Konkola Copper Mines plc

ENVIRONMENTAL ASSESSMENT

Executive Summary

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and

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GUIDE TO THE KCM ENVIRONMENTAL ASSESSMENT DOCUMENTS

This Volume

EXECUTIVE SUMMARY
- A summary of all documentation comprising the Environmental, Social, Health and Safety Plans for KCM operations

VOLUME 1 - OVERVIEW AND CORPORATE MANAGEMENT PLANS	
• Provides the historical background to the forming of KCM and an overview of KCM's operation • Provides an overview of KCM's corporate structure, corporate safety, health and environmental (SHE) policy and commitments; and a summary of the legal and other SHE requirements • Describes how the environmental and social management plans were developed • Presents the corporate level SHE Management Plan, Occupational Health Plan and Social Management Plan	
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A ENVIRONMENTAL ASSESSMENT	• A description of the Konkola Mine operation and its environmental setting • An evaluation of historical impacts and an assessment of potential impacts from future developments (including KDMP)
B ENVIRONMENTAL ACTION PLAN	• Environmental Action Plan by facilities • Environmental Monitoring Plan • Auditing and Reporting Plan • Capacity Development and Training Plan • Emergency Preparedness and Response Plan • Rehabilitation, Decommissioning and Closure Plan
2.2 Social Management Plan	
A SOCIAL ASSESSMENT	• A description of the Konkola Mine operation and its social setting • An evaluation of historical social impacts and an assessment of potential social impacts from future development (including KDMP)
B SOCIAL ACTION PLAN	• Social Management Plan: o Employment and Retrenchment.; Local Economic Development Plan; Land Use and Settlement Plan; Education and Training; Health and Welfare Plan; Physical Infrastructure Plan; Community Management Support Plan; Influx Management Plan; Disclosure and Consultation Plan; Decommissioning and Closure Plan • Management Implementation Plan o Objectives and Principles; Auditing Report; Capacity Building and Training; Social Management Co-ordination Plan
C SOCIAL DEVELOPMENT PLAN (RAP)	• Social Development Plan associated with the Resettlement Action Plan
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B SOCIAL ACTION PLAN	• Social Management Plan: o Employment and Retrenchment; Local Economic Development Plan; Land Use and Settlement Plan; Education and Training; Health and Welfare Plan; Physical Infrastructure Plan; Community Management Support Plan; Disclosure and Consultation Plan; Decommissioning and Closure Plan • Management Implementation Plan o Objectives and Principles; Auditing Report; Capacity Building and Training; Social Management Co-ordination Plan
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1.0 INTRODUCTION

This document presents an executive summary of the set of five volumes that presents the Environmental Assessment[1] for Konkola Copper Mines plc (KCM) and ZCCM (SmelterCo) Ltd, including the Konkola Deep Mining Project (KDMP). The documents encompass Environmental and Social Management Plans for these mining and processing operations. The plans have been prepared to satisfy the vesting agreement between KCM, the International Finance Corporation (IFC) and the Commonwealth Development Corporation (CDC) (both investors in the project), ZCCM Investment Holdings Limited (ZCCM-IH) and the Government of Zambia (GRZ).

The content of these five volumes is outlined in the "Guide to the KCM Environmental Assessment Documents" at the front of this report.

KCM owns and operates the Konkola (underground) and Nchanga (underground and open pit) copper mines on the Zambian Copperbelt Province, Zambia and the Nampundwe pyrite (underground) mine in Lusaka Province, Zambia. KCM took over ownership of these three mines in March 2000 from the state-owned company Zambia Consolidated Copper Mines Limited (ZCCM) as an outcome of the privatisation of the Zambian mining industry.

KCM also currently has management responsibilities on behalf of Anglo American plc (AA plc) for the SmelterCo Smelter and Refinery Complex in Kitwe, also on the Copperbelt. Figure 1 shows the locations of these operations within Zambia.

The KCM and SmelterCo now comprise the following operations:

Table 1 - Operations Comprising the KCM Project and SmelterCo

Name	Nature of Current Operations	Product	Production		Employees
			Year ended March 1999 (t)	Planned for first 9 months (t)	
Konkola	Underground mine Concentrator	Copper in ore Copper in concentrate	56 598 50 500	32 200 30 150	2 970
Nchanga	Open pit and Underground mines Two concentrators Tailings leach plant	Copper in ore Cobalt in ore Copper in concentrate Copper	181 110 13 603 97 792 60 120	148 412 3 822 64 560 50 000	6 490
Nampundwe	Underground mine Concentrator	Pyrite concentrate	65 000	48 000	390
SmelterCo	Smelter, Refinery and Acid Plants	Copper Produced (KCM)	94 480	75 000	1 500

[1] This is the terminology favoured by the International Finance Corporation. In terms of Zambian legislation a document of this type is referred to as an Environmental Impact Statement.

The general layouts of the three mines and SmelterCo can be seen on Figures 3, 4, 5 and 6. KCM has prepared this Environmental Assessment, including Environmental and Social Management Plans for its mining and processing operations, so as to:

- operate in accordance with the principles embodied in the KCM Policy on Safety Health and the Environment;
- comply with the requirements of the Zambian Mines and Minerals (Environmental) Regulations of 1997 and the Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations of 1997;
- satisfy the contractual requirement - relating to the original establishment of KCM - for the preparation of ***Final*** Environmental and Social Management Plans within two years of vesting;
- demonstrate its commitment to operating within the World Bank Group (WBG) policies and agreed guidelines.; and
- provide the environmental and social documentation required for public consultation and disclosure by the International Finance Corporation (IFC) and other potential financiers that may be approached to provide funding for the Konkola Deep Mining Project (KDMP).

The plans have been prepared in accordance with the Zambian regulations and following the policies and guidelines of the International Finance Corporation (IFC), a KCM shareholder.

KCM and SmelterCo commit to the principle of “continuous improvement” in environmental and social matters and a system of continually evaluating performance is part of their environmental management systems. KCM and SmelterCo will strive towards the best practice achievable in the context of BATNEEC.

2.0 HISTORICAL BACKGROUND TO THE ZAMBIAN COPPER MINES AND THEIR PRIVATISATION

Large-scale copper mining in Zambia began in the 1920s with the opening of mines by Zambian Anglo American (later Nchanga Consolidated Copper Mines – NCCM) and Roan Selection Trust (later Roan Consolidated Mines – RCM). The mines were nationalised in 1969. This was followed in 1982 with the merger of NCCM and RCM to form Zambia Consolidated Copper Mines Limited (ZCCM), in which the Zambian government owned a 61% share. Thereafter, the ZCCM operations were consolidated into six mining divisions and one power division.

A new government, led by President Frederick T.J. Chiluba, was elected in 1991 and initiated a process of economic reform. In 1995 the Government of the Republic of Zambia (GRZ) set in motion the privatisation of ZCCM.

By early 2001 all of the former ZCCM mining operations had been privatised, as indicated in Table 2. After KCM the largest new investor is Mopani Copper Mines plc (MCM).

Table 2 - Present Ownership of Former ZCCM Assets

Asset	Current Owner	Major Shareholders*
• Konkola Mine (incl. KDMP) • Nchanga Mine • Nampundwe Mine	Konkola Copper Mines plc (KCM)	Anglo American plc (through ZCI); IFC; CDC
• SmelterCo Smelter complex (formerly Nkana Smelter)	ZCCM (SmelterCo) Ltd.	ZCCM-IH (Currently managed by KCM for AA plc)
• Nkana Mine • Mufulira Mine and Smelter Complex	Mopani Copper Mines plc (MCM)	Glencore of Switzerland; First Quantum Minerals of Canada
• Bwana-Mkubwa Mine	First Quantum	First Quantum Minerals of Canada
• Chambishi Cobalt Plant/ Acid Plant	Chambishi Metals plc	Anglo-Vaal Minerals (AVMIN) of South Africa
• Chambishi Copper Mine.	NFC Africa plc.	Foreign Engineering & Construction Corporation NFC (owned by Non-Ferrous Metals Corporation of China)
• Chibuluma Mine	Chibuluma Mines plc	Metorex of South Africa
• Luanshya Mine	Roan Antelope Mining Corporation (Zambia) plc.	Binani Industries Group of India
• ZCCM Power Division	Copperbelt Energy Corporation plc	National Grid and Midland Power of Zambia
• Ndola Lime Plant	Ndola Lime Ltd	ZCCM-IH
• Kansanshi exploration Project		Initially sold to Cyprus Amax in 1997 subsequently taken over by Phelps Dodge
• Konkola North Exploration Project		Anglo-Vaal Minerals (AVMIN)

* Note: ZCCM has retained a percentage of the ownership of most of these assets (typically around 20%)

Following the privatisation of all its mining operations ZCCM was reconstituted as an investment company and is now called ZCCM Investment Holdings Limited (ZCCM-IH).

3.0 THE KCM PROJECT AND KDMP

3.1 Original Konkola Deep Mining Project (KDMP)

In February 1997 a group of companies known as the Konkola Deep Mining Project (KDMP) Consortium, including Zambia Copper Investments Limited (ZCI), an Anglo American plc subsidiary, signed an agreement with GRZ granting it the exclusive right to investigate the feasibility of obtaining majority ownership of the following ZCCM assets:

- the existing Konkola Mine (the ZCCM Konkola Division);
- certain unexploited ore reserves located at greater depth, but contiguous with the existing Konkola Mine (within the ZCCM Konkola Division);
- the existing Mufulira smelter and refinery (part of the ZCCM Mufulira Division) and associated infrastructure.

At around the same time another group of companies, known as the Kafue Consortium (Phelps Dodge, Noranda and Avmin), was granted the right to investigate the feasibility of taking ownership of ZCCM's Nchanga, Nkana and Chambishi operations. However, the negotiations between the GRZ and the Kafue Consortium broke down in the first half of 1998.

Although KDMP did not go ahead as originally envisaged, it is now proposed to develop the deep unexploited reserves at Konkola Mine as part of a new KDMP, as described below.

3.2 KCM Project

During the second half of 1998, ZCI was asked to consider taking ownership of a different package of ZCCM operations that had not yet been privatised (i.e., Konkola, Nkana, Nchanga, and Nampundwe). ZCI and Codelco of Chile undertook the investigations into the feasibility of taking ownership of these assets jointly and the package was referred to as the "KNNN Project". Subsequently Codelco withdrew, resulting in ZCI formulating a revised assets package involving the privatisation of Konkola, Nchanga and Nampundwe (i.e., the KCM Project). The purchase of these assets was successfully concluded and these are now owned by a newly formed company called Konkola Copper Mines plc (KCM) – a subsidiary of ZCI. The date of transfer of ownership or vesting was 31 March 2000. KCM's head office is located at the Nchanga mine in Chingola.

The links between KCM, its shareholders and other Copperbelt operations are shown on Figure 2. KCM's main shareholder is ZCI and the other shareholders are the IFC, the CDC and ZCCM-IH.

ZCI itself is an investment company owned by AA plc and other investors, with AA plc owing 51% of the shares. The indirect shareholding attributable to AA plc in KCM (via ZCI) is 33%, which gives AA plc the greatest controlling interest. The level of control is such that AA plc categorises KCM as a "managed" operation. Hence, KCM is expected to adhere to Anglo American plc's SHE Policy and Management Guidelines.

AA plc is one of the top 100 companies listed on the London Stock Exchange and is the largest mining company in the world. It comprises a number of commodity divisions, including: Base Metals, Coal, Platinum, Industrial Minerals, Exploration and Acquisitions, Ferrous Metals, Industrial Minerals and Forest Products. KCM is located within the Base Metals Division.

The KCM assets have suffered from many years of under-investment, declining production and high operating costs. It will take a number of years to rehabilitate the assets, improve management and reduce operating costs. The long-term production levels are expected to increase from the current annualised level of about 183 000 tpa to around 220 000 tpa of copper and around 2 000 tpa of cobalt (finished metal).

3.3 SmelterCo

At the outset, KCM required guaranteed access to smelting and refining facilities during at least the first three years after take over. To facilitate this requirement ZCCM-IH formed ZCCM (SmelterCo) Ltd (hereafter referred to as SmelterCo) on 31 March 2000 with the company's assets comprising the former Nkana smelter, refinery and acid plants in Kitwe.

The GRZ appointed Anglo Operations Limited (AOL) to manage the assets transferred to SmelterCo. KCM in turn manages these operations on behalf of AOL and hence KCM is able to have the necessary control over the smelting and refining of the concentrate from its mining operations.

ZCI chose not to initially purchase these facilities, as part of the KCM assets since, at the time of vesting, there was uncertainty regarding the preferred final treatment route. A hydrometallurgical route was under consideration that, if pursued, would have meant that KCM would not have required the conventional smelter and refinery beyond the short to medium-term. Subsequent investigations have revealed that the pyrometallurgical option is still the preferred treatment method and, hence, the SmelterCo facilities form part of the KDMP planning. In addition, the initial inclusion of the SmelterCo facilities would have increased KCM's capital burden, jeopardising the investment as a whole.

SmelterCo will treat concentrate from the mines owned by KCM and Mopani Copper Mines plc (MCM) and other smaller operations.

The initial rehabilitation costs for the refurbishment of the SmelterCo smelter, acid plants and refinery facilities were presented in a business plan to the British Government, represented by the Department for International Development (DFID), who agreed to provide bridging capital to the GRZ. The GRZ have made the loan available to SmelterCo to continue their operations until the facilities are sold.

AOL has an option to purchase the SmelterCo facilities within the three years covered by the management agreement, which commenced on 31 March 2000. AOL and KCM are currently proceeding on the basis that the option to purchase will be taken up so as to provide the long-term concentrate treatment route required as part of the KDMP. This decision would include the investment of additional capital to fully rehabilitate the facilities. If AOL ultimately chooses not to exercise its option to purchase the SmelterCo facilities then the assets will be offered to MCM.

3.4 KDMP Project

The assets acquired by KCM include the right to develop the unexploited ore reserves located at greater depth at Konkola as part of KDMP along the lines of the 1997 project that was described in Section 2.1, but utilising the other KCM assets and the facilities currently under SmelterCo rather than the Mufulira smelter and refinery.

KDMP entails increasing production at Konkola Mine by sinking a new shaft (No. 4 Shaft) next to the existing No. 3 Shaft to access a deeper orebody and constructing a new concentrator capable of a throughput of 18 000 tpd. This expansion project is scheduled to start in 2002 and be in full production by 2007. The mine life of Konkola Mine, including KDMP, is 30 years, to 2031. Without the KDMP expansion, mining would cease in 2011. The Feasibility Study for KDMP has identified a capital investment requirement of around US$500 million.

Raising of the Lubengele Tailings Dam Wall required as part of the KDMP implementation will cause portions of a township and an informal settlement in close proximity to the dam to be within the 1:100 year flood line. A Resettlement Action Plan, developed in accordance to WBG policies and guidelines, has been approved and is being implemented.

4.0 THE ENVIRONMENTAL ASSESSMENT PROCESS

The environmental studies for the Konkola, Nchanga and Nampundwe mines and the SmelterCo facilities have been conducted over the period from 1996 to 2001. In addition these studies have utilised previous studies carried out for ZCCM prior to 1996. The composition of the various packages that were offered for privatisation varied over the years leading up to the agreement to the purchase of Konkola, Nchanga and Nampundwe mines and the management of the smelter, refinery and acid plants at Kitwe, resulting in a fairly complex evolution of the environmental studies. The Konkola Deep Mining Project (KDMP), although only an expansion of existing facilities, has been the subject of a full environmental assessment process; whereas the facilities initially acquired by KCM are regarded as “brown-fields” sites and have been the subject of an environmental audit process.

At the time of vesting and taking over of the KCM facilities on 31 March 2000, the approved environmental studies were in the form of an Interim Environmental Management Plan (IEMP) and an Interim Social Management Plan (ISMP). As part of the approval process, these documents were on public display in Zambia and in the World Bank Info Shop in Washington DC. Also included in the suite of documents that have been on public display are the Resettlement Action Plan (RAP) and the Public Consultation and Disclosure (PCD) reports. The RAP contains the modus operandi for the resettlement of the communities that will be affected by the enlargement of the Lubengele Tailings Dam at Konkola Mine and also contains an outline Social Development Plan for the affected communities. Around 750 persons will be resettled during 2001. The PCD contains the record of the public consultation and disclosure process that took place during December 1999 and January 2000.

4.1 Final Environmental and Social Management Plans

In terms of KCM’s vesting agreements, the company was only authorised to operate under the IEMP and ISMP for a 24-month period. Within a maximum period of 21 months (i.e., by 31 December 2001), KCM was required to develop a Final Environmental Management Plan (FEMP) and a Final Social Management Plan (FSMP). These plans outline the detailed “life of mine” environmental and social management and supersede the IEMP and ISMP.

In terms of the vesting agreements it may not be possible to seek approval for implementation of KDMP from certain of the KCM shareholders or from potential financiers until the FEMP and FSMP have been completed. To avoid delaying the implementation of KDMP KCM has, therefore, opted to complete the final plans sooner than the contractual requirement. To achieve this timescale, the development of the final plans was initiated soon after vesting.

The development of the final plans entailed:

- undertaking the planning and investigation required in terms of the IEMP and ISMP; and
- thoroughly reviewing the interim plans to determine any additional areas that would require expansion to achieve the content and level of detail required in the final plans.

The FEMP and FSMP include the management requirements for the KDMP. The latest developments in a feasibility study for KDMP completed in February 2001 together with additional specialist studies recently completed have been used as the basis for FEMP and FSMP presented in these documents.

The FEMP and FSMP contain commitments to meet all WBG policies and agreed guidelines. At the outset, IFC and CDC agreed that since many elements of the project were very old (eg., SmelterCo opened in 1932), attainment of absolute WBG guideline limits (designed for green field sites) would not be technically achievable in a few instances. Therefore, IFC agreed that, for these areas, KCM would specify and commit to justifiable site specific guideline limits appropriate to plant rehabilitation projects.

4.2 Lead Environmental and Social Consultants

KCM appointed lead environmental and social consultants to undertake the development of this Environmental Assessment and, in particular, the FEMP and FSMP.

The Canadian offices of AMEC Earth & Environmental Limited were appointed to assist with the development of the FEMP. AMEC's work entailed:

- review of previous documents and literature and in particular, the original ZCCM Environmental Impact Statements;
- co-ordination of the specialist investigations; and
- compilation of the final Environmental Management Plans.

Khanya – Managing Rural Change - of South Africa, in association with ZAPRA of Zambia, were appointed to facilitate the process of developing the FSMP. Key issues that need to be addressed were employment and retrenchment, social services, land use and settlement management and public consultations and disclosure.

In simple terms, the methodology used by the social consultants entailed:

- review of previous reports and literature and, in particular, the Social Assessment undertaken for the original KDMP Environmental Assessment;
- data collection;
- generation of social information using participatory methodologies;
- stakeholder analysis; and
- establishment of consultative forums to discuss key issues.

4.3 Specialist Investigations

In preparation of the FEMP, KCM commissioned a number of studies to fill information gaps identified in the IEMP. Table 3 provides a listing of the studies conducted in preparation for the final EMP.

Black and white and false colour infrared aerial photographs were obtained during 2000 for all the KCM sites, SmelterCo and the Kafue River in the vicinity of the Copperbelt operations.

Table 3 - Studies Undertaken for the Preparation of the Final EMP and Final SMP

Study	Consultant/ Organisation	Scope
Air quality	Environmental Management Services	• Design of an air quality monitoring network around SmelterCo smelter in Kitwe • Evaluation of historical air emissions from the SmelterCo Smelter and modelling of future emission levels.
Soil contamination	African Mining Consultants	• Delineation of soil contamination at each site and development of mitigation strategy.
Mine waste management	Knight Piésold	• Development of tailings disposal management plans for each site, including emergency and contingency plans.
Hydrogeology	Water Management Consultants	• Delineation of groundwater conditions at each site. • Development of a groundwater monitoring programme.
Timber utilisation	Fractal Forest Africa/ Forest Wood	• Evaluation of the mines' current and future indigenous timber utilisation in the context of the regional timber utilisation and availability. • Assessment of alternatives to indigenous timber.
Fish contamination	RauEcon Biomonitoring	• Possible human health risk assessment from the consumption of fish from the Lubengele and Muntimpa tailings.
Archaeology	Lusaka National Museum	• Assessment of two known archaeological site within the Lubengele tailings impoundment that will be inundated with the expansion of the dam. • Includes recording and/ or removal of valuable artefacts in accordance with Zambian regulations. • Archaeological investigations are also required in the proposed Ming'omba resettlement area to determine whether or not there are any sites of archaeological significance.
Acid rock drainage	CSIR	• Compilation and review of all past work on ARD and geochemistry at all site • Gaps to be filled with collection and testing of additional samples.
Water monitoring	Anglo Coal Environmental Services	• Review of current practices for site monitoring and development of improved techniques where required.
Water management	AMEC Earth & Environmental Limited	• Development of conceptual surface water management plans for each site, including the evaluation of existing storm water systems, emergency and contingency planning.
Social management plan	Khanya	• Development of social management plans for each site.
Site rehabilitation and closure plans	AMEC Earth & Environmental Limited	• Development of conceptual decommissioning and closure plans and estimation of associated costs.

