MARAMPA IRON ORE PROJECT ENVIRONMENTAL AND SOCIAL IMPACT STATEMENT - VOLUME 2

Prepared For

MARAMPA IRON ORE (S.L.) LIMITED

Report Prepared by

SRK Consulting (UK) Limited
UK3823

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Volume 1: Executive Summary

Volume 2: Main Environmental and Social Impact Statement (this volume)

Table of Contents

List of Tables

List of Figures

List of Technical Appendices

VOLUME 3: SUPPORTING DOCUMENTATION

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MARAMPA IRON ORE PROJECT ENVIRONMENTAL AND SOCIAL IMPACT STATEMENT - VOLUME 2

1 INTRODUCTION

SRK Consulting (UK) Ltd ("SRK") has been commissioned by Marampa Iron Ore (S.L.) Limited ("MIOL") to undertake an Environmental and Social Impact Assessment ("ESIA"[1]) for the Marampa Iron Ore Project (the "Project" or "MIOP") that meets the requirements of Environment Protection Agency Act No. 11 of 2008. This environmental and social impact assessment statement ("ESIS") is the documented findings of the ESIA process.

The Project is located near the township of Lunsar, some 90 km northeast of the capital city of Freetown, in the Port Loko district of Sierra Leone, West Africa. The Project comprises Exploration Licences, EL46/2011 A and B, held by MIOL, which cover an area of 305.12 km^2. EL46/2011 A encloses (but excludes) Mining Lease ML02/09 (13.82 km^2) held by London Mining plc, as shown on Figure 1.2. ML02/09 contains the former Sierra Leone Development Company Ltd ("DELCO") open pit mining operation (see Section 1.4 for background on mining in the area). The Project involves the open pit mining and beneficiation 680 Mt of iron ore from four resource deposits in the MIOL exploration licence area.

MIOL are in an early stage of Project planning (engineering scoping) and acknowledge the importance of addressing environmental and social issues early in the planning process. The ESIA process has therefore been initiated at this early stage to maximise the opportunity for interactions between the ESIA and Project design teams, and to provide sufficient time for the collection of suitable environmental and social baseline information as input to the ESIA process and ongoing Project design.

1.1 Project setting

The Project is located in Sierra Leone, West Africa (refer to Figure 1.1). The site is approximately 90 km northeast of the capital Freetown near the town of Lunsar in the Port Loko District on the coastal plain of Sierra Leone (see regional setting in Figure 1.2). The region around the Project area is relatively flat and low-lying at a height of approximately 50-90 m above sea level ("masl"). The exploration area is characterised by two main drainage regimes; the Rokel River in the south flows from east to west and the north is drained to the west by tributaries of the Port Loko Creek. The country has a tropical savannah climate with distinct wet and dry seasons. The dry season lasts from December to mid-February, changing to wetter and warmer conditions in mid-February to April, and the rainy season stretches from May to December.

[1] *The abbreviation ESIA is one of several commonly used terms for impact assessment. Another frequently used abbreviation, "EIA" (environmental impact assessment), has been adopted by the Sierra Leone legislation. The term ESIA is used herein to emphasize the inclusion of social aspects in the impact assessment (environmental and social impact assessment). The ESIA is equivalent to the EIA referred to in the Sierra Leone requirements summarized below. The definition of the word "environment" given in the EPA Act implies that it includes social aspects.*

Figure 1.1: Location of the Project site within Sierra Leone

Sierra Leone is part of the westernmost part of the upper Guinean lowland forest, which is rich in terms of biodiversity. The natural habitat type for the coastal plain of Sierra Leone is savannah, however the biological environment around the study area is characterised by a highly disturbed environment with significant anthropogenic influences such as slash and burn and subsistence agriculture. These activities have resulted in a prevalence of secondary vegetation growth and a lack of undisturbed habitats.

In the Project area, the traditional economic activities are agriculture (largely subsistence-based), charcoal making, animal husbandry, fishing, and trading. Mining is emerging as an additional employment sector due to presence of MIOL, African Minerals Limited ("AML") and London Mining plc ("London Mining"), the latter of which recently commenced operations at the end of 2011.

The largest town in the Port Loko District is Lunsar, in which MIOL's local office is located. The population of the town has significantly increased in recent years due to the influx of people from surrounding rural areas, thought to be due to the arrival of mining companies in the area. A number of villages surround Lunsar. The houses in the villages are largely built out of mud with palm leaf or corrugated iron roofs. Most villages have a hand-pump well for water supply, but do not have a formal drainage system.

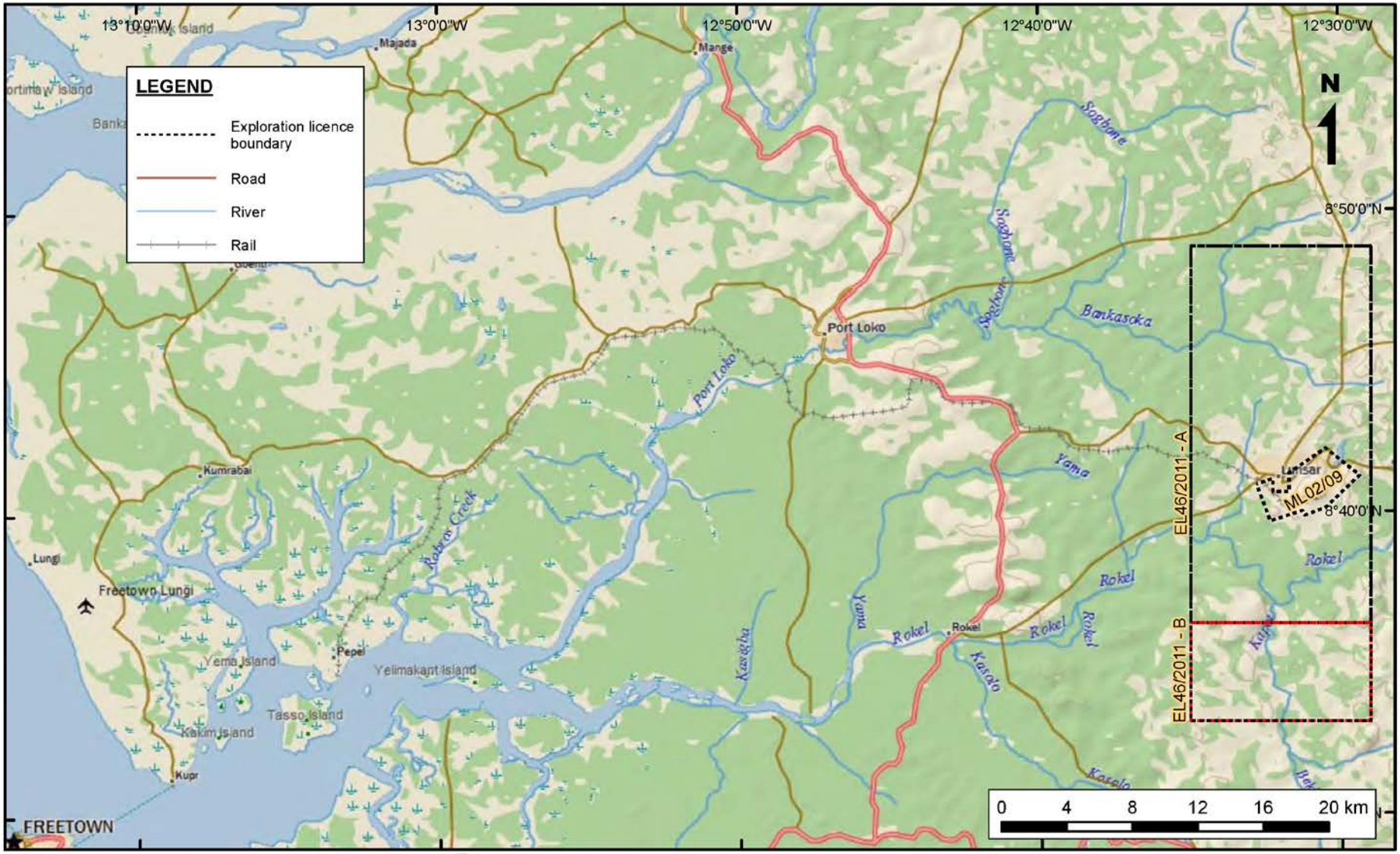


Figure 1.2: Regional setting for the Project site, showing exploration license numbers

A culturally important feature of the local communities is the presence of traditional secret societies. These are ancient cultural institutions in the Upper Guinea Coast of West Africa that remain a key element in political relations in rural Sierra Leone (UNHCR, 2007). Society rituals are often performed in dedicated areas of forest called “society bush” having restricted access for non-society members.

The natural environment is also an important livelihood resource in terms of food, construction materials, firewood and medicine.

1.2 Project proponent

The Project is owned by MIOL, a wholly owned subsidiary of Marampa Iron Ore Limited (a Bermudan registered private company), which is a wholly owned subsidiary of Cape Lambert Resources Limited (“Cape Lambert”). Cape Lambert is an Australian domiciled public company with interests in a number of resource Projects and companies with mineral assets located in Australia, Africa, Greece and South America. Cape Lambert’s stock is listed on the Australian Stock Exchange with ticker “CFE”.

Proponent details are provided in Table 1-1:

Table 1-1: Project Proponent Details

Responsible person:	**Jack Rowley**
Position:	Project Director
Contact numbers:	Mobile : +61 422 043 125 Office : +61 8 9380 9555 Fax : +61 8 9380 9666 Email : JackR@capelam.com.au
Address:	32 Harrowgate Street West Leederville WA 6007 PO Box 144 West Perth WA 6872

1.3 ESIA team

The Project’s ESIA team is largely made up of staff from a number of SRK’s global offices (UK, South Africa and Turkey practices), as well as specialists from various other consultancies. The key team members and their roles are outlined in Table 1-2. SRK is the overall Project manager for the ESIA process and has: provided reporting expertise; given insight on interpretation of the relevant guidelines and standards; and co-ordinated liaison with the Project’s client and engineering teams. Where possible, in-country expertise has been used for logistical support, ongoing water, climatic and air quality monitoring, identification of vegetation and interviewing communities during the natural resource use survey, and assistance with stakeholder consultations (in particular with regulatory authorities and local communities).

Table 1-2: ESIA Team Members

Company	Name	Role in ESIA Process	Qualifications/Experience
SRK	Fiona Cessford	Project manager	MSc, Pr.Sci.Nat., Corporate Consultant (Environment)
	Nicola Rump and Steve King	Project co-ordinators	MSc , Consultant (Environmental) MSc, Senior Consultant (Environmental)
	Lalit Kumar	Socio-economic study and stakeholder consultation.	BA (Sociology), MA (Development Planning and Administration)
	Hilde van Vlaederen	Socio-economic study reviewer	PhD (social psychology), Principal Consultant (Social)
	Bora Arpacioglu	Noise baseline characterisation	MSc, ME, Principal Environmental Engineer
	Matt Dey	Geochemistry (ARDML) characterisation	Principal Consultant (Geochemical Engineering)
	Vis Reddy	Air quality baseline characterisation and predictive modelling	MSc (Environmental Geochemistry), Pr.Sci.Nat., Principle Consultant
	Ruth Warrender	Soils and geomorphology characterisation	PhD; Consultant (Geochemistry)
	Tony Rex	Water resources study and predictive modelling team leader	PhD, C.Geol FGS, Corporate Consultant (Hydrogeology)
MIOL	Jeff Hamilton	Engineering liaison and reviewer	General Manager
	Steve Kesler	Reviewer	CEO
	Jack Rowley	ESIA client manager and reviewer	Project Director
	Local MIOL staff members	Support water resources study team through ongoing water monitoring	Trained and supervised by T. Rex of SRK
	Local MIOL staff members	Management of on-site weather station	Trained and supervised by T. Rex of SRK
Sierra Leone consultants	Aminata Kamara	Support social team with stakeholder engagement and social survey data collection; Manage field survey teams	Bachelor of Social sciences degree and over 10 years' experience in mining and infrastructure Projects in Sierra Leone
	Mr A.M.B. Feika	Identification of vegetation and assistance with surveys for Natural Resource Use study.	Chief Technician - Department of Biological Sciences, Njala University; Sierra Leone national museum curator.
Nexus Heritage	Gerry Wait	Archaeology and cultural heritage baseline study	FSA, DPhil, MIfA
Ecorex Consulting Ecologists	Warren McCleland	Ecological baseline study	Terrestrial ecologist with 14 years' experience.
Tepid Consultants	Robert Palmer	Ecological baseline study (Aquatic components)	PhD (aquatic ecology) and 20 years' experience.
Wild Resources Limited	Jenny Wong; Bryan Dickinson	Natural Resource Use study team	PhD, study team leader; BSc, MPhil;

1.4 Project background

The area around Lunsar was the focus of significant mining operations run by DELCO between 1933 and 1975. This mining operation, which is located within ML02/09, mined both the lateritic cap from Masaboin and Gafal Hills, and the underlying specular hematite schists. The specular hematite was concentrated by crushing, coarse grinding and gravity separation, with production reaching approximately 2.5 million tonnes per annum ("Mtpa") of concentrate in the late 1960s (Cape Lambert, 2009). DELCO constructed a railway and port loading facility at Pepel Port for transport of the product to worldwide markets.

During the DELCO period of operation, a large community was established in connection with the mine, which included hospitals, schools, community hall and sports facilities for employees and the local community. The health centre was a recognised training centre for student nurses and an apprentice scheme for boys was also established. The Delco mining operation closed in 1975, following a drop in iron ore prices, resulting in significant job losses. Smaller-scale operations began again in 1981, which involved dredging of the tailings by Austrian company, Austromineral GMBH. This operation was abandoned in 1985 due to increasing production costs.

Recent exploration by MIOL identified six priority areas prospective for specular hematite schist mineralisation (Figure 1.3):

- Gafal Prospect (including Gafal South and West) - an area comprising gravity high and scattered magnetic high anomalies located immediately to the west of the old Gafal Hill mining area and abutting ML02/09;
- Matukia Prospect - an area 1.5 km long covering a gravity high located immediately along strike to the north of the old Masaboin Hill mining area abutting ML02/09;
- Makambo Prospect - located approximately 8km north of the town of Lunsar;
- Mafuri Prospect - a gravity high located approximately 3 km west of Gafal;
- Rotret Prospect - a gravity high located approximately 1.5 km south of Gafal;
- Toma Prospect - approximately 7 km south of Lunsar and south of the Rokel River. The presence of hematite schist was confirmed in old prospecting pits during initial field reconnaissance in early 2009.

Of the six priority areas, MIOL is currently focussing on the development of the Gafal, Rotret, Mafuri and Matukia Prospects for the current ESIA and mining licence application.

An environmental and social reconnaissance survey was carried out by SRK in June 2009. The objectives of the survey were to assess the current environmental and social conditions of the Project area and to identify specific aspects that may require particular consideration during the development of the Project. This survey was considered to be a pre-ESIA activity, but it collected useful information for the scoping process (the first stage of the ESIA process). The survey concluded there was little existing environmental and social data available for the area likely to be affected by the Project and site-specific information would be required as the Project progresses for both engineering and environmental purposes.

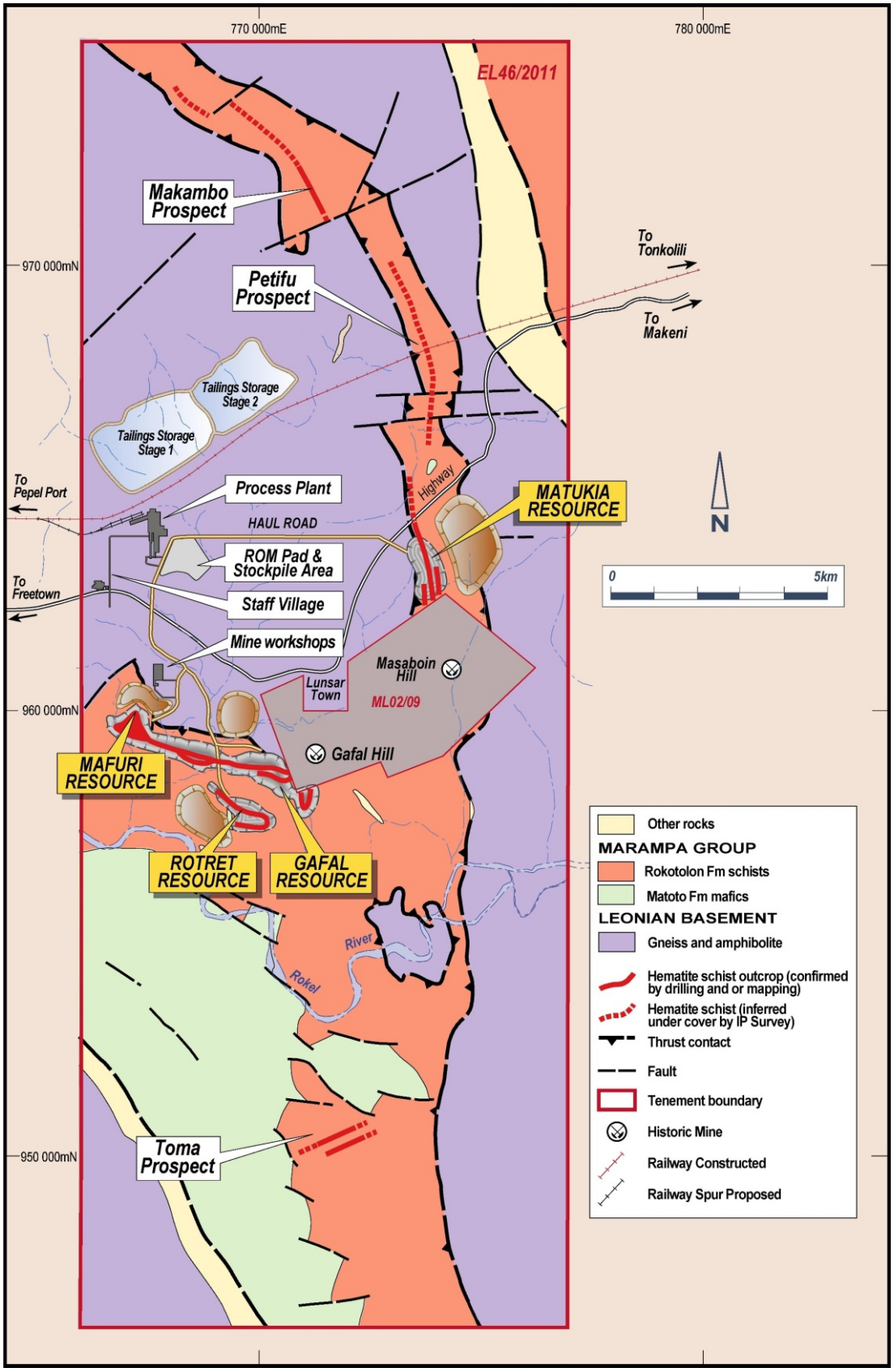


Figure 1.3: Interpretive geology of EL46/2011, relative to initial Project layout [2]

[2] *Source: Cape Lambert, 2011*

Due to the presence of historic mining activities close to the geological target areas, a long-term baseline monitoring programme commenced so that the pre-disturbance water, sediment and soil quality status in the area potentially affected by the Project could be fully characterised, as these may have been negatively affected by the previous mining activities. Social issues such as land ownership, compensation and in-migration were also highlighted as issues requiring particular consideration as the Project progressed.

Following the outcome of the survey, SRK commenced the Environmental Scoping Study ("ESS") in June 2010, which progressed to a full ESIA process in January 2011.

1.5 Project motivation

A preliminary mining scoping study conducted by Bateman Engineering Pty Ltd ("Bateman") concluded that mining at a capacity of up to 15Mtpa is technically feasible, and financial estimates to date are positive. The Project Mineral Resource is estimated at 680 million tonnes with an in-situ grade of 28.2% Fe (15% Fe cut-off grade) and, with processing, could generate a high quality saleable iron concentrate (~65% Fe), with low levels of deleterious elements.

Access to existing rail and port infrastructure, which was recently upgraded and returned to operation by AML, has the advantage of lower capital investment start-up costs and Project lead time, as well as significant environmental advantages, as opposed to construction of a new port and rail. Open pit mining is the preferred mineral extraction method, further reducing capital development costs.

As the area currently experiences high unemployment rates and has little or no infrastructural development, through appropriate management, there is potential for local communities to benefit from the Project through direct and indirect employment and development opportunities. Much of the Project footprint area has been disturbed through both previous mining and subsistence agriculture, and therefore is not ecologically pristine, reducing its conservation value and the likely environmental impact.

