m. Near the north limb, the Baluba Center orebody dips to the southwest at 210º with a relative large dip angle varying from 45º up to nearly 90º.

Muliashi North Deposit

The Muliashi North deposit is recognized as an oxidized cap. The weathering and associated oxidation occur widely from the surface and extending to variable depths. Protogenic copper sulfides, including chalcopyrite, bornite and chalcocite, distributes predominantly below 100m from the surface. Approaching the surface there is a gradual transition where copper sulfides were oxidized and produced secondary minerals. The copper mineral in the oxidized zone is predominantly malachite with minor chrysocolla.

Three orebodies have been identified in the Muliashi North deposit. Due to different host rocks one discontinuous orebody is identified as the Hangingwall Orebody (HOB) and is located just above the RL6-RL5 contact traditionally recognized as the hangingwall waste in the rest of the Roan-Muliashi Basin. The other two orebodies, namely the Upper Orebody (UOB) and the Lower Orebody (LOB), occur in the lower and/or upper zone of RL6 Formation and are separated by a pyritic zone. The RL6 Formation at Muliashi North is thinner than in the rest of Roan-Muliashi Basin.

Muliashi South Deposit

The Muliashi South deposit is located south of Muliashi North but west of the 28# Shaft. It borders with the Mashiba deposit on the western flank. The Muliashi South oxide cap covers a distance of about 800m on the surface and extends down to the upper mining limit of the underground mine which varied from section to section.

Most of sulfide ore in the area was extracted through the 28# Shaft during the period of Zambia Consolidated Copper Mines Limited ("ZCCM") ownership. Underground mining was resumed by ENYA Holding BV ("ENYA") in 2008 but only last several months and the mine was then shut down in November 2008.

Mashiba Deposit

The Mashiba Deposit is recognized as an isolated deposit located roughly 3km west of 28# Shaft. Spatially, it is localized and thins out in all three directions (east, south and west). The mineralization, with the southern part outcropping on the surface, extends about 600m along strike (east-west) and 800m along dip in the northerly direction. The thickness of the orebody within this zone is much thicker than other deposits with a maximum up to 41m.

Unlike the typical Copperbelt sulfide orebodies, the Mashiba ore has a relatively high copper oxide component and its thickness varies drastically over short distances. The ratio of the Ox-Cu content to the TCu content above 1,200m level of mineralized zone is relatively higher (>5).

Baluba East Deposit

There are two orebodies separated by a pyrite zone at the Baluba East Deposit. The orebody below the pyrite zone is the lower orebody (LOB) while the one above is the upper orebody (UOB). The UOB is the predominant orebody which was partly mined out while the LOB was not mined because it is thin. In the pyrite zone the copper grades are below 1.00%.

The oxidized cap at Baluba East Deposit is the oxidized upper part of the orebodies. It extends to a depth of about 60m. Both the LOB and the UOB have a high oxide content. The oxide level increases towards the surface where more oxidation took place. Common minerals are malachite, cuprite and chrysocolla.

Roan Basin, Roan Extension West and Roan Extension East

The areas named Roan Basin, Roan Extension West and Roan Extension East have experienced many years of underground mining and the sulfide zones were almost all depleted and some ore remains as about 60m-deep oxidized caps. These zones are characterized by the oxidized minerals of malachite, tenorite and chrysocolla, mixed with chalcocite and occasional finely disseminated chalcopyrite.

Muva Hill and Lufubu

The Muva Hill license area is located at the north of the project area, and Lufubu is situated at the western part of the Muliashi License area. Some geological investigation has been performed in both areas, and the preliminary exploration on Lufubu North and South has been conducted. It is considered that the two projects possess some exploration potential.

Mineral Resource and Ore Reserve Estimates

SRK has inspected a number of portals, tunnels, bore holes and shafts, which show the exposure of the mineralization at Chambishi Main, Chambishi West and Chambishi Southeast Mines, and Baluba Center Mine. SRK has also reviewed all original geological databases including geological surveys and mapping at different scales, drill holes, shafts, adits and drafts logging; sampling methodologies and sample preparation and assaying; assay quality control and quality assurance; the geological interpretation, mineral resource estimation procedures and parameter applied by NFCA and Sino-Mine Resource Exploration Co., Ltd ("Sinomine") for the Chambishi Main, West and Southeast Mines; by professional geologists of Dexter S. Ferreira and Andre M. Deiss for the Mwambashi Copper Deposit; by Golder Associates Africa (Pty) Ltd ("Golder") for the Baluba Center and East Mines, and the Muliashi North and South Deposits; and by SRK Consulting South Africa Ltd for the Mashiba Deposit.

Sinomine is a qualified and approved Chinese independent geological consultant, who had used methods and procedures to estimate the mineral resources which comply with Chinese standards for resource estimation. Other consulting companies who conducted the mineral resource estimation for the other mines and deposits are considered by SRK to be qualified to do so and they followed the South African Code for Reporting of Exploration Results, Mineral Resources and Reserves (the "SAMREC Code").

These copper mines and deposits are typical stratabound type deposits and the copper grades have relatively low variability throughout the mineralized bodies. SRK considers that the exploration programs provide sufficient data and a reasonable basis to estimate the resources contained in the mineralized bodies at these mines and deposits, and that the analytical methods used for these mines and deposits produced acceptable results with no material bias.

SRK conducted sample verifications at the Chambishi Main, West and Southeast Mines. Sample verification included selecting core pulp samples, core reject samples and re-sampling on site using the channeling method. The selected core pulp and reject samples were sent to the Alfred H. Knight based in Kitwe, Zambia and SGS laboratories based in Kalulushi, Zambia and Tianjin, China for analysis. Both laboratories are internationally recognized analytical branches for ASL and SGS.

SRK required all samples to be reground to -200 mesh. The standard and blank samples were provided by the Alfred H. Knight and SGS. SRK also visited both laboratories to review the quality assurance and quality control procedures. Samples were dissolved using sodium peroxide fusion ("FUS-PER05") and were assayed using the inductively coupled plasma-atomic emission spectroscopy ("ICP-AES") method.

The comparisons of results between the original core samples and SRK core pulp/reject samples, assayed from Alfred H. Knight and SGS show that the relative differences between them are mostly within 15%. These results of data verification indicate that the original database is sound and reliable for the purposes of resource estimation.

Based on reviewing the deposit geology, drilling and sampling data, and procedures and parameters used for the mineral resources estimation of the Chambishi Main, West and Southeast Mines, and SRK's data verifications at the three mines, SRK is of the opinion that the mineral resources estimated under the 1999 Chinese mineral resource system for the Chambishi Main, West and Southeast copper mines by Chinese Geological Brigades reconcile well to the relevant JORC Mineral Resource categories (a comparison of the Chinese and JORC systems is provided in Appendix II). The economic portion of the Measured and Indicated Mineral Resources can accordingly be used to estimate Proved and Probable Ore Reserves.

Mineral Resource Estimate

The copper resources of the mines, deposits, tailings and recoverable waste oxidized ore piles were estimated by the relevant geological consultants and/or consulting companies. The technical parameters used to estimate the copper resources including cut-off grade, minimum mineable thickness and maximum allowed waste thickness were carefully reviewed in this report.

The Mineral Resource estimates under the JORC Code as of December 31, 2011 for each company's mines, deposits, tailings and recoverable waste oxidized ore piles are summarized in the table below. SRK has shown in bold the details of the cut-off it believes is reasonable. Only the Measured and Indicated resources can be used for ore reserve estimation and mine planning.

The Measured, Indicated and Inferred Mineral Resources of the Chambishi Main, West and Southeast Mines in total were 11.31Mt at an average grade of 2.13% TCu, 66.29Mt at an average grade of 2.16% TCu and 151.02Mt at an average grade of 1.88% TCu, respectively.

For the Mwambashi Copper Deposit, Kakoso Tailings and Chambishi Tailings and Old Ore Piles, the total Measured, Indicated and Inferred Mineral Resources were 0.84Mt at an average grade of 2.18% TCu with 0.34% Ox-Cu, 10.77Mt at an average grade of 1.63% TCu with 0.63% Ox-Cu, and 13.10Mt at an average grade of 0.88% TCu with 0.50% Ox-Cu, respectively.

The Measured, Indicated and Inferred Mineral Resources at Baluba Center and East Mines, Muliashi North and South Mines, Mashiba Mine, Roan Basin and Roan Extension West and Roan Extension East in total were 49.14Mt at an average grade of 1.30% TCu with 0.68% Ox-Cu, 78.51Mt at an average grade of 1.30% TCu with 0.40% Ox-Cu, and 46.04Mt at an average grade of 1.55% TCu with 0.59% Ox-Cu, respectively. Only the Measured and Indicated Resources can be used for Ore Reserve estimation and mine planning.

For the CLM projects above, SRK notes that the Mineral Resources of some mines are currently unlikely to be mined due to subsidence near surface and/or are deeply covered by flood waters (see the table below for details).

Company	Deposit /Project	Cut-off (TCu %)	Measured Resource Resource (Mt)	Measured Average Grade (%) TCu	Ox-Cu	TCo	Indicated Resource Resource (Mt)	Indicated Average Grade (%) TCu	Ox-Cu	TCo	Inferred Resource Resource (Mt)	Inferred Average Grade (%) TCu	Ox-Cu	TCo
NFCA	Chambishi Main	1.00	5.12	2.50			5.61	2.49			8.14	2.42		
	Chambishi West	1.00	6.19	1.83			25.25	1.88			17.32	2.09		
	Chambishi Southeast	0.80					35.43	2.30		0.12	125.56	1.82		0.10
	Total		**11.31**	**2.13**			**66.29**	**2.16**			**151.02**	**1.88**		
SML	Mwambashi	0.50	0.82	2.22	0.91		8.38	2.00	0.75		1.77	2.10	0.26	
		0.30[7]	0.02	0.40	0.26		2.39	0.35	0.21		0.68	0.35	0.21	
	Kakoso Tailings	0.50									9.08	0.60	0.47	
	Chambishi Tailings & Ore Pile[1]	0.50									1.57	1.33	1.08	0.02
	Total		**0.84**	**2.18**	**0.34**		**10.77**	**1.63**	**0.63**		**13.10**	**0.88**	**0.50**	
CLM	Baluba Center Sulfide Ore	1.00	0.70	2.33	0.06	0.17	15.91	2.49	0.08	0.15	3.88	1.91	0.10	0.12
	Baluba Center Oxidized Ore[2]	1.00					6.56	1.65	1.14	0.12	1.62	1.70	0.93	0.10
	Muliashi North	0.30	38.87	1.14	0.67	0.06	22.13	0.98	0.59	0.07	20.02	1.18	0.41	0.05
	Muliashi South Sulfide Ore[3]	1.00					0.60	2.48	0.07		0.08	2.50	0.01	
	Muliashi South Oxidized Ore	0.30									4.40	1.73		
	Mashiba	0.50	3.17	1.89	0.24		5.67	1.96	0.22		4.97	1.67	0.43	
	Baluba East	0.50	6.40	1.90	1.00	0.02	27.64	0.77	0.31	0.03	3.27	1.03	0.37	0.04
	Roan Basin[4]	0.30									3.23	1.82	1.24	
	Roan Extension West[5]	0.30									1.82	2.79	2.54	
	Roan Extension East[6]	0.30									2.75	2.59	1.82	
	Total		**49.14**	**1.30**	**0.68**		**78.51**	**1.30**	**0.40**		**46.04**	**1.55**	**0.59**	

Note:

1 No. 9 and No. 15 Tailings, and Old oxidized cap are recoverable resources in the Chambishi area.
2 Unlikely to be mined due to subsidence near the surface.
3 Unlikely to be mined due to subsidence near the surface.
4 Unlikely to be mined due to subsidence near the surface.
5 Unlikely to be mined due to subsidence near the surface.
6 Unlikely to be mined due to subsidence near the surface.
7 Resources at cut-off grade of 0.3% Cu are in addition to resources at cut-off grade of 0.5% Cu.

The information in this report which relates to Mineral Resources is based on information compiled by Dr Yiefei Jia, a full time employee of SRK Consulting China Ltd and a Member of the Australasian Institute of Mining and Metallurgy. Dr Jia has sufficient experience which is relevant to the style of mineralization and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2004 Edition of the JORC Code. Yiefei consents to the reporting of this information in the form and context in which it appears.

Ore Reserves

Ore reserves have been estimated for the Chambishi Main, West and Southeast Mines, Baluba Center and East Mines, and Muliashi North Mine based on the each mine's mining recovery rate and dilution rate cited either from the mining production records of 2011 and/or from the feasibility study. As of December 31, 2011, the Proved and Probable Ore Reserves at NFCA's Chambishi Main, West and Southeast Mines were 9.12Mt at an average grade of 1.64% TCu and 54.59Mt at an average grade of 1.78% TCu, respectively. The Proved and Probable Ore Reserves at CLM's properties were 48.46Mt at an average grade of 1.22% TCu and 67.62Mt at an average grade of 1.07% TCu, respectively. Details are listed in the following table.

Company/Mine	Tonnes Mt	Average Grade (%)			Tonnes Mt	Average Grade (%)		
		TCu	Ox-Cu	TCo		TCu	Ox-Cu	TCo
NFCA	**Proved Ore Reserve**				**Probable Ore Reserve**			
Chambishi Main	4.13	1.92			4.52	1.92		
Chambishi West	4.99	1.41			20.35	1.45		
Chambishi Southeast					29.72	1.98		0.10
Subtotal	***9.12***	***1.64***			***54.59***	***1.78***		
CLM								
Baluba Center Sulfide	0.58	1.69	0.04	0.12	13.18	1.63	0.06	0.11
Muliashi North	38.84	1.11	0.65	0.06	22.11	0.95	0.57	0.07
Baluba East	6.38	1.81	0.95	0.02	27.57	0.73	0.30	0.03
Mashiba	2.66	1.35	0.17		4.76	1.40	0.16	
Subtotal	***48.46***	***1.22***	***0.66***		***67.62***	***1.07***	***0.34***	

The information in this report which relates to Mineral Resources is based on information compiled by Dr Yiefei Jia, a full time employee of SRK Consulting China Ltd and a Member of the Australasian Institute of Mining and Metallurgy. Dr Jia has sufficient experience which is relevant to the style of mineralization and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2004 Edition of the JORC Code. Yiefei consents to the reporting of this information in the form and context in which it appears.

Mining Assessment

NFCA — Chambishi Main, West and Southeast Mines

The designed production capacity for the Chambishi Main Mine is 6,500tpd (2.145Mtpa), and currently the mining operation takes place between the 500 and 900m level. The Chambishi West Mine's construction commenced in 2007 and the mining operation began in 2010. The designed production capacity for Chambishi West Mine is 3,000tpd (0.99Mtpa).

For both the Chambishi Main and Chambishi West Mines, development access is by both the main shaft and a decline (or ramp), and cut-and-fill and local sublevel open-stoping and sublevel caving mining methods are used. According to the production records in 2010 and 2011, the average ore loss is 38% and the mining dilution is 30%. The mined ore is dumped into internal orepass by load-haul-dump machines ("LHD") prior to being loaded into ore cars driven by electric locomotive and then hoisted to surface by skip through the main shaft.

The Chambishi Southeast Mine is currently under further exploration and construction. At the time of SRK's site visit, geotechnical drilling for the south ventilation shaft and the main shaft has been completed. The mine development is expected to be finished by the end of 2016. The designed production size is 10,000tpd (3.30Mtpa). Main shaft in conjunction with decline access is proposed and cut-and-fill, sublevel open-stoping and post-pillar cut-and-fill mining methods are to be employed. Ore loading is to be undertaken by LHD, and the ore haulage is to be carried out by both track and trackless means prior to being hoisted to surface by skip through the main shaft.

Both the ore loss and mining dilution are considerably high due to the strength of the orebody and the fact that the country rock is weak, the thickness of the orebody is thin, and the orebody is fairly flat. In addition, water inflows and design defects contribute to low resource recoverability. Therefore, the current priority is to select more reasonable and appropriate mining method.

CLM — Baluba Center Mine, Baluba East Mine and Muliashi North Mine

The underground production in Baluba Center Mine was resumed at the end of 2009. Shaft and ramp development was adopted, and the sublevel cave mining method is used. Trackless equipment is used for underground drilling, loading, and haulage. The mine is divided into eastern and western zones. Level development is progressing in the eastern zone. The mining operation of the western zone is almost finished except for several portions. According to the mining records from 2010 and 2011, the ore loss was 40% and the mining dilution was 38%.

The Muliashi North Mine has completed the infrastructure construction and commenced production in December 2012. The designed production size is 4.5Mtpa, including 0.9Mtpa of the soft rock ore and 3.6Mtpa for hard rock ore.

The basic design for the southern portion of Baluba East Mine has been finished. The designed mining area is the upper oxidized ore and a mining capacity of 900,000tpa is proposed. As the status of the deep mined-out zone in the northern portion of Baluba East Mine is unclear, this area is not incorporated into the current mine plan.

After reviewing the design documents, communication with mine management and engineers and completing a site visit, SRK opines that the measured sulfide mineral resources in the Luanshya project are limited, the potential of expansion is limited, and the mining operating cost is high. However, the upper oxidized mineral resources in the Luanshya project area is abundant and has a shallow burial depth. It is expected by SRK that these resources could be mined by open-pit mining with fairly low mine operating costs. The Muliashi North open-pit mine, in which the overburden stripping is underway, will be the dominant operational mine of CLM in the future. The mining of the deep sulfide ore has been completed, but the upper oxidized ore resource contains considerable tonnes, which are expected to generate a favorable economic outcome. The current priority is to verify the mined-out zone and subsidence status and implement a feasible treatment plan of the mined-out zone to provide parameters for the future open-pit mining.

Metallurgical and Processing Assessment

CNMC's four subsidiary companies have built a series of processing plants including ore concentrating, hydrometallurgical/electrolysis refining, and pyrometallurgical smelting operations. A series of plants are either under construction or planned to be constructed in the future.

For sulfide ore, the flotation process has been adopted to produce Cu concentrate which is then sold to CCS to produce blister Cu utilizing the pyrometallurgical smelting process. The blister Cu, with a grade above 99% Cu, is sold to international markets including China. For oxidized ore, the hydrometallurgical refining process is used to produce Cu cathode. The Cu cathode, with a grade higher than 99.95% Cu, is also sold to international markets, including China. The following table shows the technical index details of NFCA Chambishi Processing Plant, SML Chambishi Leach Plant, CCS Copper Smelter, and CLM Baluba Processing Plant in 2011 and planned parameters for SML Chambishi Processing Plant, SML Kakoso Leach Plant, NFCA Chambishi SE Processing Plant, SML-CNMC Huachin (Congo) Leach Plant and CLM Muliashi Leach Plant.

Term	NFCA-Chambishi Processing Plant	CLM-Baluba Processing Plant	SML-Chambishi Processing Plant	NFCA Chambishi SE Processing Plant
Ore Treated (t)	1,569,187	1,247,163	330,000	3,300,000
Ore Grade (Cu%)	1.67	1.36	1.86	2.02
Concentrate (t)	61,119	63,015	8,150	261,030
Concentrate Grade (Cu%)	38.03	25.42	28.00	24.00
Cu Recovery Rate (%)	88.69	94.43	91.36	93.98

Term	SML-Chambishi Leach Plant	CLM-Muliashi Leach Plant	SML-Kakoso Leach Plant	SML-CNMC Huachin (Congo) Leach Plant
Ore/Tailings Treated (t)	600,829	4,500,000	679,000	330,000
Ore/Tailings Grade (Cu%)	1.34	1.27	0.60	3.50
Cu Cathode (t)	7,003	42,105	3,000	10,000
Cu Cathode (%)	99.95	99.95	99.95	99.95
Cu Recovery Rate (%)	86.89	73.63	73.60	86.54

Term	CCS-Chambishi Copper Smelter
Cu Concentrate Fed (t)	458,771
Concentrate Grade (Cu%)	33.62
Blister Cu (t)	150,863
Blister Cu Grade (%)	99.01
Cu Recovery Rate (%)	96.59

SRK observed that the processing methods/flowsheets and applied equipment in the NFCA Chambishi and CLM Baluba processing plants, the SML Chambishi Leach Plant and the CCS Chambishi Copper Smelter, the designed SML Chambishi concentrator and CLM Baluba Slag concentrator, and the SML Kakoso Leach Plant and Muliashi Leach Plant are rational and are in line with international industrial practice.

SRK has inspected all operating plants and plants under construction. In 2011, the Cu recovery rate at NFCA Chambishi Processing Plant was 88.69%. For the CLM Baluba Processing Plant, the recovery rate of Cu was 94.43%. The Cu recovery rates of blister Cu at CCS Chambishi Copper Smelter and cathode Cu at SML Chambishi Leach Plant were 96.59% and 86.89%, respectively.

SRK observes that the Company applies relatively high level techniques and advanced equipment for production, and SRK believes that the Company can produce quality products and develop more high-quality copper products by utilizing its own technical capability.

Occupational Health and Safety (OHS)

CNMC's projects have been assessed in accordance with a series of decrees and/or regulations constituted by the Mines Safety Department of Zambia and CNMC subsidiary companies. Where possible, SRK has sighted and reviewed the Annual Operating Permits (AOP), Emergency Response Plans (ERP) and documented Occupational Health and Safety (OHS) management systems/

procedures for each CNMC subsidiary company. Established employees are provided with updated training every year or every second year depending on the employee's experience level.

OHS statistics for the CNMC's subsidiary companies have been recorded for last three years (for the operations that have been running less than 3 years, the last years of operation were provided). SRK considers the accident statistics to show that each subsidiary company has been generally committed to safety training, provision of safety equipment and safety monitoring. SRK recommends that all minor and near miss statistics should also be included in the regular compilation and review of safety statistics, and issues relating to PPE (Personal Protection Equipment) and site visit inductions and housekeeping be addressed.

Operating Costs

Major cost inputs to the each project are salaries, consumables, on site and off site administration costs, and other government charges. The cash operating costs in 2009 and 2011 and the five-year forecast of operating costs between 2012 and 2016 are provided in the table below. The historical operating costs for mining and ore processing plants (unit: USD per tonne copper concentrate) at NFCA Chambishi and CLM Baluba Processing Plants, and the operating costs for producing copper cathode at SML Chambishi Leach Plant and the blister copper at CCS Chambishi Copper Smelter (unit: USD per tonne copper metal) were sourced from the management accounts of the Group's subsidiaries. SRK classified the costs based on the Chapter 18 requirements on the HKEx. The operating cost forecast for these plants and other plants being constructed and/or planned are estimated based on the historical data. Details are summarized in the following table.

Year	Unit	NFCA-Chambishi Mining Operation	CLM-Baluba Mining Operation	SML-Chambishi Leach Plant	SML-Chambishi Processing Plant	CCS-Chambishi Cu Smelter*
2009 . . .	USD	1,470.58	N/A	2,305.39	N/A	5,872.32
2010 . . .	USD	1,697.92	1,177.32	2,715.89	N/A	7,461.11
2011 . . .	USD	1,882.16	1,360.13	3,896.52	N/A	7,749.39
2012 . . .	USD	1,634.91	1,172.65	2,638.53	502.09	7,544.22
2013 . . .	USD	1,541.62	1,179.48	3,564.22	506.09	7,514.69
2014 . . .	USD	1,449.20	1,149.14	3,172.94	510.89	7,545.75
2015 . . .	USD	1,436.84	1,149.25	3,222.64	515.79	7,541.32
2016 . . .	USD	1,436.84	1,149.25	3,275.64	521.09	7,544.85

Year	Unit	CCS-Sulfuric Acid Plant	SML-CNMC Huachin (Congo) Leach Plant	CLM-Muliashi Mining and Leach Plant	SML-Kakoso Leach Plant
2009 . . .	USD	18.92	N/A	N/A	N/A
2010 . . .	USD	18.25	N/A	N/A	N/A
2011 . . .	USD	22.76	N/A	N/A	N/A
2012 . . .	USD	27.89	3,378.44	3,696.77	N/A
2013 . . .	USD	27.89	3,374.46	3,082.98	2,796.00
2014 . . .	USD	27.89	3,451.70	2,792.63	2,663.00
2015 . . .	USD	27.89	3,220.90	2,675.03	2,663.00
2016 . . .	USD	27.89	3,245.65	2,675.03	2,663.00

Note:

* CCS Chambishi Cu Smelter: Cu concentrate costs of USD 5,537.05 in 2009, USD 7,140.12 in 2010, USD 7,291.30 in 2011 and USD 7,291.30 forecast in every year between 2012 and 2016 are included in the consumables.

Capital Costs and Investment

Between 2012 and 2016, CNMC plans to invest approximately USD1,647,582,000 in the four subsidiary companies' projects in exploration, mining development, mine construction, technical improvement, upgrading the capacities of tailing storage facilities and other supporting facilities. The investments are approximately USD898,500,000 for NFCA's projects, USD186,850,000 for SML's projects, USD213,213,000 for CCS's projects, and USD349,019,000 for CLM's project (see Table 11-4 for details). In SRK's opinion, the proposed capital investments are sufficient and likely to achieve the Company's stated targets if capital is available.

Environmental

The significant environmental aspects for the CNMC Zambian Projects that are subject to this Report are associated with the mining and mineral processing activities at the CNMC Zambian Projects' sites. The environmental review identified the most significant current and potential environmental / social management and legislative compliance liabilities that relate to operation and further development of the Project and defines gaps in operational management as relates to industry best practices.

SRK noted that at the time of the site visit CNMC was predominantly complying with Zambian national legislative requirements and had systems in place to action any non-compliance or upgrade work notices as directed to by the Environmental Council of Zambia (ECZ), but could do more to conform to industry best practices to improve their operational environmental / social management of the projects. SRK verified the CNMC Zambian Project's NFCA, SML, CCS and Luanshya operational units had obtained the necessary licenses and permits to develop and operate the projects and produced the required Environmental Social Impact Assessment (ESIA) reports, inclusive of the required Environmental Management Plan (EMP) and conceptual rehabilitation plans.

SRK notes the provided/sighted environmental and social management documentation for the CNMC Zambian Projects have been prepared in line with Zambian legislative requirements and generally in accordance with International Finance Corporation (IFC) environmental standards and guidelines, and internationally recognized industry environmental management practices. SRK observed that CNMC's subsidiary companies and staff have a good understanding of Zambian legislative requirements for conducting the appropriate project development assessments and their necessary ECZ governmental approvals, and associated licenses, permits and agreements.

At the time of SRK's site visit, the majority of CNMC subsidiary companies' project units were in full operation along with some expansion and new developments being at different phases of progress. SRK was able to review the existing operational environmental management and protection measures for the operational facilities of each project along with the developmental activities and developmental assessments and planning taking place and their planned future operational environmental management and protection measures. SRK cannot make any statements on the operational environmental performance of those sites that not yet operating.

The environmental review identified the following as the most significant current and potential environmental management and legislative compliance liabilities relating to operation and further development of CNMC Zambian Projects:

- Surface water management and discharges such as site discharges and stormwater runoff.
- Groundwater management and discharges such as mine dewatering and seepage from Waste Rock Dump (WRD) and Tailings Storage Facility (TSF).

- Dust and gaseous emissions management and mitigation.
- Storage and handling of hazardous materials.
- Waste generation and management of industrial and domestic wastes.
- Rehabilitation of waste rock stockpiles and other disturbed areas.
- Potential and current contaminated sites.
- Site erosion controls, sediment entrainment and management for disturbed areas.
- Lack of geochemical characterization of industrial waste materials such as waste rock.
- Continued implementation of closure planning process.
- Continued development of social license to operate.
- Implementation and enforcement of health and safety standard practices.

SRK noted during the site investigation that current management of the above noted potential risks were being managed at a reasonable level and is considered by SRK to be within the acceptable / tolerable risk classification, but further attention is required to reduce and maintain the realized and potential impacts at an acceptable level.

The environmental risks associated with surface and groundwater, dust and gas emissions, hazardous materials storage, WRD, TSF and stockpile management, and land disturbance and rehabilitation, can be generally managed if Zambian national environmental standards and regulatory requirements are met along with the application of industry best practices.

The environmental risks associated with the potential for generating contaminated sites and other site closure liabilities and developing and maintaining social license to operate, including health and safety standards, can be effectively managed by adopting relevant recognized international industry practices. On-site management of these above risks should be coordinated through the implementation of the operational EMP, Emergency Response Plan (ERP) and Health Safety Environment (HSE) plans which incorporate all areas of required work. Developing and maintaining a social license to operate needs to be managed through the development of Social Development Plans and support of initiatives defined through the consultation process.

Social

CNMC reported that there are no significant cultural heritage sites, burial sites or nature reserves within or surrounding any of the Project sites except for a small monument constructed to commemorate the discovery of copper resources in the area which is on the NFCA site and kept in good order. CNMC stated they have received some official notices of public complaints in relation to the activities of the Project, but they maintain the issues were minor and otherwise a positive relationship with the local communities exists due to the stated social development measures discussed below.

CNMC stated the positive effects to the surrounding local communities are mainly direct employment of local contractors and use of local suppliers and service providers where practical. CNMC has also developed a number of social development measures among local communities including water and electricity supply to local villages and the financial support for schools in the local communities. CNMC reported to SRK that they would also provide access for locals to the CNMC medical clinic along with other measures.

The CNMC Zambia Projects' ESIA's include details for the development of Social Development Programs in line with Zambian legislative requirements. However, CNMC has not developed these Social Development Programs past their initial efforts. It is SRK's opinion that the social and labor situation in the surrounding communities has the potential to lead to conflicts with these communities if CNMC does not further their social license to operate within and about these villages. CNMC stated they have no formalized social dispute resolution mechanism and reported to SRK that is carried out between CNMC and local Zambian by the local police force.

The ESIA's report, Management Programs and Action Plans must be compiled with to deal with specific mitigation measures and actions necessary for the project to comply with applicable Zambian laws and regulations and to meet the requirements of the IFC Performance Standards. This will require a number of Plans and Action Plans in order the meet the IFC Performance Standards.

CNMC stated they are currently in the process of developing the applicable policies with some key areas already addressed during the last 12 months. CNMC reported they are also committed to developing a number of plans in terms of the IFC's requirements.

Public participation/community consultation programs were confirmed as being undertaken for each Project operation as part of their ESIA along with most of the other required plans and policies. However, SRK observed that CNMC staff outside the Environmental Department had little knowledge about the program or their results. SRK found the ongoing management and continuation of these plans is where the main issue lies with regards to the social risks for the projects continued operations.

A number of non-compliance notices and other notices of a breach of environmental or social conditions for the CNMC Zambia Projects from the local or provincial governments have been sighted as part of this review. CNMC reported to SRK that each notice includes statements to rectify the non-compliances and that the CNMC subsidiary companies action the issues through Corrective Action Statements and reports on the actions taken through their annual reporting process. CNMC action non-compliances as they are identified in line with Zambian requirements. CNMC also stated to SRK that they maintain a strong relationship with local, provincial and national governments along with the local police.

Risk Analysis

Mining is a relatively high risk industry and in general, the risk may decrease from exploration, development, to the production stage. CNMC's projects are production projects and risks exist in different areas. SRK considered various technical aspects which may affect the feasibility and future cash flow of the project, and conducted a risk assessment which has been summarized in following table. The full qualitative risk analysis process is described in Appendix V.

Risk Issue	Likelihood	Consequence	Overall
Geology and Resource			
Lack of Significant Resource	Unlikely	Moderate	Low
Lack of Significant Reserve	Unlikely	Moderate	Low
Significant Unexpected Faulting	Unlikely	Major	Medium
Mining			
Significant Production Shortfalls	Unlikely	Major	Medium
Production Pumping System Adequacy	Unlikely	Moderate	Low
Significant Geological Structure	Possible	Moderate	Medium
Poor Pit Slope Condition	Unlikely	Moderate	Low
Poor Mine plan	Unlikely	Moderate	Low
Process Plant			
Lower Yields	Possible	Moderate	Medium
Lower Recovery	Unlikely	Minor	Low
Higher Production Cost	Possible	Moderate	Medium
Lower Plant Reliability	Unlikely	Major	Medium

The following table is the Environmental Qualitative Risk Assessment Matrix which is separately reported within the risk assessment chapter.

Sources of Environmental Risk	Consequence Severity	Likelihood	Inherent Environmental Risk
Surface water management and discharges (i.e. stormwater runoff, erosion control measures).	Moderate	Certain	Medium
Groundwater management and discharges (i.e. mine dewatering and seepage from the WRD).	Moderate	Possible	Medium
Dust generation and gas emissions management and monitoring.	Moderate	Possible	Medium
Storage and handling of hazardous materials.	Moderate	Likely	Medium
Waste generation and management (industrial and domestic wastes).	Moderate	Possible	Medium
Rehabilitation of the waste rock stockpiles and other disturbed areas.	Moderate	Likely	Medium
Potential and current contaminated sites	Moderate	Certain	Medium
Site erosion controls, sediment entrainment and deposition	Moderate	Certain	Medium
Lack of geochemical characterization/ ARD assessment of waste rock.	Moderate	Unlikely	Low
Continued implementation of closure planning process.	Moderate	Likely	Medium
Continued development of social license to operate	Moderate	Certain	Medium
Implementation of environmental health and safety standard practices	Moderate	Likely	Medium

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Disclaimer

The opinions expressed in this Report have been based on the information supplied to SRK by CNMC. The opinions in this Report are provided in response to a specific request from CNMC to do so. SRK has exercised all due care in reviewing the supplied information. While SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them.

Opinions presented in this Report apply to the site's conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which SRK have had no prior knowledge nor had the opportunity to evaluate.

LIST OF ABBREVIATIONS

%	Percent
^{0}	Degrees, either of temperature or angle of inclination
ASL	Above sea level
AusIMM	Australasian Institute of Mining and Metallurgy
Co	The chemical symbol for cobalt
Cu	The chemical symbol for copper
DRC	The Democratic Republic of the Congo
E	East
ENFI	Beijing Central Engineering Institute for Non-ferrous Metallurgical Industries
EPs	Exploration Permits
g	gram
g/t	gram per tonne
HKEx	The Stock Exchange of Hong Kong Limited
Indicated Mineral Resource	That part of a resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a reasonable level of confidence. It is based on exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are too widely or inappropriately spaced to confirm geological and/or grade continuity but are spaced closely enough for continuity to be assumed
Inferred Mineral Resource	That part of a resource for which tonnage, grade and mineral content can be estimated with a low level of confidence. It is inferred from geological evidence and assumed but not verified geological and/or grade continuity. It is based on information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings, and drill holes which may be limited or of uncertain quality and reliability
IP (Induced Polarization)	An exploration technique whereby an electrical current is pulsed through the ground and the response from the sub surface measured in order to identify minerals of interest. Strong IP responses may be a result of sulfide which may be associated with gold mineralization
JORC Code	Joint Ore Reserves Committee Code
JORC Committee	Joint Ore Reserves Committee of The Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia
kg	kilogram, equivalent to 1,000 grams
km	kilometers, equivalent to 1,000 meters
km^2	square kilometers
kV	kilovolts – equivalent 1,000 volts
kW	Kilowatt, equivalent to 1,000 watt
Late Triassic	a time period of approximately 18 million years from 228 million to 210 million years ago
m	Meter(s)
m^2	square meter
m^3	cube meter
M	Million

Measured Mineral Resource	That part of a resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a high level of confidence. It is based on detailed and reliable exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes
Micron	1/1,000 of a millimeter
Middle Triassic	A time period of approximately 14 million years from 242 million to 228 million years ago
MLR	Ministry of Land and Resources
mm	Millimeter(s)
Mt	Million tonne (s)
Mtpa	Million tonnes per annum
MW	Megawatt, equivalent to 1,000,000 watt
N	North, also the chemical symbol for Nitrogen
NE	North East
NEE	North East East
NE-NNE	North East-North North East
NQ size core	47.6mm diameter, approximately 70% of the core taken
NW	North West
oz	troy ounce, equivalent to 31.1035 grams
Ox-Cu	Oxidized Copper Content
pH	A measure of the acidity or alkalinity of a solution, numerically equal to 7 for neutral solutions, increasing with increasing alkalinity and decreasing with increasing acidity. The pH scale commonly in use ranges from 0 to 14
PPE	personal protective equipment
ppm	parts per million, equivalent to grams per tonne (g/t)
PQ size core	85mm diameter
PRC	People's Republic of China
Probable Ore Reserves	The economically mineable part of an indicated, and in some circumstances measured, resource. It includes diluting materials and allowances for losses which may occur when the material is mined. Appropriate assessments, which may include feasibility studies, have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and government factors. These assessments demonstrate at the time of reporting that extraction could reasonably be justified
Proved Ore Reserves	The economically mineable part of a measured resource. It includes diluting materials and allowances for losses which may occur when the material is mined. Appropriate assessments, which may include feasibility studies, have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and government factors. These assessments demonstrate at the time of reporting that extraction could reasonably be justified. Also referred to as recoverable proved reserve.
QA/QC	Quality Assurance/Quality Control
RC (Reverse Circulation)	A percussion-drilling technique in which the cuttings are recovered

RL	see mRL
S	South, also the chemical symbol for sulfur
SE	South East
t	Tonne
Te	tellurium
TCu	Total Copper Content
TCo	Total Cobalt Content
tpa	tonnes per annum
tpd	tonnes per day
Triassic	A time period, approximately 250 million to 210 million years ago
Valmin Code	Code for Technical Assessment and Valuation of Mineral and Petroleum Assets and Securities for Independent Expert Reports
Zambia	The Republic of Zambia

1 INTRODUCTION AND SCOPE OF REPORT

CNMC commissioned SRK to undertake an independent assessment of all relevant technical aspects of CNMC's four subsidiary companies' operating properties in Zambia, including the Chambishi Main and West copper mines, the Baluba Center copper mine and associated ore processing plants, leaching plants and smelter; developing projects at the Chambishi Southeast copper deposit, Mwambashi copper deposit; and projects under construction including ore processing plants and leaching plants. The SRK Independent Technical Review Report ("ITR") was required for inclusion in documents for a proposed listing ("Proposed Listing") on the Main Board of the Stock Exchange of Hong Kong Limited ("HKEx").

2 BACKGROUND AND BRIEF

2.1 Background of the Projects

SRK was commissioned by CNMC to review and report all relevant technical aspects of the CNMC's four subsidiary companies' mining properties in the Republic of Zambia. The mining permits are currently wholly or partially owned by the Company's four subsidiary mining companies. Copies of the original mining licenses are shown in Appendix 1.

CNMC has four subsidiary mining/metallurgical companies including the NFC Africa Mining PLC ("NFCA"), Sino-Metals Leach Zambia Limited ("SML"), Chambishi Copper Smelter Limited ("CCS") and CNMC Luanshya Copper Mines PLC ("CLM"). These companies are all incorporated in the Republic of Zambia, and wholly or partially owned by CNMC. Each subsidiary company wholly or partially owns the copper mine(s) and associated processing plants, leaching plants and smelter. The proposed target group structure for the listing is shown Figure 2-1.

2.2 Background of the Properties

NFCA owns the Chambishi operating mine with an associated ore processing plant. SML owns the Chambishi Leach Plant which is engaged in hydrometallurgical refining operations to produce Cu cathode, and other projects which are either under construction or have planned be conducted in the future. CCS owns the Chambishi Cu Smelter to produce blister Cu utilizing pyrometallurgical smelting operations. Luanshya owns the Baluba operating mine with an associated ore processing plant; it also owns the Muliashi Copper Mine and other projects which are either under construction or are planned to be conducted in the future. Table 2-1 lists the properties of CNMC's four subsidiary companies in Zambia.

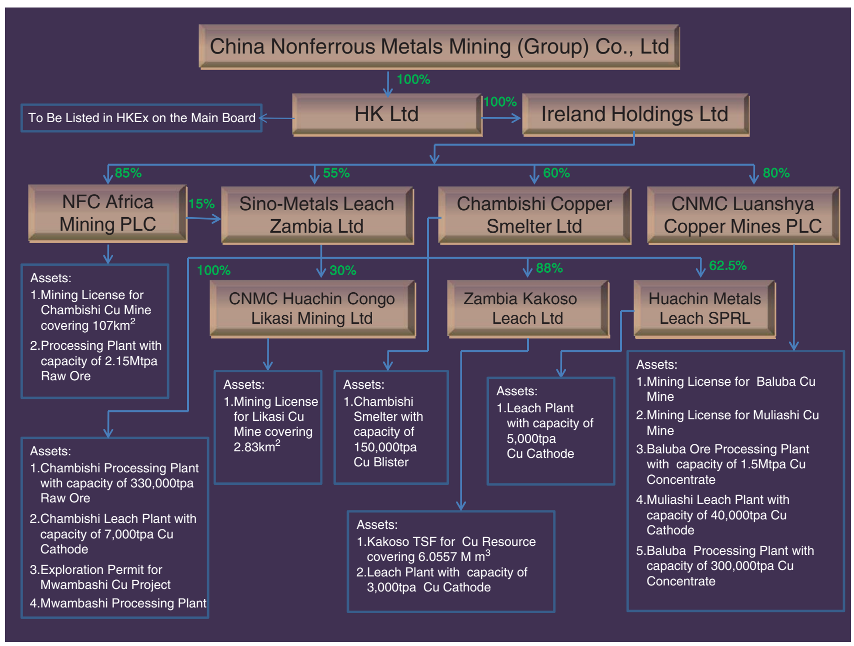

Figure 2-1: Proposed Target Group Structure

Table 2-1: Properties of CNMC's Four Subsidiaries in Zambia

Property	Designed Capacity (tpa)	Product	Source	Status
NFC Africa Mining PLC				
Chambishi Main Mine	2,145,000	Raw Ore		Production
Chambishi West Mine	990,000	Raw Ore		Production
Chambishi Processing Plant	86,000	Cu Concentrate	Chambishi Primary Ore	Production
Chambishi Southeast Mine	3,300,000	Raw Ore		Construction
Chambishi SE Processing Plant	261,030	Cu Concentrate	Chambishi SE Ore	Designed
Sino-Metals Leach Zambia Ltd				
Chambishi Processing Plant	8,150	Cu Concentrate	Chambishi Oxidized Ore	Production
Chambishi Leach Plant	7,000	Cu Cathode	Chambishi Tailings	Production
Mwambashi Cu Exploration Project				
Mwambashi Processing Plant		Cu Concentrate		Planned
Kakoso Leach Plant	3,000	Cu Cathode	Kakoso Tailings	Designed
Kakoso Tailings				
CNMC Huachin (Congo) Leach Plant	10,000	Cu Cathode		Production
Mabende Project	20,000	Cu Cathode	Mabende Cu Mine	Construction
Chambishi Copper Smelter Ltd				
Chambishi Cu Smelter	150,000	Blister Cu	Chambishi/Baluba Cu Concentrate	Production
CNMC Luanshya Copper Mines PLC				
Baluba Center Mine	1,500,000	Raw Ore		Production
Baluba Processing Plant	86,000	Cu Concentrate	Baluba Mine	Production
Muliashi North Mine	4,500,000	Raw Ore		Production
Muliashi Leach Plant	40,000	Cu Cathode	Muliashi North & Baluba East Mines	Production

3 PROGRAM OBJECTIVES AND WORK PROGRAM

3.1 Program Objectives

The principal objective of this Report is to provide existing CNMC shareholders and the HKEx with an ITR suitable for inclusion in documents that CNMC plans to submit to the HKEx in relation to the proposed listing on the Main Board. The SRK report is proposed to provide the HKEx and existing and potential shareholders in CNMC with an ITR which provides an unbiased technical assessment of the risk and opportunities associated with the mining and processing assets of the proposed listing company.

3.2 Reporting Standard

This Report has been prepared to comply with the Listing Rules of the HKEx. The Report has also been prepared to the standard of a Technical Assessment Report under the guidelines of the Valmin

Code. The Valmin Code is the code adopted by the Australasian Institute of Mining and Metallurgy and incorporates the Joint Ore Reserves Committee ("JORC") Code for the reporting of Mineral Resources and Ore Reserves. The standard is binding upon all Australasian Institute of Mining and Metallurgy ("AusIMM") members.

This Report is not a valuation report and does not express an opinion as to the value of mineral asset. Aspects reviewed in this Report do include product prices, socio-political issues and environmental considerations; however SRK does not express an opinion regarding the specific value of the assets and tenements involved.

3.3 Limitations Statement

SRK is not professionally qualified to opine upon and/or confirm that CNMC has 85%, 67.75%, 60% and 80% ownership of its four subsidiary companies of NFCA, SML, CCS and CLM, respectively, and that each subsidiary company has 100% control of the underlying tenement and/or has any unresolved legal matters relating to any transfer of ownership or associated fees and royalties. SRK has therefore assumed that no legal impediments regarding the existence of the relevant tenements exist and that CNMC and its subsidiary companies have legal rights to all underlying tenements as purported. Assessing the legal tenures and rights to the prospects of CNMC and its subsidiary companies are the responsibility of legal due diligence conducted by entities other than SRK.

3.4 Work Program

The work program consisted of a review of data provided by CNMC and its subsidiary companies, site visit to the mining tenements and other properties in April to May 2011 in the Copperbelt Province, northern Republic of Zambia; inspection of all the operating mines and development projects including the geology and resource, the production sites of the ore processing plants, leach plant and smelter; discussions with CNMC and its subsidiary companies' professionals and consultants who conducted the geological exploration and feasibility study; collection of verification samples of the Chambishi Main, West and Southeast Mines; supervision on the QA/QC on the Chambishi SE mine between June and July 2011 and resource estimation of the Chambishi SE mine in July 2011; collection and review of relevant documents; and preparation of this Report.

3.5 Project Team

The SRK project team, title and responsibility within this Report are shown in Table 3-1 below.

Table 3-1: SRK Team Members and Responsibilities

Consultant	Title	Discipline and Task
Dr Yiefei Jia	Principal Consultant (Geology)	Geology and Resources, Reporting
Qiushi Li	Senior Geologist	Geology and Resources
Pengfei Xiao	Senior Geologist	Geology and Resources
Lanliang Niu	Senior Consultant (Metallurgist)	Processing and Product Quality
Qiuji Huang	Senior Mining Engineer	Mining Assessment
Andrew Lewis	Senior Consultant (Geo-Environmental)	Environment, Permits and Approvals
Muhui Huang	Business Development Supervisor	Project Coordination and Execution
Dr Anson Xu	Principal Consultant (Geology)	Internal Peer Review
Mike Warren	Corporate Consultant (Project Evaluations)	External Peer Review

Yiefei Jia, ***PhD, MAusIMM,*** is a principal consultant (geology) with a specialty of exploration of mineral deposits. He has more than 20 years experience in the field of exploration, development, and resources estimate of precious (gold, silver, and PGE) and base metal (lead, zinc, copper, vanadium, titanium, and iron) as well as other metal ore deposits in different geological settings in China, Australia, and North America. He also has extensive experience in project management, exploration design and resource assessment and has coordinated a number of due diligence projects with technical reports for fund raising or overseas stock listing such as on the HKEx. ***Dr Jia was the project manager of this project.***

Qiushi Li, ***M.Sc., (Structural Geologist)*** graduated from China University of Geosciences with M.Sc. degree in 2006. From July 2006 to July 2009, he worked at China National Geological & Mining Corporation and Eritrea-China Exploration & Mining Sh. Co. He has been involved in exploration projects in deposits of gold, lead-zinc, copper manganese etc. With the past 6 years of working and studying, he has got more experience in various of prospecting and exploration projects. Before he joined SRK, Qiushi Li was involved in or managed many projects with exploration design, due diligence and management, as well as compiling technical report independently for clients. ***He was responsible for geological quality assurance and quality control and resources/reserves estimation.***

Pengfei Xiao, ***M.Sc., (Geophysics)*** graduated from the Chinese Academy of Sciences. In the past few years, Pengfei has completed a number of training courses on Petrology, Tectonics, and Geophysical exploration; he has also taken part in geological mapping. As a main participant, he has worked on the geophysical exploration and geological survey in some metal minerals and coal projects, including a key project sponsored by National Nature Science Foundation of China. ***Mr Xiao assisted Dr Jia in reviewing the geology and resources.***

Qiuji Huang, ***B.Eng., MAusIMM,*** a senior mining engineer with SRK Consulting China, graduated from Central South University of Mining and Metallurgy in 1982. He was previously a mining director for several gold mines in the southwest region of China. He later joined the Gold Administration Bureau of Guangxi province in charge of the supervision and direction of mine construction, mine planning and mining technology developing. Mr Huang is an expert on mine construction, mining technology, mine production and mine planning. ***He was responsible for the mining review.***

Lanliang Niu, ***BEng, MAusIMM,*** is a senior mineral processing engineer who graduated in 1987 from Beijing University of Science and Technology majoring in ore processing. He has worked on the industrial testing of gold leaching with low grade ores, managed or participated in processing and metallurgical testing for more than 10 precious and non-ferrous metals projects. With SRK, he has been responsible for the ore processing and metallurgical scope of work and has been involved in many key projects. ***He reviewed the metallurgical and processing aspects of the projects for this report.***

Andrew Lewis, ***BEng, MAusIMM,*** is a senior environmental engineer with SRK Consulting China. He has worked extensively in China and Asia for nearly a decade. He has worked on a wide variety of different projects ranging from technology transfer to environmental health and safety. His current focus is on environmental compliance, permitting, auditing and impact assessments on mining projects in China and Mongolia. He also works on environmental management systems, pollution prevention/mitigation and remediation of contaminated sites. ***Mr. Lewis was responsible for the review of environmental issues.***

Huang Muhui (Chris), ***Business Development Supervisor, Juris Master.*** Bachelor graduated from Beijing Foreign Studies University, Juris Master graduated from China University of Political Science and Law. With three years' engineering consulting experience and three years' mining project consulting experience, he has been providing project management, translation and logistic service for many SRK projects, namely, Citic Dameng Manganese — Due Diligence Review — Guangxi, China/ Jiulong Molybdenum — Due Diligence Review — Shanxi, China/Yindongpo Gold & Silver — Technical Review — Tongbai, Henan, China/Chenjiawan Cu-Mo-Au — Technical Review — Huangshi, Hubei, China / Meulaboh Bara Coal Mine — Exploration QA/QC — Aceh, Indonesia/ State Grid Copper Project — Technical Review, Kazakhstan/Tongling Non-Ferrous Copper Project — Technical Review, Ecuador. ***Chris was responsible for project coordination and execution.***

Dr Anson Xu, ***PhD, MAusIMM,*** is a principal consultant with a specialty in exploration of mineral deposits. He has more than 20 years experience in exploration and development of various types of mineral deposits including copper-nickel sulfide deposits related to ultrabasic rocks, tungsten and tin deposits, diamond deposits, and in particular, various types of gold deposits, vein-type, fracture-breccia zone type, alteration type and Carlin type. He was responsible for the resource estimate of several diamond deposits, and review of resource estimates of several gold deposits. He has recently completed several due diligence jobs for clients in China, including gold, silver, lead-zinc, iron, bauxite, and copper projects, and several technical review projects as well as HKEx technical reports. ***Dr Xu provided internal peer review to ensure the quality control of the report.***

Mike Warren, ***BSc (Mining Eng), MBA, FAusIMM, FAICD,*** is a mining engineer with over 30 years experience. He specializes in open pit and underground mining analysis, due diligence reports and mine evaluations. Mr Warren is a JORC Code competent person and Corporate Consultant (Project Evaluation) with SRK Australasia. ***He completed the external peer review of the report to ensure its quality.***

As the author of portions of the Report for CNMC on certain mineral properties in Copperbelt Province, Republic of Zambia, I, Yiefei Jia, do hereby certify that:

- I am employed by, and carried out the assignment for SRK Consulting China Limited, located at:

  B1205 COFCO Plaza
  8 Jianguomen Nei Dajie
  Beijing, the People's Republic of China
  100005
  Phone: 86-10-8512 0365, Fax: 86-10-8512 0385, Email: yjia@srk.cn

- I graduated with a Bachelor's degree in Geology and Geochemistry from Jilin University, China (B.Sc.) in 1987, a Master's degree in Geochemistry from Jilin University, China (M.Sc.) in 1990, and a Doctor's degree in Geology and Geochemistry from the University of Saskatchewan, Canada (Ph.D.) in 2001. I was awarded a Post Doctoral Fellowship from the Natural Science and Engineering Research Council of Canada ("NSERC") from April 2002 to March 2004 to work as a Research Scientist at the Australian National University. From 2004 to 2005, I worked for the Mining and Exploration Division of the Commonwealth Scientific and Industrial Research Organization ("CSIRO") as a research fellow.

- I am a member of the Australasian Institute of Mining and Metallurgy (AusIMM) (No. 230607).

- I have been directly involved in geological research and mineral exploration for more than 18 years.

- I have read the definition of "competent person" set out in HKEx listing rules and certify that by reason of my education, affiliation with a professional associations (as defined in the listing rules) and past relevant work experience, I fulfill the requirements to be a "competent person" for the purposes of the technical report.

- I visited the CNMC's properties in June 2011.

- I am the primary author responsible for the preparation and compilation of the report, and supervising Mr. Pengfei Xiao and Mr Qiushi Li to prepare geology and resource section and mining assessment section.
- I have had no previous involvement with the CNMC's projects. I have no interest, nor do I expect to receive any interest, either directly or indirectly, in the CNMC's Project, nor in the securities of China Nonferrous Metals Mining (Group) Co., Ltd and its subsidiary mining companies.
- I am not aware of any material fact or material change with respect to the subject matter of the Technical Report that is not reflected in the Technical Report, the omission to disclose which makes the Technical Report misleading.
- I am independent of the issuer applying all of the tests in sections 18.21 and 18.22 of the listing rules of HKEx.
- I consent to the filing of the Technical Assessment Report with HKEx and other regulatory authority and any publication by them, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Mr Mike Warren, Dr Anson Xu, Mr Lanliang Niu, Mr Qiuji Huang and Mr. Andrew Lewis are also independent competent persons on overall quality control, ore processing, mining and environmental and social issues. Their qualifications have been outlined in the short biographical notes above.

3.6 Statement of SRK Independence

Neither SRK nor any of the authors of this Report has any material, present or contingent interest in the outcome of this Report, nor do they have any pecuniary or other interest that could be reasonably regarded as being capable of affecting their independence or that of SRK.

SRK's fee for completing this Report is based on its normal professional daily rates plus reimbursement of incidental expenses. Payment of that professional fee is not contingent upon the outcome of the Report.

None of SRK or any authors of this report have any direct or indirect interest in any assets which had been acquired, or disposed of by, or leased to any member of the Company or any of the Company or any of its subsidiaries within the two years immediately preceding the issue of this Report.

None of SRK or any authors of this report has any shareholding, directly or indirectly in any member of the Group or any right (whether legally enforceable or not) to subscribe for or to nominate persons to subscribe for securities in any member of the Group.

3.7 Representation

CNMC and its subsidiary companies have represented to SRK that full disclosure has been made of all material information and that, to the best of their knowledge and understanding, such information is complete, accurate and true. SRK has no reason to doubt the representation.

3.8 Consent

SRK consents to this Report being included, in full, in documents that CNMC proposes to submit to the HKEx, in the form and context in which the technical assessment is provided, and not for any other purpose.

SRK provides this consent on the basis that the technical reviews expressed in the Executive Summary and in the individual sections of this Report are considered with, and not independently of, the information set out in the complete Report and the cover letter.

3.9 Indemnities

As recommended by the VALMIN Code, CNMC has provided SRK with an indemnity under which SRK is to be compensated for any liability and/or any additional work or expenditure resulting from any additional work required:

- which results from SRK's reliance on information provided by CNMC or to CNMC not providing material information; or
- which relates to any consequential extension workload through queries, questions or public hearings arising from the Report.

3.10 SRK Experience

SRK Consulting is an independent, international consulting group with extensive experience in preparing independent technical reports for various stock exchanges around the world (see www.srk.com for a review). SRK is a one-stop consultancy offering specialist services to mining and exploration companies for the entire life cycle of a mining project, from exploration through to mine closure. Among SRK's more than 1,500 clients are most of the world's major and medium-sized metal and industrial mineral mining houses, exploration companies, banks, petroleum exploration companies, agribusiness companies, construction firms and government departments.

Formed in Johannesburg, South Africa, in 1974 SRK now employs more than 1,000 professionals internationally in 42 permanent offices on six continents. A broad range of internationally recognized associate consultants complements the core staff.

SRK Consulting employs leading specialists in each field of science and engineering. Its seamless integration of services, and global base, has made the company a world's leading practice in due diligence, feasibility studies and confidential internal reviews.

The SRK Group's independence is ensured by the fact that it holds no equity in any project and that its ownership rests solely with its staff. This permits the SRK Group to provide its clients with conflict-free and objective recommendations on crucial judgment issues.

SRK China was established in early 2005, and is mainly working on Chinese mining projects independently or together with SRK's other offices, mainly SRK Australasia (see www.srk.cn and www.srk.com.au). SRK China has prepared a number of independent technical reports on mining projects for various companies which acquired Chinese projects or pursued listings on overseas stock exchanges, as showing in Table 3-2.

Table 3-2: Recent Reports by SRK for Chinese Companies

Company	Year	Nature of Transaction
Yanzhou Coal Limited (company listed on the Stock Exchange of Hong Kong Limited)	2000	Sale of Jining III coal mine by parent company to the listed operating company
Chalco (Aluminum Corporation of China)	2001	Listing on the Stock Exchange of Hong Kong Limited and New York Stock Exchange
Fujian Zijin Gold Mining Company	2004	Listing on the Stock Exchange of Hong Kong Limited
Lingbao Gold Limited	2005	Listing on the Stock Exchange of Hong Kong Limited
Yue Da Holdings Limited (company listed on the Stock Exchange of Hong Kong Limited)	2006	Proposed acquisition of shareholding in mining projects in P.R. China
China Coal Energy Company Limited (China Coal)	2006	Listing on the Stock Exchange of Hong Kong Limited
Sino Gold Mining Limited	2007	Dual listing on the Stock Exchange of Hong Kong Limited
Xinjiang Xinxin Mining Industry Company Limited	2007	Listing on the Stock Exchange of Hong Kong Limited
Espco Technology Holdings Limited	2008	Acquisition of shareholding in Tongguan Taizhou Gold-Lead projects in P.R. China
China Shenzhou Mining and Resources Inc	2008	Listing (SHZ) on the American Stock Exchange
Green Global Resource Ltd	2009	Acquisition of shareholding in iron project in Mongolia
Ming Fung Jewelry Group Ltd	2009	Acquisition of shareholding in gold projects in Anhui and Hebei Provinces, P.R. China
Continental Holdings Ltd	2009	Acquisition of a gold project in Henan Province, P.R. China
CNNC International Ltd	2010	Acquisition of a uranium mine in Africa
New Times Energy Corporation Ltd	2010	Acquisition of shareholding in gold projects in Hebei, Province, P.R. China
CITIC Dameng Resources Holdings Limited	2010	Listing on the Stock Exchange of Hong Kong Limited

3.11 Forward-looking Statements

Estimates of mineral resources are inherently forward looking statements. Being projections of future performance, they will differ from actual performance. The errors in such projections result from inherent uncertainties in interpretation of geologic data, variations in the execution of mining and processing plans, the ability to meet construction and production schedules, availability of necessary equipment and supplies, fluctuating prices and changes in regulations.

Opinions presented in this Report apply to the site's conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which SRK have had no prior knowledge nor had the opportunity to evaluate.

4 LOCATION, CLIMATE AND INFRASTRUCTURE

4.1 Location and Access

The reviewed operations include four Zambia based subsidiary companies of CNMC, namely NFCA, SML, CCS and CLM.