5.0 PROJECT DESCRIPTION, IMPACTS AND MITIGATIONS

5.1 Environmental and Socio-economic Setting

5.1.1 Environmental Setting

More than 70 years of large-scale mining activity has significantly altered the environment in the vicinity of the Copperbelt. Nampundwe Mine is an exception as it is not located in a mining region and, owing to the small size of the operation, it has not significantly altered the bio-physical environment.

Zambia experiences distinct dry and wet seasons. On the Copperbelt, around 1400 mm of rain falls in the wet summer months from November to April. On average, evaporation exceeds rainfall for two thirds of the year. The mean annual temperature is 19.4°C. The predominant wind direction is from the northeast to the southwest. Mean wind velocity ranges from about 1.4 m/sec in the summer months to 1.0 m/sec in the winter.

The weather conditions at Nampundwe are significantly different to the Copperbelt, with a mean annual precipitation of around 900 mm. On average evaporation exceeds precipitation for nine months of the year. The mean annual temperature is 21.1°C. The predominant wind direction at Nampundwe is also from the northeast to the southwest.

Table 4 contains a brief description of the bio-physical environments in the Copperbelt region. The key mining and non-mining activities that have impacted on the environment are highlighted.

Table 4 - Brief Description of the Copperbelt Bio-physical Environment

Environments	Brief Description	Main Causes of Impacts	
		Directly due to Mining	Due to non-mining Activities
Soil and land capability	The soils are highly weathered and strongly leached with low pH and low nutrient holding capacity and, hence, are only suitable for climatically adapted crops under fertilisation and good management.	Land has been occupied and contaminated or degraded in the vicinity of the mine facilities due to mechanical disturbance, chemical spills etc.	Subsistence farmers extensively cultivate the soils and few soil conservation measures are being implemented, leading to widespread degradation of the land.
Topography	The natural topography is gently undulating at elevations of around 1 250 m to 1 400 m.	Excavations, dumps and subsidence due to under-mining and mine dewatering have altered the topography.	-
Surface water	The region is drained by the Kafue River, which bisects Zambia from north to south and is the most important river in the country. The Kafue River has a well-developed dendritic drainage pattern and its tributaries drain the mine sites. The quality of the water and sediments in the Kafue River system deteriorates markedly as it passes through the Copperbelt, with the primary contaminants being suspended solids and dissolved copper.	The main sources of contaminated water are the metallurgical plant effluents and spills, tailings dam discharges, run-off from plant areas and overburden dumps and water abstracted from the mine workings.	The deteriorated condition of the sewerage systems, vandalism of the sewer lines (for illegal crop irrigation) and the lack of formal sanitation systems in the informal settlements causes poorly treated or untreated sewage to be released to the watercourses. Poor land management causes soil to be eroded into the rivers.
Groundwater	Groundwater is abundant and the regional water table is shallow, resulting in numerous marshy areas, known locally as “dambos”.	Dewatering of mine workings has caused the water table to be depressed in the vicinity of the mines. Studies to date have found no evidence that mining has caused any significant groundwater contamination.	Localised groundwater contamination is caused by poor sanitation.

Table 4 - Brief Description of the Copperbelt Bio-physical Environment (Cont'd)

Environments	Brief Baseline Description	Main Causes of Impacts	
		Directly due to Mining	Due to Non-mining Activities
Air Quality	Besides mining, the region has little industrial activity and, hence, few sources of air pollution.	Emissions from the operational SmelterCo and Mufulira smelters are currently far in excess of Zambian and World Bank standards. Both the smelters will be used to treat KCM concentrates. The elevated sulphur dioxide levels have been linked to a higher incidence of respiratory ailments and vegetation damage in the vicinity of the smelters.	Bush fires are lit to clear land, "improve" grazing, flush-out animals for hunting etc., and are also started by accident or due to natural causes. Air pollution from bush fires is especially severe in the dry winter months.
Terrestrial Ecology	The indigenous vegetation is savannah known as Miombo woodland.	Land clearing and other mining activities have caused localised habitat destruction and have displaced wildlife. The use of timber by the mines has contributed to the over-exploitation of the indigenous forests.	Shifting cultivation, uncontrolled burning and urbanisation are a major cause of habitat destruction and hunting and trapping of animals for food has decimated the wildlife numbers. A significant cause of deforestation is wood harvesting for firewood and charcoal manufacture, which are used for household cooking.
Archaeology	A number of sites dating from the Late Stone Age and Iron Age have been recorded. These are mostly of low significance and are in the form of scattered potsherds and quartz chips and flakes from hand-tool manufacture and remnants of house foundations.	Archaeological sites have been disturbed by the construction of mining infrastructure.	Considerable disturbance has resulted from land clearing for township development, subsistence farming etc.

As explained above, KCM owns and operates the Konkola and Nchanga Copper Mines on the Copperbelt, the Nampundwe Pyrite Mine in Lusaka Province; and currently has management responsibilities for the SmelterCo Smelter and Refinery Complex in Kitwe, also on the Copperbelt.

5.1.2 Socio-economic Setting

Understanding the social environment of the KCM Project necessitates the recognition of the Copperbelt's past, present and future as they are entwined with Zambia's economic and social development. Over the past decades, ZCCM's productivity has declined and the government has endeavoured to revitalise the Copperbelt by privatising the operations. It is anticipated that this will increase the productivity of the mines and, hence, ensure increased revenue for the country. The KCM Project will contribute towards this goal and has taken place against the following background:

- In 1996, although copper production had declined by more than half of its peak production, it nevertheless still accounted for 10% of the country's GDP and copper exports accounted for 80% of Zambia's export earnings.
- Current low prices for copper, in combination with the ZCCM's financial difficulties prior to the privatisation of its operations have placed the country in economic crisis.
- Slow progress in the privatisation of the country's major mining assets increased the pressure on the economy.
- To increase the prospect of attracting buyers and to improve productivity, ZCCM undertook retrenchments at most of its operations prior to their privatisation.
- In 1996 the copper industry accounted for 20% of the country's employment and threats of mine closure and further retrenchments were significant for the country's employment levels and people's abilities to earn an income (both directly and indirectly) and to survive.

It is within this context – shrinking copper production, low copper prices, deteriorating mine infrastructure and mounting job-related insecurity – that the KCM Project came into effect.

By virtue of their scale, the Copperbelt operations are the primary local economic driving forces at the centre of complex urban socio-economic environments. The towns that have developed around the mines exhibit a characteristic dependency on mining activity and also serve as centres for district governance and administration. Local industries are strongly orientated towards the mining business and consumer services are highly dependent on incomes generated through mine employment. Local economic production is therefore characterised by a lack of diversification.

The economic significance of the Nampundwe mine is not as great as the other two Copperbelt mines and SmelterCo, since it is considerably smaller and is not associated with an economic or administrative centre.

The percentage of local residents that are directly dependent (employees and dependants) on mining activities is generally around 30% of the total population.

Formal employment opportunities on the Copperbelt are largely limited to the mines, mine-related business, the local municipal councils and other sectors of the civil service. However, relatively few residents rely solely on income generated through formal employment and many employees participate in informal activities (e.g. growing vegetables, small-scale chicken

farming, informal trading and fishing) that make an important contribution towards maintaining their livelihoods.

Beyond the immediate mining environment, economic opportunities are few. Those who are unable to access formal employment opportunities in the mining sector are forced to engage in a range of alternative strategies for sustaining their livelihoods. For poorer sections of the population, these strategies generally include farming and charcoal making. While these activities are practised on a household subsistence level, they are intimately incorporated into the local mining environment, which represents an important local market for farming produce and charcoal.

The promise of privatisation is not only to revitalise the ailing local economy to some extent, but also to extend the life of the mines. This represents an important 'grace period' for adequate planning for the post-mining environment.

Sections 5.2 to 5.5 provide a summary of the principal elements of each operation, their key environmental and social features and issues related to historical impacts of past mining activities and key environmental actions that will be implemented by KCM to bring the site into compliance with Zambian regulations and within the guidelines of the WBG. Rehabilitation, decommissioning and closure is not dealt with separately under each facility but is covered collectively in Section 7.7.

5.2 The Konkola Facilities

5.2.1 Principal Project Elements

Konkola underground mine has been in operation since 1957. It is situated immediately to the south and west of the town of Chililabombwe on the Zambian Copperbelt. Chililabombwe is situated at an elevation of 1360 meters above sea level (masl) on the Central African Plateau.

The Konkola Mining Licence (Large Scale Mining Licence – LML 35) covers an area of 6669 ha. The Surface Rights cover an area of 6489 ha. The principal mining activities cover a total area of about 2280 ha. Figure 3 shows a general layout of the Konkola Mine Facilities.

The Konkola Mine employs approximately 3000 permanent employees in mining activities and associated support services. The workforce is drawn from the townships within the immediate vicinity of the mine.

Support infrastructure associated with the Konkola Mine includes: water management facilities comprised of an intake structure, storage reservoirs, dams, diversion works and stormwater drains; transport systems including roads, railways and pipelines; power supply and distribution equipment; a hospital; laboratory facilities; several administrative offices and workshops.

Production began from No. 1 Shaft in January 1957 but was temporarily suspended from March 1958 to May 1959 due to low copper prices. Since then, it has been in continuous production at a rate of approximately 1 Mtpa. No. 3 Shaft production started in 1963. A decision to place No. 3 Shaft on care and maintenance was made in 1986 due to the high unit costs it was then experiencing. The shaft was re-opened in 1990.

5.2.1.1 Present Mining Operations

There are two active shafts (No. 1 and No. 3) that access the orebody. The No. 1 Shaft is located in the south section of the orebody, and was sunk in 1953. The No. 3 Shaft is located in the north section of the same orebody, about 2 km north of the No. 1 Shaft, and was sunk in 1962. The shafts are currently established to depths below surface of 950 m and 590 m, respectively.

The two active shafts will continue to be used and the ore production rate will be increased from 2 million tonnes per annum (Mtpa) to 2.4 Mtpa during the first year of operation. The shafts, associated winders, dewatering pumping installation and ventilation system will be upgraded. The Konkola mine is one of the wettest mines in the world. Currently up to 300 000 m^3/day of water is pumped from the mine.

5.2.1.2 Mineral Processing

The existing concentrator (commissioned in 1957) consists of a crushing, milling and flotation circuit with a production capacity of 2.1 Mtpa of ore to produce a high-grade copper sulphide concentrate. Within the first year of the project the output will be increased to 2.4 Mtpa and will continue to run at that capacity until the end of 2005.

Concentrate production from Konkola will initially be treated at the SmelterCo and Mufulira Smelters and from 2003 onwards all concentrate will be treated exclusively at the SmelterCo Smelter.

5.2.1.3 Mine Waste Disposal

Waste Rock

The A Dump is situated adjacent to and to the south west of No. 1 Shaft. This dump was started in 1955, covers approximately 22.5 ha and currently receives approximately 600 tpd onto the 8.5 million tonnes (Mt) already deposited. The B Dump, started in 1957, is situated adjacent and to the north west of the No. 3 Shaft, covers an area of roughly 11 ha and receives approximately 400 tpd onto the 4.3 Mt already deposited.

Tailings

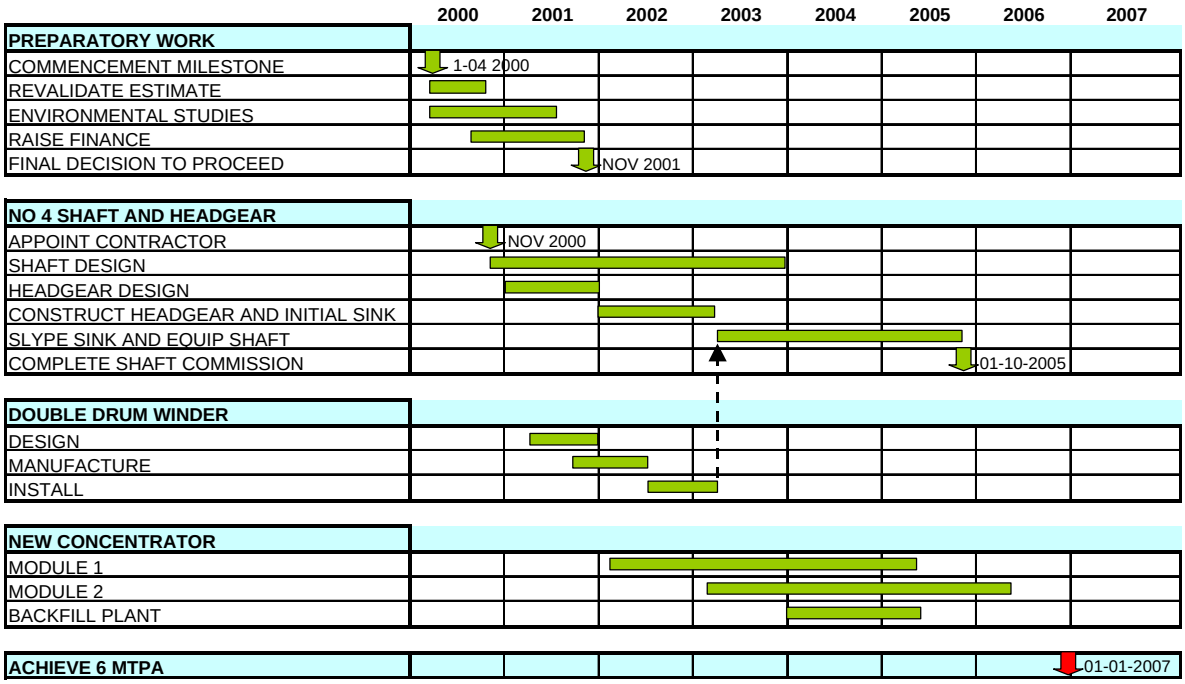
The Lubengele Tailings Dam is a valley dam (started in 1964) with a 27.5 m high wall formed with cycloned coarse tailings. The current maximum available capacity is 95 Mt. Tailings material is transported from the concentrator through one of two steel pipelines, operated alternately, and is discharged primarily from the eastern side of the impoundment. The Lubengele Dam is located in a large catchment area of 61 km^2 and captures the drainage from four streams, namely the Lubengele, Kawiri, Michela and the Ming'omba streams. Runoff from this area together with tailings water is decanted through a 1.2 m diameter penstock into the Lubengele Stream and ultimately into the Kafue River.

The existing impoundment has sufficient capacity to accommodate the tailings that will be produced during the next 12 years. However, the dam wall will need to be raised by a total of 10 m to provide adequate storage of 115 Mt for the anticipated life of mine including KDMP. This raising will be undertaken in four lifts over the project life.

5.2.1.4 KDMP Development Pans

KCM plans to increase production at Konkola Mine to 6 mtpa by the end of 2006 by sinking a new shaft (No. 4) next to Shaft No. 3 to access a deeper orebody and constructing a new concentrator capable of a throughput of 18 000 tpd. The expansion project is scheduled to start in 2002 and be in full production by the end of 2006 (see Table 5). The capital cost of this expansion will be in excess of $500 million. The mine life of Konkola Mine, including KDMP, is 30 years (to 2031). Without the KDMP expansion, mining would cease in 2011.

Table 5 - KDMP Milestones



Activities related to KDMP will include the following:

- Construction of two contractors camps to accommodate the majority of the expatriate workforce during the five year, shaft-sinking period of KDMP. Both camps will be fully serviced with electricity, reticulated sewerage and running water as well as refuse removal.

- The raising of the Lubengele Tailings Dam wall by 10 meters will flood a significant area necessitating the resettlement of part of Kawama Township and the village of Ming'omba.

- The employment of a maximum of 5000 workers during construction and the creation of 3000 jobs during KDMP operations. Most of these posts will be filled by the current workforce and re-deployment of current Konkola staff and thus, few additional direct jobs will be created.

- Construction of a new concentrator plant and related infrastructure in the vicinity of the new No. 4 Shaft.

- Building or upgrading of necessary road infrastructure to service the new shaft.

Work on No. 4 Shaft, is programmed to start two years from the date of take-over subject to the decision to proceed and the Konkola tonnage will be increased to 6 Mtpa five years thereafter. New mechanised mining methods employing backfilling will be introduced. Extensive dewatering of the strata will continue to be required before mining can take place.

Future waste rock hoisted from the existing shafts will continue to be deposited on the existing B Dump. Mining of waste rock from the dumps for aggregate production will continue in a controlled manner.

As part of KDMP, a new concentrator will be constructed next to the new shaft capable of processing up to 6 Mtpa. A backfill plant will be constructed to supply classified tailings backfill material for use in the underground mine. Water from the underground mine will continue to be used in the process and the tailings will be discharged to the Lubengele tailings disposal facility.

The majority of additional facilities required for KDMP will be within the footprint of the existing facilities and will result in minimal additional impacts. However, continuing operations between now and the end of KDMP's lifespan will affect the social environment and management measures will be required.

5.2.2 Key Environmental Features and Issues

Konkola Mine is one of the wettest mining operations in the world, and for the safe operation of the underground workings, it is necessary to pump approximately 300 000 m^3/day of water from the mine. This amounts to a continuous flow of approximately 3.5 m^3/s, which is ultimately discharged into the Kafue River.

The main environmental issue at Konkola Mine is associated with the amount of suspended solids in the mine effluent reporting to the local streams. While the mine water is generally below the permissible 100 mg/l TSS (Zambian Effluent Discharge limit), in recent years, the plant effluent water, which is mixed with the mine water prior to discharge, has had elevated suspended solids (above the WBG guideline of 50 mg/l TSS) and metals levels (mainly total copper associated with the suspended solids). The cause of the rise in TSS and metals levels has been poor maintenance of equipment due to lack of funds.

Past mining activities at Konkola have resulted in land subsidence due to near surface mining and mine dewatering. The subsidence areas are well delineated and marked to restrict public access to these areas. A monitoring program is in place to verify that further subsidence is not occurring. As mining is now accessing deeper parts of the orebody, further subsidence is not anticipated.

Water quality within the Lubengele Tailings Dam has been of concern due to the fact that unauthorised fishing from the dam could represent a health risk. However, a study on health risk from fish consumption conducted in preparation of these plans has indicated that the health risks are low, that fishing is an important resource for the local communities and that the practice would be difficult, if not impossible, to stop.

There is a need to improve waste storage and disposal practices. The same applies to the storage and handling of materials. This will aid in the prevention of spills and hence prevent additional soils and water contamination.

5.2.3 Environmental Mitigation Plan

At Konkola, as the most significant environmental issue is associated with the suspended solids in mine effluents reporting to the environment, the main mitigation measures to be taken during refurbishment of the operations aim at reducing and controlling spillage and leaks from a process control basis. Operational controls will be improved; containment areas will be constructed or repaired; ponds, containment areas and drains will be cleaned out to remove accumulated debris; worn and leaky pipelines will be replaced; systems will be put in place to return spillage to the process stream in order to reduce discharges to a minimum.

KCM's Konkola operations currently comply with all WBG policies and KCM is committed to comply with all WBG guidelines and Zambian limits by March 2003.

The Environmental Action Plan described as part of the FEMP sets out the actions that will be taken to improve and maintain environmental performance. It covers aspects such as:

- Management of releases to water which includes actions required to prevent pollutants from entering discharges from the mine and hence the environment. Clean-up actions are also addressed. KCM is committed to not only meeting the 100 mg/l TSS limit set by Zambian Regulations but achieving the WBG guideline limit of 50 mg/l TSS, as well as other parameters within the Zambian limits and/or WBG guidelines, by March 2003.

- Management of water resource usage which is aimed at identifying the actions required to minimise water wastage.

- Management of timber usage which is aimed at ensuring that proper actions are taken to significantly decrease native timber usage.

- Management of general waste which is aimed at ensuring that appropriate actions are taken with regard to the handling, storage and disposal of hazardous waste.

- Management of hazardous waste which sets out the actions required to ensure adequate measures for the handling and storage of hazardous waste. A permanent solution for hazardous waste disposal is not available since a licensed hazardous waste disposal site does not exist in Zambia. This means that hazardous waste will have to be stored on site until a permanent solution is found.

- Management of spills and leaks which is aimed at preventing pollution of soil and water. These actions are linked to the management of releases to water as well as to emergency response procedures. Spills and leaks will be treated and recorded as environmental incidents. A standard spills response action plan is outlined in the EAP which is applicable to all departments.

- Management of materials transport, handling and storage which sets out the actions required to ensure that materials are handled used and disposed of in a manner that protects the health of employees as well as surrounding communities. These actions are also important in the context of avoiding emergency and environmental incidents.

- Management of emergency incidents that is aimed at managing such incidents effectively should they occur. The overriding objectives in managing emergency incidents are to protect employee and public health and to contain the environmental impacts (i.e., prevent them from moving off-site, if possible).

As for specific actions corresponding to the Operational Phase, at Konkola the focus will be placed on the regular inspection and maintenance of pipeline infrastructure, spillage collection ponds, containment areas, process vessels, pumps and valves for leak and spillage detection. The continuous operation of pollution control equipment such as dust suppression systems, settling tanks, oil traps and effluent neutralisation systems will be an important part of the Operational Phase EAP. Regular cleaning of collection ponds, drains, containment areas, trenches and other silt retaining structures will also be done to remove accumulated debris in order to maintain containment capacity. Regular monitoring will also be used as a tool for environmental management during operations. Finally, operations will be undertaken in strict adherence to specific procedures developed during the Refurbishment Phase.