1.6 Structure of the report

The ESIS is presented in three volumes; the structure and content of the three volumes is described in Table 1-3. Information contained within this main report (Volume 2) aims to be concise with supporting technical information presented as Supporting Documents ("SD") in Volume 3. A glossary of terms is presented at the end of the report and gives an explanation of the main terms used throughout the report.

Table 1-3: Structure of the ESIS

Volume	Short Description
Volume 1	Non-Technical Summary
Non-Technical Summary	A non-technical summary of the ESIA process and main conclusions Information aims to be concise and easily understood by all interested parties.
Volume 2	Environmental and Social Impact Statement
Chapter 1: Introduction	Gives general information about the Project and its proponent.
Chapter 2: Environmental and Social Regulatory Framework	Outlines the legislative and regulatory requirements of Sierra Leone, as relevant to the Project, along with reference to international standards also considered during the study.

Volume	Short Description
Chapter 3: ESIA Objectives and Process	Provides an overview of the objectives of the ESIA and the process undertaken including the scope of work, baseline studies, impact assessment process, and public consultation and disclosure requirements. It includes the assumptions and limitations that have been recognised in the preparation of this ESIA.
Chapter 4: Project Description	Describes the proposed Project, including the mine development, processing, tailings management, power generation, water supply, transport, waste management and other associated infrastructure.
Chapter 5: Bio-physical Baseline Description	Describes the existing condition of the physical and biological components of the environment in relation to international and Sierra Leone environmental standards.
Chapter 6: Socio-economic Baseline Description	Describes the current social and economic conditions in the regional and local area, with reference to conditions in Sierra Leone as a whole.
Chapter 7: Bio-physical Impact Assessment	Identifies and evaluates bio-physical impacts likely to arise as a result of the Project in relation to sensitive natural and human receptors, and determines the overall significance of each impact. It includes identification of appropriate management measures.
Chapter 8: Socio-economic Impact Assessment	Identifies and evaluates the socio-economic impacts including identification of appropriate management measures.
Chapter 9: Community Health and Safety Risks	Summarises the potential health and safety risks to local communities as a result of the Project, and identifies appropriate management measures.
Chapter 10: Cumulative Impacts	Discusses potential cumulative impacts resulting from other developments in the area as well as future phases of the Project.
Chapter 11: Environmental and Social Management System	Provides a framework for the environmental and social management system that will need to be implemented in response to the impacts identified in Sections 7 and 8. It provides an environmental and social management plan, and includes a monitoring programme and the Stakeholder Engagement Plan (SEP) for the Project.
Chapter 12: Conclusions	Summarises the key findings and outcomes of the ESIA process.
Chapter 13: References	Contains references to documentation and other sources of information that were used in this ESIS.
Appendices	Includes appendices for the main body of the report
Appendix A	Summary of applicable legislation and international guidelines
Appendix B	SLEPA application form and supporting correspondence
Appendix C	Stakeholder Engagement Plan and supporting information
Appendix D	Resettlement Framework
Appendix E	Preliminary Project design drawings
Appendix F	Environmental Management Plan
Appendix G	Preliminary Monitoring Programmes
Appendix H	MIOL policies
Volume 3	Supporting Documents
SD 1: Terms of Reference for Specialist Studies	Defines both general and study-specific Terms of Reference (ToR) provided to the specialists and on which their respective studies were based.
SD 2: a) Climate and Air Quality Baseline and b) Impact modelling reports	Characterises the current air quality on site (baseline) and predicts (via modelling) potential impacts on air quality resulting from the Project.
SD 3: a) Noise Baseline and b) Impact modelling reports	Characterises the current noise levels on site (baseline) and predicts (via modelling) potential noise impacts on surrounding communities resulting from the Project.
SD 4: a) Biodiversity Baseline and b) Aquatic Bio-monitoring Report	Characterises the present ecological state (baseline) of the Project area and indicates existing impacts, sensitive habitats and species of special concern.
SD 5: Soils and Geomorphology Baseline report	Characterises and comments on the soil quality for the study area relative to relevant quality guidelines and average crustal abundance.

Volume	Short Description
SD 6: Geochemistry ARDML Baseline report	Characterises the expected tailings, waste rock and ore product with regard to predicted acid generation and mineral leaching properties
SD 7: a) Water Resources Baseline and b) Impact Assessment report	Characterises the current water quality and flow dynamics (both surface and ground water), and makes predictions (via modelling) regarding potential impacts on water resources
SD 8: Archaeology and Cultural Heritage Baseline report	Identifies and maps sites of cultural heritage importance within the study area and makes recommendations for further work required (Phase 2 assessment) should the Project be authorised.
SD 9: Socio-economic baseline report.	Summarises the current social and economic status of the area in the local and regional context, and provides background on Sierra Leone as a country.
SD 10: Natural Resource Use / Rural Livelihoods baseline report.	Identifies, characterises and (where possible) maps the plant and animal species used by local communities and describes agricultural and harvesting practices, including information on seasonality.

2 ENVIRONMENTAL AND SOCIAL REGULATORY FRAMEWORK

This chapter summarises the environmental and social regulatory framework for the Project, with an emphasis on requirements relating to the impact assessment process. Section 2.1 presents a brief summary of the legal/regulatory requirements of Sierra Leone and Section 2.2 describes international guidelines and standards that were referred to in the preparation of this report. Further detail on the applicable legislation and international guidelines summarised below and considered when preparing this ESIS is provided in Appendix A.

2.1 Sierra Leone requirements

Key Sierra Leone legislation pertinent to the environment and to sustainable development considered in the planning of the Project is listed in Table 2-1. The legislation most relevant to the ESIA process is:

- the Environment Protection Agency Act No. 11 of 2008 (EPA Act 2008); and
- the Mines and Minerals Act 2009.

A brief outline of the relevant requirements of these two Acts is presented in Sections 2.1.1 and Section 2.1.2, respectively, with more detail given in Appendix A. Environmental and social permissions needed by the Project are identified in Section 2.1.3.

Table 2-1: Sierra Leone environmental and sustainable development legislation

Primary subject	Policy	Legislation
Environment and sustainable development	National Environmental Policy (1994)	• The Environment Protection Agency Act, 2008 (No. 11 of 2008)
Mineral resources and mining	Core Mineral Policy of the Government of Sierra Leone (2008)	• National Reconstruction and Development Act, 1999 (No. 5 of 1999) • Mines and Minerals Act, 2009
Water	National Water and Sanitation Policy (August 2008)	• The Water (Control and Supply) Act, 1963 • Sierra Leone Water Company Act, 2001 (No. 6 of 2001)
Biodiversity and biological resources	National Biodiversity Strategy and Action Plan (developed in accordance with the requirements of the 1992 Convention on Biodiversity)	• Wildlife Conservation Act, 1972 (No. 27 of 1972)
Forestry		• Forestry Regulations, 1989 (P.N. No. 17 of 1990) • Forestry Act, 1988
Land	National Lands Policy (2005)	• Devolution of Estates Act, 2007 (No. 21 of 2007) • Land Commission Act (not promulgated yet) • Commercial Lands Act (not promulgated yet)
Radiation		• Protection from Radiation Act, 2001 (No. 14 of 2001)
Occupational environment		• The Factories Act, 1974 (1974)
Local government		• Local Government Act, 2004 (2004): An Act which provides for decentralisation and devolution of functions, powers and services to local councils.

2.1.1 ESIA/ EIA requirements in the EPA Act 2008

The EPA Act 2008 forms the legal basis for environmental management and protection in Sierra Leone. It provides for the establishment of an Environment Protection Agency ("EPA"

or “SLEPA”), which has a wide range of environmental management functions including coordination of the activities of government agencies and other agencies on matters relating to environmental protection and management. The governing body of the EPA is a Board of Directors, which comprises a chairman and senior representatives of several ministries with an interest in environmental matters and people knowledgeable in commence, finance and law.

The EPA Act requires EIA licences to be obtained for Projects with the potential to have significant impacts. The Act charts the procedure to obtain an EIA licence, with emphasis on the responsibilities of the EPA and the EPA Board, as outlined below.

- An application must be made to the EPA for a licence, accompanied by a description of the proposed Project (refer to Appendix B for Application and Screening Forms submitted to SLEPA, dated 17th August 2010) .
- The EPA will decide (within 14 days) whether an EIA is required.
- If required, the applicant should then prepare an EIA (refer to Appendix B for correspondence from SLEPA dated 20th August 2010, in which it is confirmed that an EIA is required).
- On receipt of the EIA, the EPA will circulate it to professional bodies or associations, Government Ministries and non-governmental organisations (“NGOs”) for review.
- The EPA will also open the EIA for public inspection and comment. It will notify the public of this in two issues of the Gazette (consecutive issues) and two issues of a newspaper (with an interval of at least seven days between the first and second publications).
- The EPA will submit the comments on the EIA, together with the EIA, to the Board for consideration.
- If the Board approves the EIA, it will instruct the Executive Director of the EPA to issue an EIA licence.
- The EPA will issue a licence to undertake the activity/ Project. An EIA licence will have a period of validity and contain conditions for the protection of the environment.

The EIA licence procedure presented in the EPA Act 2008 appears to be the same as that presented in the repealed Environment Protection Act 2000, except that the agencies responsible for implementation of the EIA provisions have changed. Guidelines on EIA procedures were published by the MLCPE in July 1999. The same guidelines were re-issued by the MLCPE in July 2002. The guidelines were originally intended to facilitate implementation of the EIA provisions in the old Environment Protection Act 2000 and are currently considered by the MLCPE to be valid for the EIA provisions in the new EPA Act, 2008. A summary of the EIA procedure to be followed in terms of the MLCPE guidelines is presented in Appendix A.

2.1.2 ESIA/ EIA requirements in terms of the Mines and Minerals Act 2009

The Ministry of Mineral Resources (“MMR”) controls mining and mining-related matters by means of the Mines and Minerals Act 2009. This Act replaces the Mines and Minerals Act 1994 and puts more emphasis on protection of the environment, community development and health and safety.

The Act requires an application for a large-scale mining licence be accompanied by:

- an EIA licence issued by the EPA and the corresponding EIA and environmental management programme (“EMP”);

- a list of interested and affected parties, including land owners and occupiers of the area, and details of public consultation; and
- proposals for the progressive reclamation and rehabilitation of land disturbed by mining (Article 106).

The EMP will become legally binding and will be attached to the mining licence. Compliance with the EMP will be included in the terms and conditions of the licence (Article 110). Additional conditions relating to rehabilitation could also be included in the conditions of the licence (Article 136).

Specifications for the EIA, EMP and public consultation are given in a part of the Act dedicated to Environmental Protection (Part XV, Sections 131 and 137). Reports on progress in the implementation of the EMP must be submitted to the MMR annually (Article 134). Financial assurance is required to provide for obligations originating from the EIA and EMP (Article 136).

There are several other provisions in the Act that were considered during the ESIA process. These are summarised below.

- The Act creates an obligation on large-scale mining licence holders to promote community development and it establishes the framework through which companies and communities enter into formal agreements (Part XVI, Articles 138 to 141). Licence holders are obliged to comply with community development agreements (Article 115).
- The Act promotes preferential employment of citizens of Sierra Leone, as well as preferential procurement of goods and services from Sierra Leone. Relevant sections of the Act include Articles 106, 163 and 164. An application for a mining lease must be accompanied by proposals to achieve this. Commitments made in these proposals will become legally binding by means the terms and conditions of the mining licence (Article 110).
- Land tenure[3] and compensation for disturbance of surface rights are dealt with in Articles 32 to 38 of the Act. Rural land in Sierra Leone is held by landowning families (extended families or lineages) with a chieftaincy structure playing a significant administrative and custodian role. At present, the sale of land is virtually impossible and leasing of land is challenging because property boundaries have not been surveyed, written deeds do not exist and both chiefs and recognised representatives of land owning families have to be involved in decisions on leasing of land (Appendix A). The Act states a holder of a mineral right must obtain written consents from landowners/ occupiers and/or regulatory authorities to use land currently used for other purposes. Compensation must be paid in the event of damage to property and cultivated land.

2.1.3 Other environmental and social permissions

A preliminary identification of the environmental and social permissions needed for the Project was undertaken and these are listed in Table 2-2. Additional permissions may be identified during the ongoing Project development process as a result of ongoing consultation with regulatory authorities and as a result of any legal reviews undertaken by MIOL.

[3] *The term "land tenure" is used here to refer to rights to occupancy and use of a specified area of land.*

2.2 International guidelines and standards considered

Although not legally binding on the Project, the ESIA team took consideration of a number of international guidelines and standards whilst undertaking the ESIA. These are described below, and further detail is provided in Appendix A.

2.2.1 Equator Principles, IFC requirements and WBG EHS guidelines

Development financiers can play a major role in the development and enforcement of sustainable development standards through the conditioning of their loans. A significant number of these institutions have now signed up to the Equator Principles, which provide a framework for the assessment and management of environmental and social risks in a Project by those seeking Project finance. The Principles require observance of the International Finance Corporation Performance Standards on Social and Environmental Sustainability ("IFC PS") and the Environmental, Health and Safety ("EHS") Guidelines when developing Projects in non-high income OECD[4] countries.

The individual IFC PS 2007[5] are titled:

1: Social and Environmental Assessment and Management System;

2: Labour and Working Conditions;

3: Pollution Prevention and Abatement;

4: Community Health, Safety and Security;

5: Land Acquisition and Involuntary Resettlement;

6: Biodiversity Conservation and Sustainable Natural Resource Management;

7: Indigenous Peoples; and

8: Cultural Heritage.

The EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice ("GIIP"), as defined in IFC's Performance Standard 3 on Pollution Prevention and Abatement.

2.2.2 Self-regulation in the mining sector

A number of voluntary business charters, codes of conduct/ethics/toolkits and good-practice guidelines have been generated specifically for the mining industry. Those of particular relevance to environmental management and sustainable development are:

- International Council on Mining and Metals Sustainable Development Framework - which comprises a set of ten principles, public reporting; and independent assurance;
- E3 Plus - a Framework for Responsible Exploration;
- the Voluntary Principles on Security and Human Rights;
- the Extractive Industry Transparency Initiative; and
- the Mining and Metals Sector Sustainable Development Good Practice website.

[4] Organization for Economic Cooperation and Development
[5] The IFC PS have recently been reviewed and new standards took effect as of 1 January 2012, however as these were not in force at the time most of the ESIA work was undertaken, the old PS were the main reference document for the ESIA process.

Table 2-2: Environmental and social permissions needed for the Project

Permission	Relevant legislation (and corresponding guidelines)	Responsible regulatory authority/ parties to the agreement	Main submissions to be made
EIA licence	• Environment Protection Agency Act, 2008 • Guidelines on EIA procedures published by MLCPE in July 1999	EPA	• Screening form - submitted at the screening stage (refer to Appendix B). • An ESIS (this document) to obtain an EIA licence.
Mineral right: Large-scale mining licence	Mines and Minerals Act 2009	MMR	Mining lease application accompanied by: • an EIA licence and corresponding EIA and EMP; • a list of interested and affected parties, including land owners and occupiers of the area, and details of public consultation; and • proposals for rehabilitation of land disturbed by mining; • proposals and a programme for preferential employment and training of citizens of Siena Leone; • proposals with respect to the procurement of goods and services obtainable within Sierra Leone.
Written consent to use land	Mines and Minerals Act 2009	Consent from the owners or occupants of the land.	Not specified.
Lease agreements where the holder of a mineral right requires exclusive use of land.	Mines and Minerals Act 2009	Lease agreement between the holder of the mineral right and the owners or occupiers of the land	Not specified.
Written permission to disturb classified/ protected forest (Licence for national forest, permission for community forest)	Forestry Act 1988 Forestry Regulations 1989	The Chief Conservator	Not specified.
Licence for clearing of vegetation to develop mine infrastructure	Forestry Regulations 1989	An inspector of the Forestry Division	Not specified.
Licence for clearing vegetation on the banks of a watercourse (within 1 in 100 year flood line/ about 30 m of a watercourse)	Forestry Regulations1989	Division inspector	Not specified.
Clearance authority for clearing vegetation from land designated as sacred bush.	Forestry Regulations, 1989	The Chief Conservator	Not specified.
Water use licences	None (see water legislation in Appendix A)		
Discharge permits			

3 ESIA OBJECTIVES AND PROCESS

This chapter describes the objectives of the ESIA (Section 3.1), the study area considered during the ESIA process (Section 3.2), the activities carried out (Section 3.3) and the assumptions and limitations of the study (Section 3.4).

3.1 Objectives

The overall objectives of the ESIA process are to:

- identify issues and concerns regarding the proposed Project that need to be addressed;
- identify national, international and corporate management requirements which the Project must satisfy;
- gather and evaluate baseline information to characterise the affected environment and communities;
- undertake consultation with stakeholders and promote full disclosure of information and transparency in regard to the Project;
- identify, define and evaluate environmental and social impacts so that the potentially significant impacts can be adequately addressed during Project design;
- develop a framework management system that sets out key management and monitoring objectives for the life of the mine that can be further developed and implemented by MIOL and any contractors involved;
- assess and provide feedback on selected Project alternatives as part of the pre-feasibility and feasibility phases; and
- promote environmentally and socially sustainable development.

This ESIA has been planned and undertaken with due consideration of the legal, regulatory and policy requirements outlined in Chapter 2. The Third Schedule (Section 26) of the Sierra Leone EPA Act (2008) provides the specification that an EIA should include a description of the following aspects. References to the sections in this report where these requirements are met include:

a) the location of the Project and its surroundings (Section 1.1);
b) the principle, concept and purpose of the Project (Section 1);
c) the direct or indirect effects that the Project is likely to have on the environment (Chapter 7);
d) the social, economic and cultural effect that the Project is likely to have on people and society (Chapter 8);
e) the communities, interested parties and Government ministries consulted (Section 3.3.5);
f) any actions or measures which may avoid, prevent, change, mitigate or remedy the likely effect on people and society (Chapter 11);
g) any alternatives to the proposed Project (Section 4.11);
h) natural resources in the locality to be used in the Project (Sections 4.6 and 7.2);
i) the plans for decommissioning of the Project (Section 4.11);
j) such other information as may be necessary for a proper review of the potential environmental impact of the Project (Chapter 3 (description of methodology); report Appendices and Volume 3 Support Documents).

In line with these objectives, the ESIA process supports the priorities of:

- the Project proponent – including the Project design team, the future operations management team and shareholders, who wish to develop and operate the Project in accordance with Sierra Leone law and (where possible) international standards;
- the responsible government authorities who will decide whether the Project can be approved and what conditions of approval should be applied; and
- other stakeholders, particularly local communities, who wish to understand the development proposal and the impacts on their communities and environment.

3.2 Study area

The initial ESIA study area consisted of three independent zones representing possible areas of disturbance, and two corridors linking these areas, as outlined below.

- Area 1 (29.3 km^2) covers the proposed locations of the processing plant, power generators and auxiliary infrastructure, staff village, and tailings storage facility, with the AML rail corridor crossing through the area.
- Areas 2 (18.8 km^2) and 3 (29.6 km^2) cover the geological target zones of Matukia and Gafal (and the nearby Rotret and Mafuri resource areas), respectively. The waste rock dumps will be located close to the mining areas within Areas 2 and 3.
- Two corridors of 100 m width (approximately 4.6 km^2) have been identified for transportation of the ore (via haul roads) from the mining areas in Areas 2 and 3 to the processing infrastructure in Area 1.

The study areas used for the purposes of the ESIA are shown on Figure 3.1. The figure indicates that the initial study area was expanded towards the end of the study to incorporate changes in the Project design.

The scope of the ESIA is restricted to the mining and processing operations, and specifically excludes third party infrastructure for transportation of the concentrate from the site via rail to the port, and facilities at the port. The upgrade and operation of these rail and port facilities has been undertaken by a third party and are not reliant on the feasibility of this Project, and therefore are not considered to be within the Project's area of influence.

3.3 ESIA Process

The ESIA comprises the integrated assessment of physical, biological and social environments potentially affected by the Project. The ESIA process undertaken for the Project consists of the following four phases: scoping; baseline characterization; impact assessment and reporting; and review and decision-making. The specific objectives and activities of these phases are outlined in Table 3-1 and described in the following sections. Stakeholder consultation is a critical component of the ESIA process and is highlighted in the table, with further information provided in Section 3.3.5.