The mine sites, concentrators and smelting plants of CNMC are all located within the administrative area of the Copperbelt Province in the north of the Republic of Zambia. The Chambishi mines and concentrators and smelters operated by NFCA, SML and CCS are located near the city of Kitwe, and projects operated by CLM are located near the city of Luanshya.

Both Kitwe and Luanshya are mining cities in the Copperbelt Province with decades of history. Kitwe is the local economic center and the third largest city in terms of size and population of Zambia. The general location and access of the cities near the Projects is shown in Figure 4-1.

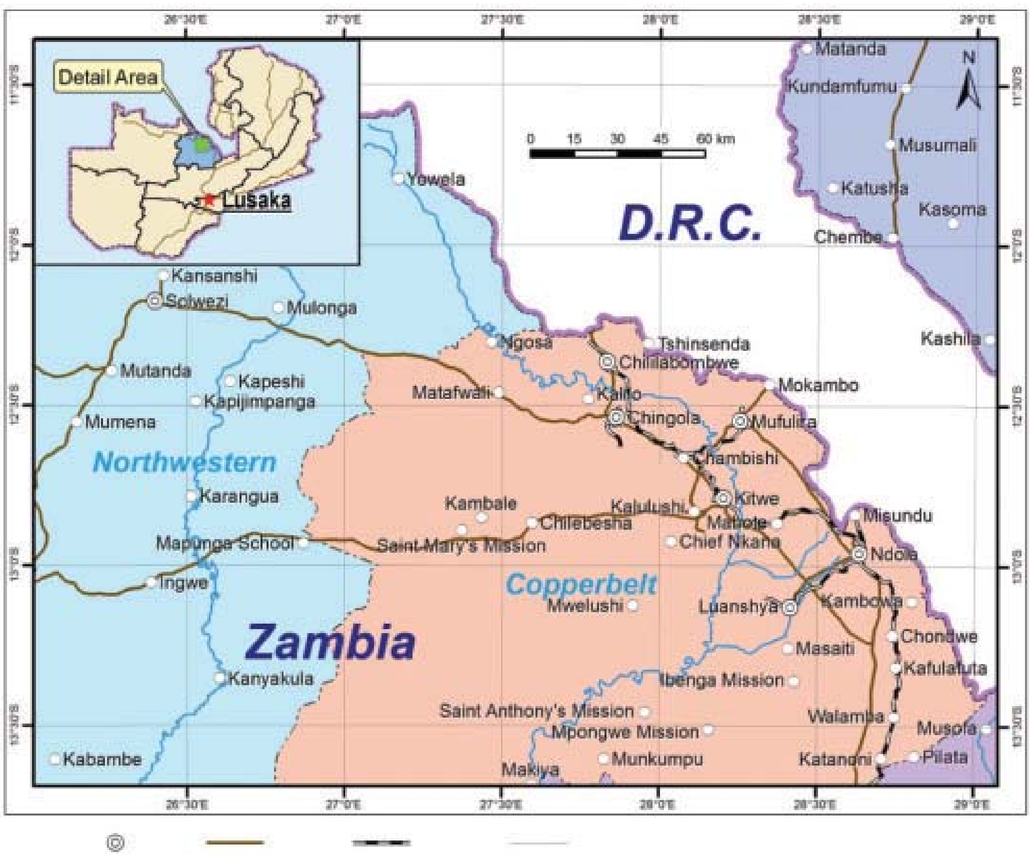

Figure 4-1: General Location and Access of the Projects

The access to the sites of the Projects is excellent. This area is generally flat without any considerable relief and the driveable unpaved roads at the mining sites are extensively developed. Railways are available at Kitwe, Chambishi and Luanshya. The main railway passes through the Copperbelt Province and extends north into the area of the Democratic Republic of the Congo ("DRC"), linking with the seaport at Dar el Salaam in Tanzania.

The airport at Ndola, the capital city of the Copperbelt Province, is located about 60km south-east of Kitwe and approximately 45km north-east of Luanshya, and services regular commercial domestic and international flights from Lusaka, Solwezi, Nairobi and Johannesburg. Another nearby airport, Southdowns Airport near Kitwe lies about 12km south-west of Kitwe but does not currently receive any scheduled services. The airport was closed down for repair in 2005, and re-opened in 2008, however it is not regularly used for civil transportation.

4.1.1 Chambishi Projects and Kakoso Tailings Development Project

Chambishi Main and Chambishi West

Chambishi Main and Chambishi West Mines are located 28km Northwest of Kitwe. The T3 road (national highway) passes the east side of the mines. The access from Kitwe to the mine sites, is generally excellent. Its geographic coordinates of the mines are approximately latitude 12°39'S and longitude 28°02'E.

Chambishi Southeast

The Chambishi Southeast Project is situated 20km northwest of Kitwe and with the geographic coordinates of latitude 12°48'S and longitude 28°00'E. The T3 national road crosses the mine site.

Mwambashi

The Mwambashi Project area is located approximately 25km to the southwest of Chingola and approximately 35km west to Kitwe. Normal access to the Mwambashi Project is via a paved road mixed with unpaved road from Chingola. A shortcut via an unpaved road of 8km links it directly with the Chambishi Main Mine; however it is available only in the dry season and on rainy days it is usually flooded. The geographic coordinates of the Mwambashi Project are about latitude 12°43'S and longitude 28°58'E.

Kakoso Tailings Development Project

The Kakoso Tailings Development Project is located about 78 km northwest of Kitwe, 4 km south of Chililabombwe and 23 km north of Chingola with the geographic coordinates about Latitude 12°37'S and 28°02'E. The T3 national road reaches the boundary and connects with the N1 road of DRC.

4.1.2 Luanshya Projects

The Luanshya Projects are located about 40km southwest of Ndola. The mine sites are well connected to Luanshya downtown with paved roads.

4.2 Climate and Physiography

The project areas are located on the great plateau in Southern Africa with relatively flat natural terrain at an elevation of about 1,200 to 1,270 m above sea level (ASL). This region lies within the tropics, but is has a pleasant climate affected by latitude. The temperature and rainfall varies greatly. Average annual temperature is around 20 degrees Celsius (°C). The year is divided into wet and dry seasons. The wet season lasts from early November until late March of the next year, and during this period rain falls almost daily. The period from the end of the wet season until September is called winter months. October is the hottest month year round, and the maximum temperature can reach 35 °C. The annual precipitation is around 1,000 to 1,500 millimeters (mm) (F. Mendelsohm, 1961).

The landscape around Kitwe and Luanshya is an attractive mix of gently undulating woodland, dambos, farmland and rivers such as the Kafue River flowing along Kitwe's eastern and southern edges. The region is drained by the Kafue River and its tributaries. The Kafue is a major tributary of the Zambezi River which is one of main river systems in Zambia and also the fourth-longest river in Africa and flows into Lake Kariba. Water supplies for both domestic and industrial use in the region are satisfactory.

4.3 Local Economy and Infrastructure

Kitwe was founded in 1936 and is the main industrial and commercial center of the Copperbelt Province. The Copperbelt Province is endowed with a range of mineral resources, in particular copper and cobalt, as well as wood and agriculture products. The development of local economy predominantly depends on mining activities. Some copper mines are located around Kitwe, such as Nkana, Chingola, Chambishi, Luanshya, Kululushi and Mindolo. Exploration and mining tools or machines are readily available in Kitwe. One of the main sources of hydroelectric power on the river is the Kariba Dam, which provides power to Zambia and Zimbabwe. The electric power grid covers all areas of the Projects. Telecommunications, hospitals, schools, university, lodges and supermarkets, as well as maintenance workshops for mining and transportation machines are available either in Kitwe or at nearby mining cities.

5 LICENSES AND PERMITS

5.1 Business Licenses

The business licenses detail of NFCA, CLM, CCS and SML are presented in Table 5-1.

Table 5-1: List of Business Licenses

Business License No.	**40172**
License Type	**Certificate of Incorporation of a Public Company**
Issued To	NFC Africa Mining PLC
Issued By	Office of the Register of Companies Republic of Zambia
Issue Date	March 5, 1998
Commencing Date	March 5, 1998
Business License No.	**40172**
License Type	**Certificate of Share Capital**
Issued To	NFC Africa Mining PLC
Issued By	Office of the Register of Companies Republic of Zambia
Issue Date	March 5, 1998
Commencing Date	March 5, 1998
Business License No.	**52849**
License Type	**Certificate of Incorporation of a Public Company**
Issued To	CNMC Luanshya Copper Mines Plc
Issued By	Office of the Register of Companies Republic of Zambia
Issue Date	November 10, 2009 (name replacement)
Commencing Date	December 12, 2003
Business License No.	**52849**
License Type	**Certificate of Share Capital**
Issued To	CNMC Luanshya Copper Mines Plc
Issued By	Office of Register of Companies Republic of Zambia
Issue Date	July 16, 2004
Commencing Date	July 16, 2004

Business License No.	**62959**
License Type	**Certificate of Incorporation of a Private Company Limited By Shares**
Issued To	Chambishi Copper Smelter Limited
Issued By	Office of the Register of Companies Republic of Zambia
Issue Date	July 19, 2006
Commencing Date	July 19, 2006
Business License No.	**62959**
License Type	**Certificate of Minimum Capital**
Issued To	Chambishi Copper Smelter Limited
Issued By	Office of the Register of Companies Republic of Zambia
Issue Date	July 19, 2006
Commencing Date	July 19, 2006
Business License No.	**62959**
License Type	**Certificate of Share Capital**
Issued To	Chambishi Copper Smelter Limited
Issued By	Office of the Register of Companies Republic of Zambia
Issue Date	July 19, 2006
Commencing Date	July 19, 2006
Business License No.	**57192**
License Type	**Certificate of Incorporation of a Private Company Limited By Shares**
Issued To	Sino-Metals Leach Zambia Limited
Issued By	Office of the Register of Companies Republic of Zambia
Issue Date	December 3, 2004
Commencing Date	December 3, 2004
Business License No.	**57192**
License Type	**Certificate of Minimum Capital**
Issued To	Sino-Metals Leach Zambia Limited
Issued By	Office of the Register of Companies Republic of Zambia
Issue Date	December 3, 2004
Commencing Date	December 3, 2004
Business License No.	**57192**
License Type	**Certificate of Share Capital**
Issued To	Sino-Metals Leach Zambia Limited
Issued By	Office of the Register of Companies Republic of Zambia
Issue Date	December 3, 2004
Commencing Date	December 3, 2004

5.2 Mining and Exploration Licenses

The mining licenses detail of NFCA, CLM and SML are presented in Table 5-2.

Table 5-2: List of Mining and Exploration Licenses

Mining License No.	**7068-HQ-LML**
License Type	**Large-Scale Mining License**
Issued To	NFC Africa Mining PLC
Issued By	Republic of Zambia Mines Development Department
Issue Date	May 12, 2010
Commencing Date	June 29, 1998
Period Granted	Twenty Five Years
Minerals Granted	Sb, Mo, Si, W, U, PGE, Au, Co, Cu, Ni, Zn, Se, Te, Cd, Ag, Ge, Fe and Pb

Mining License No.	**7069-HQ-LML**
License Type	**Large-Scale Mining License**
Issued To	NFC Africa Mining PLC
Issued By	Republic of Zambia Mines Development Department
Issue Date	May 12, 2010
Commencing Date	June 29, 1998
Period Granted	Twenty Five Years
Minerals Granted	Sb, Mo, Si, W, U, PGE, Au, Co, Cu, Ni, Zn, Se, Te, Cd, Ag, Ge, Fe and Pb

Mining License No.	**7070-HQ-LML**
License Type	**Large-Scale Mining License**
Issued To	NFC Africa Mining PLC
Issued By	Republic of Zambia Mines Development Department
Issue Date	May 12, 2010
Commencing Date	June 29, 1998
Period Granted	Twenty Five Years
Minerals Granted	Sb, Mo, Si, W, U, PGE, Au, Co, Cu, Ni, Zn, Se, Te, Cd, Ag, Ge, Fe and Pb

Mining License No.	**8097-HQ-LML**
License Type	**Large-Scale Mining License**
Issued To	CNMC Luanshya Copper Mines PLC
Issued By	Republic of Zambia Mines Development Department
Issue Date	April 29, 2010
Commencing Date	January 23, 2004
Period Granted	Twenty Years
Minerals Granted	Cu, Co, Au, Ag, Pb, Zn, Ni, U, S, Se, Bi, Te, Ge, Auf, Mo, W, Cadmium

Mining License No.	**8396-HQ-LML**
License Type	**Large-Scale Mining License**
Issued To	CNMC Luanshya Copper Mines PLC
Issued By	Republic of Zambia Mines Development Department
Issue Date	April 29, 2010
Commencing Date	October 19, 2006
Period Granted	Twenty Five Years
Minerals Granted	Copper and Cobalt

Mining License No.	**8394-HQ-LML**
License Type	**Large-Scale Mining License**
Issued To	CNMC Luanshya Copper Mines PLC
Issued By	Republic of Zambia Mines Development Department
Issue Date	April 29, 2010
Commencing Date	October 19, 2006
Period Granted	Twenty Five Years
Minerals Granted	Copper and Cobalt

Mining License No.	**8393-HQ-LML**
License Type	**Large-Scale Mining License**
Issued To	CNMC Luanshya Copper Mines PLC
Issued By	Republic of Zambia Mines Development Department
Issue Date	April 29, 2010
Commencing Date	October 19, 2006
Period Granted	Twenty Five Years
Minerals Granted	Copper and Cobalt

Mining License No.	**8395-HQ-LML**
License Type	**Large-Scale Mining License**
Issued To	CNMC Luanshya Copper Mines PLC
Issued By	Republic of Zambia Mines Development Department
Issue Date	April 29, 2010
Commencing Date	October 19, 2006
Period Granted	Twenty Five Years
Minerals Granted	Copper and Cobalt

Mining License No.	**8404-HQ-LML**
License Type	**Large-Scale Mining License**
Issued To	CNMC Luanshya Copper Mines PLC
Issued By	Republic of Zambia Mines Development Department
Issue Date	April 29, 2010
Commencing Date	September 9, 2006
Period Granted	Twenty Five Years
Minerals Granted	Copper and Cobalt

Mining License No.	**8392-HQ-LML**
License Type	**Large-Scale Mining License**
Issued To	CNMC Luanshya Copper Mines PLC
Issued By	Republic of Zambia Mines Development Department
Issue Date	April 29, 2010
Commencing Date	October 19, 2006
Period Granted	Twenty Five Years
Minerals Granted	Copper and Cobalt

Mining License No.	**15201-HQ-LPL**
License Type	**Exploration License**
Issued To	Sino-Metals Leach Zambia Ltd
Issued By	Republic of Zambia Geological Survey Department
Issue Date	January 6, 2011
Commencing Date	December 20, 2011
Period Granted	Two Years
Minerals Granted	Copper

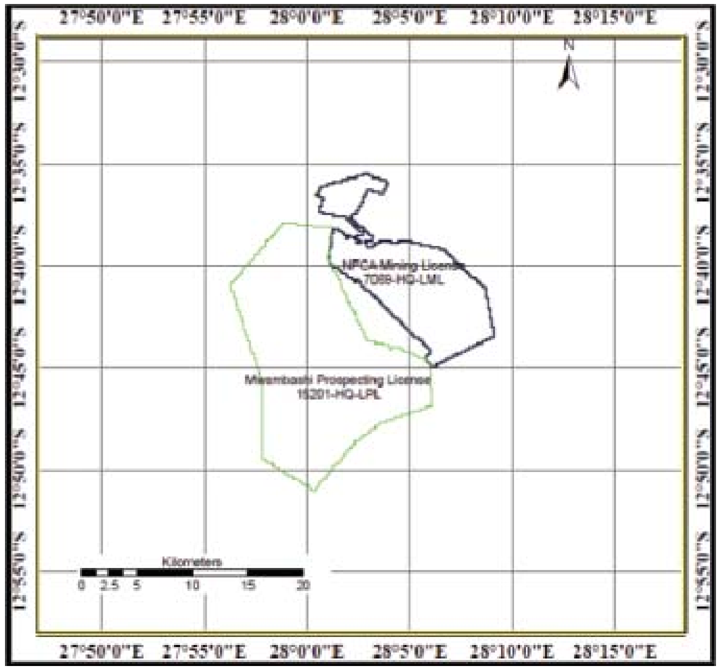

Figure 5-1: Map of Mining License Areas 7069-HQ-LML and 15201-HQ-LPL

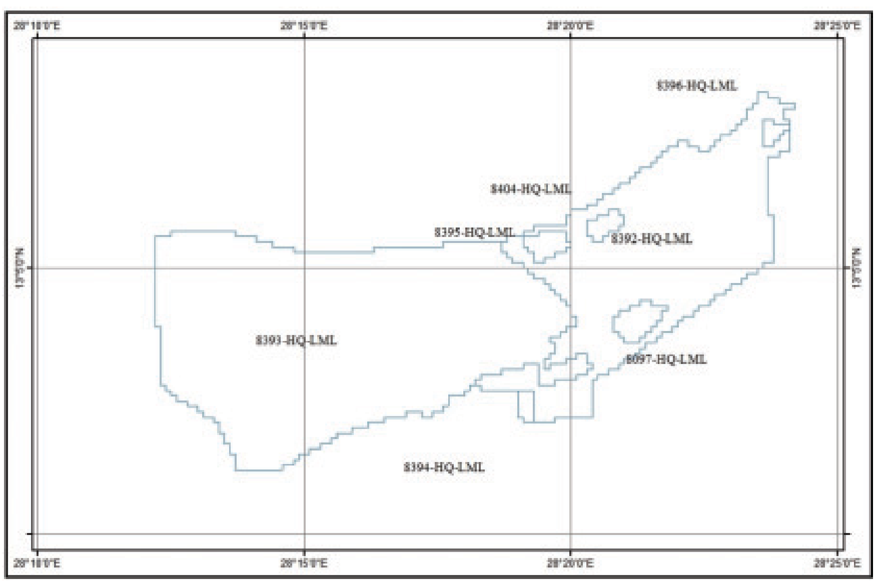

Figure 5-2: Map of Mining License Areas of CLM Projects

5.3 Annual Operating Permit

Operating Permit No.	**027/2012**
License Type	**Annual Operating Permit**
Issued To	NFC Africa Mining PLC
Issued By	Republic of Zambia Ministry of Mines & Minerals Mine Safety Department
Issue Date	February 2, 2012
Commencing Date	January 1, 2012
Period Granted	One Year
Operating Permit No.	**029/2012**
License Type	**Annual Operating Permit**
Issued To	CNMC Luanshya Copper Mines PLC
Issued By	Republic of Zambia Ministry of Mines & Minerals Mine Safety Department
Issue Date	February 10, 2012
Commencing Date	January 1, 2012
Period Granted	One Year
Operating Permit No.	**018/2012**
License Type	**Annual Operating Permit**
Issued To	Chambishi Copper Smelter Limited
Issued By	Republic of Zambia Ministry of Mines & Minerals Mine Safety Department
Issue Date	January 9, 2012
Commencing Date	January 1, 2012
Period Granted	One Year
Operating Permit No.	**036/2012**
License Type	Annual Operating Permit
Issued To	Sino-Metals Leach Zambia Ltd
Issued By	Republic of Zambia Ministry of Mines & Minerals Mine Safety Department
Issue Date	February 17, 2012
Commencing Date	January 1, 2012
Period Granted	One Year

6 GEOLOGY & MINERAL INVENTORY ASSESSMENT

The review of geology and/or resource presented in this section involves the projects below.

- NFCA Chambishi Project: it includes the three mines of Chambishi Main, Chambishi West, and Chambishi Southeast (Chambishi SE);
- SML Tailing Project: it includes the recyclable Chambishi tailing dams, Kakoso tailings development project and Mwambashi exploration and development project;
- CLM Luanshya Project: it includes seven mining licenses located in the Roan-Muliashi Basin near Luanshya.

6.1 Regional Geology

The Copperbelt of Zambia is located in the heart of Africa, south of the Equator, in the vicinity of latitude 13ºS and longitude 28ºE. The belt is enriched in copper and cobalt mineralization and extends from Ndola, the capital of Copperbelt Province of Zambia, to Katanga Province of the DRC with a nearly southeast (SE) — northwest (NW) strike.

The Chambishi and Mwambashi Projects are on the west limb of the Kafue Anticline (Figure 6-1) while the Luanshya Project is situated on the south-eastern edge of the Kafue Anticline (Figure 6-2). The Chambishi Main, Chambishi West and Chambishi SE Mines are situated at the north-east edge of the Chambishi Basin, and the Mwambashi Project is situated at the north-west edge of the Chambishi Basin.

The Kafue Anticline, trending roughly NW-SE (an average trend about 145°), is the dominant structural feature of the Copperbelt and is composed of the Basement Complex. The copper deposits in the Copperbelt are almost all lined up on either side of this geological feature. Approximately 40km through the Copperbelt the Kafue River follows the anticlinal axis, consisting of schists of the Lufubu Systems, granites intrusive therein, and two infolds of the Muva System.

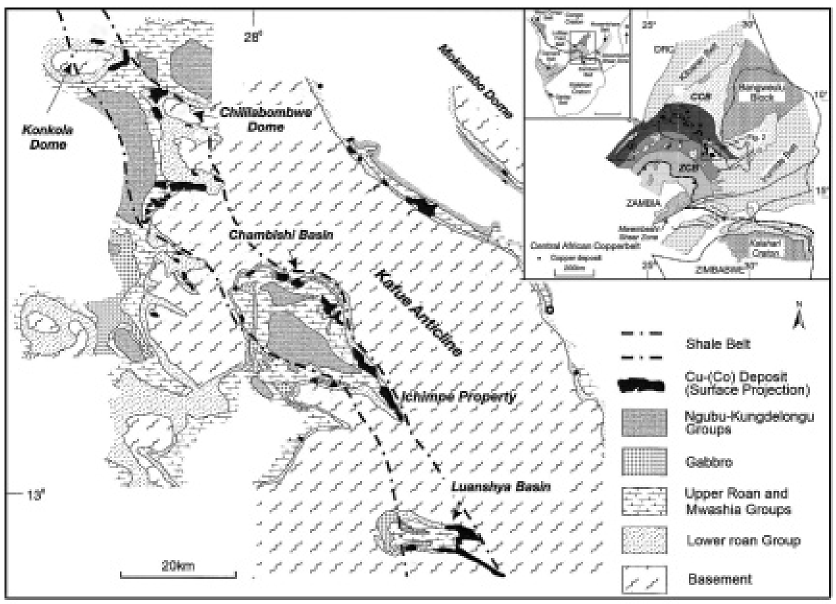

Figure 6-1: Tectonic Location of the Project Sites

(Modified from David Selley et al 2005)

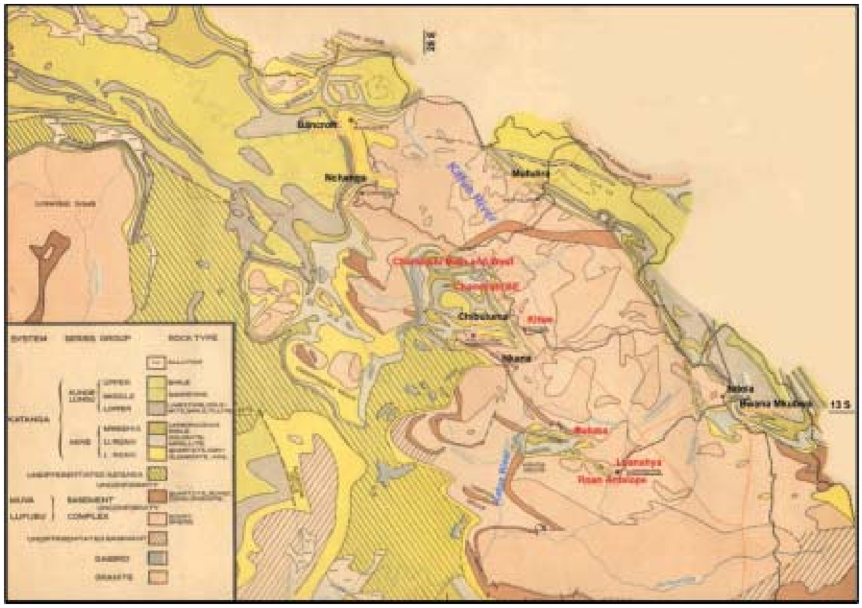

Figure 6-2: Regional Geological Map of Chambishi and Luanshya Projects*

* Sourced and modified from "Geological Map of the Northern Rhodesian Copperbelt" of 1:500,000 scale published by former Rhodesian Selection Trust Ltd incorporation with Anglo-American Corporation Ltd and printed by Mufurila Copper Mines Ltd in 1961. "Northern Rhodesian" refers to the area of what is now named Zambia.

The synclinorium parallel to the Kafue Anticline is developed in the region. Only a few minor scale faults were discovered during the mining operation stage. Some minor folds are also developed in this area. The gabbro, intruded during the Lufulian Orogeny event, is almost entirely confined to the Upper Roan Group and increases westwards across the Copperbelt.

The Kafue Anticline, i.e. the Basement Complex is overlain by the Neoproterozoic Katanga Supergroup, with an unconformity contact. The widespread Katanga System is subdivided into the Lower Roan (RL), Upper Roan (RU) and Mwashia Groups, and other series of the Nguba Group and Kundelungu Series. The Nguba Group is absent in the Chambishi area and the Luanshya area. Copper and cobalt mineralization is generally associated with the sedimentary rocks of the Lower Roan (RL) Group. The Quaternary sediments cover the regional area.

6.2 NFCA Chambishi Projects

The NFCA large-scale mining license of the Chambishi Projects includes two operating mines, namely Chambishi Main Mine and Chambishi West Mine, and one development project, namely the Chambishi Southeast (Chambishi SE) deposit, which is now under exploration and construction.

6.2.1 Local Geology and Background

The Chambishi Basin which hosts NFCA Chambishi mines (Chambishi Main, Chambishi West and Chambishi SE) is dominated by the Neoproterozoic Katanga Supergroup (Figure 6-3). The local geology and structure share the typical features of the Copperbelt.

The underlain Basement Complex consists of the Lufubu and Muva Systems and granitoids/granites. The Lufubu consists of gneiss and is overlain by the Muva System which consists of schist quartzite and conglomerate. The Basement Complex is overlain by the Katanga System with an unconformity contact. The Katanga Supergroup is widespread in the Chambishi Basin, which is subdivided into groups of Lower Roan, Upper Roan, Mwashia, Nguba and Kundelungu, among which the Nguba is absent in the Chambishi Basin. Copper and cobalt mineralization is generally associated with the sedimentary rocks of Lower Roan.

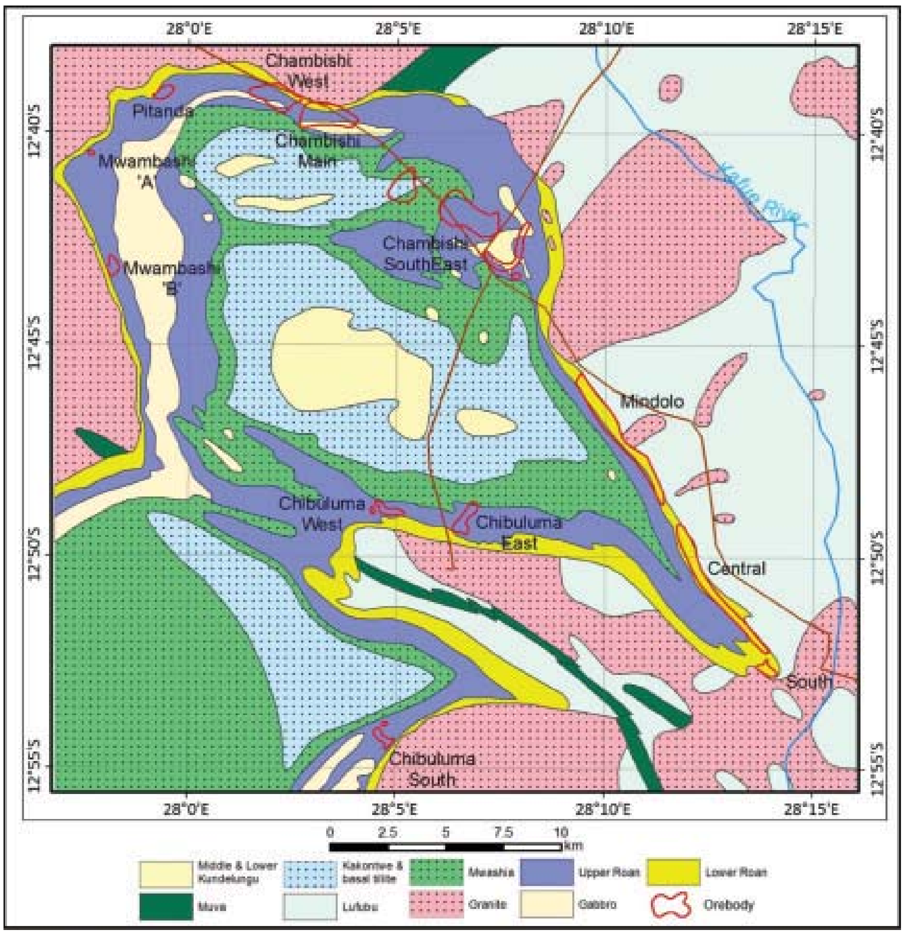

Figure 6-3: Local Geological Map of Chambishi Area

Along the rim of the Chambishi Basin, some copper/copper-cobalt deposits have experienced exploration and mining activity such as at the Nkana, Mindolo and Chibuluma deposits.

6.2.2 Geology of Chambishi Main, West and Southeast Mines

The Chambishi Main, West and Southeast Mines are situated on the northeast limb of the Chambishi Basin which is a northwest plunging synclinal basin with a strike in the north-western direction. The geological map of the Chambishi Main and Chambishi West is shown on Figure 6-4. One barren gap 200 to 300m along the strike of the mineralization was defined by the exploration program. The Chambishi Main orebody extends over 2,280m from east to west. The Chambishi West orebody extends 1,400 to 2,100m with a north-west strike. The Chambishi Southeast copper-cobalt (Cu-Co) deposit is approximately 7km southeast of the Chambishi Main Mine. Two Cu-Co mineralized bodies have been defined by NFCA in the deposit area (Figure 6-4).

Gneiss is widespread within the mapping area. Gneiss, biotite schists and quartzite of the Lufubu and Muva Systems make up the Basement Complex. A sequence of sedimentary rocks of the Katanga Supergroup, including dolomites, sandstone, limestone, silt, quartzite and illite, overlies the Basement Complex with unconformable contact. The Lower Roan, Upper Roan and Mwashia Groups of the Katanga Supergroup spread in the southern part of the area; they strike east-westerly and dip to south with a dip angle of up to 60°.

The Lower Roan is made up of basal conglomerate, quartzite, arkose, footwall conglomerate, ore shale formation and hangingwall quartzite. The Lower Roan Group hosts the copper mineralization and is overlain by the Upper Roan Group which consists of schist, quartzite, dolomite and some meta-garbbo. The Muwashia Group is distributed at the south edge of the mapping area, which is unconformably overlain by the Upper Roan Group and consists of dark-grey argillaceous sediments, minor dolostone and quartzite.

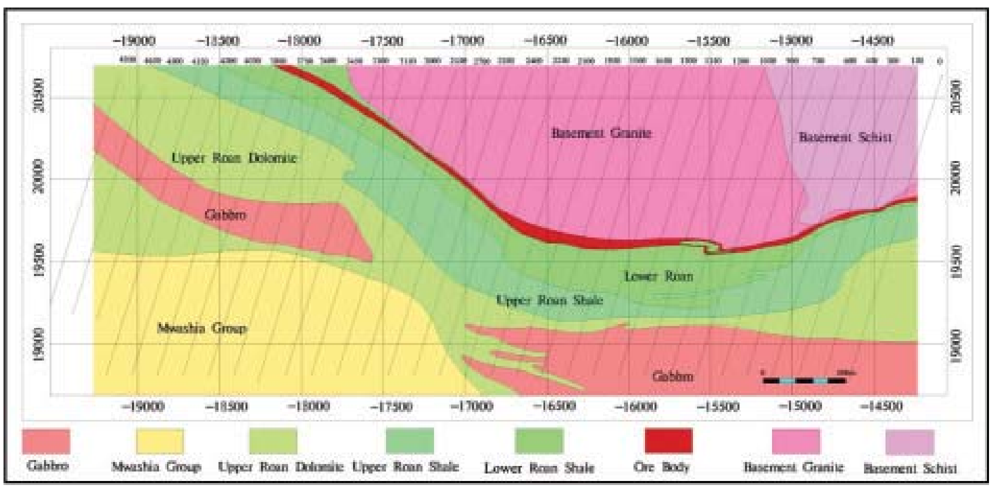

Figure 6-4: Geological Map of Chambishi Main Mine and Chambishi West Mine

The north rim of the Chambishi Basin shows considerable sinuosity due mainly to folding along a southeast-striking axial plane. The folds plunge southeast parallel to the Kafue anticline. The minor scale of interbeded folds are well developed in the siltstone of the hanging wall. The minor scale of faults with a displacement of several meters in ore bodies were discovered during the mining stage.

6.2.3 Orebody Geology

Chambishi Main and West Mines

The ore bodies at the Chambishi Copper project occur in the Ore Shale Formation of the Lower Roan. Several minor occurrences of low grade sulfide mineralization have been found in argillite and quartzite above the Ore Shale Formation and in the conglomerate below the Ore Shale Formation.

The Chambishi Main Mine has one orebody. It strikes E-W with dip angles of 15° to 75° (Figure 6-5). The extension of the orebody along the strike is around 2,280m. There is a 200 to 300m wide gap consisting of barren and low grade mineralization between the Chambishi Main orebody and the Chambishi West orebody. Down-dip extension of the Chambishi Main orebody is defined by boreholes to about 900m from the surface. The thickness of the Chambishi Main orebody ranges from 2.10m and 18.23m with an average of 8.03m. The average grade of the Chambishi Main orebody is 2.51% TCu.

The Chambishi West Mine has one orebody. The orebody strikes north-westerly and dips to the south with an average dip angle of 30º. It is about 1,400 to 2,100m long and has an average thickness of around 8.0m. The eastern part of the orebody is relatively thicker. The thickness of mineralized shale in the western part of the orebody is generally around 1.0m. Down-dip extension of the Chambishi West orebody is defined by boreholes to about 600m from the surface. The thickness of the Chambishi West orebody ranges approximately from 2m and 17m with an average of 8m (Figure 6-6). The average grade of the Chambishi West orebody is 2.15% TCu.

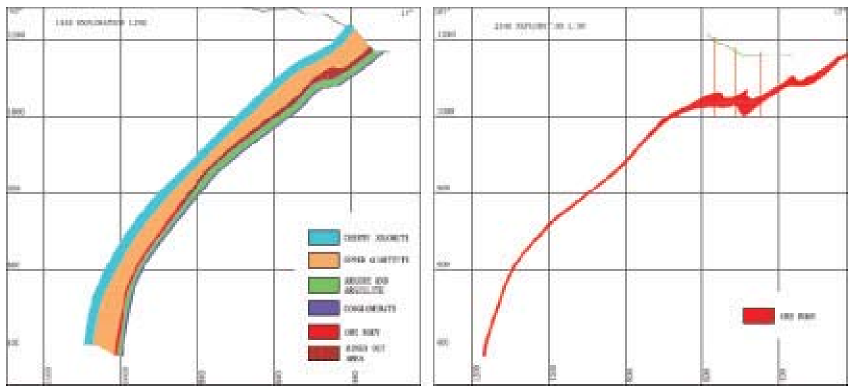

Figure 6-5: Cross-section of 1440# and 2340# Exploration Lines at Chambishi Main

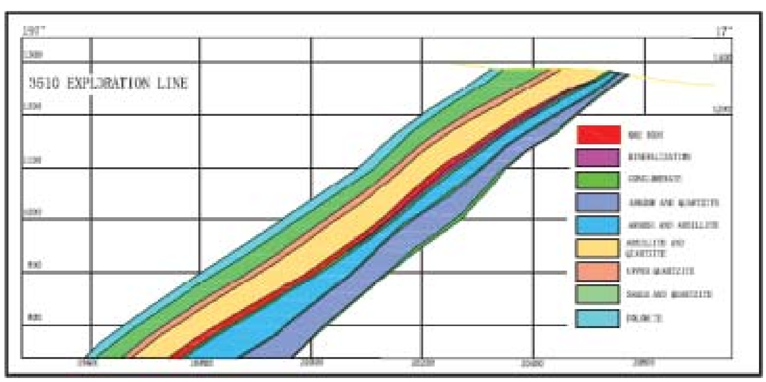

Figure 6-6: Cross-section of 3,510# Exploration Line at Chambishi West

Chambishi Southeast Mine

The Chambishi Southeast Mine has two Cu-Co ore bodies; the North orebody is in the northern zone and the South orebody is within the southern zone. The characteristics of the two ore bodies are detailed below.

The two Cu-Co mineralized bodies appear as bedded and stratified mineralization and are hosted in the Ore Shale Formation of the Lower Roan. The North orebody shown in the center of Figure 6-7 is defined between 0# and 53# exploration lines. It extends 4,500m along a southeast (SE) — northwest (NW) trend and dips to the northeast (NE) at dip angles of 5º to 15º. The width (down dip extension) of the body varies from 569 to 1,237m. The thickness of the North mineralized body varies from 1.4m to 22.9m with an averaging thickness about 10.0m. The average grades of Cu and Co as analyzed from completed drill cores are 2.30% and 0.116%, respectively.

The South orebody shown in the south of the Figure 6-7 is defined between 0# and 64# exploration lines. It extends 3,540m along the SE-NW trending. The width (down dip extension) of the orebody varies from 800m to 1,600m. This orebody is delineated by 14 drill holes.

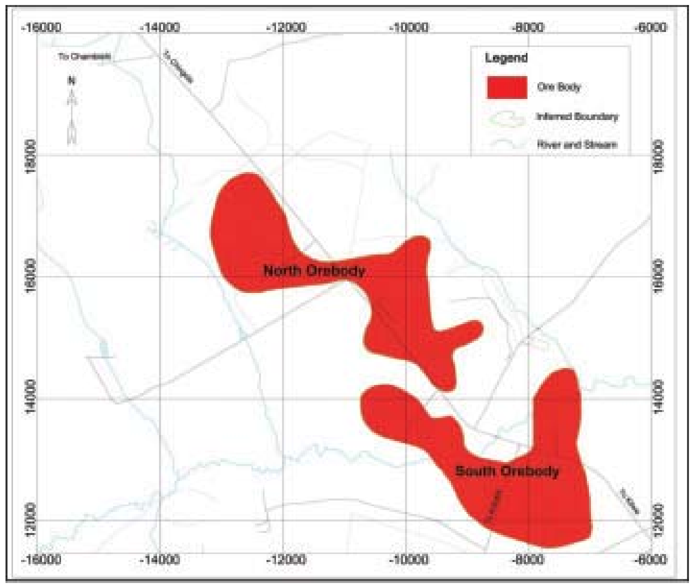

Figure 6-7: Map of Cu-Co Mineralized Bodies of Chambishi SE Mine

Figure 6-8 shows the Chambishi SE North orebody at the level of 600m deep from the surface. The orebody is intersected by current drilling explorations.

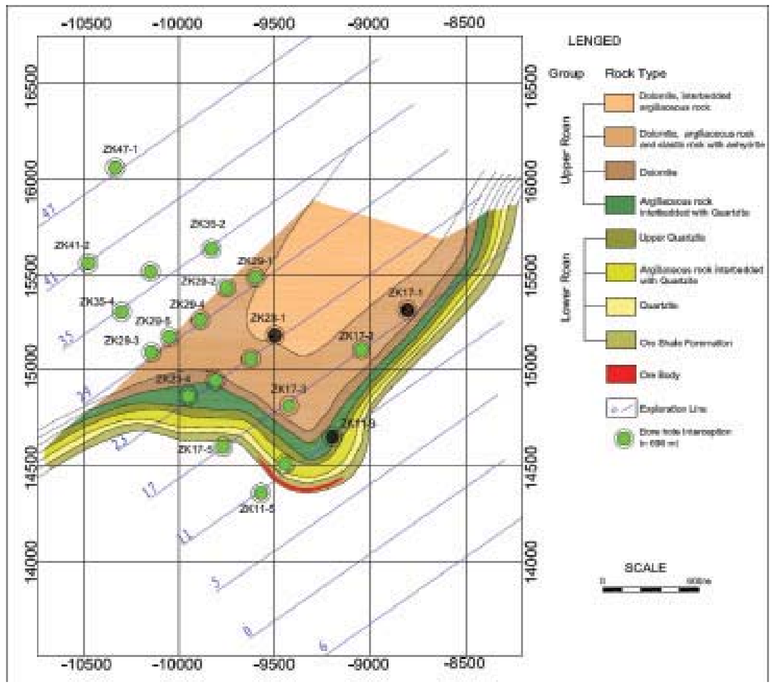

Figure 6-8: Geological Map of Chambishi SE North Orebody at -600m Level

6.2.4 Mineralogical Characteristics

Chambishi Main and West Mines

In the Chambishi Main Mine, the remaining mineralized body is below the weathering zone. Ore minerals are mainly bornite and chalcopyrite. Gangue minerals are mainly hornblende, carbonate, quartz and clay minerals. The TCu grade decreases from the top to bottom of the orebody. According to the mineral component, the Main orebody is divided into three zones (Figure 6-9): the chalcopyrite zone, the chalcopyrite-bornite zone and the bornite zone. The grades of TCu are generally below 2% in the chalcopyrite zone, 2 to 4% in the chalcopyrite-bornite zone, and more than 4% in the bornite zone (Figure 6-10).

In Chambishi West Mine, the orebody is hosted by the Ore Shale Formation of the Lower Roan Group. Ore minerals are mainly chalcopyrite, bornite with minor chalcocite. Gangue minerals are mainly hornblende, carbonate, quartz and clay minerals. The orebody shows a vertical zonation. From top (0m level) to bottom (200m level) it transitions from oxidized ore to mixed mineralization to primary ore.

Both the Chambishi Main and Chambishi West ore bodies are characterized by a banded structure and a disseminated texture.

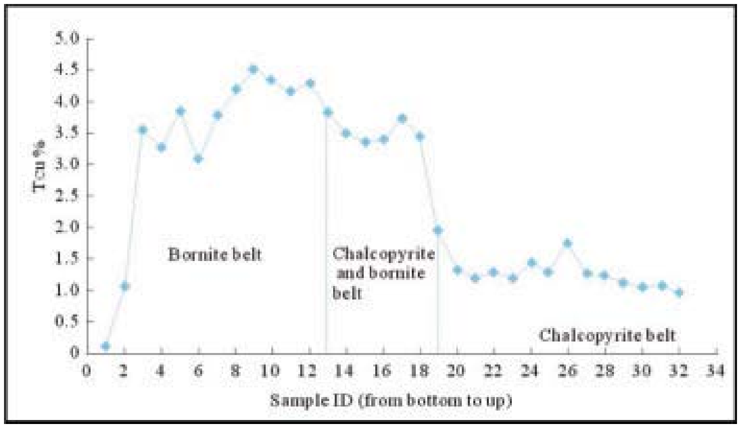

Figure 6-9: Grade of TCu Profile of 255003# Underground Borehole

Figure 6-10: Bornite Mineralization in Fresh Sample — Chambishi Main

The hangingwall rocks of the Chambishi Main orebody are shale formation. The footwall rock is basal conglomerate. The orebodies have a sharp contact with the footwall rock and the grade of TCu gradually decreases to the hangingwall.

Chambishi Southeast Mine

The mineralization at Chambishi SE is defined generally below the oxidized zone, starting at a vertical depth of 500 to 600 m. The sulfide minerals are predominantly chalcopyrite (see Figure 6-11), pyrite, pyrrhotine, carrollite, skutterudite, linnaeite and bornite. The texture of ore occurs as massive, banded, disseminated and nodular. The ore structure is characterized by xenomorphic granular and irregular granular. Chalcopyrite occurs as grains from 0.2 to 20 mm in diameter. Minor chalcopyrite shows aggregate with pyrrhotite and pyrite. A microscopic study indicates that copper bearing minerals are dominated by chalcopyrite and minor bornite. The cobalt bearing minerals include carrollite, skutterudite and linnaeite. Gangue minerals are represented by quartz, carbonate, feldspar, hornblende and clay minerals.

Figure 6-11: Chalcopyrite Mineralization — Chambishi SE Mine

The useful elements consist of Cu and Co associated with non-recoverable Au (with grade of 0.10 to 17.20ppb) and Ag (with grade of 0.10 to 5.70ppb). Harmful components are SiO_2 (35.98 to 63.05%), P_2O_5 (0.077 to 0.350%), arsenic ("As", 1.70 to 170.00ppb) and sulfur ("S", 0.43 to 5.81%). The content of the harmful components are lower than the limits of the smelting process. Trace uranium was detected in the mineralization section of borehole ZK17-2.

The host rocks are sedimentary rocks. Massive and stable quartzite and argillaceous rock formed the hanging wall. The footwall rock consists of basal conglomerate and quartzite. The N1 Cu-Co mineralized body has a sharp contact with the footwall.

6.2.5 Exploration, Sampling, Analytical Procedures and Quality Control

Chambishi Main and West Mines

Chambishi Copper Mines (including Chambishi Main and Chambishi West) were closed in 1987. A total of 305 boreholes and some tunnels located in Chambishi Main and Chambishi West were conducted by ZCCM and other companies before 1986. In 1998, NFCA obtained the business right and mining licenses, but the geological data about history exploration work could not be completely collected from ZCCM. Most of cores of old boreholes were stored in the Kalulushi Core Store.

In the Chambishi Main Mine, NFCA conducted a total of 113 underground drill holes with 7,364.33m footage for updating the resource/reserve classification of the eastern and western extension of the Chambishi Main deposit during January 2001 to March 2002. NFCA geologists completed the report of "*Prospecting Report on Eastern and Western Segments of Main Orebody Above 500 Meter Level, Chambishi Copper Mine, Zambia*". During 2004 to 2006, a total of 26 underground drill holes were carried out to define the main orebody within the depth interval from 700 to 900mL. NFCA estimated the resource/reserve and finalized the report of "*Preliminary Prospecting Report of Main Orebody Within 700-900 Meter Level, Chambishi Copper Mine, Zambia*". An additional 420 drill holes with over 34,800m footage were completed during 2004 to 2010 for mining activities and updating the resources. In Chambishi West Mine, a total of 57 underground drill holes with 4,595.65m footage and 12 surface drill holes were (Figure 6-12) were conducted by NFCA for the mining program. Most of the drill cores were kept in the core storage warehouse (Figure 6-13) at the Chambishi Copper Mine.

Figure 6-12: Location of Borehole WS001 — Chambishi West Mine

Figure 6-13: NFCA Drill Cores Storage Warehouse

The core recovery rates were generally more than 80% for the whole drill cores and above 90% for the mineralized interval. The site geologists completed the geological logging and sampling. Samples were taken from drill cores by splitting along the core axis. Each sample was generally 1m long, and wall rock and mineralization sections were sampled separately. Trench samples were collated from fresh rock in the tunnels by the channeling method at a scale of 5cm wide by 3cm deep by 2m long.

Most of samples were sent to the NFCA Chambishi Mine Laboratory for sample preparation and assaying. The samples were crushed to 2.2mm and at least 1kg crushed sample was further pulverized to 200 mesh. Finally, about 0.125kg weight of each sample was used for assay. The Atomic Absorption Spectrophotometer (AAS) method was used for assay of Cu and Co. During analysis procedure, the standard materials and blank samples were inserted in each sample batch. About 5% of total samples were randomly selected and delivered to Alfred H. Knight (Zambia) for an external check. This laboratory has international certification with accreditation standard of ISO/IEC 17025. By reviewing the procedure of sample preparation and analysis at Alfred H. Knight in May 2011, it is of SRK's opinion that the protocol meets with the requirement of the SAMREC Code.

Chambishi Southeast Mine

The exploration of Chambishi SE Cu-Co deposit commenced in 1903. Exploration work was subsequently conducted by several companies. Some trial pits and trenches were conducted between 1927 and 1929. Eight boreholes were drilled between 1930 and 1932. Geophysical and geochemical surveys as well as drilling program were carried out between 1952 and 1982. One Cu-Co mineralized body at 600 to 1,100 m below surface was delineated at Chambishi SE deposit.

To follow up the results of previous exploration, ZCCM together with Metal Mining Agency of Japan ("MMAJ") conducted 12 boreholes with 10,663m footage. Based on the findings of the drill cores combining with historical geological data, ZCCM and MMAJ re-delineated the Cu-Co mineralized body and estimated the prospective resource of Chambishi SE deposit in 1995. The resource of the Cu-Co mineralized body in the northern part of Chambishi SE was estimated at 54.79Mt with an average grade of 2.70% TCu and 0.13% TCo, and approximately 14.93 Mt of potential resource in the southern part of Chambishi SE deposit with an average of grade of 2.19 % TCu and 0.13% TCo.

Between December 2008 and October 2010, after obtaining the mining license, NFCA conducted 25 drill holes with 21,053m footage at Chambishi SE deposit. Based on the previous data of 10 boreholes conducted by ZCCM and MMAJ and samples assaying results of 25 boreholes completed by NFCA, Sinomine completed "*Exploration Report on N1 Orebody in Chambishi Southeast, Copperbelt, Zambia*" in December 2010. Ongoing exploration programs were carried out in 2011 and will continue in 2012. Geologists from Sinomine and NFCA are currently in the process of preparing the exploration report and estimating the mineral resource.

The drilling program was awarded to Sinomine who used drill rigs models HXY-2000 and HXY-44T with a depth capacity of 2,000m and 1,000m, respectively. The drill holes used between 150 and 120mm diameter diamond bits and ended with NQ diamond bits (47.6mm diameter). Downhole surveys were conducted every 50m under supervision of NFCA geologists. The core were set in wooden boxes and kept at the Chambishi Copper Mine. When the borehole was completed, a surveying engineer surveyed the location of each borehole which was marked by concrete.

The core recovery rates were generally more than 85% for the weathered section and above 95% for fresh rocks and mineralized intervals. After geological logging, the cores were transported to the Chambishi core storage warehouse. The sample was split along the core axis. Half of the cores were packed and sent to NFCA laboratory for assaying Cu and Co. The other half was stored in the warehouse. The sample length was generally 1m, and the wall rock and mineralization section were sampled separately.

Samples from Chambishi SE deposit were delivered to NFCA Chambishi Mine Laboratory for preparation and assaying. Each sample was crushed to 2.2mm and at least 1kg crushed sample was further pulverized to 200 mesh. Finally, about 0.125kg weight of each sample was used for assay. The AAS method was used for assay of Cu and Co. During the analysis procedure, standard materials and blank sample were inserted in each sample batch. Sinomine geologists selected some samples for internal and external check to insure the quality of assay results. A total of 640 basic samples were assayed in NFCA Mine Laboratory. Sinomine geologist also selected some core samples for composites analysis (56), bulk composition (16), microscopic study (69), specific gravity measure (38), mineral analysis (17) and rock strength test (26).

6.2.6 Resource/Reserve Estimation under Chinese Code

Based on the drill holes and tunnels conducted by NFCA and other companies, NFCA updated the resource/reserve estimate of the Chambishi Main at above "-600m" (600m deep from surface) level at Chambishi West by applying the conventional geological block method at the end of 2010. Sinomine re-estimated the resource/reserve at the Chambishi Main, Chambishi West and Chambishi SE Mines in early July 2011, using the software of Micromine and following the Chinese National Standard for Solid Mineral Resources/Reserves Classification (GB17766-1999). The Chinese resource classification uses a three-digit system, where the last digit indicates the geological certainty: 1 stands for measured mineral resource; 2 for indicated mineral resource; 3 for inferred resource; and 4 for predicated resource. This system is somewhat different from the criteria used in defining a resource under the JORC Code. The comparison between different systems is provided in Appendix II.

Chambishi Main and Chambishi West Mine

Resource/Reserve Category

For the Chambishi Main and West Mines, exploration (drilling) grids of 75m × 75m, 150m × 150m, and 300m × 300m were used to estimate category 111b resource, category 122b resource and category 333 resource, respectively. The category 334 resource was extrapolation from the category 333 resource; it is exploration potential but not defined by the exploration program.

Cut-off's

The technical parameters used to estimate copper resources/reserves are shown in Table 6-1.

Table 6-1: Parameters Used in Resource Estimates

Ore Type	Cut-off TCu %	Minimum Industrial TCu %	Minimum Mineable Thickness (m)	Specific Gravity
Oxide	1.00	2.00	3.00	2.67
Primary	1.00	2.00	3.00	2.67

Resources/Reserves Estimation

Based on features of the three orebodies of the Chambishi Main and Chambishi West copper mines, a polygonal method with plane projection was used by Sinomine to estimate resources in June 2011. Search radiuses were kept at 75m, 150m and 300m for resource classifications of 111b, 122b and 333, respectively. The parent block size best fits the setting and average thickness of the ore bodies. Figure 6-14 and Figure 6-15 show the geological models of the Chambishi Main and Chambishi West Mines, respectively.

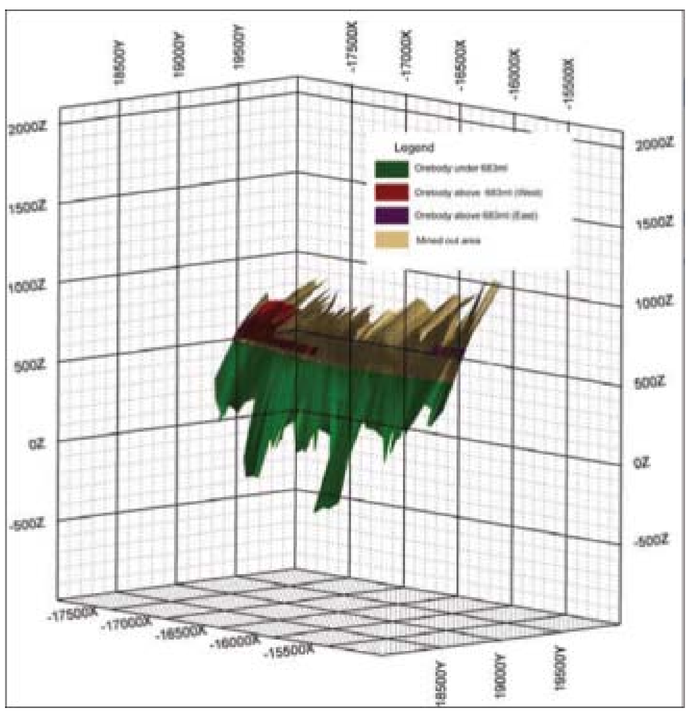

Figure 6-14: 3D Geological Model View of Chambishi Main Mine

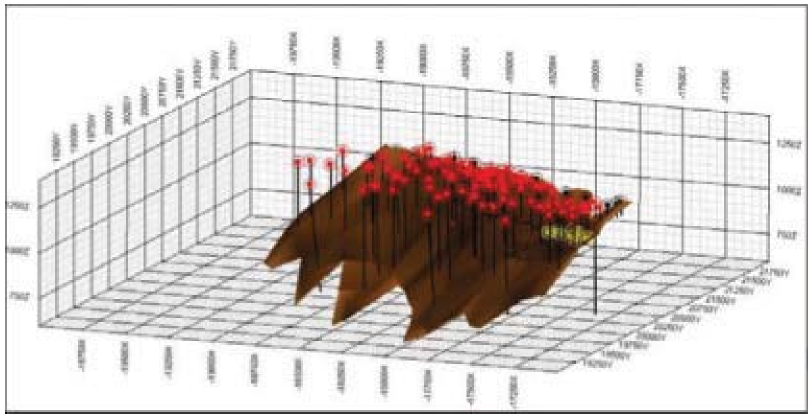

Figure 6-15: 3D Geological Model View of Chambishi West Mine

As of June 30, 2011, the remaining copper resources of category 111b, 122b and 333 resources at Chambishi Main Mine were about 5.60Mt with an average grade of 2.50% TCu, 5.75Mt with an average grade of 2.48% TCu and 8.14Mt with an average grade of 2.42% TCu, respectively. Category 334 Resource was assigned to Chambishi Main with approximately 6.00Mt averaging at 2.43% TCu.

The remaining copper resources of category 111b, 122b and 333 resources at Chambishi West Mine were about 6.58Mt with an average grade of 1.84% TCu, 25.43Mt with an average grade of 1.89% TCu and 17.32Mt with an average grade of 2.09% TCu, respectively (Table 6-2). In addition, there was about 7.85Mt of Category 334 Resource grading at 1.97% TCu as estimated by NFCA and Sinomine. The 334 Resources are regarded as reconnaissance potential and are not included in the table below.

Table 6-2: Remaining Resources at Chambishi Main Mine and West Mine — Chinese Code, as of June 30, 2011

Mine	Ore Type	Resource Category	Tonnage (1,000 t)	Grade TCu (%)	Contained Cu Metal (t)
Chambishi Main	Sulfide	111b	5,597	2.50	139,738
	Sulfide	122b	5,752	2.48	142,808
	Sulfide	333	8,144	2.42	197,135
Chambishi West	Oxidized	122b	6,292	1.14	71,506
	Sulfide	111b	6,575	1.84	121,150
	Sulfide	122b	19,134	2.13	407,795
	Sulfide	333	17,324	2.09	362,313
Chambishi Main & West	Sulfide	111b	12,172	2.14	260,888
	Sulfide	122b	24,886	2.21	550,603
	Sulfide	333	25,468	2.20	559,448
	Oxidized	122b	6,292	1.14	71,506
Total		**111b+122b**	**43,350**	**2.04**	**882,997**
		333	**25,468**	**2.20**	**559,448**

In the second half of 2011, the Chambishi Main and Chambishi West Mines were under normal mining activities. Based on the monthly production records provided by NFCA, geologists from NFCA updated the mineral resource as of December 31, 2011. In the Chambishi Main Mine, a total of 0.432 Mt of 111b category ore reserve at an average grade of 1.61% TCu and 0.138 Mt of 122b category ore reserve at an average grade of 1.81% TCu were mined out respectively. On the base of the mining recovery rate and dilution rate, a total of 0.473Mt of 111b category ore resource with an average grade of 2.43% TCu and 0.146 Mt of 122b category ore resource with an average grade of 2.23% TCu were consumed, respectively. Details of consumed resource was shown in Table 6-3.

Table 6-3: Consumed Resources at Chambishi Main and West Mines from July to December 2011

Mine	Ore Type	Category	Mined out Ore Reserve (t)	Mined out Grade TCu (%)	Mined out Metal Cu (t)	Consumed Ore Resource (t)	Consumed Grade TCu (%)	Consumed Metal Cu (t)
Chambishi Main	Sulfide	111b	431,945	1.61	6,952	472,955	2.43	11,490
	Sulfide	122b	137,913	1.81	2,497	145,655	2.23	3,259
Chambishi West	Oxidized	122b	48,432	1.80	870	125,335	2.37	2,971
	Sulfide	111b	252,679	1.85	4,673	386,842	2.07	8,015
	Sulfide	122b	26,761	1.96	524	49,846	2.12	1,057
Chambishi Main & West	Sulfide	111b	684,624	1.70	11,625	859,797	2.27	19,505
		122b	164,674	1.83	3,021	195,501	2.21	4,316
	Oxidized	122b	48,432	1.80	870	125,335	2.37	2,971
Total		**111b+122b**	**897,730**	**1.73**	**15,516**	**1,180,633**	**2.27**	**26,792**

SRK carefully reviewed the monthly production records and updated the remaining ore resources of the Chambishi Main and West Mines. As of December 31, 2011, the remaining ore resources of categories 111b and 122b at Chambishi Main mine were 5.12 Mt with an average grade of 2.50% TCu and 5.61 Mt with an average grade of 2.49% TCu, respectively. The remaining ore resource of categories 111b and 122b at Chambishi West Mine were 6.19 Mt with an average grade of 1.83% TCu and 25.25 Mt with an average grade of 2.44% TCu, respectively (see Table 6-4).