5.2.4 Social Setting and Social Action Plan

The following communities are situated on or immediately adjacent to the Konkola MSA:

- Council low cost, high density townships (including Kawama, Poor People of Zambia, Lubengele and Kakoso);
- Former mine medium and low cost, high density townships (including Helen Kaunda, Konkola and Chililabombwe);
- Council high cost, low density townships (including former mine low density areas, Kamenza, and Kamenza North); and
- Informal settlements (including Ming'omba, Fitwaola and Kebumba).

KCM operates Konkola Hospital and Konkola Trust Primary School in Chililabombwe. The company has also been involved in the running of various recreational facilities in Chililabombwe. The company intends to withdraw from direct involvement in the recreational facilities by transferring the responsibility for their running to independent clubs, societies and/ or businesses.

The immediate challenge for Chililabombwe's local authorities is to absorb the responsibilities previously held by ZCCM. KCM has a role to play in this shift - not through doing the work of the Council but rather through ensuring that the local environment, as affected by mine-related activities, is responsibly managed. This will contribute to an environment in which day-to-day Council activities can be carried out to service and sustain the district in a manner conducive to the successful operation of the mine as well as to the district's residents. In the immediate term KCM recognises that is has a social responsibility to provide some assistance to the local authorities to ensure mutual benefit from effective service delivery. This assistance, such as emergency repairs, is aimed at ensuring services are rendered to the population of which a large proportion are mine employees. The challenge for KCM is to be socially responsible but at the same time not create dependency on the mine either through taking over essential services or through the perception that KCM is a service provider. In the current local context of social and institutional poverty this challenge is immense.

The main social issues – both positive and negative - associated with KCM operations are those linked to the KDMP. A social impact assessment for this project is included in Volume 2.2, Appendix B. Positive impacts will include an increase in mine life of two decades, thereby sustaining economic activity and employment opportunities in Chililabombwe for that period of time and allowing for a period of planned economic diversification in the district. Approximately 5000 construction-related jobs will also be created over a five and a half year construction period and non-core activities will be outsourced to local companies wherever feasible, providing a substantial short to medium-term boost to the local economy. The social action

plans devised for Konkola contain management measures designed to maximise the positive impacts of the KDMP upon the local and regional socio-economic environments.
Negative impacts will include the influx of large numbers of job-seekers and contractors into Chililabombwe, which is likely to place a significant strain upon already overstretched service providers (i.e. the Asset Holding Company, the Mulonga Water and Sewerage Company, government schools and government health facilities); an increase in crime levels and health risks in Chililabombwe (specifically HIV-AIDS and malaria), a possible increase in rental fees in existing townships associated with increased housing demand and lack of supply; the creation of additional informal settlements, and increasing pressure on the natural resource base in the area which is already heavily subscribed for subsistence agricultural purposes. The social action plans devised for Konkola Mine include a number of mitigatory actions designed to reduce and/or eliminate these impacts, wherever feasible.

Finally, future tailings production associated with the KDMP will result in the inundation of Ming'omba settlement, parts of Kawama settlement and portions of the Momba Farms area, leading to the resettlement of 141 households. A separate resettlement action plan (RAP), in full compliance with the WBG operational directive in resettlement, has already been developed to address this issue and is currently being implemented. However, Volume 2.2 contains a revised and expanded Social Development Plan (Part C) for these settlements which serves as an official addendum to the approved RAP document and which spells out measures to be implemented by KCM to ensure the post-resettlement economic welfare and sustainable livelihoods of the affected communities.

5.3 The Nchanga Mine Facilities

5.3.1 Principal Project Elements

The Nchanga Mine has been in operation since the 1930's. It is situated within the town of Chingola on the Zambian Copperbelt. Chingola is situated at an elevation of 1340 meters above sea level (masl) on the Central African Plateau.

The Nchanga Mining Licence Area (LML34) covers an area of 11 763 ha while the principle mining activities covers a total area of about 3 715 ha. The plant complex covers an area of about 198 ha. Figure 4 presents an overall plan of the Nchanga operations.

The Nchanga Mine employs approximately 6 500 permanent employees in mining activities and associated support services. The workforce is drawn from the townships within the immediate vicinity of the mine.

Support infrastructure associated with the Nchanga Mine includes: water management facilities comprised of an intake structure, storage reservoirs, dams, diversion works and stormwater drains; transport systems including roads, railways and pipelines; power supply and distribution equipment; a hospital; laboratory facilities; several administrative offices and workshops.

Exploration started in 1925 followed by some mining activity which continued until 1931 when flooding and depressed copper prices forced the mine to close. Underground production started again in 1937 and production from the Nchanga Open Pit commenced in 1955. Separate mining and milling of cobalt ore began in 1985. The Tailings Leach Plant was commissioned in 1971 with expansions in 1973 and 1985. That plant was built in order to

recover acid soluble copper by treating fresh tailings from the concentrator and reclaimed tailings from old tailings dams that were constructed during historical operations.

5.3.1.1 Present Mining Operations

The mine is currently comprised of both underground and open pit operations.

Open Pit
The Nchanga Open Pit was opened in 1955 and measures approximately 4.3 km x 2.2 km x 405 m deep. The pit is mined in benches averaging 15 m high with access ramps 35 m to 50 m wide at 8% gradient.

Historically, nine satellite pits have been mined for different periods of time. Most of these pits have been exhausted and have remained under ZCCM responsibility upon transfer of ownership. Block "A", Chingola D and F Open Pits have been retained by KCM for future mining based on existing reserves.

A tragic accident resulting in the loss of lives occurred in the open pit on 8 April 2001. This is described more fully in Section 5.3.4.

Underground Mine
The main copper bearing orebody is known as the Lower Ore Body (LOB). There are also smaller orebodies known as Block A and Chingola B. The mining method currently used is "continuous advancing longwall caving" for LOB and Block A. The "room and pillar" method is used for Chingola B. The mine is serviced by a number of vertical, sub-vertical and inclined shafts. The main shafts are C and D which reach a depth of 945 m (3100 feet). There are a number of ventilation shafts in operation. A portal services the Chingola B Orebody for both ventilation and transportation.

The underground workings are currently being dewatered at a flow rate of approximately 80 000 m^3/day.

5.3.1.2 Mineral Processing

Ore processing is carried out at two plants designated as the East Mill and the West Mill. The East Mill circuit comprises crushing, washing and milling of copper ore from the Nchanga Open Pit in preparation for concentration to be carried out at the West Mill. The West Mill processes copper ore from underground operations as well as cobalt ore from the pit. Concentration is done at the West Mill and is performed using conventional flotation methods. Separate circuits are used to process the copper and cobalt ore.

Further processing is carried out at the Tailings Leach Plant where tailings from the flotation circuit and reclaim tailings from old impoundments, are leached to recover acid soluble copper. Leaching is followed by a solvent extraction and electrowinning process that generate copper cathodes as a final product. Associated processing facilities include a horizontal belt filter house, a lime neutralization plant, tailings slurry pachucas (mixing tanks) and a lead casting plant.

Defunct processing facilities include a high grade leach plant that has been out of commission since 1992 and a small size heap leach area historically used to carry out trials.

5.3.1.3 Mine Waste Disposal

Tailings

Disposal of waste from ore processing takes place primarily at the Muntimpa Tailings dam. During emergency conditions, an alternative tailings disposal site, Emergency Dam TD7, is also used.

The Muntimpa Tailings Dam is the main active tailings impoundment and was started in May 1974. The tailings are contained behind a wall, which is a cross valley structure constructed from the cycloned coarse fraction of tailings and a waste rock toe embankment with internal filter drains. The wall has a crest length of about 3000 m and a current height of 48 m.

Tailings are transported from the concentrator and TLP through two 10km long pipelines (350 mm and 450 mm diameters) and discharged primarily from the western side of the impoundment. Decant water is released via a concrete spillway and eventually drains into the Kafue River. Some revegetation work has been carried out on the crest and downstream wall of Muntimpa Dam.

The Muntimpa Tailings Dam will provide more than enough capacity to meet the future life of mine disposal requirements of 122 Mt. The dam was designed with a capacity of 404 Mt, which can be increased to 561 Mt if required. Deposition to date amounts to approximately 244 Mt.

Overburden and Waste Rock

Overburden dumps and in-pit dumping are used for disposal of overburden material generated from the open pit operations. No new overburden dumps will be developed at the Nchanga Mine. Forecast for the overburden dumps is to continue using existing facilities until completion of activities at the open pits in 2003. Approximately 100 Mm^3 of overburden will be added to the existing dumps over the next three years. The majority of the overburden will be disposed of on existing in-pit dumps.

Waste rock from underground operations is temporarily stockpiled on surface while waiting to be processed as aggregate for use in construction at the site.

5.3.1.4 Plant Upgrades

The Nchanga Mine is currently undergoing a major capital refurbishment programme to upgrade existing facilities. The programme is being implemented for optimisation and improvement of the operations at the east mill, west mill, concentrator and tailings leach plant. Most refurbishment activities were initiated on take-over by KCM in April 2000 and are scheduled for completion in 2002.

Based on present geological data and future market price and projections for copper and cobalt, the anticipated life of the Nchanga Open Pit is two more years, to 2003, although milling of some cobalt ore from the pit will continue into 2004.

Underground mining at Nchanga will continue until 2010, according to the current mining plan. The East Mill will be used to process ore from the Nchanga Open Pit until 2004. Following that period it will remain on standby until 2006 when it will be used to process stockpiled refractory ore (referred to as Chingola Refractory Ore, or CRO) feed until 2031. The West Mill will remain in operation until 2010 upon exhaustion of the underground ore. Reclaiming and reprocessing

of tailings through the Tailings Leach Plant will continue until 2010 while processing of CRO will continue till 2031.

As part of plant upgrades, the circuit at the tailings leach plant will be expanded to provide capacity for processing of the CRO which is scheduled to come on line in 2006.

5.3.2 Key Environmental Features and Issues

The main environmental issue at the Nchanga Mine relates to releases to water in the form of both controlled releases from point sources, such as discharge from the Muntimpa Tailings Dam, from other tailings dams decant systems, from the Pollution Control Dam (PCD) and from the West Mill Spillage Ponds, as well as uncontrolled releases from diffuse sources, such as runoff from the overburden dumps and tailings dams.

A review of historical information indicates that effluents discharged from the various point sources at the Nchanga Mine have not been consistently compliant with Zambian regulatory requirements with exceedences noted for parameters that include total suspended solids, sulphates, copper and cobalt, amongst others. The main cause for discharge of non-compliant effluents relates to excessive spillage that originates from the plant process vessels, thickeners, pumps, valves and containment areas. Additional causes include:

- The lack of containment for spillage either due to the absence of containment or unavailability of containment areas due to the fact that they are filled with solids and lack maintenance.

- The lack of capacity to capture spillage, pond supernatant and process equipment washwater in order to return it to the process stream.

- The lack of maintenance of infrastructure, which leads to frequent equipment failure (e.g., pipeline burst).

- Excessive flow volume reporting to the spillage ponds due to the fact that both spillage and stormwater run-off are conveyed in the site drainage infrastructure. Existing ponds do not have sufficient capacity to handle the combined flow resulting from stormwater run-off and spillage thereby resulting in discharge of overflow without adequate treatment.

- Insufficient settling provided in the spillage ponds and the PCD due to overloading. The combined effect of excess flow and the presence of excessive volume of solids accumulated in the ponds and PCD during historical operations leads to overloading of the facilities thereby resulting in the discharge of effluent without the sufficient level of treatment.

- Insufficient settling owing to the high suspended solids loads of drainage delivered to the ponds. For example, drainage reporting to the West Mill Spillage Ponds contains high concentrations of suspended solids not only because of excessive spillage from the thickeners but also due to introduction of concentrate into the spillage ponds as a result of carry over with stormwater runoff.

As for diffuse sources of releases to water, erosion of exposed surfaces on overburden dumps and tailings dam embankments due to exposure to rainfall, results in carry over of suspended solids to adjacent land and streams. Erosion also causes the formation of erosion gullies on

embankment walls. Control of erosion and runoff from these facilities is therefore an environmental issue due to potential effects in terms of siltation and contamination of local watercourses including the Nchanga, Chingola, Mushishima and Muntimpa Streams, as well as the Kafue River as the final recipient of drainage from these streams. The lack of information on seepage from tailings dams, spillage ponds and PCD and potential effects on groundwater also constitutes an issue of environmental concern at Nchanga.

Other environmental issues identified at the Nchanga Mine include the presence of soil contamination resulting from:

- inadequate handling and storage of concentrates;
- inadequate handling and disposal of waste such as off-specification material;
- spillage of tailings along the pipeline routes due to leakage caused by the lack of maintenance of pipeline infrastructure and/or pumping of acidic tailings at times when the neutralisation system has not been operational;
- spillage of fuel and oil in workshops and vehicle service and maintenance areas;
- spillage of oil from equipment and machinery that suffer from a lack of maintenance;
- equipment washing in open unbunded areas; and
- accidental releases of acid, reagents and lime due to inadequate transport, handling and storage practices.

5.3.3 Environmental Mitigation Plan

At Nchanga, the most significant environmental mitigation measures being implemented by KCM aim at reducing and controlling spillage and leaks via improved process control. Operational controls will be improved; containment areas will be constructed or repaired; ponds, containment areas and drains will be cleaned out to remove accumulated debris; worn and leaky pipeline will be replaced; systems will be put in place to return spillage to the process stream in order to reduce discharges to a minimum; treatment systems will be installed on site drainage and provisions will be made for neutralisation of effluents prior to being release to the environment.

KCM's Nchanga operations currently comply with all WBG policies and KCM is committed to comply with all WBG guidelines and Zambian limits by March 2003.

The Environmental Action Plan described as part of the FEMP sets out the actions that will be taken to improve and maintain environmental performance. It covers aspects such as:

- Management of releases to water which includes actions required to prevent pollutants from entering discharges from the mine and hence the environment. Clean-up actions are also addressed. KCM is committed to not only meeting the 100 mg/l TSS limit set by Zambian Regulations but achieving the WBG guideline limit of 50 mg/l TSS by March 2003.

- Management of water resource usage which is aimed at identifying the actions required to minimise water wastage.

- Management of general waste which is aimed at ensuring that appropriate actions are taken with regard to the handling, storage and disposal of hazardous waste.

- Management of hazardous waste which sets out the actions required to ensure adequate measures for the handling and storage of hazardous waste. A permanent solution for hazardous waste disposal is not available since a licensed hazardous waste disposal site does not exist in Zambia. This means that hazardous waste will have to be stored on site until a permanent solution is found.

- Management of spills and leaks which is aimed at preventing pollution of soil and water. These actions are linked to the management of releases to water as well as to emergency response procedures. Spills and leaks will be treated and recorded as environmental incidents. A standard spills response action plan is outlined in the EAP which is applicable to all departments.

- Management of materials handling and storage which sets out the actions required to ensure that materials are handled in a manner that protects the health of employees as well as surrounding communities. These actions are also important in the context of avoiding emergency and environmental incidents.

- Management of emergency incidents which is aimed at managing such incidents effectively should they occur. The overriding objectives in managing emergency incidents are to protect employee and public health and to contain the environmental impacts (i.e., prevent them from moving off-site, if possible).

As for specific actions corresponding to the Operational Phase, at Nchanga the focus will be placed on the regular inspection and maintenance of pipeline infrastructure, spillage collection ponds, containment areas, process vessels, pumps and valves for leak and spillage detection. The continuous operation of pollution control equipment such as dust suppression systems, settling tanks, oil traps and effluent neutralisation systems will be an important part of the Operational Phase EAP. Regular cleaning of collection ponds, drains, containment areas, trenches, paddock dams and other silt retaining structures will also be done to remove accumulated debris in order to maintain containment capacity. Regular monitoring will also be used as a tool for environmental management during operations. Finally, operations will be undertaken in strict adherence to specific procedures developed during the Refurbishment Phase.

Eight houses in the Nchanga North Township are within the blast line when mining occurs in certain portions of the Nchanga Open Pit (NOP), hence these houses need to be vacated when blasting takes place. Prior to vesting, AA plc's negotiators acting on behalf of ZCI indicated that the preference would be for the houses located in close proximity to be vacated and demolished. This was to avoid the operational difficulties associated with having to vacate house before blasting can take place. This position was, therefore, recorded in the IEMP. However, contrary to these wishes, ZCCM, in conjunction with the Zambian authorities, proceeded to sell the houses. Once this had occurred the AA plc negotiators requested assurance that this state of affairs would be condoned. In response a "letter of comfort" from the Mines Safety Department (MSD) was included in the vesting agreements. Hence there is currently no intention to vacate the houses and KCM will have to accept the operational nuisance of having to ensure that the houses are vacated prior to blasting. If the procedure is followed, the MSD are of the opinion that there is no danger to the house occupants.

There are also 130 houses that are closer to the edge of the NOP than the 100m statuary limit normally applicable to habitation adjacent to mine workings. ZCCM obtained an exemption from the MSD for this and this exemption has been transferred to KCM. The MSD is of the opinion that there is no danger to the houses in question, hence their willingness to extend the

exemption. Given the recent slope failure at the NOP south face (see Section 5.3.4), which did not endanger any of the houses in close proximity to the pit, KCM intends commissioning an assessment by independent experts of all its open pit slopes. The outcome of this assessment will determine the need for any further measures to safeguard the house in close proximity to the NOP.

The high rate of erosion of the overburden dumps in the Nchanga mining area during intense stormwater runoff cause sedimentation of the surrounding streams. The approach for rehabilitation during mining and for the eventual closure of the dumps has been to manage stormwater flows either on top of the dumps or at the toe, rather than to try to reprofile the dumps to achieve flatter slopes. The GRZ and ZCCM accepted that while reprofiling may be a better long-term rehabilitation approach, the cost would be excessive.

In a proposed agreement between ZCCM, the GRZ and KCM, KCM will be held responsible for managing the erosion from the Nchanga overburden dumps within their Surface Rights Area for a period of three years following KCM's takeover of the Nchanga open pit. Additionally, KCM will be responsible for maintenance of the erosion control measures for an additional three years, after which responsibility for the final closure and post-closure monitoring of the overburden dumps is handed to GRZ.

An exception to this arrangement is with respect to the management of runoff from the south and west sides of the dumps. Because underground mining will continue until 2010 and runoff from the south side of the dump cannot be allowed to spill into the NOP until this point (to prevent flooding of the underground workings), closure of runoff and sediment controls for the south and west dump areas only, will not be completed until the end of 2010. After this time, responsibility for the control of runoff and sediments from these areas will be handed over to GRZ.

Therefore, these rehabilitation measures have been designed to promote the natural and gradual reprofiling of the dumps to more stable grades by allowing erosional processes to continue, while managing the associated runoff and sedimentation.

5.3.4 Recent NOP Slope Failure and Remedial Action Plan

At 14h00 hours on Sunday 8th April 2001, a major slope failure occurred, with minimal warning, in the South face of the NOP. The failure was along the southern perimeter road and had a span of approximately 400m along the strike between 24E and 28E section lines.

The failed material buried 10 employees who were working on the 255m and 270m benches. A rope shovel, drill rig, grader and a Land Rover were totally destroyed, two dozers suffered extensive damage, and other equipment was lightly damaged.

A full scale rescue/recovery operation was launched as soon as it was established that the conditions were conducive for this work. The Mine Workers Union of Zambia were involved in all aspects of the rescue plan and communications with families of the deceased.

A statutory investigation is in progress by the Mines Safety Department to determine the cause of the accident, but it is apparent that the above normal rainfall in the area was a major contributory factor.

The volume of moved material has been estimated at approximately 5.5 million t, and mainly comprises Banded Sandstone, a material of low cohesion.

SRK Consulting, who have historically been involved with the pit design, were called upon to assist with the design of the rescue and recovery plan and the investigation into the causes of the failure. Boreholes have been installed to dewater the elevated water table until the haul road and drainage system destroyed in the failure, have been rebuilt, and a longer term plan for dewatering has been developed.

The financial and operational consequences of the accident have been examined and a number of options considered, ranging from closure of the pit when current stockpiles and exposed ore were exhausted to recovery of all the ore previously planned to be mined.

A scenario whereby the ore is recovered, but with a loss of copper production in 2001 and 2002 amounting to some 23 000 t in comparison to the current production forecast, is likely to be pursued. The lost production will be made good in the following two years, with the NOP then scheduled to close in 2004.

Repositioning of the perimeter haul road, which was destroyed, and sewerage and water pipelines, cut-off drains and power lines on the pit rim has commenced. An Emergency Resettlement Action Plan (RAP), prepared in accordance with WBG standards, is in the process of being finalised for the residents of 20 houses that need to be demolished to cater for the redefined pit rim, haul road and servitude.

5.3.5 Social Setting and Social Action Plan

The following communities are situated on or immediately adjacent to the Nchanga MSA:

- Former mine high density township (Lulamba);
- Council high cost, low density (former low density mine townships and Chingola South);
- Council low cost, high density (Kapisha, Kabundi, Chingola East, Chikola and former low cost mine townships, e.g. Nchanga North);
- Informal settlements (Katunga, Bululngu, Kulundu, Kamuchanga and Fipuya).

KCM operates Nchanga South Hospital, three health centres, three health posts and the Nchanga Trust Primary School in Chingola. The company has also been involved in the running of various recreational facilities. The company intends to withdraw from direct involvement in the recreational facilities by transferring the responsibility for their running to independent clubs, societies and/ or businesses.