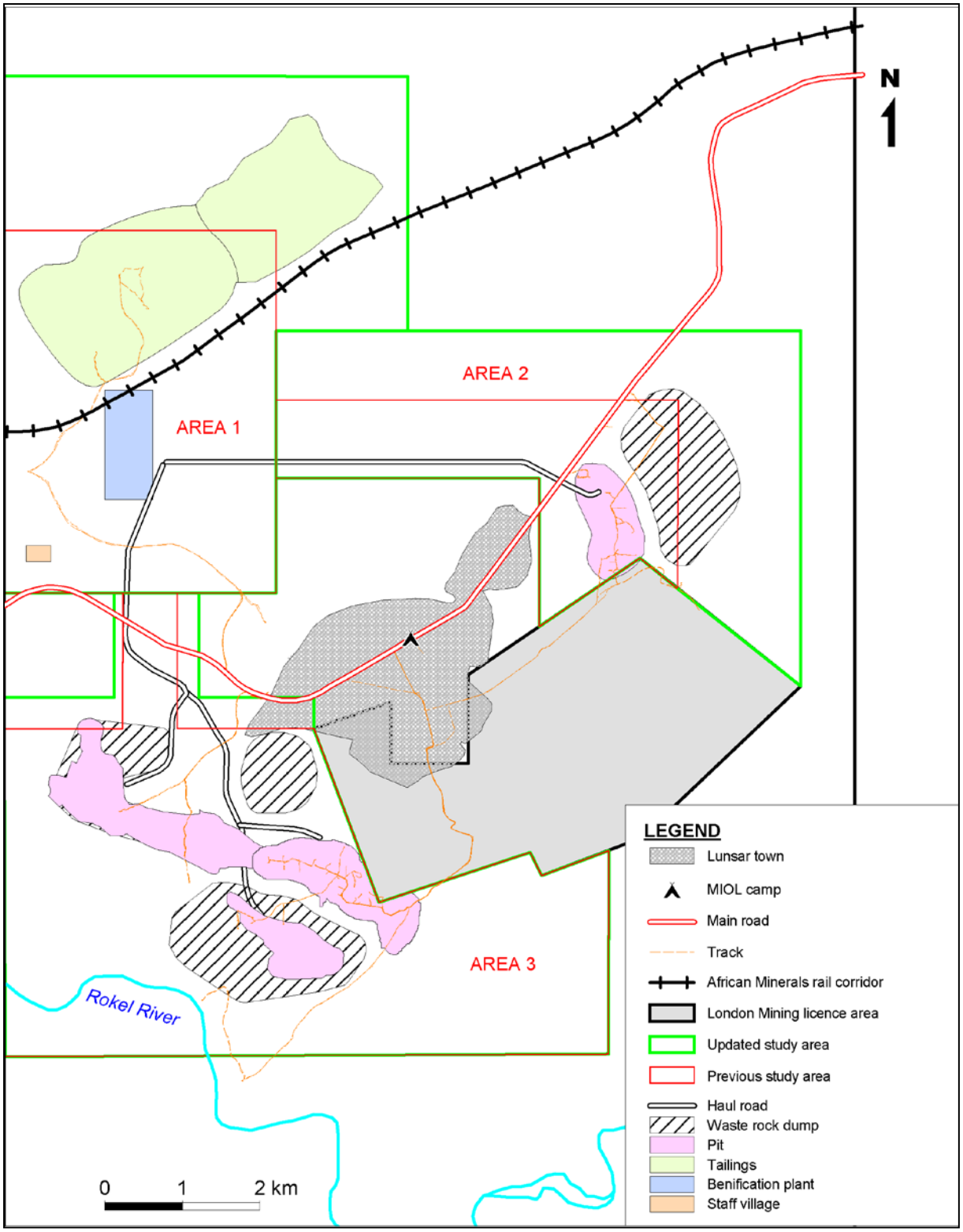


Figure 3.1: Study areas for MIOP ESIA

Table 3-1: MIOP ESIA process

Phases	Main purpose	Main activities	Documents produced
Phase 1: Scoping	• Preliminary planning of the ESIA approach and incorporation of the ESIA plans into the overall programme. • Initial round of issue identification to define baseline and specialist investigations required to support the ESIA process. • Desktop social scan to enable the engagement process to be planned, followed by the first round of consultation to share information and gather issues of concern that might influence the terms of reference for the ESIA (discussed further in Section 3.3.5).	• The ESIA team used a preliminary Project description from the Project planning team to determine what specialist studies were likely to be required. • Scoping-level stakeholder consultation indicated what issues were of concern. This was used to refine the terms of reference for specialist studies.	• A stakeholder engagement plan and stakeholder database • An ESIA scoping report (including the terms of reference for the ESIA) • A background information document for stakeholders • Records of engagement of stakeholders
Phase 2: Baseline investigations	• Collect background information on the environmental and social setting of the Project	• Baseline specialist investigations	• Reports by the specialists
Phase 3: Impact assessment and report compilation	• Investigate specific issues raised (by stakeholders, specialists and the ESIA team). • Define the potential impacts of the Project and identify measures for the management of the impacts. • Determine the significance of the potential impacts with and without management. • Evaluate the overall acceptability of the Project (from environmental and social perspectives).	• Review of available Project information and information from the scoping exercise and the baseline investigations. • Discussions with Project engineers to identify opportunities to eliminate or mitigate impacts through modification of the Project. • Further specialist investigations of specific issues. • Impact assessment exercise. • Report compilation.	• Reports by specialists • ESIS
Phase 4: Development of a detailed implementation and management plan	• Develop an environmental and social management system framework for the Project to ensure that: • the management commitments in the ESIA report and the conditions of approval are fully implemented; • there is ongoing improvement in social and environment performance throughout the life of the Project.	• Consultation with the Project team to develop a plan that covers: • policies, procedures, practices and action plans where necessary; • monitoring and evaluation procedures; • resource needs (human and financial); • a management system framework for implementation of the programme.	• Framework implementation and management plan.

3.3.1 Phase 1: Scoping activities

"Scoping" is a term conventionally applied by ESIA practitioners to indicate the beginning or inception phase of an ESIA process. The United Nations Environment Programme ("UNEP") environmental assessment training programme (June 2002 and April 2007) explains that the main purpose of scoping is to identify:

- the important issues to be considered in the ESIA;
- the appropriate time and space boundaries of the assessment;
- the information necessary for decision-making; and
- the potential impacts (significant effects) to be studied in detail.

Desktop review and environmental and social scan

An environmental and social scan of the study area was carried out in June 2010. The aim of the scan was to update the information collected during the reconnaissance survey (Section 1.4.1) and visit the new geological target areas. The scan involved the following activities:

- a review of any new information (prepared since June 2009) and maps of the study area;
- discussions with staff at the site relating to exploration activities, status of Project development and community relations; and
- general observations of the surrounding biophysical and social environment.

Stakeholder engagement

Following a period of stakeholder identification and analysis, a stakeholder engagement plan ("SEP") was developed to guide the stakeholder consultation process. As part of the scoping consultations, a background information document ("BID") was prepared and distributed among stakeholders to help explain the Project and the ESIA process. Preliminary consultation meetings were held with key Government ministries during July 2010.

Scoping consultations with local communities and other key Project stakeholders were undertaken in March 2011. Following these meetings, the Terms of Reference ("ToR") for the ESIA and specialist studies were reviewed to incorporate stakeholder issues where required.

Preliminary hydrological assessment

A hydrologist visited the site during June 2010 to undertake a preliminary hydrological and hydrogeological assessment of the study area and to install an on-site meteorological station (for collection of on-site meteorological data for use during the ESIA). The activities carried out during this site visit were:

- collection and summary of background data and maps from previous studies;
- site walk-over with GPS and compilation of surface and groundwater feature inventory;
- identification of surface water monitoring sites and measurement of river flow and basic water chemistry on the Baki, Batabana and Kagbu Rivers at the time of the visit; and
- inventory and water-table monitoring of existing boreholes where possible.

Issue identification

During scoping and continuing through the ESIA process, issues on which attention needed to be focused were identified from the following:

- iterative and systematic review of the Project description as it was developed by the Project team to identify Project aspects that could be possible sources of impacts

("aspects" is a term for the "mechanisms" by which Project activities cause environmental and social impacts);
- consideration of the areas of influence;
- careful consideration of comments made and concerns raised by stakeholders; and
- review of the findings of baseline investigations and specialist investigations.

The main aspects that have been identified are listed in Table 3-2. Identified impacts associated with these aspects were grouped under issue headings to keep the analysis of impacts as simple, streamlined and coherent as possible. The issue headings were chosen considering similarities and links between impacts and management measures required to address the impacts. The chosen issue headings are given in Table 3-2.

The identified impacts and issues influenced the approach to presentation of information in this ESIS. The information on the Project description (Chapter 4) and environmental and social baseline description (Chapters 5 and 6) has been presented in a manner providing a foundation for the detailed discussion of impacts (Chapters 7, 8 and 9).

Identification and analysis of Infrastructure site alternatives

As part of the ESIA process the ESIA team undertook an analysis of the proposed Project alternatives for major infrastructure such as the tailings facility and waste rock dump locations. Project infrastructure site alternatives that are of importance from environmental and/or social perspectives are discussed in Section 4.11. Decisions taken on site alternatives, and the factors influencing these decisions, are outlined in the analysis.

3.3.2 Phase 2: Baseline investigations

Baseline studies were performed to provide information on the environmental and social setting of the Project, characterize the pre-disturbance environment and provide a baseline against which impacts can be assessed and monitored. A description of the baseline, including the results of these studies, is provided in Chapters 5 and 6. Baseline study scopes of work and more detailed information on the baseline studies is contained in Volume 3 (Support Documents).

A list of the specialist studies undertaken for the ESIA is presented in Table 3-3. The baseline studies were managed by SRK (UK) and undertaken by groups of local and international specialists in each respective field. The studies were undertaken in accordance with ToR, a copy of which is included as Support Document 1 of Volume 3, and was provided to SLEPA prior to commencement. Detailed ToR for each specialist study is provided in the baseline study reports, which are provided in Volume 3 (Support Documents 2 to 10) of the ESIS.

Table 3-2: Preliminary impacts identified for the Marampa Project

Aspect group	Aspect	Mechanism	Potential impacts
Land trans-formation	Surface disturbance at the mine site; Topographic change at the mine site (open pit workings, waste rock dumps, and tailings storage facilities)	Site clearance within footprint of mine and associated infrastructure	• Disturbance of sites of archaeological, historic or cultural importance • Loss of land available to local communities • Disruption of tracks and roads by infrastructure (such as fences, water supply pipeline, haul roads etc.) • Mine infrastructure and activities resulting in visual intrusion and loss of 'sense of place' on local communities • Changes to land capability • Habitat loss or fragmentation and direct loss of plants and animals leading to alteration of ecosystem services • Indirect habitat alteration through colonisation by invasive species
		Construction of open pits, waste rock dumps and TSF.	
		Alteration of surface water drainage at the sites of infrastructure	• Changes in availability of water to downstream water users and ecosystems • Changes in spatial and temporal patterns of flow, influencing erosion, sedimentation, and flooding, affecting downstream water users and ecosystems
Water resources	Water take	Abstraction for mine supply Dewatering of workings	• Interference or reduced availability of water to other users and ecological receptors • Alteration of watercourse flow regimes, resulting in changes to flood patterns, fluvial processes, erosion, aquatic habitat, ecosystems and ecosystem services • Increase in stream turbidity and siltation, affecting aquatic fauna and flora
	Water diversion	Interruption of or changes to surface water channels to accommodate construction of mine infrastructure	
	Discharges from point and diffuse sources	Seepage from mine and mineral-processing waste disposal / dirty water holding facilities; Uncontrolled discharges (such as during storm events, spills, leaks etc.); Wastewater discharges; Runoff from exposed surfaces (sediment mobilisation, nitrates from blasting); Seepage from potential pit lakes formed at closure	• Deterioration of groundwater and surface water quality potentially impacting on communities and ecological systems, for example from increased turbidity from sediment laden runoff, heavy metal leachate from mine facilities and nutrients from blasting or sewage treatment etc. • Adverse health effects on the health of humans or animals drinking the water
Biodiversity and ecology	Alterations to natural water courses	Contamination of water resources; Abstraction from and changes to flow of streams	• Loss of natural habitat for aquatic / wetland species • Threat to species of special concern due to loss of habitat • Effects on community usage of rivers (for harvesting of natural resources)
	Loss of indigenous vegetation	Clearing for mine infrastructure	• Increase in spread of alien invasive species • Loss of habitat and food sources for indigenous species • Loss of important resource for local communities

Aspect group	Aspect	Mechanism	Potential impacts
Soil quality	Land Clearance	• Erosion of topsoil by wind or surface water runoff	• Reduction in protective vegetation cover • Increased potential for soil erosion and sediment mobilisation • Sediment deposition on down-gradient land and in downstream water courses • Increased potential for leaching of soils, increasing iron or zinc concentrations in surface water runoff
	Construction of mine buildings and related facilities	• Loss of agricultural land • Soil compaction	• Loss of currently productive and potentially viable land • Decline in crop production, with subsequent pressure on food supplies to local communities • Reduced soil productivity potential
	Run-off from mine facilities	• Contaminated stormwater runoff from exposed surfaces	• Degradation of soils within exposed areas and in vicinity of roads and other developed areas • Potential decline in soil chemical quality and productivity potential
Air quality	Point emissions	• Vehicle emissions; • Stack emissions; • Stationary sources (such as generators, crusher); • Incinerators	• Increase in background concentrations of fine particulate matter (dust) leading to nuisance and health effects for nearby communities • Increase in background concentrations of gaseous pollutants (such as sulfur dioxide, nitrogen dioxide and carbon dioxide etc.) potentially causing health risks to nearby communities • Increase in national (Sierra Leone) contribution of greenhouse gases to global greenhouse gas concentrations.
	Diffuse emissions	• Fugitive dust emissions from dry surfaces (such as TSF, waste rock dumps, stockpiles and other exposed areas)	• Increase in concentrations of course particulate matter leading to nuisance and health effects for nearby communities
Noise and vibration	Equipment/ vehicle operation Blasting	• Noise emissions; • Vibrations from blasting and equipment /vehicles	• Increased disturbance to nearby sensitive receptors (such as local communities, schools etc.) • Sensory disturbance resulting in animal displacement
Waste production (wastes other than mine waste)	Domestic, construction and operational wastes	• Litter; • Sewage; • Non-process related industrial wastes; • Hazardous wastes (such as waste oils, chemicals, spent packaging)	• Waste disposal sites resulting in creation of an attractive nuisance to scavenger animals • Contamination of soil and/or water • Degradation of land and health risks associated with the above impacts • Visual and ecological impacts due to uncontrolled dumping of waste

Aspect group	Aspect	Mechanism	Potential impacts
Economic development	Job creation Procurement of services and supplies	• Direct employment during construction and operation; • Indirect employment by service providers and suppliers	• Direct or indirect employment of locals contributing to alleviation of widespread unemployment and poverty • Skills acquisition through job training • Improved infrastructure and services • Potential for sustainable economic developments • Improved standard of living for local communities through social development initiatives
	Payment of tax and levies	• Tax on profits; • Duties on imports; • Payroll tax; • Value added tax	
	Community investment	• Investment in social development initiatives	
Resettlement and land acquisition	Land acquisition within the Project site	• Physical displacement (relocation of dwellings / villages)	• Involuntary impoverishment – loss of assets, income and livelihood • Loss of access to common property resources (such as wells, boreholes, schools, health clinics etc. • Loss of access to cultural resources such as sacred bush • Human rights abuses (related to resistance of displacement) • Psychological impacts on individuals manifesting as apathy, helplessness and a sense of inadequacy • Breakdown of social networks and community cohesion (community disarticulation) • Reduced food security leading to malnutrition and poor health • Civil unrest and instability, particularly between host communities and resettled population • Exacerbation of inequality
		• Economic displacement (loss of access to land used for agriculture, artisanal mining, natural resources etc.)	
Social organisation	In-migration of job-seekers to local villagers	• Influx of job seekers to local villages placing additional pressure on already limited resources and resulting in social ills	• Increased pressure on government services • Development of informal settlements • Increases in social ills (petty crime, alcohol abuse, prostitution, vandalism) • Health deterioration resulting from an increased risk of exposure to disease • Increased pressure on natural resources (such as clearance of land for subsistence agriculture) • Increased pressure on natural resources such as wood (for fuel) and fauna (increased bush meat consumption) • Increased cost of living for those not benefiting from the Project
Archaeology and cultural heritage	Loss of cultural heritage items / areas	• Clearing of land for mine infrastructure, causing loss or disturbance of items / areas of cultural / heritage importance.	• Lack of understanding or appropriate mitigatory / compensatory action by developers, causing dissatisfaction amongst local communities • Loss of items / areas of heritage importance from communities and society as a whole • Social impacts relating to loss of cultural identity

Aspect group	Aspect	Mechanism	Potential impacts
Closure	Retrenchment / Cease of operations	• Loss of employment/business; • Outward migration; • Cessation of taxes, fees and royalties to government	• Unemployment and loss of income • Closure of support and service businesses • Outward migration of skilled workers, leaving the elderly and the unskilled behind leading to the eradication of the consumer base • Psychological impacts on individuals manifesting as apathy, helplessness and a sense of inadequacy • Erosion of Governments' revenue base leading to a reduction in the allocation of funds to the area and subsequently deterioration in quality of life
	ARDML / contamination of water or soil	• Consumption of contaminated fish, fauna or forest products • Consumption or use of water from pits for irrigation or livestock watering	• Health impacts on humans and animals relating to bioaccumulation of heavy metals etc. in soil and water resources near the mine

Table 3-3: Specialist Studies undertaken during the ESIA

Name of study	Source	Supporting documentation reference
Climate and Air quality	SRK (South Africa)	ESIA Volume 3, SD 2
Noise	SRK (Turkey) and Eddie Jewel Acoustics (impact modelling)	ESIA Volume 3, SD 3
Ecology and Biodiversity	Ecorex Consulting Ecologists and Nepid Consulting	ESIA Volume 3, SD 4
Soils and Geomorphology	SRK (UK)	ESIA Volume 3, SD 5
Geochemistry - Acid Rock Drainage and Metal Leaching	SRK (UK)	ESIA Volume 3, SD 6
Water Resources	SRK (UK), with in-country assistance	ESIA Volume 3, SD 7
Archaeology and Cultural Heritage	Nexus Heritage	ESIA Volume 3, SD 8
Socio-economic	SRK (UK), with in-country assistance	ESIA Volume 3, SD 9
Natural Resource Use	Wild Resources Limited , with in-country assistance	ESIA Volume 3, SD 10

The general objectives of these bio-physical and social baseline reports are to:

- provide an overview of existing available literature relevant to the biophysical and social characteristics of the area (international, national, regional and local context);
- justify the methodology used to undertake the study (sampling, analysis and assessment tools), highlighting any limitations or assumptions;
- provide a description of the existing bio-physical and/or social setting (baseline conditions);
- provide a statement on the conservation importance of each component of the environment;
- identify sensitive natural and human receptors susceptible to impacts arising from possible Project activities;
- bench mark the baseline conditions of the Project-affected area against recognised in-country and international guidelines and standards; and
- provide recommendations on further studies that may be required and recommendations for management and monitoring of the potentially affected environment should impacts occur.

The scope of baseline study requirements were finalised following consultation with SLEPA, and have taken into account the issues or concerns raised by stakeholders and the public during scoping consultations (Section 3.3.5). The baseline study reports will be submitted to SLEPA as part of the ESIS and can be made available by MIOL to other stakeholders upon written request.

Where available, Sierra Leone standards and guidelines have been used, supplemented with the most appropriate international guidelines. However, in most cases appropriate local guidelines were not available and the specialists used their professional judgement in selecting the most appropriate international guidelines for their respective studies. In doing so, consideration was given to similarities in environmental conditions between Sierra Leone and the country-specific standard to be adopted (unless the standard is not country-specific, such as standards developed by the World Health Organisation or IFC).

Each of the baseline study reports (included in Volume 3 and summarised in Chapters 5 and 6) specified which standards or guidelines were used for that particular study. It is noted that these guidelines are not legally binding but merely intended for reference purposes. Using the baseline conditions measured on site, site-specific criteria for acceptable limits may be devised for the Project if required at a later stage.