Table 6-4: Remaining Ore Resources at Chambishi Main and West Mines, as of December 31, 2011

Mine	Ore Type	Resource Category	Tonnage (1,000 t)	Grade TCu (%)	Contained Cu Metal (t)
Chambishi Main	Sulfide	111b	5,124	2.5	128,248
	Sulfide	122b	5,606	2.49	139,549
	Sulfide	333	8,144	2.42	197,135
Chambishi West	Oxidized	122b	6,167	1.11	68,535
	Sulfide	111b	6,188	1.83	113,135
	Sulfide	122b	19,084	2.13	406,738
	Sulfide	333	17,324	2.09	362,313
Chambishi Main & West	Sulfide	111b	11,312	2.13	241,383
		122b	24,690	2.21	546,287
		333	25,468	2.2	559,448
	Oxidized	122b	6,167	1.11	68,535
Total		**111b+122b**	**42,169**	**2.03**	**856,205**
		333	**25,468**	**2.2**	**559,448**

Chambishi Southeast Mine

Resource/Reserve Category

According to the Chinese National Standard for Solid Mineral Resources/Reserves Classification (GB17766-1999), an exploration (drilling) grid of 100-150m × 100m was used to define the Category 332 Resource and a grid of 300m × 200m was applied to estimate Category 333 Resource.

Cut-offs

Based on the sample assay results of 51 drill cores mostly from drilling campaign between 2008 and 2011, the mineral resource for north and south Cu-Co mineralized zones in Chambishi SE deposit was estimated by Sinomine utilizing the software of Micromine 12.0.5E (Figure 6-16; Figure 6-17). The bulk density of 2.67t/m^3 was applied referring to the result of the Chambishi Main and West Mines. The resources were estimated under a series of cut-off grades of 1.0% TCu and 0.8% TCu and 0.5% TCu. Table 6-5 shows the technical parameters used to estimate the ore resources of the Chambishi Southeast Mine.

Table 6-5: Parameters for Resource Estimation at Chambishi Southeast Mine

Cut-offs (TCu)	Minimum Mineable Thickness	Maximum allowed barren gap width
1.00%	3m	3m
0.80%	3m	3m
0.50%	3m	3m

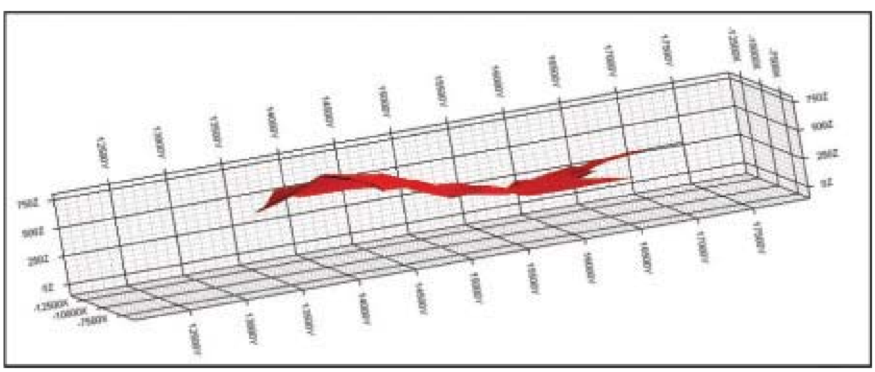

Figure 6-16: 3D Geological Model View of North Orebody at Chambishi SE Mine

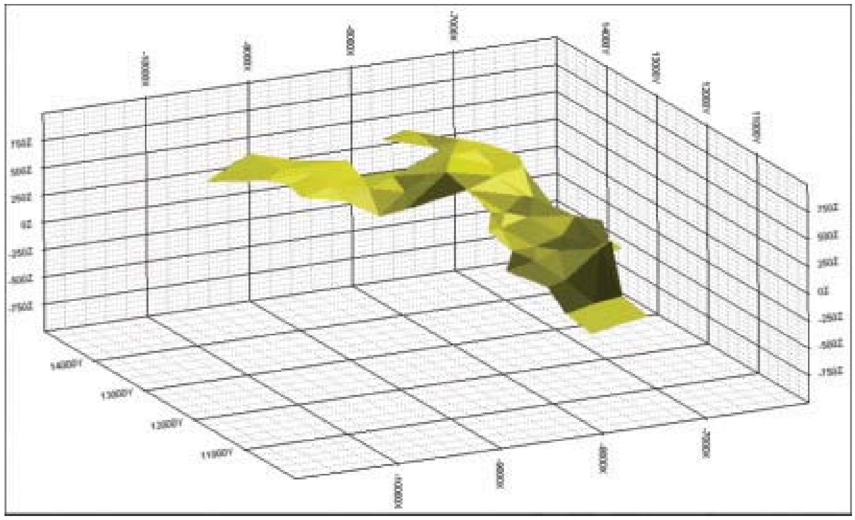

Figure 6-17: 3D Geological Model View of South Orebody at Chambishi SE Mine

Resources/Reserves Estimation

As of December 31, 2011, under cut-off grades of 1.0% TCu, 0.8% TCu and 0.5% TCu, the estimated mineral resources in 332 and 333 categories at Chambishi Southeast Mine were 30.15Mt with an average grade of 2.35% TCu and 0.144% TCo and 62.25Mt with an average grade of 2.12% TCu and 0.111% TCo, 35.43Mt with an average grade of 2.30% TCu and 0.123% TCo and 125.56Mt with an average grade of 1.82% TCu and 0.095% TCo, and 38.49Mt with an average grade of 2.22% TCu and 0.122% TCo and 128.94Mt with an average grade of 1.79% TCu and 0.091% TCo, respectively (Table 6-6).

Table 6-6: Resource Summary at Chambishi SE Mine — Chinese Code, as of December 31, 2011

Cut-off (TCu)	Mineralized Zone	Ore Type	Resource Category	Tonnage (1,000t)	Average Grade TCu (%)	Average Grade TCo (%)	Contained Metal (t) TCu	Contained Metal (t) TCo
1.00%	North Orebody	Sulfide	332	26,637	2.45	0.143	651,312	37,971
		Sulfide	333	31,470	2.45	0.078	771,332	24,490
	South Orebody	Sulfide	332	3,511	1.66	0.152	58,429	5,352
		Sulfide	333	30,783	1.77	0.145	545,535	44,753
	Total	**Sulfide**	**332**	**30,148**	**2.35**	**0.144**	**709,741**	**43,323**
		Sulfide	**333**	**62,253**	**2.12**	**0.111**	**1,316,867**	**69,243**
0.80%	North Orebody	Sulfide	332	31,097	2.40	0.121	746,260	37,719
		Sulfide	333	62,765	1.97	0.060	1,239,526	37,859
	South Orebody	Sulfide	332	4,329	1.62	0.139	70,067	6,028
		Sulfide	333	62,793	1.66	0.129	1,042,313	80,886
	Total	**Sulfide**	**332**	**35,426**	**2.30**	**0.123**	**816,326**	**43,747**
		Sulfide	**333**	**125,558**	**1.82**	**0.095**	**2,281,839**	**118,745**
0.50%	North Orebody	Sulfide	332	34,165	2.29	0.120	783,238	40,847
		Sulfide	333	66,147	1.91	0.056	1,263,593	36,894
	South Orebody	Sulfide	332	4,329	1.62	0.139	70,067	6,028
		Sulfide	333	62,793	1.66	0.129	1,042,313	80,886
	Total	**Sulfide**	**332**	**38,494**	**2.22**	**0.122**	**853,304**	**46,875**
		Sulfide	**333**	**128,940**	**1.79**	**0.091**	**2,305,906**	**117,779**

6.2.7 Resource/Reserve Estimation under JORC Code

Ore Resource/Reserve — JORC Code Classification System

The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves, prepared by the Joint Ore Reserves Committee of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia in September 1999 and revised in December 2004 (the "JORC Code") is a mineral resource/ore reserve classification system that has been widely used and is internationally recognized. The JORC Code is used by SRK to report the mineral resources and ore reserves of the CNMC Zambian Copper Properties in this technical report.

A mineral resource is defined in the JORC Code as an identified in-situ mineral occurrence from which valuable or useful minerals may be recovered. Mineral resources are classified as Measured, Indicated or Inferred according to the degree of confidence in the estimate:

- A Measured resource is one which has been intersected and tested by drill holes or other sampling procedures at locations which are close enough to confirm continuity and where geoscientific data are reliably known;

- An Indicated resource is one which has been sampled by drill holes or other sampling procedures at locations too widely spaced to ensure continuity, but close enough to give a reasonable indication of continuity and where geoscientific data are known with a reasonable level of reliability; and

- An Inferred resource is one where geoscientific evidence from drill holes or other sampling procedures is such that continuity cannot be predicted with confidence and where geoscientific data may not be known with a reasonable level of reliability.

An ore reserve is defined in the JORC Code as that part of a Measured or Indicated Mineral Resource which could be mined and from which valuable or useful minerals could be recovered economically under conditions reasonably assumed at the time of reporting. Ore reserve figures incorporate mining dilution and allow for mining losses and are based on an appropriate level of mine planning, mine design and scheduling. Proved and Probable Ore Reserves are based on Measured and Indicated Mineral Resources, respectively. Under the JORC Code, Inferred resources are deemed to be too poorly delineated to be transferred into an ore reserve category, and therefore no equivalent possible ore reserve category is recognized or used.

The general relationships between Exploration Results, Mineral Resources and Ore Reserves under the JORC code are summarized in Figure 6-18. The Ore Reserves are quoted as comprising part of the total Mineral Resource rather than the Mineral Resources being additional to the Ore Reserves quoted. The JORC Code allows for either procedure, provided the system adopted is clearly specified. In this report, all of the Ore Reserves are included within the Mineral Resource statements.

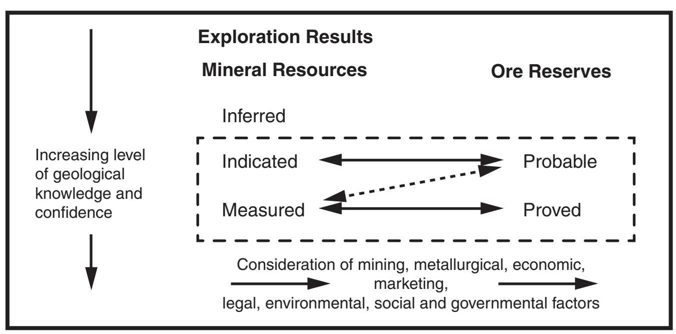

Figure 6-18: Schematic Ore Resources and Their Conversion to Ore Reserves

Review on Original Geological Database

SRK has reviewed all original geological databases including geological survey and mapping at different scales; recent drill holes conducted by NFCA including 113 underground holes with 7,364.33m footage conducted at Chambishi Main Mine during January 2001 to March 2002; 420 surface holes with 34,800m footage conducted in the Chambishi Main Mine during 2004 to 2010; 57 underground holes with 4,595.65m conducted at the Chambishi West Mine between 2004 and 2010, and 25 surface holes with 21,053m footage conducted at the Chambishi SE deposit from December 2008 to October 2010; logging; sampling methodologies and sample preparation and assaying; assay quality control and quality assurance; the geological interpretation, mineral resource estimation procedures and parameters applied by NFCA. As the Chambishi (Main, West and Southeast) copper mine is a stratabound-type deposit and the copper grades are relatively consistent throughout the mineralized bodies, SRK considers that these exploration programs provide a reasonable basis to estimate the mineralized bodies at Chambishi Main, Chambishi West and Chambishi Southeast Mines, and that the analytical methods used for these deposits produced acceptable results with no material bias.

Based on reviewing the deposit geology, drilling and sampling data, and procedures and parameters used for the estimation of mineral resources, SRK is of the opinion that the mineral resources estimated under the 1999 Chinese mineral resource system for the Chambishi Main, Chambishi West and Chambishi SE copper deposits by NFCA and Sinomine conform to the equivalent JORC Mineral Resource categories. The economic portion of the Measured and Indicated Resources can accordingly be used to estimate Proved and Probable Ore Reserves.

SRK's Verifications — Check Samples

Chambishi Main and Chambishi West Mines

SRK collected 113 samples and sent them to the Alfred H. Knight laboratory. These samples include 4 chip samples from No. 0 block of 552mL in the Chambishi Main Mine, 4 chip samples from 150mL of in the Chambishi West Mine and 105 pulp samples from the core of Chambishi Main Mine and Chambishi West Mine. The chip samples returned good result as shown in Table 6-7. Overall, the relative differences between the original and SRK results are within 15% for TCu (see Figure 6-19). These results of data verification indicate that the original database is sound and reliable for the purposes of resource estimation.

Table 6-7: Assay Result of Chip Samples at Chambishi Main and West Mines

No.	Lab ID	Sample ID	Location		Assay Result (TCu%)
1	A37550/1	C552-0-E1	Chambishi Main	No.0 block, 552mL	7.96
2	A37550/2	C552-0-E2	Chambishi Main	No.0 block, 552mL	3.09
3	A37550/3	C552-0-E3	Chambishi Main	No.0 block, 552mL	2.22
4	A37550/4	C552-0-W1	Chambishi Main	No.0 block, 552mL	7.05
5	A37550/5	CW01	Chambishi West	150mL	2.14
6	A37550/6	CW02	Chambishi West	150mL	1.44
7	A37550/7	CW03	Chambishi West	150mL	0.39
8	A37550/8	CW04	Chambishi West	150mL	0.29

* Samples collected by SRK and analyzed in Alfred H. Knight laboratory

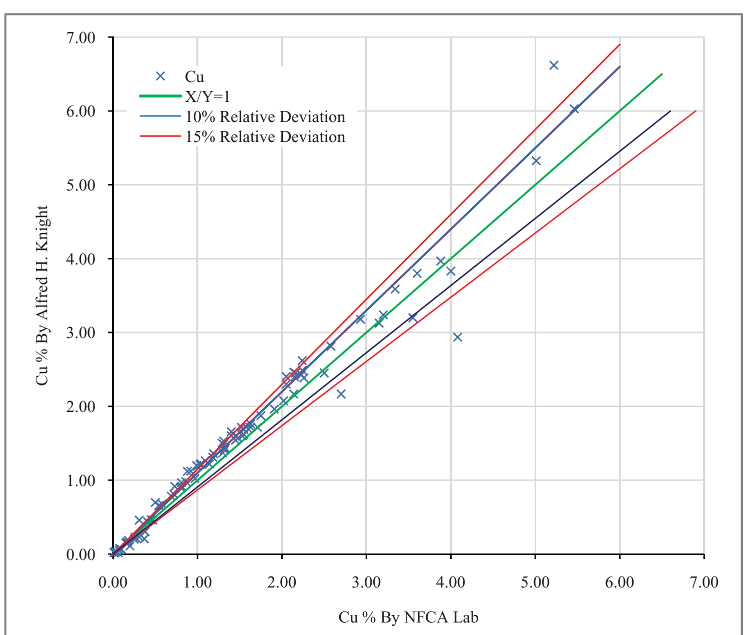

Figure 6-19: Performance of Core Pulp Duplicates at Chambishi Main and West Mines

Chambishi Southeast Mine

SRK geologists selected a total of 48 pulp samples from the mineralized intervals of six drill cores from the Chambishi Southeast deposit accomplished in 2010. These samples were dispatched to SGS branch laboratory located in Tianjin City, China (SGS TJ) for external check.

Overall, the relative differences between the original and SRK results are within 15% for TCu (see Figure 6-20). These results of data verification indicate that the original database is sound and reliable for the purposes of resource estimation.

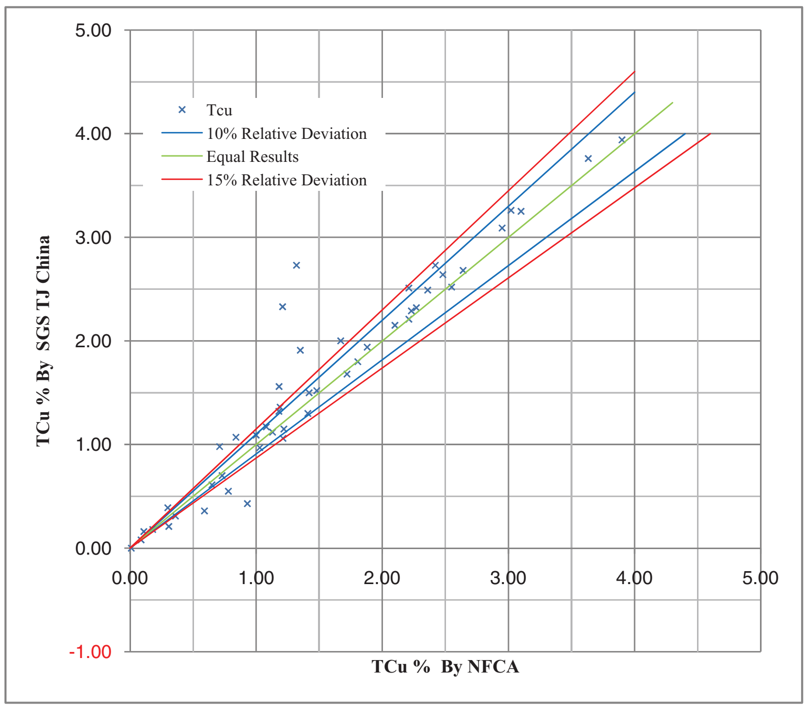

Figure 6-20: Performance of Core Pulp Duplicates at Chambishi Southeast Mine

Ore Resource Estimation

The Mineral Resource estimates under the JORC Code as of December 31, 2011 for the Chambishi Main Mine, Chambishi West Mine and Chambishi Southeast Mine are summarized in Table 6-8. Under cut-off grade of 1.00% TCu, the Measured, Indicated and Inferred Mineral Resources were 5.12Mt with an average grade of 2.50% TCu, 5.61Mt with an average grade of 2.49% TCu and 8.14Mt at an average grade of 2.42% TCu, respectively at the Chambishi Main Mine; and 6.19Mt with an average grade of 1.83% TCu, 25.25Mt with an average grade of 1.88% TCu and 17.32Mt at an average grade of 2.09% TCu, respectively at the Chambishi West Mine.

Under cut-off grade of 0.8% TCu, the Indicated and Inferred Mineral Resource was 35.43Mt with an average grade of 2.30% TCu and 0.123% TCo, and 125.56Mt with average grade of 1.82% TCu and 0.095% TCo at the Chambishi Southeast Mine. Only Measured and Indicated Mineral Resources can be used for Ore Reserve estimation and mine planning.

Table 6-8: Ore Resources Summary at Chambishi Main, West and Southeast Mines — JORC Code, as of December 31, 2011

Mine	Ore Type	Resource Category	Tonnage (1,000 t)	Grade TCu (%)	Contained Cu Metal (t)	Grade TCo (%)	Contained Co Metal (t)
Chambishi Main	Sulfide	Measured	5,124	2.50	128,248		
	Sulfide	Indicated	5,606	2.49	139,549		
	Sulfide	Inferred	8,144	2.42	197,135		
Chambishi West	Oxidized	Indicated	6,167	1.11	68,535		
	Sulfide	Measured	6,188	1.83	113,135		
	Sulfide	Indicated	19,084	2.13	406,738		
	Sulfide	Inferred	17,324	2.09	362,313		
Chambishi Southeast	Sulfide	Indicated	35,426	2.30	816,326	0.123	43,747
	Sulfide	Inferred	125,558	1.82	2,281,839	0.095	118,745
Subtotal	Oxidized	Indicated	6,167	1.11	68,535		
	Sulfide	Measured	11,312	2.13	241,383		
	Sulfide	Indicated	60,116	2.27	1,362,613		
	Sulfide	Inferred	151,026	1.88	2,841,287		
Total		**Measured+ Indicated**	**77,595**	**2.16**	**1,672,531**		
		Inferred	**151,026**	**1.88**	**2,841,287**		

Ore Reserve Estimation

Ore reserves were estimated for both the Chambishi Main Mine and Chambishi West Mine based on the mining recovery rate of 62% and dilution rate of 30% from the mining production records of 2010. As of December 31, 2011, the Proved and Probable Ore Reserves at the Chambishi Main Mine were 4.13Mt at an average grade of 1.92% TCu and 4.52Mt at an average grade of 1.92% TCu, respectively; and the Proved and Probable Ore Reserves at the Chambishi West Mine were 4.99Mt at an average grade of 1.41% TCu and 20.35Mt at an average grade of 1.45% TCu, respectively (see Table 6-7).

Based on the "*Exploration and Developing Feasibility Study on North Ore Body at Chambishi Southeast Mine*" prepared by Shenyang Design and Research Institute of Nonferrous Metallurgy in December and an updated exploration report with resource estimate prepared by Sinomine in July 2011, SRK believes that the South orebody is currently not mineable. With respect to the mineral resource and grade of copper, the North orebody can be designed as an underground mine.

SRK believes that a mining dilution rate of 17.38%, a mining loss rate of 18.58% and a head grade of 2.02% are reasonable. SRK also noted that the cut-off grade Cu of 0.80% is relevant to an average in-situ grade Cu of 2.40% for the Indicated Resource of the North orebody. Therefore based on these parameters and considering other modifying factors such as production capacity, operating costs and capital costs, SRK estimated the Ore Reserves of the North orebody of the Chambishi Southeast Mine (Table 6-9). As of December 31, 2011, the Probable Ore Reserve was 29.72Mt with an average of 1.98% TCu and 0.10% TCo.

Table 6-9: Ore Reserve Summary at Chambishi Main, West and Southeast Mine — JORC Code, as of December 31, 2011

Mine	Ore Type	Reserve Category	Tonnage (1,000 t)	Grade TCu (%)	Contained Cu Metal (t)	Grade TCo (%)	Contained Co Metal (t)
Chambishi Main	Sulfide	Proved	4,130	1.92	79,422		
	Sulfide	Probable	4,518	1.92	86,545		
Chambishi West	Oxidized	Probable	4,971	0.85	42,441		
	Sulfide	Proved	4,988	1.41	70,209		
	Sulfide	Probable	15,382	1.64	252,023		
Chambishi Southeast	Sulfide	Probable	29,720	1.98	589,251	0.10	29,783
Subtotal	Oxidized	Probable	4,971	0.85	42,441		
	Sulfide	Proved	9,117	1.64	149,631		
	Sulfide	Probable	49,620	1.87	927,097		
Total		**Proved+Probable**	**63,708**	**1.76**	**1,119,097**		

Exploration Potential and Recommendation

Chambishi Main and Chambishi West Mines

SRK noticed the ore bodies of the Chambishi Main Mine and Chambishi West Mine are open at depth and along the strike. More exploration work needs be carried out to define the orebody and update the resource category. SRK recommends to NFCA that a QA/QC protocol should be carried out in the exploration program in the future. The samples collected from the exploration program should be analyzed in a certified laboratory. Standard material, duplicates and blank samples should be inserted to check the quality of the assay results. The company should also keep all sample rejects and pulps for future checks. Competent person(s) as defined in JORC Code should be involved in the future exploration programs and for reporting resource estimates.

Chambishi Southeast Mine

Sinomine is conducting drilling program to update the resource at the Chambishi Southeast Mine under SRK's supervision. SRK will continue to carry out the resource estimation following the JORC Code once the whole exploration is completed.

6.3 SML Projects

A part of the SML resources are currently sourced from the previous Chambishi tailings. The Mwambashi Project and Kakoso Tailings have been acquired by SML and are under development. The review in this section will focus on the Mwambashi Copper Deposit, and the Kakoso and the Chambishi tailings operated by SML.

6.3.1 Mwambashi Development Project

The Mwambashi Copper Deposit is held by SML. This prospecting license (No. 15201-HQ-LPL/1) was transferred from Edgeway Business Solutions Limited to SML on January 6, 2011.

6.3.2 Deposit Geological Settings

The Mwambashi Copper Project is situated on the western flank of the Chambishi Basin (Chambishi-Nkana Basin) and the west limb of Lufulian Anticline which is characterized by folds and thrust (Figure 6-21). This project area was dominated by late Proterozoic Katanga metasediments of the Roan Group. The granite and schist of Basement Complex are exposed in places. The Basement Complex is dominated by granite in the Mwambashi Project area. The Roan Group lies on the granite of the Basement Complex with unconformable contact at a dip to the northeast (approximately 35°) in the vicinity of the mineralization body. The Roan Group can be subdivided into the Lower Roan, Upper Roan and Mwashia subgroups from bottom to top. The copper mineralized body was hosted in the Ore Shale Formation of the Lower Roan. The Upper Roan was frequently intruded by gabbros. The surface of project area was overlain by quaternary sediments.

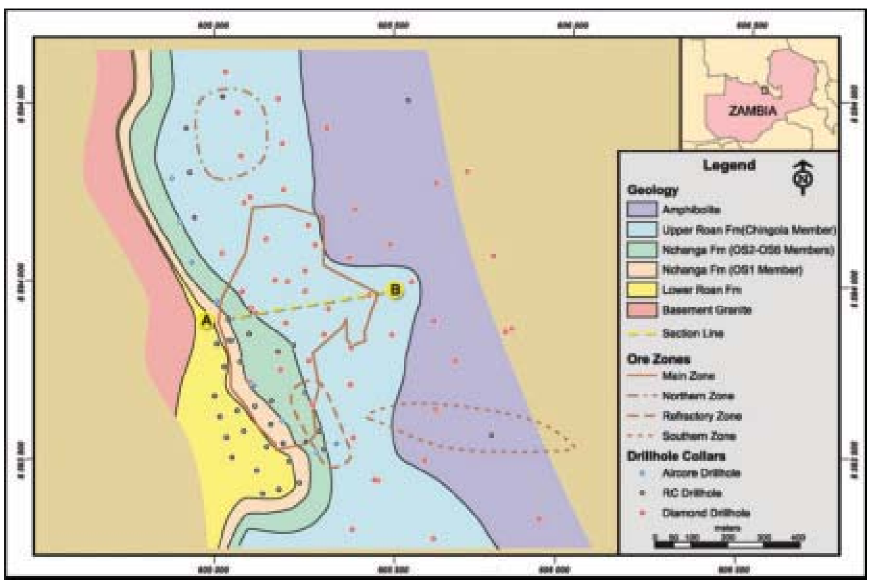

Figure 6-21: Mwambashi Generalized Geological Map (Feasibility Study, 2006)

6.3.3 Orebody Geology

The Mwambashi Copper Deposit is also a stratabound-type deposit with a stratiform shape and is hosted by arenaceous sediments in the Lower Roan. The thickness of mineralization varies from 30m in the shallower area to less than 1.0m thickness at depth with average thickness of 15m. The mineralized body is about 600m long and continues to a depth of approximately 250m below the surface. It is still open at depth (Figure 6-22).

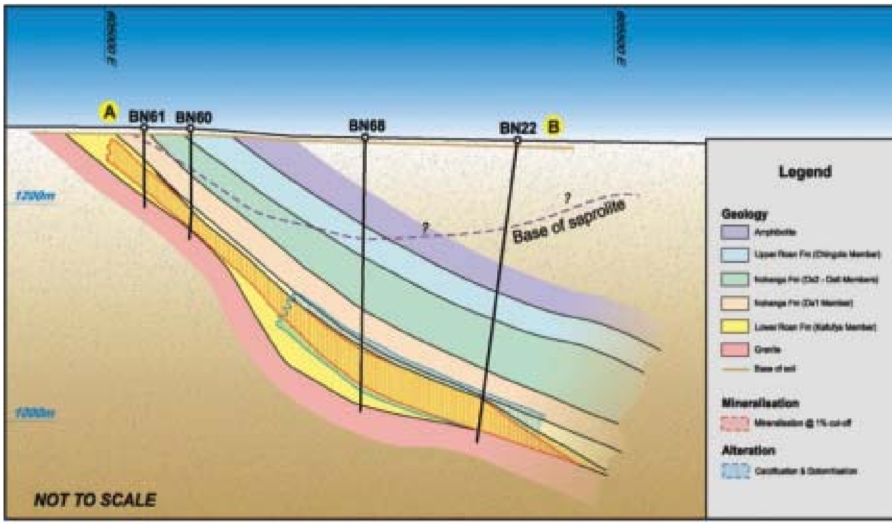

Figure 6-22: Cross-section of Mwambashi Copper Project

6.3.4 Mineralogical Characteristics

This mineralized body at Mwambashi shows a vertical zonation. Below the overburden, the first 15 to 20m of the mineralized body is predominantly oxidized mineralization which consists of mainly malachite and subordinate chrysocolla and pseudomalachite (Figure 6-23). The mixed sulfide-oxide mineralization zone has ratios of oxide and sulfide varying from 80:20 to 20:80 from the top to the bottom. The sulfide mineralization zone is predominantly chalcopyrite, bornite and chalcocite. Ore minerals are mainly malachite, chalcocite, chalcopyrite, chrysocolla and pseudomalachite with minor bornite and traces of cuprite and native copper.

Significant cobalt mineralization is restricted to the northern zone of the Mwambashi mineralized body. The average grade of Co is around 0.40% in this zone, and an average of 0.04% Co for the entire mineralized body. In the shallow parts of the body, the assay result indicates that the grade of Co is greater than 0.05%, but no visible cobalt minerals were detected.

Figure 6-23: Malachite of Mwambashi Copper Deposit

6.3.5 Exploration, Sampling, Analytical Procedures and Quality Control

Geological mapping at Mwambashi was conducted in 1927, followed by pitting in 1929 to establish the stratigraphy. Three boreholes (BN1 to BN3) were drilled in 1951. From 1963 to 1967, RST conducted soil sampling, gravity and magnetic survey and auger drilling over the full strike length of the Lower Roan on the western wedge of Nkana-Chambishi Basin. AZAM/ZCCM commenced the exploration activity in 1995, and carried out scoping study in 2003 and updated this study in 2005. In 2006, TEAL Exploration & Mining Inc ("TEAL") completed the feasibility study of Mwambashi Copper Project (Table 6-10).

In September 2005, RSG Global Pty Limited completed an Independent Technical Report followed the National Instrument 43-101 Standards of Disclosure for Mineral Project (NI 43-101) on TEAL's Properties in Central Africa including the Mwambashi property. In November 2005, SRK Consulting (South Africa) Ltd was appointed by AZAM (now as a subsidiary of TEAL, a Canadian listed company) to audit and review the geotechnical investigations and contracted to undertake hydro-geological investigation for Mwambashi Copper Project. In 2006, SRK completed the geotechnical logging on diamond drill core on site followed the recommendation from geotechnical drilling for the determination of mining design.

Table 6-10: Summary of Exploration Work Completed at Mwambashi

Year	Company	Exploration Work	Description
1927-1950	RST*	Geological Mapping	Mapping and Geochemical Survey
1954	RST	Drilling	Three boreholes were conducted
1963-1967	RST	Drilling and Survey	Soil sampling, gravity and magnetic surveys
1967-1970	RST	Drilling	37 boreholes for test anomaly
1971-1973	RST/RCM*	Drilling and Survey	2 holes, EM, magnetic and radiometric techniques
1974-1975	MINDECO/Noranda		Metallurgical test
1995-2003	TEAL/ZCCM	Drilling	72 drill holes, 10,346m and scope study
2005-2006	TEAL/ZCCM	Drilling	6 drill doles for geotechnical purpose, 959m
2005	TEAL/ZCCM	Technical report	Independent Technical Report compiled by RSG Global
2006	TEAL/ZCCM	Drilling	5 drill holes for hydrogeological monitoring , 258 m
	TEAL	Feasibility Study	2 drill holes as pump test wells, 259 m

* RST Global Pty Limited

In January 2011, TEAL transferred this prospecting license, drill cores and geological data to SML. At present, the drill cores are kept in core boxes with original marks then covered with the water-proof plastic sheets and are stacked at the yard of the SML Camp (office district). No additional exploration work has been conducted by SML.

During SRK's site visit from April 25 to May 6, 2011, SRK inspected the project area and verified some bore holes collars with a handheld GPS (Figure 6-24) and reviewed the original core logs, down-hole survey and sampling and assaying methods. The exploration program including drilling, core handling, logging and sampling conducted at Mwambashi Project followed "*The Geological Procedures Manual for Konkola North Project*" which is an internal standard for ZAZM. Qualified personal completed the works of down-hole survey, RQD assessment and geological logging. RSG considered that core logging by TEAL and predecessors was generally undertaken to acceptable industry standards. SRK checked some drill cores from the Mwambashi Copper Project (Figure 6-25). The average core recovery of the mineralized intervals was more than 90%.

Figure 6-24: Borehole MW27

Figure 6-25: Drill Cores

The sampling work was assigned by the logging geologist. Each fresh core sample was split using a diamond splitter along a line marked by geologists. The weathered and fractured core samples were cut with a chisel. Sample length was generally between 0.5 to 1.0m. One half of the core was bagged and sent for preparation. Weather and fracture core samples were cut with chisels with similar width. The samples at one meter intervals from RC, percussion, air core and rotary air blast drilling were placed in bags and sent for preparation.

Samples were crushed to -2mm, and split into two. One half was stored in plastic bags while the other was pulverized. Compressed air and quartz material was used to clean the pulveriser after each sample. The samples were riffled to produce a 100 gram ("g") for assay. RSG Global has inspected the sample preparation facility and reported that "all the equipment is well maintained and would appear to be operational, the operation of the facility is considered to be professional".

The analyses for 1995 to 1997 drill core samples were carried out by ZCCM, and check assays were conducted at African Rainbow Minerals Ltd ("AVRL") in Johannesburg. The samples from 2000 to 2001 drill cores were analyzed by Alfred H. Knight in Kalulushi and check assays were sent to the Society of Economic Geologists Inc ("SGE") in Kalulushi and AVRL. The standard material and duplicate were inserted into the basic samples. All core samples from the 2000 and 2011 drilling programs were analyzed for total copper, acid soluble copper, total cobalt and total zinc.

Two assay standards material of Cu with a concentration of 203ppm and 30,501.43ppm were inserted in the assay program. The QA/AC result of the standard, undertaken by Alfred H. Knight Lab, show no bias for Cu, and positive and negative bias of 9.5% for Co, -8.3% for Zn and -14% for acid soluble Cu ("AS-Cu"), which were within the acceptable values of 15%.

A total of 176 duplicate samples (62 from BN drill holes series and 114 from MW drillholes series) were analyzed. The result returned from Alfred H. Knight indicated good precision.

6.3.6 Resource Estimation

The initial resource for Mwambashi was estimated by Camisani and Van der Merwe in 2001 and updated by Van der Merwe in 2005 with the classification of Measured Mineral Resource. In

February 2005, ARM estimated the resource at Mwambashi Copper Project using deterministic wireframer and ordinary kriging. The mineral resource estimate was classified by Anglovaal Mining Research Laboratories ("ARM") as Indicated Mineral Resource at 8,614,304t with an average grade of 2.43% TCu and 1.11% for acid soluble Cu and 0.066% for TCo.

In July 2006, GeoLogix Mineral Resource Consultants (Dexter S. Ferreira — Geostatistics and Andre M. Deiss — Geological Modelling) estimated the resource using DatamineTM, VulcanTM SD mining software for the Mwambashi B area for TEAL. Two cut-off grades of 0.3% TCu and 0.5% TCu were used to delineate the orebodies (Figure 6-26).

The block model parent cell was set as 30m in the X, 30m in the Y and 10m in the Z based on the average drillhole spacing of approximately 60m. The high-grade portion of orebody was treated as the midpoint. Based on the results of 78 specific gravity samples measured in 2005 by RCM, the bulk density of 2.5t/m^3 was used for resource estimate with the exception of overburden. A density check carry out in 2005 supported this bulk density result.

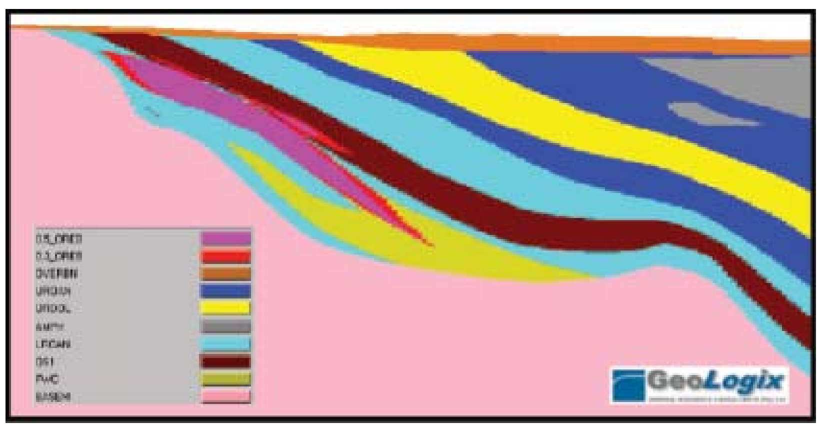

Figure 6-26: Section View of Geological Model (From Feasibility Study 2006)

The estimated resource at cut-off grades of 0.50% TCu (high-grade) and 0.30% TCu (low-grade) at the Mwambashi Copper Project is shown in Table 6-11 and Table 6-12, respectively.

As of December 31, 2011, the high-grade Measured, Indicated and Inferred Resource were 0.82Mt with an average grade of 2.22% TCu and 0.91% soluble TCu, 8.38Mt with an average grade of 2.00% TCu and 0.75% soluble TCu, and 1.77Mt with an average grade of 2.10%TCu and 0.26% soluble TCu, respectively (Table 6-11). The low-grade Measured, Indicated and Inferred Resource were 0.02Mt with an average grade of 0.40% TCu and 0.26% soluble TCu, 2.39Mt with an average grade of 0.35% TCu and 0.21% soluble TCu, and 0.68Mt with an average grade of 0.35%TCu and 0.21% soluble TCu, respectively (Table 6-12).

Table 6-11: High-Grade Resource Summary at Mwambashi Copper Mine, as of December 31, 2011*

Ore Type	Category	Resource (Mt)	TCu (%)	Contained TCu (t)	Acid Soluble TCu (%)	Soluble TCu (t)
Oxidized	Measured	0.02	1.98	475	1.69	407
	Indicated	0.14	1.44	1,990	1.20	1,665
	Inferred	0.04	0.78	300	0.66	252
Mixed	Measured	0.54	2.26	12,245	1.21	6,544
	Indicated	6.45	1.95	125,998	0.89	57,512
	Inferred	0.36	1.72	6,194	0.73	2,641
Sulfide	Measured	0.26	2.15	5,599	0.22	580
	Indicated	1.79	2.22	39,741	0.23	4,129
	Inferred	1.37	2.24	30,597	0.13	1,724
Total	**Measured**	**0.82**	**2.22**	**18,319**	**0.91**	**7,531**
	Indicated	**8.38**	**2.00**	**167,729**	**0.75**	**63,306**
	Inferred	**1.77**	**2.10**	**37,092**	**0.26**	**4,617**

* at a cut-off grade of 0.50% TCu

Table 6-12: Low-Grade Resource Summary at Mwambashi Copper Mine, as of December 31, 2011*

Ore Type	Category	Resource (Mt)	TCu (%)	Contained TCu (t)	Acid Soluble TCu (%)	Soluble TCu (t)
Oxidized and Mixed	Measured	0.02	0.40	94	0.26	61
	Indicated	2.39	0.35	8,333	0.21	5,043
	Inferred	0.68	0.35	2,356	0.21	1,439

* at a cut-off grade of 0.30% TCu

The mineral resource estimate and classification of the Mwambashi Copper Project were carried out under the guidance of the SAMREC Code. The SAMREC Code has similar requirements as the JORC Code. SRK has reviewed the estimation method and classification and considered that the resource is unbiased. SRK supports the classification of the estimate resource as being compliant with the JORC Code.

6.3.7 Kakoso Tailings Development Project

The Kakoso Tailings Development Project is located about 78km northwest of Kitwe, 4km south of Chililabombwe and 23 km north of Chingola with geographic coordinates of 12°37'S and 28°02'E.

In 2010, SML conducted prospecting work on the Kakoso Tailing Dam. A total of 13 and 10 auger holes were carried out on the main tailing dam and the subsidiary dam, respectively, with an exploration grid of 200m × 200m. The average depth of tailing in the main dam is 11.4m, and 5.1m in the subsidiary dam. A total of 78 samples were collected and returned an average grade of 0.60% TCu and 0.45% acid soluble copper. The area of the main dam and subsidiary dam is 388,700m^2 and 320,500m^2, respectively. The volume of the Kakoso Tailings Development Project is 6,055,700 m^3. The bulk density of tailing as measured by SML is 1.50 t/m^3. SRK conducted a site visit and reviewed the resource estimation method, which SRK classifies as an Inferred Resource category under the guidance of the JORC Code.

As of December 31, 2011, the JORC Code compliant Inferred Resources were 6.65Mt with an average grade of 0.62% TCu and 0.48% soluble TCu at the main dam, and 2.45Mt with an average grade of 0.55% TCu and 0.45% soluble TCu at the subsidiary dam, respectively (see Table 6-13).

Table 6-13: Resource Summary of Kakoso Tailings Development Project, as of December 31, 2011

Dam	Category	Resource (Mt)	TCu (%)	Contained TCu (t)	Acid Soluble TCu (%)	Soluble TCu (t)
Main	Inferred	6.65	0.62	41,230	0.48	31,920
Subsidiary	Inferred	2.45	0.55	13,475	0.45	11,025
Total	**Inferred**	**9.08**	**0.60**	**54,705**	**0.47**	**42,945**

SML completed a study in July 2010 but SRK considers that the exploration work completed by SML may not be enough to support a feasibility study, as defined by international industry practice. SRK recommends that more auger drillholes and survey should be carried out in order to update the resource estimate.

6.3.8 Chambishi Tailings Development Projects

The Chambishi Copper Mine has nine tailing dams including 6th, 7th, 7Ath, 8th, and 9th, Luano, Musahashi, Wener Dam and New Dam, and an acidic leaching residues dumps named 10th. All of them are located within the mining license of Chambishi Copper Mine. In June 2001, Chambishi Copper Mine carried out some prospecting work in those tailing dams and leaching residues to complete a resource estimate. A total of 73 samples were collected for analysis Cu and Co. In 2008, sampling program was conducted in Luano tailing (16th), and a total of 62 samples were collected. The bulk density of 1.6t/m^3 was used by NFCA for the resource estimation in 2011.

There were three oxidized ore piles in the Chambishi Copper Mine located nearby the open pit. In July 2003, NFCA carried out sampling work on the oxidized ore piles named 3-1#, 3-2# and 4#. A total of 79 samples were collected from shallow pits along the exploration line with grid spacing of 10m × 10-15m at the three oxidized ore piles. The bulk density of 2.70t/m^3 was applied for mineral resource estimate.

SRK has carefully reviewed the sampling method and resource estimation by NFCA, and also reviewed the historical production records of SML. According to the production records, SRK suggests that it be reasonable using the average feed grade instead of the average grade of tailings and the oxidized ore piles for resource estimate. SRK considers that the value of 1.14% can be using the acid contained copper grade. The resource of the oxidized ore piles was estimated by SRK utilizing the same method.

As of June 30, 2011, the JORC Code compliant Inferred Resources remaining at 7#, 7A#, 8#, 9# and 10# tailing dams were 0.71Mt with an average As-Cu grade of 1.44%. The remaining Inferred Resources of three oxidized ore piles were 1.11Mt with an average As-Cu grade of 0.87% (Table 6-14).

Table 6-14: Remaining Resources of Tailings and Oxidized Ore Piles, as of June 30, 2011

Type	Category		Resource (Mt)	Acid Soluble TCu (%)	Contained TCu (t)	TCo (%)
Tailings	Inferred	Estimated Resource in 2001	3.088	1.44	44,467	0.026
		Consumed by June 30, 2011	2.381	1.14	34,287	
		Remaining Resource on June 30, 2011	**0.707**	**1.44**	**10,180**	**0.026**
Oxidized Ore Piles	Inferred	Estimated Resource in 2003	1.916	0.87	16,669	0.012
		Consumed by June 30, 2011	0.804	0.63	6,994	
		Remaining Resource on June 30, 2011	**1.112**	**0.87**	**9,676**	**0.012**

Based on the production records provided by SML from July to December 2011, a total of 247,897t of tailings at an average grade of 1.13% As-Cu and 5,639t of oxidized ore piles at an average grade As-Cu of 1.42% were consumed from July to December 2011, respectively (Table 6-15). As of December 31, 2011, the JORC Code compliant Inferred Resources of tailings were 0.46Mt with an average grade of 1.44% As-Cu. The remaining Inferred Resources of the oxidized ore piles as of the same date were 1.11Mt with an average grade of 0.87% As-Cu (Table 6-16).

Table 6-15: Consumed Resources from July to December 2011

	Tailing			Oxidized Ore Piles		
Month (2011)	Consumed resource (t)	Consumed Metal Cu (t)	Acid Soluble TCu (%)	Consumed resource (t)	Consumed Metal Cu (t)	Acid Soluble TCu (%)
July	43,112	504.41	1.17	1,673	24.26	1.45
August	46,781	505.24	1.08	1,766	28.78	1.63
September	37,787	438.33	1.16	469	5.3	1.13
October	41,118	432.74	1.05	0	0	0
November	35,763	407.4	1.14	1,551	19.7	1.27
December	43,336	515.7	1.19	180	1.98	1.10
Total	**247,897**	**2,803.82**	**1.13**	**5,639**	**80.02**	**1.42**

Table 6-16: Remaining Resources of Tailings and Oxidized Ore Piles, as of December 31, 2011

Type	Category		Resource (Mt)	Acid Soluble TCu (%)	Contained TCu (t)	TCo (%)
Tailings	Inferred	Remaining Resource on June 30, 2001	0.707	1.44	10,180	0.026
		Consumed by December 31, 2011	0.248	1.13	2,804	
		Remaining Resource on December 31, 2011	**0.460**	**1.44**	**7,376**	**0.026**
Oxidized Ore Piles	Inferred	Remaining Resource on June 30, 2001	1.112	0.87	9,676	0.012
		Consumed by December 31, 2011	0.006	1.42	80	
		Remaining Resource on December 31, 2011	**1.106**	**0.87**	**9,596**	**0.012**

SRK carefully reviewed the geological data regarding the tailing dams, residues and oxidized ore piles in the Chambishi Copper Mine. In 2001, some sampling work was conducted using the shallow pit and trenching sampling method, and some drilling was completed. Most of shallow pits and trenches were too shallow to completely intercept the tailing, such as the 6#, 7#, 7A#, 8# and 9#. Only one sample was collected from 10# residues. SRK considers that some samples collected do not fully represent the grade and resource of tailings at Chambishi. More exploration work such as drilling, pitting and survey should be conducted to improve the resource classification and provide higher certainty regarding the estimate of the tailings resource.

6.4 CNMC Luanshya Projects

6.4.1 Local Geology and Background

The Luanshya projects operated by CLM involve seven mining licenses including areas named Luanshya-Baluba, Muliashi, Roan Basin, Roan Extension East, Roan Extension West, Baluba East and Muva Hill. The Muliashi license covers the deposits of Muliashi North, Muliashi South, Mashiba and Lufubu, as well a part of the oxidized cap at Baluba Center (Figure 6-27).

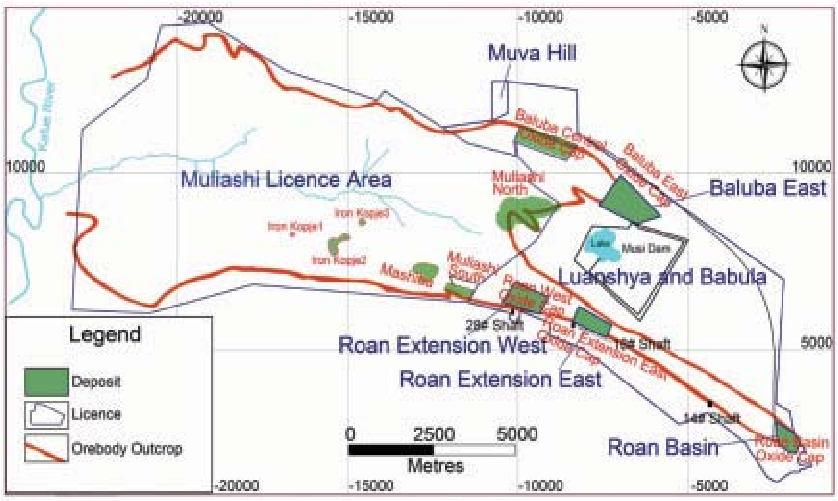

Figure 6-27: Licenses and Deposits of CLM Luanshya Project

CLM's Luanshya projects are located at the south-eastern end of the Copperbelt. The Roan-Muliashi Basin, which hosts the Luanshya (former Roan Antelope deposit) and the Baluba mines, is an isolated basin and an outlier of the Katanga Supergroup on the south-eastern edge of the Kafue Anticline. The Kafue Anticline is the most dominant geological facet of the Zambian Copperbelt. The copper deposits of the Copperbelt are almost all lined up on either side of this geological feature.

The Roan-Muliashi Basin begins approximately 2km west of the town of Luanshya and extends for more than 22km east towards the Kafue River. The geology of CLM's Luanshya projects is shown in Figure 6-28. Generally, the project area, Roan-Muliashi Basin, is made of three major basins, namely the Roan Basin, the Baluba Syncline and the Lufubu-Muliashi Basin. The Baluba Syncline is in the north of and is an echelon with the Roan Basin, both of which open gently into the Muliashi Synclinorium. In the central-east part of the project area the Baluba Syncline forms a fold nose whose southern limb joins the north limb of the Roan Basin and forms a crest at Muliashi North halfway between Baluba and Shaft 28# (south of Roan Extension West, refer Figure 6-27). The crest plunges suddenly to the west and abruptly thins out into the southwest trending monoclinal structure. The south limb of the Baluba Syncline continues westwards and opens up to join its north limb. Around this point the Baluba north limb becomes the north limb of the Muliashi Synclinorium in the Roan-Muliashi Basin.

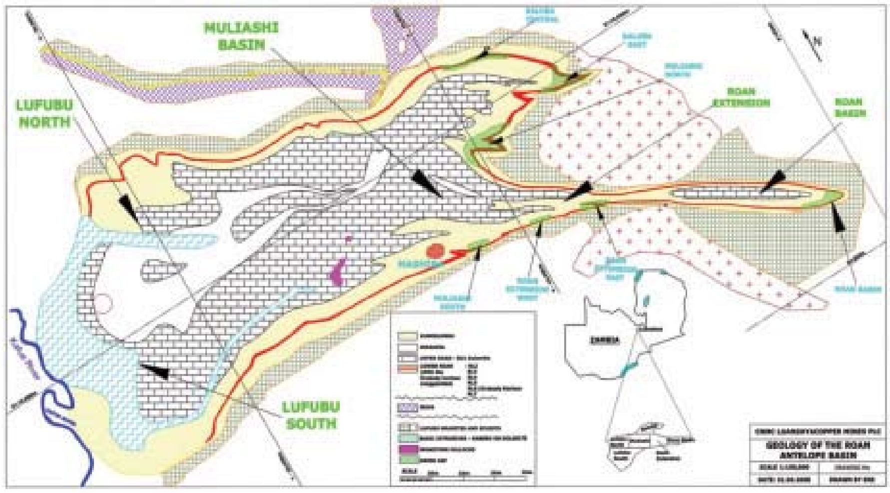

Figure 6-28: Geological Map of CLM Luanshya Projects

The local stratigraphic column of the Roan-Muliashi Basin is depicted in Table 6-17 below. Two planes of unconformity occur, one between the Lufubu and Muva systems within the Basement Complex, and the other between the Muva System and Katanga Supergroup. The Basement Complex comprises the older tremolite-biotite schist which is intruded by granite. Comprised of Lower and Upper Roan and Mwashia Groups from lower to upper respectively, the so-called "Mine Series" of copper deposits in Copperbelt is hosted in Katanga Supergroup (or System) and overlaid by tillite of Kundelungu Series.

Table 6-17: Stratigraphic Column of Luanshya Project Area

System	Series	Group	Formation	Rocks/Lithology
Katanga Supergroup	Kundelungu			Tillite
	Mine	Mwashia		Carbonaceous shale
		Upper Roan	RU1	Dolomite and argillite
		Lower Roan	RU2	Argillites with dolomite
				Basal schist
			RL3	Arkose, grits, quartzites, argillites and conglomerates
			RL4	Schistose argillite
				Cherty dolomite
			RL5	Upper dolomites and dolomitic argillites
				Quartzite
				Interbedded argillites and quartzites
			RL6	Argillite (Copperbelt Ore Shale)
				Dolomite schist
			RL7	Transitional schist
				Footwall conglomerate
				Argillaceous quartzite
				Second conglomerate
				Aeolian quartzite
				Basal conglomerate
Basement Complex	Muva			Quartzite and mica schist
	Lufubu			Schist and granite (the intrusive)

The Lower Roan (RL) and Upper Roan (RU) Groups, which occupy most of the Roan-Muliashi Basin area, are presented as folded and regionally metamorphosed sediments which include arenaceous, argillaceous and dolomitic formations. A total of seven formations have been identified as shown in Table 6-17.

The Roan-Muliashi formations are folded to form a tightly folded Roan Basin which is surrounded by the basement to the north, east and south. The north and south limbs of the Roan Basin are squeezed and become overturned in the west where the limbs open out into the wider Roan Extension, a zone immediately west of the Roan Basin.

The Roan Antelope deposit is a large continuous copper mineralization in the Roan-Muliashi Basin that extends from east to west over a stretch of 25 km. The strike length of economic mineralization is about 15 km on the Luanshya side and approximately 5 km on the Baluba side. In the east, at Roan Basin, there is only one feasibly economic orebody, the upper orebody (UOB). The lower orebody (LOB) is thin and uneconomic. In the Roan Extension to the west of the Roan Basin the lower orebody becomes more prominent. The two orebodies are separated by a pyrite zone and the ore hosting units including the hangingwall formations are highly folded. Further to the west in the Muliashi area the upper orebody diminishes and later disappears completely where only the LOB exists and it is overlain by a pyrite zone.

The economic copper mineralization is mostly confined to the Formation RL6 (refer Table 6-17) and partly in the transitional schist bed of the upper RL7 formation. This comprises a thin (up to 2 meters) zone of chalcocite, locally with cuprite, in a gritty dolomite schist or breccia, named the Transitional Schist. Chalcopyrite and sometimes native copper (especially in Baluba west) also occur in this zone. Chalcopyrite and sometimes bornite occur in the tremolite-biotite-dolomite schist. This has a thickness of up to 4 meters and structurally overlies the transitional schist.

The RL6 overlies the RL7 and varies in thickness from about 30 m to 65 m towards the east. The formation consists of a basal micaceous dolomitic schist of about 3-6 m thick overlain by a biotitic quartz-feldspar argillite. Economic copper-cobalt mineralization occurs abundantly within the micaceous dolomitic schist and extends into the argillite. The dolomitic schist is generally a weak stratum.

The argillite (equivalent to the Copperbelt Ore Shale) overlying the schist also contains chalcopyrite. Upwards it grades through a mixed zone of both chalcopyrite and pyrite into a predominantly pyrite zone and beyond that into a chalcopyrite or chalcocite zone of the upper orebody.

6.4.2 Mineralogical Characteristics

Overall, the mineralization is mostly sulfide in the form of chalcopyrite, chalcocite and bornite. Within the lower orebody, the bottom contact is geological and is invariably on the contact of the Footwall Conglomerate with the RL6 Formation while the orebody hangingwall shows a gradational change within the argillite. Generally the best copper and cobalt grades occur near the footwall of the orebody (dolomite schist). The average grade of primary copper ores in the Baluba and Mashiba areas is about 2% Cu.

The oxidized caps of the copper deposits are widely spread within the CLM Luanshya Projects area. As the Luanshya deposits have been mined for almost 80 years, the sulfide ores are no more dominant among the total remaining resources. The average grades of oxidized ores vary, from about 1% Cu at Baluba East and Muliashi North, to about 1.7% Cu at Baluba Center and Muliashi South, up to greater than 2.5% Cu at Roan Extension East and West.

The main copper bearing minerals are chalcocite in Baluba East and Roan Basin and chalcopyrite in the rest of Roan-Muliashi Basin. However, chalcocite occurs throughout the Roan Antelope deposit largely as a minor mineral in the transitional schist as fine disseminations or erratic blebs. Chalcopyrite occurs as blebs and fine disseminations, however it is absent in the Baluba East. Comparative to chalcopyrite and chalcocite, bornite is a subordinate mineral and occurs as replacement of chalcopyrite.

The occurrence of both chrysocolla and malachite is common throughout the deposit. However, it is usually limited to staining only. Cuprite is also present, but is more common in transitional and tremolite-biotite-dolomite schist. Native copper has been found in footwall lithologies such as transitional and footwall conglomerate.

Major cobalt mineralization only occurs in the form of carrollite in the main Baluba deposit (Baluba Center). Chalcopyrite has been found to contain granular aggregates of carrollite and linnaeite, suggesting exsolution. Carrollite occurs as fine disseminations and scattered specks.

Pyrite occurs below the upper orebody in the in Baluba East and above the lower orebody in the rest of Baluba. In similar fashion, the pyrite zone lies below the upper orebody in Roan Basin and above the lower orebody in Muliashi. It occurs within the RL6 Argillite (Ore Shale) often aligned to bedding. The tenor of mineralization drops off within the upper dolomitic schist and overlying argillite where the typical mineralization consists of a mixed chalcopyrite-pyrite zone. The top of the economic copper mineralization is normally within this zone as the rock becomes very pyritic above (see Figure 6-29).

Figure 6-29: Weathered Copper Ore with Pyritic Features

Sulfide mineral zoning has been studied systemically. The paragenetic sequence appears as follows: barren near shore sediments, to chalcocite in shallow waters, to bornite with carrollite and chalcopyrite, then chalcopyrite and finally pyrite.

The useful elements consist of copper (Cu) and cobalt (Co) and associated components, including Au and Ag. Iron mineralized bodies are discovered in some parts of the deposit, and the grades of other elements are not high enough to be recovered commercially.

6.4.3 Geology of Baluba Center Mine and Muliashi Projects

Baluba Center Mine

The currently operating underground mine of CLM is the Baluba Center Mine which started production in 1973; it is located approximately 10km northwest of the Roan Antelope Mine (near Roan and Luanshya area), on the northeast flank of the Muliashi Basin. The Baluba Center Mine operates with a granted mining license (8097-HQ-LML) "Luanshya Mine and Baluba Mine" covering a total area of 46.34km^2, occupying the eastern part and accounting for nearly half of the total CLM Projects area.

Roan Antelope Mine was established in 1911. Due to the resources being nearly depleted (about 93% of the total resources were depleted as cited from data provided by CLM) and the remaining resource areas experiencing flooding and surface subsidence, the Luanshya Mine (main part of the former Roan Antelope deposit) and shafts were closed in 2001. Therefore within the area covered by mining license "Luanshya and Baluba Mines" currently only the Baluba Mine exists with production of sulfide copper ores.

Muliashi Projects

The Muliashi-Luanshya license (License 8393-HQ-LML) includes four deposits, namely Baluba Center Oxide Cap (which has been reported together with Baluba Center Sulfide in Section 6.4.4 Ore Body Geology — Baluba Center Mine), Muliashi North, Muliashi South and Mashiba as shown in Figure 6-30. The license covers an area of 81.22km².

The Muliashi North Deposit is situated in the center of the CLM Projects' license area, at the eastern edge of Muliashi Basin and close to the west of Roan Basin. The Muliashi South Deposit is located south of Muliashi North but west of the 28# Shaft. The Mashiba Deposit is recognized as an isolated deposit located approximately 3km west of 28# Shaft.