The main social issues associated with the Nchanga operations are the effects of the anticipated mine closure on an already weak economy; the impact of KCM withdrawal from its use of Nchanga North Hospital upon healthcare levels for non-employees; and a current crisis in service provision. Although both of the latter issues fall outside of KCM's agreed realm of responsibility, the potential disruption of the social fabric of Chingola, which these might cause, renders them noteworthy.

Chingola's economy is weak, un-diversified and still dominated by the mine. Prospects for the economy are poor due to the potential closure of the mine. It is anticipated that 6 000 jobs will be lost at Nchanga Mine over the next decade, with critical periods including the closure of Nchanga open pit in 2005 (1355 retrenchments) and the closure of Nchanga underground in

2011 (2098 retrenchments). The biggest challenge in the promotion of sustainable development in Chingola is the establishment of a mechanism that can strengthen the local economy despite the downscaling of the mining sector. In this regard KCM will focus on improving people's skills to sustain their livelihoods in a post-mining economy and on developing economic sectors alternative to mining such as manufacturing and agriculture. In the interim, KCM will support local suppliers in order to strengthen the local economy.

KCM has entered into an arrangement with the government run (ex-ZCCM) Nchanga North Hospital to provide services to its employees until upgrading of Nchanga South Hospital is completed in July 2001. This arrangement has contributed valuable financial support as well as the provision of key KCM support staff for Nchanga North Hospital, and its termination is likely to precipitate serious financial and operational difficulties for this under-funded facility.

Chingola faces a potential crisis in service delivery, due to the large numbers of retrenched mineworkers who have been unable to secure alternative income sources and who are therefore unable to afford to pay for water, electricity and maintenance services. This has reduced cost recovery of bulk service utilities (i.e., Asset Holding Company and Mulonga Water and Sewerage Company) and has rendered the sustainability of these utilities questionable. This poses a risk to KCM as employees and their families are dependent upon such services. In the immediate term KCM recognises that is has a social responsibility to provide some assistance to the local authorities to ensure mutual benefit from effective service delivery. This assistance, such as emergency repairs, is aimed at ensuring services are rendered to the population of which a large proportion are mine employees. The challenge for KCM is to be socially responsible but at the same time not create dependency on the mine either through taking over essential services or through the perception that KCM is a service provider. In the current local context of social and institutional poverty this challenge is immense.

5.4 The Nampundwe Facilities

5.4.1 Principal Project Elements

Nampundwe mine is located 48 km west of Lusaka in a rural area. It is the southernmost of KCM's operations. The mine produces a bulk concentrate of pyrite required for the copper smelters (SmelterCo and Mufulira) and the Roast Leach Electrowin plants (Mopani Copper Mines and Chambishi Metals) on the Copperbelt. The Mining Licence Area is about 951 ha and the principal mining activities cover a total area of about 114 ha.

5.4.1.1 Present Mining Operations

Exploration activities at Nampundwe commenced in 1913 and various small mining activities took place over the next few decades. The mine has been fully operational since 1970 and it comprises the following main components:

- an underground mining operation which is accessed via two shafts (Shaft No. 1 and Shaft B). Currently mining is taking place at the 480ft Level;
- a concentrator, which was designed to treat 800 tpd of pyrite ore; the concentrator process involves crushing, milling, a flotation process and filtering of the concentrate to remove excess moisture prior to its dispatch; and
- a tailings dam made up of a series of paddocks (Paddocks No. 1 to 21); the tailings dam is located about 700 m from the plant.

The pyrite concentrate is moved to the Copperbelt using road transport, as there is no rail link to the mine. Currently, the transport of pyrite is undertaken by a road transport company, under contract to KCM.

About 400 people are employed in mining activities and associated support services. The workforce is drawn mainly from the mine township located adjacent to the mine. Apart from the mine employees and their dependants, the only other inhabitants in the area are subsistence farmers and the community in a nearby site-and-service scheme, the latter of which is located in the mine licence area.

5.4.1.2 Plant Upgrades

The planned life-of-mine for Nampundwe is 30 years. Currently, pyrite production from Nampundwe is not able to meet the demand for pyrite concentrate of the Copperbelt Smelters. As a temporary measure, KCM are obtaining additional pyrite ore from the Iron Duke Mine in Zimbabwe. In the longer term, KCM will be undertaking a number of measures to improve both the production rate of the Nampundwe operation as well as its environmental performance.

The main upgrading activities include:

- extension of the underground mining operation to the 730ft Level;
- upgrading/replacement of equipment in the underground mine;
- upgrading and replacement of equipment in the concentrator plant to improve production; and
- extension of the tailings dam through the operation of a new paddock (the predeposition works for this paddock (Paddock 18) have been completed).

5.4.2 Key Environmental Features and Issues

The Nampundwe Mine is located in a rural area where the predominant activity is subsistence farming. In developing the final EMP a review of the environmental characteristics of the mine and its surroundings was undertaken.

The Nampundwe Mine area is situated within the Kafue River catchment, which is drained by a number of seasonal streams of which the Kacheta Stream, which lies 2 km to the west of the mine, is the most prominent. Natural drainage from the mine site, and the tailings dam, flows to the south-east towards the Kacheta Stream. Since the site and its surroundings, with the exception of the small hills to the northeast, are relatively flat there is little natural drainage from the site. Stormwater and effluent are discharged from the site via the same open channel and this water is utilised by local subsistence farmers. Consequently, runoff from the site, does not reach the Kacheta Stream.

In comparison to other KCM operations, Nampundwe is a relatively small mine and owing to the small size of the operation, it has not significantly altered the bio-physical environment. The main environmental issues at Nampundwe are associated with the discharge of effluents and the spillage on concentrate along the transport route.

Water that is discharged from the mine site is high in suspended solids. There have been occasions when the total suspended solids level in the water has exceeded the legal standard. In addition, there is visual evidence of the deposition of fines in drainage channels located both

on- and off-site. This may impact on soil fertility in the long-term (deposition of fines into the soil fabric) as well as on crops and stock as metals (although at low concentrations) are contained in the suspended solids.

There is evidence of soils contamination at Nampundwe and the investigation into soils contamination revealed the following:

- Poor housekeeping has resulted in the contamination of soil, especially in the plant area. Sources include:

    - spillage of chemicals, oils, concentrates etc.;
    - washing of equipment in open, unbunded areas;
    - storage of concentrate and other materials in the open or in poorly contained areas; and
    - accumulation of stocks of industrial waste in open and uncontained areas.

- Inorganic contamination outside the Nampundwe plant area is associated with pyrite concentrate spills and windblown tailings emanating from the tailings dam. The major concern with regard to off-site contamination is that concentrate spills along the road during transport. Low pH values have been recorded up to 20 m on either side of the gravel road. The impact on the surface and ground water as well as the indigenous vegetation and agricultural land use is considered to be high. The mine is currently investigating alternative transport options.

5.4.3 Environmental Mitigation Plan

Environmental mitigation measures being implemented by KCM in the refurbishment phase include infrastructure upgrade and refurbishment that will be undertaken in part through the Capital Refurbishment Programme. The issue associated with suspended solids in effluent water is being addressed by upgrading sumps and improving on the maintenance of equipment and drains. A new sedimentation pond to provide additional settling capacity prior to release of the mine water will be constructed.

The Nampundwe operations currently comply with all WBG policies and KCM is committed to comply with all WBG guidelines and Zambian limits by March 2003.

The Environmental Action Plan described as part of the FEMP is focused on managing those aspects of the operation that could be of concern from an environmental point of view or that have already had an environmental impact. An EAP is provided for each main component (department) of the Nampundwe Mine. The EAP sets out the actions that will be taken to improve and maintain environmental performance. It covers aspects such as:

- Management of releases to water which includes actions required to prevent pollutants from entering discharges from the mine and hence the environment. Clean-up actions are also addressed.

- Management of water resource usage which is aimed at identifying the actions required to minimise water wastage.

- Management of general waste which is aimed at ensuring that appropriate actions are taken with regard to the handling, storage and disposal of hazardous waste.

- Management of hazardous waste which sets out the actions required to ensure adequate measures for the handling and storage of hazardous waste. A permanent solution for hazardous waste disposal is not available since a licensed hazardous waste disposal site does not exist in Zambia. This means that hazardous waste will have to be stored on site until a permanent solution is found.

- Management of spills and leaks which is aimed at preventing pollution of soil and water. These actions are linked to the management of releases to water as well as to emergency response procedures. Spills and leaks will be treated and recorded as environmental incidents. A standard spills response action plan is outlined in the EAP which is applicable to all departments.

- Management of materials handling and storage which sets out the actions required to ensure that materials are handled in a manner that protects the health of employees as well as surrounding communities. These actions are also important in the context of avoiding emergency and environmental incidents.

- Management of emergency incidents which is aimed at managing such incidents effectively should they occur. The overriding objectives in managing emergency incidents are to protect employee and public health and to contain the environmental impacts (i.e., prevent them from moving off-site, if possible).

Concern also currently exists regarding about 30 temporary prefabricated houses located within the theoretical “caving area.” These houses were built previously under ZCCM management for contractors. Land within “caving areas”, as determined in accordance with the Zambian regulations, is seldom affected catastrophically. In the case of the area occupied by the Nampundwe houses there is no indication of instability of the surface. However, the presence of the houses is in contravention of the law and therefore, cannot be allowed to remain indefinitely. Alternative housing is presently being investigated for relocation of the people occupying these dwellings. While this remains the responsibility of ZCCM, KCM has initiated discussion with ZCCM to facilitate the process. It is anticipated that ZCCM will have relocated the dwellers by the end of 2002.

5.4.4 Social Setting and Social Action Plan

The majority of KCM employees at Nampundwe originate from areas elsewhere in Zambia, which has led to a distinction being drawn between ‘local expatriates’ (i.e. Zambians originating elsewhere) and ‘locals’ (i.e. the Sala people originating in areas near the mine). The following communities are situated on or immediately adjacent to the Nampundwe MSA:

- Kasunka Township and Nampundwe Housing Estate (including the ex-Kalengwa settlement);
- Nampundwe Site and Service; and
- Scattered agricultural settlements.

Nampundwe Mine is geographically isolated from other economic centres. As a result, KCM has had to take over the provision of almost all social services (i.e. water, electricity, sewerage and refuse removal) to Nampundwe town at vesting. KCM has also taken over one health clinic that was previously run by ZCCM. The company does not own a school in the area, and instead contributes to the running of the Nampundwe Basic School.

The main social issues associated with the Nampundwe operation are the sustainability of KCM's continuing role as social service provider to local communities, and the degree of economic dependency of these communities on the mine.

The Mumbwe District Council's lack of capacity and resources implies that KCM will not in the short-term be able to transfer service provision responsibilities (i.e. water, electricity, refuse removal and sewerage services) to local government. Every attempt will, however, be made by KCM to build capacity amongst the local community so that local people are able to play a greater role in the management of their affairs.

The lack of other economic engines in the area implies that the local economy will continue to be highly dependent on the mine. The only feasible option for KCM in this situation is to retain dependency on the mine but to make individuals more mobile through the transfer of skills and awareness so that they are able to find employment elsewhere when the mine closes.

5.5 The SmelterCo Facilities

5.5.1 Principal Project Elements

The SmelterCo smelter, acid plants and refinery complex (formerly known as the Nkana Smelter and Refinery) is located immediately south of the city of Kitwe on the Zambian Copperbelt. These facilities are owned by Zambia Consolidated Copper Mines – Investment Holdings Limited (ZCCM-IH).

ZCCM-IH appointed Anglo Operations Limited (AOL) to manage the SmelterCo assets. AOL had an interest in the SmelterCo facilities as KCM requires guaranteed access to smelting and refinery facilities during at least the first three years after take-over. KCM manages these operations on behalf of AOL.

KCM has an option to purchase the SmelterCo facilities within the five years covered by the management agreement, which commenced on 31 March 2000. If KCM does not exercise its option to buy the SmelterCo assets before 31 March 2003, they will be offered to MCM.

The SmelterCo plants are located within the SmelterCo Licence Area – Large Scale Mining Licence Number 38 (see Figure 6). The former ZCCM Nkana mining activities, as well as the concentrator and cobalt roaster, leach and electrowinning plants, have been purchased by Mopani Copper Mines plc (MCM).

5.5.1.1 Present Smelter Operations

The SmelterCo smelter complex was commissioned in 1932 and the SmelterCo refinery started up in 1950. Development and expansion of the facilities has been undertaken since then, however no major rehabilitation has occurred over recent years. Consequently the smelting facilities have become very run down. They consist of old and outdated technologies and are in need of major repairs in certain areas. Gas and particulate emissions are exceeding acceptable standards and SmelterCo is focusing on reducing these. This involves repairs to the off-gas handling systems as well as modifications to plant unit operations (See below).

The SmelterCo surface rights area covers the following main facilities:

- concentrate receiving, storage and blending facilities;
- primary smelting furnaces;
- conventional copper converters;
- anode casting;
- electro-refining;
- sulphuric acid production;
- slag dump (SD67);
- workshops, administration and other buildings;
- acid tanks and a lime rock storage area separate from the main complex;
- salvage yard; and
- power plant.

MCM facilities are located immediately adjacent to SmelterCo, with two areas under MCM surface rights located within the SmelterCo area.

Concentrates from the Nkana (MCM), Chibuluma (Chibuluma Mines plc), Nchanga (KCM) and Konkola (KCM) mines are processed at SmelterCo. Sulphuric acid is produced as a by-product from the process. This acid is shipped primarily to the Nchanga facilities for use in the tailings leach process and also to the MCM cobalt plant at the Nkana Mine and the MCM refinery at Mufulira.

5.5.1.2 Plant Upgrades

The smelter operation will increase its throughput in order to process all the concentrates produced by the KCM Project. This increase in capacity will take four years and during this time an overflow of concentrates will be toll-smelted at MCM's Mufulira Smelter.

The design capacity of the SmelterCo operation is 240 000 tpa of copper from concentrate. The production will increase to about 158 000 tpa of copper cathodes by the year 2006 and an average of 200 000 tpa of copper cathodes over the following 25 years to planned closure in 2031.

The planned refurbishment of the SmelterCo plants will improve the efficiency of the plants as well as address the environmental impacts from air emissions, in particular sulphur dioxide and particulates. This will require a capital injection of US$91.3 million and will use 'best-available-technology-not-entailing -excessive-costs' (BATNEEC). This refurbishment, to be substantially completed by March 2003, includes design, construction and training. KCM plans to take ownership of the smelter facilities for the future treatment of its concentrate. When KCM purchases SmelterCo, additional expansionary capital (currently estimated at US$ 60 million) will be invested in further improvements of the facilities.

A brief outline of the activities to be undertaken during each phase is provided below.

Phase I – Refurbishment Phase (2000 – 2003):

The main upgrading work planned in the smelting complex over the first three years of the project (the refurbishment phase) includes:

- installation of a new flash dryer and the associated dense phase transportation of dried copper concentrates to the reactor tuyere injection system;
- refurbishment of reverberatory furnaces. The CMT will be modified to a reactor type of vessel, which will be used for the bulk of the concentrate smelting. All the reactor off-gases will be routed to the acid plant. A single reverb will be operated to treat the slag from the reactor, requiring a small amount of seed concentrate;
- refurbishment of the existing converters;
- repairs to bins, chutes, conveyors and dust extraction/suppression systems; and
- repairs to the cooling water system, including chemical dosing to ensure closed loop systems.

The main upgrading work to the tankhouse planned over the first three years of the project includes:

- rebuilding of the tankhouse sequentially;
- replacement of cells with polymer concrete units;
- upgrading of the electrical systems, together with two new transformer rectifiers; and
- upgrading of the control and instrumentation.

Phase II – Expansion Phase (2003 – 2006)

The main expansion work planned in the smelting complex following take-over by KCM includes:

- installation of three new anode furnaces and two new casting wheels;
- installation of larger El Teniente reactor and slag cleaning furnaces;
- rehabilitation of 1/2D unit at the tankhouse; and
- installation of one new transformer/rectifier to cope with the increase capacity requirements.

Provision has also been made for the extensive rehabilitation and upgrading of the Acid Plants No. 3 and No. 4 to produce approximately 950 tpd of sulphuric acid.

Tankhouse and acid plant modifications are presently underway. The acid plant efficiencies have already started to improve and the availability of the plant is targeted at 95% once all improvements have been made (by 2003).

Planned modifications to the smelting operations at SmelterCo, listed above, will gradually move the operation from the reverberatory furnaces to the modified CMT. At present approximately 70% of the smelting is being conducted in the reverberatory furnaces and 30% in the CMT. Once the CMT is refurbished (that is by 2002) up to 70% of the concentrates will be smelted in the CMT and 30% in the reverberatory furnaces. The modified CMT will be a reactor type vessel, where all off-gases will be routed to the acid plant.

5.5.2 Key Environmental Features and Issues

The poor air quality on the SmelterCo site and in the surrounding environment is the major environmental. Emissions of concern are:

- sulphur dioxide and dust due to fugitive releases near ground level from the reverberatory furnaces and the converters;
- sulphur dioxide and dust due to stack releases from the reverberatory furnaces, converters and anode furnaces;
- sulphur dioxide and sulphur trioxide (acid mist) from the acid and pyrite plant stacks;
- dust from material handling facilities, in particular the coal stockpile and pulverising plant and the concentrate dryer; and
- dust from roads and material transfer, such as conveyers.

These emissions have resulted from:

- leaks in the piping, plant and equipment;
- the breakdown or inefficiency of the dust extraction system;
- poor availability and capacity of the acid plants;
- the conventional method of converting, which results in the turning in and out of the converters and the external transfer of matte from the reverberatory furnaces to the converters;
- the reverberatory furnaces' emissions having a low concentration of sulphur dioxide, which cannot be efficiently treated in the acid plant and are released to atmosphere through a stack;
- the nature of the process a batch process that does not give a constant feed to the acid plant; and
- unsurfaced roads and other access routes.

Other emissions that are significant to the total emission inventory for the site are sulphur dioxide and particulates from the cobalt roaster owned by MCM and situated approximately 1 km to the north of the smelter. Although an emission inventory has not been undertaken for the site as yet, the contribution from this source, if no capture occurs, is estimated to be as much as 10% of the total emissions from the site.

The emissions from SmelterCo operations have resulted in a significant impact on the surrounding environment due to:

- very high daily concentrations of pollutants in (up to 13 100 µg/m^3) the ambient air at ground level, with numerous exceedances of threshold levels that result in detrimental health effects;
- high ambient ground level concentrations being experienced for a large part of the time (up to 983 µg/m^3), thus increasing the dose to sensitive receptors such as people and vegetation, to unacceptable levels; and
- one to five day continuously high concentrations above the threshold level resulting in an unacceptable dose.

The most sensitive environments around SmelterCo that have been adversely affected by air pollution from its activities are the residential areas to the south, east and north of the complex. Wusakile Township to the east of the site is susceptible to impacts in the rainy season when the wind direction is preferentially towards the township. Daily maxima of up to 2 250 µg/m^3 and annual maxima of up to 167 µg/m^3 have been recorded. The potential impacts are on human

health, vegetable gardens and buildings in this area. The contribution of the Cobalt Roaster emissions to the overall impact to the south could be large due to the low level of the emissions and the constant venting that is occurring at present at the cobalt plant. Without significant improvements, the high ambient ground-level concentrations on site (near-field) would negatively impact employees of both SmelterCo and MCM.

The soil contamination assessment has indicated areas where historical activities at the site have impacted on local soils and vegetation. Much of this impact has been a result of poor emission control and material handling practices and the lack of spill prevention and clean-up procedures.

Poor water management practices have also been identified as an environmental concern. Historically, leaks in water pipelines have lead to excessive use of water resources due to wastage. This situation is currently being addressed through the capital refurbishment programme. The lack of data on flow volumes to develop an accurate water balance due to lack of information of both inflows and outflows into the different plants and processes will be addressed.

5.5.2.1 Environmental Mitigation Plan

At SmelterCo, the most significant environmental mitigations being implemented by KCM aim at reducing and controlling stack and fugitive emissions from a process control basis. The planned refurbishment of the SmelterCo plants will improve the efficiency of the plants as well as address the environmental impacts from air emissions, in particular sulphur dioxide and particulates. The smelter, and associated facilities, will be upgraded in two phases. From March 2000 to March 2003, the current Refurbishment Phase, an estimated $91 million will be invested in SmelterCo to improve its operations as discussed above. This refurbishment includes design, construction and training.

The end of the refurbishment and construction phase coincides with the timing of the purchase option agreement with KCM (31 March 2003). After this, KCM will enter into an expansion phase where further improvements will be put in place. KCM plans to take ownership of the smelter facilities for the future treatment of its concentrate. When KCM purchases the SmelterCo facilities, an additional expansionary capital of over US$60 million will be invested in further improvements of the facilities.

The planned smelter upgrade involves improving the plant capacity as well as improving discharge emissions (see below). The prime objective at SmelterCo is to, as far as possible, improve the sulphur fixation and overall smelter operation applying the principles of “Best Available Techniques Not Entailing Excessive Costs” (BATNEEC). “Excessive Costs” was taken as costs rendering the project uneconomic and resulting in permanent closure of the facility.

KCM is committed to operating within WBG policies and guidelines. To this end, several studies were undertaken to evaluate different primary smelting technologies. The different technologies evaluated were:

- Cyclone Smelting/Retrofit to Reverberatory Furnaces (Contop);
- Top Blown Rotary Converter (TBRC) Smelter Process;
- Electric Smelting Process;

- The Noranda Process;
- Outokumpu Flash Furnace Smelting Process;
- Inco Flash Smelting Process;
- Mitsubishi Continuous Smelting Process; and
- Hydrometallurgical Process.