3.3.3 Phase 3: Impact identification and definition

Starting in the scoping phase and refined throughout the ESIA process, specific aspects of the Project are identified that may give rise to impacts, positive or negative. Impact definition is iterative throughout the ESIA process and generally entails developing a description of the aspect, pathway and receptor that comprise the impact, as outlined below (social impact may require a different approach – discussed further below):

- aspect is the mechanism by which Project activities may cause impacts (for example, gaseous emissions to the atmosphere or effluent discharges to a water body);
- receptor is a person, natural ecosystem, structure or infrastructure system that experiences the impact; and
- pathway is the mechanism by which the aspect affects the receptor (such as inhalation of air or drinking of water).

Impacts are defined where there is a plausible pathway between the Project aspects and receptors. The aspects, pathways and receptors are identified based on:

- previous environmental or social studies;
- review of the evolving Project description to identify aspects;
- consideration of the area of influence to determine pathways and receptors;
- experience of the ESIA and Project specialists;
- consideration of issues raised by stakeholders; and
- findings of baseline investigations as they become available.

Impact assessment

Impact assessment is an iterative process starting with issue identification and impact definition during the scoping phase, as outlined in Section 1.1.1. As the ESIA progresses, the emphasis shifts to impact evaluation, which consists of the systematic evaluation of each of the identified impacts using criteria enabling the significance of the impacts to be determined and the impacts to be ranked accordingly. As part of this process, management measures are defined to reduce the significance of negative impacts or enhance positive ones. After consideration of the management measures, the significance of the resulting (residual) impacts is re-evaluated using the same criteria. The identified management measures form the basis for subsequent development of the Project's environmental and social management programme.

In some cases impact evaluation involves the use of predictive modelling to determine impact significance. The results of these studies are presented in the impact assessment chapters, and more detailed information is contained in the support documents as outlined in Table 3-3. The predictive modelling exercises undertaken include:

- air quality;
- water resources (both chemical and physical changes); and
- noise.

Cumulative impacts consider other proposed or anticipated future activities in the vicinity of Lunsar that may have additive or synergistic effects on the impacts of the Project. These include the construction and operation of a mine within ML02/09 (London Mining concession area) and the AML railway line to Pepel Port, which runs through the Project area. Both of these developments began operation in late 2011. Cumulative impacts were considered in the ESIA process and are discussed in Section 10.

Impact grouping

Different types of impacts are often interrelated and therefore an integrated holistic approach has been taken to impact assessment. For example: different aspects can impact on the same receptor; different impacts can have cumulative impacts on receptors; one impact could result in a sequence of different impacts (a chain of different impact events); and one primary impact could have a diversity of secondary impacts. This interrelationship between impacts can make description and evaluation of impacts complicated and repetitive. For this reason and to facilitate impact evaluation, impacts have been grouped where possible. Generally grouping takes account of similarities in the sources of the impacts, the aspects, the pathways of exposure, the receptors and/or the management measures required to address the impacts.

There are no strict rules about how impacts should be grouped and people may group impacts differently. What is important is that grouping facilitates a reader-friendly and structured discussion of impacts. The groupings of impacts are not discrete; there are overlaps between groups of impacts that require cross-referencing.

Social impacts may be grouped and evaluated slightly differently, taking cognisance of the points listed below:

- social issues are often clustered and interdependent rather than clearly separable;
- communities are dynamic and in a continual process of change, with the Project one factor contributing to this change - it is often difficult to identify if an issue is attributable to a Project aspect, to factors beyond the Project's control or a combination of both;
- social issues are not always objectively measurable and often need to be inferred rather than measured - a combination of insight into social processes in general and knowledge of the communities under study are important to draw valid inferences;
- social issues are often unavoidable and difficult to manage, and as such management strategies aim to manage change rather than avoid an issue; and
- successful management of a potentially negative issue may result in a positive outcome.

A section on Community Health and Safety Impacts has been included (Chapter 9) to discuss specific health and safety issues associated with the Project on surrounding communities. These issues include noise, air quality, and the various safety risks (including traffic); specific management measures are provided.

Impact description

There is a trend away from highly prescriptive approaches to impact evaluation. Most ESIA practitioners recognise that impact evaluation is not a purely objective and quantitative exercise. It has a subjective element; often based on qualitative judgement and values as well as scientific criteria. Consequently, in the impact assessment chapter's emphasis is placed on describing how impacts have been interpreted so others can understand the rationale of the assessment.

Each impact description:

- starts with a definition of the impact using an impact statement outlining the aspect-pathway-receptor;
- describes the sensitivity, importance or value of the receiving environment or receptors;
- explains the extent of change associated with the impact;
- rates the significance of the impact;
- explains the effectiveness of proposed management measures; and
- characterises the level of uncertainty in the impact assessment.

The significance of an impact is determined based on the product of the consequence of the impact and the probability of its occurrence. The consequence of an impact, in turn, is a function primarily of three impact characteristics:

- magnitude;
- spatial scale; and
- timeframe.

Magnitude is determined from quantitative or qualitative evaluation of a number of criteria discussed further below. Where relevant, this includes consideration of the sensitivity of the receptor, the importance or value of the receptor and the extent of change experienced by the receptor.

The **sensitivity** of existing or reasonably foreseeable future receptors reflects their ability to tolerate disturbance or change. More vulnerable receptors may be less adaptable than the majority of receptors. For example, if a minor disturbance has the potential to result in the permanent loss of the biodiversity of a habitat, the affected environment would be categorised as having a low tolerance to disturbance and is consequently a highly sensitive habitat. In another example, a population with high levels of unemployment is likely to be more sensitive to job creation than an area with low unemployment, meaning that new jobs will have a greater positive magnitude in an area where people need jobs.

The **importance or value** of the receptor can be described using the following indicators:

- status of legal protection;
- inclusion in local government policy;
- level of public concern;
- number of receptors affected;
- intrinsic or perceived value placed on the receiving environment by stakeholders; and
- economic value to stakeholders.

Where legally designated protection is not specified, importance or value is likely to be a subjective evaluation based on available information, the opinion of the experts on the ESIA team and consideration of the views of affected stakeholders.

The **extent of change** may be measured qualitatively or quantitatively. One way of measuring change is by comparing to relevant thresholds. Examples of possible thresholds are listed below with the main sources of legal and functional thresholds applied in the ESIA being the host country standards and the World Bank Group EHS Guidelines:

- legal thresholds - established by law or regulation and often numeric in nature;
- functional thresholds – where if exceeded, the impacts will disrupt the functioning of an ecosystem sufficiently to destroy resources important to the nation or biosphere

irreversibly and/or irretrievably;

- normative thresholds - established by social norms, usually at the local or regional level and often tied to social or economic concerns;
- preference thresholds - preferences for individuals, groups or organizations only, as distinct from society at large; and
- reputational thresholds – the level of risk a company is willing to take when approaching or exceeding the above thresholds.

Spatial scale is another impact characteristic affecting impact consequence. The spatial scale of impacts can range from localized (confined to the proposed Project site) to extensive (national or international extent). They also may vary depending on the component being considered. Different scales have been used for the bio-physical impacts and the socio-economic impacts.

The impact **timeframe** is the third principal impact characteristic defining impact consequence and relates to either its duration or its frequency (when the impact is intermittent). Impact duration can range from relatively short (less than four years) to long (beyond the life of the Project). Frequency ranges from high (more than 10 times a year) to low (less than once a year). These timeframes will need to be established for each Project based on its specific characteristics and those of the surrounding environment.

Additional characteristics, including reversibility, sustainability and timing (onset) of the impact, can also play a role in consequence determination of some types of impact. As appropriate, these additional characteristics are considered and described alongside the three primary characteristics of magnitude, spatial scale and duration.

Once the impact consequence is described on the basis of the above impact characteristics, the probability of impact occurrence is factored in to derive the overall impact significance. The probability relates to the likelihood of the **impact** occurring, not the probability that the source of the impact occurs. For example, a continuous Project aspect (such as generation of dust) may result in an unlikely probability of impact if there are no receptors within the area influenced by that activity.

The resulting significance rating may be further qualified by explaining the effectiveness of proposed management measures designed to mitigate or enhance the impact, and by characterizing the level of confidence or uncertainty in the assessment. The characteristics used for the written impact descriptions are outlined in Table 3-4. The next section outlines the specific process used in this ESIA for impact significance rating.

Table 3-4: Characteristics used to describe an impact

Characteristics	Sub-components	Terms used to describe the impact
Type		• Positive (a benefit), negative (a cost) or neutral
Nature		• Biophysical, social, cultural, health or economic • Direct, indirect or cumulative
Phase of Project		• Construction, operation, decommissioning or post closure
Magnitude	Sensitivity of receptor	• High, medium or low capacity to accommodate change • High, medium or low conservation importance • Vulnerable or threatened • Rare, common, unique, endemic
	Importance or value of receptor	• High, medium or low concern to some or all stakeholders • High, medium or low value to some or all stakeholders (for example, for cultural beliefs) • Locally, nationally or internationally important • Protected by legislation or policy
	Severity or degree of change to the receptor	• Gravity or seriousness of the change to the environment • Intensity, influence, power or strength of the change • Never, occasionally or always exceeds relevant thresholds
Spatial scale	Area affected by impact - boundaries at local and regional extents will be different for biophysical and social impacts.	• Area or volume covered • Distribution • Local, regional, transboundary or global
Timeframe	Length of time over which an environmental impact occurs or frequency of impact when intermittent	• Short term or long term • Intermittent (what frequency) or continuous • Temporary or permanent • Immediate effect (impact experienced immediately after causative Project aspect) or delayed effect (effect of the impact is delayed for a period following the causative Project aspect)
Probability - likelihood or chance an impact will occur		• Definite (impact will occur with high likelihood of probability) • Possible (impact may occur but could be influenced by either natural or Project related factors) • Unlikely (impact unlikely unless specific natural or Project related circumstances occur)
Reversibility / sustainability		• Potential for recovery of the endpoint from the impact • Reversible or irreversible • Sustainable beyond the Project's life
Effectiveness of management measures (will management measures reduce impact to an acceptable level)		• Indication of what could occur in the absence of management measures • Effectiveness of proposed measures
Confidence in impact evaluation (degree of certainty in the significance ascribed to the impact)		• Scientific uncertainty – limited understanding of ecosystem (or community) and processes governing change • Data uncertainty – restrictions introduced by incomplete or incomparable information, or by insufficient measurement techniques • Policy uncertainty – unclear or disputed objectives, standards or guidelines • Personal opinion – some impact may be perceived different by different people

Impact significance rating

The impact significance rating process serves two purposes: firstly, it helps to highlight the critical impacts requiring consideration in decision making processes (such as engineering planning decisions, government approval of the Project, the feasibility decision and Project finance approvals); secondly, it serves to show the primary impact characteristics, as defined above, used to evaluate impact significance. The impact rating system used in the ESIA was selected because it:

- is simple and does not detract from the written description of potential impacts;
- is easy for stakeholders to understand; and
- is useful in helping to distinguish impacts needing to be brought to the attention of decision makers.

Impact assessment matrices can become complex if too many categories are used or if specific criteria are developed for each environmental component or Project activity. The rating system used here is a simple 3x3 matrix and is standardised across all environmental components and activities. It relies on the clear description of the impact given in the text to show the reader how the final significance rating has been arrived at. It is recognised that this simple approach may limit the evaluation of some impacts associated with a specific environmental component or activity. Therefore under certain circumstances the ESIA practitioner may choose to modify the criteria used in the matrix table for that specific evaluation; any such modifications are clearly explained in the text.

The impact significance rating system is presented in Table 3-5 and involves three parts as outlined below.

- Part A: Define impact consequence using the three primary impact characteristics of magnitude, spatial scale and duration. When assessing the magnitude, it is not necessary that all definitions given by the table agree with the assessment chosen. The justification for the assessment should be clearly explained in the impact discussion. In the case of negative impacts, the most conservative definition should generally be used – in other words, if any of the definitions fall under the major category then the overall magnitude is major. For positive impacts, a balance should be sought with the rating reflecting the most likely definition that applies.
- Part B: Use the matrix to determine a rating for impact consequence based on the definitions identified in Part A; and
- Part C: Use the matrix to determine the impact significance rating, which is a function of the impact consequence rating (from Part B) and the probability of occurrence.

Table 3-5: Method for rating the significance of impacts

PART A: DEFINING CONSEQUENCE IN TERMS OF MAGNITUDE, DURATION AND SPATIAL SCALE *Use these definitions to define the consequence in Part B*			
Definition		**Criteria**	
MAGNITUDE		**Negative**	**Positive**
	Major	• Large number of receptors affected • Receptors highly sensitive and/or are of conservation importance • Substantial deterioration, nuisance or harm to receptors expected • Relevant thresholds often exceeded • Significant public concern expressed during stakeholder consultation • Receiving environment has an inherent value to stakeholders	• Large number of receptors affected • Receptors highly amenable to positive change • Receptors likely to experience a big improvement in their situation • Relevant positive thresholds often exceeded
	Moderate	• Some receptors affected • Receptors slightly sensitive and/or of moderate conservation importance • Measurable deterioration, nuisance or harm to receptors • Relevant thresholds occasionally exceeded • Limited public concern expressed during stakeholder consultation • Limited value attached to the environment	• Some receptors affected • Receptors likely to experience some improvement in their situation • Relevant positive thresholds occasionally exceeded
	Minor	• No or limited receptors within the zone of impact • Receptors not sensitive to change • Minor deterioration, nuisance or harm to receptors • Change not measurable or relevant thresholds never exceeded • Stakeholders have not expressed concerns regarding the receiving environment	• No or limited receptors affected • Receptors not sensitive to change • Minor or no improvement in current situation • Change not measurable • Relevant positive thresholds never exceeded • No stakeholder comment expected
TIMEFRAME (determine specific to each Project)		**Duration of continuous aspects**	**Frequency of intermittent aspects**
	Short term/ low frequency	Less than 4 years from onset of impact	Occurs less than once a year
	Medium term/ frequency	More than 4 years from onset of impact up to end of life of Project (approximately 15 years)	Occurs less than 10 times a year but more than once a year
	Long term/ high frequency	Impact is experienced during and beyond the life of the Project (greater than 15 years)	Occurs more than 10 times a year
SPATIAL SCALE (determine specific to each Project)		**Biophysical**	**Socio-economic**
	Small	Within 200 m of the Project footprint area	Within the chiefdom in which the activity occurs
	Intermediate	Within the district in which the facilities are located	Within the province in which the activity occurs
	Extensive	Beyond the district in which the facilities are located	Beyond the province in which the activity occurs (national / international)

PART B: DETERMINING CONSEQUENCE RATING *Rate consequence based on definition of magnitude, spatial extent and duration*				
MAGNITUDE	**TIMEFRAME**	**SPATIAL SCALE**		
		Small	**Inter-mediate**	**Extensive**
Minor	**Short term / low frequency**	Low	Low	Medium
	Medium term / frequency	Low	Low	Medium
	Long term / high frequency	Medium	Medium	Medium
Moderate	**Short term / low frequency**	Low	Medium	Medium
	Medium term / frequency	Medium	Medium	High
	Long term / high frequency	Medium	High	High
Major	**Short term / low frequency**	Medium	Medium	High
	Medium term / frequency	Medium	Medium	High
	Long term / high frequency	High	High	High

PART C: DETERMINING SIGNIFICANCE RATING *Rate significance based on consequence and probability*				
		CONSEQUENCE		
		Low	**Medium**	**High**
PROBABILITY (of exposure to impacts)	**Definite**	Low	Medium	High
	Possible	Low	Medium	High
	Unlikely	Low	Low	Medium

+ denotes a positive impact.

Using the matrix, the significance of each described impact is initially rated. This initial rating assumes the management measures inherent in the Project design and described in the Project description (Chapter 4) are in place. For example, if a fuel store has been designed with secondary containment, the initial impact rating takes this into account.

For most impacts an impact summary table is given to present the rating results, as shown in the example below. The heading row of the table gives the impact definition (see above). The following rows present the impact characteristics and significance ratings. The final row presents any additional management measures identified by the impact assessor as required to appropriately control/enhance the impacts. These would be over and above the inherent management measures incorporated into the Project design. Included in the summary table is a confidence assessment, which provides the reader with an indication of the assurance level placed on the rating process and addresses the concept of uncertainty. A statement is also given on whether the impact is reversible or sustainable.

The management measures given in the table will take the form of either: mitigation measures (those measures needed to reduce the significance of negative impacts to an acceptable level); or enhancement measures (those measures needed to optimise the effects of positive impacts). Where such measures are stipulated, the final table row provides the rating for the 'residual impact' (negative impacts) or 'enhanced impact' (positive impacts), which assumes these measures are successfully implemented and reflects the actual impact expected from the Project. Where no residual impact is given the actual impact of the Project is the initial impact.

Table 3-6: Example of impact significance rating summary table

Impact X: Example impact statement (aspect, pathway and receptor)			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)			
Magnitude description	Sensitivity		
	Receptor importance or value		
	Extent of change / threshold compliance		
	Magnitude rating		
Timeframe description	Duration		
	Frequency		
	Timeframe rating		
Scale			
CONSEQUENCE RATING			
PROBABILITY RATING			
SIGNIFICANCE RATING			
Reversibility/sustainablity			
Confidence			
Management measures • Measure 1 • Measure 2 etc.			

The strategy for selecting practical mitigation measures is as follows:

- avoid the impact wherever possible by removing the cause(s) – always preferred;
- reduce the impact as far as possible by limiting the cause(s) – preferred where impacts cannot be avoided;
- ameliorate the impact by protecting the receptor from the cause(s) of the impact – only where the causes of the impact cannot be reduced; and
- providing compensatory measures to offset the impact – this is used only when none of the above are appropriate and is often used when impacts to biodiversity resources cannot be mitigated.

All relevant management measures (inherent design measures, mitigation measures, enhancement measures and good practice measures) are eventually consolidated into the environmental and social management programme, which forms a fundamental part of the environmental and social management system described in Chapter 11 and which may become legally binding.

3.3.4 Phase 4: ESIA report review and decision-making

The purpose of this ESIA report is to present the information from the ESIA process that is available and relevant in an integrated and holistic manner. It aims to provide the big picture in as non-technical a manner as far as possible. Technical detail is provided in the various supporting documentation such as the specialists baseline and impact assessment studies, which are provided as the supporting documentation in Volume 3 of the ESIA report.

The ESIA will be submitted to the relevant regulatory authorities for review and consideration. The review will inform the government's decision and enable it to set the conditions of

approval. The ESIA report will also be made available for public review and there will be feedback consultations with stakeholders. The feedback consultations will inform stakeholders about progress with Project planning, expected impacts and proposed mitigation measures. The consultations will acknowledge issues raised by stakeholders and tell them how these are to be addressed, and they will provide stakeholders with an opportunity to comment on the Project and proposed mitigation measures.

Stakeholders that have shown an interest in the ESIA will be involved in the feedback consultations. Records of the feedback consultations will be provided to regulatory authorities for consideration in the Project approval decision. The feedback consultations will not be replaced by any government public hearing that are prescribed because they are important to the long-term constructive relationship between the Project and stakeholders, but it is possible that the government may be amenable to replacing/ integrating public hearings with the feedback consultations.

3.3.5 Stakeholder consultation

The purpose of stakeholder consultation during the ESIA process is to enable the views, interests and concerns of Project stakeholders, including vulnerable or disadvantaged groups, to be taken into account. The objectives and activities of the stakeholder consultation, and how these link to the ESIA process, are shown schematically in Figure 3.2.

Approach

During the Scoping phase, and following a process of stakeholder identification and analysis, an initial SEP was developed to guide the initial and ongoing stakeholder consultation process. As part of the scoping consultations, a BID was prepared and distributed among stakeholders to help explain the proposed Project and the ESIA process.

Details on the ESIA stakeholder consultation are presented in the SEP. The SEP is a live document, which has been updated throughout the ESIA process and will continue to evolve as the Project proceeds through the construction, operation and decommissioning phases. The purpose of the SEP to date was to guide and record public consultation and disclosure activities during the ESIA process. The SEP to guide the stakeholder engagement process through the construction phase and the rest of the life of the Project has been presented as part of the ESMS.

Summary of ESIA stakeholder consultation

Initial stakeholder consultations focused on formally initiating the ESIA process with SLEPA and identifying specific regulatory requirements of relevant Government ministries. The meetings were held on a one to one basis in the relevant Government ministry office. A BID outlining the status of the Project was provided to ministry representatives, who were given the opportunity to raise issues associated with the Project and were encouraged to contact MIOL if queries arose. Minutes of these meetings are included as Appendix 2 to the SEP (Appendix C).