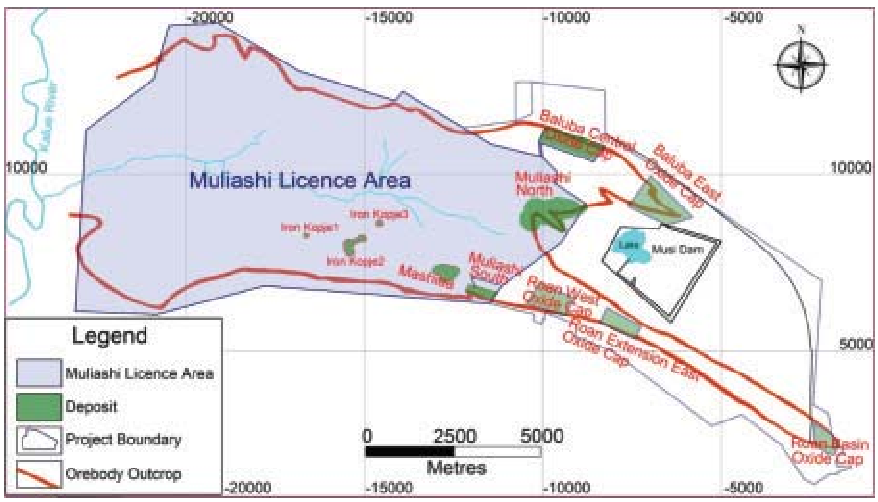

Figure 6-30: Location of Muliashi Project

The Mashiba Deposit is recognized as an isolated deposit located roughly 3km west of 28# Shaft (refer Figure 6-27). Spatially, it is localized and thins out in all three directions (east, south and west), and distributed largely in the lower orebody with a sporadic pyrite zone above it.

6.4.4 Orebody Geology

Baluba Center Mine

The mineralized units within the Baluba syncline are recognized as extending for about 3km along the east trending strike and approximately 1.5km down dip. Economic copper mineralization is largely confined to the RL6 argillite and a thin zone near the upper contact of the RL7 Formation. The Baluba Center oxidized cap exists above the oxide-sulfide interface assumed to be approximately 60m below surface. The oxide content increases towards the surface while the sulfide minerals increase with depth and become predominant roughly 60m from surface.

The outcrop of the oxidized cap is distributed on the north limb of the Baluba Syncline, extending approximately 3,000m from west to east with thickness of 10m and depth of 110m below surface. As an ore-controlling structure, the syncline's northern limb has varying southerly dips, with the shallowest being 45° at both the eastern and western ends. Near the center of the deposit about SS45 (in the shaft area) the dip is nearly vertical (Figure 6-31).

Baluba Center sulfide orebody (mineralized syncline with economic feasibility) extends about 3,600m and is distributed on both limbs of the Baluba Syncline. The width (along dip) of the orebody is about 1,500m and the thickness varies from several meters up to dozens of meters averaging about 10m. Near the north limb, the Baluba Center orebody dips to the southwest (210º) with a relative large dip angle varying from 45º to nearly 90º.

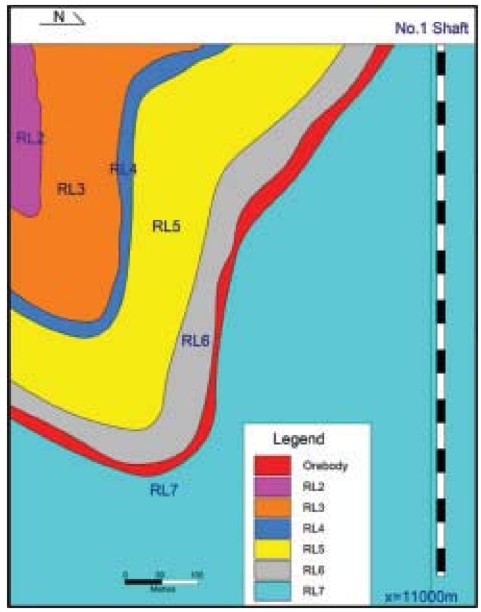

Figure 6-31: Vertical Section SS45 — Baluba Center Mine

Muliashi North Deposit

The deposit is recognized as an oxidized cap with copper oxidation ratio about 52%. Weathering and associated oxidation have occurred widely from surface spreading to variable depths. Protogenic cooper sulfides, including chalcopyrite, bornite and chalcocite, are distributed predominantly below 100m from the surface. Approaching the surface there is a gradual transition where copper sulfides were oxidized and produced secondary minerals. The copper mineral in the oxidized zone is predominantly malachite with minor chrysocolla. A poorly crystallized manganese oxide with adsorbed copper and cobalt is also present in the area.

Three orebodies have been identified in the Muliashi North deposit. Due to different host rocks, one discontinuous orebody has been identified as Hangingwall Orebody (HOB) and is located just above the RL6-RL5 contact traditionally recognized as the hangingwall waste in the rest of the Roan-Muliashi Basin. The other two orebodies, namely the Upper Orebody (UOB) and the Lower Orebody (LOB), both occurred in the lower or upper zone of RL6 Formation and are separated by a pyritic zone. The RL6 Formation at Muliashi North is thinner than the other formations of the Roan-Muliashi Basin.

Muliashi South Deposit

The Muliashi South oxidized cap covers a distance of about 800m on surface and extends down to the underground upper mining limit which varies from section to section.

Mashiba Deposit

Figure 6-32 illustrates a digital model built by geologists from SRK's South Africa office. The southern part of the mineralization outcrops on surface, and extends about 600m along strike (east-west) and 800m along the dip direction (north). A tight asymmetrical fold or "ridge/crest", trending ESE, crosses the deposit halfway down its depth. The thickness of the orebody within this zone presents as much thicker with the maximum up to 41m. This "ridge" appears to be associated with an east trending fold present in the Muliashi deposit. There is another thick zone measuring up to 15m in thickness which trends roughly north-south and dissects the "ridge" at its midpoint. The thick zone (called the second "ridge" by SRK South Africa) is irregular in shape and not always evident. It appears to be open ended down dip while it thins out close to the southern limit of the deposit.

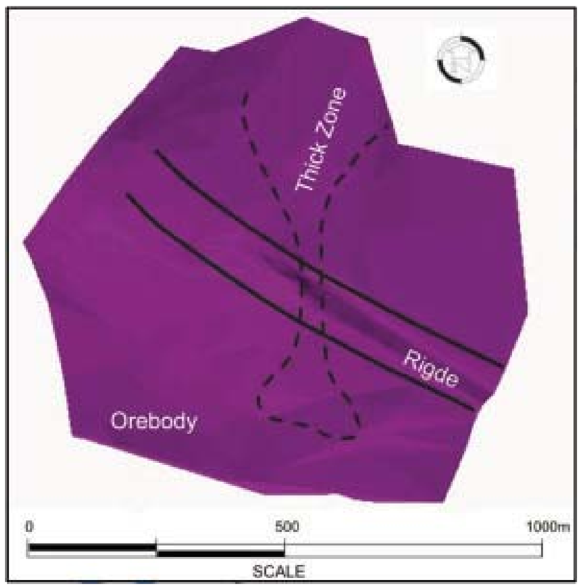

Figure 6-32: Orebody Model of Mashiba Deposit (From F. Camisani, SRK Consulting South Africa, 2008)

Unlike typical Copperbelt sulfide orebodies, the Mashiba ore has a relatively high copper oxide component and its thickness varies drastically over short distances. The oxide copper covers virtually the whole deposit but confines itself largely along the dolomite schist at the RL6—RL7 contact. This is a zone of relatively high porosity and weathering.

The Ox-Cu/TCu ratio over the entire mineralized length of the borehole intersections reveals that the zone with relatively high ratio (Ox-Cu/TCu>5) is localized above the elevation of 1,200m ASL, ie down to 100m from surface. The same higher ratio oxide applies in the crest area of the fold.

6.4.5 Resource and Reserve Estimation

Baluba Center Mine

Sulfide Mineral Resource and Ore Reserve

In 2008 before CNMC took over the Baluba mine, the Johannesburg based consultancy Golder performed an estimation of resources of Baluba Center sulfide using GEMCOM Software and the oxide deposit as commissioned by the former mine owner Luanshya Copper Mines PLC. The geostatictics and results are detailed in the report *"Resource estimation of the Baluba Center, Baluba East and Muliashi North Ore Bodies, Luanshya, Zambia"*. Samples from a total of 1,793 holes were used in the estimation, and the resources were classified abiding with the SAMREC Code. In September 2008 Golder reported the Baluba Center Sulfide resources as 9.05Mt Measured Resource grading at 2.45% Cu, 4.70Mt Indicated Resource grading at 2.23% Cu, and 14.87Mt Inferred Resource grading at 2.03% Cu using a cut-off grade of 1.00% TCu.

Additional exploration including underground drilling and sampling was conducted by CLM during the production after 2009, and based on the new exploration results and depletion investigations CLM re-assigned the resource blocks and performed a detailed update of the resources following SAMREC Code classification. The Software AutoCAD and 3DMine were applied and Inverse Distance (Square) Method was used for estimation. The Kriging variance and distance to sample as well as a strict grid of exploration have been taken into account when classifying the resource categories. The updated sulfide resources of the Baluba Center Mine as of July 1, 2010 using a cut-off grade of 1.0% Cu are shown in Table 6-18.

Table 6-18: Sulfide Mineral Resource of Baluba Center Mine, as of July 1, 2010

Category	Resource (Mt)	Average Grade*		
		%TCu	%Ox-Cu	%TCo
Measured	1.20	2.30	0.07	0.16
Indicated	14.16	2.21	0.08	0.16
Inferred	3.88	1.91	0.10	0.12

* TCu — total copper "Cu"; Ox-Cu — copper oxide; TCo — total cobalt "Co"

SRK has carefully reviewed the exploration programs conducted by CLM including logging; sampling methodologies and sample preparation and assaying; assay quality control and quality assurance; the geological interpretation, mineral resource estimation procedures and parameters applied by CLM. SRK considers that these exploration programs provide a reasonable basis to estimate the mineralized bodies at Baluba Center Mine and that the analytical methods used for these deposits produced acceptable results with no material bias.

Based on the production details provided and depletion data from July 2010 to June 30, 2011, the sulfide resources using a cut-off grade of 1.0% Cu were updated. As of June 30, 2011, the JORC Code compliant Measured, Indicated and Inferred Resources were estimated at 0.73Mt with an average grade of 2.31% TCu and 0.17% TCo, 16.68 Mt with an average grade of 2.23% TCu and 0.15% TCo, and 3.88Mt with an average grade of 1.91% TCu and 0.12% TCo, respectively (Table 6-19). Only the Measured and Indicated Resources may be converted to Ore Reserve and used for mine planning.

Table 6-19: Sulfide Mineral Resource at Baluba Center Mine, as of June 30, 2011

Category	Resource (Mt)	Average Grade		Contained Metal	
		TCu (%)	TCo (%)	Cu (t)	Co (t)
Measured	0.73	2.31	0.17	16,863	1,241
Indicated	16.68	2.23	0.15	371,964	25,020
Inferred	3.88	1.91	0.12	74,108	4,656

Based on the monthly production records from July to December 2011 at the Baluba Center Mine, a total of 0.034 Mt with average grades of 1.86% TCu and 0.61% TCo of Measured Resource and 0.768 Mt with average grades of 1.86% TCu and 0.161% TCo of Indicated Reserve were consumed.

As of December 31, 2011, the JORC Code compliant Measured, Indicated and Inferred Resource were estimated at 0.70 Mt with an average grade of 2.33% TCu and 0.170% TCo, 15.91 Mt with average grade of 2.25% TCu and 0.149% TCo, and 3.88Mt with an average grade of 1.91% TCu and 0.12% TCo, respectively (Table 6-20).

Table 6-20: Sulfide Mineral Resource at Baluba Center Mine, as of December 31, 2011

Category	Resource (Mt)	Average Grade		Contained Metal	
		TCu (%)	TCo (%)	Cu (t)	Co (t)
Measured	0.696	2.33	0.170	16,239	1,187
Indicated	15.912	2.25	0.149	357,669	23,782
Inferred	3.88	1.91	0.120	74,108	4,656

Based on the production data analysis in 2011, the mining loss rate and a dilution rate at the Baluba Center Mine of 40% and 38%, respectively, and other modifying factors, SRK estimated the ore reserves. As of December 31, 2011, the estimated Proved and Probable Ore Reserves were 0.58Mt at an average grade of 1.69% TCu and 0.123% TCo and 13.17Mt at an average grade of 1.63% TCu and 0.108% TCo, respectively (Table 6-21).

Table 6-21: Ore Reserves at Baluba Center Mine (Sulfide Ore), as of December 31, 2011

Category	Reserve (Mt)	Average Grade		Contained Metal	
		TCu (%)	TCo (%)	TCu (t)	TCo (t)
Proved	0.576	1.69	0.123	9,730	710
Probable	13.175	1.63	0.108	214,812	14,225

Oxidized Mineral Resource and Ore Reserve

In September 2008, Golder Associates also conducted a resource estimation following the SAMREC Code for the oxidized cap at the northern part of the Baluba deposit. The SAMREC Code is similar to the JORC Code. The Indicated and Inferred Resources were 6.56Mt at an average grade of 1.65% TCu with 1.14% Ox-Cu and 0.12% TCo, and 1.62Mt at an average grade of 1.70% TCu with 0.93% Ox-Cu and 0.10% TCo, respectively (Table 6-22). The oxidized ore resources were not mined from September 2008 to December 31, 2011.

Table 6-22: Mineral Resource at Baluba Center Mine (Oxidized Ore), as of December 31, 2011

Category	Resource (Mt)	Average Grade*		
		%TCu	%Ox-Cu	%TCo
Indicated	6.56	1.65	1.14	0.12
Inferred	1.62	1.70	0.93	0.10

* TCu – total copper "Cu"; Ox — Cu – copper oxide; TCo — total cobalt "Co"

It is noticed that the Oxidized Resource Cap has subsided and/or has the potential to sink. Therefore most of the Baluba Center Oxide resources listed in Table 6-22 are unlikely to be mined at the present time. The resources are not able to be designed for reserves estimation.

Muliashi Projects

Muliashi North Deposit

Before CLM took over the deposit, four drilling campaigns had been carried out at Muliashi North. The first campaign was from 1963 to 1971, followed by drilling and tunnelling programs between 1971 and 1975. Table 6-23 demonstrates the total exploration workload from the first two exploration programs.

Table 6-23: Workload Spreadsheet between 1963 and 1975 in Muliashi North Deposit

Item	Count	Footage (m)
Boreholes	159	40,049
Pits and auger holes	244	2,381
Prospect trench	1	2
Winzes	3	300
Crosscuts and drives at 152m level	4	570

Two feasibility studies were carried out during 1998 and 2007. Low grade zones in between the original three orebodies were counted in as a new orebody. The cut-off grade was also reduced from 0.50% to 0.30% TCu. The reduced cut-off grade effectively decreased the average grade further but significantly increased the tonnages.

Boreholes were drilled along sections which were positioned 75 meters apart. On each section boreholes were sited at distances varying from 30m to 100m apart depending on the complexity of the structure and mineral variations. Most boreholes were vertical.

The historical drill cores are now kept at a warehouse near CLM's general office. During the site visit to CLM in early May 2011, SRK observed the open-pit stripping at Muliashi North, inspected the newly-drilled boreholes and drill cores stored at another warehouse near 28# shaft (Figure 6-33). The new exploration was undertaken by Sinomine under the supervision of CLM's experienced geologists.

Figure 6-33: Historical Storage (Left) and New (Right) Drill Cores — Muliashi North Project

Mineral Resource and Ore Reserve

A number of resource estimations for the Muliashi North area were carried out since the initial exploration campaign in 1963.

As shown in Table 6-24, the latest resource estimation was conducted and reported by Golder using SAMREC Code. Using a cut-off of 0.30% Cu, the Measured, Indicated and Inferred Mineral Resources were 38.87Mt at an average grade of 1.14% TCu with 0.67% Ox-Cu and 0.06% TCo, 22.13Mt with an average grade of 0.98% TCu with 0.59% Ox-Cu and 0.07% TCo, and 20.02Mt at an average grade of 1.18% TCu with 0.41% Ox-Cu and 0.05% TCo, respectively.

Table 6-24: Resource Summary at Muliashi North Deposit, as of December 31, 2011

		Average Grade (%)			
Category	**Resource (Mt)**	**TCu**	**Ox-Cu**	**TCo**	**Oxide/Total Cu**
Measured	38.87	1.14	0.67	0.06	59%
Indicated	22.13	0.98	0.59	0.07	60%
Inferred	20.02	1.18	0.41	0.05	35%

CLM has planned to utilize the resources through developing an open pit at Muliashi North. Such plan has been achieved and production commenced in December 2011. The current resource status has not changed significantly since the latest resource estimation.

Based on the rates of mining recovery and dilution at 97% and 3%, respectively, as cited in the Preliminary Design (NERIN) and considered other modifying factors, the Proved and Probable Ore Reserves of the Muliashi North Project are estimated at 38.84Mt at an average grade of 1.11% Cu and 22.11 Mt at an average grade of 0.95% Cu, respectively (Table 6-25).

Table 6-25: Ore Reserves at Muliashi North Deposit, as of December 31, 2011

Category	Reserve (Mt)	Grade Cu (%)	Contained Metal Cu (t)
Proved	38.84	1.11	429,824
Probable	22.11	0.95	210,368

It is noted that since 2010 a total of 58 additional boreholes and 9 trenches have been completed and the new samples were not included in the resource inclusive of reserve estimations above. To date of SRK's visit of the project, CLM was continuing the exploration in Muliashi North, and SRK was advised that a new assessment of the Project, including resource estimation, would be commenced after the exploration of this stage is completed and all samples are assayed.

Muliashi South Deposit

Most of sulfide ore at the Muliashi South Deposit was extracted through the 28# Shaft during the ZCCM ownership period. Underground mining was resumed in 2008 but only last several months and in November 2008 the mine was shut down by ENYA.

Oxidized mineral resources and the remaining sulfide mineral resources were estimated by Snowden in 2006 and Golder in 2008 respectively using the SAMREC Code. Using a cut-off grade of 0.30% TCu, the oxidized Inferred Resource was estimated at 4.4Mt with an average grade of 1.73% TCu. The remaining sulfide Indicated and Inferred Resources were estimated at approximately 0.60Mt at an average grade of 2.48% TCu and 0.08Mt at an average grade of 2.5% TCu (Table 6-26). The Muliashi South deposit was not mined from 2008 to December 31, 2011.

Table 6-26: Resource Summary at Muliashi South Deposit, as of December 31, 2011

Category	Resource (Mt)	%TCu
Sulfide Ore		
Indicated	0.60	2.48
Inferred	0.08	2.50
Oxidized Ore		
Inferred	4.44	1.73

It should be noted that the sulfide resources have been flooded and re-construction and mining for the small amount of sulfide resources (probably some parts of the resource are no longer accessible) is currently unlikely to be economically feasible, but after de-watering it could be economically used in the future.

The Mineral Resources listed above suggest that currently no Ore Reserves could be stated at Muliashi South. It is recommended the Company carry out more detailed exploration in order to verify and upgrade the resources, which may allow some reserves to be designed and/or estimated.

Mashiba Deposit

The initial drilling at Mashiba started in the 1930s, but most of the drilling occurred between 1950 and 2007. A total of 77 boreholes have been drilled to date within and in the immediate vicinity of the deposit, of which 54 were drilled before 2007 and 23 in 2007. Of the pre-2007 boreholes ("old holes"), 16 had only "% TCu" grade recorded over the entire orebody intersection. Of these, 7 holes had no "Ox-Cu" assays. Within the pre-2007 boreholes, 32 were assayed for "% TCu" continuously over the entire mineralization, but only a few samples per intersection (1-3) were assayed for "% Ox-Cu". The 2007 campaign boreholes were assayed for both "% TCu" and "% Ox-Cu".

In 2008 geologists from SRK's South Africa ("SRK SA") office, with Luanshya Copper Mines Plc's ("LCM") assistance, were able to reconstruct most of the borehole core assay data to generate a mineral resource. However, SRK SA's staff did not validate any of the pre-2007 borehole drilling, core logging, sampling or assaying QA/QC procedures.

Mineral Resource and Ore Reserve

A total of 66 drillholes (48 "old holes" drilled prior to 2000 and 18 holes of the 2007 campaign) were drilled within the Mashiba deposit proper and were used for the estimation of resources by SRK's SA staff in January 2008. SRK conducted a site visit and reviewed the resource estimation method, which is comparable to the Inferred Resource category in the JORC Code. Using a cut-off grade of 0.5% TCu, the JORC Code compliant Measured, Indicated and Inferred Mineral Resources were 3.17Mt at an average grade of 1.89% TCu and 0.24% Ox-Cu, 5.67Mt with an average grade of 1.96% TCu and 0.22% Ox-Cu, and 4.97Mt at an average grade of 1.67% TCu, 0.43% Ox-Cu, respectively (Table 6-27). The Mashiba deposit was not mined from 2008 to December 2011.

Table 6-27: Resource Summary at Mashiba Deposit, as of December 31, 2011

Category	Resource (Mt)	TCu (%)	Ox-Cu (%)
Measured	3.17	1.89	0.24
Indicated	5.67	1.96	0.22
Inferred	4.97	1.67	0.43

In addition, a tonnage of 2.8Mt at an average grade of 1.7% TCu with 0.6% Ox-Cu was estimated by SRK SA's staff. This tonnage refers to the peripheral part of the deposit which does not satisfy the conditions of the JORC Code Resource classifications, and this additional prospective material at the Mashiba Project should be considered to be an exploration target.

Regarding the resources reliability, SRK SA's report also made comments and recommendations as below.

"It is SRK's opinion that a borehole twinning program should be undertaken before any mining commences at Mashiba. It is recommended that at least 25% of the pre-2007 boreholes should be twinned with new boreholes and the new core assays checked with the existing pre-2007 assays. If the assay variance is greater than 10% then SRK recommends that the deposit should be re-drilled and assayed to the current QA/QC standards."

It should be noted that a certain proportion of verification drilling will be necessary before a mining design can be completed in the future, as some of the original data of the historical boreholes is no longer available.

By consideration of similar type of operating mines in this region, and applying the mining recovery rate of 60% and dilution of 40%, the Ore Reserves were estimated by SRK as shown in Table 6-28. However the figures should be adjusted after a detailed study, and any other factors regarding geological, mining, cost, legal, social and environmental aspects which possibly impact the reserve estimates should be also seriously considered.

Table 6-28: Estimated Ore Reserves at Mashiba Deposit, as of December 31, 2011

Category	Reserve (Mt)	Grade Cu (%)	Contained Metal Cu (t)
Proved	2.66	1.35	35,948
Probable	4.76	1.40	66,679

6.4.6 Baluba East, Roan, Roan Extension and Others

Baluba East

Baluba East as the name implies is situated at the eastern end of the Baluba Syncline. The north and south limb of Baluba Syncline meet to form a nose which plunges westwards. The nose outcrops near SS04. The syncline increasingly opens up wider as it deepens and plunges at 40º westwards.

Orebody Geology

At Baluba East there are two orebodies separated by a pyrite zone. The orebody below the pyrite zone is the lower orebody (LOB) while the one above is the upper orebody (UOB). The UOB is the predominant orebody which was partly mined out while the LOB was not mined out because it is thin. In the pyrite zone the copper grades are below 1.00% allowing the pyrite to be dominant in the zone.

Towards the west the north limb of Baluba East joins the north limb of Baluba Center. However, there is a near barren zone that demarcates Baluba East from Baluba Center. Similarly, the south limb of Baluba East and the Center Limb East are separated by a near barren gap.

The oxide cap at Baluba East is the oxidized upper part of the orebodies. At a depth of about 60m both the LOB and the UOB have high oxide content. The oxide level increases towards the surface where more oxidation took place. Common minerals are malachite, cuprite and chrysocolla. It is a reasonable approximation to consider the 60m line below surface as the oxide-sulfide interface. Below the oxide-sulfide interface the materialization increases in sulfur content, with a resulting drop in oxide copper. The oxide-sulfide interface is not fixed and therefore can be found at different horizons. The major sulfur minerals are chalcocite, minor bornite and chalcopyrite. What is clearly noticeable is the lack of cobalt in the Baluba East orebody.

The mined out area at Baluba is between SS7 and SS15, while east of SS13 mining reached the trough of the north and south limbs. Mining started on the north limb and it was to proceed to the south limb at a later date. Figure 6-34 shows the typical section of the Baluba East deposit.

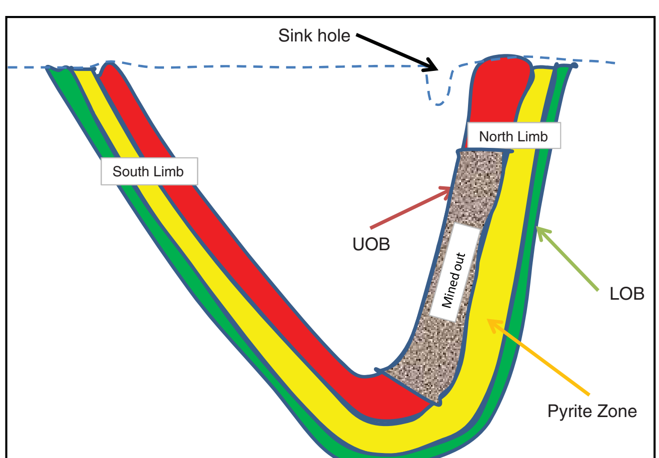

Figure 6-34: Typical Baluba East Section

Resource and Reserve Estimation

Two major sink holes were conducted at the surface of Baluba East in 2006. Using a cut-off grade of 0.30% TCu, the resource was estimated by Snowden at 10.0Mt at an average grade of 1.43% TCu.

During 2007, a total of 19 boreholes were drilled at Baluba East. The purpose of drilling these holes was to determine the remaining ore resource and its grade in the oxide part of both the north limb and the south limb.

In September 2008, Golder estimated the resources of Baluba East in line with the SAMREC Code, which is similar to the JORC Code. As the mine was not operated from September 2008 to December 31, 2011, the JORC compliant Measured, Indicated and Inferred Mineral Resources at Baluba East Mine at December 31, 2011 were 6.40Mt at an average grade of 1.90% TCu, 1.00% Ox-Cu and 0.02% TCo, 27.64Mt with an average grade of 0.77% TCu, 0.31% Ox-Cu and 0.03% TCo, and 3.27Mt at an average grade of 1.03% TCu, 0.37% Ox-Cu and 0.04% TCo, respectively (Table 6-29).

Table 6-29: Estimated Resources at Baluba East Deposit, as of December 31, 2011

Category	Resource (Mt)	%TCu	%Ox-Cu	%TCo
Measured	6.40	1.90	1.00	0.02
Indicated	27.64	0.77	0.31	0.03
Inferred	3.27	1.03	0.37	0.04

* TCu — total copper "Cu"; Ox-Cu — copper oxide; TCo — total cobalt "Co"

Based on a recovery rate of 95% as well as a dilution rate of 5% for open-pit mining and other modifying factors cited from the feasibility study, the Ore Reserves of Baluba East were estimated as shown in Table 6-30. However, the figures should be adjusted after a detailed study, and any other factors regarding geological, mining, cost, legal, social and environmental aspects which possibly impact the reserve estimates should be also seriously considered.

Table 6-30: Estimated Ore Reserves at Baluba East, as of December 31, 2011

Category	Reserve (Mt)	%TCu	%Ox-Cu	%TCo
Proved	6.38	1.81	0.95	0.019
Probable	27.57	0.73	0.30	0.029

Roan Basin

Roan Basin forms the furthest eastern end of the Roan-Muliashi Basin. Like Baluba East, the fold nose of Roan Basin is formed by the north and south limbs (see Figure 6-27). The fold nose of Roan Basin is located beneath the cricket field north of the CLM's general office. The Luanshya River diversion tunnel passes just east of the surface projection of the fold nose.

The Roan Basin oxide cap forms a syncline which plunges to the west at approximately 20º and outcrops to the east at the cricket field. The south limb has a strike of approximately 290º and dips between 45º and 50º to the north. The north limb strikes between 90º and 110º and dips at between 60º and 70º to the south.

The oxidized cap occurs over an area of 600m west to east and 400m, north to south, while the mineralized zone is 20m thick at 30m below the surface. It extends from the fold nose at SS02 to SS40 on the south limb.

The first tonne of copper ore was hoisted at Roan Antelope deposit in 1931. Mining was carried out using the Beatty Shaft, now decommissioned. Only the sulfide ore was extracted because at the time the technology to treat oxide ores was not yet developed.

Mining was carried out 60m below the surface. The oxide-sulfide interface dictated the upper limit of mine extraction. The upper limit of underground mining averaged 45m below the surface although it reached 25m below the surface on a few local sections such as 6# and 14#.

Drillholes into the Roan Basin oxide cap are all shallow (less than 70m) and so un-oxidized sulfide material has not been intersected. There are, however, zones of mixed oxide/sulfide material identified in the logs. These zones are characterized by oxide minerals malachite, tenorite and chrysocolla, mixed with chalcocite and occasional finely disseminated chalcopyrite.

Eight boreholes were drilled at Roan Basin. These boreholes were meant to define the previous mining limit and to confirm the presence of the orebody.

In 2006, Snowden estimated the resources at Roan Basin following the SAMREC Code. Using a cut-off grade of 0.30% TCu, the Inferred Resource was 3.3Mt at an average grade of 2.12% TCu, and there were no sufficient assays for copper oxide at the time.

In 2010, CLM re-estimated and updated the resources of Roan Basin as 3.23Mt Inferred Resource grading 1.82% Cu and 1.24% Ox-Cu.

As the Roan Basin is close to CLM General Office, roads and Luanshya downtown as well as other facilities, the future mining activity will be impacted by these factors. It is likely that only a part of the resources could be extracted.

Roan Extension West

The deposit is located north of and in between 18# and 28# Shafts (see Figure 6-27). It is probably the smallest asset of the oxide caps at Luanshya. In the Roan Extension Basin both the LOB and UOB deposits exist and are fully developed but highly folded. The pyrite zone is also well developed such that the cubic pyrite minerals are clearly seen.

Very little data is known about the Roan Extension West deposit because it represents a very small deposit among the Luanshya oxide assets. It is also thought that part of the oxide cap may be overlain by the waste dump north of 28# Shaft. Both the LOB and the UOB form the oxide cap that was undermined by underground mine extraction. As a result some of the orebody may have been lost due to the slumping of the ore horizon following the mining induced caving.

Following the SAMREC Code, the resource of oxidized caps estimated by Snowden using a cut-off grade at 1.00% Cu was about 1.82Mt Inferred Resource at an average of 2.79% TCu with 2.54% Ox-Cu. The underground sulfide resources are almost depleted and a subsidence potential of the surface exists. At present, it is unlikely that the Roan Basin Extension West will be mined.

Roan Extension East

Three quarters of the Roan Extension East is located north of 18# Shaft. The deposit is the surface express of a limb in the Roan Extension Basin. The limb forms a small syncline which increases the ore resource in comparison to the Roan Extension West. Similar to the Roan Extension West, the underground sulfide resource in the area is almost depleted and subsidence has occurred in the local area.

The Inferred Resource at Roan Extension East was estimated by Snowden following the SAMREC Code at 2.75Mt with an average of 2.59% TCu and 1.82% Ox-Cu.

Muva Hill and Lufubu

The Muva Hill is located at the north of the Projects area, and Lufubu is situated at the western part of the Muliashi License. The lithological systems of Muva and Lufubu are named after the prospects' names. Some geological investigation has been performed in both areas and preliminary exploration on Lufubu North and South has been conducted. It is considered that the two projects share some exploration potential.

6.4.7 Exploration Analytical Procedures and Quality Control

The historical exploration and sampling, analytical procedures as well as quality control of the CLM Luanshya Projects have been described separately in this report, including in the section on Muliashi and Mashiba. For an overall assessment of the exploration of CLM Luanshya Projects, the sections below describe the typical procedures of the historical exploration regarding QA/QC. Due to some of the historical data being not available, most of the knowledge is derived from SRK's site observations and recent documents provided to SRK.

Drilling and Sampling Procedures

The detailed procedures that Luanshya Copper Mines uses for core logging, sampling, bagging, transporting and the handling of analyses to reduce errors and biases in the assays and to maintain integrity of the assay in order to increase confidence in the estimate of the resources are discussed below. Note that the procedures discussed refer to the 2007-2008 in-fill drilling program.

Core Handling: During the drilling all the core was checked for core recovery, for the condition of core (core grinding if any), the nature of core (weathering, etc.), the nature of fragmentation and any fractures of the core. The core losses were recorded on a daily basis. The borehole was stopped when the hole intersected the orebody horizons, namely argillite, dolomite schist and transitional schist. About six meters of drilling was allowed into the footwall beyond the last visible copper mineralization. The hole would be stopped in the argillaceous quartzite rock unit. If no visible mineralization was observed, and this sometimes happened even if no mineralization existed, the drilling of the borehole would be stopped 3.0m after passing the rock units of the ore formation (i.e. dolomite schist or transitional schist).

All the drills in the recent drilling programs (since 1990s) used the wire line drilling method. In this method the drill bit (crown) is attached to the core-barrel at the end of the drill string (i.e. at the bottom of the borehole). The core is collected by the inner tube which sits a few millimeters above the drill bit inside the core barrel. During drilling the core enters the inner tube and is held in position by the core lifters. When the drill run is completed (a drill run is usually 3m long) the inner tube is pulled by a winch attached to a wireline. The core-barrel remains down the hole. On surface the core is removed from the inner tube by using water under pressure from the by-pass hose. This prevents the core from breaking up. Sometimes the core is removed from the inner tube by tapping the inner tube which is raised on one end.

Care was taken by the driller to avoid damaging the core in any way. This ensured that all the geological data was collected during the logging and subsequent sampling of the core to get the full benefit of core drilling.

Core Transportation: Core was laid out in 1.5-meter long runs inside the core boxes. Each core box had 5 runs. Due to core losses a core box may indicate it held more than 7.5m of core length. However, the actual physical core in the box would only be 7.5m.

The core boxes were labelled with the borehole number and the meters found therein e.g. MO382 from 0.0m to 8.0m. The core was transported by Toyota Land cruiser in a closed core box to the core yard where core logging and sampling took place. All core boxes had covers. Before the core box may be stored permanently each box was stencilled with the borehole number and the length of core kept in the box.

Keeping of Core: The core boxes were stacked one on top of another and according to the core box number within the batch of one borehole. CLM currently has two large warehouses for core storage, and both historical and recent drill cores are stored there.

Marking of Core Boxes: In the field where drilling took place, the core boxes were marked by a gem marker. After logging, the core boxes were stencilled with red gloss paint on a white background. The stencilled labels indicated the borehole number and the core length kept with the core box.

Core Logging: The cores were logged by geologists at the core shed using a standard drill-hole log sheet. The rock unit was described in terms of color, texture, fabric, grain size, structure, state of weathering, mineralization, competence of rock, etc.

SRK recommends that CLM check and re-log relevant historical cores, as some of the markers in core boxes are lost or unreadable.

Core Losses: Any core losses were marked by measuring what was marked between drill runs such as the 3.0m per drill run. If the core per drill run fell short of the stated length the missing core was the loss and the remaining core was expressed as a core recovery in percent of the drill run. For the in-fill drilling campaign of Muliashi North the core recovery was in excess of 90%.

Core Cutting: The core was cut in half along its length using a diamond core cutter. Half of the core was sampled and bagged while the other half remained in the box for the record. The core was split using a chisel leading to uneven sides being split.

Core Sampling: A sample interval of 0.5m was maintained throughout the sampled zones except where there was a lithological (geological) contact. Sample lengths of 1m or higher were also used in some places where the rock unit and the mineralization was homogeneous. Sampling across the contacts was avoided whenever possible. Core losses for each sample interval was determined and compared with that measured during logging and that recorded during the drilling. This information was recorded in the sample book together with a simple core description.

Procedure on Mineral Standards

African Mineral Standards, a company based in South Africa, provided the mineral standards for assaying. The company specializes in making reference material for African ores. The mineral standards that African Mineral Standards provides have a Certificate of Analysis and each packet is labelled with the value of the reference material. Inside this there is an unlabelled manila (khaki) envelope which contained the mineral standard of known value. The unlabelled manila envelope was put into an empty sample bag with a numbered sample ticket. The purpose of the reference material was to monitor the accuracy of a single analysis.

Blank Samples: Pure sand from Muva Hill, a quartzite hill near Baluba Mine, was used as sample blanks. The sand was put into a sample bag with ticket number of the same series. The stub of the ticket was indicated "blank". The purpose of using pure sand as a blank sample (i.e. sample without copper) was to check sample contamination arising from the pulp preparation of the previous sample.

Duplicate Samples: The remainder of the pulp after removing material for assaying was kept in marked manila envelopes. At random a pulp from a previously analyzed batch of samples was selected. This pulp, a duplicate sample of a known value, was put into an unmarked envelop and sent to the laboratory with other samples in batch. In the stub of the sample ticket book the original sample number was recorded for future reference. The purpose of the duplicate sample was to check the reproducibility of the assay value of the copper in the laboratory analysis.

Bagging of samples: A sample ticket was put into every sample bag immediately after placing the core sample. A record of the drilled length, core loss and the visual estimates of the copper mineralization were recorded on the remaining stub in the sample ticket book. This helps to check against the assayer's copper metal determination. The sample interval and the distance of the sample from borehole collar were also recorded on the stub of the sample ticket. This information was used to reconstruct the interval where the sample was taken when compiling the drill-hole data. In this way the sample interval will be correctly positioned in the correct dimensional space.

Transportation of Samples: Immediately after the bagging of the entire core of a borehole that was chosen to be sampled was completed, the samples were transported to the assay lab. They were transported as one batch so that when the sample analyses were completed the assay results were also dispatched to the Company geology staff as one batch.

Transmission of Assays from the Laboratory: The laboratory sent the assay results to the relevant geology department as e-mail attachments. A hard copy was later sent as confirmation of the dispatched assays.

Procedure of Using Electronic Assays: The assays were transferred to assay sheet on the drill-hole log by the cut and paste method. In this way it was possible to avoid typographical errors which may introduce random errors.

Sample Preparation

In May 2011, SRK visited the laboratory and a procedure of sample preparation adopted by CLM Laboratory is shown in Figure 6-35. It is SRK's opinion that the sample preparation is performed in line with the standard defined by CLM Laboratory.

Assaying

The CLM Laboratory routinely assays all the samples from prospecting, mining and from the concentrator. The laboratory is not accredited to any ISO standards or other international agency. All the procedures at the laboratory have been internally standardized and are described in a manual called "Analytical Methods of Analyses" compiled by the Analytical Services Department of the mine.

The sample preparation at the mine follows the steps shown in Figure 6-35. The pulverized -150 micron sample retained at the end of the sample preparation is further split and coned. A portion of 1g is then analyzed for CuO, one portion of 0.25g is analyzed for TCu and one portion of 0.25g for Co.

The analyses are done using Atomic Absorption Spectrophotometric methods in one of the two Atomic Absorption Spectrometers in use at the laboratory. The lab has standardized a series of internal checks which are done on every sample submitted for analysis.

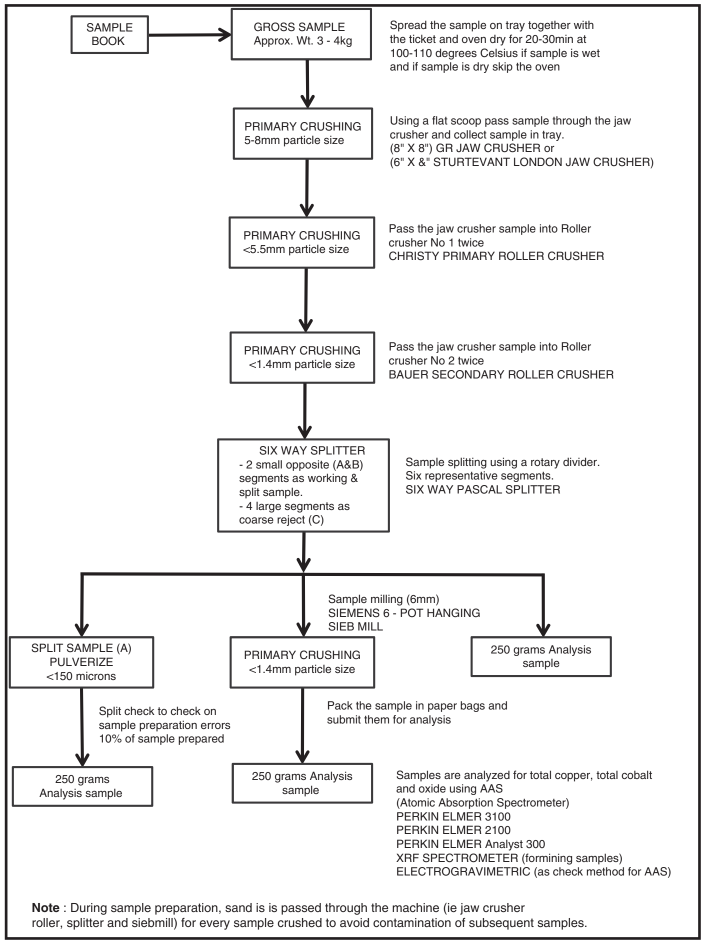

Figure 6-35: Sample Preparation Procedure — CLM Laboratory

QA/QC Procedures for Geological Samples

The placement of mineral standards, blanks and duplicate samples is predetermined statistically as 1:20. Each borehole intersection will have between 1 and 5 mineral standards, blanks and duplicates with the former figure being most frequent. Mineral standards, blanks and duplicates are placed in samples for the following reasons:

- Accuracy, using standards or certified reference material to assess accuracy and analytical bias.
- Contamination, using blanks to assess contamination in sample preparations.
- Precision, using duplicate data to assess bias, precision and extent of random errors in the system.

During QA/QC analysis the assay values of standard materials are compared and statistically analyzed. If the variance of standards falls within two standard deviations then the assay values are considered as accurate.

Pure sand was used as blank sample (i.e. sample without copper) to check sample contamination arising from the pulp preparation of the previous sample. Graphical methods are used to analyze the assays of blanks during QA/QC analysis. If the assay value detected in the blank is below the threshold of 0.3% total copper then no contamination is considered to have taken place.

The duplicate assays are compared with the original assays during QA/QC. If the relative percentage between the two assays of the same sample are below 10% then the assay are considered accurately reproduced.

SRK has randomly checked some original assay sheets during the visit to the laboratory and has found that the laboratory complied with the protocols discussed above.

Conclusions and Recommendations

Overall, the exploration, sampling and assaying were performed in compliance with the JORC Code and/or SAMREC Code. As a large and well-know mining zone in the Copperbelt with almost a 100-year history, during which the deposits were continually explored and developed, it is difficult and unlikely to verify all the work at various stage of historical drilling programs. With the assistance of CLM personnel, SRK was able to read the available documents for historical exploration and mining, review the present exploration data of Baluba Center, Baluba East and Muliashi North Project, visit the mining sites and CLM Laboratory, and check the drill core remaining. Results of the reviews and inspections partly reflected that the drilling and sampling was performed following a reasonable procedure.

Although the CLM Laboratory has no accreditation to any international agency or standard, it has successfully inherited and formed a standard procedure and discipline to perform the sample preparation and assaying. The QA/QC protocols used in CLM Laboratory apply to the general procedures of the same level of accuracy as any other respected laboratory in Zambia.

It is recommended that future exploration will be strictly managed with standard procedures in compliance with the JORC Code and all data should be securely stored for further check and review.

6.4.8 History and Background

Luanshya and Baluba Mines

The Roan Antelope orebody at Luanshya was first discovered in 1902. In 1927, Roan Antelope Copper Mines Limited was incorporated by Rhodesian Selection Trust Group to develop an underground mine complete with concentrator and smelter. The first ore was hoisted four years later, commencing copper production that continued until 2000. By 1943, annual copper output had reached 44,000t and increased to an average of 95,000t during the 1950s. In 1960 it peaked at 105,000t. During those times the mine provided about 15% of Zambia's total copper production. The relatively cobalt-rich Baluba orebody, 14.5 km west of Luanshya, was discovered in 1928 but was developed only in the late 1960s and came into full production in 1973.

The Zambian copper mining industry was nationalized in 1970. In 1982, ZCCM was formed to manage the operations. In 1987-88 a major restructuring began, and a renewed efficiency drive projected increased national production to reach 600,000t/a by 2000. However, copper production declined to 285,000t/a by 1998 due to inefficiencies and declining reserves. In 1997, the Government began its privatization program. In September 1997, a consortium comprising the Binani Group, the Dallah Albaraka Group and Allenby Finance Limited bought 85% of Luanshya and Baluba to operate it as Roan Antelope Mining Corporation of Zambia Plc ("Ramcoz"). ZCCM Investments Holdings Plc held the balance.

The smelter shut down and re-opened several times during the 1990s and was finally closed in February 1999. This required toll-treatment arrangements with the Nkana and Mufulira smelters. In November 2000, Ramcoz was placed in receivership due to its failure to meet production targets. The failure was brought about by insufficient funding, which led to failing maintenance of infrastructure and decreasing availability of equipment.

In February 2001, abnormally high rainfall and inadequate pumping facilities resulted in the overtopping of the Luanshya Dam and flooding of the adjoining caved area. Three shafts (Storke or No 14, Irwin or No 18 and Maclaren or No 28) were flooded, resulting in the suspension of production. Dewatering was successfully undertaken by the receiver.

In January 2004, a Swiss registered company, J&W Investments, acquired the property. Baluba Mine was their real interest. After their assessment of Luanshya Mine, they decided to close it down permanently and were issued with a certificate of closure by the Government.

At the time of the purchase, the Baluba Mine was not operational. By June 2004, production was restored and the mine has since operated continuously. The Luanshya projects experienced a short-time pause in production in early 2009 due to the impact of world economic crisis. After CNMC took over LCM from ENYA in 2009, the Baluba Mine resumed operations.

Muliashi Area

The Muliashi North deposit has been known since the mid 1900s. The first borehole was drilled in 1963 and since then more drilling was done. Unfortunately the deposit contained mainly oxide ore and the technology to process oxide ore did not exist then. As a result the deposit was virtually ignored by ZCCM.

In October 1997, the Luanshya Division of ZCCM was acquired by Ramcoz. By January 1998 the new company had commissioned Kilborn SNC Lavalin Europe, UK ("KSLE") to carry out a feasibility study to determine the mining method, the metallurgical process, the capital cost and the profitability of mining the then-little Muliashi North deposit. Due to poor copper prices and financial problems, Ramcoz started experiencing serious operational challenges. To save the Muliashi North project the mining license area was demarcated into two, one for underground operations and the other for surface ores.

Finally in November 2000 a receiver was appointment for Ramcoz and following the rainy season (February 2001) Luanshya Mine was flooded. The water was pumped out of the Luanshya shaft system (three shafts connected underground) by December 2001. Three years later LCM took over the mine, but in January 2004 decided to flood the mine indefinitely. In January 2007, LCM commissioned Snowden Mining Industry Consultants Pty Ltd to undertake a feasibility study on Muliashi North.

7 MINING ASSESSMENT

7.1 Introduction

CNMC obtained 85% controlling stake of Chambishi Cu Mine through competitive bidding in 1996. In July 2009, CNMC acquired 80% controlling stake of Luanshya Cu Mine. NFCA was founded on September 28, 1998 by CNMC taking over Chambishi Cu Mine, which was divided into three areas for independent mining, including the main deposit, west deposit and southeast deposit.

The main deposit reconstruction for Chambishi Cu Mine commenced on July 28, 2000 and was commissioned on July 28, 2003. The designed mining production rate was 6,500tpd (2.145Mtpa). However, the actual maximum mined tonnes were only 4,500tpd, which dropped to around 3,000tpd in steady operation. In 2011, the mined tonnes of the main deposit were 1.03Mt. The infrastructure construction for the western deposit was initiated from June 2007 and commissioned in July 2010. The designed mining production size for western deposit was 3,000tpd (0.99Mtpa). The mined tonnes in 2011 were 487,123t. The deposit exploration and mine construction for the southeast deposit started in December 2010 and are expected to be accomplished by December 2016, with designed mining production rate of 10,000tpd (3.30Mtpa)

In July 2009, CNMC obtained the controlling stake of Luanshya Cu Mine through acquisition and founded CLM to take over the mine construction and operation.

The Luanshya Cu Mine owned by CLM comprises 7 ore zones, of which two zones were in operation in 2011, i.e. Baluba Center and Muliashi North. The underground production in Baluba Center was resumed at the end of 2009, and the designed mining and processing capacity was 4,545tpd (1.5Mtpa). The mined tonnes in 2011 were 1.2Mt, and forecast at 1.4Mtpa in 2012 prior to the full production of 1.5Mtpa in 2013.

The Muliashi North Mine completed the infrastructure construction and overburden stripping in 2011. The designed mining production rate is 13,636tpd (4.5Mtpa) which divide into soft ore for 900ktpa and hard ore for 3,600ktpa. Mining commenced in December 2011 and the planned mining capacity is 3,480,000t in 2012. The basic design for Baluba East's south part has been finished and the upper oxidized ore is designed to be mined with mining production rate of 0.9Mtpa. As the status of the deep mined-out zone in Baluba East north part is not defined yet, this area is not incorporated into the current mine plan.

Chambishi Main, West and Southeast Mines

Chambishi Cu Mine owned by NFCA is located in Kalulushi City and the Cu mineral resources are distributed mainly in three deposit zones, i.e., the main, west and southeast zones. Underground mining is used for all deposits.

After obtaining the controlling stake of Chambishi Cu Mine, NFCA commissioned Sinomine to conduct supplemental exploration in the project area. Since 2000, NFCA successively commissioned Beijing Central Engineering Institute for Non-ferrous Metallurgical Industries ("ENFI") and Shenyang Design and Research Institute of Nonferrous Metallurgy to complete a feasibility study and basic design for the main deposit, west deposit and southeast deposit. Based on the requirement of NFCA, Chambishi Cu Mine has been designed to be divided into three sections consisting of independent development and production systems, i.e., the main, west and southeast zones.

The production rate designed for the main deposit is 6,500tpd (2.145Mtpa), and the main mining operations take place between the 500 and 900m level. Main shaft development combined with decline access is used, and cut-and-fill and local sublevel open-stoping and sublevel caving mining methods are used. The ore is dumped into internal orepass by LHD prior to being loaded into ore cars driven by electric locomotive and then hoisted to surface by skip through the main shaft.

The west deposit is about 300m from the main deposit, with basically the same mineralization. The deigned production rate is 3,000tpd (0.99Mtpa). The mine construction commenced in 2007 and the mine was commissioned in 2010. Main shaft development combined with decline access is employed, and cut-and-fill mining method is used. After being dumped by LHD, the ore is hauled by self-dumping underground cars before being hoisted to surface through the main shaft.

The southeast deposit is about 7km from the main deposit, with basically the same mineralization. The designed production size is 10,000tpd (3.30Mtpa). Main shaft development in conjunction with decline access is used, and mining methods of cut-and-fill sublevel open-stoping and post-pillar cut-and-fill are used. Ore loading is undertaken by LHD, and the ore haulage is carried out by both track and trackless means prior to being hoisted to surface by skip through the main shaft.

Except for the main level, all the underground development and mining haulage in Chambishi Cu Mine is trackless. Hydro-electric jumbo and production drill, LHD and self-dumping underground cars are imported. The final product is Cu concentrate.

Following three years' reconstruction and improvement, the main deposit of Chambishi Cu Mine was commissioned in 2004. According to the production records, the mined ore in 2010 and 2011 amounted to 1.29Mt and 1.03Mt, respectively, giving an average ore loss of 38% and mining dilution of 30%. The planned mined ore in 2012 is 1.00Mt.

The development for the west deposit was completed in 2010, followed by the trial production. The mined tonnes in 2010 and 2011 reached 50,000t and 487,123t respectively, and the planned tonnes are 860,000t in 2012.

The exploration and construction for the southeast deposit commenced at the end of 2010. As of SRK's site visit, geotechnical drilling for the south ventilation shaft and the main shaft had been accomplished. The mine development is expected to be finished by the end of 2016 prior to the underground commissioning.

Through reviewing the design documents, communication with mine management and engineers, and the site visit, SRK opines that although the mineral resources in Chambishi Cu Mine are significant, the mine production is still obstructed by many issues, and the resource utilization is restricted to some extent, leading to high operating cost. The future of the mine might be significantly influenced by the fluctuation of commodity prices and other external factors.

Luanshya Baluba Center and East and Muliashi Mines

The Luanshya Cu Mine is located 12km west of Luanshya city. The Luanshya Cu Mine was owned by ZCCM before 1997 and then in 2004 acquired by ENYA, which founded LCM. In June 2009, CNMC took over LCM with an investment of US$50 million and renamed the company as CLM, of which 80% equity shares were owned by CNMC and the rest by ZCCM.

The whole project area of Luanshya Cu Mine comprises 7 mineral zones, i.e. Baluba Center, Baluba East (south part and north part), Muliashi North, Muliashi South, Roan Extension West, Roan Extension East and Roan Basin. Baluba East (south part) is not yet developed.

Underground mining is used at Baluba Center and production has resumed. By the end of 2009, the production rate for sulfide ore was 1,500tpd while the mined tonnes were 765,000t in 2010 and 1.22Mt in 2011. The mine is expected to achieve a steady production rate of 1.5Mt in 2013.

The lower sulfide ore at the northern part of Baluba East, Muliashi South and Roan Basin has been almost mined out except for the Roan Extension West and Roan Extension East, where there is still about 20Mt of sulfide ore. The sublevel caving mining method is expected to be employed in those areas resulting in large area of surface subsidence, and the upper oxidized ore has also been impacted. Therefore, there is a potential safety hazard for the mining production of the overlying oxidized ore as the mined-out zone status is not currently clear. Furthermore, the Muliashi South mine has been flooded and the production may not resume soon. CLM has suspended the mining plan in Baluba East, and the status of the mined-out zone in the deep area has yet to be identified.

Currently the oxidized ore of the CLM project is mainly from Muliashi North. Oxidized ore from other areas is planned to be used as a backup resource, which is expected to be developed only after the mined-out zone is identified.

After reviewing the design documents, communication with mine management and engineers and site visit, SRK opines that the measured sulfide mineral resources at the Luanshya project area are limited, and the mining conditions and issues are similar to those in Chambishi Cu Mine. Therefore, the potential of expansion is limited, and the mining operating cost is high. However, the upper oxidized mineral resources in the Luanshya project area is abundant with a shallow burial depth, which could be mined by open-pit with fairly low mining operating cost. The Muliashi North open-pit mine, in which the overburden stripping is underway, will be the dominant operational mine of CLM in the future. As for the zones where the mining of the deep sulfide ore has been completed, the upper oxidized resources are still considered and will undergo economic analysis. The current priority is to verify the mined-out zone and subsidence status and implement a feasible treatment plan to determine conditions for future open-pit mining.

7.2 Mining Technical Conditions

7.2.1 Geotechnical Conditions

Chambishi Main, West and Southeast Mines

The project area is located in a plateau region with simple terrain and topography. The semi-hard rock group is controlled by fold structures and gabbro intrusions, which have an extensive distribution and significant thickness. An aquifer is present in the weathering zone and is moderate water-bearing bed distributed in the structural fracture. The geotechnical conditions are extremely poor since the rock mass has transformed into the soft erosion layers. The country rock quality is moderate with good stability. Therefore the geotechnical conditions for the upper folded structure are complicated while those for the lower orebody and hanging wall and footwall rocks are simple.

Golder carried out some rock mechanics tests and a joints structure survey at 500m and 400m levels of the main deposit. In addition, rock quality assessments and geological records from the core samples from the orebody and rocks below 500m elevation were also conducted, with details as follows:

Ore and rock density varies from 2.59 to 2.71t/m^3 with an average density of 2.67t/m^3 at Chambishi Main and West Mine and 2.60t/m^3 at Chambishi Southeast deposit:

UCS: central area: 116MPa; west area: 168MPa.

Averaged RQD of orebody and hanging wall rock is 63 (below the 500m elevation, RQD is higher in the east and varies significantly in the central and west area).

Based on the ore and rock lithology, the averaged UCS for main rocks are as follows:

Ore and hanging wall rock: 80 to 100MPa; footwall quartzite: 100 to 120MPa; and granite: 140 to 160MPa.

In SRK's view, the quality of the geological survey is low, but the structure of the deposit is complex, resulting in restrictions on mine design and technical management. Therefore, a thorough and systematic geological survey is necessary to provide reliable parameters for mine development and operations.

Luanshya Baluba Center and East and Muliashi Mines

The strata in the Luanshya project area mainly comprise epimetamorphic rock, with complex fold structure overlying an ancient granite base bed.

The averaged density of ore and rock is 2.67t/m^3. SRK was informed that generally the UCS of ore-bearing slate is over 100MPa. The ore-bearing schist of the lower orebody has poor stability and the UCS is around 500MPa whereas the UCS is around 75MPa for conglomerate, which is adjacent to the footwall rock.

The geological structure in the project area is characterized by bedding, joints, cleavage and some secondary fissures. The rock mass deformation is controlled by a crushed belt, which may easily result in collapse, landslide and transformation. In addition, the regional ground water is a significant factor affecting rock mass stability.

Based on the UCS, the ore and wall-rock of the Baluba deposit are classified as medium hard. The stopes are generally stable under the circumstance of the current mining depth without structural influence. Local collapse may result from rock stress.

Compared to Chambishi Cu Mine, the stability of the main deposit in the Baluba project area is poorer than that of the east area of the Chambishi main deposit and similar to that of the west area, giving an unstable nature.

The Muliashi North zone is located in the middle of Luanshya Cu project area, and the deposit is bounded in the basin that consists of a fold structure. The sulfide minerals mainly include chalcopyrite, bornite and pyrite.

The project area structure is dominated by fold without faults. The orebody and rock mass are characterized by sedimentary beddings and metamorphic and tectonic structure. The geotechnical conditions are significantly influenced by metamorphism where the bedding structure is developed.

According to the records, no geological survey has been conducted to date, and the status of the beddings, joints and cleavages is not identified. In addition, the major groups of joint and fissure planes are yet to be identified. Therefore, SRK opines that a supplementary geological investigation will provide additional data for the mine development and operations.

7.2.2 Hydrogeological Conditions

Chambishi Main, West and Southeast Mines

Chambishi Cu project is located in a plateau hilly area with ASL ranging from 1,250 to 1,325m. The topography is gentle with a gradient of between 2% and 4%. The rainy season is from November to next April, and the climate is warm and humid. The cool season is from May to July, with a dry and cool climate. The temperature is high in the dry season ranging from August to October. The annual average precipitation in project area is 1,341mm, and a maximum precipitation of 2,687mm has been recorded. The annual average evaporation is 2,072mm. The main water course near the mine is the Kafuai River which is about 10 km northeast of the project area. The supply of ground water is sufficient, with the ground water supply area estimated at 67km^2 to 83km^2, and the precipitation permeability coefficient is between 0.1 and 0.15.

As the two main aquifers of the Chambishi deposit, the orebody is of medium porosity while the hanging wall dolomite is of rich porosity. The footwall granite or schist is impervious.

The ground water quantity is shown in Table 7-1.

Table 7-1: Groundwater Quantity at Chambishi Project Area

Water Gushing Quantity	Unit	Main Deposit	West Deposit	Southeast Deposit
Normal	m^3/d	28,000-30,000	15,000	18,000-24,000
Maximum	m^3/d	36,624	28,000	30,000-40,000

Ground water was a significant factor that influenced the mining production in the historical operations. The main water prevention and treatment work comprises water-detection and drainage during deposit development, followed by the completion of pre-drainage of the orebody and hanging wall dolomite aquifers by using drainage drifts and drill holes.