The most definitive study on the subject that was supplied for review was titled "*Class One Study For Nkana Smelter and Acid Plants*" performed by SNC Lavalin (1999). The criteria used to evaluate the different technologies in this study were:

- metallurgical applicability;
- industry acceptance;
- previous/current scale of proven operational production experience;
- ease of incorporation within the production scenario proposed at SmelterCo;
- economic factors (i.e., indicative capital and operating costs); and
- environmental considerations.

The technologies considered acceptable for the SmelterCo Smelter upgrade was a modified CMT (Teniente) process. It is planned to upgrade the existing El Teniente vessel and then to replace it with a new vessel of greater capacity at a later date.

The proposed refurbishment and expansion program will result in significant improvements to air emissions from SmelterCo. SmelterCo (and KCM) is committed to achieving over 75% sulphur capture by March 2003 (from the current sulphur capture of 35%) and to further increase sulphur capture to consistently above 80% of the sulphur feed by March 2007 (once the electric furnace replaces the reverb furnaces).

Furthermore, fugitive emissions will be reduced from the present 30% of the sulphur feed to 10% of the sulphur feed by March 2003 and down to less than 5% by March 2007. These sulphur capture target are considered the best achievable levels with the refurbishments and expansion plans outlined above that were selected using BATNEEC principles.

Based on the above discussions, and that the refurbishment of SmelterCo will be in accordance to BATNEEC principles, KCM is committed to achieving the following target values for sulphur emissions and ambient air quality within the time frame required for the upgrading of the facilities.

<u>Sulphur Capture</u>
Sulphur capture will be increased from 30% of the sulphur feed at vesting to a minimum of 75% by March 2003 (end of Phase I). Upon takeover of SmelterCo by KCM, further capital projects (Phase II) will result in further increases sulphur capture to above 80% by 2005.

Ambient SO_2

At vesting, sulphur emissions were in excess of 70% of the sulphur feed and daily maxima in excess of 10,000 µg/m^3 were recorded in monitoring stations around the site.

However, SmelterCo will adopt a site specific ambient air quality limit of 500 µg/m^3 for a daily averaging period. This limit is considered justifiable since it represents the lowest level at which adverse effects have been noted in vulnerable groups (elderly people and/or persons already suffering from respiratory illnesses) in locations where very high concentrations of airborne particulate are also present. The daily limit of 500 µg/m^3 was the standardWBG guideline value prior to 1998. In the WBG's "Sulfur Oxides Pollution Prevention and Control" guideline it is noted that human health impacts of concern are short-term exposure to SO_2 concentrations above 1000 µg/m^3.

Since the available literature indicates that some adverse affects on vulnerable groups may commence at levels of around 500 µg/m^3, SmelterCo will track this via monitoring hospital and clinic admission statistics, public complaints and, if necessary, via focussed health surveys of target vulnerable groups. However, it should be noted that possible health impacts due to the very adverse historical ambient air quality conditions are, in the short to medium-term, likely to mask any further impacts due to operation under the much improved conditions that will prevail following the rehabilitation and upgrading of the facilities.

SmelterCo is committed to achieving the daily limit of 500 µg/m^3 at a distance of 1km from the smelter 95% of the time by March 2006. If ambient air quality monitoring results indicate that this is not being achieved, then adjusting the operating conditions during, in particular, adverse climatic conditions will be pursued. However, modelling predictions of ambient air quality indicate that this level of performance should be achieved following rehabilitation and upgrading of the facilities without needing to resort to operational changes. At distances of less than 1km management can be more comprehensive and can include the use of personal protective equipment.

Although SmelterCo have committed to meeting ambient limits for SO_2 of 500 µg/m^3 based on currently available information, operating experience may in future allow this to be reduced. KCM and SmelterCo have committed to the principle of "continuous improvement" in environmental management and the companies will strive towards the best practice available in the context of BATNEEC (see Section 1).

Particulate Emissions

Improvements in particulate emissions will primarily be achieved through process modifications and, in particular, by phasing out process units that are major contributors to the current particulate loading.

150 mg/Nm^3 will be adopted as the maximum particulate emission concentration for all the stacks that will remain in operation on completion of the refurbishment. Due to the timing of the refurbishment programme, all stacks will only achieve better than 95% compliance with this standard by 2007, although substantial compliance will be achieved by March 2006.

The reduction in the particulate load released to the environment due to process modifications will have the greatest impact on ambient air quality. The improvements encompass the complete elimination of major sources of particulate emissions. Thereafter minor further improvement will only be possible by reducing the concentration of particulates in the remaining operational stacks.

Indications are that on completion of the upgrading, ambient air quality will not be particularly sensitive to concentration variations in the operational stacks of between 50mg/Nm^3 (the current WBG guideline for new copper smelters) and 150mg/Nm^3. There is some uncertainty as to the final effectiveness of the particulate control measures that will be implemented in the remaining operational stacks. If all the proposed upgrades are completely successful then concentrations of 50mg/Nm^3 or less should be achievable. However, due to current uncertainty regarding the final effectiveness of the upgrading SmelterCo can, at present, only commit to achieving a concentration limit of 150mg/Nm^3 95 % of the time. In line with its commitment to continuous improvement, SmelterCo will endeavor to improve this limit as confidence in the effectiveness of the upgrading increases.

As for specific actions corresponding to the Operational Phase, SmelterCo will focus on the regular inspection and maintenance of the various components of the plants, air emission controls, spillage collection ponds, containment areas, process vessels, pumps and valves for leak and spillage detection. The continuous operation of pollution control equipment such as dust suppression systems, settling tanks, oil traps and effluent neutralisation systems will be an important part of the Operational Phase EAP. Regular cleaning of collection ponds, drains, containment areas, trenches, paddock dams and other silt retaining structures will also be done to remove accumulated debris in order to maintain containment capacity. Regular monitoring will also be used as a tool for environmental management during operations. Finally, operations will be undertaken in strict adherence to specific procedures developed during the Refurbishment Phase.

5.5.3 Social Setting and Social Action Plan

The current local social environment in Kitwe has been shaped largely by the privatisation of ZCCM Nkana Division and the sale of Council houses to sitting tenants. The most immediate effects of these two changes in the local social environment have been the numbers of unemployed who have moved into informal sector activities. The high levels of unemployment have forced more people to engage in subsistence agriculture, and the lack of income has reduced the financial viability of the Kitwe City Council. The transfer of housing from ZCCM to the new owners has not taken place and so rates and taxes are not being collected. The transfer of assets from ZCCM to private interests has created a mix of development agents in the Kitwe district. No longer is one company, namely ZCCM, responsible for most service provision. It will be some time before the public understands the new roles and responsibilities involved in the transition to new development agents, i.e. private companies operating schools and health institutions and the City Council managing bulk infrastructure.

KCM does not own SmelterCo, and as a result is not directly involved in the management of social issues – e.g. service provision, healthcare or education – in Kitwe. This may change in future if KCM decides to buy SmelterCo. The only significant social issue associated with current KCM activities in Kitwe is that of air pollution and its impact upon surrounding communities, which has been discussed above in the environmental summary.

6.0 CORPORATE LEVEL SHE MANAGEMENT

6.1 KCM commitment to Safety, Health and Environment

KCM's commitment to effective Safety, Health and Environment (SHE) management is demonstrated by the formation of SHE Committees, the adoption of a SHE Policy and the establishment of a SHE Department. The board of KCM have appointed a SHE Committee of the Board to oversee SHE management within the company. In addition to this Board Committee, the following SHE committees have been established:

- SHE Executive Committee;
- Safety Implementation Committee;
- Occupational Health Implementation Committee; and
- Environmental Implementation Committees at each operation and/ or discipline.

As discussed above, the size of the shareholding and the level of control of Anglo American (AA) plc makes KCM a "managed" operation. Hence, KCM is expected to adhere to AA plc's SHE Policy and Management Guidelines. An organogram of KCM SHE corporate governance structure is shown in Figure 7.

As one of the top 100 companies listed on the London Stock Exchange and as the largest mining company in the world, AA plc is open to considerable scrutiny by the investment community and other stakeholders. The London listing requirements include adherence to the Combined Code on Corporate Governance and its Internal Controls (commonly known as the "Turnbull Report"). The "Turnbull Report" essentially requires risk identification and management systems to be established within the company.

AA plc's commitment to Safety, Health and Environment (SHE) management is demonstrated by the establishment of a SHE Committee of the Board to broadly direct SHE management within the company's commodity Divisions. The Board has also approved a corporate SHE Policy and Management Guidelines. (The guidelines are consistent with ISO 14001 and OHSAS 18001). KCM's SHE policy is based on the same principles. KCM intends to be ISO 14001 registered within the next five years.

Commencing in 2001, AA plc has initiated publishing an annual public SHE report covering the performance of all its Divisions. The intention is also to move towards public reporting by each of the commodity Divisions. A number of individual operations are already producing public SHE reports. KCM operations will be included in that report starting in 2002.

KCM is committed to ensuring that adequate funding is made available to fund its SHE management programmes. As an initial investment to improve health, safety, social and environmental conditions at the current facilities, a budget of approximately $34 million has been allocated to the SHE department for various upgrading programmes (the categories of SHE expenditure during the various phases of the project are provided in Volume 1, Section 2). This does not include the cost of refurbishment of the facilities included in the Capital Projects' budget of some $270 million (excluding any expansion projects and KDMP). As outlined throughout the documents, health and safety and environmental conditions have suffered due to a lack of investment funds and a degradation of the facilities over the years. The refurbishment of the existing facilities will greatly improve occupational health and safety conditions and

reduce the environmental impacts of the operations. In addition, the SHE department has an annual operating budget of $1.2 million for ongoing management programmes.

6.2 SHE Department

KCM's SHE Department comprises a core team supported by resources within other departments. The SHE Department reports to the Vice President – Safety Health and Environment, who is a member of the company's Executive Committee.

The SHE Department comprises the following key personnel:

SHE		Vice President – SHE SHE Data Analyst
Occupational safety		Safety Manager *RAMP Co-ordinators*
Occupational hygiene		Occupational Hygiene Engineer *Ventilation Engineers*
Environment	Technical/ bio-physical	Environmental Manager Environmental Coordinators Environmental Officers EMS Co-ordinator
	Social	Social Manager Community Development Co-ordinator Community Development Officers Community Liaison Co-ordinator *Community Liaison Officers* Resettlement Co-ordinator

Italics = On another Department's strength

6.3 Occupational Health Management

Occupational health is the discipline that deals with the prevention, treatment and rehabilitation of work related injury and illness through processes such as medical surveillance, workplace audit and advocacy on health related issues in the workplace.

Occupational Health comprises mainly the medical and hygiene disciplines, but it forms an integral part of the holistic approach to Safety, Health and the Environment adopted by KCM.

KCM's strategy on Occupational Health makes provision for:

- the establishment of a health and safety policy;
- a system for consultation with employee representatives on health and safety matters;
- structures for the operational implementation and review of the policy, and
- the development of a system for the assessment and management of occupational hazards.

The system requires interaction between a number of departments and committees, including Safety, Medical, Hygiene Environmental, Mining, Human Resources, Training, Procurement, etc.

The **elimination / control / protection** process represents the basic logical sequence of dealing with hazards from an occupational point of view.

Preliminary risk profiles for all the potential occupational hygiene risks have been established based on historic ZCCM data and KCM data gathered during 2000. An occupational hygiene management programme, in line with international convention, has been defined on the basis of these risk profiles. This programme will be adapted as new information indicating the need for a review of the risk levels that workers are exposed to becomes available.

The programme includes:

- the maintenance and preparation of hazard monitoring equipment;
- the routine monitoring of potential exposures by the Ventilation and Safety Departments;
- the co-ordination of engineering hazard control measures;
- liaison with relevant departments; and
- reporting and review.

6.4 Risk Awareness and Management Programme for KCM (RAMP.K)

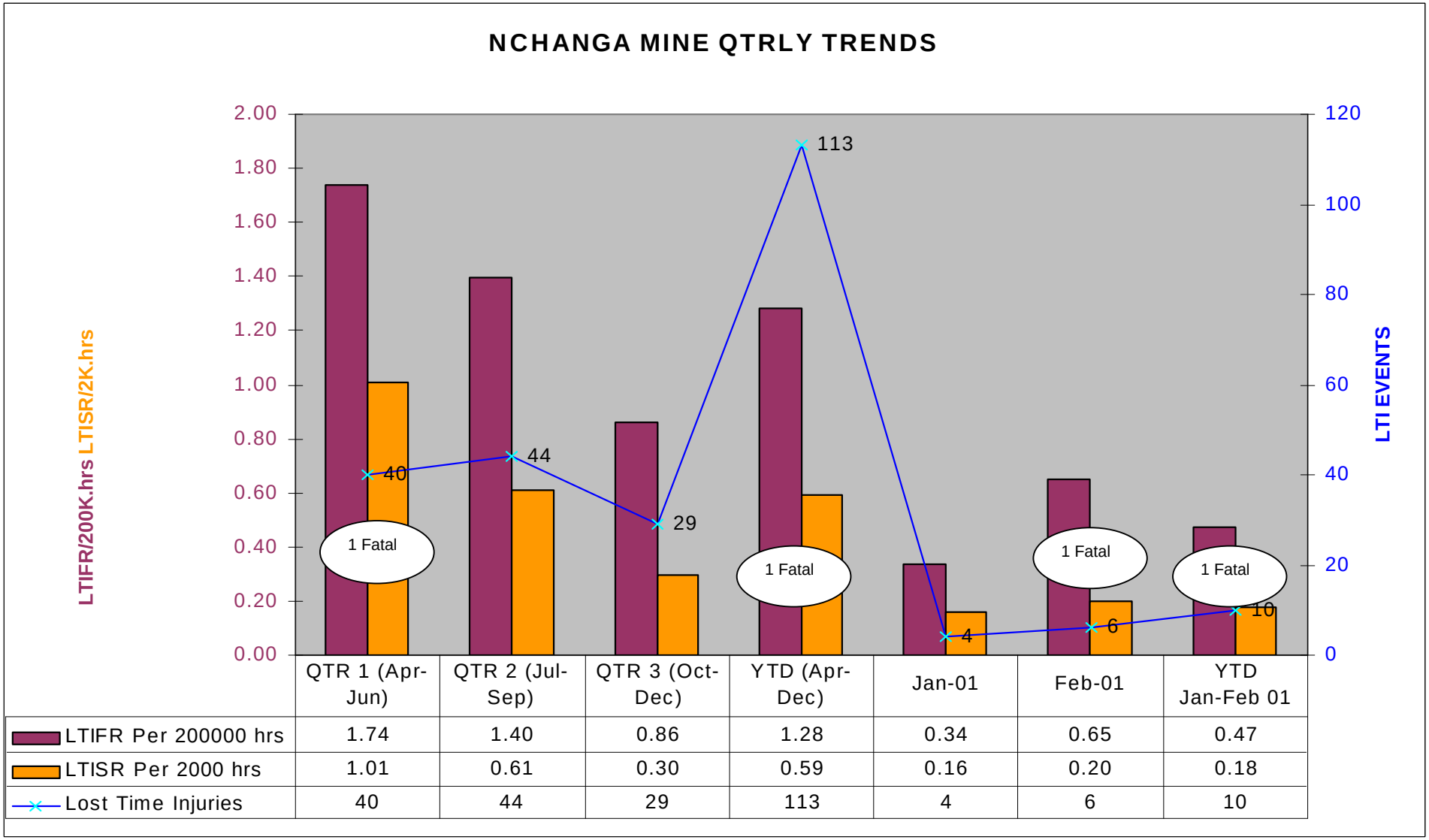
KCM has embarked on a risk based approach to occupational health and safety through a programme known as the Risk Awareness and Management Programme for KCM, in short, the RAMP.K. The programme is focused on two main areas:

1. To raise the awareness in all persons undertaking work for KCM on the risks that they may be exposed to in the course of doing their work and how best to manage those risks so as not to cause injury to themselves and those people they may be in contact with.

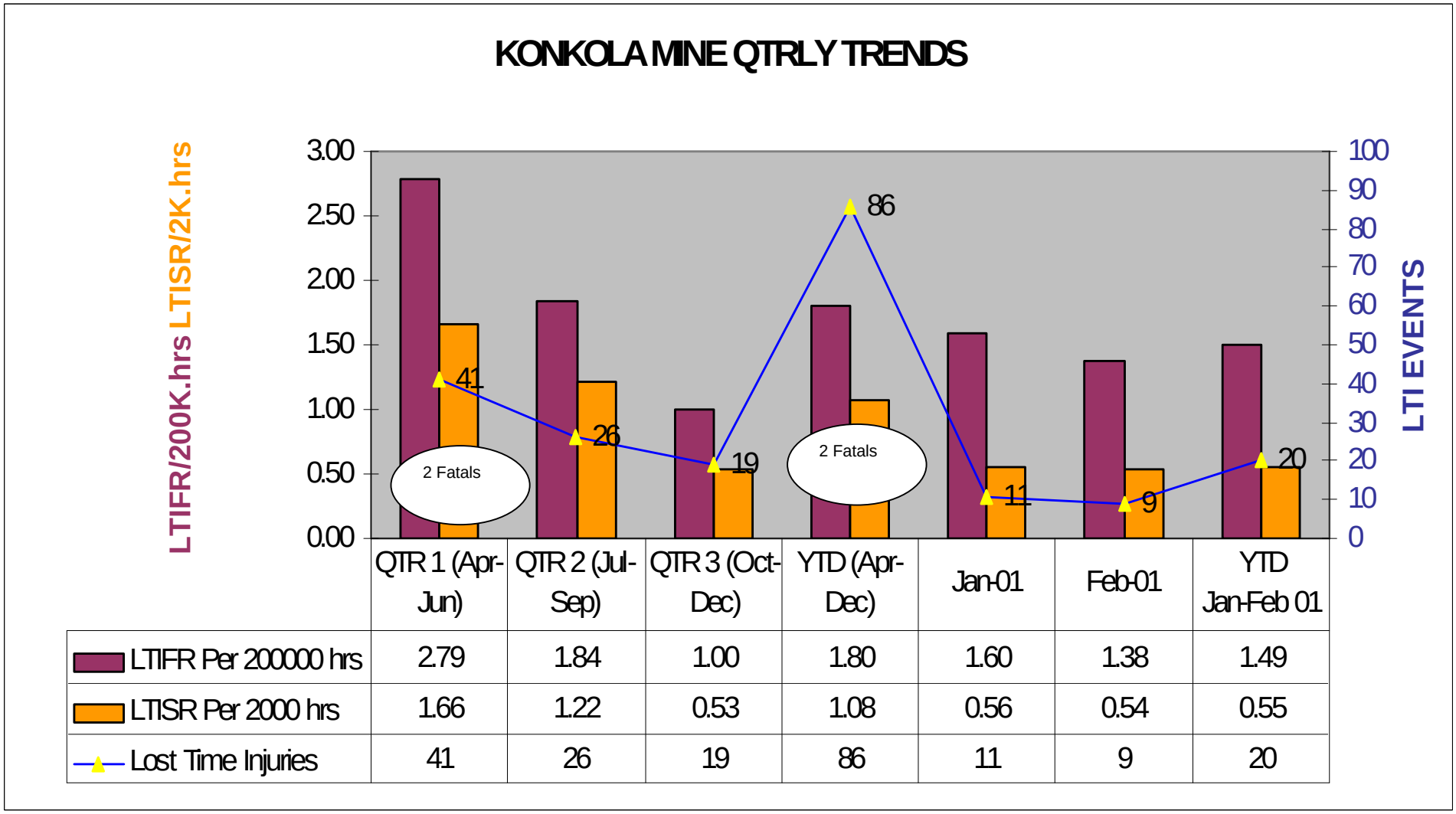
2. Equipping people with skills for hazard identification and hazard management in all the work places at KCM.

The programme commenced in July 2000 with the training of a selected number of KCM trainers by experts contracted from International Risk Control Africa (IRCA). After the trainers were trained, they were deployed to various training centres in KCM where they in turn continued to conduct two day courses for all KCM employees including personnel employed by contractors. By March 2001, 18 000 persons had undergone safety awareness training which represents over 100% of the total number trained at KCM Mines and SmelterCo Plants.