Following these meetings, a screening form was completed and submitted to SLEPA in line with the national Environmental Impact Assessment (EIA) process (Section 2.1). SLEPA categorised the Project as Category A, thus requiring an Environmental and Social Impact Assessment (ESIA) for the Project (refer to Appendix B for correspondence from SLEPA dated 20th August 2010).

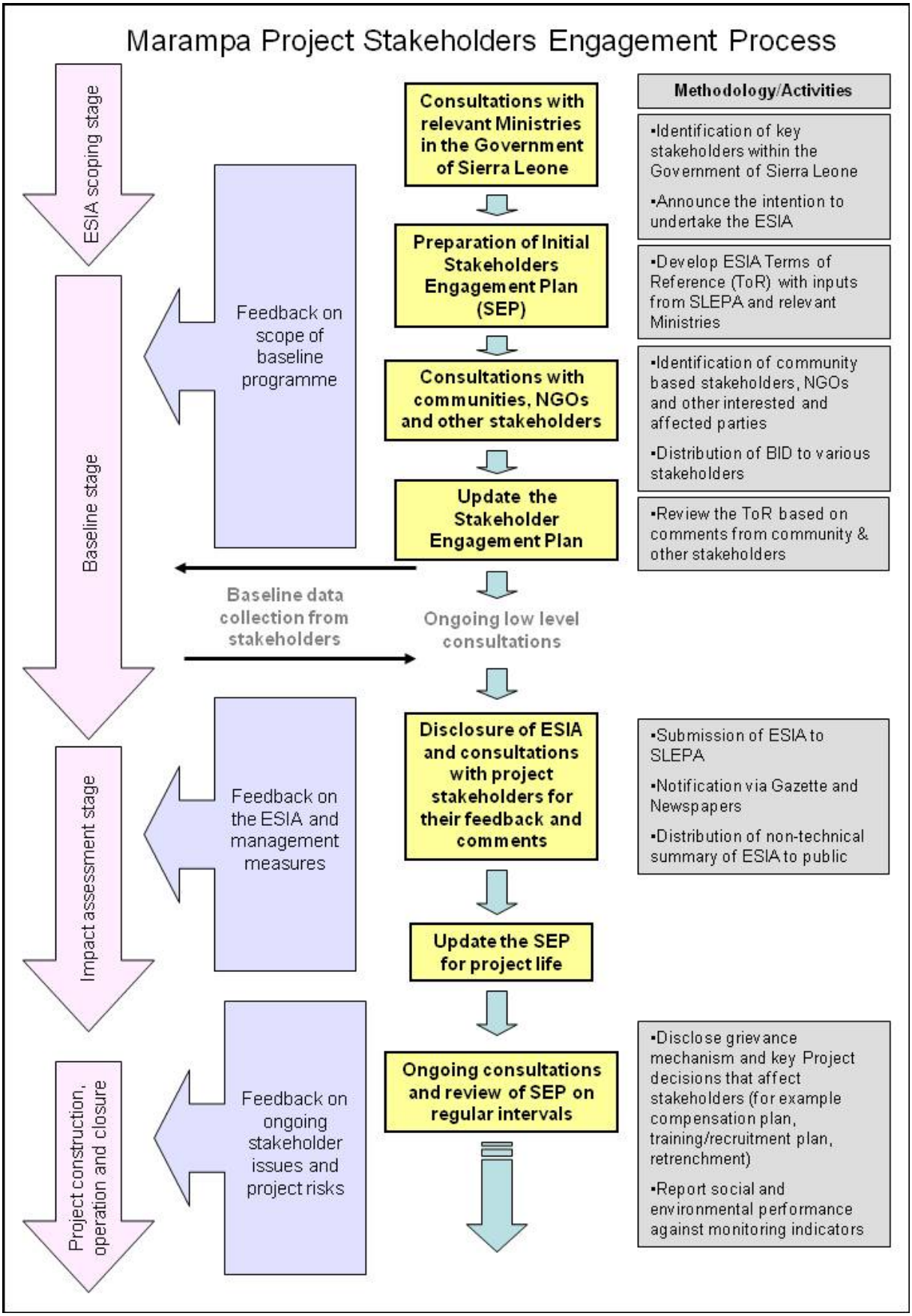


Figure 3.2: Overview of the stakeholder engagement process undertaken

An interim consultation meeting to discuss the ToR for the baseline studies and other issues was held SLEPA in February 2011. Stakeholder consultation meetings for the scoping phase of the ESIA were held with local communities, NGO's and authorities in March 2011, and any additional issues raised that had not already been included in the ToR for the baseline studies were included at that stage.

A list of the stakeholders who were engaged during the ESIA process is appended to the SEP. The stakeholders include:

- local communities;
- national, provincial and local government and authorities;
- community based organisations ("CBOs") and NGOs; and
- others, such as private sector, academia and the media.

Issues raised by stakeholders during the ESIA process have been recorded in a database, along with a response indicating how these issues have been addressed through the ESIA process, and are summarised in Table 3-7. A summary of the issues and responses to each issue is included as an Issues Report in Appendix C. The Issues Report details the issues raised; identifies people who raised them and their affiliations; and shows how the issues have been addressed in the ESIA by means of comments and/or cross referencing to relevant sections of the ESIA report.

A final round of stakeholder consultations for the ESIA process will be held on submission of the draft ESIA report to SLEPA, following which any additional issues raised will be addressed in the final ESIA report submitted to SLEPA for approval.

A full record of the stakeholder consultation process to date is presented in the SEP. The current version of the SEP is presented in Appendix C and this will be updated following feedback consultation with stakeholders.

Table 3-7: High-level summary of stakeholder issues raised and where addressed in the ESIS

Subcategory	Issue raised	Addressed in ESIA report
Community health and safety	Dust and noise impacts on local communities	Section 9.1 and 9.2
	Safe use of explosives	Section 9.5.1
	Traffic safety	Section 9.3
Land transformation	Loss of agricultural land and insufficient rehabilitation	Section 7.1
	Visual impacts	Section 7.1
Ecological	Use of appropriate vegetation for rehabilitation	Section 7.3
Water resources	Added pressure on limited water resources	Section 7.2
Economic development	Requirement for tangible community development	Section 8.1
	Employment for local communities (and attracting workers from farms and schools)	Section 8.1
Social organisation	Conflict within and between communities	Section 8.3
Resettlement and land acquisition	Compensation for land	Section 8.2
	Correct implementation of resettlement	Section 8.2
Management measures	Implementation and monitoring of management measures	Chapter 11

3.4 Assumptions and limitations

The ESS was initiated early in the Project planning process and as such limited Project information was available at that stage. In the absence of a provisional Project layout, a general study area was defined indicating zones within which disturbance was considered likely. By the time most of the baseline studies were complete, the Project description had been refined and new study areas were delineated (Figure 3.1), which were slightly larger than the original study areas. As additional Project information became available, the focus areas for subsequent field trips supporting the ESIA process were amended accordingly and in consultation with the Project team. The initial baseline field work areas were however defined based on the original (slightly reduced) study area compared to the revised Project study areas, which show expansion mainly in Areas 1 and 2. This does not represent a fatal flaw for the baseline as the areas involved are similar. However this has meant that baseline information used in the impact assessment has been extrapolated over a wider and marginally different area.

Stakeholder consultations with local communities and the general public were delayed until March 2011, which represented a limitation for the scoping process, as not all stakeholder issues were available prior to initiating the baseline studies. However, this did not preclude stakeholder issues from being considered in these studies as soon as they were available. SRK can confirm no critical new issues were identified and the minor issues were appropriately addressed by the ongoing baseline studies before completion. Therefore the delay in consultations is not considered to be critical to the ESIA nor the stakeholder engagement process as a whole, nor to have resulted in issues not being suitably addressed.

The scope of the ESIA is restricted to the potential mining and processing operations around Lunsar and specifically excludes construction of the rail transportation of the concentrate from the site to the port, and facilities at the port. As a third party is responsible for these facilities, the rail line and ports are not considered to be within the Project's area of influence. It does however include product transport pipelines, running from the ore processing area on site to Tagrin Port, along an existing rail corridor that is also operated by a third party.

The Project is currently at a pre-feasibility study and thus some details of the design may change as the Project moves into the feasibility and detailed design phase. At this stage no significant changes are expected, however should changes to the Project description occur that materially affect the outcome of this impact assessment report, an addendum would be prepared.

4 PROJECT DESCRIPTION

This Chapter provides a preliminary description of the major Project components based on the Project design. The exploration licence area (EL46/2011) covers 305.12 km^2 in total. The development area of the Project's footprint (and hence the study area for this ESIA) is 52.3 km^2. Further detail of the preliminary design is provided in Appendix E.

The ultimate Project involves the construction of facilities and infrastructure to produce up to 15 Mtpa[6] of iron concentrate. This will be done in two stages. Stage 1 will involve the construction of facilities to produce 2.5 Mtpa of iron concentrate through the mining of oxide ore only. Stage 2 (an extension to Stage 1) involves expanding these facilities, and the construction of additional facilities, to enable the production of a total of up to 15 Mtpa of iron concentrate through the mining of oxide and/or fresh ore.

While the development plan of Stage 2 of the Project is reasonably known at this time, it will be the subject of a detailed feasibility study moving forward. Where possible this ESIA will describe (and assess impacts relating to) the full proposed development, i.e. production of up to 15 Mtpa of concentrate (Stage 2), clearly stating where detail relates specifically to Stage 1. Changes and additional components (such as for product export) to the Stage 2 development proposal resulting from the outcomes of the detailed feasibility study (and therefore not described or assessed in this ESIA) will however be covered by a future amendment to the ESIA. Potential future expansion plans are discussed further in Section 4.13.

The existing railway between Marampa and the Pepel Port facilities has been refurbished and placed back in to operation by AML to service their Tonkolili Mine. An access agreement is in place with AML, allowing MIOL to export 1.8 Mtpa (potentially increasing to 3.4 Mtpa) of concentrate through the rail and Pepel port facilities for its Stage 1 development. An environmental authorisation has been obtained for these as part of AML's Project, and they are therefore not included in this ESIA. Product export will involve pumping concentrate via pipelines to the port of Tagrin and will be covered in the amendment to this ESIA.

The main Project components included in this ESIA are listed below:

- Four open pits (Matukia, Gafal, Rotret and Mafuri) and four associated waste rock dumps ("WRD")
- Run of mine ("ROM") and low grade stockpiles
- Beneficiation plant, comprising:
  - crushing;
  - stockpiling;
  - ore reclamation;
  - scrubbing / grinding;
  - rougher / scavenger magnetic separation;
  - rougher / scavenger concentrate regrind;
  - cleaner and recleaner magnetic separation;
  - concentrate thickening and filtration;
  - tailings thickening;
  - reagent storage and use; and

[6] *It should be noted that references to concentrate production rates refer to dry metric tonnes. The moisture content of the product may range between 8-10%, which will increase the actual tonnage of concentrate produced, transported and exported accordingly (wet metric tonnes).*

  - supporting utilities.

- Tailings storage facility ("TSF")
- Power generation and distribution facilities
- Water supply facilities
- Stormwater management facilities
- Waste water management systems
- Communications systems
- Accommodation
- Medical and emergency services
- Utilities (potable water supply, fire water system, air compressor systems)
- Mobile equipment (vehicles etc.)
- Buildings for storage, offices, workshop, laboratory, etc.
- A rail spur and head, connecting to the existing Pepel railway line
- Use of existing road routes for transport of supplies to the mine (including the existing Makeni Highway, connecting Freetown to Lunsar) and some new on-site roads to connect Project infrastructure

The design, construction, operation and closure of the Project components are described in the following sub-sections. For some components, such as power and water supply, alternative options and their social or environmental implications were evaluated. These are described together with the decision-making rationale. Where relevant, inherent design measures to protect the bio-physical or social environmental have been highlighted; these measures are assumed to be in place when evaluating the initial Project impacts in Chapters 7, 8 and 9.

4.1 Construction

The facilities at the mine site for Stage 1 will be constructed over an 18 month period. Once Stage 1 is in operation construction of Stage 2 will commence, and will continue for a further 18 to 24 months. The total construction period for the Project will therefore be approximately 3 to 3½ years. This section outlines the activities occurring during or just prior to construction, which may impact upon the bio-physical or social environment.

4.1.1 Land acquisition and resettlement

The resettlement and compensation process will be undertaken in adherence with the legislative requirements in Sierra Leone and the international guidelines. The objective will be to ensure that the standard of living and livelihoods of Project affected people ("PAPs") are either improved, or at least restored to pre-resettlement levels.

The approach to the resettlement process will involve establishment of a Resettlement Working Group ("RWG") to facilitate the consultation process and negotiations and establishment of a Grievance Committee. The planning phase of the resettlement process will include a census and assets survey to provide the baseline profile of each affected household, and a valuation survey to establish the market value and cost of production for the main local crops and buildings. Following this, an entitlement framework for the PAPs will be prepared and signed off by the RWG and relevant government agencies. Once agreed with the PAPs, a moratorium will be declared that restricts the construction of new buildings/structures in the Project displacement areas. The implementation phase of

resettlement will include the following activities:

- Construction of resettlement sites in preparation for physical relocation of PAPs;
- Initiation of income restoration and sustainable development initiatives to restore or improve the standard of living of PAPs; and
- Concurrent monitoring and evaluation to determine the standard of living of PAPs relative to pre-resettlement levels.

4.1.2 Construction camp and laydown area

During the construction phase, contractors will provide temporary facilities to house construction personnel. It is expected that this will be separate from MIOL's accommodation camp. The location of this camp has not yet been determined. The decision regarding a location will be driven by Project requirements (proximity to construction sites) but will take cognisance of the local communities in the area. The camp will be powered from diesel generators, water will come from the mine site's potable water system (though a temporary treatment system may be required until such time as the full system is in place) and waste disposal will be via suitable package sewage treatment works with a discharge of treated effluent to a soakaway or evaporation basin.

A fenced and secured construction laydown area will be built in proximity to the camp or construction site to store construction materials. This will mainly comprise a compacted earth base, however if hazardous material (for example fuels, oils, lubricants, paints etc.) storage is required this will be within suitable constructed containment facilities (with impermeable bases and roofs as required).

4.1.3 Land clearance and infrastructure development

Initial construction activities include land clearance, site grading for temporary material laydown areas, permanent structure foundations, roadway development and storm water management ponds. This will be followed by construction of the infrastructure. In addition to infrastructure footprint areas and mine pre-stripping, land will be cleared to provide access to borrow pits. At this stage the location of the borrow pits is not known but wherever possible these will be located within the footprints of areas to be disturbed.

Construction equipment will include rock crushers, concrete mixer trucks, concrete pumper trucks, mobile cranes, container handler, forklifts, excavators, loaders, dozers, graders, water trucks, and pick-up trucks.

Most construction activities take place within the Project component footprints but some existing (non-Project) linear infrastructure will be affected during construction as listed below. In these cases, MIOL will interact with the operator of the relevant infrastructure to minimise disturbance during the construction period.

- The haul roads between the pits and the beneficiation plant cross the national road to Freetown. At these locations the haul road will be constructed in a culvert under the national road.
- The pipeline from the beneficiation plant to the TSF crosses the existing rail way line. This will also be constructed in a culvert under the railway line.
- The new MIOL rail spur will need to link into the existing rail line to Pepel port.

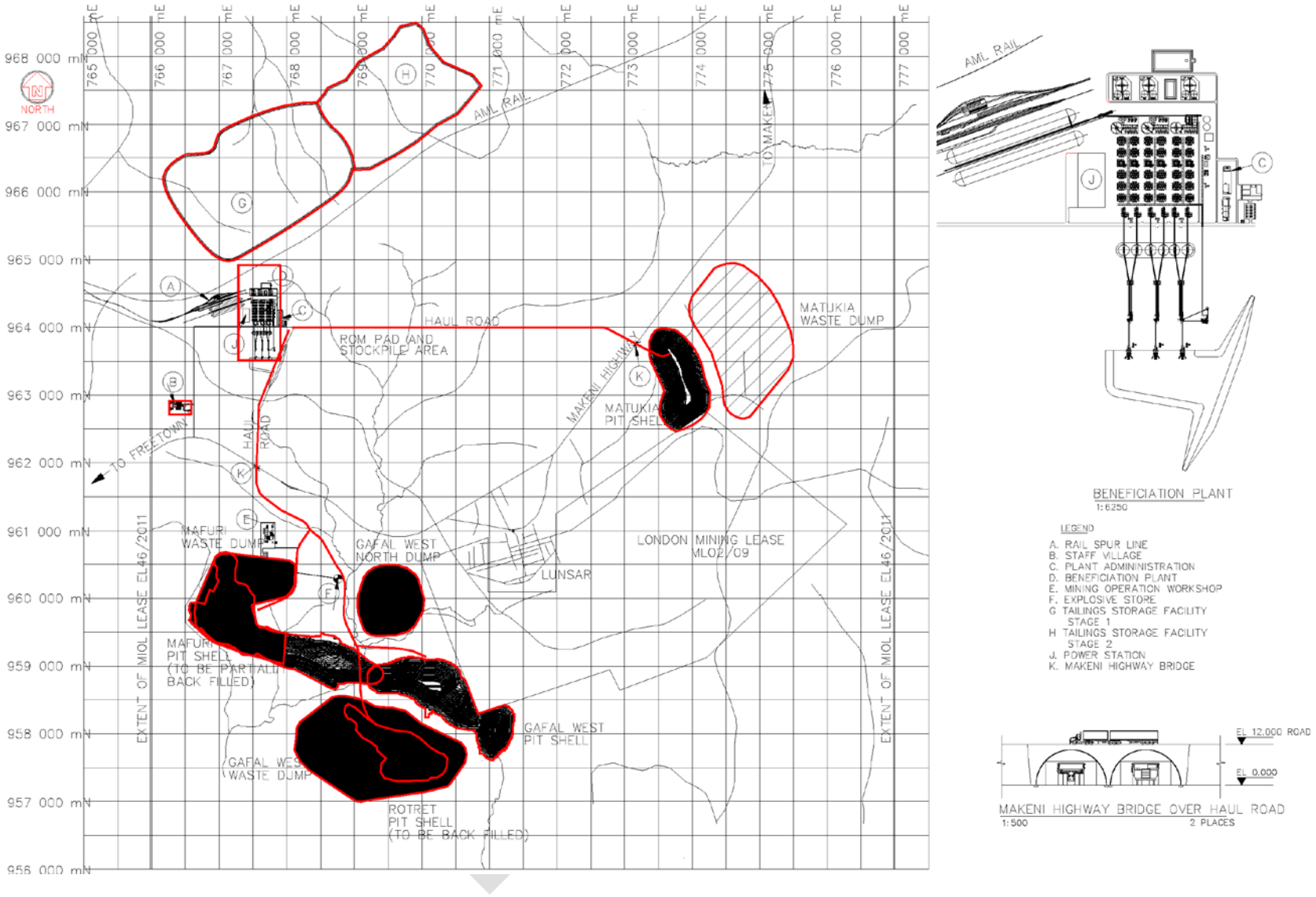


Figure 4.1: Overall site layout plan for the Project, with additional detail on the beneficiation plant and road crossing

4.1.4 Construction management

The construction activities will be managed by an Engineering, Procurement and Construction Management ("EPCM") contractor. The EPCM contractor will be managed by a small team of owner's construction personnel. The EPCM contractor will select and recommend main contracting companies for the various stages of the work including earthworks, concrete works, structural works, mechanical and piping works, electrical works and building works.

Due to the specialised nature and extent of the construction works, it is expected that the main contracting companies will be sourced from outside of Sierra Leone. It will be a requirement of the contracts, however, that the main contractors employ, or sub-contract to, Sierra Leoneans where possible.

It is expected that the construction labour force will peak at around 600 – 700 personnel, of which 30 – 70% could be locally sourced unskilled labour, depending on the type of construction work being conducted at the time (e.g. concrete works, earthworks, mechanical and electrical installations). Due to the specialist nature of the construction works, it is expected that the majority of the skilled workforce will come from outside of Sierra Leone. The Company will implement a policy, however, where-in the use of Sierra Leonean labour is maximised where-ever possible, with training provided to maximise opportunities for such staff to transfer to operational roles.

4.2 Mine site operation

4.2.1 Preliminary pit design

Four open pits have been designed to access ore bodies; Rotret Pit, Matukia Pit, Mafuri Pit and Gafal Pit. The main ore type at each location is a specular hematite schist, with minor amounts of magnetite and goethite. The Stage 1 development is based on the mining of shallow oxide ore, to produce nominally 2.5 Mtpa of concentrate. The Stage 2 development will continue with mining of any remaining oxide ore and mine fresh ore to produce up to 15 Mtpa of concentrate.