The development in the orebody and country rocks is difficult due to the large water flow and rock mass instability. As the caving mining method is used, mining is directly restricted by the high water flow in the hanging wall. The water in the orebody and dolomite aquifers is drained in advance. The water at the next level (100m interval) below is drained in advance, and the drainage method has been verified to be successful.

Water-prevention crown pillars are reserved in the west and south deposits below the bottom of the open-pit. The pillar top width is about 10m, and the top elevation is about 1,098m. During the ramping-down period of the open-pit operations or the maintenance period, the pit water is drained to the underground mine through pipelines. In the storm season, a floating pump is used to pump the water to the underground mine. Each year, hundreds of tonnes of sludge are cleaned from the pit bottom to control the water level and ensure normal operational conditions of the pump.

Luanshya Baluba Center and East and Muliashi Mines

The terrain in the Luanshya project area is gentle with an ASL of between 1,260 and 1,285m. The mine area has a subtropical climate, which is similar to the Chambishi project area.

As the main aquifer in the Baluba project area, the chert dolomite aquifer is located in the hanging wall of the orebody. Therefore, water drainage must be conducted before mining operations can commence. Currently, the ground water level in the main production area has dropped to around 600mL, which no longer constitutes any influence on mining production.

The ground water quantity is shown in Table 7-2.

Table 7-2: Groundwater Quantity at Luanshya Project Area

Underground Gushing Water	Unit	Baluba Center	Muliashi North	Baluba East
Normal	m^3/d	14,000	11,386	9,221
Maximum	m^3/d	18,000	46,430	52,020

SRK was informed that the hydro-geologic data for the Luanshya project is poor, and no more hydro-geologic exploration has been conducted since CLM took over the project. The design for water drainage and slope stability may be affected since the hydro-geologic data is limited. Therefore, SRK opines that supplementary hydro-geologic exploration should be carried out to obtain reliable data for mining of the upper oxidized deposit.

7.3 Deposit Development

7.3.1 Chambishi Main, West and Southeast Mines

The Chambishi Cu project owned by NFCA comprises 3 deposits, i.e., the main, west and southeast deposits. Open-pit mining was initially adopted for the main deposit before 1978, followed by underground mining afterwards. The underground development for the western orebody was completed in July 2010 prior to the mining production commissioning. In addition, the feasibility study for the southeast deposit was also completed, and the geotechnical drilling for the south ventilation shaft and main shaft had been concluded as of SRK's site visit. The underground development started in 2011 and the mining production is projected to be started by the end of 2016.

Chambishi Main Mine Development

Underground mining of the main orebody at Chambishi has been conducted for many years, and a completed development system is in place. Based on ENFI's design, the original development system was planned to be reused, i.e., footwall shaft #3 combined with a 3.6m wide × 3.3m high decline development. The ore, workers, and materials are hoisted through shaft #3 (6.5m diameter), and adit #6 located at the pit bottom was used for the trackless equipment access. The mining operations are conducted in three areas, i.e., the eastern area above 500m, western area above 500m and central area between 500 and 900m. Through the internal orepasses, the ore from the eastern and western areas is loaded to mine cars with the haulage track at the 500m level and then dumped to the main orepass beside shaft #3. The ore below 500m level is drawn to the 700m main haulage level via internal orepasses and then is transferred by mine car on tracks to the ore dump station of shaft #3.

The 700m level is used as an initial truck haulage level, and a second main haulage level will be formed when production is commenced at the 900m level. The ore on the 900, 700 and 500m levels is transported to a centralized crushing station at 920m prior to hoisting to the surface.

The waste rock is trucked along the central ramp to the upper levels and then dumped to the mined-out zones. The development system longitudinal section for the Chambishi Main deposit is shown in Figure 7-1, and shaft #3 headframe is shown in Figure 7-2.

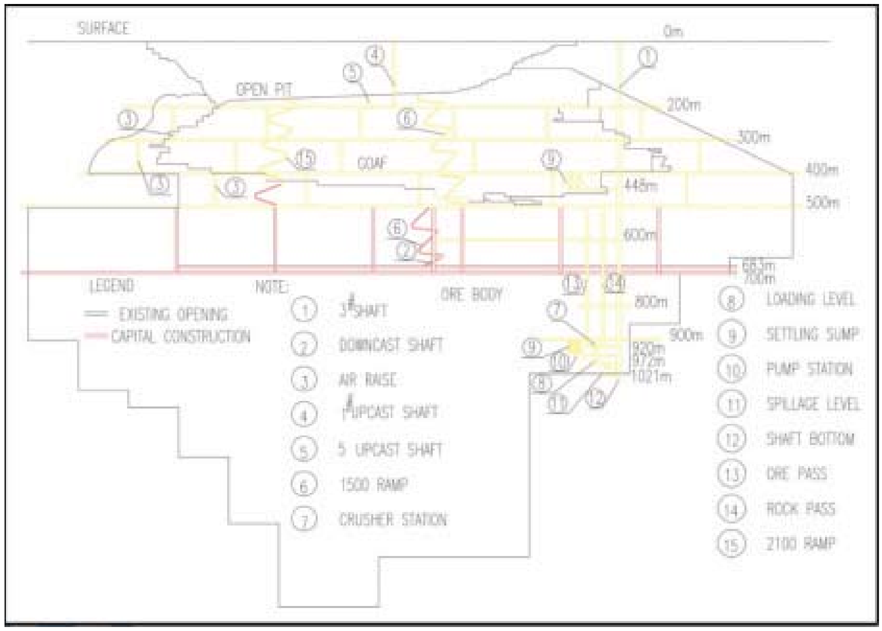

Figure 7-1: Development System at Chambishi Main Mine (Longitude-Section)

SRK noticed that the maintenance cost for mine development is relatively high. SRK also observed within ENFI's design that waste rock is not planned to be lifted to surface but used as underground back-fill instead. However about 2,000tpd of waste rock is required to be hoisted to surface during actual production, therefore a certain percentage of hoisting capacity of shaft 3# was occupied, which is one reason the project ore throughput did not achieve the designed capacity.

Figure 7-2: An Overview of Shaft 3# at Chambishi Main Mine

Chambishi West Mine Development

In the basic design for the western deposit completed by ENFI in 2007, a combined development of main ramp and central auxiliary shaft is used. The main ramp portal elevation is 174m and it was an exploration adit in the previous open-pit.

The main ramp is used as the access for ore haulage, workers and materials, as well as fresh air intake. The profile of the main ramp is 4.0m wide × 3.6m high, with a gradient of 12.5%, except for 5% at the curved portions, gentle areas and level access connections. The turning radius of the main ramp is 20m, and safety bays are set up along the main ramp.

The central auxiliary shaft is located in the footwall of the deposit, and has a depth of 545m and a net diameter of 5.0m. A 3,600mm×1,600mm cage with a counter-balance weight is used in the hoisting system. The auxiliary shaft is developed to 500m level for the hoisting of workers and materials and is used as a fresh air shaft as well. The water supply pipe, discharge pipe and cables are all set up in the shaft.

The western return air shaft is located at the footwall the orebody. The net diameter of shaft is 3.7m, and the depth is 221m. A ladder compartment is set up in the western return air shaft as a second egress.

The eastern return air shaft is located at the footwall the orebody. The net diameter of the shaft is 3.7m, and the depth is 207m. No ladder compartment is set up in the shaft.

There are three auxiliary sublevels, i.e., 100m, 164m, and 300m. The 100m sublevel is used as a return air access, and the 164m sublevel is used for fresh air access, ore loading and collecting drainage water of the stope backfilling. The 300m sublevel is used for exploration and water pre-drainage.

The portal of the main decline of the western orebody is shown in Figure 7-3, and the central auxiliary shaft is shown in Figure 7-4.

Figure 7-3: Portals of Main Ramp of Chambishi West Mine

Figure 7-4: Headframe of Central Auxiliary Shaft at Chambishi West Mine

SRK opines that trackless mining could be further technically argued based on the conditions which include the orebody occurrence, orebody and wall rock stability, and large water inflows. Mine development and maintenance and safety management should also be reconsidered.

Chambishi Southeast Mine Development

The exploration and development of the Chambishi Southeast deposit has not been fully completed yet. The Indicated and Inferred Resources were estimated based on the stage exploration results, and therefore the Indicated Resource was used as the basis for mine design. In 2010, NFCA commissioned Shenyang Design and Research Institute of Nonferrous Metallurgy to complete a feasibility study for exploration and construction. The southeast deposit is divided into north mineralized belt and south mineralized belt, which respectively comprise two orebodies. The north mineralized belt consists of the North orebody while the south mineralized belt is composed of the South orebody. Mining production is planned to be conducted in the North ore body based on the Probable Ore Reserves.

Both the main and the auxiliary shafts are circular in cross-section. The net diameter of the auxiliary shaft is 7.2m, and the shaft top elevation is 1,220m, with the depth of 1,120m. A single cage hoisting system is used with the cage specification of 3m × 5.18m.

The diameter of the main shaft is 6.5m, and a double skip hoisting system is used. The 740m, 940m and 1,020m levels are used as track haulage levels, through which ore is transferred to the main orepass. There is a primary crushing chamber about 53m below the 1,020m level. After crushing, the ore is drawn to the bottom ore loading pocket and then hoisted to the surface using skips.

A part of the waste rock is used for backfilling of mined-out zones, and the rest is hoisted to the surface after crushing.

The main shaft and auxiliary shaft are also used for air intake while the south and north ventilation shafts are used for air exhaust.

Chambishi Southeast orebody was undergoing infill drilling at the time of SRK's site visit, with supervision by SRK site geologist. SRK suggests that a mine design with higher confidence degree should be accomplished for Chambishi Southeast deposit after the infill exploration is completed and the resource/reserve model is upgraded.

7.3.2 Luanshya Baluba Center and East and Muliashi Mines

For the Luanshya project owned by CLM, only Baluba Center Mine was in operation at the time of SRK's site visit. Overburden stripping of Muliashi North Mine is underway, and mining production commenced in December 2011. Mining will be deferred for Baluba East Mine.

Baluba Center Mine Development

After CLM took over the Baluba Center Mine, the original development system was utilized. A central shaft combined with a decline in the foot wall is used for the development. B1 and B2 shafts are located along the strike of the deposit. B1 is used for ore and waste rock hoisting, and B2 is used for the hoisting of workers, materials and equipment. The central decline extends down to 580m level and is mainly used for the access of trackless equipment. The main haulage levels are 480m and 580m levels, with level interval of 100m. The ore and waste rock are dumped to the orepass and then loaded into mine cars at the main haulage levels and transferred to dumping stations near the B1 shaft prior to primary crushing and hoisting to the surface.

A two-wing centralized diagonal ventilation system is employed. The fresh air flows into the working face through B1 and B2 shafts and the central decline. B4 shaft is used for the return air of the western and central mining areas, and B5 shaft is used for the returned air of the eastern area. B1 and B2 shafts headframes are shown in Figure 7-5, and the plan of the development system of the Baluba Center Mine is shown in Figure 7-6.

Figure 7-5: An Overview of B1 and B2 Shaft Headframes at Baluba Center Mine

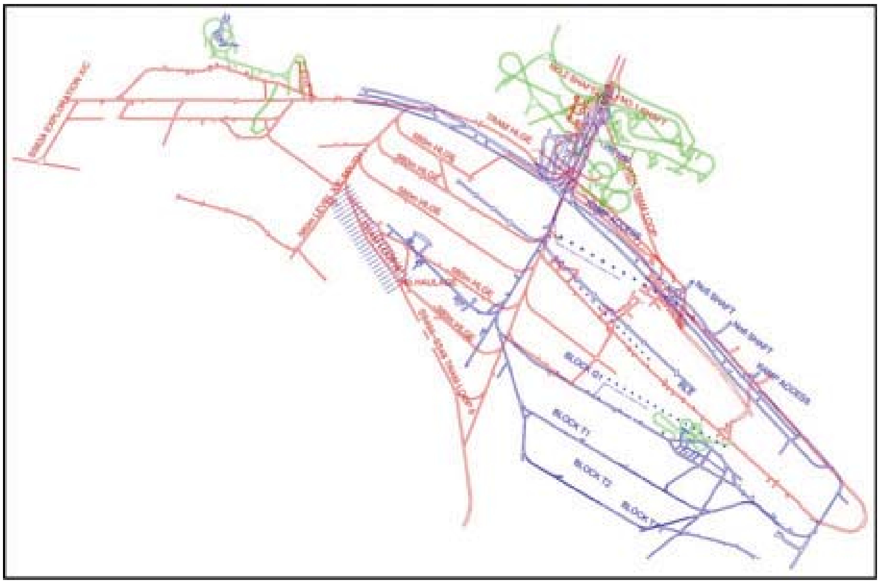

Figure 7-6: Development System of Baluba Center Mine

Since the facilities and equipment of original development system are in good condition, Shenyang Design and Research Institute of Nonferrous Metallurgy did not make amendment on the development system of Baluba Center Mine in the design completed in 2009. Except for local collapsed areas that have been restored, the original development system is planned to be used for mining production, and SRK is in agreement with this plan.

Pit Optimization and Development Approach of Muliashi North Zone

In January 2010, China NERIN Engineering Technical Co., Ltd. ("NERIN") accomplished the "*Basic Design for Muliashi Project of CNMC Luanshya Copper Mines PLC*", which optimized the ultimate pit of Muliashi North.

The geotechnical optimization parameters of the slope and road for the ultimate open-pit limit are listed in Table 7-3.

Table 7-3: Geotechnical Optimization Parameters of Open-pit Limit at Muliashi North Zone

Item	Unit	Value	Notes
Bench Height	m	15	30m (after bench merger)
Bench Face Angle	°	65	
Overall Interramp Slope Angle	°	38-42	
Berm Width	m	20	Safety Berm: 10m; Cleaning Berm: 15-20m
Road Width	m	20	Pit Bottom Single Lane: 12m
Road Maximum Gradient	%	8	
Road Minimum Turning Radius	m	25	
Transitional Length	m	60	
Top Bench Elevation	m	1,280	
Pit Bottom Elevation	m	1,085	
Pit Closing Elevation	m	1,250	
Pit Top Dimension	m	2,500×500	
Pit Bottom Dimension	m	120×100	
Waste Rock Quantity	1,000t	146,477.7	
Ore Quantity	1,000t	42,642.2	
Average Stripping Ratio	t/t	3.44	Oxidized Rate:60%

The overall pit is of irregular strip shape with an E-W strike. The No. 1, No. 2 and No. 3 pits are located from east to west, and the pit bottom elevations are 1,205m, 1,115m and 1,085m, respectively. The No.3 pit has the highest slope, which extends to 180m high while the slope in the east is lower with maximum height of 79m. The ultimate pit plan is shown in Figure 7-7.

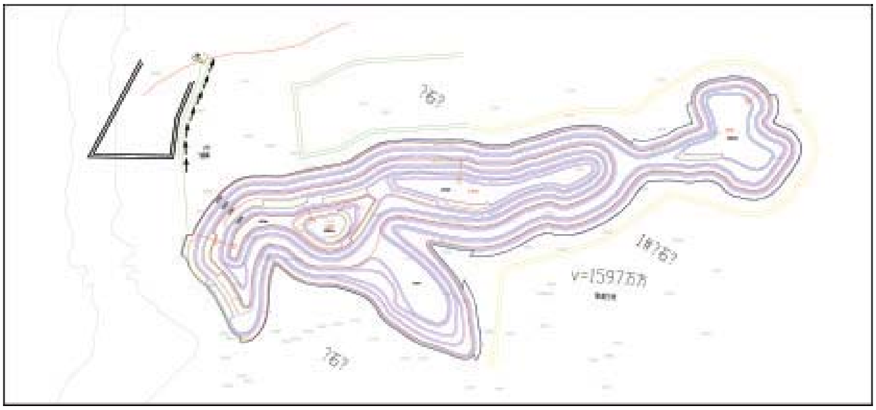

Figure 7-7: A Plan View of Open-pit Design at Muliashi North Zone

The deposit development is to be carried out with road-truck transportation, which is a conventional development approach for open-pit mining.

SRK opines that the pit should be dynamically designed with consideration of the economic and technical optimization.

7.4 Mining Methods

7.4.1 Chambishi Main Orebody

In accordance with the orebody occurrence, thickness and ore and wall rock strength, ENFI proposed different mining methods to different areas in main orebody mine design, in which two portions including three mining areas are delineated for mining.

The first portion refers to the area above the 500m level, which is further divided into the west and east mining area. The west mining area is to be mined from top to bottom, while the east area is to be mined from the bottom to the top.

The second portion refers to the area from the 500m level to 900m level. Mining is firstly to be conducted to the 700m level by stoping upwards. In 4 to 5 years of full production, the 900m level development and associated haulage level should be commenced. By then the 900m level and the 700m level production will be carried out at the same time. The 900m level also uses bottom-up stoping strategy.

Mining methods applied include sublevel caving, sublevel open-stoping, cut and fill, and sublevel open-stoping with post backfill. These mining methods are separately adapted to:

- Sublevel caving: fold area in the west of the orebody above the 500m level;
- Sublevel open-stoping: non-fold area in the west of orebody from the 500m level to 700m level;
- Cut and fill: east area above the 500m level and part of orebody between the 500m level and 700m level in west of exploration line No. 1950; and
- Sublevel open-stoping with post backfill for the orebody between the 500m level and 900m level except for the part that is mined by cut and fill.

The average mining dilution is designed to be 25% and the average designed ore loss is 25%. In practice at the mine, all of the abovementioned mining methods have their shortcomings resulting in ore loss and mining dilution exceeding the upper-limits of the mining benchmark, and the mining production efficiency is affected as well. In 2010 and 2011, the actual ore loss and mining dilution of the mine were 38% and 30%. About 1.2881Mt of ore was mined in 2010 and 1.0283Mt of ore was mined in 2011, respectively.

As the development tunnels in ore are difficult to maintain, sublevel open-stoping has been rarely used. Cut and fill and sublevel open-stoping with post backfill had also been seldom applied due to their lower efficiency and higher cost. Presently, the most used mining method is sublevel caving which accounts for 77.56% of all mining methods. Based on the orebody dip angle, thickness, sublevel caving is further divided into low sublevel caving and high sublevel caving with sublevel height of 8 to 10m and 16 to 20m, respectively. Figure 7-8 shows a diagram of the low sublevel caving mining method.

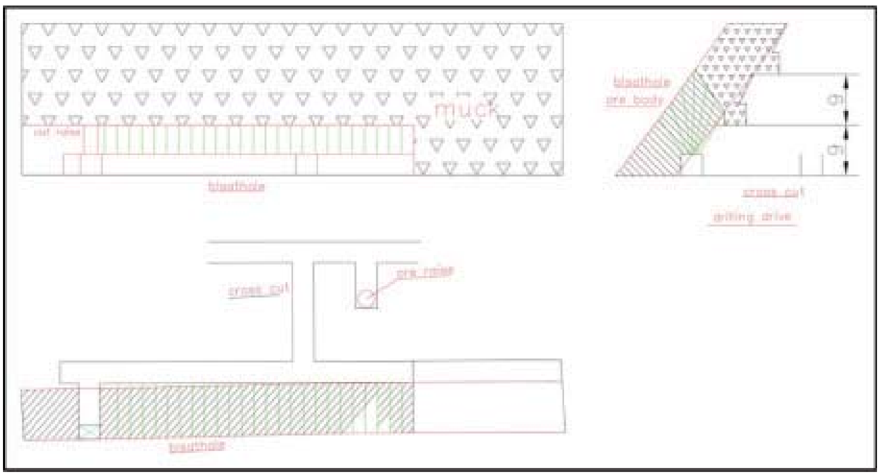

Figure 7-8: Scheme of Low Sublevel Caving Method for Chambishi Main Orebody

The mining block is aligned transversely along the plunge of the orebody with a length of about 150m and sublevel height of 10m. The spacing between cross-cuts is 10m and they have a profile of 3.6m wide x 3.3m high.

The stope production drilling is undertaken by Simba H1354 drill while the drift drilling is undertaken by Boomer 281 single boom hydraulic jumbo.

ANFO is used for blasting, which is charged by explosive loading truck, and a non-electric blast is used.

Ore and waste rock are loaded and trammed by ST1000 LHD with bucket volume of 5.6m^3.

Engineers of NFCA explained that although the stoping efficiency of the sublevel caving is higher than that of cut and fill, ore loss and mining dilution are also high due to the following:

- The footwall drilling draft is prone to rock burst; and
- Ore adjacent to the boundaries between the orebody and the hanging wall or footwall rock cannot be effectively recovered

SRK believes that the current mining plan has resulted in higher ore losses and mining dilution than would normally result from the mining methods. Because trackless mining is used, the drift profile is required to be larger than 3.2m wide × 3.0m high which causes rock failures in the roof due to stress. SRK observes that in ENFI's design, waste rock is not planned to be lifted to the surface, but is to be used in underground back-filling. During actual production, about 2,000tpa of waste rock is required to be hoisted to the surface. Therefore, a certain percentage of hoisting capacity of Shaft 3# will be occupied for waste hoisting. In addition, if waste rocks are dumped to the orepass the dilution rate will increase.

To conclude, it is SRK's opinion that the current use of the sublevel caving method should be reconsidered, based on the technical argument regarding the mining dilution. Therefore, further studies of mining methods should be conducted in order to determine a more acceptable mining method. SRK recommends that both the underhand cut and fill (UCF) and the underhand drift and fill (UDF) should be considered in the potential mining methods study, as it is likely that after a comprehensive trade-off study, the UCF and UDF methods might produce positive results including efficiency and operating cost, ore loss, mining dilution and revenue.

7.4.2 Chambishi West Orebody

ENFI conducted a basic design of the west orebody in 2008 which considered the orebody, country rock and orebody strength and ground water as main factors influencing mining method selection. The study concluded that, in order to ensure mining operations, the aquifers in the orebody should be drained prior to mining.

The west orebody is classified as dipping and moderately thick. The strength of the orebody is moderate while that of the hangingwall rock is weak. Therefore, cut and fill, post-pillar cut and fill and drift and fill mining methods were selected, with stope fill to be placed as hydraulic sandfill.

Following the commissioning of the west orebody in 2010, an industrial test on drift and fill mining method has been carried out in the stopes of #10, 11 and 12 at 150m level.

- Drift profile: 4m wide x 4m high;
- Slice height: 4m;
- Drill: Simba 281 jumbo;
- LHD: ST 1010

Figure 7-9 shows a scheme of the drift and fill mining method for the Chambishi West orebody.

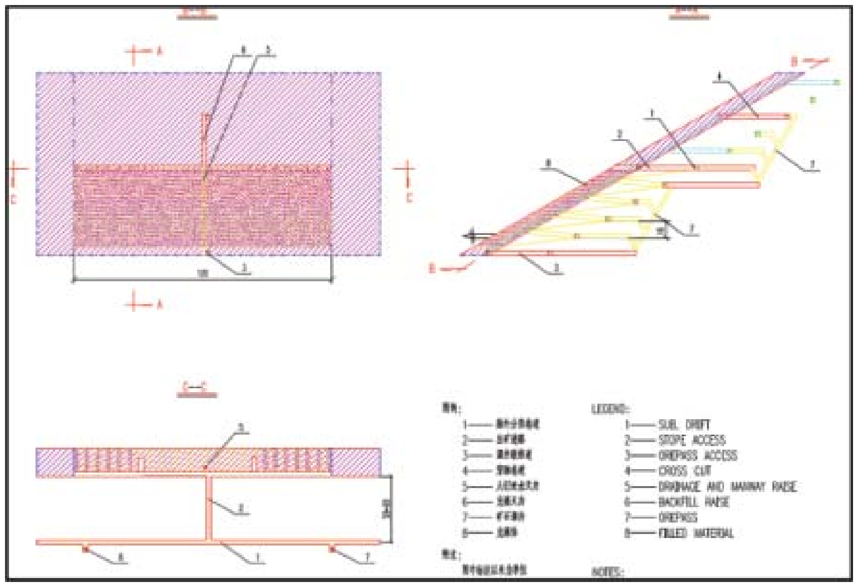

Figure 7-9: Drift and Fill Scheme for Chambishi West Orebody

SRK observed during the site visit that the first 15 stopes are completed with trial exploitation but need to be back-filled in order to proceed with the following upward mining. However, a potential bottleneck for sustainable production is caused by the backfilling system including both the hydraulic sandfill and the waste rock fill. To achieve the designed production capacity, it is imperative for the mine to solve the problems resulting from the hydraulic sandfill slurry pump and to ensure the quality of the waste rock.

The designed mining loss and mining dilution are 25% utilizing the above mentioned method. Based on the actual mining records in 2010 and 2011, the mining loss and mining dilution were 38% and 30%. About 0.5Mt of ore was mined in 2010 and 487,123t of ore was mined in 2011.

7.4.3 Chambishi Southeast Orebody

Southeast orebody is divided into the South orebody and the North orebody by exploration line No. 0#. Both the North and South orebodies are delineated at a cut off grade of TCu≥0.8%. In December 2010, Shenyang Design and Research Institute of Nonferrous Metallurgy carried out the "*Chambishi Mine Southeast Orebody Feasibility Study*" on the North orebody.

Based on the North orebody occurrence and technical conditions of mining, Shenyang Design and Research Institute of Nonferrous Metallurgy proposed four mining methods for orebody N1, including sublevel open-stoping with post-backfill, room and pillar with post-backfill, post pillar cut and fill, and overhand drift and fill. Applicable conditions for each mining method are detailed in Table 7-4.

The designed mining loss and mining dilution are 15.58% and 17.38%, respectively.

Table 7-4: Applicable Conditions for Each Mining Method at Chambishi Southeast Mine

Mining Method	Orebody Dip Angle	Stability		Thickness
		Orebody	Hangingwall Rock	
Sublevel open-stoping with post-backfill	>15°	Stable	Stable	<10m
Post pillar cut and fill	No limits	Stable	Unstable	>10m
Room and pillar mining with post-backfill	<15°	Stable	Stable	<7m
Overhand drift and fill	No limits	Stable	Unstable	>2m

SRK suggests more geological exploration should be conducted in the Southeast orebody in order to provide an improved resource base for future mine designs and planning and to minimize investment risks.

7.4.4 Baluba Center Mine

Quite a few mining methods have been used at Baluba Center since the underground commissioning in 1973. Methods included cut and fill, drift and fill, post pillar cut and fill, sublevel caving and sublevel open-stoping. The sublevel open-stoping was the main mining method of the Baluba Mine before 2006, but others became more popular with sublevel caving being predominant due to the deficiency of the backfill system during the later operational period of LCM.

The mine design at the time of reopening recommended sublevel open-stoping for thick orebodies with steep dip and sublevel caving for orebodies with moderate dip. These account for the majority of orebodies at Baluba.

The sublevel caving of the Baluba Center Mine is similar to that used in the Chambishi Main orebody except for the sublevel height of 10m. Figure 7-10 shows scheme of the sublevel caving without bottom sill pillar.

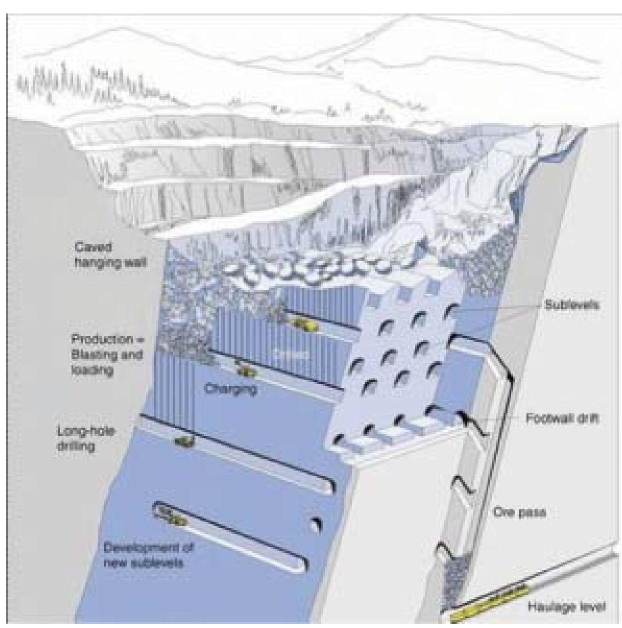

Figure 7-10: Scheme of Sublevel Caving without Bottom Sill Pillar at Baluba Center Mine

SRK noticed that fractures are well developed within the Baluba orebody, and the strength of the footwall rock is weak, resulting in higher ore loss and mining dilution than is usual for this method. In 2010 and 2011, the actual ore loss was 40%, and the mining dilution was 38%. It is SRK's opinion that sublevel caving is not technically capable of dealing with such a weak orebody and low footwall rock strengths. Therefore, selective mining techniques should be examined together with the potential for development to be designed in the hanging wall.

7.4.5 Muliashi North and Baluba East Open-Pit Mines

In the basic design conducted by NERIN on the Muliashi North and Baluba East Mines, the open-pit mining method is employed with the following parameters.

- Drilling: φ250mm drill;
- Blasting: Emulsion and non-electric detonation;
- Loading: 11m^3 hydraulic excavator; and
- Hauling: 91t truck.

The mining recovery rate and mining dilution rate are designed to be 97% and 3% for the Muliashi North Mine and 95% and 5% for the Baluba East Mine. The designed stripping ratios are 3.44 at Muliashi North Mine and 4.04 at Baluba East Mine. Figure 7-11 shows a snapshot of waste being loaded at Muliashi northwest open-pit.

Figure 7-11: An Overview of Waste Loading at Muliashi Northwest Open-pit

The Muliashi North open-pit commenced mining in December 2011. SRK considers that the mine design by NERIN is feasible, but there is room to optimize the equipment size and fleet. In addition, selective mining should also be addressed in the basic design to facilitate the mine operations.

7.5 Mine Plan

7.5.1 Mine Work Schedule, Production Scale and Life of Mine (LoM)

The work schedule for the mines of both NFCA and CLM is 330 working days per year, three shifts per day, and eight hours per shift.

It is SRK's opinion that the mine plan is reasonable for the underground mine, but considering the rainy season from November to April it is difficult for the open-pit mine to achieve the targeted working days. Therefore, 300d/a is more reasonable.

The mined tonnes in 2011, production scale and LoM for the all mines of NFCA and CLM are listed in Table 7-5. The LoM (in years) is based on projects' mine designs, and the numbers reflect the designed total years of mine life.

Table 7-5: Production Capacity and Service Life of Each Mine of NFCA and CLM

Company	Mine	Designed Capacity (Mtpa)	2011 Production (Mt)	LoM (years)	Remark
NFCA	Chambishi Main	2.145	1.028	13	Production re-commenced in 2003
	Chambishi West	0.99	0.487	25	Production commenced in 2010
	Chambishi Southeast	3.3		20	Production expected to commence in 2016
CLM	Baluba Center	1.5	1.224	13	Production re-commenced in 2010
	Muliashi North	4.5		12.5	Production commenced in December 2011
	Baluba East	0.9		7	Production expected to commence in 2017

In terms of the mine design, SRK believes that the recommended mine production rate might drop after considering the orebody shape, occurrence and geotechnical and hydro-geological conditions. As a result, the LoM might expand.

SRK has been informed that the mining sequence of the Muliashi project is expected to be the Muliashi North in first six years followed by the Baluba East thereafter.

7.5.2 Mine Plan

Both NFCA and CLM have a five-year mining plan from 2012 to 2016 (see Chapter 11). Production from the southeast orebody is planned to commence after 2016. Production at Muliashi North commenced in December 2011 and production at Baluba East is expected to commence in 2017 (6 years after Muliashi North). In SRK's opinion, the production target projected by NFCA and CLM can be achieved if there are no serious disturbances or unexpected events.

8 ORE PROCESSING ASSESSMENT

8.1 NFCA-Chambishi Processing Plant

8.1.1 Introduction

NFCA owns the Chambishi Main, West and Southeast Mines and one processing plant ("Chambishi Processing Plant") in the Copperbelt Province of Zambia. Currently, the Chambishi Main and West Mines are in operation and the Chambishi Southeast Mine is under construction and exploration.

The Chambishi Processing Plant has a designed capacity of 6,500tpd to treat the ore extracted from the Chambishi Main and West Mines. The plant processes the sulfide ore and/or the mixed sulfide and oxidized ore with oxidization rate less than 20%. The oxidized and blended ore with oxidation rate higher than 20% is transferred to SML for processing. The copper concentrate product is then sold to CCS.

Chambishi Copper Concentrator started operation in 1965. Trench leaching was initially adopted to process oxidized and blended ore from open pits and underground. From 1978, flotation was adopted to replace trench leaching to produce copper concentrates with ore processing capacity reaching 6,500tpd. In August 1987, the Chambishi Concentrator was shut down and production ceased. NFCA took over Chambishi Copper Mine in September 1998. In April 2000, ENFI completed the *Preliminary Construction Design Scheme of Chambishi Copper Mine's Restoration*, in which the large-scaled technical improvement and upgrading were conducted in relation to both mining and processing of the main orebody. The restoration construction of Chambishi Copper Mine commenced in July 2000, and it was finished and put into operation in July 2003. After the restoration, the processing capacity reached 6,500tpd (2,150,000tpa). SRK understands that the restoration of the Chambishi Concentrator was successful, and better mineral processing technical parameters were achieved with renewed equipment and an optimized process flowsheet.

In 2010, ENFI compiled *Feasibility Study Report on West Orebody of Chambishi Copper Mine,* in which the designed mining capacity is 3,000tpd (990,000tpa). As for the main orebody, the flotation method is also adopted to process sulfide ore and produce copper concentrates. Currently, ore from the west orebody is transferred to the Chambishi Concentrator for handling as well. Figure 8-1 is an overview of the Chambishi Concentrator (ore leaching heaps of SML are on the left side of the conveyor belt).

In 2010, Shenyang Design and Research Institute of Nonferrous Metallurgy compiled *Feasibility Study Report on Southeast Orebody's Exploration and Construction of Chambishi Copper Mine,* in which the designed mining capacity is 10,000tpd (3,300,000tpa). A new processing plant with 10,000tpd capacity is planned to be built and, similarly to the main and west orebody, the flotation method is expected to be adopted to process sulfide ore and produce copper concentrate. The Chambishi Southeast Processing Plant is expected to be put into service in 2016. The output of copper concentrate will be sold to CCS.

Figure 8-1: An Overview of Chambishi Processing Plant

8.1.2 Process Flow

Figure 8-2 shows the process flowsheet of the Chambishi Processing Plant. It can be divided into four steps including ore crushing, milling, flotation and dewatering. A brief description is set out below.

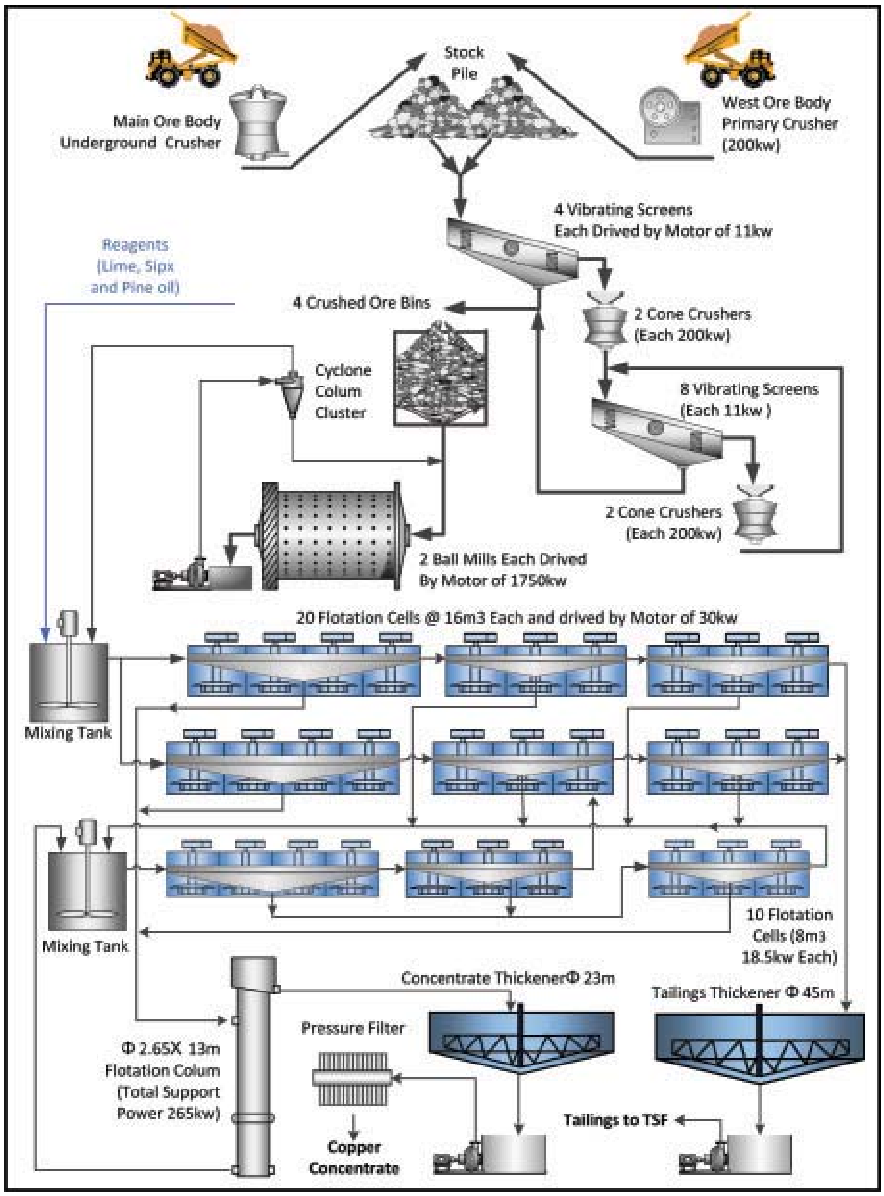

Figure 8-2: Copper Recovery Process Flow

Ore Preparation — Crushing

Pre-screening and three-stages of crushing within single closed circuit process are used to crush ore to a size smaller than 14mm. Currently the feed materials is mainly sulfide ore from the main and west orebodies. A rotary crusher installed underground in the main orebody crushes the ore to less than 220mm. The crushed ore will be hoisted to the surface and transferred by a 1.8m belt conveyor to the concentrator's raw ore stockpile. Ore from the west orebody is trucked to the crushing station in the concentrator for primary crushing, and then transported to the raw ore stockpile to a belt conveyor and then transferred to four vibrating screens for pre-screening. Ore particles larger than 14mm are fed for cone crushing and then transferred to 8 vibrating screens for check screening. Ore particles larger than 14mm are fed for cone crushing for the third time. The crushed ore is returned to the vibrating screens for check screening again, forming a closed circuit to control the size to less than 14mm. Ore passing through the two sets of vibrating screens (smaller than 14mm) is transferred to four fine ore bins for stock pilling.

Milling

Single closed-circuit milling is used to mill the crushed ore to 80% passing 74μm (-200 mesh 80%) in preparation for flotation. Ore is fed evenly by vibrating feeder from the fine ore bins to the ball mills, and milled ore from the ball mill is pumped to a group of cyclones to be classified. Underflow recirculates for re-milling. The overflow proceeds for flotation. The milling-classification circuit has two mills in parallel where the diameter of each ball mill is 4.27m, and the length is 6.1m, which are powered by a 1750kw electric motor. The cyclone group is composed of six cyclones with a diameter of 500mm.

Flotation

The flotation system consists of open circuits for roughing-scavenging combining centralized middling flotation. The overflow's concentration from the cyclones is 33% Cu, and 80% of the grain sizes are smaller than 74μm. Flotation reagents are blended into the mixing drum, and then a series of flotation cells separate copper minerals and gangue minerals, producing rough concentrates and tailings. The flotation system includes 1 unit of roughing and 2 units of scavenging. The middling central processing circuit includes 1 unit of roughing, 1 unit of scavenging and 1 unit of cleansing. The rough concentrates produced from roughing and centralized middling flotation are pumped to a flotation column (2.65m in diameter and 13m in height) for cleansing. Figure 8-3 is an overview of the flotation section at the Chambishi Processing Plant.

Figure 8-3: Flotation Section of the Chambishi Concentrator

Dewatering

Copper concentrates are pumped to a 23m diameter thickener to be dewatered to 65-70% solids, which then are pumped to a frame filter press so the water content can be reduced to less than 10.5%, producing final copper concentrates which are sold to CCS. Tailings from flotation are pumped to a 48m diameter thickener to be dewatered to 45% solids which are then pumped to the tailings storage facility ("TSF"), or pumped to the filling and mixing station where the coarse particles will be classified and used as filling materials for underground mining. The overflows from these two thickeners flow to a water tank (an unserviceable former thickener) with a diameter of 76m. The recycled water is pumped back to the concentrator and supplemented with fresh water.

8.1.3 Tailings Storage Facilities

The TSF for the Chambishi Processing Plant is located at the Musakashi river valley, 7km from the concentrator. The TSF was originally designed by WLPU, a British company, in 1989 and was a rock filled seepage drainage dam made of red clay with 15m height, and storage capacity of 3.1 million m^3. When NFCA took over, the storage was almost full. NFCA reconstructed the TSF by reinforcing and heightening the dam wall according to ENFI design, by which the storage capacity was expanded to 4.73 million m^3. The life of the expanded TSF was filled by the end of 2010. In May 2010, NFCA again heightened and reinforced the tailings dam wall, expanding the storage capacity to 5.73 million m^3 which can serve for another 5 years at the current production rate. Considering some coarse tailings are used as underground filling material (where the estimated consumption will be 52% of total tailings), the service life of the TSF can be prolonged to 8.5 years. Figure 8-4 shows an overview of the Musakashi TSF which is in good condition and equipped with improved drainage and flood control systems.

In case of the TSF storage running out by 2018, new TSFs are planned to be built in April 2018 at a site downstream, 2km from the current TSF.

Figure 8-4: An Overview of the Chambishi TSF

8.1.4 Production Records and Technical Parameters

Table 8-1 lists the production record and technical parameters of NFCA's mineral processing from 2008 to 2011. The data indicates that NFCA has achieved a high level in relation to the grade of copper concentrate and the recovery of copper. The copper concentrate also contains gold and silver with grades of 2g/t and 80g/t, respectively, for which NFCA will be paid. The copper concentrate also contains 1,000g/t of bismuth which is treated as a price penalty. SRK has noticed that the quantity of ore processed is well below the designed production capacity of 2,150,000tpa. The high proportion of oxide ore and high clay content result in lower grade and lower recovery rate of copper. SRK believes that the proportion of oxide ore and clay content will decrease and the recovery rate of copper will increase along with the deepening exploitation of the west orebody. However, the Cu grade of copper concentrate will decrease along with more ore being exploited from both west orebody and southeast orebody, because chalcopyrite is the main copper mineral in the west orebody.

Table 8-1: Product Technical Index of Chambishi Processing Plant, 2008 to 2011

Term	Unit	2008	2009	2010	2011
Treated Ore	t	1,450,916	1,358,682	1,330,539	1,569,187
Ore Grade	Cu%	1.87	1.81	1.75	1.67
Concentrate	t	58,189	53,341	50,325	61,119
Treated Ore/Concentrate	t/t	24.93	25.47	26.44	25.67
Concentrate Grade	Cu%	44.68	44.06	43.78	38.03
Contained Cu Metal in Concentrate	t	26,001	23,502	22,030	23,247
Copper recovery rate	Cu%	95.83	95.57	94.61	88.69

8.1.5 Material Consumption and Production Costs

The system for reagent use in the NFCA Chambishi Concentrator is simple. To process one tonne of raw ore, the lime used as acid-base regulator is 229g, sodium iso-propyl (Sodium isopropyl xanthate, Sipx) used as collector is 14g, terpenic oil (2#) used as foaming agent is 18g, and steel ball consumption is 690g. The quantity of these reagents used is rather small so that production costs can remain on a relatively low level. The operating costs at the Chambishi Processing Plant in recent three years are discussed in Chapter 11.

8.1.6 Chambishi Southeast Processing Plant

The designed ore processing capacity is 10,000tpd (3,300,000tpa) by adoption of advanced semi-autogenous milling (SAG) process. The flotation method to process sulfide ore and produce copper concentrate is the same as at the Chambishi Processing Plant. The designed technical index of the Chambishi Southeast Processing Plant is listed in Table 8-2. According to the Company's plan, the plant will commence production in 2016, and the half-year production is anticipated to produce 29,500t copper in copper concentrate in 2016. The operating cost is expected as US$56.31 per tonne of ore. SRK is the opinion that the designed recovery is acceptable, but the designed operating costs are relatively lower compared with the Chambishi Processing Plant even if the inflation is not considered.

Table 8-2: Technical Index of Chambishi Southeast Processing Plant

Term	Unit	Capacity
Ore processing capacity	Mtpa	3.3
Concentrate throughput	t	261,030
Treated Ore/Concentrate	t/t	12.64
Head grade	%Cu	2.02
	%Co	0.104
Concentrate grade	%Cu	24.00
	%Co	0.60
Recovery	%Cu	93.98
	%Co	45.63
Contained Cu	t	62,647
Contained Co	t	1,566

8.1.7 Conclusions and Recommendations

Copper minerals contained in the ore of the Chambishi Main orebody mainly include bornite (Cu_5FeS_4, Cu 63.44%), followed by chalcocite (Cu_2S, Cu 79.8%) and a small amount of chalcopyrite ($CuFeS_2$, Cu 34.6 %). For west orebody, chalcopyrite is the main content, followed by chalcocite and a small amount of bornite. Minerals of the southeast orebody are similar to those of the west orebody, with chalcopyrite being the main component. All these minerals have good floatability and the flotation recovery rate is relatively high. Due to different contents of Cu in different minerals, the grades of copper concentrate from different orebodies are also different. The grade of copper concentrates from the main orebody is the highest.

The oxidization degree of ore from the west orebody is 10 to 15%, with a high content of clay minerals. As a result, copper concentrate grade and recovery rate have decreased, but the production records are generally satisfactory. SRK believes that the oxidization degree and clay content will decrease while the recovery rate of copper concentrates will increase with the deepening exploitation of west orebody.

The Chambishi Processing Plant was successfully built and transformed from an old concentrator. The equipment was upgraded and the process flowsheet has been optimized. Due to insufficient supply of feed ore, the actual processing capacity is still far from reaching the designed capacity which is 2,150,000tpa.

Access to the Chambishi Processing Plant is generally good and the water and power supplies are well equipped. Machinery maintenance and laboratory testing are also well performed. The plant can meet the requirements of processing sulfide ore from the three orebodies of NFCA.

8.2 SML — Chambishi Leach Plant

8.2.1 Introduction

The mineral resources for the SML Chambishi Leach Plant are sourced from the large amounts of stripped waste rocks from oxidized ore, tailings of heap leaching and flotation tailings from the Chambishi mine area.

In March 2004, a sulfuric acid leaching test was conducted. The results listed in Table 8-3 show that the combination of agitation leaching and heap leaching can be adopted to process copper-containing residues remaining at the Chambishi West Mine area.

Table 8-3: Results of Leach Test

Type of resources	Leaching method	Conditions	Leaching rate
Stripped waste rocks	Column leaching	-25mm, 30days	65%
		-80mm, 30days	53%
Heap leaching tailings	Column leaching	-25mm, 10days	90%
Flotation tailings	Agitation leaching	2hr	75%

In order to make full use of the waste copper mineral resources left over, Shanxi Zhongtiaoshan Engineering Design and Research Institute Co. Ltd was entrusted to design the copper hydrometallurgy. The process of leaching (agitation leaching+heap leaching) — extraction — electro-winning is adopted to produce electrolytic copper. The designed annual production capacity of the project is 5,000 tonnes. This project was started in November 2004 and the actual production scale was expanded to 8,000tpa during the process of construction. Meanwhile, the Chambishi Sulfuric Acid Plant was also constructed to provide sulfuric acid, as the leaching reagent, for copper hydrometallurgy. It was finished and put into trial operation on June 30, 2006. On December 31, 2006, the trial production was completed and 1,503 tonnes of electrolytic copper was produced. The hydrometallurgy plant is still in normal operation, however the Chambishi Sulfuric Acid Plant has ceased production because CCS went into production (CCS owns a Sulfuric Acid Plant as well).

In Chambishi and its surrounding areas as well as within borders of the DRC, there are considerable amounts of low-grade copper containing tailings resources. SML has or is obtaining these resources in a variety of ways. Chinese research institutes are also being entrusted to study the method of using these low-grade resources economically and rationally. Microbial oxidization leaching and other methods are included in the study. SML plans to achieve the following production targets step by step before 2015: the production of electrolytic copper to reach 30,000tpa, contained copper in concentrates to reach 2,000tpa and cobalt contained in cobalt salts to reach 2,000tpa, which is proposed to be achieved by the Chambishi Processing Plant with a daily processing capacity of 1,000 tonnes, 10,000 tonnes of copper per year of CNMC Huachin (Congo) Leach Plant in the D.R.C, Kakoso copper hydrometallurgy of 3,000tpa and other newly purchased mines and tailings utilizations in the D.R.C.

8.2.2 Hydrometallurgical Method

Figure 8-5 shows the operation principles of copper hydrometallurgy, including the circulation of leaching solution, organic phase for extraction and electrolytic solution. The processing method used for Chambishi copper hydrometallurgy is shown in Figure 8-6. It includes agitation leaching of tailings, heap leaching of oxidized ore, leaching solution and electrowinning. Electrolytic copper with a content of 99.95% Cu is forecast to be produced. A brief description is as follows.

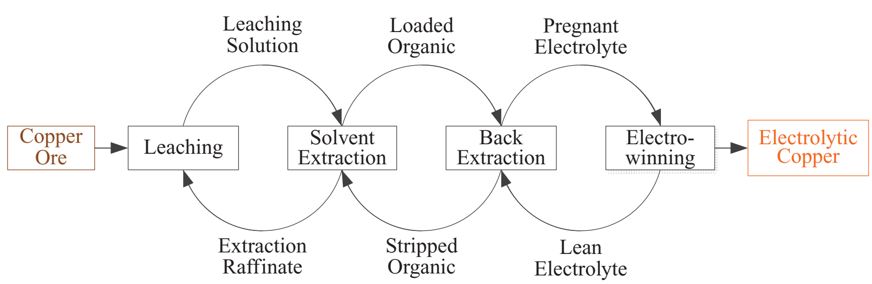

Figure 8-5: Operation Principle of Cu Hydrometallurgy

Agitation leaching of tailings

Old tailings are transported by truck to a place near the agitation leaching plant. The raffinate solutions after copper extraction are sprayed on the tailings by high-pressure water guns and then conveyed to a slurry tank. The slurry concentration should be controlled at about 25% solids. Then it is pumped to an agitation leaching tank which is 6m in diameter and also 6m high where sulfuric acid is supplemented. Four tanks are linked together in a series and the total leaching process lasts 4 hours, solid copper minerals being turned to copper sulfate solution. After leaching, slurry is pumped to a thickener with a diameter of 20m where solid-liquid separation is carried out. The overflow is the solution containing copper which is transferred to sedimentation tank for further clarification and then pumped to the extraction plant. The underflow has a concentration of 60% solids. It continuously undergoes counter-current washing by three thickeners with a diameter of 20m washing out the copper-containing solution which are also put in the sedimentation tank for clarification and pumped to the extraction plant. The underflow from the third thickener is the leaching tailings which are pumped to the TSF for storage. Figure 8-7 is an overview of the agitation leaching plant.

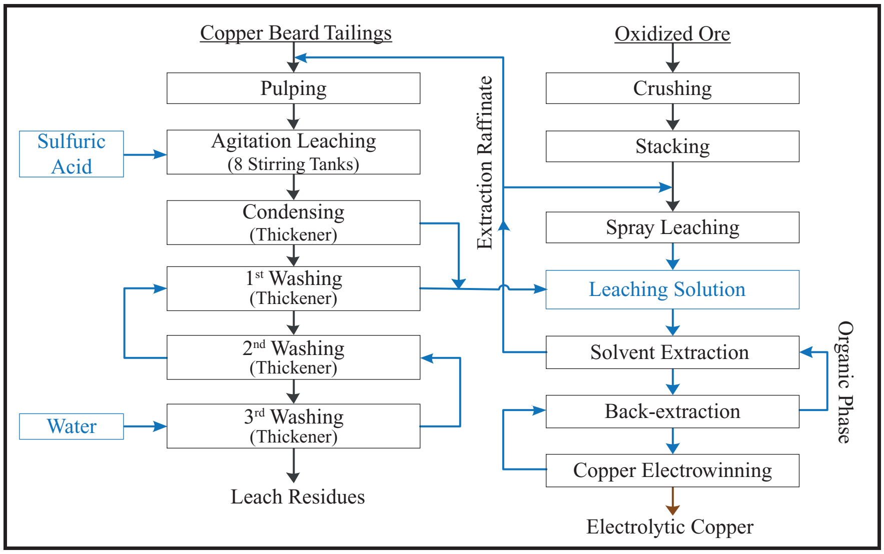

Figure 8-6: Hydrometallurgical Method Process for Cu Recovery

The daily processing capacity of the leaching plant is 1,500t of ore. In order to increase copper output, SML has externally purchased part of the basic copper carbonate and high-grade oxidized ore. The high-grade oxidized ore contains some copper sulfide which is hard to leach. The suggestions for small concentrators with a daily processing capacity of 100t should be to recycle this type of copper sulfide by process of crushing-milling-flotation. Thus a small amount of concentrates can be produced and sold to CCS. The tailings will be pumped to the agitation leaching circuit.

Figure 8-7: An Overview of Agitation Leach Plant

Heap leaching of oxidized ore

The heap leaching site is very close to the Chambishi Processing Plant. There is a slope (3 to 5%) inclining to one side. After it is leveled and compacted, a layer of high density polyethylene (HDPE) membrane with a thickness of 1.5mm is used to prevent the seepage of leaching solution. A jaw crusher is used to crush the oxidized ore to a size smaller than 50mm which is then transported to the heap leaching site for stacking. After the heap is built, a pipeline network for pumping liquid and distribution nozzles are installed on top of the heap to spray the extraction raffinate from the extraction plant. When the solution flows from top to the bottom of the heap, sulfuric acid in the raffinate will react with copper minerals, generating dissoluble copper sulfate which seeps away from the heap in the form of a solution. On the lower side of the heap, there is a liquid storage container and flood control pool formed by a layer of HDPE membrane with a thickness of 1.5mm to prevent the seepage. The liquid storage container collects and store copper-containing solution which, after sedimentation and clarification, is transferred to the extraction plant.

Heaps are built layer by layer or one by one in series. The leaching cycle for a single heap with one layer lasts 90 days. After that is completed, another layer is laid on top of it, with a height of 2 to 3m. Leaching solution containing sulfuric acid is also sprayed. The total leaching time may last a few years. However, in the later stage, the copper content in the leaching solution cannot meet the requirements of extraction. Thus sulfuric acid is supplemented to this kind of leaching solution, which is then used for new heap leaching irrigation. When leaching is finished, tailings can be stockpiled right on the site. In Figure 8-7, the left side of the photo, which is enclosed by the belt conveyer corridor, is the ore heap for leaching.

Copper extraction

Four to six grams of copper are contained in one liter of leached solution from agitation leaching and heap leaching. The pH value of the leach solution is 1.8 to 2. The process adopted in the extraction plant is two-stage for extraction and one-stage back extraction/recycling process to increase the content of copper to 40 to 50g per liter ("g/L") and leaving many impurities in the solution.

The copper containing solution is then pumped to the electrolysis plant, to produce pure Cu metal. The extraction agent used is Lix984 and kerosene 260# is used as the diluent. The concentration of the organic phase is controlled at 15 to 17%. The reagents are mixed with leaching solution so that copper ions in the leaching solution (aqueous phase) can go to the organic phase. Then aqueous phase separates from the loaded organic phase in the clarification tank. The copper content in the aqueous phase is less than 0.1g/L and the pH value is 0.8 to 1.5 after one stage recycling. The extraction raffinate is returned to the leaching operation after the residual organic matter has been removed (using oil). The copper content in the loaded organic phase is 8g/L. The loaded organic phase will contact with a lean electrolytic solution consisting of: Cu 30 to 35g/L, H_2SO_4 170 to 180g/L. After recycling, the contents of Cu and H_2SO_4 in the copper-rich solution are respectively 40 to 45g/L and 150 to 160g/L. After oil is removed, the solution is transferred to the electrolysis plant to produce electrolytic copper. After extraction, the organic phase is recycled for use in the extraction operation.

Copper electrolysis (Copper electrowinning)

The copper-rich solution is evenly pumped, by measuring with a metering pump, to 54 parallel electrolytic cells where copper ions obtain electrons and become metallic copper through reduction on the negative plate when direct current is supplied. The anode used is a Pb-Ag-Ca-Sr quaternary alloy. In order to prevent corrosion and improve current efficiency, traces of cobalt sulfate are added to the alloy. 1000×900mm stainless steel plate is used as the material of some cathodes and it is hoisted out every 24 hours to separate out copper cathode. It is then used as starting sheets for other cathodes and is taken out from the electrolytic cells after 7 days' electrolysis. After that, it is soaked in hot water with a temperature of 80°C for washing. The commodity-copper cathode is produced after drying, and the content of copper can be controlled above 99.95%. The electrical current density used is 200-220A/m^2 and the electrolytic cell voltage is 1.8 to 2.4V. In order to maintain the content of ferric ions in the electrolytic solution under 3g/L and ensure the quality of cathode copper, part of the lean electrolytic solution is returned for extraction operation in open circuit. Figure 8-8 is a photo of the electrolysis plant and a cathode starting sheet is in the lower right corner.

Figure 8-8: Copper Electrolysis Plant

8.2.3 Tailings Storage Facilities

The TSF of SML is close to the agitation leaching plant and cell leaching tailings pile. It is a ground-based tailings pond with its surrounding dams being built by old tailings and waste rocks. On the ground, a layer of HDPE membrane, which is 1.5mm thick, is used to prevent seepage. The tailings pond has been in service for five years and has expanded gradually to an area of 450,000m^2. On one side of the TSF, the old tailings have been used so that a water reservoir with a capacity of 40,000m^3 is formed and used as a flood control pool for excessive water storage during the rainy season. It is planned that the dam body should be heightened every year to enlarge capacity and store newly generated tailings. Meanwhile, the exhausted areas of both the old and new TSF will be covered to reduce or prevent seepage. In normal production, the clarified water from the TSF can be added to the production process as washing water for leached residues of the agitation leaching plant. Figure 8-9 is a photo of part of the TSF.

The existing potential safety risk is the imperfect flood control system during the rainy season. SRK suggests that flood control and flood drainage systems of the TSF should be improved.

Figure 8-9: An Overview of SML's TSF

8.2.4 Production Records and Technical Index

Table 8-4 shows the production records of SML from 2008 to 2011. There are four sources for raw materials of agitation leaching: old tailings, oxidized ore from the Chambishi Copper Mine, externally purchased high-grade oxidized ore, and basic copper carbonate. Flotation is in place to handle externally purchased high-grade ore and copper concentrates can be produced. Agitation leaching is used on tailings from the flotation residues from externally purchased oxidized ore as well as old tailings, whose contributions to the output of electrolytic copper are getting greater year by year. The scale of heap leaching is small and copper recovery rate is relatively low, so that it contributes to the increase in the electrolytic copper output by less than 10%. The raw materials fed to the agitation leaching tank is a mixture with different leaching performances and it is difficult to determine the specific recovery rate of each material. Judging by the nature of materials, SRK indicates that the copper extraction rate of basic copper carbonate is about 96%. The copper recovery rate of externally purchased oxidized ore is about 95% and that of the oxidized ore exploited is about 90%. The recovery rate of old tailings is about 75%. Leaching solution from heap leaching and agitation leaching are mixed and then extraction and electro-winning is conducted. As the cycle for heap leaching is very long, it is hard to determine the specific recovery rate. The Cu recovery rate listed in Table 8-4 is an approximation.