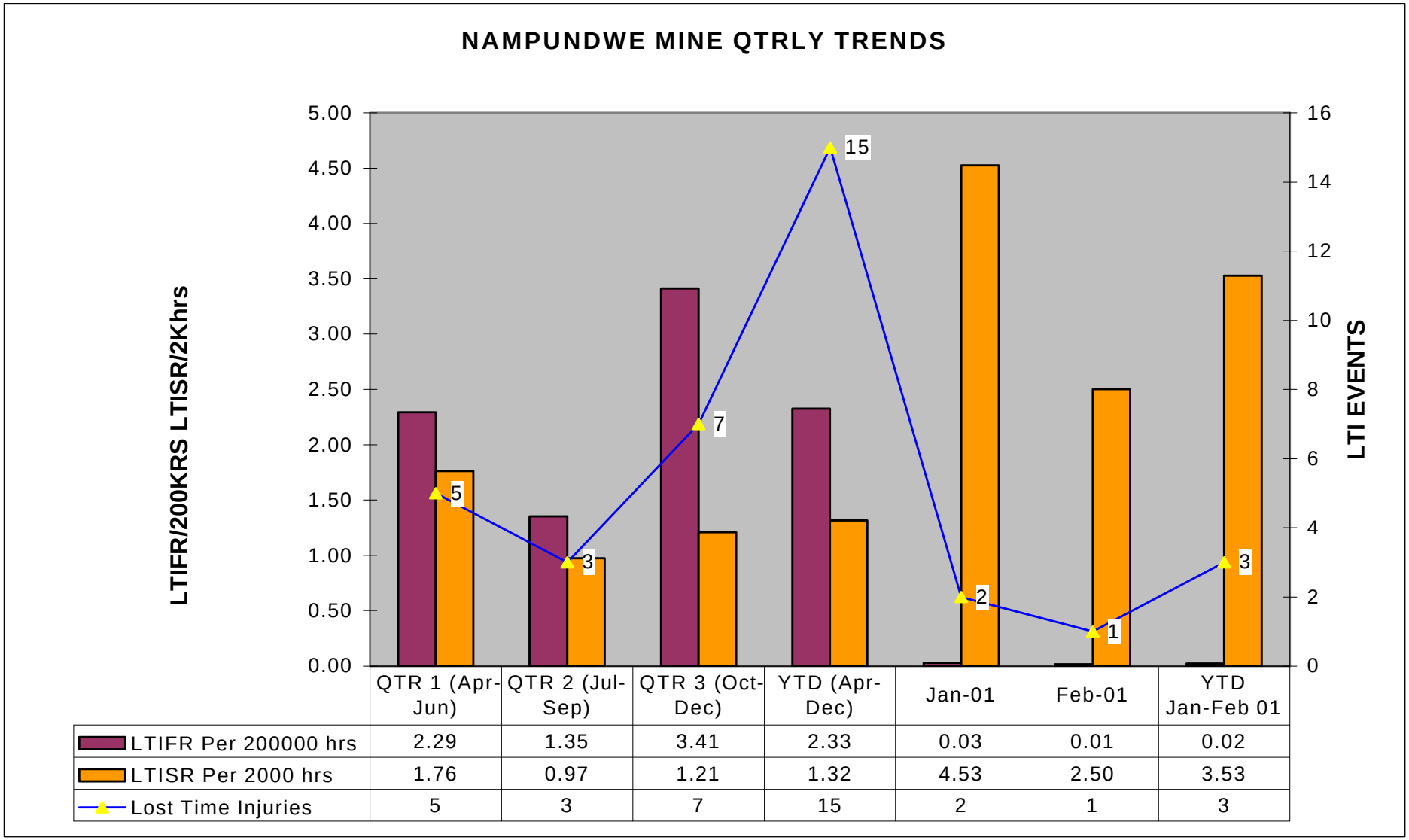
The second critical part of the programme involved the training of a selected number of front line officials drawn from all KCM operations in the Baseline Risk Assessment Course (BRAC) The course was aimed at equipping employees with the skills to identify and document all hazards in their respective working areas and to make recommendations on what was required in order to eliminate or minimize the risk that the hazard may pose. The process of collecting and compiling data on hazards was completed during September 2000. KCM has now embarked on the implementation of the RAMP.K program, including further training. The graphs shown below indicate the safety statistics for the individual operations.



	QTR 1 (Apr-Jun)	QTR 2 (Jul-Sep)	QTR 3 (Oct-Dec)	YTD (Apr-Dec)	Jan-01	Feb-01	YTD Jan-Feb 01
LTIFR Per 200000 hrs	1.74	1.40	0.86	1.28	0.34	0.65	0.47
LTISR Per 2000 hrs	1.01	0.61	0.30	0.59	0.16	0.20	0.18
Lost Time Injuries	40	44	29	113	4	6	10

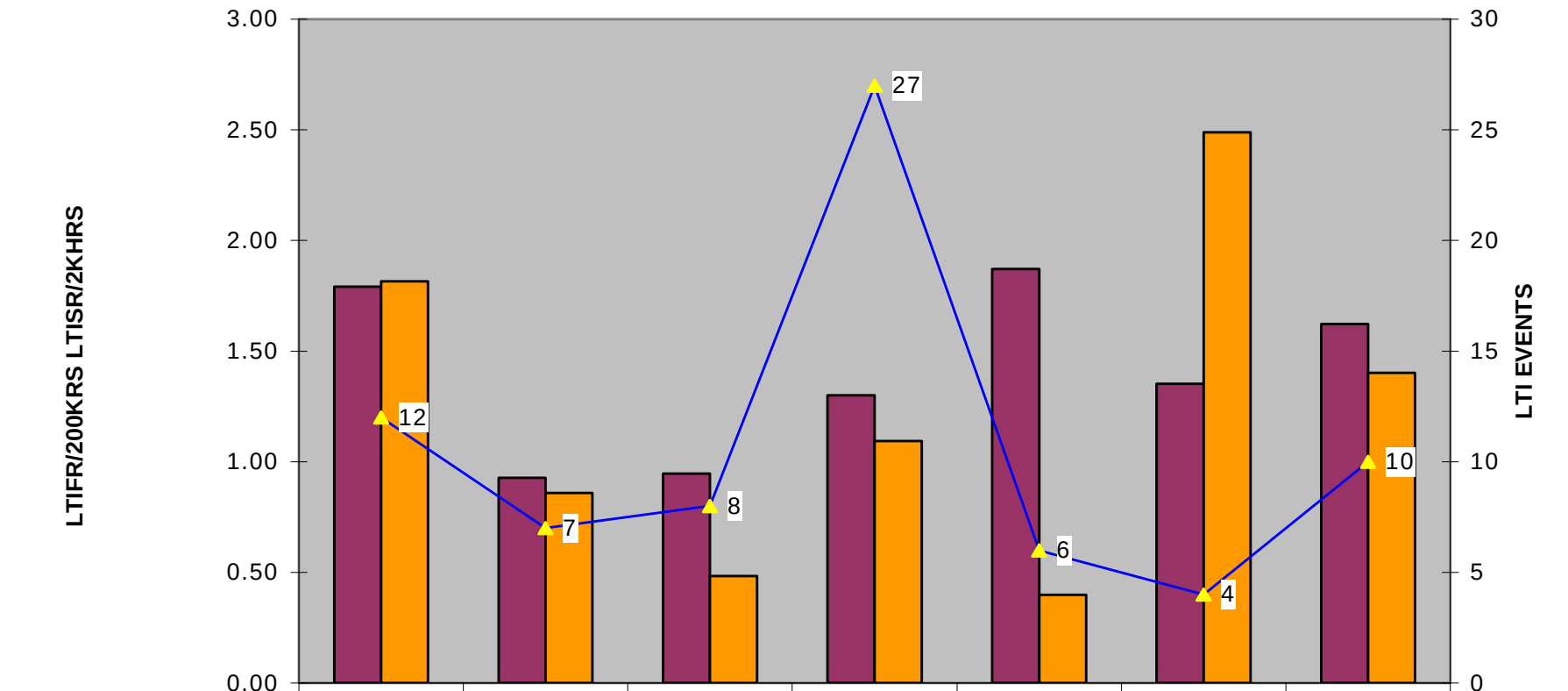


	QTR 1 (Apr-Jun)	QTR 2 (Jul-Sep)	QTR 3 (Oct-Dec)	YTD (Apr-Dec)	Jan-01	Feb-01	YTD Jan-Feb 01
LTIFR Per 200000 hrs	2.79	1.84	1.00	1.80	1.60	1.38	1.49
LTISR Per 2000 hrs	1.66	1.22	0.53	1.08	0.56	0.54	0.55
Lost Time Injuries	41	26	19	86	11	9	20



	QTR 1 (Apr-Jun)	QTR 2 (Jul-Sep)	QTR 3 (Oct-Dec)	YTD (Apr-Dec)	Jan-01	Feb-01	YTD Jan-Feb 01
LTIFR Per 200000 hrs	2.29	1.35	3.41	2.33	0.03	0.01	0.02
LTISR Per 2000 hrs	1.76	0.97	1.21	1.32	4.53	2.50	3.53
Lost Time Injuries	5	3	7	15	2	1	3

SMELTERCO PLANTS QTRLY TRENDS



	QTR 1 (Apr-Jun)	QTR 2 (Jul-Sep)	QTR 3 (Oct-Dec)	YTD (Apr-Dec)	Jan-01	Feb-01	YTD Jan-Feb 01
LTIFR	1.79	0.93	0.95	1.30	1.87	1.35	1.62
LTISR	1.82	0.86	0.48	1.09	0.40	2.49	1.40
Lost Time Injuries	12	7	8	27	6	4	10

7.0 ENVIRONMENTAL MANAGEMENT

The Final EMPs are intended as a tool for environmental management of KCM's operations. The plans are presented in two parts: **Part A – Environmental Assessment** – provides a detailed description of the facilities, how they operate, their existing conditions and future upgrade/expansion plans. The environmental setting of the operations is described based on previous studies as well as additional investigations conducted in preparation of the EMPs. Wherever historical impacts have been identified, an outline of how KCM intends to remediate these impacts and/or prevent future impacts is given, leading to **Part B – Environmental Action Plan** (or EAP) - where a detailed action plan is provided.

Each plan addresses environmental management actions for two phases:

- The Refurbishment Phase, where environmental management actions focus on activities associated with the installation of new equipment, the construction of new facilities and the decommissioning and dismantling of defunct facilities and equipment. Essentially these are once-off activities which are aimed at bringing the operation into compliance with the required environmental standards. The refurbishment activities involve capital projects.

- The Operational Phase, where environmental management actions for the ongoing operation are provided. It should be noted that many of these programmes and procedures will be developed and implemented while refurbishment is in progress, to facilitate effective environmental management of ongoing operations in the short-term and into the future (post refurbishment). The operational EAP will need to be updated on a regular basis.

7.1 Contractual Agreements

The transfer of ownership of the ZCCM assets to KCM was in terms of a Development Agreement under the Mines and Minerals Act. Table 6 illustrates, in simple terms, the overall environmental management process set in place by the agreement.

The Development Agreement contains specific references as to how the Zambian legislation applies during the "implementation period". In terms of Statutory Instrument No. 19 of 2000 (the Mines and Minerals (Environmental) (Exemption) Order, 1999), KCM has been granted a temporary derogation from the standards set out in legislation provided that KCM is not in breach of its applicable environmental plan. During this period , GRZ will not take any action to secure KCM's compliance with environmental laws earlier or to a greater extent than agreed in KCM's environmental plans or impose fines or other penalties upon KCM. Once KCM has brought its operations into compliance with legislative standards then general legislation will apply, stabilised under the Development Agreement to apply in the form in force on 31 March 2000. During the Stability Period, GRZ has undertaken not to effect changes to the environmental laws which:

- prevent KCM from complying with its environmental and social plans;
- materially effect the maintenance or operation of the Environmental Protection Fund; or
- impose requirements that are more onerous than those specified in the environmental plans.

In terms of the vesting contracts KCM was required to determining within 24 months the full extent to which the facilities are non-compliant with Zambian legislation and WBG policies.

During this period, justifiable site-specific environmental and social standards needed to be negotiated and agreed with IFC and GRZ, where necessary. The results of the investigation and negotiations and the mitigation measures necessary to achieve the agreed standards are contained in the EMPs and SMPs contained in this Environmental Assessment.

KCM and SmelterCo are committed to meeting GRZ and WBG requirements for their facilities with 3 years of vesting (i.e. by 31 March 2003). The only is exceptions are achievement of the site-specific guideline value for SO_2 ambient air quality and stack particulate concentrations at SmelterCo where full compliance will only be achieved by March 2006.

Table 6 - Environmental Management and Performance during Different Time Periods

	Project Time Periods		
	Take over	**Year 2**	**Year 3**
	"Implementation Period"		"Normal Operation"
EMP to be followed:	IEMP	Final EMP	Final EMP
Main environmental management requirements contained in EMPs:	• Improve performance, where practical. • Maintain existing controls. • Undertake further investigations, where necessary. • Decommission and close defunct facilities. • Compile Final EMP.	• Complete outstanding rehabilitation. • Complete upgrading.	• Undertake progressive rehabilitation. • Decommission and close facilities.
Environmental performance:	• Best performance possible with management actions outlined in the Interim EMP in place. • Full legal compliance cannot be guaranteed, since upgrading will only just have been started. • Compliance with WBG policies.	• Best performance possible with management actions outlined in the Final EMP in place. • Full compliance with Zambian law and WBG guidelines cannot be guaranteed, since upgrading will only be complete at the end of the period. • Compliance with WBG policies.	• Full compliance with Zambian law and WBG guidelines, with the exception of ambient SO_2 and stack particulate concentrations at SmeterCo as outlined above, • • Compliance with WBG policies.

7.2 Environmental Management Plan Objectives

The purpose of the EMP is to provide a framework for environmental management actions that will enable KCM to meet its environmental performance objectives. These need to be derived from KCM's Environmental Management Objective which is to:

- Ensure that KCM is operating in accordance with the Corporate Policy of Safety, Health and the Environment, which aims to:

    - conserve environmental resources;
    - prevent or minimise environmental impacts arising from the operations;
    - demonstrate active stewardship of land and biodiversity;
    - promote good relationships with and enhance the capacities of the local communities of which it is part; and
    - respect people's culture and heritage.

Specific objectives of the EMP are to:

- bring the existing operations into compliance with acceptable environmental standards;
- ensure that compliance with environmental legal standards and/or agreed target emissions is achieved and maintained in the ongoing management of operations;
- document environmental concerns and appropriate environmental management measures;
- provide concise and clear instructions for personnel regarding the actions that are required to prevent and/or minimise adverse environmental impacts;
- enable the commitments arising from KCM's environmental policy and agreements with the GRZ and the IFC to be implemented at a practical level;
- manage the environment so that a contribution can be made towards sustainable development through minimising the adverse impacts on the local environment and utilising environmental resources responsibly; and
- promote good relationships with the communities within which the facility operates.

The two phases covered by the EMP each have a different emphasis, which is reflected in the objectives of each phase, as shown in Table 4. As previously mentioned the focus in the refurbishment phase is on once-off activities (primarily capital projects) which are required to bring the project into compliance with environmental standards whereas the operational phase is aimed at implementing actions to achieve and maintain compliance on an ongoing basis.

The Interim Environmental Management Plan (IEMP) for each operation was based on information current when it was drafted in 1999. Additional issues identified during the interim period have been included in the Environmental Action Plan (EAP). As previously mentioned, in terms of agreement with the IFC and GRZ, the IEMPs needed to be updated into ***Final*** Environmental Management Plan.

The EMPs are presented in six major components:

- Environmental Action Plan;
- Environmental Monitoring Plan;
- Auditing and Reporting Plan;
- Capacity Development and Training Plan;
- Emergency Preparedness and Response Planning; and
- Rehabilitation and Decommissioning Plan.

Table 7 - Specific Objectives for the Refurbishment and Operational Phases

Refurbishment Phase (2000 – 2003)	Operational Phase (2003 – 2031)
• Apply "Best-Available-Technology-Not-Entailing- Excessive-Costs" (BATNEEC) principles in the choice of technology for major upgrading and refurbishment. • Improve the efficiency of the plants so that they become more cost effective. • Install technology and equipment to reduce the environmental impact of the operations. • Install technology and equipment to improve environmental monitoring capability. • Monitor efficiencies and improvements during commissioning of new plant and equipment. • Treat, recycle and/ or ultimately dispose of waste generated during refurbishment in an environmentally acceptable manner. • Develop procedures for those aspects of environmental management that require procedures (i.e., waste management, materials handling, emergencies, communication etc.). • Initiate proactive improvement to continually improve ambient conditions as technology and knowledge increase. • Undertake environmental awareness training. • Develop environmental management structures, procedures and reporting. • Develop effective response procedures.	• Document and manage environmental impacts on the surrounding environment. • Increase production in an environmentally acceptable manner. • Apply and update as necessary procedures for those aspects of environmental management that require procedures (i.e., waste management, materials handling, emergencies, communication etc.). • Promote proactive improvement to continually improve ambient conditions as technology and knowledge increase. • Monitor impacts on sensitive environments, (i.e., community and ecosystems) • Proactively reduce or eliminate negative impacts, where possible. • Monitor efficiencies and improvements in an ongoing manner. • Continually promote good housekeeping practices. • Treat, recycle and/ or ultimately dispose of waste in an environmentally acceptable manner. • Undertake environmental awareness training. • Maintain and improve environmental management structures and procedures.

7.3 Environmental Monitoring Plan

The environmental monitoring plan is the responsibility of the Safety, Health and Environment Department. The plan's main objective is to monitor compliance with environmental permits and standards as well as to monitor effects on the environment resulting from operations at the mine. Monitoring of various elements such as processes, control systems and specific environmental components, will be undertaken in order to meet this objective. For example, operational processes that involve the consumption of resources such as hazardous material and/or that generate waste and effluent will be monitored. Environmental control systems will also be monitored to verify that they are operating effectively. Specific environmental components such as water and air will be monitored to detect any potential effects resulting from operations. Specific targets, objectives and parameters will be set and monitoring will be used to assess performance, identify trends, and supply information in order to determine the need for additional control measures.

7.4 Auditing and Reporting Plan

Auditing and Reporting procedures will involve both departmental and operation-wide environmental reviews to ensure that the EMP is being implemented, to identify corrective actions if necessary and to assess the effectiveness of corrective measures.

This process has already been initiated and the first external audit of the EMPs (and SMPs) was recently conducted in April 2001. KCM will conduct internal and external audits throughout the Rehabilitation and Operational Phases of the project to ensure that its policies and the EMPs are adhered to by the operations.

7.5 Capacity Development and Training

Capacity development and training will be implemented to raise environmental awareness amongst mine managers, employees, contractors and the surrounding community as well as to train relevant personnel in specialized environmental management tasks and inform them about specific policies and procedures. The presented plan takes into consideration the ISO 14001 requirements for capacity development and training, as KCM intends to get ISO 14001 registration within five years (i.e., by 2006).

The program has already been initiated through the implementation of the IEMPs. Several meetings with staff and operations managers have been held to explain the environmental plans and verify that appropriate actions are being taken. Capacity development and training will continue throughout the Rehabilitation and Operational Phases.

7.6 Emergency Preparedness and Contingency Planning

As emergency preparedness and response is an important component of an ISO 14001 Environmental Management System, this issue has been incorporated in requirements outlined for all of KCM's operations. The objectives of emergency preparedness and contingency planning are to maximize the effectiveness of the response to and the management of unforeseen events thereby minimising the potential magnitude and extent of effects resulting from these unforeseen events. The objectives of emergency preparedness and contingency planning will be met by ensuring that emergency response procedures are in place for each potential emergency event, training personnel in emergency response procedures, providing the necessary and adequate emergency response equipment and establishing an effective communication and reporting system.

KCM is committed to having effective emergency response procedures in place by the end of 2001.

7.7 Rehabilitation and Decommissioning

Finally, the schedule and cost estimate for closure, rehabilitation and decommissioning of the facilities upon completion of operations and activities at each site are presented in the form of a conceptual plan. The objectives of the plan are to ensure long-term physical and chemical stability of the site as well as ensuring compatibility of land use with that of surrounding lands.

Progressive rehabilitation encompasses those activities which are undertaken during the operations phase of a facility to prepare the facility and/or site for final closure. Progressive rehabilitation activities can be undertaken without hindering regular mining operations, and are generally carried out in areas which are no longer expected to be affected by normal mining operations. Such activities may include the progressive revegetation of inactive mining areas, the erection of warning signs in areas of subsidence, the installation of erosion control structures or the construction of final surface spillways for tailings impoundments.

Decommissioning activities are undertaken at the end of the operational life of a facility to achieve the required closure objectives, namely, public health and safety, environmental protection and the restoration of land capability to pre-disturbance levels. For purposes of scheduling, a period of three years has generally been assumed for the completion of decommissioning activities towards final closure of the mining facilities. Closure will be considered complete when the site of facility can be shown to be physically and chemically stable.

Following closure of each mining component, provision has been made for a three year period of monitoring and maintenance, after which the site would be returned to GRZ following granting of a Site Closure Completion Certificate.

Table 8 - Summary of Rehabilitation and Decommissioning Costs

Operation	Progressive Rehabilitation Costs (2001 – 2031)	Decommissioning and Closure Costs (2031 – 2034)	Post- Closure Monitoring and Maintenance (2035 – 2037)	Total Cost
Konkola	$1 300 000	$8 800 000	$500 000	$10 600 000
Nchanga	$6 510 000	$26 110 000	$1 630 000	$34 300 000
Nampundwe	$530 000	$1 200 000	$90 000	$1 820 000
SmelterCo	N.A.	$19 600 000	$1 000 000	$20 600 000
TOTAL	**$8 340 000**	**$55 710 000**	**$3 220 000**	**$67 320 000**

Closure costs will be funded by means of contributions to a fund required in terms of Zambian mining law.

8.0 SOCIAL MANAGEMENT

As part of the vesting and financing agreements KCM has produced Social Management Plans (SMPs) for its operations, including SmelterCo which KCM manages.