Provisional pit dimensions and ore and waste recovery volumes are presented in Table 4-1. The total mine life is approximately fourteen years.

Table 4-1: Preliminary Ore/Waste Volumes per Pit

Deposit	Ultimate Pit Length (m)	Ultimate Pit Width (m)	Pit Area (ha)**	Ore (kt)	Waste (kt)	Total (kt)
Gafal	2,200	800	150	151,541	181,721	333,263
Mafuri	2,700	800	200	177,933	199,904	377,838
Matukia	1,600	800	125	128,392	185,201	313,592
Rotret	1,500	500	75	55,246	45,366	100,612
Total			**550**	**513,112**	**612,192**	**1,125,305**

** Approximate area of disturbance in hectares

Average pit slopes will be 30 degrees, and slope heights vary between 20 and 55 m. The oxide ore will be mined from within 40-50m of the natural ground level with the ultimate pit shells expected to extend to depths varying from 150- 280 metres below ground level ("mbgl"), and crest elevations of 70 to 90 mRL (reduced level in meters with respect to mean sea level).. The average mine life for each pit is approximately ten to thirteen years, with the exception of Rotret, which has an expected mine life of six to seven years.

The pits will be bunded to prevent surface water inflow. Runoff from the area surrounding the pits will be diverted to stormwater settlement ponds (located close to each pit).

4.2.2 Preliminary production schedule

The provisional mining schedule is presented in Table 4-2. Mineral extraction is due to commence within 18 months with mining rates varying from 8-12 Mtpa. Total movements will increase from 12 to 66 Mtpa during Stage 1 and up to 110 Mtpa during Stage 2 (due to commence 18 months after the start of Stage 1), as production increases and deeper pit stages are developed. The four pits will be mined in sequence to prioritise recovery of oxide ore for staged processing and open up areas of ore for the expanded Stage 2 circuit. Cross sections showing the interpretive geology for each pit (showing the oxide and fresh ore proportions) are provided in Figure 4.2 to Figure 4.5.

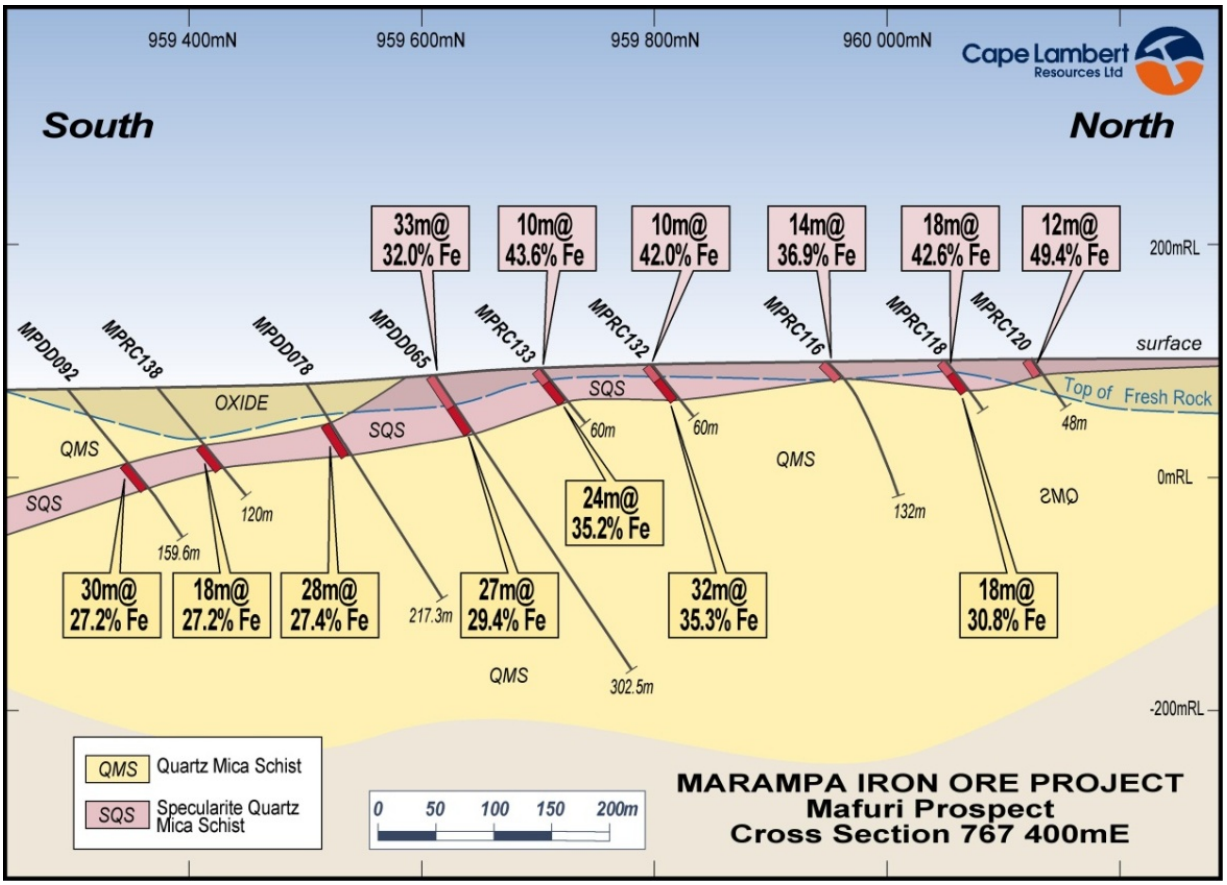


Figure 4.2: Mafuri prospect interpretive geology

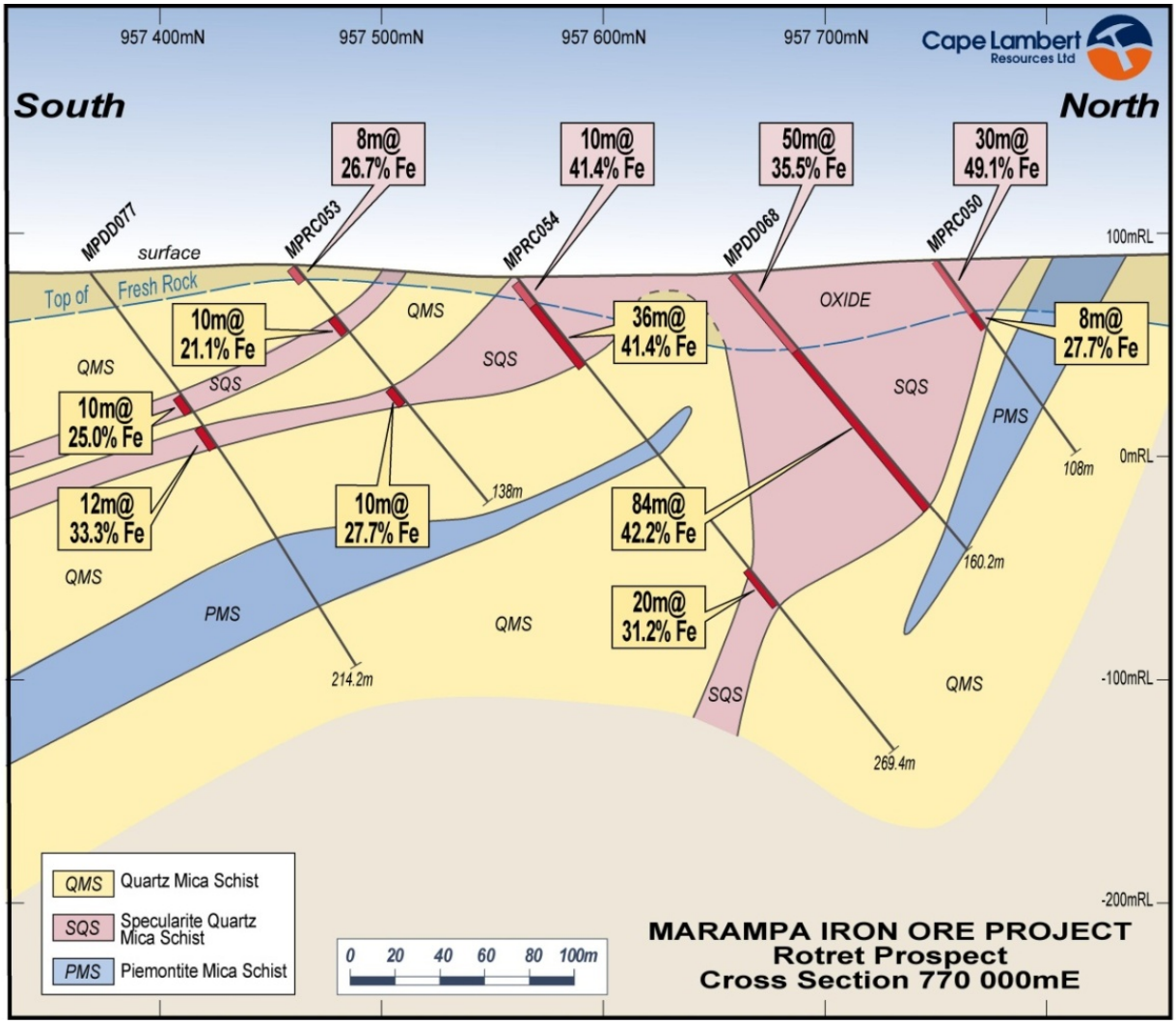


Figure 4.3: Rotret prospect interpretive geology

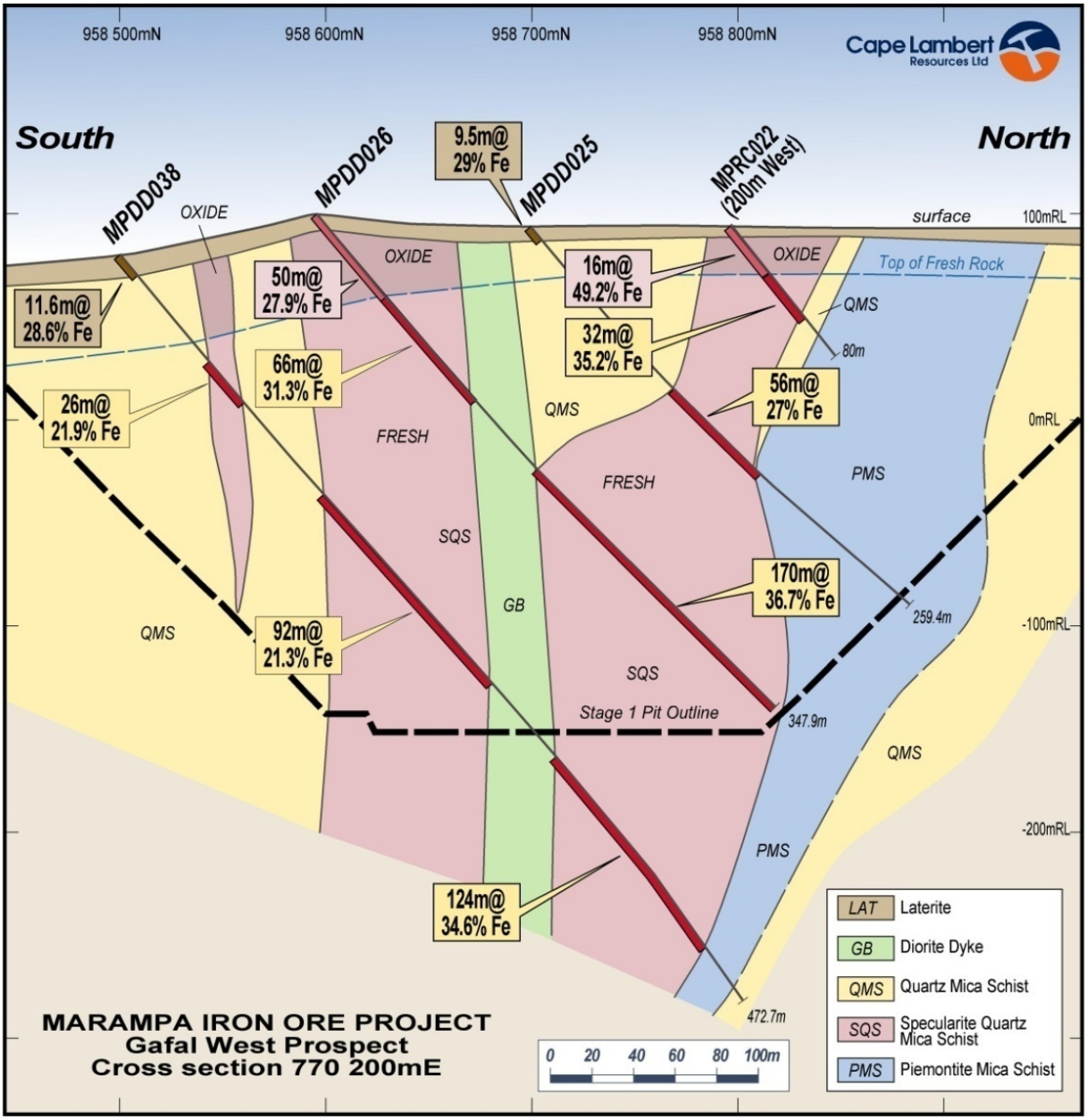


Figure 4.4: Gafal prospect interpretive geology

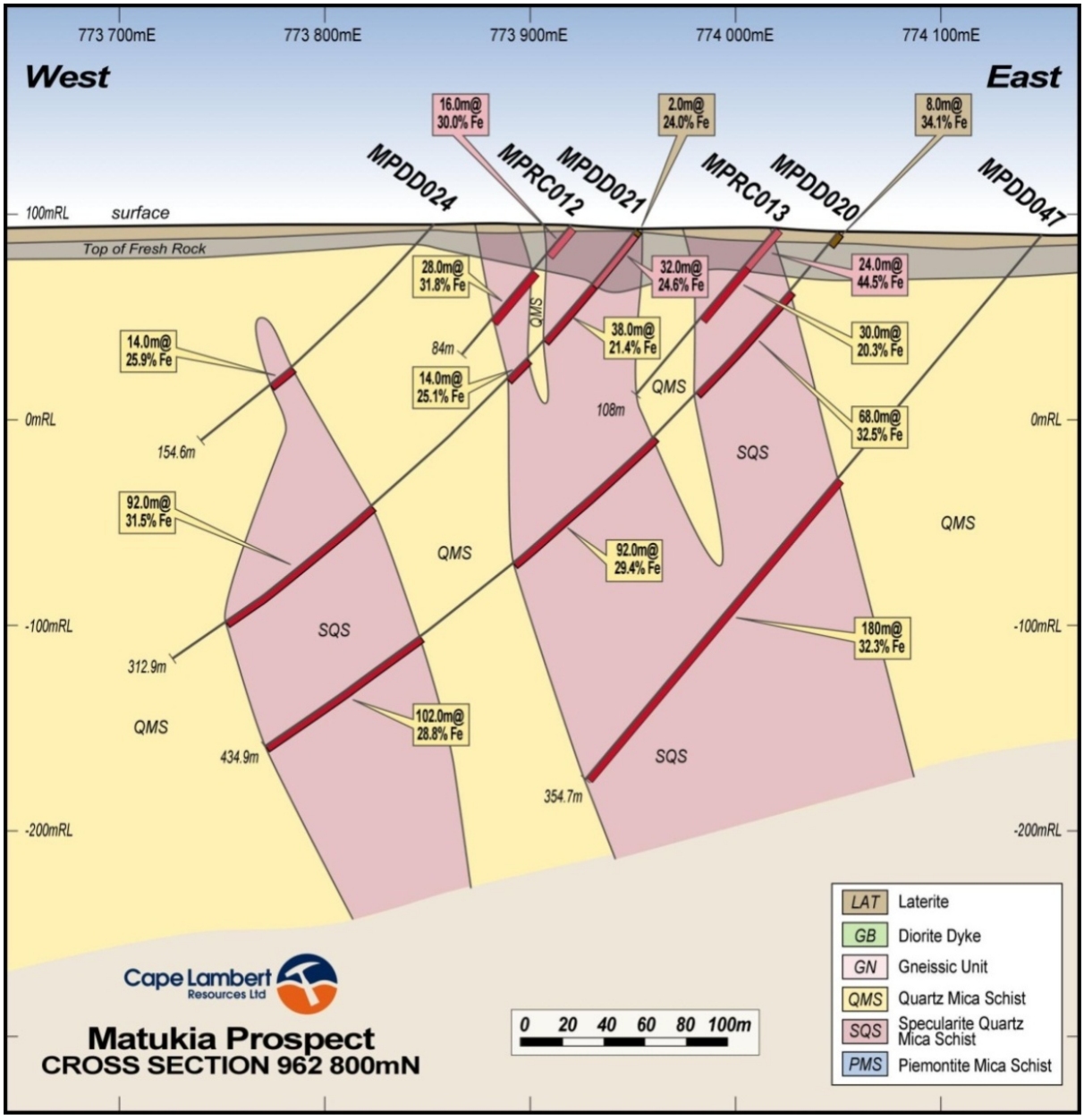


Figure 4.5: Matukia Prospect Interpretive Geology

Table 4-2: Indicative production schedule

Marampa Scoping Study Production Schedule, Jun'12

Ver.6b1: 15Mtpa Option

Annual Summary

Physicals Schedule

Physicals			Total	2015 Q4	2016 Q4	2017 Q4	2018 Q4	2019 Q4	2020 Q4	2021 Q4	2022 Q4	2023 Q4	2024 Q4	2025 Q4	2026 Q4	2027 Q4	2028 Q4	2029 Q4	2030 Q4	2031 Q4
Waste Mined		kT	677,928	484	3,190	23,761	23,400	22,736	63,856	67,990	60,851	56,373	56,033	54,431	61,746	60,056	61,354	55,886	5,781	
Ore Mined		kT	535,373	2,646	8,589	25,813	39,620	43,955	30,737	31,750	38,861	43,263	43,862	45,284	38,266	39,569	38,351	41,501	23,307	
Total Mined		kT	1,213,301	3,129	11,779	49,574	63,021	66,690	94,593	99,740	99,712	99,636	99,895	99,715	100,012	99,625	99,705	97,387	29,088	
Ore Stockpiled		kT	58,050	2,646	4,348	10,761	8,229	9,897	1,208		2,877	5,122	4,863	6,216	361			1,524		
Ore Reclaimed		kT	58,050		495	2,656	1,880	3,215	8,465	7,245	3,850	1,839	391	179	3,243	2,823	5,687		14,967	1,115
ROM Rehandle	25%	kT	107,967		947	3,542	6,654	7,455	7,599	7,799	7,967	7,996	7,878	7,850	8,230	8,478	8,808	7,995	7,655	1,115
Direct Feed	80%	kT	427,406		3,790	14,167	26,617	29,818	30,395	31,196	31,867	31,984	31,512	31,398	32,918	33,913	35,230	31,982	30,619	
Total Process Feed		kT	535,373		4,737	17,708	33,271	37,273	37,994	38,994	39,834	39,980	39,390	39,248	41,148	42,391	44,038	39,977	38,274	1,115
Oxide Processing		kT	44,985		4,737	7,720	11,073	13,247	6,318				653	852		386				
Non-Oxide Processing		kT	490,388			9,989	22,198	24,026	31,676	38,994	39,834	39,980	38,738	38,395	41,148	42,006	44,038	39,977	38,274	1,115
Total Processing		kT	535,373		4,737	17,708	33,271	37,273	37,994	38,994	39,834	39,980	39,390	39,248	41,148	42,391	44,038	39,977	38,274	1,115
		Fe%	27.2		36.0	33.2	30.6	28.3	27.8	27.2	26.7	26.6	26.9	27.0	25.9	25.3	24.4	26.6	27.6	27.6
		SiO2%	41.5		34.9	36.4	38.4	40.5	40.7	40.8	41.3	41.4	41.3	41.8	42.9	44.0	45.1	42.1	41.0	41.0
		Al2O3%	5.8		5.5	6.0	5.9	6.2	6.2	5.8	6.1	5.9	5.7	5.6	5.8	5.8	5.9	5.3	5.0	5.0
		TiO2%	0.24		0.23	0.24	0.24	0.25	0.25	0.23	0.24	0.24	0.23	0.23	0.23	0.24	0.24	0.22	0.21	0.21
		LOI%	2.58		2.24	2.29	2.54	2.80	2.91	2.98	2.92	2.85	2.74	2.63	2.47	2.27	2.00	2.37	2.42	2.42
		P%	0.13		0.04	0.06	0.08	0.10	0.11	0.12	0.12	0.14	0.14	0.14	0.16	0.17	0.19	0.16	0.14	0.14
		S%	0.00		0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concentrate Production																				
Oxide		kT	19,214		2,500	3,750	5,000	5,000	2,350				200	300		114				
Non-Oxide		kT	186,923			4,790	9,660	10,000	12,650	15,000	15,000	15,000	14,800	14,700	15,000	14,886	15,000	15,000	15,000	437
Total Concentrate		kT	206,137		2,500	8,540	14,660	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	437
Shipped Concentrate		kT			1,800	8,400	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	937
Concentrate Stocks		kT			700	840	500	500	500	500	500	500	500	500	500	500	500	500	500	

The development sequences for the deposits, over the full Project development, can be summarised as follows:

- Rotret pit development in four pit phases:
  - Oxide pit development in two phases, southern part first;
  - Deeper pit development in two pit phases, southern part first.
- Mafuri pit development in six pit phases:
  - Oxide pit development in two pit phases, first the wider area at west and then along strike to east;
  - Deeper pit development in four pit phases, first the wider area at the west, then the two pit phases along strike to east and final southern wall cutback along strike.
- Gafal pit development in six pit phases:
  - Oxide pit development in three pit phases from west to east (Gafal South last);
  - Deeper pit development in three pit phases from west to east (Gafal South last).
- Matukia pit development in three pit phases:
  - Oxide pit development as a single phase;
  - Deeper pit development in two pit phases along strike, first stage located centrally and second phase cutting final walls along strike.