Although the recovery rate from heap leaching is lower than other processing methods, it has a flexible scale and advantages of low investment and low operating costs. Combined with agitation leaching, heap leaching maintains a good water balance. Wash water used in agitation leaching is later applied to heap leaching in the form of extraction raffinate and excessive water is consumed by evaporation in the heap leaching process. In this way, sulfuric acid contained in the solution can be fully utilized and its total usage is reduced. The cost of environmental treatment of acidic waste water is saved as no acidic water is discharged.

Table 8-4: Product Technical Index of Chambishi Leach Plant from 2008 to 2011

Index	Item	2008	2009	2010	2011
Raw materials feed (t)					
Agitation leaching	Old tailings	428,118	449,500	462,820	495,187
	Oxidized ore	0	17,700	14,050	9,273
	Purchased ore	12,528	18,687	26,732	47,590
	Purchased Cu carbonate	4,554	546	0	0
Heap leaching	Oxidized ore	130,000	160,000	90,000	48,779
	Total	575,200	646,433	593,602	600,829
Raw materials feed (Cu%)					
Agitation leaching	Old tailings	1.34	1.27	1.25	1.10
	Oxidized ore	—	2.07	2.09	1.58
	Purchased ore	4.3	5.96	5.89	4.11
	Purchased Cu carbonate	34.81	36.54	—	—
Heap leaching	Oxidized ore	0.92	0.83	0.74	1.04
	Average	1.50	1.40	1.40	1.34
Cu contained in materials (t)					
Agitation leaching	Old tailings	5,312	6,044	5,785	5,443
	Oxidized ore	0	366	294	147
	Purchased ore	538	1,114	1,577	1,954
	Purchased Cu carbonate	1,585	200	0	0
Heap leaching	Oxidized ore	1,196	1,328	666	507
	Total	8,632	9,051	8,322	8,051
Cu Cathode (t)					
Agitation leaching		5,955	5,954	6,849	6,753
Heap leaching		550	559	255	250
Total		6,505	6,513	7,103	7,003
Cu recovery rate (Cu%)					
Agitation leaching		80.08	77.09	89.46	89.51
Heap leaching		46.02	42.09	38.21	49.27
Estimated total Cu recovery		75.36	71.96	85.36	86.98

8.2.5 Reagent consumption and production costs

Table 8-5 shows the consumption rates of the main reagents in the past three years and reflects the unit cost of production, excluding all kinds of taxation by the state or local governments where the projects are located. Unit cost and material consumption are influenced by the composition of materials fed as well as the copper grade. The hydrometallurgical method has advantages in processing low-grade oxidized ore to produce high quality copper metal directly. The process is simpler than its alternatives and the investment and operational cost are lower and therefore it is the best option and practice to process large amounts of low-grade oxidized ore and old tailings. The operating costs at the Chambishi Leach Plant are discussed in Chapter 11 of this report.

Table 8-5: Power, Water and Major Reagent Consumption at Chambishi Leach Plant

Item	Unit	2008	2009	2010	2011
Sulfuric acid	t/t Cu	1.64	2.01	2.28	2.47
Kerosene	l/t Cu	57.03	77.54	55.53	62.40
Extraction reagent	kg/t Cu	3.60	5.39	3.80	3.47
Guar gum	g/t Cu	4.61	57.58	17.46	0.03
Cobalt sulfate	g/t Cu	8.84	8.60	11.26	0.02
Flocculating agent	kg/t Cu	3.45	3.78	3.09	2.55
Lime	kg/t Cu	82.85	30.22	63.88	90.57
Water	t/t Cu	101.56	81.57	56.08	28.37
Electrical Power	kWh/t Cu	2,866	2,779	3,051	3,212

8.2.6 Future development

The remaining tailings resources on the surface at Chambishi can still satisfy the needs for the next five years at the current production capacity of SML. There are also large amounts of low-grade tailings resources available. In order to maintain sustainable operation, SML has entrusted Chinese research institutions to study the technologies to utilize the low-grade tailings. SML is also actively seeking and developing other copper resources. Table 8-6 shows SML's investment plan over the next 5 years, including the new Kakoso Leach Plant with capacity of 3,000t Cu cathode annually. SML plans to achieve more sustainable development based on two kinds of resources: surface resource and underground resource. The surface resource includes old tailings and low-grade copper waste rocks, which are widely distributed in the Copperbelt ranging from Zambia to the DRC. Underground resource includes the Mwambashi Copper Mine (owned by SML), oxidized ore of the Chambishi Copper Mine (owned by NFCA) and the Congo Likasi Copper Mine (owned by Huachin).

Table 8-6: SML Projects under Construction or Planned for Development

Projects	Designed Capacity	Investment (US$1,000)	Construction Period
Kakoso Leach Plant	3,000tpa Cu Cathode	17,000	2012.6 to 2013.6
Mwambashi Mine Development		50,000	2012.8 to 2014.8
Industrialization of Bioleaching Test*		3,500	2011.5 to 2013.05
Mabende Project	20,000tpa Cu Cathode	95,000	2012.1 to 2014.5

Note:

* The bio-leaching technology is being currently tested and is expected to be used to treat the resource of Mufulira tailings dam, which contains low grade Cu sulfide considered non-profitable using the traditional hydrometallurgical method

8.2.7 SML Chambishi Processing Plant

The SML Chambishi Processing Plant is located at Chambishi West Mine. The plant is fed with ore from the NFCA Chambishi West orebody. Based on the ore processing testing results conducted on the oxidized orebody by ENFI, a combination of flotation and agitation leaching is planned to be used. The results in Table 8-7 show that minerals of copper sulfide and copper oxide can be recovered by a combination of flotation and agitation leaching, with the total copper recovery rate reaching 92%.

The SML Chambishi Processing Plant processes mixed ore and oxidized ore with an oxidization rate higher than 20%. Taking into account the influence of oxidized ore over flotation parameters, the combination of "flotation + hydrometallurgy" process has been finally adopted after many comparative studies. This processing method can provide good Cu recovery from sulfide and oxidized ore. The best economic results from the west orebody can also be achieved using this processing method. The SML Chambishi Processing Plant has a designed daily raw ore processing capacity of 1,000t (330,000tpa). The same flotation process as used at the NFCA Chambishi Processing Plant is used to recover copper sulfide ore and produce copper concentrates for sale to CCS. Tailings are pumped to the existing SML Chambishi Leaching Plant for copper extraction by hydrometallurgy methods. Figure 8-10 shows the construction of the SML Chambishi Processing Plant. The plant was completed and began trial production in May 2011. It now processes ore from the Chambishi West Orebody and No. 3# waste rocks. It is also expected to process oxidized ore from the Mwambashi Mine.

Table 8-7: Designed Processing Index Oxidized Ore from Chambishi West Mine

Parameters	Unit	Designed	2011.9-12
Raw ore treated	tpa	330,000	48,461
Raw ore grade	% Cu	1.86	1.78
Concentrate yield	%	2.47	4.32
Concentrate	tpa	8,150	2,094
Concentrate grade	% Cu	28.00	20.40
Tailings	tpa	292,590	46,367
Tailings grade	% Cu	0.96	1.00
Cu recovery rate (flotation)	%	42.43	49.47
Cu recovery rate (agitation leaching tailings)	%	85.00	—
Cu recovery rate in total	%	91.36	—

Figure 8-10: SML Chambishi Processing Plant

8.2.8 Kakoso Tailings Development Project

SML and Shenzen Resources Limited ("Shenzen") signed an agreement to form a joint venture company, Kakoso Metals Leach Limited. Shenzen holds 12% of the project and is responsible for obtaining the licenses for water, power and land use. SML, which holds 88% of the project, invested capital and made the processing technique available, and is responsible for the construction and operational management of the project.

The Kakoso tailings deposit is located in the middle of the Zambian Copperbelt, at the northern edge of Chingola, 4km from Chililabombwe town and 25km from Chingola. The Kakoso tailings pond is 50km from Chambishi and 78km from Kitwe. The Project can be easily accessed via a secondary road, 8km from the paved road that links Kitwe and Chingola. The total area of the Kakoso tailings pond is 709,200m^2, including a main pond with an area of 388,700m^2 and an auxiliary pond with an area of 320,500m^2. The total volume is 6,055,700m^3. According to the measured bulk density of 1.5t/m^3, the quantity of ore is estimated at 9,080,000t. From April to May of 2010, 13 holes were drilled in the main tailings pond with an average depth of 11.4m, and 10 holes had been drilled in the auxiliary tailings pond with an average depth of 5.1m. The spacing between each hole was 200m, and 78 samples were collected. Calculated from the grade of the samples collected, the average grade of TCu is 0.60%, and that of copper oxide and cobalt are respectively 0.47% and 0.04%. The average oxidization rate was estimated at 78.3%. Agitation leaching tests have been conducted on tailings containing a TCu grade of 0.64% with an Ox-Cu grade of 0.52%. The leaching rates of total copper and oxide copper were 79.53% and 89.90%, respectively. The consumption of acid was 29kg per tonne.

In July 2010, Shenyang Design and Research Institute of Nonferrous Metallurgy carried out a feasibility study for the Kakoso tailings pond development and utilization. The preliminary design of the Kakoso Leach Plant with a capacity of 3,000tpa Cu cathode was completed in 2011. The process of "agitation leaching-extraction-electrowinning" will be adopted to produce Cu cathode with a purity of 99.95% Cu. The designed technical parameters are listed in Table 8-8. SRK believes that the samples tested are not fully representative of the tonnes proposed to be treated. The designed copper oxide recovery rate of 90% is assessed as optimistic, and the actual annual production of cathode is unlikely to reach 3,000t. Due to the low grade of the tailings, SRK suggests that new samples which better represent the total resource should be collected and leaching tests should be conducted to determine the likely leaching conditions of Cu and Co.

Table 8-8: Designed Parameters of Kakoso Leach Plant

Item	Unit	Index
Quantity of tailings processed	tpa	679,000
Cu cathode product	tpa	3,000
Operating life of tailings	year	12
Tailings feed grade	TCu%	0.60
	Ox-Cu%	0.47
Cu leaching rate	Ox-Cu%	90.00
Extraction recovery rate	Ox-Cu%	98.00
Electrolysis recovery rate	Ox-Cu%	99.50
Cu recovery rate in total	Ox-Cu%	87.76

8.2.9 Mwambashi Mine development

According to the "*Mwambashi Copper Project Feasibility Study*" completed by Teal in July 2006, the Mwambashi orebody shares similar parameters with ore bodies in the local area, including an oxidization rate of 80%. Malachite is the main mineral in the oxidized ore, followed by a small amount of chrysocolla and chalcocite, etc. Chalcocite is the main mineral in the sulfide ore, followed by a small amount of chalcopyrite and malachite. Flotation of sulfide ore is usually easy while it is hard to leach with sulfuric acid. For oxidized ore, it is easy to leach with sulfuric acid while flotation is less effective. These conditions make the processing method of such deposits complex and a combination of different methods is commonly adopted. At Mwambashi, flotation is proposed to be used to process sulfide ore to produce copper concentrates. For oxidized ore, hydrometallurgy is proposed to produce electrolytic copper. For mixed ore, flotation is proposed to recover sulfide ore, and then leaching will be conducted on the tailings to produce electrolytic copper. The grade of the ore as well as smelting and processing performance will be used to decide whether the combined methods can be adopted.

Mwambashi has carried out many tests on drill core and drill chips. Please refer to Table 8-9 for details. Konkola Copper Mines conducted flotation and leaching test work in 2004. The acid-insoluble flotation recoveries mostly did not exceed 70%. Leach efficiencies ranged from about 80% to 95%, AS-Cu basis, although a few of the deeper samples yielded lower efficiencies.

Material from the Mwambashi project responds well to a combination of flotation and leaching:

- Sulfide copper flotation recoveries of 90% to 97% are achievable, some low-grade ore from the upper levels may yield rather lower acid insoluble copper ("AI-Cu") recoveries;

- Oxide flotation is partly successful, but recoveries are limited to about 45% to 65%, AS-Cu basis;

- Sulfuric acid leaching of the oxide minerals is quite successful. Leach extractions range from 75% to 95%, acid-soluble copper basis, after four hours of ambient-temperature leaching at pH 1.8. There is a clear relationship between leach efficiency and feed grade, as there seems to be a limiting residue grade of about 0.6% to 0.8% AS-Cu in most cases;

- Only flotation or only leaching was used to process certain mixed samples and the copper recovery rate is not ideal. Therefore, the combined methods should be adopted.

SML plans to commence construction at the Mwambashi project in 2012. SRK suggests that further tests of mixed samples with different oxidization rates should be carried out before a development design is finished. Through the tests, the flotation and leaching parameters of these samples can be determined so that smelting and processing methods for ore with different oxidization rates can be decided. It appears that hydrometallurgy should be conducted for oxidized ore and flotation should be conducted for sulfide ore, while for some mixed ore, the combined process of "flotation + leaching" is proposed, but this will increase investment and metallurgical costs. Therefore, it is important to make clear the metallurgical parameters and complete a good technical and economic evaluation.

Table 8-9: Test Results of Mwambashi Ore Samples

	Head Grade %		Concentrate Grade %	Recoveries %			Leach Efficiency %
Composite	**TCu**	**AS-Cu**	**TCu**	**TCu**	**AS-Cu**	**AI-Cu**	**AS-Cu**
Test results from Teal, 2006 Teal Exploration and Mining Incorporated							
Oxidized samples	2.58		25.80	68.6	69.8	62.1	95.7
Mixed samples	0.42		17.30	86.4	56.4	94.8	86.5
Test results of AVRL in 2001 Anglovaal Mining Research Laboratories							
Primary sulfide ore	5.12	0.65	59.50	92.0	50.1	95.7	6.6
Chalcocite dominant ore	3.60	0.89	64.50	86.0	49.2	94.6	16.3
Mixed sulfide/oxidized ore	2.90	1.80	54.50	65.2	23.5	89.3	44.9
Oxidized ore	2.25	1.96	40.50	50.3	26.6	84.7	79.9
RCM test results in 1972 Roan Consolidated Mines							
Chalcocite/malachite	5.60	1.08	27.10	92.4	72.8	97	
Chalcocite/chrysocolla	2.20	0.82	9.30	74.8	54.3	87.4	
Malachite/chrysocolla	2.06	1.73	6.80	43.5	44.7	38.9	
Chalcocite/oxidized ore	4.17	1.30	12.60	87.6	74.3	94.2	

8.2.10 Other resource development

SML has a 30% of share in the development of Huachin Copper Mine within the borders of the D.R.C. The construction of one hydrometallurgy plant having an annual production capacity of 10,000t Cu cathode began in January 2011 and was completed in February 2012. The Mabende Leach Plant with a designed capacity of 20,000tpa cathode Cu is currently under construction and is expected to commence production in 2014. The planned cathode Cu production capacities are 10,000t in 2014 and 20,000t in 2015 and 2016. The Mabende Leach Plant is a joint venture company of SML and Congo Huachin. SML also owns a 60% share of the Mabende Leach Plant. In addition, one sulfuric acid producing plant that is removed from the Chambishi Leach Plant is under construction, and one cobalt recovering system is planned as well. SML commissioned Shenyang Design and Research Institute of Nonferrous Metallurgy to conduct the cobalt recovery system design with a production capacity of 800tpa $CoCO^3$ in the first phase. This production capacity can be increased by 2,000tpa.

8.2.11 Conclusions and Recommendations

SML has adopted a combined hydrometallurgical method of heap leaching and agitation leaching to process low grade copper resources in the Chambishi Mine area. The method is appropriate and the process is rational. The hydrometallurgy plant is well built and the parameters are stable. This has not only made full use of the copper resources which used to be regarded as waste rocks, but also brought great economic benefits for the Company. Since heap leaching can effectively adjust the solution volume of the whole leaching-extraction system, it is suggested that the scale of heap leaching should be expanded.

Oxidized ore of the copper belt usually contains some copper sulfide which cannot be leached. The microbial oxidization leaching method is being studied and developed to process the low-grade tailings resources, with the aim of increasing the Cu recovery rate. SRK appreciates this and suggests that SML should speed up research to cultivate bio-metallurgical talents so that this method can be conducted on low-grade tailings and "waste rocks". The expected technical advantage can help increase resources and economic benefits.

In the process of hydrometallurgy, a small amount of cobalt in ore can also be leached and it will accumulate in the circuit, creating reasonable conditions for its recovery. SRK suggests that SML should monitor cobalt closely and make evaluations about the feasibility of cobalt recovery.

Due to the large quantity of resources of raw materials, it is suggested that supervision should be strengthened, and the operational parameters should be adjusted along with the changes in raw materials, in order to achieve the best metallurgical results.

The infrastructure of the metallurgy plants and concentrators should be constructed in advance and industrial tests and pilot production should be carried out.

8.3 Chambishi Copper Smelter Ltd. (CCS)

8.3.1 Introduction

CCS was registered in July 2006 in Zambia. Its associated smelter is located about 3.5km east of Chambishi Town, Kalulushi City in the Copperbelt Province. The smelter was designed by ENFI. Construction commenced in November 2006, and in February 2009 the main body of the smelter was put into trial production. In June 2009, the construction was completed and full production began. The smelter takes Cu concentrate as feed for blister copper production and has a blister copper production capacity of 0.15Mtpa and sulfuric acid production capacity of 0.3Mtpa (as a by-product). Figure 8-11 shows a photo of the Chambishi Copper Smelter.

Figure 8-11: An Overview of Chambishi Copper Smelter

After a detailed comparison of various processing flows and studies on economic feasibility and operability, CCS selected the pyrometallurgical smelting process of "Isa furnace oxygen injection and rich oxygen bath smelting — electric furnace precipitation — converter blow" for production. The SO_2 gas generated is used for sulfuric acid production by two stages conversion and two stages absorption after a circuit of heat recovery boiler dust collection, high voltage electrostatic de-dusting and sulfuric acid purifying and waste heat is applied for power generation. CCS has its associated sulfuric acid production workshop, oxygen station, water treatment station and waste heat power generation plant. Considering that smelting slag still has about 1% of Cu residues which is a relatively high content, a flotation separation workshop is under construction to recover Cu from smelting slag to improve total Cu recovery rate. At the same time, CCS is also carrying out preliminary preparation for 0.25Mtpa blister copper and copper anode production expansion.

During the site visit, SRK found that the smelter and its supporting facilities are well allocated and constructed. The flowsheet adopted at CCS for smelting is rational and conforms to local practice with good technical parameters. Further study on Cu, Co and Bi recovery from slag and smelting gas will further improve the Cu recovery rate and bring additional profit to the Company.

8.3.2 Smelter Description

The pyrometallurgical smelting flow used is indicated in Figure 8-12 and it includes five main circuits which are detailed as follows.

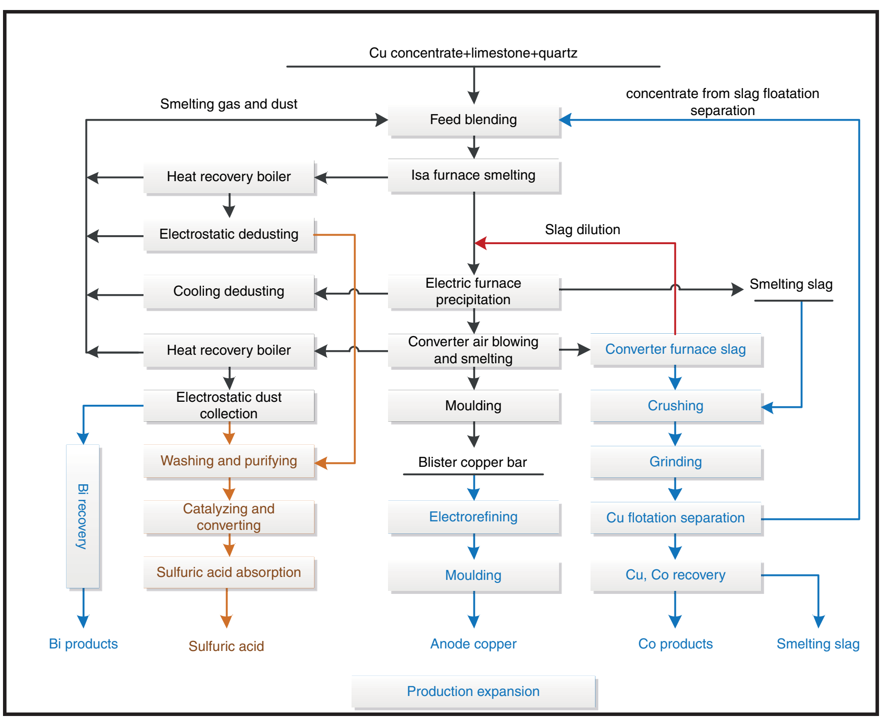

Figure 8-12: CCS Pyrometallurgical Smelting Flowsheet

Feeds Blending

Pyrometallurgical copper smelting at CCS uses Cu concentrate produced from Lumuwana, Kanshanshi, NFCA, Chibuluma and Luanshya as raw materials. Fluxes used are quartz and limestone. Cu concentrates, fluxes, coal and recycled dust from smelting are stored separately at the smelter prior to being sent to their own feed bins (14 to 17m^3) by cranes, and then constantly transferred to the feeder on the top of smelting furnace by conveyor belt using a fixed scale and quantities so that feed materials are blended.

Smelting

The smelter uses the advanced smelting furnace oxygen injection and oxygen rich bath smelting process. The smelting furnace is an Isa furnace, the intellectual property of which is held by Xstrata Technology Pty Limited. A lance into the feed mixture of the furnace injects air with a relatively high oxygen content forming a high temperature bath where the solid feed, smelting fluxes and air react and reactions of heating, dewatering, dissociation, smelting, oxidization, matte smelting and slag formation are finished. The heat needed for bath temperature maintenance comes from the smelting process itself and is maintained by the addition of coal to the feed mixture injected through lance. Bath temperature is controlled at 1,170 to 1,200°C. Because the smelting temperature is relatively low, natural cooling is used for Isa furnace cooling. Gas generated is sent to the heat recovery boiler for cooling and de-dusting and then to the dust catcher for purifying prior to sulfuric acid production.

Electric Furnace Precipitation

Matte and slag in an Isa furnace are difficult to separate due to strong agitation. In view of this, an electric furnace is used. The precipitation electric furnace has 3 self baking electrodes with a diameter of 1m and capacity of 6300KVA. Using electrical power, the electric furnace is controlled at 1,200 to 1,280°C where matte and slag are layered and separated. Slag is removed, cooled and stored in a slag dump. Approximately 1.3t of slag with a Cu grade <1% will be generated to produce one tonne of blister Cu. The matte with Cu content of 50 to 65% is poured into tundishes and then sent to the converter for further processing. Gas from electric furnace precipitation has a low content of SO_2 which is cooled by water and purified by dust catcher and finally discharged to the air through a chimney.

Converter Air Blowing and Smelting

The converter air blowing and smelting circuit are traditional and mature consisting of three set of P-S converters with blister copper production capacity of 100 to 150t per day, a diameter of 4m and length of 11.7m. Each circuit is operated in series. Matte from the previous electric furnace precipitation circuit is fed to the converter with a quartz flux and high oxygen content air to remove impurities of S and Fe by oxidization. Blister copper is produced. The whole air blowing and smelting circuit can be divided into two sections of slag generation and copper production. The air blowing and smelting of slag generation period refers to FeS oxidization and quartz addition for slag generation. At the end of the slag generation period, the Cu content of matte is higher than 75% and Fe content is less than 1%. In the copper production period air blowing and smelting, S in Cu_2S is oxidized into SO_2 and copper melt is formed. Products in this converter air blowing and smelting circuit include blister copper, converter slag and gas. Blister copper is poured into tundish and sent for moulding. Converter slag contains approximately 8% copper, which is sent back to the previous electric furnace precipitation circuit. The gas has a high SO_2 content which is used for sulfuric acid production after passing through the heat recovery boiler and dust collection.

Blister Copper Moulding

Blister copper from the converter is sent to a moulding workshop by crane and tundish, and poured into moulds forming copper bars. Each copper bar weighs either 1.1t or 0.7t and after cooling is stored for sale.

8.3.3 Expansion Plan, Supporting Facilities and Comprehensive Utilization

Expansion Plan

CCS has conducted research on the production capacity of all pyrometallurgical smelters and main copper mines in Zambia and the demand in the local market for sulfuric acid. It is proposed to expand the Chambishi Copper Smelter's production capacity to 0.25Mtpa of copper including 70,000t of blister copper bar with Cu content higher than 99% and 180,000t of copper anode for electro-refining. Isa furnace smelting capacity is forecast to improve to 0.75Mtpa from the current 0.4Mtpa of Cu concentrate. ENFI completed the relevant expansion feasibility study and construction design at the end of 2009. At the time of this report the plant was undergoing expansion.

The expansion proposes to construct a new converter smelting circuit with associated heat recovery furnace and dust collection facilities, as well as a pressure and absorption oxygen producing system and an acid producing system. In order to improve additional value of products, two 4.15m diameter and 12m long anode furnaces with blister copper processing capacity of 300t each are proposed to be added. Blister copper is cast to copper anode which is suitable for electro-refining. The production expansion is designed to be realized by improving oxygen concentration and oxygen supply without addition to the Isa furnace and precipitation electric furnace. Regarding raw material sources, smelting techniques and sulfuric acid market demand, it is SRK's opinion that the expansion target can be achieved. However, production capacity expansion to 0.25Mtpa of copper may be difficult to achieve by simply increased oxygen injection into the Isa furnace. Detailed measures and plans to achieve the expansion target achievement should be worked out.

Sulfuric Acid Production

The gas from the Isa furnace and converter has a SO_2 content of approximately 6.8%, which passes through heat recovery, boiler dust collection and cooling and de-dusting and purifying prior to being sent to the sulfuric acid production plant where pure SO_2 gas is obtained after dilute sulfuric acid washing and purifying, heat exchange, mist removing and concentrated sulfuric acid drying. After two stages of V_2O_5 catalysis, SO_2 is oxidized into SO_3, which is then absorbed by concentrated sulfuric acid forming sulfuric acid. Sulfuric acid from the drying tower, the medium absorbing tower and the ultimate absorbing tower are mixed and stored in 6 tanks with a total capacity of 16,400m^3. Final sulfuric acid concentration is 98%.

SO_2 gas generated from copper smelting is purified by a de-dusting system and sulfuric acid production, by which environment pollution is reduced. Sulfuric acid with a concentration of 98% is produced and the production capacity is 0.25 to 0.33Mtpa. The sulfuric acid has a low impurities content and high quality, and is sold to a local copper ore hydrometallurgical smelter. As part of the production expansion, a new 0.3Mtpa sulfuric acid production line is proposed.

Oxygen Station

The oxygen plant uses a molecular sieve as the absorbent for air separation which is assisted by changes of pressure. The gas produced contains 90% oxygen which is supplied to the Isa furnace and P-S converter for smelting. Oxygen-rich air not only improves the smelting capacity, but also increases SO_2 content in the furnace gas which is used to produce sulfuric acid. Current oxygen production capacity is 1,200Nm³/h (1,200m³/h in normal state). Another 8,000Nm³/h pressure-absorption circuit is proposed to achieve the smelter expansion target.

Water Treatment Station

Water for production and domestic usage comes from the Kafue River which is located 6.2km from the smelter, and from where water is pumped to a pond constructed in the water treatment plant. 19,200m³ of water is transported to the plant every day, and this is sufficient to meet the expanded demand for production and domestic usage. The water treatment plant uses a flocculant agent to process river water to deionized water and soft water. After passing through a flocculation-sedimentation-filtering and absorption process, treated water is supplied to the heat recovery boiler and smelting furnace and as equipment cooling water. The production capacity of the water treatment plant is 1,200m³/d, which can meet current smelting needs. To achieve production expansion target, a new 8,000m³/d line is proposed to increase the ultimate water treatment capacity to 9,200m³/d. A total of 19,000m³/d water including 8,000m³ fresh water is forecast to be consumed when the production expansion is completed, all of which can be supplied by the water treatment plant.

Power Plant

The Isa furnace and three converters are separately equipped with heat recovery boilers. Deoxidized, deionized water is injected into the heat recovery boiler. High temperature gas is cooled by a heat exchanger and heat is recovered for saturated steam generation, and then the steam is fed to the thermal power plant driving steam turbine for power generation. Dust from the gas is settled in the boiler, so that the discharged gas is suitable for de-dusting and sulfuric acid production.

The temperature of the gas from Isa furnace and converter is about 1,200°C, which is reduced to about 350°C in heat recovery boiler. Deoxidized deionized water injected into the heat recovery boiler is increased in temperature from 104°C to 257°C. Through a heat exchange process, saturated steam is separated and transferred by pipeline to the power plant to drive steam turbines, during which process steam's temperature is reduced to 60°C. Steam is recycled and re-injected to the heat recovery boiler for another cycle of heat exchange and power generation.

The installed capacity of the electricity generation plant is 5,000kW. At the time of the SRK site inspection, 168.43kWh of electricity was generated for each tonne of blister copper smelting, which accounted for approximately 15% of total smelter power consumption. The proposed smelter production expansion plan is to add one more converter and one heat recovery boiler to increase steam and power generation. It is expected that the power generated by recovered heat from the smelter can account for up to 17 to 18% of the total power consumption of the smelter when the expansion target is achieved.

Comprehensive Utilization

Cu Recovery from Converter Slag

Au, Ag and Co are concentrated into matte with other metal sulfides during blister copper smelting, and then Co is concentrated into converter slag in form of an oxide, while Au and Ag are concentrated into blister copper in the converter. The total recovery rate of Au and Ag can be 94% or higher. Because converter slag has 6 to 8% Cu and 0.8 to 1.2% Co, it is sent back to converter to recover more Cu. However, metal recovery cannot achieve a good performance as Cu and Co is lost in smelting slag and dilution. A flotation separation processing plant is under construction and proposes to recover Cu from converter slag. The processing plant is planned to be put into production at the end of 2011 for existing slag processing. When the expansion target is achieved, smelter slag and converter slag will be processed in the same circuit at staggered processing times. The processing plant has a designed production capacity of 1,200tpd using three closed stages of crushing and two closed stages of grinding to crush the slag to 85% passing 43μm. The flotation circuit consists of one stage rougher flotation, two stages of scavenging and two stages of cleaning for Cu concentrate and tailings. The Cu concentrate will be sent to the Isa furnace with gas recovered by the heat recovery boiler after moisture is reduced to below 12%. Tailings are processed for Co recovery. The designed flotation separation parameters are indicated in Table 8-10.

Table 8-10: Cu Recovery Indexes of Slag

Item	Unit	Smelting Slag	Converter Slag	Total
Slag	t/a	318,498	79,416	397,915
Slag grade	Cu%	0.80	8.70	2.38
Concentrate yield	%	5.497	23.875	9.165
Concentrate	t/a	17,508	18,961	36,469
Tailings	t/a	300,991	60,456	361,446
Concentrate grade	Cu%	8.57	34.40	22.00
Tailings grade	Cu%	0.35	0.64	0.40
Cu recovery rate	%	58.89	94.40	84.83

Co and Bi Recovery

In 2010, the feed materials had Co and Bi grades of 0.154% and 0.036%, respectively, therefore Co and Bi recovery could provide additional profit to CCS. Co is mainly concentrated in the converter slag during the smelting process and then in flotation tailings during Cu flotation. The slag is ground to 85% less than 0.043mm prior to Cu flotation, which is quiet favorable for Co recovery. Flotation tailings have 0.5 to 0.6% Cu and 0.8 to 1.2% Co. Agitation leaching is used for Cu and Co extraction. Reverse circulation solution is used for electrolytic copper and electrolytic cobalt production through the electrowinning method. CCS has signed a contract with a technical company in Hunan Province for research on flotation tailings Cu and Co extraction techniques. Both companies intend to set up a jointly owned plant for Cu and Co recovery. The plant is expected to be commissioned at the end of 2013 and it is designed to process material containing 300t of Cu and 500t to 700t of Co.

Bi is mainly concentrated in gas and dust collected by the converter electrostatic dust collection circuit with content higher than 10%. Every day about 3t of gas containing Bi is generated. On the site SRK found that collected dust is bagged and stored in raw material stockpile. CCS commissioned Yunnan Copper Science Development Co., Ltd to complete Cu and Bi extraction research, from which hydrometallurgical smelting including leaching and electrowinning was proposed. Final products of BiOCl with a Bi content higher than 60% and 99% purity electrolytic copper can be obtained. The Bi recovery rate is no less than 95% and the total Cu recovery rate is also no less than 95%. Research tests and verification tests are coming to an end and relevant design is about to commence. After consideration of the gas increase caused by the production expansion, a 6tpd converter gas processing line is currently under construction and is expected to be completed by mid 2012.

8.3.4 Smelting Performance

The technical parameters of the Chambishi Smelting Plant from 2009 to 2011 are listed in Table 8-11. The designed blister copper quality has been achieved and more than 94% of precious metals are concentrated in the blister copper. In 2009, the Au and Ag grades in blister copper were 7.1g/t and 52.9g/t, respectively. When the smelting slag flotation separation system is put into operation, the total recovery rate of Cu is expected to increase to 98% or higher. Additionally, the Cu recovery rate is expected to further increase from the use of Co and Bi extraction.

Table 8-11: Technical Parameters of CCS Pyrometallurgical Smelting Plant, 2009 to 2011

Item	Unit	2009	2010	2011
Feed Cu concentrate	t	333,749	457,334	458,771
Concentrate grade	Cu%	37.31	35.16	33.62
Contained Cu metal in concentrate	t	124,519	160,804	154,233
Blister Cu output	t	108,419	165,118	150,863
Blister Cu grade	Cu%	99.19	99.08	99.01
Contained Cu metal in Blister Cu	t	107,538	163,600	149,365
Cu metal tonnage in recycled feed	t	11,435	-8,774	34,896
Cu recovery rate	%	95.55	96.28	96.59
Sulfuric acid output	t	217,117	330,034	328,842
Sulfuric acid concentration	%	98.32	98.21	98.25

8.3.5 Materials Consumption and Production Cost

The material consumption required to produce one tonne of blister Cu is indicated in Table 8-12. The amount of kerosene, coal and electricity consumed has been converted into a coal equivalent for calculation and statistics. Due to high head grade and because waste heat is used for electricity generation, 184.2kg of coal equivalent is required for each tonne of blister copper production. This number is far below the 550kg limit stipulated in national standards of China for comprehensive materials consumption for each tonne of blister copper production. The operating costs are discussed in Chapter 11.

Table 8-12: Material and Energy Consumption

Item	Unit	2009	2010	2011
Fuel	l	14.55	8.41	7.04
Coal	kg	139.5	122.61	98.59
Power	kWh	1,010	870	947
Energy	BTU	235.6	184.2	182.3
Fluxes	kg	272.5	224.4	227.8
Oxygen	Nm^3	689.2	563.1	677.8
Refractory Materials	kg	12	12	12
Electrode Paste	kg	3	3	3

8.3.6 Conclusions and Recommendations

The CCS smelter is rationally designed and well constructed. The smelter uses "Isa furnace smelting-electric furnace precipitation-PS converter air blowing and smelting" flow for Cu smelting, which conforms to local practices and is relatively easy to operate.

Raw materials fed to the furnace do not need to be dried, so the whole smelting process is simplified and production cost is reduced. Moreover, the Isa furnace's life is prolonged by the adoption of furnace temperature control and natural cooling system which can further reduce production costs.

SRK believes it is rational to replace the electric furnace by flotation separation for copper recovery from converter slag, by which the overall Cu recovery rate is forecast to increase to 98% or higher. Bi and Co recovery is possible and the relevant design is applicable, and an additional profit is expected to be achieved.

After considering raw material supply and local sulfuric acid demand, SRK believes expansion from 0.15Mtpa to 0.25Mtpa blister copper production is reasonable. However the existing Isa furnace production capacity may not be expanded sufficiently only by improving oxygen injection. It is suggested that the proposed Isa furnace production capacity increase plan should be reconsidered.

8.4 CNMC Luanshya Copper Mines PLC (CLM)

8.4.1 Introduction

Luanshya copper mine was once a joint enterprise; it operated several copper mines, one processing plant and one smelter. The mine and processing plant construction commenced in 1928 and production began in 1931. The smelter was put into production in 1933 with a production capacity of 40,000tpa, and the capacity exceeded 100,000tpa in the 1960s, which made it the biggest copper producer in Zambia. The smelter was closed a long time ago.

In 1997, Ramcoz acquired the mine and in 2000 commenced the management and operation of the Luanshya copper mine, Baluba copper mine and its associated processing plant. Production was suspended in October 2000 due to an electricity shortage, but in January 2001 it was resumed. In February 2001, a rainstorm caused the Luanshya River to flood the collapsed area of the mine causing another production suspension. In April 2001, the Baluba copper mine's production was also suspended because of an unsatisfactory performance.

In 2004, a Dutch company, ENYA, established LCM through a business acquisition. The LCM assets include the Luanshya copper mine, Baluba copper mine, Baluba processing plant and their supporting facilities which were put back into operation. In January 2004, Luanshya copper mine was closed, production of LCM was transferred to the Baluba copper mine and processing plant. In 2006, LCM acquired the mining right of the Muliashi North mining area and commissioned Bateman to complete a mining design to achieve a capacity of 60,000tpa Cu cathode. However, LCM suspended production in December 2008 and transferred the mine with associated processing plant to CLM. CNMC holds 80% share of CLM.

The mining area owned by CLM can be divided into 7 sections. From west to east and from north to south they are Baluba Center, Baluba East (further divided as south wing and north wing), Muliashi North, Muliashi South, Roan Extension West, Roan Extension East and Roan Basin area, in which Muliashi North and Baluba East (south wing) have not been developed so far. By the end of 2009 the Baluba Center Mine has been recommissioned to operate with a capacity of 1,500tpd sulfide ore and the further production capacity is expected to achieve 5,000tpd. Excavated ore is sent to the Baluba Processing Plant by an 11.4km long belt conveyor. Except for approximately 20Mt sulfide ore at Luanshya, West Extension and Roan Extension East which has not been excavated, sulfide ore at the other locations has been mined out. Due to a large-scale surface collapse and settlement and for safety reasons, the overlying oxidized ore in these areas cannot be used. The oxidized ore in Muliashi North and Baluba East (south wing) can be utilized, and it is the main raw material source for the Muliashi Leach Plant.

At the time of this report CLM had three mineral processing plants, namely the Baluba Processing Plant, Muliashi Leach Plant, and Baluba Smelting Slag Processing Plant. According to the production recovery design compiled by Shenyang Design and Research Institute of Nonferrous Metallurgy in September 2009 for the Baluba copper mine, equipment and techniques in the processing plants were to be updated, and 3,000tpd processing capacity was achieved by the end of 2009 and 5,000tpd was achieved by the end of 2010. NERIN designed Muliashi Leach Plant to achieve a capacity of 40,000tpa Cu cathode product. This plant commenced production in March 2012. CLM plans to repair the original 4 ball mills and replace old flotation cell in the Baluba Processing Plant to allow processing of the smelting slag.

8.4.2 Baluba Processing Plant

History and Current State

Since the Baluba Processing Plant was commissioned a long time ago, equipment is outdated and the processing flow is not optimal. In June 2009 when CLM was formed, a production recovery and plant update plan were designed and implemented. The crushing system and flotation circuit were all replaced with new equipment, three sets of 3.5m × 4.5m ball mills were repaired, one flotation column and two ceramic filters were added and the processing flow was upgraded, so that 5,000tpa processing capacity was achievable. The upgraded flowsheet is similar to the NFCA Chambishi Processing Plant and is used for processing sulfide ore excavated from the Baluba Center Mine. The product consists of a Cu-Co concentrate and is sold to CCS, while the tailings are dewatered prior to being pumped to the TSF.

Figure 8-13 shows the ball mills of the Baluba Processing Plant after they have been repaired and SRK notes that they are now in good condition. The processing capacity of the plant has been returned to the original 5,000tpd. However, due to insufficient feed, the actual processing throughput at the time of this report was less than 4,000tpd. During SRK's site visit, one 3.5m × 4.5m ball mill, four 2.4m x 2.7m ball mills and 120 sets of 8.5m^3 flotation cell were still undergoing repair and maintenance. CLM proposed to change those flotation cells to save energy when processing historical smelting slag. Relevant technical upgrading was completed by the end of 2011.

Figure 8-13: Ball Mills at Baluba Processing Plant

Technical Parameters

Table 8-13 shows the technical parameters at Baluba Processing Plant from 2009 to 2011. The Cu recovery rate achieved was a high level of 93 to 95%. Baluba ore is mainly chalcopyrite, with some pyrite and small quantities of bornite and carrollite. The ore has a Co content of 0.1%. About 48% Co exists in carrollite and 32% exists in pyrite. The Cu mainly occurs as chalcopyrite, which has a lower Cu content of chalcopyrite than the secondary Cu minerals of bornite and chalcocite, therefore the Cu grade in the concentrate is relatively low (approximately 25% in 2011). Due to the high pyrite content of the ore from Baluba Center Mine and in order to increase the Cu grade of the concentrate, the pyrite should be prevented from being concentrated into the Cu concentrate. Because the pyrite is the main carrier of Co, so the recovery of Co is also lower.

Table 8-13: Production Index of Baluba Processing Plant, 2009 to 2011

Item	Unit	2009	2010	2011
Ore Milled	t	6,580	765,446	1,247,163
Head Grade	Cu%	1.42	1.40	1.36
	Co%	0.13	0.10	0.11
Concentrate	t	608	49,339	63,015
Ore Milled/Concentrate	t/t	10.82	15.51	19.79
Concentrate Grade	Cu%	14.57	20.30	25.42
	Co%	1.07	1.09	0.90
Contained Cu Metal in Concentrate	t	89	10,016	16,018
Recovery rate	Cu%	94.81	93.48	94.43
	Co%	76.05	67.56	40.14

Materials Consumption and Production Cost

The system for reagent use at the CLM Baluba Processing Plant is very simple. To produce one tonne of concentrate, 857g of lime is used as pH regulator, 21g of sodium iso-butyl Xanthate ("Sipx") is used as a collector, 9.6g of sodium n-butyl xanthate ("Snpx") is used, 27.2g of terpenic oil (2#) is used as a foaming agent and steel ball consumption is 529g. The quantity of these reagents used is quite small so that the production costs is at a relatively low level. The operating costs are discussed further in Chapter 11.

Tailings Storage Facilities

The Musi TSF is formed by a valley interception dam and is located at the entrance of the Musiyakupatwa which is 7km northwest of Baluba Processing Plant. The dam is constructed of coarse tailings. To date 115.3Mt of tailings have been stored. In the design complied by Shenyang Design and Research Institute of Nonferrous Metallurgy for Baluba Processing Plant production recovery, the Musi TSF storage capacity expansion has also been included. CLM commenced the construction based on this design. At the time of SRK's site visit, three ledges have been formed and each of them is constructed with a 5m wide berm and flood discharging channel, and on the top of which a 10m high subsequent ledge is proposed to be constructed of compacted rock to increase the total TSF design capacity by 18,356,000m^3 with an effective capacity of 12,850,000m^3. Based on an annual ore processing capacity of 1.5Mt, the expanded TSF can provide storage for 13 years.

The flood carrying capacity of the existing spillways at the Musi TSF is not sufficient, therefore it is proposed to widen it to 18.0m with a series of weirs, increasing the frequency of major flood reduction to once every 1,000 years. Spillways are constructed of a mortar stone structure with draining pipes.

Tailings are pumped to the TSF by six slurry pumps through two lines of 400mm diameter rubber lined pipes having a length of 8,000m each. Recycled water flows to Luanshya Dam formed by impounding the Luanshya River upstream. The Luanshya Dam is the water resource for the processing plant and water collected comes from upstream of Luanshya River, Baluba mine water and Musi TSF recycled water. The water quantity in Luanshya Dam exceeds the processing plant fresh water consumption.

8.4.3 Muliashi Leach Plant

The Muliashi Leach Plant processes oxidized ore of the Muliashi North Mine. In the future, the plant is also expected to process ore from the Baluba East Mine. Considering oxidized ore can be easily dissolved by acid, in 1998 SNC-Lavalin conducted a leaching test on samples. The copper recovery was higher than 70%, ambient agitation leaching yield rate was 51 to 58% and heated agitation leaching yield rate was higher than 75%. In 2008 Mintek (of South Africa) used a 6m high column for a hard ore sample leach test. The leaching cycle was 180 to 246 days and the Cu leach yielding rate was 72.9 to 76.9% with a sulfuric acid consumption of 40,000 to 56,000g for processing one tonne of ore. A soft ore sample was agitated and leached at a temperature of 65°C and had a Cu leach rate of 82 to 87% and a Co leach rate of 20 to 25% with a sulfuric acid consumption of 27,000 to 53,000g for processing one tonne of ore.

Feasibility studies were conducted separately in 1998 and 2008, and both of them selected the "open pit mining-heap leaching and heated agitation heap leaching-extraction-electrowinning" for producing copper cathode. In June 2010, NERIN completed a preliminary design for the Muliashi Leach Plant called "heap leaching and heated leaching-extraction-electrowinning" to process oxidized ore excavated from Muliashi North and Baluba East Mines. The processing capacities for hard and soft ore were designed to be 3.6Mtpa and 900,000tpa, respectively, with a total of 4.5Mtpa, and the annual Cu cathode production capacity was designed to be 40,000tpa.

Hard ore is crushed to -50mm and then sent for screening to produce -6mm fine ore. 6-50mm coarse hard ore is then sent for heap leaching at a designed leaching capacity of 2.556Mtpa and Cu metal output of 21,000tpa. -6mm fine ore is ground to 80% less then 106μm with soft ore and then sent for heated agitation leaching at a leaching capacity of 1,944Mtpa and Cu metal output of 19,000tpa. The technical parameters are indicated in Table 8-14. SRK believes that the design is reasonable and can be achieved.

Table 8-14: Muliashi Leach Plant Production Parameters

Item	Unit	Value
Heap Leaching		
Feed Ore	1,000t	3,060
Ore Grade	%Cu	1.23
Ore size	mm	6 to 50
Cu Leaching Rate	%	72
Agitation Leaching		
Feed Ore	1,000t	1,440
Ore Grade	%	1.36
Ore size	mm	0.106 (80%)
Cu leaching Rate	%	82
Cu Recovery Rate from Leachate	%	96
Extraction-electrowinning		
Cu Extraction Recovery Rate	%	98
Cu Electrowinning Recovery Rate	%	99.5
Cu Cathode Output (99.95%)	t	40,000

A total of US$350 million was designed to be invested in the Muliashi Leach Plant project, involving open pit mining, processing, TSF construction, infrastructure construction and relevant supporting facilities construction. Trial production lasted three months, the stabilized production duration is 8 years, the forecast production reducing period is 4 years and the total operation duration is 12.5 years. The processing plant is located at the west of Muliashi North open pit and adjacent to the 500m blasting safety line. Co is planned to be concentrated during leaching and extraction circuit of Cu recovery, but no Co recovery has been constructed (space has been allocated in the agitation leaching plant for future construction). Due to a relative high Co content of the Luanshya mining area, it is SRK's opinion that construction of a Co recovery circuit should be conducted at the same time as the Cu circuit and the relevant design work should be completed as soon as possible.

According to "*Preliminary Design Report of Muliashi 40Ktpa Cu Cathode Project*" by NERIN in December 2010, the designed operating cost is to be USD 3,539 per tonne product (Metal Cu), in which the direct operating cost is to be USD 2,475.59 per tonne product (Metal Cu). SRK reviewed the related data, and disclosed the operational cost forecasts within Chapter 11.

Figure 8-14: An Overview of Muliashi Leach Plant

8.4.4 CLM Production Plan

Table 8-15 shows the CLM history and forecast of the production plan for the period 2009 to 2014. The target of 1.5Mtpa throughput is difficult to achieve at the Baluba Processing Plant because mining capacity cannot currently provide sufficient ore feed. The construction of the Muliashi Leach Plant is ongoing and the associated mine is at the stage of surface soil stripping for infrastructure construction. In order to achieve the proposed production goals, SRK suggests improving the capacity of mining and heap leaching. The Baluba Smelting Slag Processing Plant should be put into production as early as possible. Due to the available slag quantity and the existing equipment allocated, the proposed 0.3Mtpa production capacity should be increased to 0.6Mtpa or higher and Co concentrated in the slag should be recovered.

SRK does not agree with separating Co from Cu concentrate which is planned at the Baluba Processing Plant, because the Co concentrate obtained in this way will have a high content of Cu and a low content of Co with a high investment and cost. It is more practical to separate Co concentrate from smelting slag at the CCS plant. Because 32% Co of the Baluba ore is concentrated in pyrite which in turn contains 1.95% Co, SRK believes that a study on a flowsheet to achieve "Cu and (pyrite) bulk separation-Cu and S separation, Co separation for S concentrate" is necessary to increase Co recovery rate.

Table 8-15: CNMC Luanshya Copper Mines PLC, CLM Production Plan

Plant	Unit	2009	2010	2011	2012	2013	2014
Baluba Processing Plant(1)							
Ore Treated	1,000t	7	765	1,247	1,400	1,500	1,500
Concentrate Output	1,000t	1	49	63	76	81	79
Contained Cu Metal	t	88	10,017	16,018	18,500	19,845	19,845
Muliashi Leach Plant(2)							
Ore — Heap Leaching	1,000t				1,065	2,556	2,556
Ore — Agitation Leaching	1,000t				1,472	1,942	1,942
Cu Cathode Output	t				18,912	32,959	40,033

Notes:

(1) Recoverable test in 2009, trial production in 2010 and production from 2011.

(2) Feasibility study in 2009, design in 2010, trial production in 2011 and production from 2012.

8.4.5 Conclusions and Recommendations

The Baluba Processing Plant has been upgraded, by which outdated equipment has been eliminated and the production flow optimized. Based on the actual production parameters, the reconstruction has been successful. However due to the insufficient ore feed, the actual processing capacity in Baluba Processing Plant has not achieved the designed 1.5Mtpa.

The Co content in extracted ore is relatively high at about 0.1%; where 48% Co exists as carrollite and 32% Co is concentrated in pyrite. Currently, the flotation process is to extract Co in both carrollite and pyrite into the Cu concentrate. CLM is planning to separate Co concentrate from this Cu concentrate product through flotation and hydrometallurgical processes.

The Muliashi Leach Plant is rationally designed to produce 40,000tpa electrolytic copper by hard ore heap leaching and soft ore heated agitation leaching-extraction-electrowinning. In order to achieve the production target, SRK suggests increasing both the mining capacity and the heap leaching scale to provide sufficient Cu metal for electrowinning. Due to a high Co content in the ore, a relevant Co recovery design should also be completed so that it can be put into production at the same time with the Cu recovery.

The smelting slag stockpile near the Baluba Processing Plant contains about 10Mt, which is a good resource for Cu and Co recovery. A study should be conducted to estimate the quantity and occurrence of all valuable metals, so that a recovery flowsheet and feasibility study can be completed and commercial production can be realized as soon as possible.

9 WORKFORCE

9.1 Workforce Numbers

Workforce numbers at each of the subsidiary companies at the end of December 31, 2011 are shown in Table 9-1, Table 9-2, Table 9-3, and Table 9-4, respectively. SRK believes that the workforce number for each operating mine, leach plant and smelter is sufficient to match the current mining and processing capacity of each company.

Table 9-1: NFCA Labor Statistic

Department	Sub-Total	Chinese	Zambian
NFCA Headquarter	**262**	**33**	**229**
Management	9	9	0
Administration and Operation	51	8	43
Safety and Environmental	25	1	24
Budget & Finance	17	7	10
Human Resources	13	2	11
Supply	50	5	45
Sales & Marketing	2	1	1
Security	95	0	95
Mining Department	**606**	**15**	**591**
Mining Operation	451	5	446
Technical	17	7	10
Equipment & Power	82	1	81
Back Fill Station	56	2	54
Metallurgical Processing Plant	**111**	**14**	**97**
Concentrator	32	8	24
Technical	14	5	9
Mechanical & Electrical	33	1	32
Lab	32	0	32
Contractor 1 ("Jinchengxin")	1,907	176	1,731
Contractor 2 ("Sinomine Resouce")	252	60	192
Contractor 3 ("Tongling Zhongdu")	295	90	205
Total	**3,433**	**388**	**3,045**

Table 9-2: CLM Labor Statistic

Department	Sub-Total	Chinese	Zambian
Management	11	9	2
Underground Mining	1,343	6	1,337
Concentrator	293	7	286
Operations	269	2	267
Mechanical & Electrical	4	1	3
Production Services	130	0	130
Technical	129	8	121
Muliashi Project	60	26	34
Human Resources	25	0	25
Luanshya Hospital	124	0	124
Budget & Finance	23	5	18
Supply	41	8	33
Safety and Environmental	34	0	34
Administration & Corporate Affairs	95	8	87
Trust School	38	0	38
Craft School	11	0	11
Contractor 1 ("Panorama Security")	414	0	414
Contractor 2 ("Zambian Nonferrous Metals Exploration & Construction Limited")	184	0	184
Contractor 3 ("Workforce Contractors Ltd")	54	0	54
Contractor 4 ("Geology and Construction Co")	66	8	58
Contractor 5 ("Shunxin Investment")	73	0	73
Contractor 6 ("MCC 15")	1,320	370	950
Contractor 7 ("Chipako Priviate Co")	30	0	30
Contractor 8 ("Pro-Earthworks")	25	0	25
Contractor 9 ("PIGOTT")	14	0	14
Contractor 10 ("LWP Enterprises Ltd")	13	0	13
Contractor 11 ("MS Shamrock Ltd")	66	0	66
Total	**4,889**	**458**	**4,431**

Table 9-3: CCS Labor Statistic

Department	Sub-Total	Chinese	Zambian
CCS Headquarters	**1,129**	**135**	**994**
Management	8	8	0
Administration and Corporate Affairs	57	11	46
Technical & Engineering	32	3	29
Equipment	174	9	165
Lab	54	9	45
Marketing	52	8	44
Human Resources	12	2	10
Budget & Finance	5	4	1
Acid Plant	80	10	70
Slag Processing Plant	80	8	72
Oxygen Plant	38	5	33
Power Station	50	11	39
Production & Technology	5	4	1
Safety, Heath & Environmental	31	0	31
Supply	28	3	25
Water Plant	20	3	17
Copper Smelter	398	32	366
Beijing Office	5	5	0
Contractor 1 ("H.G.Security")	62	0	62
Contractor 2 ("MCC 15")	804	212	592
Total	**1,995**	**347**	**1,648**

Table 9-4: SML Labor Statistic

Department	Sub-Total	Chinese	Zambian
Management	7	6	1
Administration & HR	24	4	20
Operations	16	4	12
Budget & Finance	4	3	1
Technical & Production Services	17	4	13
Public Relations	3	0	3
Electrolytic Plant	40	4	36
Tailings Treatment	101	5	96
Concentrator	55	7	48
Mechanical & Electrical	19	1	18
Leaching Plant	67	5	62
Oxide Ore Purchasing	5	3	2
Engineering	6	1	5
Police GTeam (Security)	35	0	35
Total	**399**	**47**	**352**

9.2 Assessment of Workforce

Based on the labor contract laws of the Republic of Zambia, all Company staff and employees have signed work contracts. The Companies also pay allowances including housing, medical, underground, work injury, transportation, telephone, annual bonus, unemployment, leave, long service awards and national pension scheme funds for employees. SRK was informed during the site visit that the Companies' staff and contractors are relatively stable.

As of December 31, 2011, workforce numbers including management staff, technical staff, operational staff, and exploration, mining and construction contractors in total were 3,433 at NFCA, 4,889 at CLM, 1,995 at CCS and 399 at SML. The total staff turnover is about 8% per year. SRK was informed during the site visit that the Company is planning to decrease the turnover rate and build more stable management and production teams by further improving safety conditions and increasing salary levels.

10 OCCUPATIONAL HEALTH AND SAFETY

10.1 Safety Permits and Procedures and Training

The main Safety Permit for mining and minerals projects under Zambian legislative requirements is the Annual Operating Permit issued by the Mines Safety Department of Zambia. SRK sighted and reviewed CNMC Subsidiary Companies Annual Operating Permits for the last three years (except for operations younger than three years old — where SRK reviewed the permits from the beginning of operations until present). At the time of SRK's site visit the SML and Luanshya Projects had not received their Annual Operating Permit for 2011 but SRK sighted the submitted applications for their required Annual Operating Permits.

SRK was provided with Emergency Response Plans (ERP) for the CNMC Zambia Project's individual subsidiary companies operations which covered the base requirements for responding to mine emergencies. SRK also sighted and reviewed documented Occupational Health and Safety (OHS) management systems/procedures for the CNMC Zambia Project's operations. The reviewed OHS management systems and procedures which have mainly been developed by the companies' Environmental and Social Departments include:

- Health and Safety Policy and Plan
- Safety Management System Organizational Chart

- Hazard Register for Mine Work — for Daily use
- Hazard Register for Entry to Underground Work
- Hazard Register for underground Development activities
- Shaft Firefighting requirements list
- Hazard Register for start of shift
- Hazard Register from Entry examination
- Hazard Register for underground support activities
- Hazard Register for extending service columns
- Hazard Register for Face Preparation
- Hazard Register for underground area marking off
- Hazard Register for handheld drilling
- Hazard Register for Explosives Management
- Hazard Register for Explosives Charging up
- Hazard Register for Blasting measures
- Hazard Register for cleaning development end with LHD
- Fire Risk Survey for Shaft Complex
- Fire Risk Survey for Shaft Top Risk
- Risk Register for Fixed Structures, Cu filtration plant
- Cu Filter Fixed Equipment inherent vs residual risk matrix
- Failure Mode & Effect Analysis (FMEA) Risk Assessment for underground Haulage rehabilitation, 14-9-2009
- FMEA Risk Assessment for underground drives, 1-10-2010
- FMEA Risk Assessment for removal of raisebore machine, 15-10-2010
- Hazard & Operability Study (HAZOP) for Heap Leach 9-6-2011
- Mines Risk Assessment Report (whole project) — prepared by International Mining Industry Underwriters Limited (IMIU), Mar 2005
- Risk Evaluation: Inherent v Residual after employing Corrective and Preventive Controls
- Hazard Register Long Hole Drilling, equipment transport

- Hazard Register Long Hole Drilling, drill rig assembly
- Hazard Register Long Hole Drilling, drilling operations
- Hazard Register Long Hole Drilling, dismantling drill rig
- Mines Risk Assessment Report (whole project) — prepared by IMIU, Apr 19, 2007
- Mining Risk Engineering Assessment Report — Zurich Risk Engineering Ltd, Feb 2008
- Emergency Procedures Plan, June 22, 2010
- Emergency Procedures for Fire Plan, Sept 16, 2010
- Mine Flood Control Manual REV August 1, 2009, prepared by Geology Dept
- Emergency Response Procedure, Oct 11, 2009
- Flood Control Procedures — Action Legend in Pump Chambers

10.2 Occupational Health and Safety Observations and Training

Each of CNMC's subsidiary companies has a Safety Monitoring Division which is responsible for the safety of mining, processing plants and tailing dams. Regular reviews of safety responsibilities for each workshop are conducted by the officers from the Safety Monitoring Division.