Social management is a critical issue in modern mining companies. It forms part of the overall KCM vision for the future as reflected in the SHE Policy:

> *"We will uphold the values of good corporate citizenship and seek to contribute to the wider economic, social and environmental well being of Zambia".*

8.1 The District and Local Context

The Districts of Chililabombwe, Chingola, Kitwe and Mumbwa and the immediate environment around the mines were the most important areas considered in the development of the Social

Management Plans. It is within these area that mine activities, and the management thereof, will have greatest impact. In addition, it is at the District level where the interactions between KCM's interventions and the Government of the Republic of Zambia (GRZ) planning and activities need to be most carefully structured. For example, the SMP for Nampundwe highlights that the opportunity for district authority service provision in Nampundwe is less likely to occur in the short-term than in the Copperbelt towns. As a result the underlying philosophy at Nampundwe is slightly different than at the other mine. At Nampundwe the mine will, for the time being, continue to provide water and sanitation

The SMP for each site is backed up by a Sustainable Livelihoods analysis of the micro levels through to the macro levels (local, district, provincial and national) and considers the latest trends in international Corporate Citizenship. In so doing, the mining company has not been placed at the centre of development, as was the case in the past, but rather as a key stakeholder. The adoption of the Corporate Citizenship model, which promotes the integration of social responsibility values into the organisation rather than being managed by one department, has provided the opportunity to assess the contribution of different departments to social management at each mine and how these departments can collectively manage components of the SMP.

KCM is operating in an environment in which the mining company is no longer the principle development agent. The GRZ is responsible for the management of development at the local level. The shift in emphasis away from the mines (former ZCCM) to the GRZ has created a significant challenge for the Copperbelt Province. The balance between being socially responsible and re-creating dependency on the mine is difficult to achieve. In an environment where lack of local government capacity to manage delivery and development services makes the potential reliance on mining companies high, it is critical that the social environment around KCM should not be viewed as the "KCM community". In light of this complex scenario in which KCM is operating, the Social Management Plans have considered the most appropriate way in which KCM should manage the social impacts associated with its mining operations and promote social responsibility.

8.2 Social Management Plan Objectives

The specific objectives of the SMP are:

- to minimise negative consequences and optimise opportunities from mining throughout the live of the operations and, if possible, beyond closure;
- to promote co-operation between the company and stakeholders;
- to increase local capacity through, for example, local business development; and
- to promote Corporate Citizenship.

8.3 Implementation Principles

The following principles underlie the implementation of the Social Management Plans over the life of each mine (refurbishment/construction through to closure):

- Implementation is a two-way process between the company and society – both parties should benefit from the plan.

- Community dependence on the mining company, as experienced during the ZCCM period of operation, should be reduced.

- Local cultures and communities must be respected.

- The plans will be implemented with people and not only for people.

- The vast differences within communities in the districts have been recognised and the plans have endeavoured to take account of this.

- The KCM operations will be operated in accordance with the WBG guidelines for social management.

- Resettlement will be avoided wherever possible. Where resettlement is unavoidable, it will be carried out in accordance with WBG OD 4.30 directives and internationally accepted practices, ensuring the dignity of affected communities as well as the long-term sustainability of their livelihoods.

- KCM will recognise the social environment as continually changing. Thus, plans will be flexible and tailored to the specific operational environments over the life of the operations.

- Negative social impacts will be prevented, where possible, rather than merely implementing reactive mitigation. The plans will focus on interventions that will increase opportunities for sustainability beyond the life of the mine. This is of particular significance with regard to social responsibility programmes that will be developed in partnership with communities and local authorities and institutions. Social responsibility is more than mitigating direct impacts but also about making a contribution to society.

- The open and participatory sharing of information regarding the KCM operations will take place, where appropriate. The SMPs recognise the complex and dynamic nature of the social environment and, therefore, emphasise the need for constant dialogue with stakeholders so as to identify their short versus long-term objectives.

- The interdependence of biophysical and social components of the environment and the consideration of the impact that changes to one component will have on the other has been recognised. The plans recognise that people are an integral part of the environment.

- Corporate social responsibility is an asset to the company and can improve benefits to shareholders. The SMPs encourage partnership approaches between and among stakeholders (government, community, NGOs/donors and the private sector) and KCM – with the role of KCM as more a facilitator and animator, than a provider.

8.4 Organisational Structure

The SHE Department is responsible for the implementation and successful co-ordination of the Social Management Plan. A Social Manager will be responsible for a team to implement aspects of the SMP and to co-ordinate different departments roles and responsibilities.

8.5 Structure of the Social Management Plans

The management plan for each site is divided into two parts: Part A describes the mining operations and the social setting for which social management is important. The rationale for the issues that require management is provided. Part B provides the Social Action Plans. In the SMP for Konkola Mine, an additional Part C provides the Social Development Plan for the communities to be affected by resettlement (part of Kawama and Ming'omba).

8.6 Social Action Plan

Social Action Plans have been designed to avoid or limit negative impacts and to increase the potential for the social environment to benefit from the KCM Project.

The Social Action Plans outline KCM's commitment to managing the following key social issues:

8.6.1 Employment and Retrenchment Action Plan

The management of employment and retrenchment is a key conduit by which KCM can influence the social environment in the vicinity of its operations. In this regard KCM will design and implement:

- retrenchment benefits as agreed with the Mine Workers Union of Zambia (MUZ);
- adequate counselling prior to retrenchment;
- a retrenchment training plan aimed at re-skilling;
- a multi-skilling and training programme after all feasibility studies are carried out;
- a local employment enhancement strategy that focuses on the employment of local residents during the construction as well as operational phases. Local employment is of critical importance in order to optimise the benefits of, in particular, the KDMP project for the local economy; and
- an 'expatriate replacement strategy' to ensure that, over a reasonable period of time, expatriate employees will be replaced by local expertise, where possible. This plan will be linked to the bursary scheme to the Universities of Zambia and Copperbelt.

KCM will investigate:

- the provision of micro-business development training, through the economic diversification initiative;
- opportunities and design a plan for employing more women in the company (this has an impact on poverty reduction); and
- ways of improving the quality of labour and workplace conditions, which will increase competencies and managerial capacity in the local environment.

8.6.2 Local Economic Development Plan

KCM recognises that local economic development is of paramount importance to sustainable development beyond the life of mine and to maximise the opportunities during the life of mine. As a result, KCM will implement a procurement strategy that supports local business development.

KCM has established a Local Business Development Unit. Under this Unit, KCM will establish a fund (corporate level) to promote the development of small and medium-scale businesses. KCM has approached its shareholders (AA, IFC, CDC) to contribute to the fund and the IFC is presently funding a feasibility study to evaluate the best approach in developing this Local Business Development Unit. It is anticipated that the greatest opportunity for business development will be in the agricultural and medium-scale manufacturing sectors that are aimed at supplying of products to the mining and agricultural sector.

KCM will establish an Employment Centre to support and promote local employment.

8.6.3 Land Use and Settlement Plan

Hazardous Areas

KCM will implement measures, in accordance with Zambian law, to discourage people from entering hazardous areas. These measures will include the erection of warning signs and community awareness programmes.

Land and Resource Utilisation outside Hazardous Areas

KCM's strategy relating to the use of land and resources on its surfaces, but outside hazardous areas, is the following:

Dambo and Upland Cultivation
KCM recognises that there are many people cultivating KCM land. In areas where there are no immediate plans for mining activity, KCM will maintain the *status quo* regarding dambo and upland cultivation, but will make the community and other stakeholders aware that this position might change in the near future, depending on the requirements of its future mining operations.

Surface Water
Surface water on the Mine Surface Rights includes streams (dambos), dams, tailings dams and shallow wells. These provide water for drinking and other domestic purposes, irrigation and other purposes, as well as a source of fish for eating. In some cases the quality of the water or fish might be found not to be within generally accepted limits for human consumption. In these cases information and awareness programmes will be implemented to discourage the use of these resources, so as to minimise potential health impacts.

Woodlands/Forests
Woodlands/forests are, as far as practical, to be maintained in their present form. KCM aims to conserve environmental resources and demonstrate active stewardship of land and biodiversity. There is some forest worthy of conservation remaining on the Konkola Mine Surface Rights, namely the "caving area" north/east of Twin Rivers Farm and the area towards the magazine and Fitwaola Dambo. Otherwise there is disturbed woodland covering the Mine Surface Rights.

Settlements

The few settlements remaining within KCM Surface Rights, such as Fipuya (Nchanga Mine), will not be resettled unless the mineralisation of the site is economically viable and mining is unable to take place without adversely affecting conditions in the vicinity of the settlement. KCM will be conducting geological surveys of the area to determine the mineralisation and will take a decision about the economic viability of the area. If the area is not considered economically viable then KCM will consider ceding the land to the relevant authority. In the unlikely event of resettlement being required in the future, it will be undertaken in accordance with the WBG OP 4.30.

The settlements of Kawama and Ming'omba will be resettled according to WBG OD 4.30 requirements. The SMP for Konkola Mine includes a Social Development Plan (SDP) for the settlements.

KCM will aim to discourage further informal settlement on its Surface Rights, particularly in areas that might be required for future mining operations.

8.6.4 Education and Training Plan

The trust schools are an important asset for KCM's employees and the communities of Chililabombwe and Chingola and should be sustained beyond the life of the mine. Before closure KCM will investigate the economic viability of creating an independent Trust School.

In Nampundwe KCM will endeavour to assist the government school, where practical.

8.6.5 Health and Welfare Plan

The Konkola Hospital and Nchanga South Hospital are important assets for the company's employees and the communities of Chingola and Chililabombwe.

KCM will continue to operate the Konkola and Nchanga Hospitals and the Nampundwe Clinic for the life of the mine. At least four years before closure, KCM will investigate the feasibility of transferring the hospitals and other facilities to an independent institution.

Implementation of the KCM Health Services policy, whereby surplus medical capacity at the KCM hospitals is made available to non-employees on a fee-paying basis, will continue. This fee will be evaluated and adjusted from time to time, taking account of the need for cost recovery and affordability. KCM currently provides support to the government medical services. The nature and magnitude of this support will be evaluated on a continual basis.

Collaboration with government health services is necessary to ensure that critical medical services are provided to the community such as malaria spraying, rabies control and child immunisation.

HIV/AIDS awareness and prevention amongst workers and public is critical to prevent the further spread of the disease and reduce deaths amongst workers and their families.

In March 2001, KCM undertook an anonymous and unlinked voluntary HIV/AIDS prevalence survey amongst its employees and contractors. A total of 6 135 permanent employees out of a total workforce on duty of 9 524 were surveyed, representing 64.4% of the workforce. In addition, 2 388 contract employees participated. Of the total of 8 523 people surveyed, 18% were found to be HIV positive (i.e. 82% HIV negative). This survey is the first step in KCM's strategy in comprehensively managing the HIV/ AIDS epidemic.

KCM will, in consultation with other Zambian HIV/AIDS organisation and government structures, design and implement an HIV/AIDS awareness and prevention campaign.

KCM will make HIV/AIDS awareness and prevention programme a component for contractor evaluation. KCM contractors will participate in all KCM HIV/AIDS programmes.

8.6.6 Recreational Facilities Plan

Within the first two years of operation KCM will investigate management options for all clubs and recreation facilities. In some cases, KCM will decide to support those clubs that have high social benefits (e.g., football club), but the nature of such support will be determined by the investigations.

8.6.7 Physical Infrastructure Plan

The physical infrastructure that KCM uses could be a valuable asset to society when the mines close. In this regard KCM will consider alternative uses of facilities before closure and manage a process that supports the sustainability of the facilities.

8.6.8 Community Management Support Plan

The immediate challenge for the various local authorities is to absorb the responsibilities previously held by ZCCM. KCM recognises that they have a role to play in this shift - not through doing the work of the Council but rather through ensuring that the local environment, as affected by mine-related activities, is responsibly managed.

8.6.9 Influx Management Plan

The population of Chililabombwe will grow as a result of KDMP construction. To prevent the establishment of informal settlements, conflict over resources and extra pressure on council capacity, KCM will consult with all stakeholders about the construction of KDMP and ensure that they have the necessary information to plan for the resulting population increase.

KCM will raise awareness about the timing of construction to all stakeholders. This is to minimise a "boom and bust" economic scenario in Chililabombwe.

KCM will engage the Chililabombwe Council about land availability for the influx of people. This is to ensure that KCM reduces the risk of people settling on KCM land.

8.6.10 Disclosure and Consultation Plan

As part of its community liaison programme KCM will establish **Consultative Forums,** which aim to:

- communicate KCM policy around social and environmental management;
- engage with stakeholders regarding issues of common interest and to provide a platform for stakeholders to articulate roles and responsibilities for managing the issues; and
- provide stakeholders with the opportunity for recording concerns regarding KCM's activities.

KCM will:

- facilitate the formation of a Steering Committee for the Consultative Forum;
- develop and manage a stakeholder database; and
- implement a complaints and comments process for the public.

The plans aim to position KCM as a *stakeholder organisation* whereby interests, concerns, perceptions and knowledge from stakeholders is integrated into the organisation throughout the life cycle of the operations.

8.7 Social Performance Indicators

The social performance indicators for each Action Plan will be developed as a first step in implementing the Action Plans. The reason for this is to ensure that the specialists in each field, such as the Manager Medical Services or the Manager Supplies, participate in the development of the indicators.

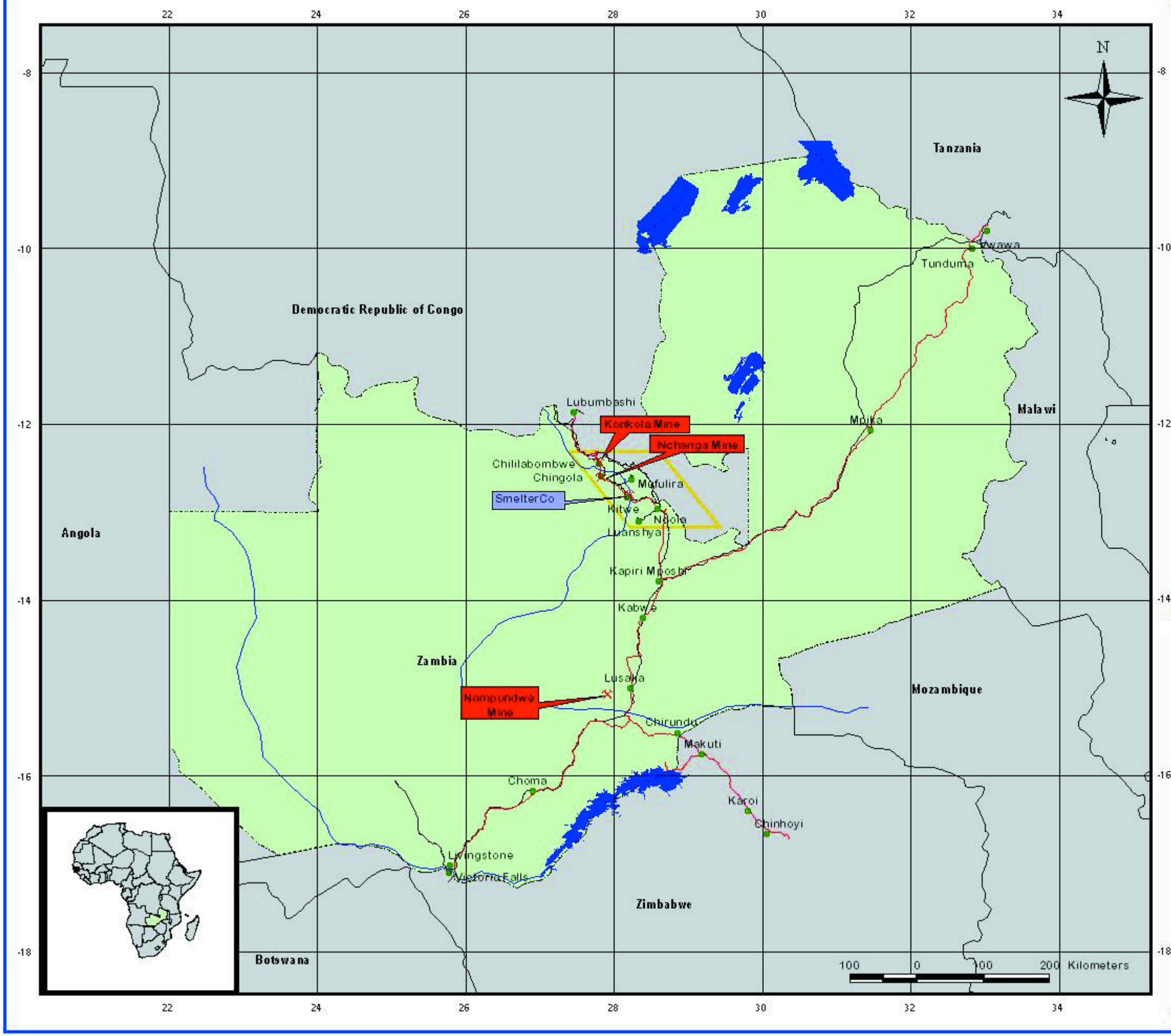
8.8 Social Monitoring Plan

The Annual Environmental and Social Monitoring Report, to be produced by an external consultant, will cover the social management performance.

Each Action Plan has a built in monitoring function. Aside from the annual monitoring, internal audit of all Social Action Plans will be undertaken. The Social Manager, SHE and the Community Liaison co-ordinator, will undertake the monitoring.

8.9 Capacity Building and Training Plan

KCM will implement a series of workshops to mobilise the implementation of the Social Management Plan. As social management in KCM is based on the activities of various departments it is necessary to ensure that all departments understand the objectives of the plans and manage social issues from the same principles. In some cases different departments are required to work on the same projects or activities and this will require co-operation.



Legend

- International Boundary
- Road
- Railway
- River
- Town
- Mine
- Africa
- Zambia
- Copperbelt Region
- Lake
- KCM owned operations
- ZCCM (SmelterCo) Ltd., operated by KCM