Once the Rotret Pit and the third phase of the Mafuri Pit are complete, they will be backfilled with waste rock from further expansion of the Gafal Pit and an extension of the Mafuri Pit to the south-east. The Matukia Pit will be used to store 120 Mm^3 of tailings towards the end of the mine life.

Surface water management

Major drainage diversion works are required prior to and during the development of the Mafuri oxide pit and Mafuri expansion towards Gafal open pit, as the eventual pit is likely to totally cut across the Gafal stream. The proposed sequence of mining and backfilling of pits (filling approximately 50% of the pit areas with waste and tailings material, reducing the area required for the WRD) listed below will determine the timing for the various components of the drainage diversion works required.

- Development of the western part of the Mafuri pit first, making it available for waste backfilling (from the development of eastern pit areas) after year 5;
- Completion of Matukia pit by year 9, making it available for tailings storage for the rest of mine life;
- Completion of Rotret pit by year 10, making it available for waste backfilling from the later pit phases in the Gafal West and Mafuri East areas; and
- Completion of the Mafuri eastern and Gafal western pit boundaries (adjoining) last to delay the Mafuri East stream diversion towards the end of mine life.

There are no major drainage routes crossing through the Gafal and Rotret open pits as they are located mostly at higher ground. Significant flows are not expected through the two streams crossing the Matukia pit as the catchment areas feeding these streams are small. Major drainage works are however required for the development of Mafuri pit in phases, preliminary plans for which are summarised below and depicted in Figure 4.6 to Figure 4.8.

Further detail on the water management plan for the mine will be developed during feasibility studies.

- A drainage channel (5 m width) will be required to divert the Mafuri West stream before the start of mining Mafuri oxide pits (year 2). With the exception of a 200 m section cutting through a hill, the drainage channel to the west of the pit boundary will be generally shallow. Some sections of the channel will require bunding to divert the water from the pit. The material excavated for construction of the channel (50 000 bcm) will be used to construct this bund.
- Excavation of a major drainage channel (maximum depth 10-12 m and length 600 m) at the north of the Mafuri pit to divert the water from the Mafuri East stream before the development of last phases of Mafuri and Gafal pits (~ year 8).
- As the channel excavation at the north of Mafuri is completed, mining and waste backfilling of the Mafuri pit in the central area will be finalised to allow diverted water to cross the Mafuri pit. Suitable materials and construction methods will be used to seal the channel over the waste backfill.
- After the construction of the channels listed above (~year 8), the water flow in the main Mafuri West stream will be diverted by means of a bund. This will cause damming to approximately 3-4m depth in the lower catchment as the water level rises and flows through the newly excavated channel further north.

The expected layout at the end of Stage 2 mining is shown in Figure 4.8.

4.2.3 Mining operations

Conventional open pit mining methods including drilling, blasting, loading and hauling will be used. Ore will be transported from the pits via haul truck and taken directly to the beneficiation plant area, located approximately 6 km from the pits. Mining will be conducted on a 24 hour basis, with three crews working two 12 hour shifts.

The waste to ore strip ratio is expected to be 1.2 over the life of mine and approximately 0.4 when mining the oxide material (Stage 1). Where possible, waste material mined will be used for the construction of access and haul roads, as well as for construction of the embankment for the tailings storage facility.

Haul roads will generally be constructed to a width of 18 m. Underpasses will be required at the Makeni Highway in two locations, one to the west of Lunsar and the other to the east of Lunsar (see locations on Figure 4.1). The haul roads will be designed to achieve a haulage level a few meters above the maximum standing water level.

Blasting activity during the mining of oxide material will be minimal, with the rate of activity increasing as the mining of fresh ore (Stage 2) commences and would generally occur during the day time only. Blasting is likely to utilise ammonium nitrate-fuel oil (ANFO) as a bulk explosive and non-electric surface and down hole delays. Each hole will be stemmed prior to blasting.

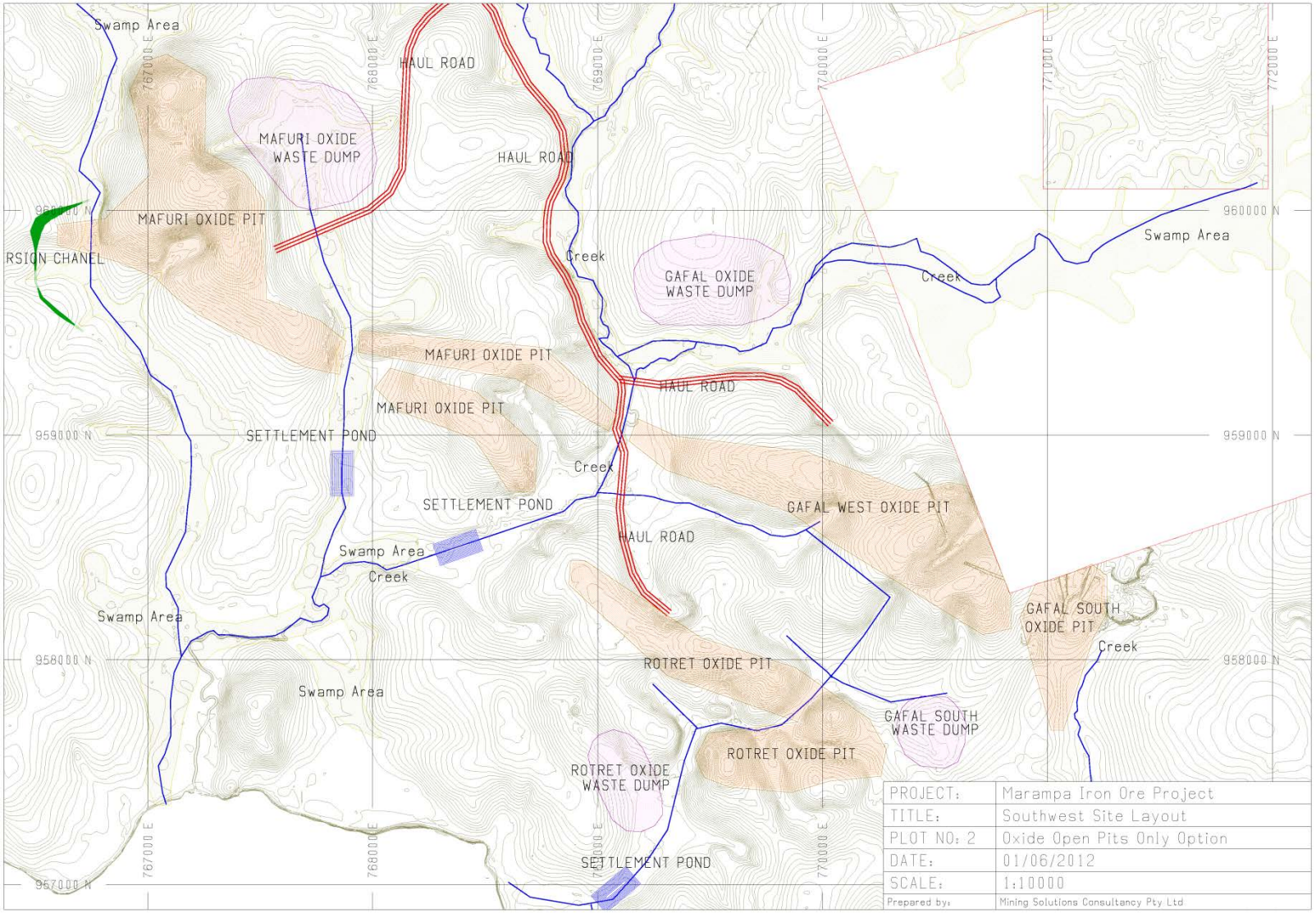


Figure 4.6: Layout for Stage 1 mining, showing preliminary surface water management design

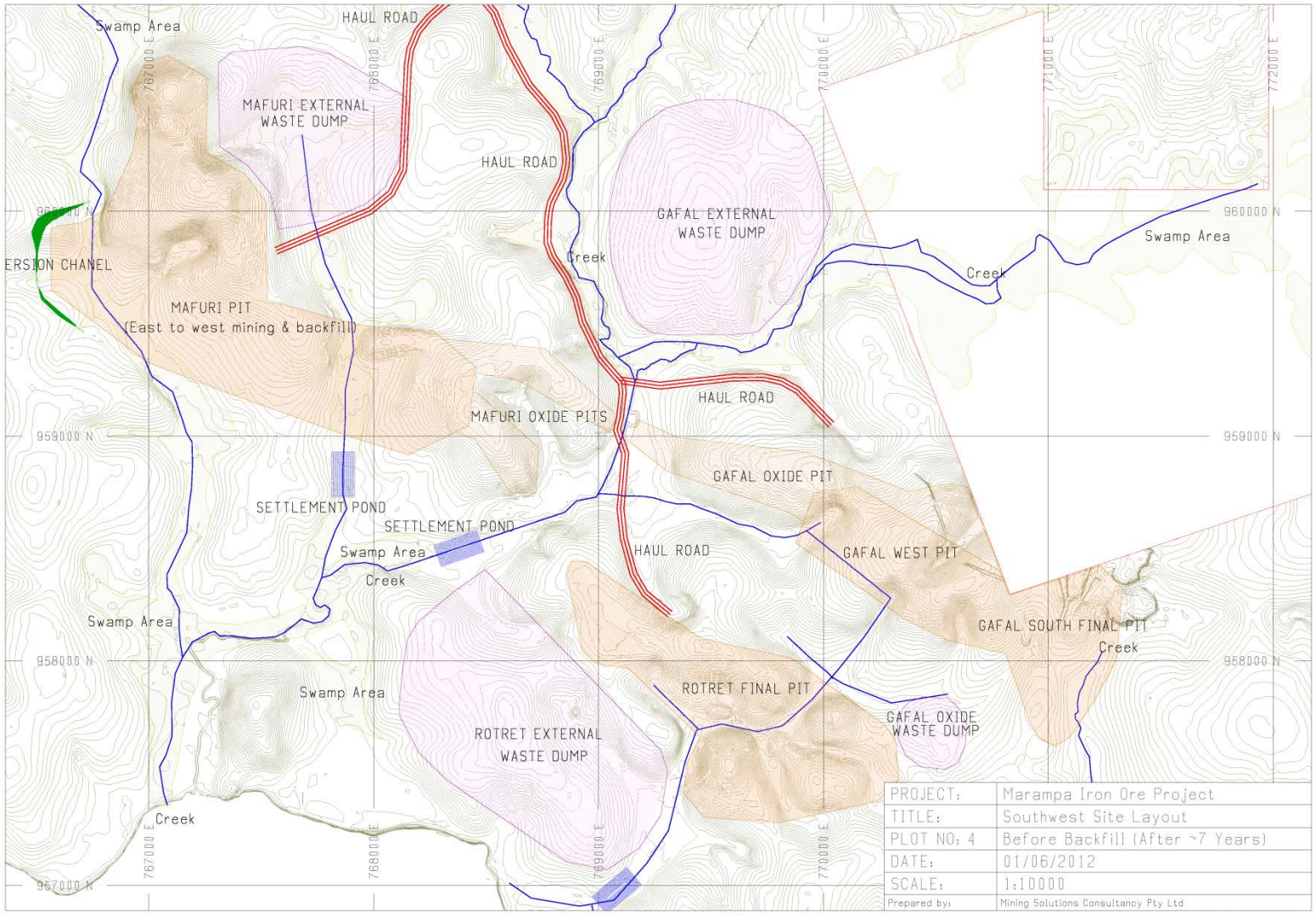


Figure 4.7: Layout for Stage 2 mining, showing preliminary surface water management design

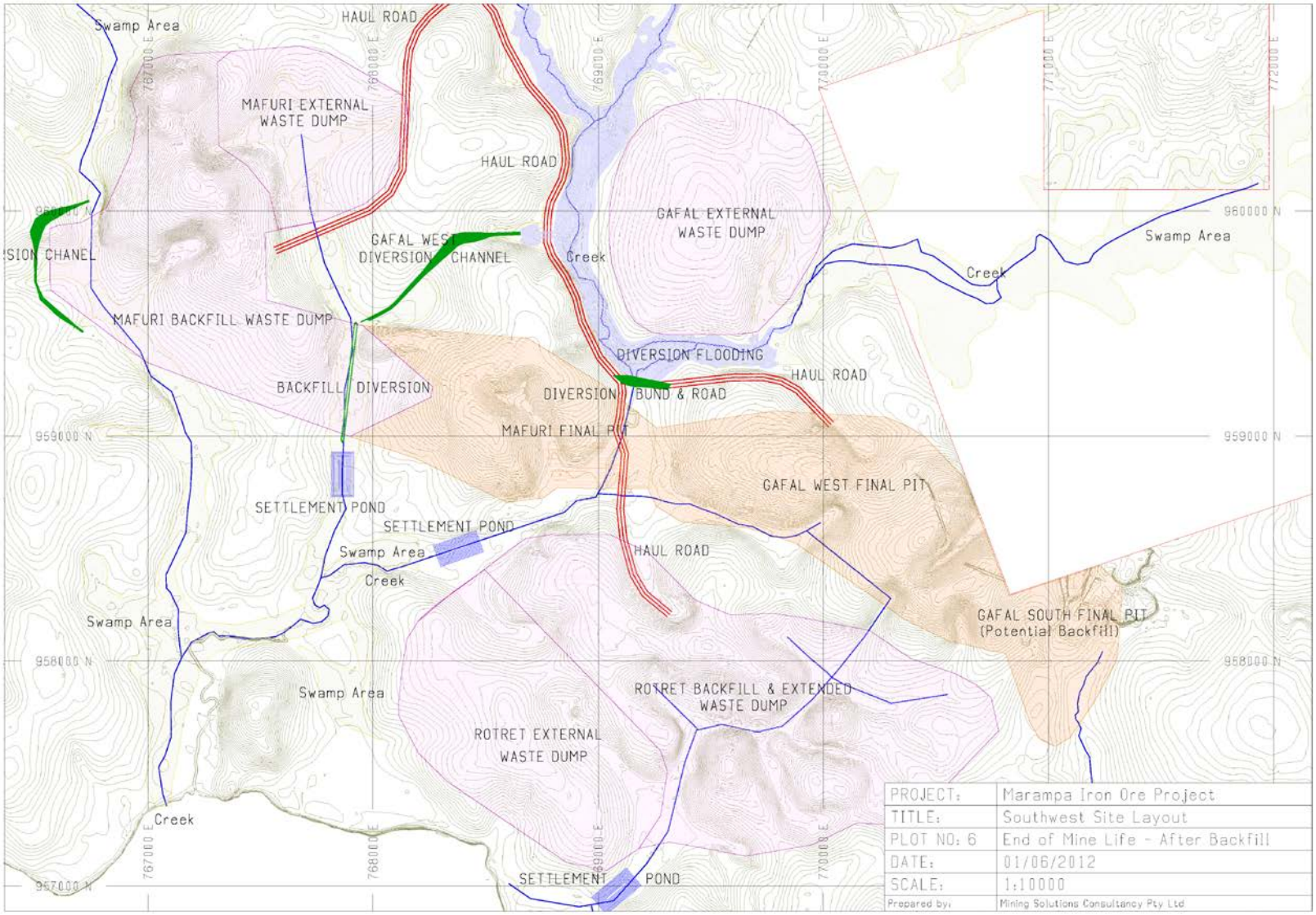


Figure 4.8: Layout at end of mine, showing backfilled pits and preliminary surface water management design

Preliminary hydrological and hydrogeological studies indicate major dewatering operations will be necessary to manage the combination of rainfall runoff and groundwater inflow. Dewatering requirements, based on seasonal conditions, will range from less than 10,000m^3/d to greater than 40,000m^3/d at maximum pit development. Dewatering is likely to be achieved through a combination of groundwater abstraction ahead of mining, and in-pit sump dewatering. The excess water will pumped to settlement ponds before release to the natural water courses that drain to the Rokel River with a proportion directed to the TSF during the dry season.

4.2.4 Mining equipment

The preliminary estimates of the mining equipment required for the production schedule is provided in Table 4-3. The numbers may vary slightly over the mine life depending on the ore and waste haul distances. The truck requirements per excavator are relatively high due to the 6 km ore haulage to the plant site and generally low waste to ore ratios. Based on 300 mining days per year (assuming about 60 days lost due to high rainfall), it is estimated that up to about 85 kt ore would need to be transported per day from the pit to the beneficiation plant (requiring approximately 350 movements in a 240 tonne truck), and 120 kt rock waste per day (requiring approximately 500 truck movements between the pits and the waste rock dumps).

Table 4-3: Mining equipment

Mine development Stage	Stage 1	Stage 2
Liebherr R984C Excavator	2	2
Caterpillar 777D/F D/Truck	12	16
Liebherr R995 Excavator		6
Caterpillar 793 D D/Truck		48
Cat D10T Dozer	2	8
Cat 16M Grader	1	6
Cat 773D WT Water truck	2	6
Caterpillar 992 FEL	1	2
Tamrock Drill	1	2
Reedrill SKSS Drill	2	8

The workshop for servicing the mining equipment will be located to the north of Mafuri Pit (location shown on Figure 4.1) and include 5 maintenance bays and a washdown bay. If the wash down only involves the removal of external dirt and dust, a sedimentation process will be used to reduce the total suspended solids content before discharging the waste water. If machinery, engines, engine parts and other equipment are being cleaned, then the washdown bay will drain through an appropriate filtration system consisting of a holding tank and oil/water separator.

Hazardous materials (reactive, flammable, corrosive and toxic) will be stored in clearly labelled containers (in a designated storage area) and vehicles. Storage and handling of hazardous materials will be in accordance with local regulations, and appropriate to their hazard characteristics. Fire prevention and secondary containment will be provided for the workshop and storage facilities.

4.2.5 Explosives storage

The daily bulk explosive requirement for the mining operations will be minimal during the

Stage 1 mining operation. For Stage 2 it will vary between 25-40 tonnes per day, depending on the depth of the pits and strength of the rocks mined. Approximately two weeks supply of bulk explosives will be stockpiled at the site in a purpose built shed, the location of which is indicated close to the Gafal waste dump on Figure 4.1. The shed will be designed, structured, ventilated and secured based on Australian standards (AS 2187) or other acceptable international standards. It is expected that approximately 1-2 bulk explosives trucks will arrive to site daily for 4-5 days of the week, with detonating explosives and other accessories transported every 1-2 weeks,

A steel container transportable explosives magazine, built to industry standards, will be located away from other installations and critical infrastructure. The magazine will be secured for access to authorised personnel only, ventilated sufficiently, provided with adequate lighting and electrical wiring in compliance with regulations.

The detonators and explosives for the site will be transported separately in containers and vehicles built to appropriate standards. Licensed professionals and equipment and a sufficient level of security personnel and equipment will be employed during the transport of the explosives. The explosives at the site will be handled by the licensed shot firers and appropriate equipment will be used in transportation and installation before the blasts.