During site visits, SRK noted that appropriate safety signage was in place at hazard points throughout the various sites and the Material Safety Data Sheets (MSDS) had been promulgated, although they were not at the point of hazard at all the various project sites. SRK also notes that accident response equipment such as showers and eyebaths for contact with hazardous materials were in various states of readiness. Housekeeping in general around the entrance of the NFCA underground mine, concentrator and other areas was poor and should be improved in order to reflect best practice (i.e. clean and dry floors, infrastructure maintenance, etc.). SRK recommends an audit of accident response equipment and housekeeping procedures be undertaken and a register set up to record what equipment requires repair, what areas require new or additional equipment installed and maintenance of in place equipment.

SRK observed that CNMC employees were provided adequate personal protective equipment (PPE) for the majority of tasks they undertake and areas where they work in although this was observed to not always be the case. However, SRK notes that individuals visiting the sites were only provided minimal PPE (i.e. hardhats) when entering the work areas, no evidence of a record system for staff or visitors checking into and out of underground workings and no induction training was provided to detail hazards present about the sites and the company's standard procedures for entering said areas. SRK advises that CNMC would benefit from the continued implementation, review and improvement of the company's health and safety procedures be undertaken for entrance to all site areas; both staff and visitors.

SRK was informed that according to the new employees experience level and work field, they must accept half-day, one-day, or two-day safety training and checking required certificate or license (e.g., the use of explosives) before going to work. For specific workforces, before the start of each shift, employees hold regular safety meetings of about 15 minutes duration with the previous shift workers in their work area. The previous shift workers are required to complete a written and signed safety record to advise the incoming shift about the prevailing work conditions.

Established employees are provided with updated training every year or every second year depending on the employee's experience level. Employees with roles which require certification or licensing (e.g., the use of explosives) are trained by the relevant statutory authority. Such training could extend over seven days per annum and includes skills testing before a certificate or license is issued.

10.3 Historical Occupational Health and Safety Records

OHS statistics for the CNMC subsidiary companies have been recorded for last three years (for the operations that have been running less than three years, the last years of operation were provided). Injuries and safety related incidents are recorded. Table 10-1 shows the accident statistics of each subsidiary company for the last year.

Table 10-1: Safety Statistics for Each Subsidiary Company's Operations

	NFCA/Contractors	SML	CCS	Luanshya/Contractors
2009 Minor Incidents / Injuries	1/52	Not Reported	59	Not Reported/n.a.
2009 MSD Reportable Accidents	0/23	0	6	4/n.a.
2009 Fatalities	1/3	0	0	1/n.a.
2010 Minor Incidents / Injuries	2/16	Not Reported	59	Not Reported/n.a.
2010 MSD Reportable Accidents	0/8	0	3	10/n.a.
2010 Fatalities	1/1	0	1	1/n.a.
2011 Minor Incidents / Injuries	2/23	0	46	44/12
2011 MSD Reportable Accidents	1/7	0	0	9/3
2011 Fatalities	0/1	0	0	1/2

Note:

* "not applicable" (n.a) is reported for Luanshya Contractors in 2009 and 2010 as NFCA reported to SRK that no contractors had been working at the site prior to 2011.

SRK considers the existence of the above accident statistics and procedures being developed to show that each subsidiary company has been generally committed to safety training, provision of safety equipment and safety monitoring. SRK recommends that all minor and near miss statistics should also be included in the regular compilation and review of safety statistics.

11 PRODUCTION, OPERATING AND CAPITAL COSTS

11.1 Production History

Table 11-1 shows the CNMC's four subsidiary companies' historical production records from 2008 to 2011.

Table 11-1: Historical Production Records of Mines and Plants

Mine/Plant	Item	Unit	2008	2009	2010	2011
NFC Africa Mining PLC						
Chambishi Cu Mine	Ore Mined	t	1,450,983	1,358,042	1,338,137	1,515,429
	Ore Grade	Cu (%)	1.87	1.81	1.75	1.67
	Where: Chambishi Main Mine	*t*	*1,450,983*	*1,358,042*	*1,288,137*	*1,028,306*
	Ore Grade	*Cu (%)*	*1.87*	*1.81*	*1.75*	*1.58*
	Where: Chambishi West Mine	*t*	*N/A*	*N/A*	*50,000*	*487,123*
	Ore Grade	*Cu (%)*	*N/A*	*N/A*	*1.86*	*1.86*
Chambishi Concentrator	Ore Treated	t	1,450,916	1,358,682	1,330,539	1,569,187
	Cu Concentrate	t	58,189	53,341	50,325	61,119
	Concentrate Grade	Cu (%)	44.68	44.06	43.78	38.03
	Treated Ore/ Concentrate	t/t	24.93	25.47	26.44	25.67
	Cu Recovery Rate	(%)	95.83	95.57	94.61	88.69
Sino-Metals Leach Zambia Ltd						
Chambishi Leach Plant	Cu Cathode	t	6,505	6,513	7,103	7,003
	Cu Recovery Rate	Cu (%)	75.36	71.96	85.36	86.98
Chambishi Copper Smelter Ltd						
Chambishi Cu Smelter	Blister Cu	t		108,419	165,118	150,863
	Blister Cu Grade	Cu (%)		99.19	99.08	99.01
	Cu Recovery Rate	Cu (%)		95.55	96.28	96.59
CNMC Luanshya Copper Mines PLC						
Baluba Cu Mine	Ore Mined	t		6,580	765,446	1,224,068
	Ore Grade	Cu (%)		1.42	1.40	1.36
		Co (%)		0.13	0.10	0.11
Baluba Concentrator	Ore Treated	t		6,580	765,446	1,247,163
	Cu Concentrate	t		608	49,339	63,015
	Concentrate Grade	Cu (%)		14.57	20.30	25.42
		Co (%)		1.07	1.09	0.90
	Treated Ore/ Concentrate	t/t		10.82	15.51	19.79
	Cu Recovery Rate	(%)		94.81	93.48	94.43
	Co Recovery Rate	(%)		76.05	67.56	40.14

11.2 Operation Costs

CNMC's four subsidiaries' management provided cash operating cost analysis including mining operations, ore processing plants, electrolytic copper plant, and smelter. Consumption of reagents and other materials in the operating cost records are based on prices obtained by suppliers overseas. Information regarding salary scales was used to calculate labor costs. Power consumption and costs were based on local standards in Zambia.

11.2.1 Mining and Processing Costs

Mining is conducting by underground mining techniques utilizing either the services of mining contractors or the subsidiaries' own employees. For mining and development, contractors are responsible for partly providing the necessary production and support equipment as well as all direct labor and front line supervision. The Company generally provides explosives to the contractors. The Company also provides power and water supplies for mining operations carried out by contractors. The mining contracts are signed based on the amount of ore mined and its quality control such as the average grade as well as loss rate and dilution rate. The mine development contracts are signed based on the footage of a certain height × width tunnel that the contractor is required to complete. Safety and environmental issues are also detailed in the contract to define liabilities and responsibilities for both parties.

The operating costs for mining and ore processing plants at Chambishi and Baluba are estimated based on mine and plant monthly production data. Table 11-2 shows the operating costs of mining and processing plant (unit: USD per tonne of copper concentrate). The major cash operating costs for mining were from consumables, on-site and off-site administration, labor, fuel and electricity, and non-income taxes and governmental charges; and for ore processing were from the on-site and off-site administration, non-income taxes and governmental charges, consumables, labor, and fuel and electricity. It should be noted that the operating costs for the CNMC's projects were sourced from the management accounts of the Group's subsidiaries. SRK only classified the costs based on the requirements of the HKEx in Chapter 18.

Table 11-2: Mining and Processing Costs (USD/t), 2009 to 2011

Cash Operating Cost	NFCA-Chambishi Operation		
	2009	2010	2011
Workforce Employment	139.76	187.26	207.86
Consumables	154.95	156.09	107.59
Mining Contact	801.00	871.45	991.47
Fuel, Electricity, Water and Other Services	79.32	106.88	145.91
On-site and off-site Administration	245.45	274.61	318.49
Environmental Protection and Monitoring	0.86	0.90	0.85
Transportation of Workforce	2.74	7.20	7.80
Product Marketing and Transport	46.51	93.52	102.19
Non-income Taxes, Royalties and Other Governmental Charges			
Contingency Allowance			
Total	**1,470.58**	**1,697.92**	**1,882.16**

Cash Operating Cost	CLM-Baluba Center Operation		
	2009	2010	2011
Workforce Employment(1)		416.71	462.56
Consumables		378.12	475.50
Mining Contract			
Fuel, Electricity, Water and Other Services		92.50	128.86
On-site and off-site Administration		277.17	276.05
Environmental Protection and Monitoring		0.28	0.25
Transportation of Workforce			
Product Marketing and Transport		12.55	16.92
Non-income Taxes, Royalties and Other Governmental Charges			
Contingency Allowance			
Total		**1,177.32**	**1,360.13**

Note:

(1) Fees of mining contractors were included

11.2.2 Copper Cathode and Blister Copper Product Costs

The operating costs for producing electrolytic copper (Cu cathode) and for smelter copper (blister Cu) and associated sulfuric acid are estimated based on the leach plant and smelter monthly operating data. The major costs were from consumables, on-site and off-site administration, labor, and fuel, electricity and other services for the Chambishi Leach Plant, and came from consumables, on-site and off-site administration, non-income taxes, royalties and other governmental charges, and electricity and other services for the Chambishi Copper Smelter (Table 11-3). It should be noted that the operating costs for the CNMC's projects were sourced from the management accounts of the Group's subsidiaries. SRK only classified the costs based on the requirements of the HKEx in Chapter 18.

Table 11-3: Cu Cathode and Blister Cu Product Costs (USD/t), 2009 to 2011

Cash Operating Cost	SML-Chambishi Leach Plant		
	2009	2010	2011
Workforce Employment	380.93	543.57	674.74
Consumables	1,121.76	1,231.45	2,041.94
Fuel, Electricity, Water and Other Services	242.75	267.07	393.28
On and off-site Administration	457.85	551.18	670.76
Environmental Protection and Monitoring	1.54	0.84	0.84
Transportation of Workforce			
Product Marketing and Transport	100.57	121.78	114.96
Non-income Taxes, Royalties and Other Governmental Charges			
Contingency Allowance			
Total	**2,305.39**	**2,715.89**	**3,896.52**

Cash Operating Cost	CCS-Chambishi Cu Smelter		
	2009	2010	2011
Workforce Employment	30.79	30.59	63.85
Consumables(1)	5,570.78	7,185.72	7,364.32
Fuel, Electricity, Water and Other Services	63.65	46.01	40.25
On-site and off-site Administration	156.97	77.61	111.49
Environmental Protection and Monitoring	0.51	0.23	0.25
Transportation of Workforce(2)			
Product Marketing and Transport	49.62	120.95	169.24
Non-income Taxes, Royalties and Other Governmental Charges			
Contingency Allowance			
Total	**5,872.32**	**7,461.11**	**7,749.39**

Notes:

(1) Cu concentrate costs of USD5,537.05 in 2009, USD7,140.12 in 2010, and USD7,291.30 in 2011 were included in the consumables

(2) Fees for transportation of workforce were included in the on-site and off-site administration cost

Cash Operating Cost	CCS-Sulfuric Acid Plant		
	2009	2010	2011
Workforce Employment	3.29	3.69	7.09
Consumables	2.79	2.80	1.58
Fuel, Electricity, Water and Other Services	5.01	6.26	6.34
On and off-site Administration	7.83	5.50	7.75
Environmental Protection and Monitoring	0.004	0.001	0.002
Transportation of Workforce(1)			
Product Marketing and Transport(2)			
Non-income Taxes, Royalties and Other Governmental Charges			
Contingency Allowance			
Total	**18.92**	**18.25**	**22.76**

Notes:

(1) Fees for transportation of workforce were included in the on-site and off-site administration cost

(2) Cost for sulfuric acid product transport was billed to the purchaser

11.3 Capital Costs and Investments

From 2012 to 2016, CNMC plans to invest approximately USD1,647,582,000 in the four subsidiary companies' projects in exploration, mining development, mine construction, technical improvement, upgrading the capacities of tailing storage facilities and other supporting facilities. The investments are approximately USD898,500,000 for NFCA's projects, USD186,850,000 for SML's projects, USD213,213,000 for CCS's projects, and USD349,019,000 for CLM's project (see Table 11-4). In SRK's opinion, the proposed capital investments are sufficient and likely to achieve the Company's stated targets if the capital is in place.

Table 11-4: Subsidiary Companies' Investment Plan, 2012 to 2016

Project/Mine	2012	2013	2014	2015	2016	Total (1,000USD/ Project)
NFCA						
Main orebody production and development	11,500	2,000	1,000	9,000	12,500	36,000
West orebody system upgrade, construction of Stage II	24,000	15,000	10,000	14,000	17,000	80,000
Southeast orebody development	116,000	150,000	180,000	180,000	154,000	780,000
Prospecting	1,500	1,000				2,500
Subtotal (1,000USD/a)	**153,000**	**168,000**	**191,000**	**203,000**	**183,500**	**898,500**
SML						
Huachin Project, Congo	12,000	2,000				14,000
Kakoso 3ktpa leach project	9,000	8,000				17,000
Mwambashi Project	25,000	20,000	5,000			50,000
Electrolyzer update	3,650					3,650
Mabende Project, Congo	50,000	30,000	15,000			95,000
Bio-leaching industrial test	3,500					3,500
Mwambashi risk exploration	500	1,000	1,000	1,200		3,700
Subtotal (1,000USD/a)	**103,650**	**61,000**	**21,000**	**1,200**		**186,850**
CCS						
Capacity expansion of smelter/ sulfuric plant and TSF	66,821	88,535	4500			159,856
Bi recovery from electrostatic dust	1,857					1,857
Co recovery system from converter slag			25,500	25,000		50,500
Metals comprehensive utilization					1,000	1,000
Subtotal (1,000USD/a)	**68,678**	**88,535**	**30,000**	**25,000**	**1,000**	**213,213**
CLM						
Baluba Center development, upgrade and exploration (SCu)	9,002	5,585	1,367	1,190	1,500	18,644
Muliashi Leach Project	100,000					100,000
Mashiba exploration, development and construction (SCu)			195,000	6,302	8,538	209,840
Muliashi South exploration, development and construction (SCu)			20,000	192	343	20,535
Subtotal (1,000USD/a)	**109,002**	**5,585**	**216,367**	**7,684**	**10,381**	**349,019**
Total	**434,330**	**323,120**	**458,367**	**236,884**	**194,881**	**1,647,582**

11.4 Forecast on Operating Costs and Production Capacity

Table 11-5 shows the forecast of the operating costs (cost unit: USD per tonne of copper concentrate) of mining and ore processing plants at NFCA-Chambishi and CLM-Baluba, and the operating costs for producing the electrolytic copper (Cu cathode) at SML-Chambishi Leach Plant, SML-Chambishi Processing Plant and the smelter copper (blister Cu) and associated sulfuric acid product plants at CCS-Chambishi Copper Smelter between 2012 and 2016. The major costs are salary, consumables, fuel, electricity and other services, on-site and off-site administration, and non-income taxes, royalties and other governmental charges. The forecast cost estimates are based on each subsidiary company's historical production records, which were sourced from the management accounts of the Group's subsidiaries. SRK only classified the costs based on the requirements of the HKEx in Chapter 18.

SRK notes that there are two potential uncertainties to be further checked: firstly, the feeding resource of SML bio-leaching project; secondly, the bio-leaching technology is to be further demonstrated and implemented.

Table 11-5: Forecast on Mining and Processing Costs between 2012 and 2016

	NFCA-Chambishi Operation				
Cash Operating Cost	**2012**	**2013**	**2014**	**2015**	**2016**
Workforce Employment	182.71	173.06	163.51	163.20	163.20
Consumables	152.29	144.25	136.29	136.03	136.03
Mining Contract	850.22	805.33	760.90	759.41	759.41
Fuel, Electricity, Water and Other Services	104.28	98.78	93.33	93.15	93.15
On and off-site Administration	193.90	173.70	152.01	144.13	144.13
Environmental Protection and Monitoring	5.39	5.11	4.83	4.82	4.82
Transportation of Workforce	0.46	0.40	0.34	0.32	0.32
Product Marketing and Transport	2.85	2.85	2.85	2.85	2.85
Non-income Taxes, Royalties and Other Governmental Charges	111.34	108.33	106.97	104.83	104.83
Contingency Allowance (Health and Safety)	31.47	29.81	28.16	28.11	28.11
Total	**1,634.91**	**1,541.62**	**1,449.20**	**1,436.84**	**1,436.84**

Cash Operating Cost	CLM-Baluba Mining Operation 2012	2013	2014	2015	2016
Workforce Employment(1)	452.43	438.29	426.89	426.89	426.89
Consumables	336.18	348.94	339.86	339.86	339.86
Mining Contract					
Fuel, Electricity, Water and Other Services	113.81	118.31	115.05	115.05	115.05
On and off-site Administration	228.45	231.97	225.92	225.92	225.92
Environmental Protection and Monitoring	10.31	9.99	9.73	9.73	9.73
Transportation of Workforce	0.69	0.64	0.64	0.64	0.64
Product Marketing and Transport	12.54	12.54	12.54	12.54	12.54
Non-income Taxes, Royalties and Other Governmental Charges	18.10	18.87	18.39	18.50	18.50
Contingency Allowance (Health and Safety)	0.13	0.13	0.12	0.11	0.11
Total	**1,172.65**	**1,179.48**	**1,149.14**	**1,149.25**	**1,149.25**

Note:

(1) Fees of mining contractors were included

Cash Operating Cost	SML-Chambishi Leach Plant 2012	2013	2014	2015	2016
Workforce Employment	600.00	625.43	481.58	529.78	529.78
Purchase Ore(1)	0.00	999.18	699.43	699.43	699.43
Consumables	766.25	1,822.46	1,519.28	1,519.28	1,519.28
Fuel, Electricity, Water and Other Services	354.28	352.05	350.58	350.58	350.58
On and off-site Administration	642.98	564.98	556.48	556.48	556.48
Environmental Protection and Monitoring	2.14	2.14	2.14	2.14	2.14
Transportation of Workforce	6.68	6.68	6.68	6.68	6.68
Product Marketing and Transport	265.00	189.29	255.00	255.00	255.00
Non-income Taxes, Royalties and Other Governmental Charges					
Contingency Allowance (Health and Safety)	1.20	1.20	1.20	1.20	1.20
Total	**2,638.53**	**3,564.22**	**3,172.94**	**3,222.64**	**3,275.64**

Note:

(1) Fees for purchase of ore were not included

Cash Operating Cost	SML-Chambishi Processing Plant 2012	2013	2014	2015	2016
Workforce Employment(1)	40.00	44.00	48.40	53.20	58.50
Consumables	307.22	307.22	307.42	307.52	307.52
Fuel, Electricity, Water and Other Services	133.55	133.55	133.55	133.55	133.55
On and off-site Administration	2.00	2.00	2.20	2.20	2.20
Environmental Protection and Monitoring	4.05	4.05	4.05	4.05	4.05
Transportation of Workforce(2)					
Product Marketing and Transport	7.34	7.34	7.34	7.34	7.34
Non-income Taxes, Royalties and Other Governmental Charges	5.69	5.69	5.69	5.69	5.69
Contingency Allowance (Health and Safety)	2.24	2.24	2.24	2.24	2.24
Total	**502.09**	**506.09**	**510.89**	**515.79**	**521.09**

Notes:

(1) Fees of mining contractors were included

(2) Fees for transportation of workforce were included in the on-site and off-site administration cost

Cash Operating Cost	CCS-Chambishi Cu Smelter				
	2012	2013	2014	2015	2016
Workforce Employment	25.09	19.98	22.38	23.22	26.00
Consumables[(1)]	7,188.95	7,210.26	7,210.26	7,215.68	7,215.68
Fuel, Electricity, Water and Other Services	41.09	41.35	43.42	41.60	42.35
On and off-site Administration	144.16	102.75	128.75	122.96	122.96
Environmental Protection and Monitoring	0.06	0.05	0.05	0.04	0.04
Transportation of Workforce[(2)]	0.00	0.00	0.00	0.00	0.00
Product Marketing and Transport	143.33	139.20	139.79	136.80	136.80
Non-income Taxes, Royalties and Other Governmental Charges	1.03	0.70	0.70	0.65	0.65
Contingency Allowance (Health and Safety)	0.51	0.40	0.40	0.37	0.37
Total	**7,544.22**	**7,514.69**	**7,545.75**	**7,541.32**	**7,544.85**

Notes:

(1) Cu concentrate costs of USD7,291.30 in 2011 forecast were included in the consumables

(2) Fees for transportation of workforce were included in the on-site and off-site administration cost

Cash Operating Cost	CCS-Sulfuric Acid Plant				
	2012	2013	2014	2015	2016
Workforce Employment	2.57	2.57	2.57	2.57	2.57
Consumables	1.68	1.68	1.68	1.68	1.68
Fuel, Electricity, Water and Other Services	7.47	7.47	7.47	7.47	7.47
On and off-site Administration	10.36	10.36	10.36	10.36	10.36
Environmental Protection and Monitoring	0.01	0.01	0.02	0.02	0.02
Transportation of Workforce	0.00	0.00	0.00	0.00	0.00
Product Marketing and Transport[(1)]	0.86	0.86	0.86	0.86	0.86
Non-income Taxes, Royalties and Other Governmental Charges[(2)]	4.87	4.87	4.87	4.87	4.87
Contingency Allowance (Health and Safety)	0.07	0.07	0.07	0.07	0.07
Total	**27.89**	**27.89**	**27.89**	**27.89**	**27.89**

Notes:

(1) Cost for sulfuric acid product transport was billed to the purchaser

(2) For the sulfuric acid product, there were no export taxes and other charges

Table 11-6 below is the operating cost forecast of the CNMC Huachin (Congo) Leach Plant; all the data are sourced from "*Feasibility Study of CNMC Huachin (Congo) 5,000tpa Cu Cathode Project*" by Shenyang Design and Research Institute of Nonferrous Metallurgy in December 2010. For the operating cost forecast of the SML Kakoso Leach Plant, all the data are sourced from "*Preliminary Design Report of Kakoso 3,000tpa Cu Cathode Project*" by Shenyang Design and Research Institute of Nonferrous Metallurgy in March 2011.

Table 11-6: Operating Cost Forecast of SML-CNMC Huachin (Congo) and SML-Kakoso Leach Plants

Cash Operating Cost	CLM-Muliashi Mining and Leach Plant				
	2012	2013	2014	2015	2016
Workforce Employment	382.39	206.70	179.40	170.86	170.86
Consumables	1,385.46	1,293.83	1,175.22	1,126.75	1,126.75
Fuel, Electricity, Water and Other Services	726.50	674.79	623.43	599.92	599.92
On and off-site Administration	832.37	528.45	461.50	435.05	435.05
Environmental Protection and Monitoring	10.16	19.24	16.69	15.90	15.90
Transportation of Workforce					
Product Marketing and Transport	224.93	224.97	206.85	197.00	197.00
Non-income Taxes, Royalties and Other Governmental Charges	134.97	135.00	129.55	129.55	129.55
Contingency Allowance (Health and Safety)					
Total	**3,696.77**	**3,082.98**	**2,792.63**	**2,675.03**	**2,675.03**

Cash Operating Cost	SML-CNMC Huachin (Congo) Leach Plant				
	2012	2013	2014	2015	2016
Workforce Employment	330.00	330.00	399.30	247.50	272.25
Purchase Ore(1)	1,728.60	1,730.18	1,726.62	1,726.62	1,726.62
Consumables	2,468.77	2,466.01	2,467.90	2,457.40	2,457.40
Fuel, Electricity, Water and Other Services	204.67	203.45	204.50	202.00	202.00
On and off-site Administration	172.25	172.25	177.25	111.25	111.25
Environmental Protection and Monitoring	1.50	1.50	1.50	1.50	1.50
Transportation of Workforce					
Product Marketing and Transport	200.00	200.00	200.00	200.00	200.00
Non-income Taxes, Royalties and Other Governmental Charges					
Contingency Allowance (Health and Safety)	1.25	1.25	1.25	1.25	1.25
Total	**3,378.44**	**3,374.46**	**3,451.70**	**3,220.90**	**3,245.65**

Note:

(1) Fees for the transportation of ore were not included

Cash Operating Cost	SML-Kakoso Leach Plant				
	2012	2013	2014	2015	2016
Workforce Employment		600	600	550	550
Consumables		1,000	1,000	1,000	1,000
Fuel, Electricity, Water and Other Services		380	380	350	350
On and off-site Administration		550	550	498	498
Environmental Protection and Monitoring		5	5	5	5
Transportation of Workforce		6	6	5	5
Product Marketing and Transport		250	122	122	122
Non-income Taxes, Royalties and Other Governmental Charges					
Contingency Allowance (Health and Safety)					
Total		**2,796**	**2,663**	**2,663**	**2,663**

The production capacities and production forecast for the years from 2012 and 2016 are listed in Table 11-7.

Table 11-7: Production Capacities and Production Forecast, 2012 to 2016

Project/Mine	Unit	2012	2013	2014	2015	2016
NFCA-Chambishi Processing Plant						
Mined and Treated Ore	1,000t	1,700	2,000	2,200	2,350	2,350
Chambishi Main Orebody	1,000t	1,000	1,000	1,000	1,000	1,000
Chambishi West Orebody	1,000t	860	1,090	1,000	1,150	1,150
Average Feed Grade	% Cu	1.75	1.78	1.85	1.89	1.89
Chambishi Main Orebody	% Cu	1.68	1.72	1.84	1.89	1.89
Chambishi West Orebody	% Cu	1.85	1.85	1.85	1.89	1.89
Total Cu Recovery Rate	%	89.19	88.10	87.73	87.21	87.21
Cu Concentrate	t	65,089	77,635	87,358	96,767	96,767
Concentrate Grade	% Cu	38.72	37.36	37.06	36.62	36.62
Contained Cu Metal in Concentrate	t	25,200	29,006	32,372	35,438	35,438
NFCA-Chambishi SE Processing Plant						
Mined and Treated Ore from Chambishi Southeast	1,000t					16,500
Average Feed Grade	% Cu					2.00
Average Feed Grade	% Co					0.10
Total Cu Recovery Rate	%					93.98
Total Co Recovery Rate	%					45.63
Cu Concentrate	t					122,917
Concentrate Grade	% Cu					24.00
Concentrate Grade	% Co					0.60
Contained Cu Metal in Concentrate	t					29,500
Contained Co Metal in Concentrate	t					700
CLM-Baluba Processing Plant						
Mined and Treated Ore from Baluba Center Mine	1,000t	1,400	1,500	1,500	1,500	1,500
Average Feed Grade	% Cu	1.40	1.40	1.40	1.40	1.40
Cu Recovery Rate	%	94.50	94.50	94.50	94.50	94.50
Cu Concentrate	t	75,510	81,000	79,380	79,380	79,380
Concentrate Grade	% Cu	24.50	24.50	25.00	25.00	25.00
Contained Cu Metal in Concentrate	t	18,500	19,845	19,845	19,845	19,845
CLM-Muliashi Leach Plant						
Ore Mined	1,000t	4,700	4,600	4,600	4,600	4,600
Includes: Hard Ore	1,000t	3,080	1,000	1,000	1,000	1,000
Soft Ore	1,000t	1,620	3,600	3,600	3,600	3,600
Cu Grade of Ore Mined	%	1.09	1.19	1.19	1.19	1.19
Where: Hard Ore	%	1.12	1.06	1.06	1.06	1.06
Soft Ore	%	1.05	1.22	1.22	1.22	1.22
Ore Processed	1,000t	2,537	4,498	4,498	4,498	4,498
Includes: Agitation Leach Ore	1,000t	1,472	1,942	1,942	1,942	1,942
Heap Leached Ore	1,000t	1,065	2,556	2,556	2,556	2,556
Total Cu Recovery	%	51.53	61.59	74.81	74.81	74.81
Cu Recovery of Agitation Leach	%	76.00	76.00	76.00	76.00	76.00
Cu Recovery of Heap Leach	%	21.05	51.33	73.97	73.97	73.97
Total Cu Cathode Output	t	18,912	32,959	40,033	40,033	40,033

Project/Mine	Unit	2012	2013	2014	2015	2016
Cu Cathode Output of Agitation Leach	t	16,562	16,915	16,915	16,915	16,915
Cu Cathode Output of Heap Leach	t	2,350	16,044	23,118	23,118	23,118
Cu Metal Contained in Cathode	t	18,817	32,795	39,833	39,833	39,833
SML-Chambishi Processing Plant						
Treated Ore	1,000t	330	330	330	330	330
Includes: Chambishi West Oxidized Ore	1,000t	240	240			
#3 Oxidized Ore Pile	1,000t	90	90			
Ore from Mwambashi	1,000t			330	330	330
Average Feed Grade	% Cu	1.41	1.41	1.71	1.71	1.71
Where: Chambishi West Oxidized Ore	% Cu	1.60	1.60			
#3 Oxidized Ore Pile	% Cu	0.90	0.90			
Ore from Mwambashi	% Cu			1.71	1.71	1.71
Cu Recovery Rate	%	52.00	52.00	36.00	36.00	36.00
Cu Concentrate	t	10,000	10,000	10,000	10,000	10,000
Concentrate Grade	% Cu	20.00	20.00	20.00	20.00	20.00
Contained Cu Metal in Concentrate	t	2,000	2,000	2,000	2,000	2,000
SML-Chambishi Leach Plant						
Heap Leached Ore	1,000t	135	135	135	135	135
Cu Grade of Heap Leached Ore	%	0.65	0.65	0.65	0.65	0.65
Cu Recovery of Heap Leach	%	60.00	60.00	60.00	60.00	60.00
Cu Metal Recovered in Heap Leach	t	526	526	526	526	526
Agitation Leached Ore	1,000t	1,214	1,189	1,021	1,021	1,021
Includes: Tailings from Processing Plant	1,000t	434	434	320	320	320
Old Tailings of TSF #6 & #16	1,000t	302				
Outsourcing Ore	1,000t		94	94	94	94
Old Tailings TSF #15	1,000t	478	957	478	478	478
Tailings of Mwambashi Ore Processing Plant	1,000t			129	129	129
Average Feed Grade of Agitation Leach	%	0.50	0.48	0.77	0.77	0.77
Includes: Tailings from Processing Plant	%	0.45	0.45	0.80	0.80	0.80
Old Tailings of TSF #6 & #16	%	1.05				
Outsourcing Ore	%		3.50	3.50	3.50	3.50
Old Tailings TSF #15	%	0.20	0.20	0.20	0.20	0.20
Tailings of Mwambashi Ore Processing Plant	%			0.80	0.80	0.80
Cu Recovery of Agitation Leach	%	90.01	81.14	82.59	82.59	82.59
Cu Metal Recovered in Agitation Leach	t	5,472	6,471	6,471	6,471	6,471
Average Cu Recovery	%	86.16	81.14	82.59	82.59	82.59

Project/Mine	Unit	2012	2013	2014	2015	2016
Cu Cathode Output	t	6,000	7,000	7,000	7,000	7,000
Cu Metal Contained in Cathode	t	5,998	6,997	6,997	6,997	6,997
SML-CNMC Huachin (Congo) Leach Plant						
Treated Ore	t	297,000	330,000	330,000	330,000	330,000
Treated Ore Grade	% Cu	3.50	3.50	3.50	3.50	3.50
Cu Cathode	t	*9,000*	*10,000*	*10,000*	*10,000*	*10,000*
Cu Recovery Rate	%	86.54	86.54	86.54	86.54	86.54
Cu Metal Contained in Cathode	t	8,996	9,995	9,995	9,995	9,995
Co Metal Contained in Co Carbonate Product	t			800	800	800
SML-Kakoso (Tailings) Leach Plant						
Treated Ore	t		475,300	679,000	679,000	679,000
Treated Ore Grade	% Cu		0.60	0.60	0.60	0.60
Cu Cathode	t		*2,100*	*3,000*	*3,000*	*3,000*
Cu Recovery Rate	%		73.60	73.60	73.60	73.60
Cu Metal Contained in Cathode	t		2,099	2,998	2,998	2,998
SML-Mabende (Congo) Leach Plant						
Treated Ore	t			481,450	963,400	963,400
Ore Grade	% Cu			2.40	2.40	2.40
Cu Cathode	t			10,000	20,000	20,000
Cu Recovery	%			86.5	86.5	86.5
Cu Metal Contained in Cathode	t			9,995	19,990	19,990
CCS-Chambishi Copper Smelter						
Feed Cu Concentrate	t	518,523	764,809	764,809	825,994	825,994
Concentrate Grade	% Cu	33.60	33.50	33.50	33.50	33.50
Cu Recovery Rate	%	96.60	96.60	96.60	96.60	96.60
Blister Cu output	t	180,000	250,000	250,000	270,000	270,000
Blister Cu grade	Cu %	99.00	99.00	99.20	99.50	99.50
Contained Cu metal in Blister Cu	t	168,300	247,500	247,500	267,300	267,300
Sulfuric Acid Output	1,000t	400	560	560	600	600
Sulfuric Acid Concentration	%	98.25	98.25	98.25	98.25	98.25

Note:

* Co recovery rate is not specified in the Company's forecast

12 UTILITIES AND INFRASTRUCTURE

12.1 Road Access

NFCA, CLM, CCS and SML are located in the Copperbelt Province in the north of the Republic of Zambia. NFCA, CCS and SML are located in the Chambishi Town area. CLM is located in the Luanshya city area. In the mining areas of Chambishi and Luanshya, there are railways and public roads leading to Lusaka and other cities of Copperbelt Province. Table 12-1 shows the exact distance among them.

Table 12-1: Distance between Chambishi & Luanshya Mining Areas and Related Cities

Cities	Unit	NFCA	CLM	Remarks
Lusaka	km	360	320	
Kitwe	km	28	49	
Ndola	km	70	30	
Mufulira	km	40		
Luanshya	km		12	
Durban(South Africa)	km	2600	2600	To Shanghai: 13,400km
Dar es Salaam (Tanzania)	km	2100	2100	To Shanghai: 12,000km
Kapilrimbohemia	km			To Dar es Salaam: 1,860km

Zambia is landlocked so the consumables and products can only be imported and exported by trains or trucks, via Dar es Salaam port in Tanzania or Durban port in South Africa. The railways and public roads in the two mining areas lead to all major cities and towns as well as other mining plants. There are domestic airlines services from Lusaka, Kitwe and Ndola and there are international services available in Lusaka and Ndola.

The roads within these two mining areas are mainly paths connecting mining industrial areas, processing industrial areas and life welfare facilities. Normally, the roads can handle trucks with a loading capacity up to 25t. CCS is very close to the Zambian national highway from Lusaka to Kitwe. SML is very close to the NFCA concentrator. The NFCA roads are accessible between the plants and 1.5km from Lusaka highways. SRK thus holds the view that the traffic condition of the two mining areas and smelter is generally good.

12.2 Electrical Power Supply

The electrical power supply can meet the needs of mine infrastructure and production, since there is a rich power resource in Zambia. Hydropower is used to generate electricity in Zambia and the total capacity is more than 800MW. There is a national power network which is controlled by ZESCO. A file presented by the Zambian power supply department in September 2006 shows that the power network in the Chambishi and Luanshya region is very stable. The period of each power failure lasted no more than 1.5h in the past 20 years.

The power supply for NFCA comes from LUANO central step-down substation of ZESCO. In the mining area, there is a CHISENGA substation (66kV/11kV). The power for the processing industrial area is supplied by a 66kV/11kV power distribution room. The two substations are connected by a 66kV line. The original power supply system remains basically sound.

At CLM, there are three substations which are named Baluba S/S, IRWINS/S and MACLAREN S/S. The power is supplied by CEC through 66kV transmission lines. CEC has indicated that enough power will be supplied for the projects awaiting construction and those in operation, including open-pit mining in Muliashi North.

CCS uses double circuit inlet lines with a load of 66kV. Power is supplied after being reduced to 10kV by the central transformer. The double 66kV power source is from CHISENGA substation which is 3km from CCS and LUANO substation which is 15km away. A 66kV/11kV substation with double inlet lines is needed in CCS. One circuit line is connected to CHISENGA substation and the other line is connected to LUANO substation (12km away from CHISENGA substation; Figure 12-1)

Operation mode: CEC is responsible for 66 to 11kV transformation and CCS is in charge of power lower than 11kV.

According to the feasibility study design, the installation power of the equipment is 62,740kW, and the calculated load is 36,298kW, with a power consumption of about 188×106kWh per year. At CCS, there is a waste-heat power station with a 6,300kW (maximum) steam turbine which can recover the waste heat to generate power. The voltage of the power supplied is 10kV and it is connected to a 10kV bus bar of the central step-down substation.

The power supply for SML is transferred from CHISENGA substation of NFCA and distributed to every plant through a distribution room. The annual power consumption is about 21,300,000kWh and it may increase to 30,000,000kWh in future. SML submits seasonal power supply reports to NFCA.

According to the load calculation results, the existing CHISENGA and CHAMBISHI substations can meet the power requirements of more loads of mining and processing.

The average local price of power in 2011 was 5.6 cents/kWh.

Based on the current situation, SRK thinks that the power supply for CNMC projects in Chambishi and Luanshya mining areas is sufficient, since the hydro-power source is in excess of industry needs.

Figure 12-1: CCS 66/11kV Substation

12.3 Water Supply

NFCA, CCS and SML

The water supply for Chambishi, including domestic and industrial water, comes from underground water discharge. Industrial quality water is supplied to the NFCA Chambishi Processing Plant, SML and CCS which are in the same area. Industrial quality water is collected into a water reservoir with the volume of 50,000m^3 (Figure 12-2). Domestic water is treated and purified before use; NFCA is presently supplying domestic water to Chambishi town 3km from the mine.

CCS and SML are paying NFCA fixed prices for water supply.

CLM

CLM sources industrial quality water (for processing) from the Luanshya water reservoir, which collects water from the Musi TSF, Baluba Center Mine and Luanshya River. The domestic water for workers at the Baluba Processing Plant and administration office are supplied by a local Luanshya water company.

SRK is of the opinion that the current water supply for whole project is sufficient, but there is still a need to consider the demand of future expansions.

Figure 12-2: NFCA Water Reservoir

12.4 Machinery Maintenance Facilities

Based on SRK's site visit, the mechanical maintenances for NFCA, CLM, CCS and SML are basically carried out internally, related machinery maintenance workshops are responsible for and capable of such duties.

Machinery maintenance workshops in the local communities and international mine equipment manufacturers can be available as necessary for machinery maintenance.

12.5 Administration and Living Facilities

According to information collected during SRK's site visit, all four companies own their own office and living facilities, with the offices and administration facilities located within the production areas (Figure 12-3). The locations of accommodation for NFCA are in Kitwe, for CLM are in Luanshya which were reconstructed from former LCM facilities, for CCS the accommodation is adjacent to the smelter plant, and for SML is in Chambishi Town. All facilities are comprehensive, sufficient to meet the needs for business and staff leisure, and also with good environments. Company-provided transportation is available for all projects.

Figure 12-3: NFCA Office Building ("Central Control Building")

13 MAJOR CONTRACTS

13.1 Mining Contracts

NFCA: the Company has one mining contract with Jinchengxin Mining & Construction Zambia Ltd at Chambishi Main and West Mines valid from 2011 to 2013. The mining contract includes development of tunnels, mining preparation and production, underground supporting, underground haulage, back filling and maintenance of ventilation system. Duties to be performed, technical staff allocations and quality of work are specified in the contract and other duties can be added to the contracts as required. Clauses included in the contract indicate both rewards and penalties which apply if production quantities or qualities meet or do not meet contract requirements, and the payment will be issued in accordance to the mining schedules' accomplishment.

CLM: All mining development and mining activities in the Baluba Center Mine are undertaken by CLM's own employees. All mining operations in the Muliashi North Mine are carried out by a contractor, Fifteen MCC Africa Construction & Trade Ltd.

13.2 Supply Contracts

Supplies of consumable materials such as diesel fuel and reagents for metallurgical and processing plants and other plant are generally purchased at market prices on short-term contracts with a term of one year.

13.3 Transport Contracts

ROM Transport:

ROM ("run of mine") transport for both the Chambishi Main Mine and CLM mines are through conveyer belts from mine shafts to concentrators.

ROM transport for the Chambishi West Mine is by trucks from shaft to concentrator.

ROM transport between mine and concentrator designed for the Chambishi Southeast Mine is through conveyer belts from mine shaft to concentrator.

Product Transport:

There is one production transport contract for NFCA with All Cargo Solutions Ltd using trucks to transport the copper concentrate in bulk at FOT (Free on Truck) terms from the NFCA Chambishi Mine to CCS for further handling.

There is one production transport contract for NFCA with Sinotra Company Limited using trucks to transport the copper concentrate in bulk on an FOT (Free on Truck) terms from the CLM Mine to CCS for further handling.

There is one production transport contract for CCS with Cargo Management & Logistics Limited using trucks to transport blister copper ingot from CCS to IFC Pretoria Depot/South Africa & Transworld Cargo/Namibia for temporary storage, loading into containers and delivery to Durban and Walvis Bay ports ready for shipment.

13.4 Product Sales Contracts

Product Sales between NFCA/CLM and CCS:

The Company provided SRK with examples of NFCA and CLM's product sales contracts with CCS which indicated the terms including major aspects as quality, quantity, price, delivery, deductions, quotational period and payment. The price is the sum of the metal payments less the deductions which consist of the treatment charges and the refining charges specified below:

Copper: 95.25% — 95.5% (CLM & CCS) to 96.00% (NFCA & CCS) of the final copper content shall be paid for at the LME official settlement price for Copper Grade A, as published in the Metal Bulletin and averaged over the quotational period.

Silver: 90% of the final silver content, subject to a minimum deduction of 30g/dmt (CLM & CCS) to 35g/dmt (NFCA & CCS), shall be paid for at the London Bullion Fixing for Spot Silver (U.S. equivalent), as published in the Metal Bulletin, London and averaged over the quotational period.

Gold: 90% of the final gold content, subject to a minimum deduction of 1g/dmt, shall be paid for at the mean of the London AM/PM quotation as published in the Metal Bulletin, and averaged over the quotational period.

Product Sales between CCS and External Buyers:

The Company provided SRK with examples of CCS's product sales contracts with CNMC International Trade Ltd which indicate the terms including major aspects as quality, quantity, price, delivery, deductions, quotational period and payment. The price is the sum of the metal payments less the deductions which consist of the treatment charges and the refining charges specified below:

Copper: The final agreed copper content, subject to a deduction of 0.3 unit/dmt, shall be paid for at the LME Copper Grade A cash settlement quotation in US$ as published in the Metal Bulletin of London, averaged over the quotational period.

Gold: If the final gold content is below or equal to 1g/mt, no payment will be made; if final gold content is above 1g/mt and up to 10g/mt, the buyer will pay for 90% of the final gold content; if the final gold content is above 10g/mt, the buyer will pay for 92% of the final gold content at the mean of the London "AM/PM" US$ quotation of Gold as published in the Metal Bulletin of London, averaged over the quotational period.

Silver: If the final silver content is below or equal to 20g/mt, no payment will be made; if final silver content is above 20g/mt but less than 500g/mt, the buyer will pay for 90% of the final silver content; if the final silver content is above 500g/mt, the buyer will pay for 92% of the silver content at the London Spot quotations, in US$ as published in the Metal Bulletin of London, averaged over the quotational period.

Refining Charges:

Copper: The Refining Charge shall be US$300 per tonne of payable copper.

Silver: The Refining Charge shall be US¢30.00 per troy ounce of payable silver.

Gold: The Refining Charge shall be US$4.00 per troy ounce of payable gold.

Product Sales between SML and External Buyers:

The Company provided SRK with examples of SML's product sales contracts with Trafigura AG Switzerland, CNMC Albetter Albronze Co., Ltd and Tianjin Zhongse International Trading Co., Ltd which indicated the terms including major aspects such as quality, quantity, price, delivery, deductions, quotational period and payment. The price basically according to London Metal Exchange Official Cash Settlement for Copper Grade "A" averaged over the Quotational Period less a certain amount per metric tonne.

13.5 Workforce Contracts

According to the contract example provided by the Company's subsidiaries, based on the labor contract laws of Republic of Zambia, all Company staff and employees have signed work contracts. The Company's subsidiaries also transact allowances including housing, medical, underground, work injury, transportation, telephone, annual bonus, unemployment, leave, long service awards and national pension scheme funds for employees.

The contracts offered for Chinese staff are usually on a two-year basis, for Zambian senior and managerial staffs are usually on a three-year basis, and the Company's subsidiaries offer either short term contracts (CCS, MLZ) or permanent contracts (NFCA, CLM) to regular Zambian laborers. SRK was informed that the Company's subsidiaries companies have fully complied with the Zambian labor law. The contracts also specify the responsibilities of the employer and employee and define the liabilities of each party.

14 ENVIRONMENTAL AND SOCIAL ASSESSMENT

14.1 Environmental Review Objective

The objective of this environmental due diligence review was to identify and verify the existing and potential environmental liabilities and risks, and assess any associated proposed remediation measures for the CNMC Zambian Projects.

The SRK scope of the contracted environmental review of the CNMC Zambia Projects comprised the following operations run by the four subsidiary companies:

- NFCA; includes two operating mines (Chambishi Main, Chambishi West) and one developing mine (Chambishi Southeast), as well as processing facilities.
- SML; Sino-Acid Products (Zambia) Ltd (SAPZ); besides its main leaching project near Kitwe, also includes the Kakoso tailing dam, and Vat and Heap Leach facilities and hydrometallurgical plant.
- CCS; smelter and associated facilities.
- CLM; has a large-scale mining license which includes two operating mines (Baluba Center Mine and Muliashi North) and a hydrometallurgical plant.

14.2 Environmental Review Process, Scope and Standards

The process for verifying the environmental permitting and licensing compliance and operational conformance for the CNMC Zambian Projects comprised a review and inspection of the projects' environmental management performance against:

- Zambian national environmental regulatory requirements (Appendix III).
- World Bank/International Finance Corporation (IFC) environmental standards and guidelines (Appendix IV).
- Internationally-recognized environmental management practices.

The methodology applied for this environmental review of CNMC Zambian Projects comprised a combination of document review, site visit and interviews with company technical representatives. The site visit was undertaken from April 25 to May 6, 2011.

14.3 Status of Environmental Approvals

SRK as part of the independent environmental review received and reviewed project development and operational licenses, permits, assessment documentation and governmental approvals for the CNMC Zambian Projects. SRK observed that CNMC's subsidiary companies and staff have a good understanding of Zambian legislative requirements for conducting the appropriate project development assessments and their necessary Environmental Council of Zambia (ECZ) governmental approvals, and associated licenses, permits and agreements.

SRK sighted and reviewed CNMC subsidiary companies' Annual Operating Permits, issued by the Mines Safety Department of Zambia for the last three years (or periods for which newer operations have been running). At the time of SRK's site visit the SML and Luanshya Projects had not received their Annual Operating Permit for 2011 but SRK sighted the submitted applications for their required Annual Operating Permits.

SRK was provided with copies of the Environmental Social Impact Assessments (ESIA) prepared for the CNMC Subsidiary Companies' mines and mineral processing facilities and sighted the subsequent governmental approvals for the assessments.

SRK sighted and reviewed the CNMC Subsidiary Companies' operations, required annual Environmental Management Plans (EMP) and Annual Environmental Report (AER) for the previous three years (except for operations that have been running for less than three years – in which case SRK reviewed the plans for the periods they have been operating) along with their governmental acceptances.

SRK was also provided Environmental Protection Fund Audit Reports and documentation of annual environmental bond requirements and payments for the CNMC Zambian Project's operational units for the last three years (or periods for which newer operations have been running). SRK notes the defined bond amount is derived from the CNMC Zambian Project's annual Environmental Protection Fund Audit Report and EMP and considers progressive rehabilitation works that have been carried out throughout the year along with an independent classification of the individual project's environmental and hence closure liability in conjunction with the ECZ.

SRK also sighted and reviewed a large number of required secondary environmental operational licenses, permits and agreements for the CNMC Zambian Project's and their associated facilities. The majority of these Environmental Licenses are required to be renewed yearly and SRK during the site visit was able to verify that the renewal of these licenses was occurring in line with Zambian Legislative Requirements.

14.4 Environmental Compliance and Conformance

The significant environmental aspects for the CNMC Zambian Projects that are subject to this Report are associated with the mining and mineral processing activities at the CNMC Zambian Projects' sites. The environmental review identified the most significant current and potential environmental / social management and legislative compliance liabilities that relate to operation and further development of the CNMC Zambian Projects and defines gaps in operational management as relates to industry best practices.

SRK noted that at the time of the site visit CNMC was predominantly complying with Zambian national legislative requirements and had systems in place to action any non-compliance or upgrade work notices as directed to by the ECZ, but could do more to conform to industry best practices to improve their operational environmental / social management of the projects. SRK verified that the NFCA, SML, CCS and CLM had obtained the necessary licenses and permits to develop and operate the projects and produced the required ESIA reports, inclusive of the required Environmental Management Plan (EMP) and conceptual rehabilitation plans.

SRK notes the provided/sighted environmental and social management documentation for the CNMC Zambian Projects have been prepared in line with Zambian legislative requirements and generally in accordance with IFC environmental standards and guidelines, and internationally recognized industry environmental management practices.

At the time of SRK's site visit, the majority of CNMC subsidiary companies' project units were in full operation along with some expansion and new developments being at different phases of progress. SRK was therefore only able to review the existing operational environmental management and protection measures for the operational facilities of each project along with the developmental activities and developmental assessments and planning taking place and their planned future operational environmental management and protection measures for operations being developed and those undertaking expansion works.

SRK noted during the site investigation that current management of potentially significant environmental and social risks were at the time of the site visit being managed at a reasonable level and is considered by SRK to be within the acceptable / tolerable risk classification, but further attention to reduce and maintain the realized and potential impacts at an acceptable level, especially as relate to social and community aspects.

The environmental risks associated with surface and groundwater, dust and gas emissions, hazardous materials storage, waste rock dumps (WRD), tailings storage facilities (TSF) and stockpile management, and land disturbance and rehabilitation, can be generally managed if Zambian national environmental standards and regulatory requirements are met along with the application of industry best practices.

The environmental risks associated with the potential for generating contaminated sites and other site closure liabilities and developing and maintaining social license to operate; inclusive of health and safety standards can be effectively managed by adopting relevant recognized international industry practices. On-site management of these above risks should be coordinated through the implementation of the operational EMP, Environmental Response Plan (ERP) and Health Safety Environment (HSE) plans which incorporate all areas of required work. Developing and maintaining a social license to operate needs to be managed through the development of Social Development Plans and support of initiatives defined through the consultation process.

14.5 Land Disturbance

The main impact on the surrounding ecological environment is due to disturbance and the potential for contamination caused by surface stripping, waste rock and tailings storage, processing plant drainage, processing wastewater, explosions, transportation and associated buildings that are constructed. If effective measures are not taken to manage and rehabilitate the disturbed areas, the surrounding land can become polluted and the land utilization function will be changed, causing an increase in land degradation, water loss and soil erosion.

The projects' ESIA's provide estimates of areas of disturbances for mines, surface infrastructure and processing facilities, vat and heap leaches, smelters and hydrometallurgical plants, WRD, TSF and other associated infrastructure. SRK was also able to confirm during the site visit that the CNMC Zambian Projects employ the use of a land disturbance and rehabilitation registry for recording all land related disturbance impacts.

Project environmental assessment and management documentation also stipulate measures for minimizing disturbances through the course of normal operations. SRK also observed during the site visit that identified disused disturbed areas and facilities were being progressively rehabilitated and being reported to the ECZ via the required annual reports and feeds into the ongoing Mine Closure Planning process.

14.6 Flora and Fauna

The development of mining and mineral processing projects may also result in impacts to or loss of flora and fauna habitat. Project ESIA's should determine the extent and significance of any potential impacts to flora and fauna habitat. Where these potential impacts to flora and fauna habitat are determined to be significant, the ESIA should also propose effective measures to reduce and manage these potential impacts.

Flora and fauna baseline assessments have been conducted within the individual operations ESIA's for the CNMC Zambian Projects. The ESIA's report that no rare or endangered species were identified in or around the various project sites. Fauna was found to be limited in the area due mainly to historical agricultural practices and flora was considered to be a mix of endemic and invasive species. The ESIA's also provide adequate measures for managing potential impacts upon floral and faunal communities around the project sites. The greatest potential impact to the ecology of the area is due to the influx of invasive weed and plant species which impact upon the natural make-up and diversity of the system. This represents the area in which the CNMC subsidiaries can make more effort to reduce the potential for these species to colonize the area.

14.7 Waste Rock and Tailings Management

14.7.1 Waste Rock Management

Currently at the CNMC Zambian Projects' sites there are a number of historical and currently active WRD. The WRDs are numbered and listed on various site management plans. The ECZ requires that these WRDs are assessed regularly for stability and drainage and dust generating impacts upon the surrounding environment. SRK verified that CNMC's subsidiary companies were complying with this requirement through the submission of the independent and internal reports to the ECZ.

The CNMC Zambian Projects' ESIA's provides estimates of waste rock that will be produced by their operations. SRK observed at site that conditions of the WRDs were reasonable, although it is SRK's opinion that improvements could be made to management measures for surface water runoff controls aimed at reducing entrained sediment loads from the drainage before release from the project sites.

The CCS smelter project also has developed slag dumps for the stockpiling of solid wastes from the smelting and associated processes. The slag is placed in either of two dumps; the first for temporary storage prior to reuse and the second for permanent storage.

Top soil stripped as part of the projects development had not at the time of SRK's site visit been separately stockpiled for later reuse, but had been dumped within the WRD sites. SRK recommends that stripped topsoil should be stockpiled for later reuse in rehabilitation works.

CNMC's subsidiary companies stated that no waste rock geochemical/acid rock drainage (ARD) assessment has been conducted due to the general geology and geochemistry of the Zambian Copperbelt being rich in carbonates which naturally act as a buffering / neutralizing agent against sulfidic materials. SRK also observed that no management measures for dealing with potential ARD were in place for the CNMC Zambian Projects. While SRK also considers the likelihood of ARD occurring to be minimal and in that SRK observed no incidences of probable ARD during the site visit the potential still has not been defined through a geochemical characterization program.

SRK recommends conducting a comprehensive ARD/geochemical characterization assessment of waste rock to help determine effects on pH and its impact on leaching heavy metals to confirm the impact is not significant. Additionally, the separate stockpiling of topsoil for use in rehabilitation works would be beneficial.

14.7.2 Tailings Management

Currently at the CNMC Zambian Projects' sites there are a number of historical and currently active TSFs. A number of the CNMC subsidiary companies' projects are reprocessing tailings from a number of the historical TSFs with economical copper contents. The TSFs are numbered and listed on various site management plans. The ECZ requires that these TSFs are assessed regularly for stability and drainage and dust generating impacts upon the surrounding environment. SRK verified that CNMC's subsidiary companies were complying with this requirement through the submission of the independent and internal reports to the ECZ.

The CNMC Zambian Projects' ESIA's provides estimates of tailings that will be produced by their operations. SRK observed at site that conditions of the TSFs were reasonable, although it is SRK's opinion that improvements could be made to management measures for surface water runoff controls aimed at reducing entrained sediment loads from the drainage before release from the project sites.

SRK notes that some of the TSFs (leaching plants associated TSFs) were lined with HDPE liners to prevent seepage of low pH tailings water to the surrounding environment (surface and ground water) from the facilities that recycle the acidic leaching process water. TSFs for normal tailings from concentration circuits did not employ the use of HDPE liners, but rather looked to ensure pH stability via the addition of lime as necessary.

CNMC stated, there was one incident of non-compliance (abnormal pollution) which resulted from a burst in the tailings line and discharge of about 5 tonnes of tails into the Fisansa Stream. Immediately a standby line was put on, patched the holed line and excavated the tailings material from the stream and transported it to the designated Musi Tailings Dump. SRK notes that this is an example of the company's system for actioning any operational issue that arises in accordance with Zambian requirements and industry best practices.

CNMC's subsidiary companies stated that no tailings geochemical/ARD assessment has been conducted due to the general geology and geochemistry of the Zambian Copperbelt being rich in carbonates which naturally act as a buffering / neutralizing agent against sulfidic materials. SRK also observed that no management measures for dealing with potential ARD were in place for the CNMC Zambian Projects. While SRK also considers the likelihood of ARD occurring to be minimal and in that SRK observed no incidences of probable ARD during the site visit the potential still has not been defined through a geochemical characterization program.

SRK recommends conducting a comprehensive ARD/geochemical characterization assessment of tailings to help determine effects on pH and its impact on leaching heavy metals from the TSFs to confirm the impact is not significant.

14.8 Water Aspects and Impacts

The CNMC Zambia Project sites are characterized by heavy rainfall through a large part of the year in the wet season and minimal rainfall throughout the dry season. The main surface water protection target in the area surrounding the project sites is the Kafue River which is the main economic waterway in Zambia and a tributary of the Zambezi River.

Water use for the CNMC Zambian Projects is mainly for ore processing, dust suppression, operation water and domestic water of the office and lodging buildings at project sites. CNMC stated they do not record the amount of water used for each activity, although the projects' ESIA's include estimations of water requirements and potential impacts to water resources in the area.

The potential impacts of the CNMC Zambian Projects on surface water are due to changes / diversions of local water courses, run-off (inclusive of sediment and contaminant entrainment) from the mine and waste areas, and run-off from the WRD's, heap leaches and TSF's. The projects' ESIA's report mine surface workings, WRD's and TSFs will be designed to collect drainage water into sedimentation ponds before being either recycled or discharged. SRK noted during the site visit that natural wetland areas are also being used for secondary purification during release to the environment via local drainage channels and gullies.

Process waste water from processing, electrowinning and smelting operations partially being recycled for reuse either via thickeners prior to pumping tails to the TSFs or from the TSFs' supernatant water. SRK feels there is opportunity for greater use of recycled water for processing activities which would reduce requirements for sourcing fresh water from local surface water bodies.

Plant drainage systems for the various industrial plants (concentrators, hydrometallurgical and pyrometallurgical plants) were constructed with internal collection drains and sumps for return of plant drainage to the processing circuit via pumps. SRK observed these systems to be well designed and if maintained and used correctly will continue to provide appropriate protection against out flowing drainage of contaminated plant water.

SRK observed that surface and ground water management measures for the most part had been reasonably developed and implemented for the CNMC Zambian Projects' operations. SRK also verified CNMC's subsidiary companies had also developed monitoring plans and were carrying out monitoring of surface and groundwater and site discharges in line with Zambian requirements which are comparable with industry best practices. Protocols were also in place to report to the ECZ any issues with above standard parameters and corrective measures were developed in cooperation with directives from the ECZ.

14.9 Air Emissions

Dust emissions for the CNMC Zambian Projects are mainly from mining operations, ore and waste stockpiles, ore crushing and transportation. Sporadic significant fugitive dust emissions from these sources were observed during the site visit.

Detailed assessments of these potential dust emissions and their impacts have been completed within the Projects' ESIA's. The ESIA's and associated EMP define measures for managing dust emissions which are mainly in line with Zambian legislative requirements and best industry practices. SRK observed that the majority of the defined measures had been introduced at site and that CNMC subsidiary companies are upgrading remaining measures in line with directives from the ECZ.

SRK observed CNMC subsidiary companies' operations utilize a number of water spray trucks at their sites to suppress dust generation from roads and stockpiling areas. SRK also notes that CNMC have installed dust suppression / collection equipment at the majority of ore crushing, handling and transfer points and other dust generation source points. The CNMC Zambian Projects were also at the time of SRK's site visit installing dust mitigation devices for a number of point sources that previously did not have them. The identified major outstanding point sources without suppression measures yet to be installed include the ore stacking conveyor systems at the Chambishi mine and Baluba mine.