Konkola Copper Mines plc

ENVIRONMENTAL ASSESSMENT

KCM Operations- Location Plan

Figure 1

File Name: Es_fig1.pdf

Date: March 2001

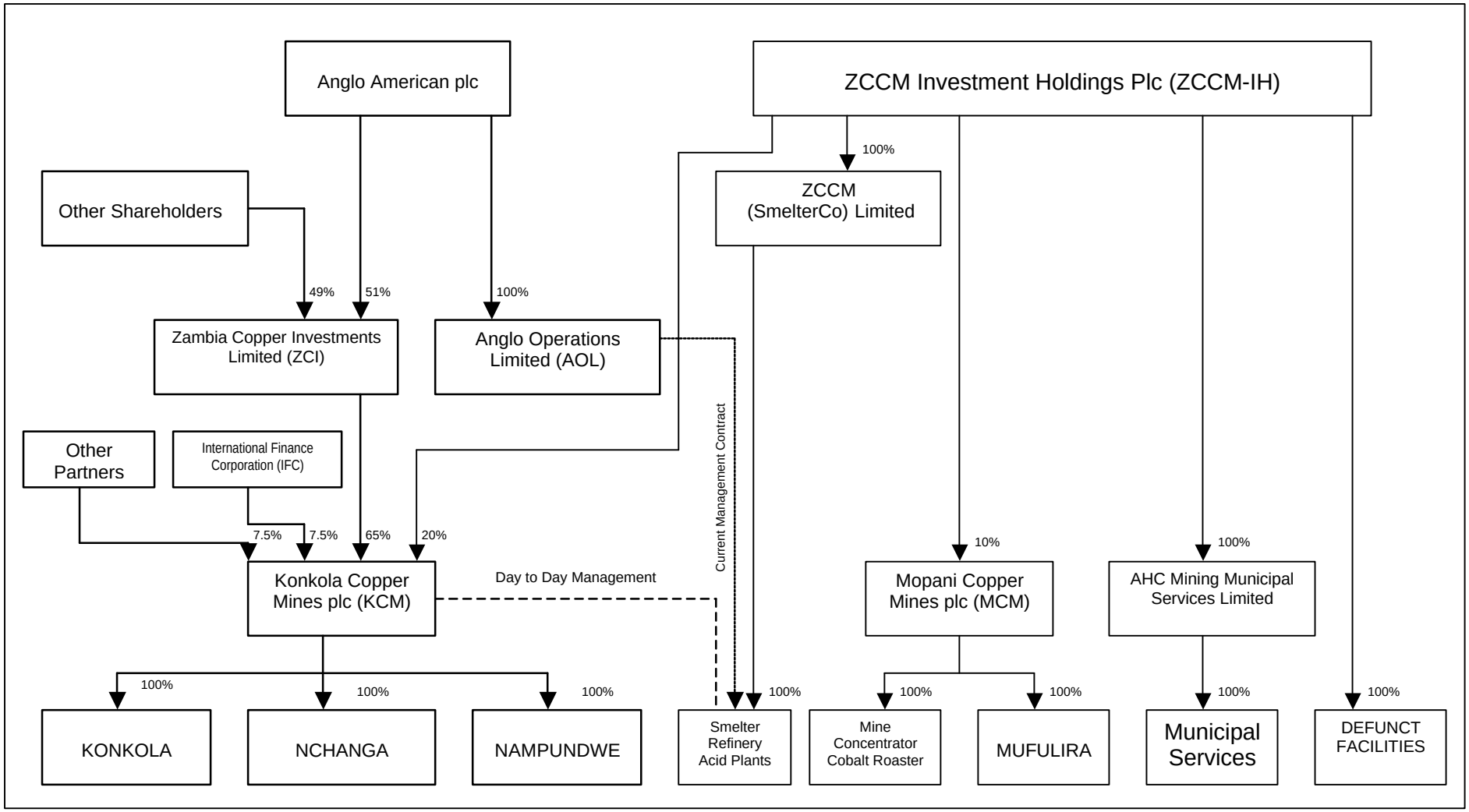
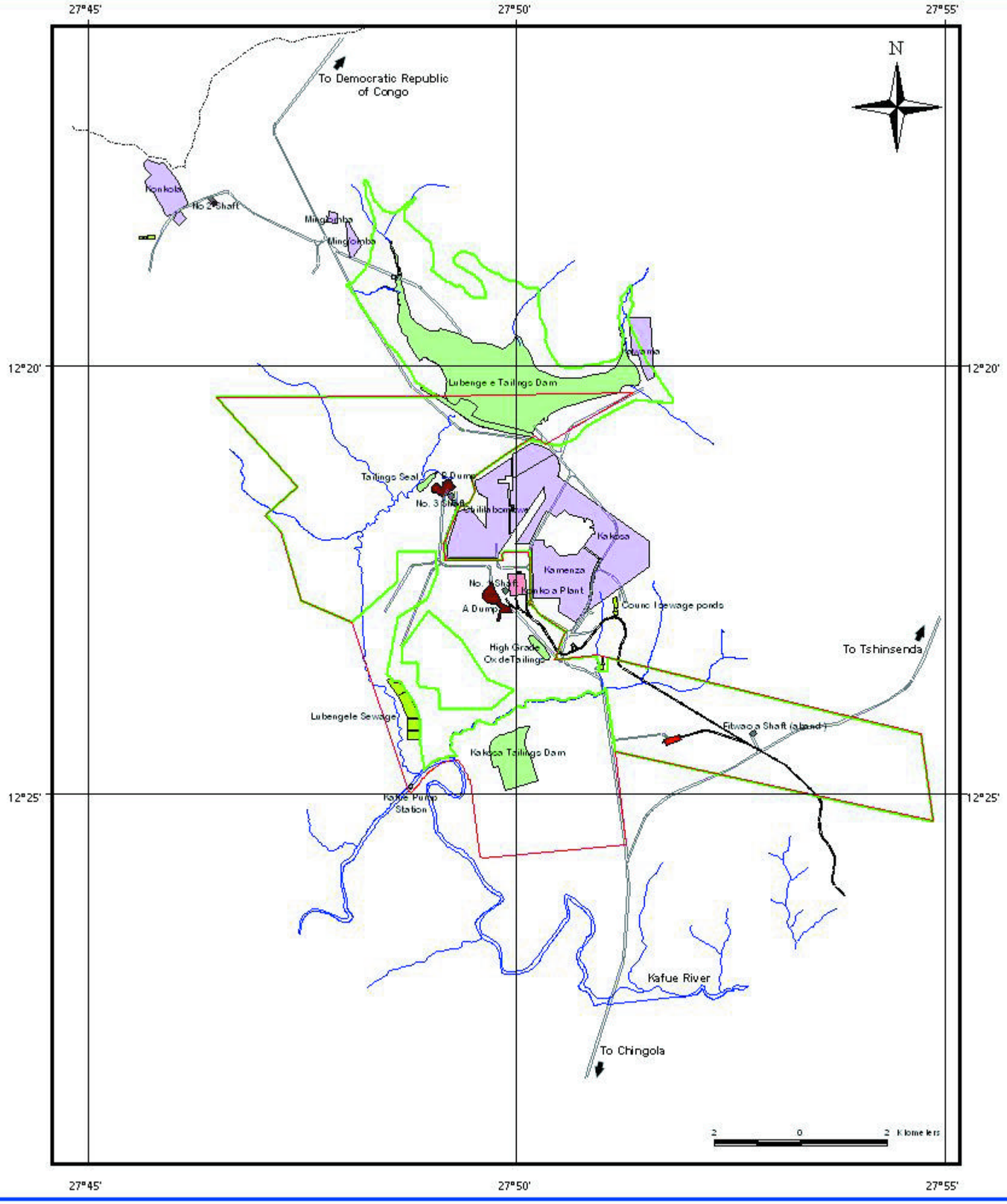


Figure 2 - Links Between KCM, Its Owners and Some Other Copperbelt Operations



Legend

- Current Mine Licence Boundary
- Current Surface Rights Boundary
- International Boundary
- Road
- Railway
- River
- Plant
- Tailings Dam
- Shaft
- Sewage Pond
- Explosive Magazine
- Waste Rock Dump
- Settlement

Konkola Copper Mines plc

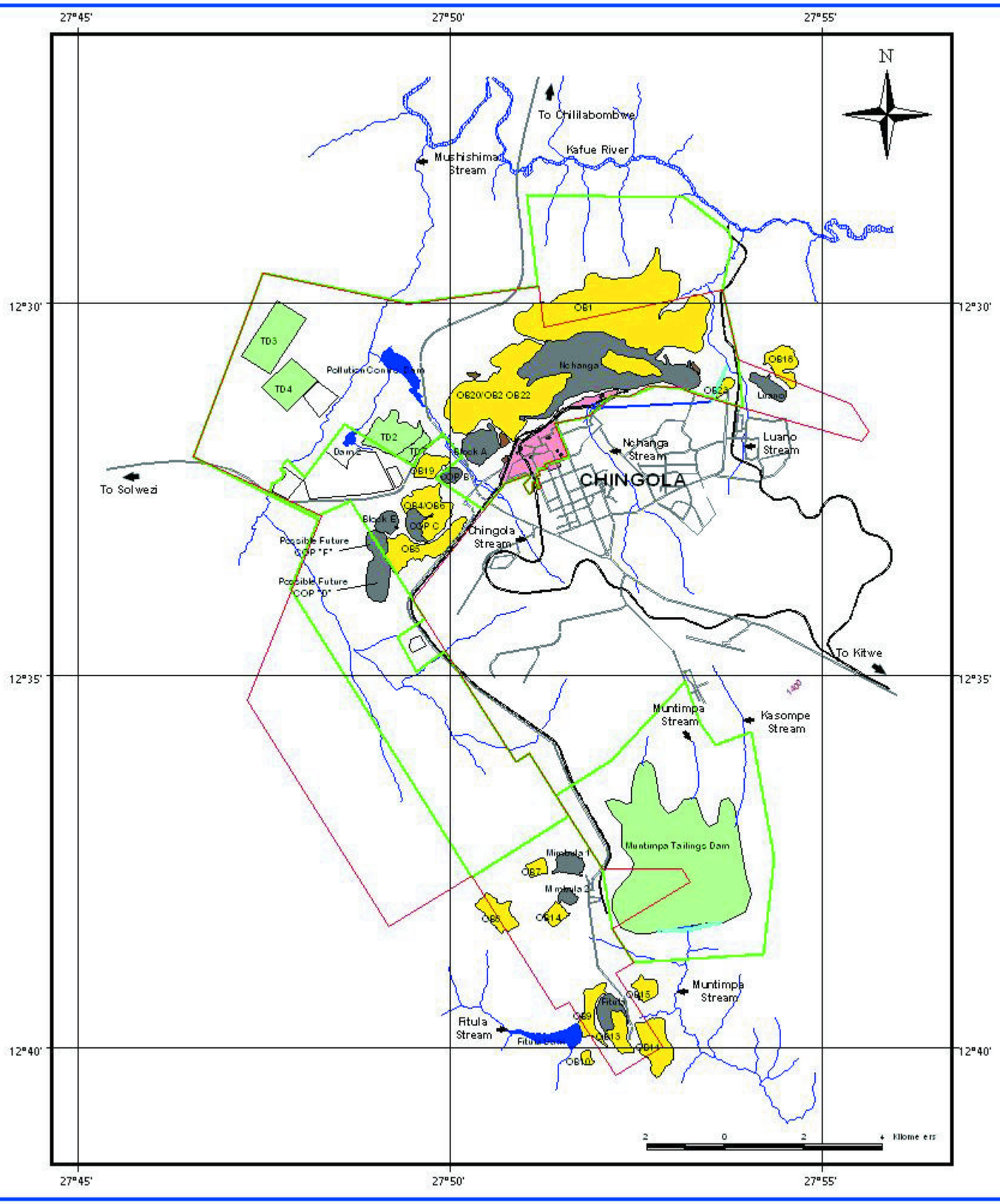
ENVIRONMENTAL ASSESSMENT

Overall Plan of Konkola Mine Operations

Figure 3

File Name: Es_fig3.pdf

Date: March 2001



Legend

- Current Mine Licence Boundary
- Current Surface Rights Boundary
- Road
- Railway
- River
- Plant
- TD — Tailings Dam
- Open Pit Mine
- OB — Overburden Dump
- Dam
- Wasterock Dump

Konkola Copper Mines plc

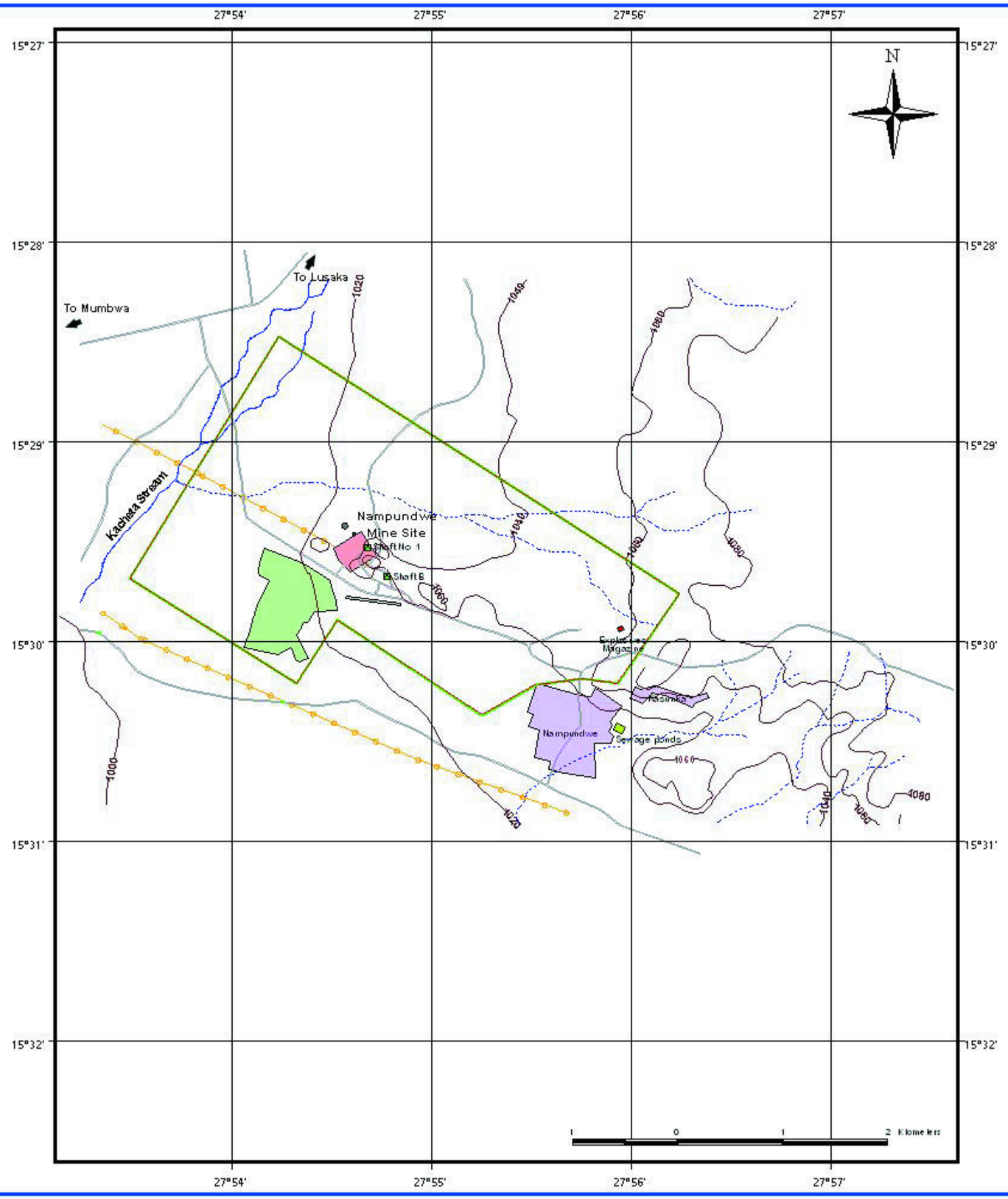
ENVIRONMENTAL ASSESSMENT

Overall Plan of the Nchanga Mine Operations

Figure 4

File Name: Es_fig4.pdf

Date: March 2001



Legend

- Current Mine Licence Boundary
- Current Surface Rights Boundary
- Road
- River
- Powerline
- 1000 — Contours(20m intervals)
- Airstrip
- Plant
- Tailings Dam
- Sinkhole
- Sewage Pond
- Settlement
- Explosive Magazine
- Shaft

Konkola Copper Mines plc

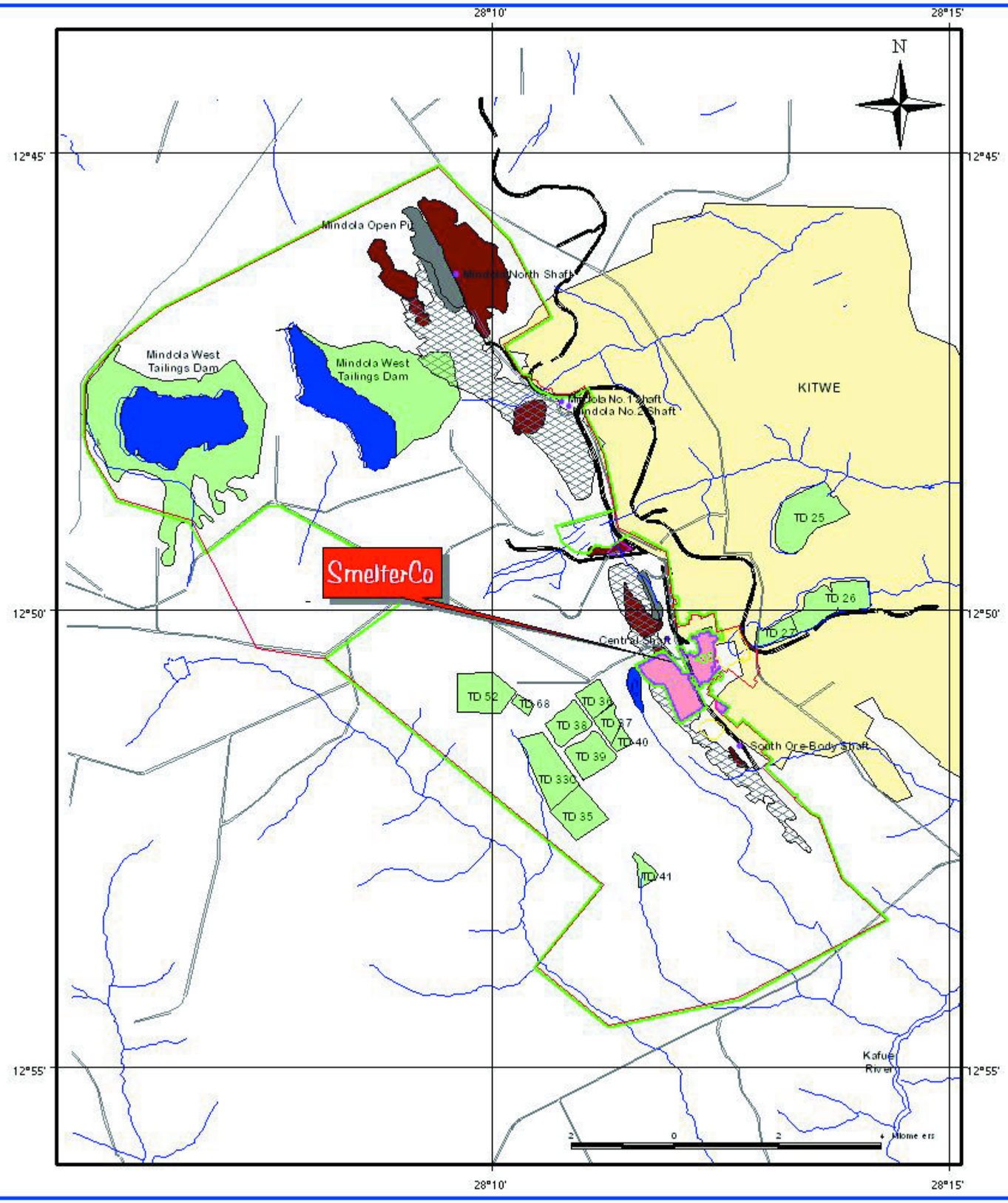
ENVIRONMENTAL ASSESSMENT

Overall Plan of the Nampundwe Mine Operations

Figure 5

File Name: Es_fig5.pdf

Date: March 2001



Legend

- MCM Mine Licence Boundary
- MCM Surface Rights Boundary
- SmelterCo Surface Rights Boundary
- Current AVMIN Licence Boundary
- Road
- Railway
- River
- SmelterCo Plant Area
- Non-SmelterCo Facilities within Nkana Plant Area
- Tailings Dam
- Open Pit Mine
- Underground Mining
- Wasterock Dump
- Dam
- Settlement

ENVIRONMENTAL ASSESSMENT

Overall Plan of SmelterCo Facilities

Figure 6

File Name: Es_fig6.pdf

Date: March 2001

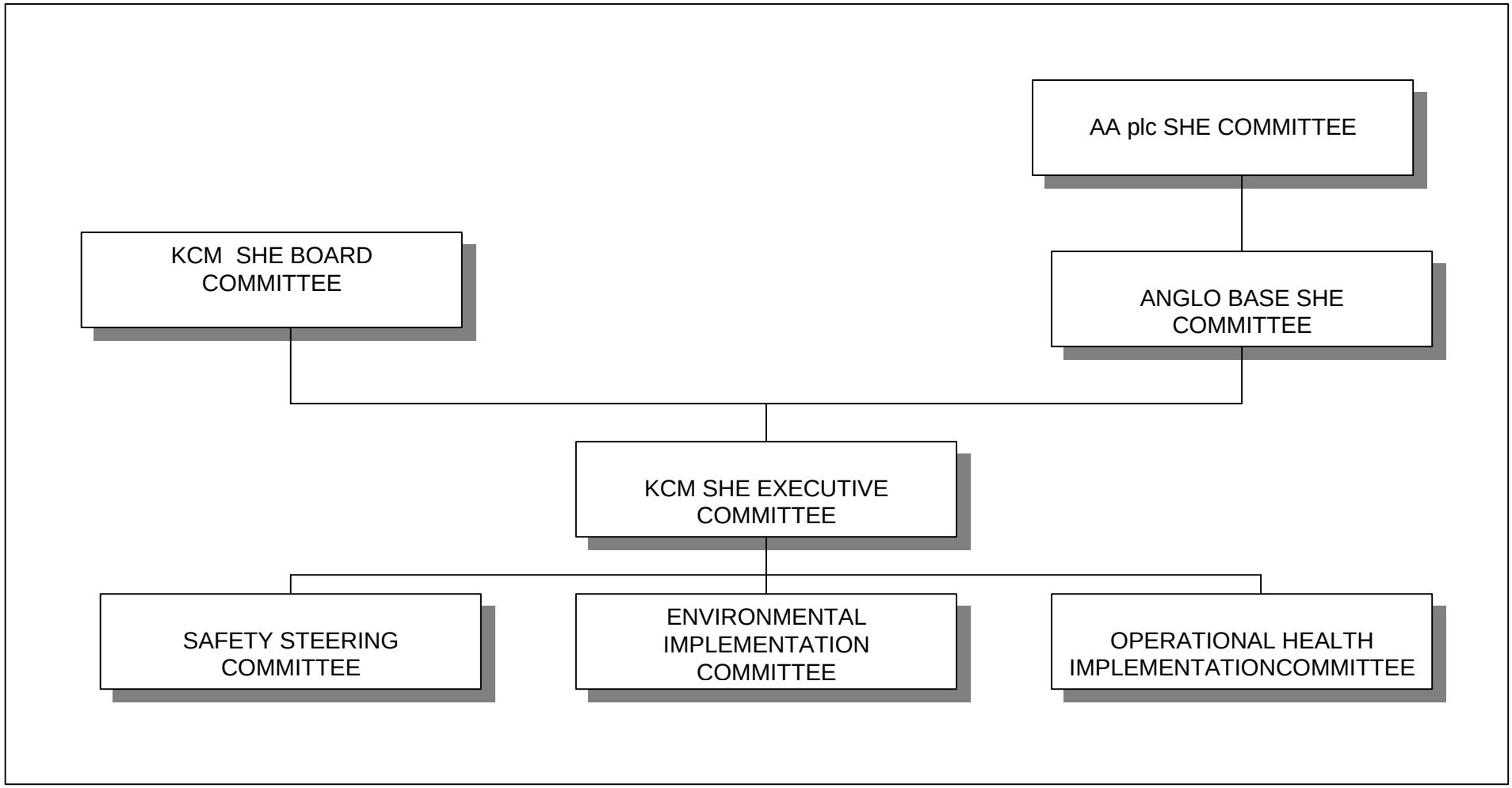


Figure 7 - KCM plc SHE Corporate Governance Structure