Gas emissions generated by the CNMC Zambian Projects are predominantly from the operation of fixed and mobile plants and emissions include fugitive waste gas, smelter and hydrometallurgical plant emissions. The main pollutants from the various project operations include CO, NO_x, SO_x, hydrogen sulfide, acid mists and particulate matter. Detailed assessments of these potential gas emissions and their impacts have been completed within the Projects' ESIA's.

SRK observed that a number of measures had been taken through process design and implementation to reduce NO_x, SO_x and particulates being emitted from major gaseous waste discharge source points. The Projects' ESIA's state that external environmental impacts from these discharges should meet Zambian standards if the mitigation measures SRK observed were properly implemented.

The main internal impact from gaseous waste emissions comes from hydrogen sulfide point and fugitive source emissions at the CCS smelter and workers are required to wear gas masks to safely work in those surrounds. SRK notes that as visitors we were not provided with such personal protective equipment (PPE) during the site visit or provided an induction stating on-site dangers of exposure to hydrogen sulfide.

CNMC subsidiary companies reported there has been some operational monitoring of dust and some gas emissions for the CNMC Zambian Projects, but SRK feels this could be further upgraded to meet industry best practices and to ensure compliance with Zambian requirements for atmospheric emissions monitoring.

Greenhouse Gas Emissions

SRK was informed that there is no Zambian national legislative requirement for the Project to estimate its greenhouse gas emissions or to implement any emissions reductions. As such, none of the Project environmental assessment documentation reviewed addresses the issue of greenhouse gas emissions. However, these are components of IFC environmental requirements and are considered as internationally-recognized environmental management practices. Therefore, SRK recommends that consideration be given by CNMC to developing initiatives to quantify greenhouse gas emissions and assess possible emission reduction strategies for the CNMC Zambian Projects.

14.10 Noise Emissions

The activities that are carried out in the mining industry are characterized by producing sound emissions which, if they are not adequately managed, could affect the health and security of the workers, produce changes in the surrounding faunal compositions and in the environment in general. The main noise sources for the CNMC Zambian Projects will be from the operation of fixed equipment (crushers, compressors, pumps, smelter and hydrometallurgical facilities) and mobile equipment (mainly drilling and haulage activities).

The projects' ESIA's assessed noise sources and mitigating measures and state noise emissions may impact the local acoustic environment, but state with appropriate noise suppression equipment and measures noise will not exceed national noise standards. SRK observed that noise impacts are generally negligible due to the remoteness of most sites, except for off-site transportation.

CNMC subsidiary companies reported there has been some operational monitoring of noise emissions for the CNMC Zambian Projects and SRK notes that noise impacts are reviewed annually as part of the Annual Environmental Monitoring Inspection Reporting process. SRK though opines this could be further upgraded to meet industry best practices and to ensure compliance with Zambian requirements for noise emissions monitoring.

14.11 Hazardous Materials Management

Processing reagents used at the CNMC Zambian Projects' sites were observed by SRK to be stored mainly within purpose-built warehouses. CNMC protocols for handling, transfer and mixing of hazardous reagents at the individual operational sites was well managed and appropriate consideration given to safety with appropriate segregation of materials and safety signage and measures implemented. Acid storage tanks and other hazardous liquids also employed adequate secondary containment to contain a medium to major leak / spill.

Oil (diesel and motor) stored on-site was observed by SRK to have appropriate secondary containment facilities at the time of the site investigation. Storage of diesel oil was within a number of above and below-ground tanks at various locations about the CNMC Zambian Project sites. Motor oil and lubricants were also stocked in dedicated storages areas although secondary containment of these facilities would benefit from improved collection facilities. Some evidence of leaks and spills not being fully contained was evident about these areas.

The Project's ESIA reports contain details of practices in relation to environmental control and management of the above stated hazardous materials. CNMC also has hazardous materials management protocol at site and adequately trained the staff on safety and environmental considerations. While all the individual projects had Material Safety Data Sheets (MSDS) for hazardous materials used within their operations, not all areas were these materials were stored, handled or used had MSDS documentation on hand.

SRK suggests CNMC continue to manage storage, containment and collection facilities for hazardous materials and upgrade areas with substandard containment to comply with Zambian national regulations and recognized industry practices.

14.12 Waste Management

14.12.1 Waste Oil

The CNMC Zambian Projects produce waste oil from the servicing and maintenance of equipment. The Projects' ESIAs make reference to the management of waste oil and estimates annual generation rates and details an assessment of the storage and handling requirements for this waste oil. SRK observed waste oil collection at Projects' sites was limited to motor oils and lubricants from various fixed and mobile equipment. While hardstands for conducting maintenance work were in place, a lack of dedicated storage areas (with appropriate secondary containment) was observed during the site visit. SRK observed waste oil stored at the maintenance areas being stored outside on open ground and a fair amount of oil being leaked to the environment at a number of the project sites.

SRK recommends all maintenance works be carried out over hardstands to minimize the spillage of waste oil to the soil/water environment. The waste oil collected should be stored in containers within dedicated storage facilities with secondary containment. Initiatives for the sale and recycling of waste oil should be developed and implemented to fulfill Zambian national standards and industry best practices for the reuse/recycling of waste products (including hydrocarbons).

14.12.2 Solid Wastes

The Projects' ESIAs make reference to the management of solid wastes and details measures for their collection and disposal. SRK observed minimal examples of uncontrolled rubbish dumping within the current operational project site areas during the site visit. Most site areas had adequate rubbish bins about, although some instances of uncontrolled dumping were witnessed.

CNMC reported to SRK that the Luanshya Project's domestic solid wastes were collected by the local government for disposal offsite at a local government landfill. It was reported that the NFCA, SML and CCS projects previously used the same system for waste disposal, but were barred from continuing to do so due to waste oil and lubricant substances being dumped in these landfills. The present practice for disposal of waste was at an ad-hoc chosen site where surface dumping of general domestic waste was occurring along with the same waste oil and lubricants. These sites were unmanaged and represent contaminated sites and will continue to get worse without remediatory steps to address the practice which is not in line with Zambian requirements or industry best practices.

SRK observed that scrap iron was being collected and stockpiled in a number of designated areas about site prior to being sold for recycling in line with Zambian national directives on the reuse/recycling of waste products.

SRK recommends placing sufficient refuse collection points about the site for the collection of refuse prior to disposal. SRK also suggests a dedicated landfill be constructed in line with Zambian standards at the Project sites for the responsible disposal of solid wastes and that waste oils and lubricants not be dumped there but rather collected and stored for later recycling.

14.12.3 Sewage and Oily Wastewater

The Project's ESIAs provide detailed assessments regarding sewage generation and management measures to control potential environmental impacts. SRK observed appropriate septic systems to have been installed at all the CNMC Zambian Projects' sites and residential facilities. The treated sewage is then discharged to natural surface water channels and gullies surrounding the Project sites.

The management of oily wastewater or wash-down wastewater is addressed within the CNMC Zambian Projects' ESIA reports. Washing mobile equipment and plant wash-down drainage currently occurs within containment areas and the collected oily water then drains to installed gravity flow oil-water separation facilities. After treatment the separated water is discharged into site surface flow drains which discharge to local surface water channels and gullies surrounding the sites. Separated waste oil is supposed to then be collected for recycling, although SRK was informed by staff at site that this process still required further attention to meet the stated requirements from the ECZ.

SRK recommends ECZ instructions to upgrade management procedures regarding oily waste water be followed to ensure compliance with Zambian requirements.

14.13 Contaminated Sites Assessment

The assessment, recording and management of contaminated sites within mining or mineral processing operations is a recognized international industry practice (i.e. forms part of the IFC Guidelines) and in some cases a national regulatory requirement (e.g. an Australian environmental regulatory requirement). The purpose of this process is to minimize the level of site contamination that may be generated throughout a project's operation while also minimizing the level and extent of site contamination that will need to be addressed at site closure.

A contaminated site or area can be defined as:

"An area that has substances present at above background concentrations that presents or has the potential to present a risk of harm to human health, the environment or any environmental value".

The CNMC Zambian Projects, individual operations do not employ standalone Contaminated Sites Assessment programs, but rather the process is undertaken through the annual environmental reporting procedure conducted by independent reviewers and ECZ inspections. The Environmental Departments for the individual operations reported to SRK that they do record areas of known contamination for remediatory action also as part of their normal duties.

Annual EMPs also outline requirements for reducing contamination of land and water in and around the sites, identifying such sites and carrying out remediation measures to rectify the contamination.

During the site visit, the major contaminated site was the area used by NFCA, SML and CCS for waste disposal where clear evidence of unmanaged dumping of rubbish and waste oils and lubricants was occurring. SRK also observed other areas of minor to medium contamination (oil spills and rubbish) about areas of the Project sites, mainly, by hydrocarbon storage areas, concentrator sites and vehicle maintenance areas. SRK recommends that a contaminated sites assessment and management process be formalized and regularly conducted for the CNMC Zambian Projects such as is outlined in EMP and in line with directions from the ECZ, thereby actively enabling remediation of current and future contaminated sites.

14.14 Environmental Management Plan

The purpose of an operational EMP is to direct and coordinate the management of the project's environmental risks. The EMP documents the establishment, resourcing and implementation of the project's environmental management programs. The site environmental performance is monitored and feedback from this monitoring is then utilized to revise and streamline the implementation of the EMP.

Zambian legislation requires the development of an EMP alongside the ESIA at the proposal to develop stage of a project as part of project approvals and also requires the preparation of annual EMP's as part of the annual reporting and compliance / performance checking process.

CNMC's subsidiary companies provided SRK with their original EMP which outlines responsibilities for an Environmental Protection Department, management, monitoring and protection measures for project assessment and approval that were accepted by the ECZ. SRK also sighted the previous couple of years annual EMP's for each of the CNMC Zambian Projects operations.

SRK sighted CNMC's subsidiary companies monitoring plan inclusive of sampling points and result records for their individual projects. Monitoring includes: surface and ground water up and downstream / gradient from the projects' operational facilities and discharge points and atmospheric monitoring. SRK opines the monitoring plans fulfill the companies' obligations under Zambian legislative requirements and is generally in line with industry best practices.

14.15 Emergency Response Plan

The IFC describes an emergency as 'an unplanned event when a project operation loses control, or could lose control, of a situation that may result in risks to human health, property, or the environment, either within the facility or in the local community'. Emergencies are of a scale that have operational wide impacts, and do not include small-scale localized incidents that are covered under operational area specific management measures. Examples of an emergency for a mining/ mineral processing project are events such as pit wall collapse, underground mine explosion, the failure of a TSF or a large-scale spillage/discharge of hydrocarbons or chemicals.

The recognized international industry practice for managing emergencies is for a project to develop and implement an Emergency Response Plan (ERP). The general elements of an ERP are:

- Administration — policy, purpose, distribution, definitions of potential site emergencies and organizational resources (including setting of roles and responsibilities).
- Emergency response areas — command centers, medical stations, muster and evacuation points.
- Communication systems — both internal and external communications.
- Emergency response procedures — work area specific procedures (including area specific training).
- Checking and updating — prepare checklists (role and action list and equipment checklist) and undertake regular reviews of the plan.
- Business continuity and contingency — options and processes for business recovery from an emergency.

SRK was provided with ERP's for the CNMC Zambian Projects individual operations that included environmental emergency response measures, protocols and directives that cover most of the above components along with health and safety measures. SRK noted some discrepancies between planned measures as stated in the ERP and preventative and response measures and facilities implemented and installed at the various sites. Namely, the operational readiness of response facilities such as eye baths, showers and preventative measures such providing inductions and enforced requirement for PPE for everyone at or visiting the sites.

SRK recommends that CNMC implement the operational ERP for all the CNMC Zambian Projects operations, in line with Zambian national requirements and recognized international industry practices.

14.16 Site Closure Planning and Rehabilitation

The Zambian national requirements for mine closure are covered under the *Mines and Mineral Act 2008*, the *Environmental Protection and Pollution Control Act 1990*. Project ESIA's also report guidance in the development of closure policy and accepted practices has been taken from the Equator Principles. In summary these legislative requirements and accepted practices guidance cover the need to conduct land rehabilitation, to prepare a site closure report and submit a site closure application for assessment and approval.

The recognized international industry practice for managing site closure is to develop and implement an operational site closure planning process and document this through an operational Closure Plan. This operational closure planning process should include the following components:

- Identify all site closure stakeholders (e.g. government, employees, community etc.).
- Undertake stakeholder consultation to develop agreed site closure criteria and post operational land use.
- Maintain records of stakeholder consultation.
- Establish a site rehabilitation objective in line with the agreed post operational land use.
- Describe/define the site closure liabilities (i.e. determined against agreed closure criteria).

- Establish site closure management strategies and cost estimates (i.e. to address/reduce site closure liabilities).
- Establish a cost estimate and financial accrual process for site closure.
- Describe the post site closure monitoring activities/program (i.e. to demonstrate compliance with the rehabilitation objective/closure criteria).

The development of a conceptual closure plan inclusive of cost estimates and the payment of bond accrual funds are required for project development assessment and governmental approval. SRK sighted these closure plans and cost estimates which cover the above listed components had been developed and bond accrual funds set up in line with Zambian legislative requirements for each of the CNMC subsidiary companies project operations.

Zambian annual reporting and assessment requirements also require the development of an operational closure plan that is progressively updated annually to incorporate new operational developments, disturbances, rehabilitation of areas and other changes that may have occurred. The annual payment of the closure accrual bond fund is then based upon this annual update and revised annual payments are made accordingly. SRK sighted the last couple of year's operational closure plans including revised cost estimates along with governmental acceptances of the plans and records of bond accrual fund payments in line with Zambian legislative requirements.

SRK though considers the assessment of social / community / stakeholder conditions can be improved through the ongoing progressive closure planning process to better define opportunities to assist enable the local communities to gain benefit throughout the projects life and after closure.

SRK opines that rehabilitation measures stated in the Projects' ESIA's, conceptual and operational closure plans are reasonable and appropriate as regards site and environmental conditions when considered against industry best practices, but feel more can done to improve the analysis of social measures as regard community involvement throughout the project operational phase and self-sufficiency objectives for post-closure.

14.17 Social Assessment

The land use for the general area surrounding the Project sites is a mix of sustenance agricultural, charcoal production, mining and mineral activities and forestry. CNMC stated that the population of the surrounding area is a mix of different tribal Zambian communities and some Congolese refugees. CNMC also reported that there are no significant cultural heritage sites, burial sites or nature reserves, within or surrounding any of the Project sites except for a small monument constructed to commemorate the discovery of copper resources in the area which is on the NFCA site and kept in good order.

CNMC stated they have received some official notices of public complaints in relation to the activities of the CNMC Zambian Projects, but they maintain the issues were minor and otherwise a positive relationship with the local communities exists due to the below stated social development measures.

CNMC stated the positive effects to the surrounding local communities are mainly direct employment of local contractors and use of local suppliers and service providers where practical. CNMC has also developed a number of social development measures among local communities including water and electricity supply to local villages and the financial support for schools in the local communities. CNMC also reported to SRK that they would also provide access for locals to the CNMC medical clinic along with other measures.

The CNMC Zambian Projects' ESIA's include details for the development of Social Development Programs in line with Zambian legislative requirements. CNMC has not itself though further developed these Social Development Programs past their initial efforts. It is SRK's opinion that the social and labor situation in the surrounding communities has the potential to lead to conflicts with these communities if CNMC does not further their social license to operate within and about these villages. CNMC stated they have no formalized social dispute resolution mechanism and reported to SRK that is carried out between CNMC and local Zambian by the local police force.

The ESIA's report, Management Programs and Action Plans must be compiled to deal with specific mitigation measures and actions necessary for the project to comply with applicable Zambian laws and regulations and to meet the requirements of the IFC Performance Standards. This will require a number of Plans and Action Plans in order the meet the IFC Performance Standards which are listed below:

- Public Consultation and Disclosure Plan
- Social and Labor Development Plan
- Training and Localization Plan
- Resettlement Framework
- Decommissioning, Closure and Rehabilitation Plan
- Social and Environmental Awareness and Training Plan
- Emergency Preparedness and Response Plan
- Community Health and Safety Action Plan
- Hazardous Waste Management Plan
- Hazardous Materials Management Plan
- Retrenchment Plan
- Human Resources Policy
- HIV/AIDS Policy
- Occupational Health and Safety Policy
- Environmental, Social and Heritage Policy

CNMC stated they are currently in the process of developing the applicable policies with some key areas already addressed during the last 12 months. CNMC reported they are also committed to developing a number of plans in terms of the IFC's requirements. These include the development of the following:

- Occupational Health and Safety Policy
- Environmental Policy

- Decommissioning, Closure and Rehabilitation Plan
- Resettlement Framework
- Public Consultation and Disclosure Plan
- HIV/AIDS policy
- Relocation Policy Framework
- Social and Labor Development Plan
- Training and Localization Plan
- Hazardous Materials Management Plan
- Retrenchment Plan
- Emergency Preparedness and Response Plan
- Community Health and Safety Action Plan
- Hazardous Waste Management Plan
- Training and Localization Plan

Public participation/community consultation programs were confirmed as being undertaken for each Project operation as part of their ESIA along with most of the other required plans and policies. SRK though observed that CNMC staff outside the Environmental Department had little knowledge about the program or their results. SRK found the ongoing management and continuation of these plans is where the main issue lies with regards to the social risks for the projects continued operations.

A number of non-compliance notices and other notices of a breach of environmental or social conditions for the CNMC Zambian Projects from the local or provincial governments have been sighted as part of this review. CNMC reported to SRK that each notice includes statements to rectify the non-compliances and that the CNMC subsidiary companies action the issues through Corrective Action Statements and reports on the actions taken through their annual reporting process. CNMC also stated to SRK that they maintain a strong relationship with local, provincial and National governments along with the local police.

CNMC reported to SRK that the industrial relations climate was disturbed from 28 to 29 November, 2011 when employees at the hospital proceeded on an industrial action strike for the following reasons:

- Erratic water supply at the hospital;
- Shortage of qualified medical personnel;
- Dilapidated hospital infrastructure;
- Lack of security at the hospital;

- Poor communication between senior and junior nurses;
- Uncompetitive salaries

CNMC stated the strike was called off after the workers were persuaded to return to work by Union Head Office officials with management promising to address all the above concerns. SRK notes that this industrial action comprised only the staff from the hospital and not the mining or processing operations thereby not impacting upon mining or processing output.

CNMC reported the Company experienced another illegal strike from 8 to 11 December, 2011 when workers demanded, initially, that management should withdraw the proposal of salary harmonization from the 2012 collective bargaining session. Management acceded to the employees' demand but the workers made their return to work contingent upon the dismissal four Zambian management officials. The strike was only called off when Government intervened through the Ministry of Labour. During the strike the Company lost 4,128 man-hours and 664 tons of copper in concentrate. Management has improved communication channels to avoid such uncalled for illegal strikes in future.

14.18 Evaluation of Environmental & Social Risks

The sources of inherent environmental and social risk are project activities that may result in potential environmental and social impacts that detrimentally effect the projects continued operations. These project activities have been previously described within this Report.

In summary, the most significant potential compliance and environmental risks for the development of the CNMC Zambian Projects, currently identified as part of the project assessment, are:

- Surface water management and discharges such as site discharges and stormwater runoff.
- Groundwater management and discharges such as mine dewatering and seepage from WRD and TSF.
- Dust and gaseous emissions management and mitigation.
- Storage and handling of hazardous materials.
- Waste generation and management of industrial and domestic wastes.
- Rehabilitation of waste rock stockpiles and other disturbed areas.
- Potential and current contaminated sites.
- Site erosion controls, sediment entrainment and deposition.
- Lack of geochemical characterization of industrial waste materials such as waste rock.
- Continued implementation of closure planning process.
- Continued development of social license to operate.
- Implementation of health and safety standard practices.

SRK noted during the site investigation that current management of the above noted potential risks were at the time of the site visit being managed at a reasonable level and is considered by SRK to be categorized as acceptable / tolerable risk classification (i.e. requiring normal operational risk management measures), but further attention to reduce and maintain the realized and potential impacts at an acceptable level. The environmental qualitative risk assessment matrix is included within the full project risk assessment in section 15, Table 15-2 of this Report.

The environmental risks associated with surface and groundwater, dust and gas emissions, hazardous materials storage, WRD, TSF and stockpile management, and land disturbance and rehabilitation, can be generally managed if Zambian national environmental standards and regulatory requirements are met along with the application of industry best practices.

The environmental risks associated with the potential for generating contaminated sites and other site closure liabilities and developing and maintaining social license to operate; inclusive of health and safety standards can be effectively managed by adopting relevant recognized international industry practices. On-site management of these above risks should be coordinated through the implementation of the operational EMP, ERP and HSE plans which incorporate all areas of required work. Developing and maintaining a social license to operate needs to be managed through the development of Social Development Plans and support of initiatives defined through the consultation process.

15 Project Risk Assessment

Mining is a relatively high-risk industry. In general, the risk may decrease from the exploration to the development to production stage. CNMC's projects are production projects, in which the risks are relatively low. SRK considered various technical aspects which may affect these iron projects, and has conducted a risk assessment which has been summarized in Table 15-1. The Environmental Qualitative Risk Assessment Matrix is shown in Table 15-2. The full qualitative risk analysis process is described in Appendix V to this Report.

Table 15-1: Summary of CNMC's Project Risk Assessment

Risk Issue	Likelihood	Consequence	Overall
Geology and Resource			
Lack of Significant Resource	Unlikely	Moderate	Low
Lack of Significant Reserve	Unlikely	Moderate	Low
Significant Unexpected Faulting	Unlikely	Major	Medium
Mining			
Significant Production Shortfalls	Unlikely	Major	Medium
Production Pumping System Adequacy	Unlikely	Moderate	Low
Significant Geological Structure	Possible	Moderate	Medium
Poor Pit Slope Condition	Unlikely	Moderate	Low
Poor Mine plan	Unlikely	Moderate	Low
Process Plant			
Lower Yields	Possible	Moderate	Medium
Lower Recovery	Unlikely	Minor	Low
Higher Production Cost	Possible	Moderate	Medium
Higher Production Cost	Unlikely	Major	Medium
Capital and Operating Costs			
Project Timing Delays	Possible	Moderate	Medium
Capital Cost Increases	Possible	Moderate	Medium
Capital Costs — Ongoing	Possible	Moderate	Medium
Operating Costs Underestimated	Possible	Moderate	Medium

Table 15-2: CNMC Zambia Environmental Qualitative Risk Assessment Matrix

Sources of Environmental Risk	Consequence Severity	Likelihood	Inherent Environmental Risk Ranking
Surface water management and discharges (i.e. stormwater runoff, erosion control measures).	Moderate	Certain	Medium
Groundwater management and discharges (i.e. mine dewatering and seepage from the WRD).	Moderate	Possible	Medium
Dust generation and gas emissions management and monitoring.	Moderate	Possible	Medium
Storage and handling of hazardous materials.	Moderate	Likely	Medium
Waste generation and management (industrial and domestic wastes).	Moderate	Possible	Medium
Rehabilitation of the waste rock stockpiles and other disturbed areas.	Moderate	Likely	Medium
Potential and current contaminated sites	Moderate	Certain	Medium
Site erosion controls, sediment entrainment and deposition	Moderate	Certain	Medium
Lack of geochemical characterization/ ARD assessment of waste rock.	Moderate	Unlikely	Low
Continued implementation of closure planning process.	Moderate	Likely	Medium
Continued development of social license to operate	Moderate	Certain	Medium
Implementation of environmental health and safety standard practices	Moderate	Likely	Medium

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101. Air emission modeling results for CCS chimney discharges. Numerous for 2010

102. CCS Investment License (No. ZDA2592/07/07) from Zambia Development Agency, 27-6-2007 until 26-6-2017

103. CCS Multi-Facility Economic Zone License (No.01) from Zambia Development Agency, 2-7-2008 until 2-7-2018

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125. CCS Sulfuric Acid Storage License (No. PTS/ND/925/2009) issued by ECZ on Aug 24 2009 — valid from Jan 1 2009 — Dec 31 2009

126. CCS Acid Plant Stack Emission License (No. ECZ/AP4/112) issued by ECZ on Aug 24, 2009 — valid from Jan 1, 2009 — Dec 31, 2009

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136. NFCA Large-Scale Mining License (No. 7069-HQ-LML) issued by the Mines Development Department on July 12, 2010 — valid for 25 years

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152. NFCA Annual Operating Permit (No. 35/2009) issued by Mines Safety Department, Jan 22, 2009 — valid for 2009

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154. NFCA Annual Operating Permit (No. 11/2011) issued by Mines Safety Department, Jan 19, 2011 — valid for 2011

155. NFCA Environmental Inspection Report for site inspection carried out by ECZ in Aug 2010

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160. Luanshya Hazard Register for Mine Work — for Daily use — prepared by Enviro/Safety Dept.

161. Luanshya Hazard Register for Entry to Underground Work — prepared by Enviro/Safety Dept.

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168. Luanshya Hazard Register for extending service columns — prepared by E/S Dept.

169. Luanshya Hazard Register for Face Preparation — prepared by E/S Dept.

170. Luanshya Hazard Register for underground area marking off — prepared by E/S Dept.

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184. Luanshya Cu Mines Risk Assessment Report (whole project) — prepared by International Mining Industry Underwriters Limited (IMIU), Mar 2005

185. Luanshya Risk Evaluation: Inherent v Residual after employing Corrective and Preventive Controls — prepared by E/S Dept.

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189. Luanshya Hazard Register Long Hole Drilling, dismantling drill rig — prepared by E/S Dept.

190. Luanshya Cu Mines Risk Assessment Report (whole project) — prepared by IMIU, Apr 19, 2007

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199. Luanshya Internal Audit for Health Care Waste Management- Luanshya Mine Hospital & Residential Clinics — prepared by E/S Dept. 27-01-2011

200. Luanshya Internal Audit for Baluba Surface Diesel Workshop; Hydrocarbon Contamination & Waste Management — prepared by E/S Dept. 18.03.11

201. Luanshya ENVIRONMENTAL PROTECTION FUND AUDIT REPORT, Baluba Mine — Concentrator — Workshops and Musi Dam — prepared by CHAMSPRO LIMITED (independent consultants) Feb 2011

202. Luanshya ENVIRONMENTAL PROTECTION FUND AUDIT REPORT, DECOMMISSIONED AND CLOSED SHAFTS (14 SHAFT- 18 SHAFT and 28 SHAFT) — prepared by CHAMSPRO LIMITED Feb 2011

203. Luanshya ENVIRONMENTAL PROTECTION FUND AUDIT REPORT, MULIASHI COPPER PROJECT — prepared by CHAMSPRO LIMITED Feb 2011

204. Luanshya ESIA Approval letter for Muliashi Project issued by ECZ on 10-11-2010

205. Luanshya Copper Mines Decommissioning and Closure ESIA Approval Letter, issued by ECZ on 10-11-2010

206. Luanshya ESIA for Operational CNMC Luanshya Copper Mines Approval Letter, issued by ECZ on 10-11-2010

207. Luanshya ESIA for Muliashi Project, produced by Epoch Resources (consulting group) in 2007

208. Luanshya ESIA for Luanshya Copper Mines, produced by No author or date provided

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210. Luanshya EMP 2011 prepared by E/S Dept. for Luanshya Copper Mines

211. Luanshya Copper Mines ESIA for Decommissioning and Closure, no author provided, Dec 2009

212. Luanshya Safety Statistics for 2009 — 2010

213. Luanshya Details of Reportable and Fatal Accidents Dec 2010

214. Luanshya Application for Annual Operating Permit to Mines Development Department and Mines Safety Director, dated Mar 7, 2011

215. Luanshya Decommissioning Plans and Closure of Muliashi Project ESIA, prepared by E/S Dept. No Date provided

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217. Luanshya Water Abstraction (from Musiyapatwa River) Permit (No.WDB/1661) issued by Zambian Water Board, May 16, 2006 — valid for 5 years

218. Luanshya Large-Scale Mining License (No. 8404-HQ-LML commencing on Nov 9, 2006 — valid for 25 years, issued by the Mines Development Dept. on Apr 29, 2010

219. Luanshya Large-Scale Mining License (No. 8396-HQ-LML), commencing on Oct 19, 2006 — valid for 25 years, issued by the Mines Development Dept. on Apr 29, 2010

220. Luanshya Large-Scale Mining License (No. 8395-HQ-LML), commencing on Oct 19, 2006 — valid for 25 years, issued by the Mines Development Dept. on Apr 29, 2010

221. Luanshya Large-Scale Mining License (No. 8394-HQ-LML), commencing on Oct 19, 2006 — valid for 25 years, issued by the Mines Development Dept. on Apr 29, 2010

222. Luanshya Large-Scale Mining License (No. 8393-HQ-LML) commencing on Oct 19, 2006 — valid for 25 years, issued by the Mines Development Dept. on Apr 29, 2010

223. Luanshya Large-Scale Mining License (No. 8392-HQ-LML), commencing on Oct 19, 2006 — valid for 25 years, issued by the Mines Development Dept. on Apr 29, 2010

224. Luanshya Large-Scale Mining License (No. 8097-HQ-LML), commencing on Jan 23, 2004 — valid for 20 years, issued by the Mines Development Dept. on Apr 29, 2010

225. Luanshya Production Hazard / Risk Register, prepared by E/S Dept. Apr 30, 2011

226. SINO-METALS ENVIRONMENTAL MANAGEMENT PLAN 2009

227. SINO-METALS ENVIRONMENTAL MANAGEMENT PLAN 2010

228. SINO-METALS MWAMBASHI EMP

229. SINO-METALS SHEQ REPORTING — ORGANIZATION CHART

230. SINO-METALS ECZ-COMPLIANCE MONITORING — 1, 2, 3 and 4

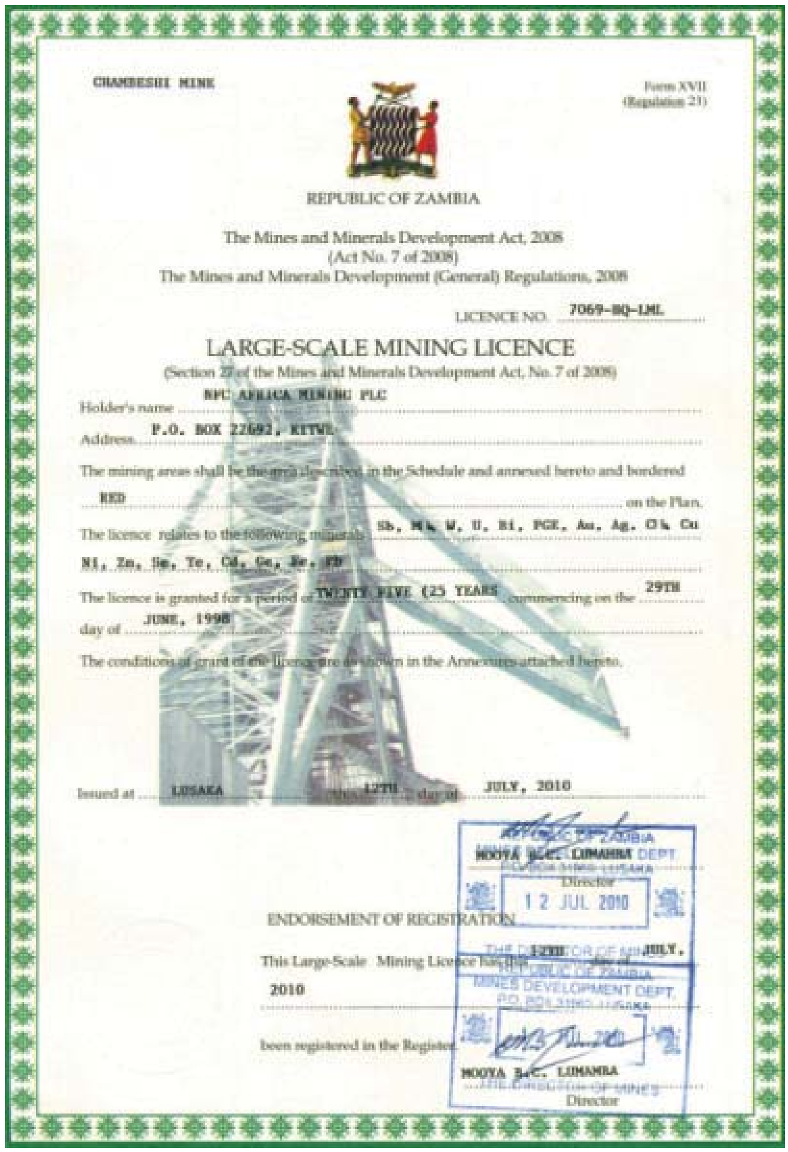
231. SINO-METALS ECZ-LICENSING — 1, 2, 3 and 4

232. SINO-METALS ANNUAL REPORTS

APPENDICES

Appendix I: Mining Licenses

Mining License — NFCA Chambishi Project (7069-HQ-LML)



CHAMBESHI MINE

Form XVII
(Regulation 23)

REPUBLIC OF ZAMBIA

The Mines and Minerals Development Act, 2008
(Act No. 7 of 2008)
The Mines and Minerals Development (General) Regulations, 2008

LICENCE NO. 7069-HQ-LML

LARGE-SCALE MINING LICENCE

(Section 27 of the Mines and Minerals Development Act, No. 7 of 2008)

Holder's name NFC AFRICA MINING PLC

Address P.O. BOX 22692, KITWE

The mining areas shall be the area described in the Schedule and annexed hereto and bordered RED on the Plan.

The licence relates to the following minerals Sb, Mo, W, U, Bi, PGE, Au, Ag, Co, Cu Ni, Zn, Se, Te, Cd, Ge, Be, Pb

The licence is granted for a period of TWENTY FIVE (25 YEARS commencing on the 29TH day of JUNE, 1998

The conditions of grant of the licence are as shown in the Annexures attached hereto.

Issued at LUSAKA this 12TH day of JULY, 2010

MOOYA B.C. LUMAMBA
Director

ENDORSEMENT OF REGISTRATION

This Large-Scale Mining Licence has this 12TH day of JULY, 2010

been registered in the Register.

MOOYA B.C. LUMAMBA
Director

Mining License – CLM Project (8097-HQ-LML)

Form XVII
(Regulation 23)

LUANSHYA AND BALUBA MINES

REPUBLIC OF ZAMBIA

The Mines and Minerals Development Act, 2008
(Act No. 7 of 2008)
The Mines and Minerals Development (General) Regulations, 2008

LICENCE NO. 8097-HQ-LML

LARGE-SCALE MINING LICENCE

(Section 27 of the Mines and Minerals Development Act, No. 7 of 2008)

Holder's name CNMC LUANSHYA COPPER MINES PLC

Address P.O. BOX 90456, LUANSHYA

The mining areas shall be the area described in the Schedule and annexed hereto and bordered RED on the Plan.

The licence relates to the following minerals Cu, Co, Au, Ag, Pb, Zn, Ni, U, S, Se, Bismuth, Te, Ge, Auf, MO, W & Cadmium

The licence is granted for a period of TWENTY (20) YEARS commencing on the 23RD day of JANUARY, 2004

The conditions of grant of the licence are as shown in the Annexures attached hereto.

ANNEXURES 1-7

Issued at LUSAKA this 29TH day of APRIL, 2010

MOOYA S.C. LUMAMBA
Director

ENDORSEMENT OF REGISTRATION

This Large-Scale Mining Licence has this 29TH day of APRIL, 2010 been registered in the Register.

MOOYA S.C. LUMAMBA
Director

Mining License — CLM Project (8396-HQ-LML)

Form XVII
(Regulation 23)

ROAN BASIN – LUANSHYA

REPUBLIC OF ZAMBIA

The Mines and Minerals Development Act, 2008
(Act No. 7 of 2008)
The Mines and Minerals Development (General) Regulations, 2008

LICENCE NO. 8396-HQ-LML

LARGE-SCALE MINING LICENCE
(Section 27 of the Mines and Minerals Development Act, No. 7 of 2008)

Holder's name CNMC LUANSHYA COPPER MINES PLC

Address P.O. BOX 90456, LUANSHYA

The mining areas shall be the area described in the Schedule and annexed hereto and bordered RED on the Plan.

The licence relates to the following minerals COPPER AND COBALT

The licence is granted for a period of TWENTY-FIVE (25) YRS commencing on the 19TH day of OCTOBER, 2006

The conditions of grant of the licence are as shown in the Annexures attached hereto.

ANNEXURES 1-7

Issued at LUSAKA this 29TH day of APRIL, 2010

MOOYA B.C. LUMAMBA
Director

ENDORSEMENT OF REGISTRATION

This Large-Scale Mining Licence has this 29TH day of APRIL, 2010

been registered in the Register.

MOOYA B.C. LUMAMBA
Director

Mining License — CLM Project (8394-HQ-LML)

Form XVII
(Regulation 23)

MUVA HILL – LUANSHYA

REPUBLIC OF ZAMBIA

The Mines and Minerals Development Act, 2008
(Act No. 7 of 2008)
The Mines and Minerals Development (General) Regulations, 2008

LICENCE NO. 8394-HQ-LML

LARGE-SCALE MINING LICENCE

(Section 27 of the Mines and Minerals Development Act, No. 7 of 2008)

Holder's name CNMC LUANSHYA COPPER MINES PLC

Address P.O. BOX 90456, LUANSHYA

The mining areas shall be the area described in the Schedule and annexed hereto and bordered RED on the Plan.

The licence relates to the following minerals COPPER AND COBALT

The licence is granted for a period of TWENTY-FIVE (25) YRS commencing on the 19TH day of OCTOBER, 2006

The conditions of grant of the licence are as shown in the Annexures attached hereto.

ANNEXURES 1-7

Issued at LUSAKA this 29TH day of APRIL, 2010

MOOYA M.C. LUMAMBA
Director

ENDORSEMENT OF REGISTRATION

This Large-Scale Mining Licence has this 29TH day of APRIL, 2010 been registered in the Register.

MOOYA M.C. LUMAMBA
Director

Mining License — CLM Project (8393-HQ-LML)

MULIASHI – LUANSHYA

Form XVII
(Regulation 23)

REPUBLIC OF ZAMBIA

The Mines and Minerals Development Act, 2008
(Act No. 7 of 2008)
The Mines and Minerals Development (General) Regulations, 2008

LICENCE NO. 8393-HQ-LML

LARGE-SCALE MINING LICENCE

(Section 27 of the Mines and Minerals Development Act, No. 7 of 2008)

Holder's name CNMC LUANSHYA COPPER MINES PLC

Address P.O. BOX 90456, LUANSHYA

The mining areas shall be the area described in the Schedule and annexed hereto and bordered RED on the Plan.

The licence relates to the following minerals COPPER AND COBALT

The licence is granted for a period of TWENTY-FIVE (25) YRS commencing on the 19TH day of OCTOBER, 2006

The conditions of grant of the licence are as shown in the Annexures attached hereto.

ANNEXURES 1-7

Issued at LUSAKA this 29TH day of APRIL, 2010

MOOYA S.C. LUMAMBA
Director

ENDORSEMENT OF REGISTRATION

This Large-Scale Mining Licence has this 29TH day of APRIL, 2010 been registered in the Register.

MOOYA S.C. LUMAMBA
Director

Mining License — CLM Project (8395-HQ-LML)

Form XVII
(Regulation 23)

ROAN EXTENSION WEST – LUANSHYA

REPUBLIC OF ZAMBIA

The Mines and Minerals Development Act, 2008
(Act No. 7 of 2008)
The Mines and Minerals Development (General) Regulations, 2008

LICENCE NO. 8395-HQ-LML

LARGE-SCALE MINING LICENCE

(Section 27 of the Mines and Minerals Development Act, No. 7 of 2008)

Holder's name CNMC LUANSHYA COPPER MINES PLC

Address P.O. BOX 90456, LUANSHYA

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MOOYA B.C. LUMAMBA
Director

Mining License — CLM Project (8404-HQ-LML)

Form XVII
(Regulation 23)

ROAN EXTENSION EAST - LUANSHYA

REPUBLIC OF ZAMBIA

The Mines and Minerals Development Act, 2008
(Act No. 7 of 2008)
The Mines and Minerals Development (General) Regulations, 2008

LICENCE NO. 8404-HQ-LML

LARGE-SCALE MINING LICENCE

(Section 27 of the Mines and Minerals Development Act, No. 7 of 2008)

Holder's name CNMC LUANSHYA COPPER MINES PLC

Address P.O. BOX 90456, LUANSHYA

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The licence relates to the following minerals COPPER AND COBALT

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The conditions of grant of the licence are as shown in the Annexures attached hereto.

ANNEXURES 1-7

Issued at LUSAKA this 29TH day of APRIL, 2010

MOOYA B.C. LUMAMBA
Director

ENDORSEMENT OF REGISTRATION

This Large-Scale Mining Licence has this 29TH day of APRIL, 2010 been registered in the Register.

MOOYA B.C. LUMAMBA
Director

Mining License — CLM Project (8392-HQ-LML)

BALUBA EAST -LUANSHYA

Form XVII
(Regulation 23)

REPUBLIC OF ZAMBIA

The Mines and Minerals Development Act, 2008
(Act No. 7 of 2008)
The Mines and Minerals Development (General) Regulations, 2008

LICENCE NO. 8392-HQ-LML

LARGE-SCALE MINING LICENCE
(Section 27 of the Mines and Minerals Development Act, No. 7 of 2008)

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Appendix II: Chinese Resource and Reserve Standards

Categorization of Mineral Resources and Ore Reserves

The system for the categorization of mineral resources and ore reserves in China is in a period of transition which commenced in 1999. The traditional system, which is derived from the former Soviet system, uses five categories based on decreasing levels of geological confidence — Categories A, B, C, D and E. The new system (Rule 66) promulgated by the Ministry of Land and Resources (MLR) in 1999 uses three-dimensional matrices, based on economic, feasibility/mine design and geological degrees of confidence. These are categorized by a three number code of the form "123". This new system is derived from the UN Framework Classification proposed for international use. All new projects in China must comply with the new system, however, estimates and feasibility studies carried out before 1999 will have used the old system.

Wherever possible, the Chinese Resource and Reserve estimates have been reassigned by SRK to categories similar to those used by the JORC Code to standardize categorization. Although similar terms have been used, SRK does not mean to imply that in their present format they are necessarily classified as 'Mineral Resources' as defined by the Australasian Code for the Reporting of Exploration Results, Mineral Resources and Ore Reserves (the "JORC Code").

A broad comparison guide between the Chinese classification scheme and the JORC Code is presented in the following table.

	Chinese Resource Category	
JORC Code Resource Category	Previous system	Current system
Measured	A, B	111, 111b, 121, 121b, 2M11, 2M21, 2S11, 2S21, 331
Indicated	C	122, 122b, 2M22, 2S22, 332
Inferred	D	333
Non-equivalent	E	334

Definition of the New Chinese Resource and Reserve Category Scheme

Category	Denoted	Comments
Economic	1	Full feasibility study considering economic factors has been conducted
	2	Pre feasibility to scoping study which generally considers economic factors has been conducted
	3	No pre feasibility or scoping study conducted to consider economic analysis
Feasibility	1	Further analysis of data collected in "2" by an external technical department
	2	More detailed feasibility work including more trenches, tunnels, drilling, detailed mapping
	3	Preliminary evaluation of feasibility with some mapping and trenches
Geologically controlled	1	Strong geological control
	2	Moderate geological control via closely-spaced data points (e.g. small-scale mapping)
	3	Minor work which is projected throughout the area
	4	Review stage

Relationship between JORC Code and the Chinese Reserves System

In China, the methods used to estimate the resources and reserves are generally prescribed by the relevant Government authority, and are based on the level of knowledge for that particular geological style of deposit. The parameters and computational methods prescribed by the relevant authority include cut-off grades, minimum thickness of mineralization, maximum thickness of internal waste, and average minimum 'industrial' or 'economic' grades required. The resource classification categories are assigned largely on the basis of the spacing of sampling, trenching, underground tunnels and drill holes.

In the pre-1999 system, Category A generally included the highest level of detail possible, such as grade control information. However, the content of each category B, C and D may vary from deposit to deposit in China, and therefore must be carefully reviewed before assigning to an equivalent "JORC Code type" category. The traditional Categories B, C and D are broadly equivalent to the 'Measured', 'Indicated', and 'Inferred' categories that are provided by the JORC Code and USBM/USGS systems used widely elsewhere in the world. In the JORC Code system the 'Measured Resource' category has the most confidence and the 'Inferred' category has the least confidence, based on the increasing levels of geological knowledge and continuity of mineralization.

<table>
<tr><th colspan="2">Old Chinese Classification</th><th colspan="2">A & B</th><th colspan="3">C</th><th>D</th><th>E & F</th></tr>
<tr><th colspan="9">New Chinese Classification</th></tr>
<tr><td rowspan="2">"E" Economic Evaluation (1XX)</td><td>Designed Mining Loss Accounted</td><td>Recoverable Reserve (111)</td><td>Probable Recoverable Reserve (121)</td><td></td><td>Probable Recoverable Reserve (122)</td><td></td><td></td><td></td></tr>
<tr><td>Designed Mining Loss NOT Accounted (b)</td><td>Basic Reserve (111b)</td><td>Basic Reserve (121b)</td><td></td><td>Basic Reserve (122b)</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Marginal Economic (2MXX)</td><td>Basic Reserve (2M11)</td><td>Basic Reserve (2M21)</td><td></td><td>Basic Reserve (2M22)</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Submarginal Economic (2SXX)</td><td>Resource (2S11)</td><td>Resource (2S21)</td><td></td><td>Resource (2S22)</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Intrinsic Economic (3XX)</td><td></td><td></td><td>Resource (331)</td><td></td><td>Resource (332)</td><td>Resource (333)</td><td>Resource (334)</td></tr>
<tr><td colspan="2">"F" Feasibility Evaluation</td><td>Feasibility (010)</td><td>Pre-Feasibility (020)</td><td>Scoping (030)</td><td>Pre-Feasibility (020)</td><td>Scoping (030)</td><td>Scoping (030)</td><td>Scoping (030)</td></tr>
<tr><td colspan="2">"G" Geological Evaluation</td><td colspan="3">Measured (001)</td><td colspan="2">Indicated (002)</td><td>Inferred (003)</td><td>Predicted (004)</td></tr>
<tr><td colspan="2" rowspan="4">Comparison to JORC Code</td><td colspan="5"></td><td colspan="2">Unclassified</td></tr>
<tr><td colspan="3"></td><td colspan="3">Inferred Resource</td><td></td></tr>
<tr><td></td><td colspan="2">Probable Reserve or Indicated Resource</td><td colspan="4"></td></tr>
<tr><td colspan="3">Proved / Probable Reserve or Measured Resource</td><td colspan="4"></td></tr>
</table>

Appendix III: Zambian Environmental Legislative Background

The core pieces of legislation and associated regulations governing environmental management of mining activities and environmental protection are the Environmental Protection and Pollution Control Act (EPPCA) of 1990 and Environmental Impact Assessment Regulations (ESIAR) of 1997, the Mines and Minerals Act of 1955 and the Mines and Minerals Environmental Regulations of 1997. The EPCCA establishes the Environmental Council of Zambia (ECZ) as the national body responsible for enforcing environmental regulations and coordinating sectoral Government agencies involved in environmental management in their sectors. These responsibilities are managed by ECZ's Technical Secretariat, which effectively constitutes Zambia's Environmental Protection Agency (EPA).

The Environmental Impact Assessment regulations require that an Environmental Impact Assessment (ESIA) be prepared for all investments that have a major impact on the environment. The identification and implementation of adequate environmental mitigation measures is also regulated by the ESIAR. The Mines and Minerals Act and the Mines and Minerals Environmental Regulations 1997 address the environmental, health and safety aspects of mining activities in Zambia. The body mandated with monitoring and enforcing compliance with environmental regulations is the Mines Safety Department (MSD) within the Ministry of Mines and Minerals Development (MMMD). They regulate environmental protection and pollution control in the areas where prospecting, exploration and mining operations are being carried out.

The regulation of the environmental impacts of the mining sector also involves other sectors, each with its own regulatory instruments: water affairs, tourism, transport, radiation protection, health, energy, national heritage conservation, local Government and land. These bodies are responsible for sectoral regulations and constitute Delegated Authorizing Agencies (DAAs) under the EPPCA. The ECZ defers to these agencies on specific technical issues, but retains the role of overall coordination of their respective contributions.

The EPPCA also sets environmental quality standards and makes the polluter responsible for meeting them. Thus under the EPPCA, all effluents and emissions from mining operations are regulated through a system of permits, licenses and fines. Dumps, including overburden dumps and tailings dams, are similarly regulated.

The following are other Zambian laws that provide environmental legislative support to the *Mines and Mineral Act (2003)*:

- *Mines and Mineral Development Act, 2008*
- *Environmental Protection and Pollution Control Act, No 12 of 1990, Cap 24*
- *Environmental Protection and Pollution Control Amendment Act, No 12 of 1999*
- *Ozone Depleting Substances Regulations, 2000*
- *The Air Pollution Control (Licensing and Emissions Standards) Regulations, S. I. 141 of 1996*
- *The Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations, 1997*
- *The Hazardous Waste Management Regulations, S.I. No 125 of 2001*

- *The Pesticides and Toxic Substances Regulations, 1994*
- *The Water Act, 1949*
- *The Water Pollution Control (Effluent and Waste Water) Regulations 1993*
- *The Zambia Wildlife Act, No 12 of 1998*
- *The National Heritage Conservation Commission Act of 1989*

International Conventions and Protocols to which Zambia is a signatory:

- *The Basel Convention on the Control of Trans-boundary movements of Hazardous wastes and their disposal*
- *The United Nations Framework Convention on Climate Change (UNFCCC)*
- *Montreal Protocol on Substances that Deplete the Ozone Layer*
- *Convention Concerning the Protection of the World Cultural and Natural Heritage*
- *Stockholm Convention on Persistent Organic Pollutants (Pops)*

Appendix IV: World Bank/International Finance Corporation (IFC) Environmental Standards and Guidelines

In seeking to obtain project financing or to list on a stock exchange, these institutions themselves require the proponent to comply with such documents as the Equator Principles and the IFC Performance Standards and Guidelines. This is exemplified by the following preamble from the Equator Principles (July 2006):

Project financing, a method of funding in which the lender looks primarily to the revenues generated by a single project both as the source of repayment and as security for the exposure, plays an important role in financing development throughout the world. Project financiers may encounter social and environmental issues that are both complex and challenging, particularly with respect to projects in the emerging markets.

The Equator Principles Financial Institutions (EPFIs) have consequently adopted these Principles in order to ensure that the projects we finance are developed in a manner that is socially responsible and reflect sound environmental management practices. By doing so, negative impacts on project-affected ecosystems and communities should be avoided where possible, and if these impacts are unavoidable, they should be reduced, mitigated and/or compensated for appropriately. We believe that adoption of and adherence to these Principles offers significant benefits to ourselves, our borrowers and local stakeholders through our borrowers' engagement with locally affected communities. We therefore recognize that our role as financiers affords us opportunities to promote responsible environmental stewardship and socially responsible development. As such, EPFIs will consider reviewing these Principles from time-to-time based on implementation experience, and in order to reflect ongoing learning and emerging good practice.

These Principles are intended to serve as a common baseline and framework for the implementation by each EPFI of its own internal social and environmental policies, procedures and standards related to its project financing activities. We will not provide loans to projects where the borrower will not or is unable to comply with our respective social and environmental policies and procedures that implement the Equator Principles.

The following appendix Table AIV-1 and appendix Table AIV-2 provide a brief summary of the Equator Principles and IFC performance standards respectively. These documents are used by the EPFI's and stock exchanges in their review of social and environmental performance of proponent companies.

Table AIV-1: Equator Principles

Equator Principles	Title	Key Aspects (Summary)
1	Review and Categorization	Categorize such project based on the magnitude of its potential impacts and risks.
2	Social and Environmental Assessment	Conduct a Social and Environmental Assessment ("Assessment"). The Assessment should also propose mitigation and management measures appropriate to the nature and scale of the proposed project.
3	Applicable Social and Environmental Standards	The Assessment will refer to the applicable IFC Performance Standards, and applicable Industry Specific EHS Guidelines ("EHS Guidelines") and overall compliance with same.
4	Action Plan and Management System	Prepare an Action Plan (AP) which addresses the relevant findings of the Assessment. The AP will describe and prioritize the actions, mitigation measures, corrective actions and monitoring to manage the impacts and risks identified in the Assessment. Maintain a Social and Environmental Management System that addresses the management of these impacts, risks, and corrective actions required to comply with host country laws and regulations, and requirements of the applicable Standards and Guidelines, as defined in the AP.
5	Consultation and Disclosure	Consult with project affected communities. Adequately incorporate affected communities' concerns.
6	Grievance Mechanism	Establish a grievance mechanism as part of the management system. to receive and resolve concerns about the project by individuals or groups from among project-affected communities. Inform the affected communities about the grievance mechanism in the course of the community engagement process and ensure that the mechanism addresses concerns promptly and transparently, and is readily accessible to all segments of the affected communities.
7	Independent Review	Independent social or environmental expert will review the Assessment, AP and consultation process to assess Equator Principles compliance.
8	Covenants	Covenant in financing documentation: a) to comply with all relevant host country social and environmental laws, regulations and permits; b) to comply with the AP during the construction and operation of the project; c) to provide periodic reports not less than annually, prepared by in-house staff or third party experts, that (i) document compliance with the AP, and (ii) provide compliance with

Equator Principles	Title	Key Aspects (Summary)
		relevant local, state and host country social and environmental laws, regulations and permits; and d) to decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan.
9	Independent Monitoring and Reporting	Appoint an independent environmental and/or social expert, or require that the borrower retain qualified and experienced external experts to verify its monitoring information.
10	EPFI Reporting	Each EPFI adopting the Equator Principles commits to report publicly at least annually about its Equator Principles implementation processes and experience, taking into account appropriate confidentiality considerations.

Table AIV-2: IFC Performance Standards

IFC Performance Standard	Title	Objective (Summary)	Key Aspects (Summary)
1	Social and Environmental Assessment and Management Systems	Social and EIA and improved performance through use of management systems.	Social & Environmental Management System (S&EMS). Social & Environmental Impact Assessment (S&EIA). Risks and impacts. Management Plans. Monitoring. Reporting. Training. Community Consultation
2	Labor and Working Conditions	EEO. Safety and Health	Implement through the S&EMS. HR policy. Working condition. EEO. Forced & child labor. OH&S.
3	Pollution Prevention and Abatement	Avoid pollution. Reduce Emissions.	Prevent pollution. Conserve resources. Energy efficiency. Reduce waste. Hazardous materials. EPR. Greenhouse Gases
4	Community Health, Safety and Security	Avoid or minimize risks to community.	Implement through the S&EMS. Do risk assessment. Hazardous materials safety. Community exposure. ERP
5	Land Acquisition and Involuntary Resettlement	Avoid or minimize resettlement. Mitigate adverse social impacts	Implement through the S&EMS. Consultation. Compensation. Resettlement planning. Economic displacement

IFC Performance Standard	Title	Objective (Summary)	Key Aspects (Summary)
6	Biodiversity Conservation and Sustainable Natural Resource Management	Protect and conserve biodiversity	Implement through the S&EMS. Assessment. Habitat. Protected areas. Invasive species.
7	Indigenous Peoples	Respect. Avoid and minimize impacts. Foster good faith	Avoid adverse impacts. Consultation. Development benefits. Impacts to traditional land use. Relocation.
8	Cultural Heritage	Protect cultural heritage	Heritage Survey. Site avoidances. Consultation.

Appendix V: Project Technical Review — Risk Analysis

To ensure the technical integrity of the risk analysis process as applied in the project technical review process, the following Australian Standards for risk analysis and risk management have been utilized for overall guidance:

AS/NZS 3931:1998 Risk Analysis of Technological Systems — Application Guide;

AS/NZS 4360:1999 Risk Management; and

HB 203:2004 Environmental Risk Management — Principles and Process.

These Australian Standards have been developed in line with comparable international standards.

A risk is generally described in terms of the severity/consequence and likelihood of an undesirable occurrence or incident. The greater the potential severity and likelihood of an undesirable occurrence, the higher the level of risk associated with the related activity.

The generic approach for this project technical review qualitative risk analysis has the following three steps:

Establish the context/define the scope of the analysis — goals/objectives, the analysis strategy and evaluation criteria.

Identify and analyze the risks in terms of consequence and likelihood.

Evaluate and rank the risks.

Qualitative Risk Analysis — Scope

The scope definition and context for the qualitative risk analysis can be summarized as follows:

Goals/Objectives — The primary objective is to analyze the qualitative risks associated with the project's development, operational and closure aspects.

Strategy — The strategy employed comprises the application of a qualitative risk analysis where the 'relative magnitude' of risks associated with the project are estimated. Inclusive within this process are also the concepts of inherent and residual risks. Inherent risks being those hazards that are present within the project without any remedial management, and residual risks are defined as those hazards remaining after the application of remedial risk management measures. The risks analyzed are those considered as the 'inherent risks' for the project at the time of the technical review.

This qualitative risk analysis strategy has the following key steps:

Step 1 — Develop a qualitative risk matrix. This has relative significance rankings for the potential consequences/impacts, levels of event likelihood and the corresponding risk rankings from negligible to extreme.

Step 2 — Define the inherent risks (i.e. at the time of the technical review). List the sources of risks and apply the qualitative risk analysis to define the level of risk.

Qualitative Risk Analysis Matrix

The proposed qualitative risk matrix uses the following definitions for consequence and likelihood:

Consequence:

- **Catastrophic**: Disaster with potential to lead to business failure.
- **Major**: Critical event/impact, which with proper remedial management, will be endured.
- **Moderate**: Significant event/impact, which may be managed under normal procedures.
- **Minor**: Consequences/impacts that may be readily absorbed, but some remedial management effort is still required.
- **Insignificant:** No additional/remedial management required.

Likelihood:

- **Certain**: The event is expected to occur in most circumstances.
- **Likely**: The event probably will occur in most circumstances (i.e. also could be on a regular basis such as weekly or monthly).
- **Possible**: The event should occur at some time (i.e. once in a while).
- **Unlikely**: The event could occur at some time.
- **Rarely**: The event may occur only in exceptional circumstances.

Based on these definitions the Qualitative Risk Matrix is presented below.

	Consequences				
Likehood	Insignificant	Minor	Moderate	Major	Catastrophic
Certain	Low risk	Moderate risk	Moderate risk	High risk	Extreme risk
Likely	Low risk	Moderate risk	Moderate risk	High risk	High risk
Possible	Negligible risk	Low risk	Moderate risk	Moderate risk	High risk
Unlikely	Negligible risk	Low risk	Low risk	Moderate risk	Moderate risk
Rarely	Negligible risk	Negligible risk	Negligible risk	Low risk	Moderate risk

The risk definitions from this risk matrix can be further grouped into risk evaluation categories that are based on regulatory compliance and the ability for the risk to be managed to a level that conforms to industry standards, guidelines and/or codes of practice. These are:

Category 1 — Unacceptable Inherent Risks (Extreme/high risks) — can be defined as those sources of risk that are essentially unacceptable, which if uncorrected, may result in business failure or critical impacts to business.

Category 2 — Tolerable Inherent Risks (Moderate risks) — can be defined as those sources of risk that are tolerable and while, at the time of the technical review, they are non-compliant/non-conforming they can made to be compliant/conforming (acceptable risks) through the application of risk management measures.

Category 3 — Acceptable Inherent Risks (Low/negligible risks) — can be defined as those sources of risk that are acceptable and are compliant with legal requirements and conform to recognized industry standards, guidelines and codes of practice.

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