The explosive storage areas will be located and drained adequately to prevent any flooding. The explosives magazine will be effectively earthed against lightning. The explosive structures will be marked clearly in the site plans, and the facilities and equipment will be clearly signed for identification.

4.2.6 Waste rock dumps

Excavated waste rock over the life of the mine is estimated to total approximately 612 Mt (Table 4-1), and will initially be transported via haul trucks to four WRDs, one adjacent to each pit. The exact configuration of the WRDs will depend on the final pit outlines, though the dumps are currently anticipated to have an average height of between 15 and 20 m above natural topography during Stage 1, increasing to 50 m in height by the end of mine life. In addition to the external waste dumps, a total of approximately 200 ha of earlier mined out pits will be backfilled progressively with the waste mined from later pit stages.

The approximate areas of disturbance for each of the final waste dumps are as follows:

- 100 ha Gafal waste dump
- 100 ha Mafuri waste dump
- 350 ha Matukia waste dump
- 250 ha Rotret and Gafal waste dump
- 800 ha Total area required for external waste dumps

During Stage 1, a relatively large amount of laterite low grade ore will need to be stockpiled. This stockpiled laterite material will be reclaimed during the Stage 2 operation and blended to make up 10% of the process plant feed. It is proposed that the ROM and long-term stockpile area will be used for this purpose. The preliminary estimate of area requirement for the ROM pad and long term ore stockpiles is approximately 100 ha.

The waste dumps will be constructed in 20 m lifts as the final face slopes are formed progressively as each lift reach the area limits. The waste dump face slopes will be less than 20 degrees with 10 m wide berms located between 10-20 m vertical intervals to prevent erosion from high rainfalls. The overall slope of the waste dumps will be 16-18 degrees.

Any waste that might be an environmental concern and any oxide waste that might be a stability concern will be dumped internally within the dumps and covered with neutral waste to protect against weathering. Geochemical investigations have been completed on expected waste rock samples from the four pits, as well as the expected ore, concentrate and tailings materials and reveal low potential for acid generation. Leaching of metals from the waste rock is also unlikely (although further geochemical assessment will be conducted to confirm this).

Drainage channels will be constructed around the waste dump areas and through the waste dump slopes, as necessary, to direct the surface water flow to the settlement ponds. The settled water in the ponds will be released to environment with regular water quality tests performed to monitor the quality of the discharge. If the water in the pond exceeds the agreed water quality standards, it will be contained until it complies or redirected to the TSF.

4.2.7 Topsoil

Topsoil recovered from the pit and waste dump areas will be stored separately and used for the rehabilitation of the waste dump surfaces and other structures.

4.3 Processing

The beneficiation plant will consist of facilities and areas for crushing, stockpiling, ore reclamation, grinding, wet high intensity magnetic separation (including roughing and scavenging, regrinding, cleaning and recleaning), concentrate thickening and filtration, tailings thickening and utilities, and reagent storage. The general arrangement of the beneficiation plant (showing the components for Stage 1 and the additional components for the Stage 2 expansion) is shown on Figure 4.10[7]. The TSF and rail loading spur will be located close to the beneficiation plant (Figure 4.1).

4.3.1 Stage 1 Beneficiation Plant

During Stage 1, processing will treat oxide ore only to nominally produce 2.5 Mtpa of iron ore concentrate, although the actual production output will be matched to the tonnage of sales in place at the time. The process flowsheet for Stage 1 is shown schematically in Figure 4.9. Parts of the Stage 1 process plant will be constructed at a larger capacity, to facilitate the Stage 2 expansion. The Stage 1 process plant will include the following key components, shown on Figure 4.10:

- 5 Mtpa primary crushing module;
- 2.5 Mtpa wet scrubbing module;
- 2.5 Mtpa Wet High-Intensity Magnetic Separation (WHIMS) plant;
- 5 Mtpa concentrate thickener;
- 5 Mtpa tailings thickener;
- 2.5 Mtpa concentrate pressure filtration facility;
- 1,000,000 tonne linear product stockpile including stacking equipment; and
- A rail spur to connect to the Project to the existing Tonkolili to Pepel railway line.

Oxide ore will be hauled from the pits to the beneficiation plant and deposited by haul truck either directly into the primary crusher, or stockpiled on the ROM ore pad before being loaded by front end loader into the primary crusher. The primary crushing plant will consist of sizers

[7] *Note the pipeline to Tagrin port shown on this layout plan is not included in the scope of this ESIA*

(toothed rolls crushers) to reduce the ore to rocks of less than 250 mm. The ore will then be fed by conveyor to a rotary wet scrubber where it is further reduced in size to 850 µm. Scrubbed material will be pumped directly to the rougher magnets within the WHIMS circuit. Scrubber oversize material will be directed to a temporary stockpile and will be processed through the comminution circuit for the fresh ore, when it is installed in the Stage 2 beneficiation plant.

The scrubbed ore will be processed initially via three sequential stages of WHIMS including initially, two stages of roughers and a scavenger stage. The scavenger WHIMS units will be operated at higher field strength to maximize overall iron recovery. The non-magnetic fraction from the scavenger stage will be the final beneficiation plant tailings stream, which will be thickened prior to disposal to the TSF. The scavenger concentrate will be reground to a top size of 180 µm before recycling to the first stage rougher WHIMS unit to optimize iron recovery from the beneficiation plant.

The concentrates from both the rougher stages will be screened at 250µm, with the -250µm fraction reporting directly to the cleaner WHIMS units. The +250µm fraction will undergo regrinding in closed circuit with a 250µm screen before proceeding to the cleaner WHIMS magnets. The cleaner tails will be directed back to the rougher WHIMS, whilst the cleaner concentrate passes to the recleaner stage. The final concentrate product from the recleaner stage will have an iron grade of approximately 65% iron with low levels of deleterious elements. The recleaner tailings are returned to the cleaner magnetic separators.

All of the WHIMS magnetic separators require significant amounts of wash water to remove the magnetic fraction from the WHIMS magnet matrix. The concentrate fractions will be dewatered using hydrocyclones, and the cyclone overflow streams will be recycled within the plant as wash water.

The final concentrate is flocculated and thickened to approximately 65% solids via a conventional thickener and then pumped to three agitated slurry holding tanks of approximately 4,580m^3 each with surge capacity to store concentrate for approximately 20 hours of plant operation. The clear thickener overflow will be returned as wash water for the cleaner and recleaner magnetic stages. From the holding tanks, thickened product will feed a pressure filtration plant for dewatering. The filter cake (with a moisture content of approximately 8%) will be stacked onto 1,000,000 tonne linear stockpiles adjacent to the rail siding. Front end loaders will recover the product from these stockpiles for loading into the rail cars, for transport to Pepel port.

Supernatant water from the TSF will be recovered and recycled within the beneficiation plant.

4.3.2 Stage 2 Beneficiation Plant expansion

During Stage 2, processing will continue to treat oxide and/or fresh ore to nominally produce up to 15 Mtpa of concentrate. The process flowsheet for the full Project (Stage 2) is shown schematically in Figure 4.9. The Stage 2 expansion will generally replicate the Stage 1 process plant modules, but will also add a secondary and tertiary crushing and screening plant to process the harder fresh ore material (Figure 4.10).

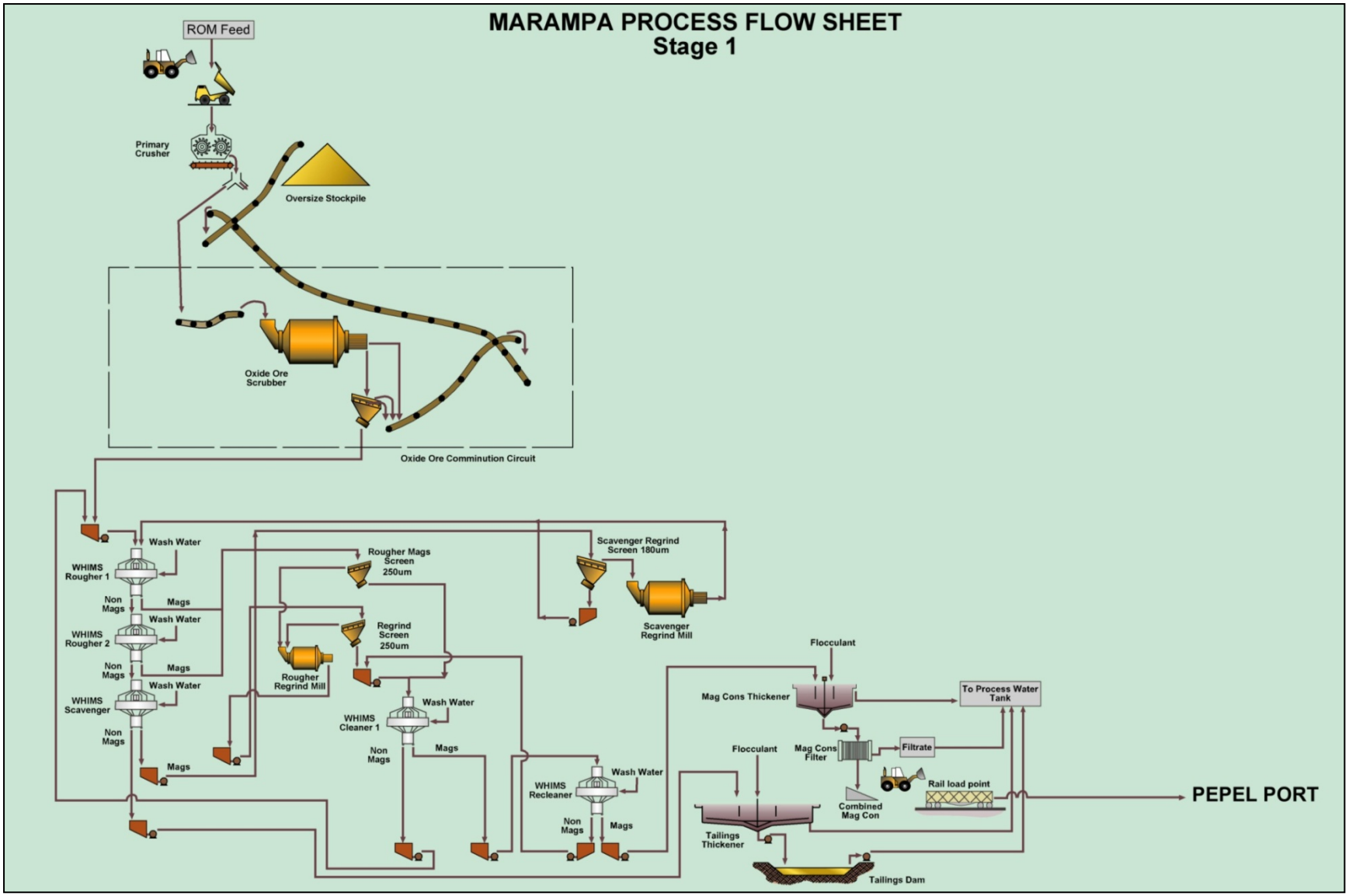


Figure 4.9: Schematic process flow diagram for Stage 1

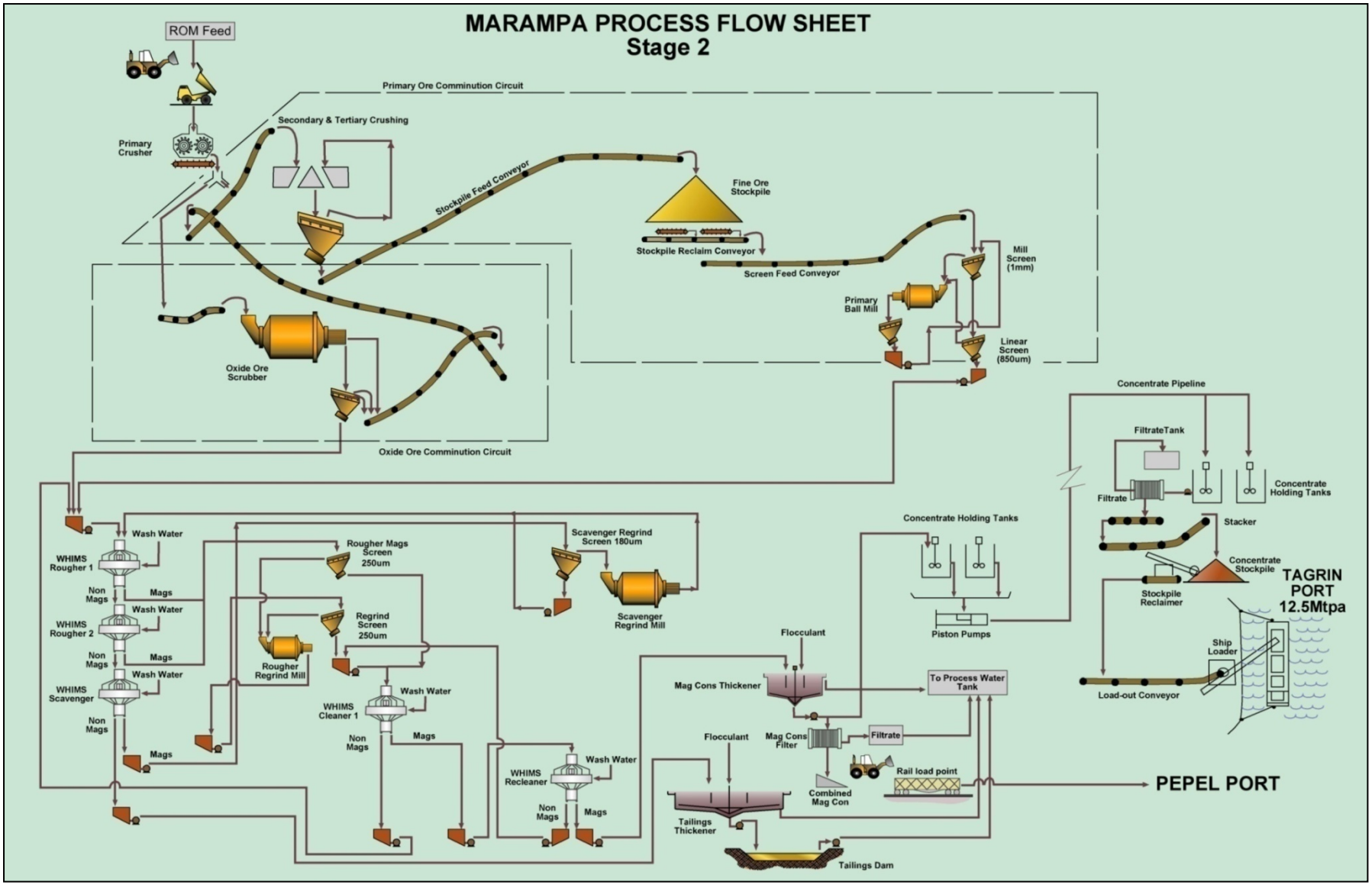


Figure 4.10: Schematic process flow diagram for Stage 2 (full development)

The expansion will add the following key components at the beneficiation plant:

- 2 x 5 Mtpa primary crushing modules;
- 1 x 2.5 Mtpa wet scrubbing module;
- 3 x 5Mtpa secondary / tertiary crushing and screening modules;
- 3 x fine ore stockpile stacking equipment and six fine ore stockpiles, including 6 x 2.5 Mtpa tunnel reclaim systems;
- 6 x 2.5Mtpa primary ball milling modules;
- 5 x 2.5 Mtpa WHIMS plant;
- 2 x 5 Mtpa concentrate thickener;
- 2 x 5 Mtpa tailings thickener;
- 2.5 Mtpa concentrate pressure filtration facility; and
- 4 x concentrate slurry storage tanks.

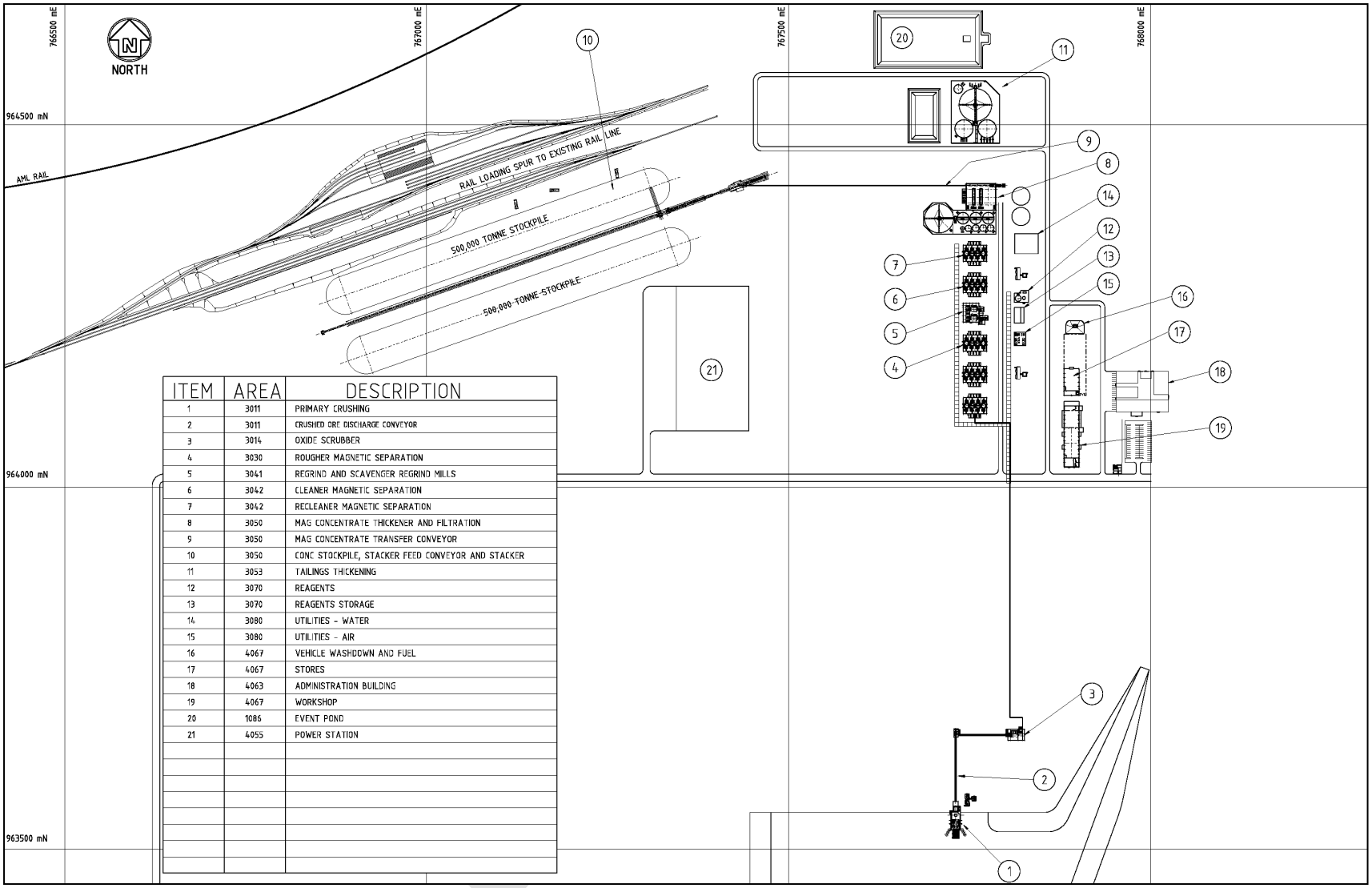
Oxide ore will continue to be processed as described in Section 4.3.1, but at an increased capacity of concentrate production. Fresh ore will be blended with a minor component of laterite ore and fed from the primary crusher directly to the secondary / tertiary crushing and screening plant. The crushed -10mm product from this plant will then be discharged to fine ore stockpiles for temporary storage. Tunnel reclaimers will recover the fine ore from the stockpiles and convey it to the primary ball milling circuits. The primary ball mills will operate in closed circuit with vibrating screens, creating a milled product finer than 850µm. This will then proceed to the rougher magnets in the WHIMS circuit. From here the two ore types are processed in the same way, following the description in the section above.

During Stage 2, 1.8 Mtpa (or up to 3.4 Mtpa) of concentrate will continue to be railed to and stored at Pepel, for subsequent export, while the remaining concentrate will be exported via the port of Tagrin.

The entire plant will be controlled using modern instrumentation including magnetic flowmeters, level sensors, density control systems (non-radio-active), automated valves, variable speed motors, etc. These units will be integral components to a computer operated, intelligent process logic control system, which will be managed by trained beneficiation plant operators from central Control Rooms situated within the plant.

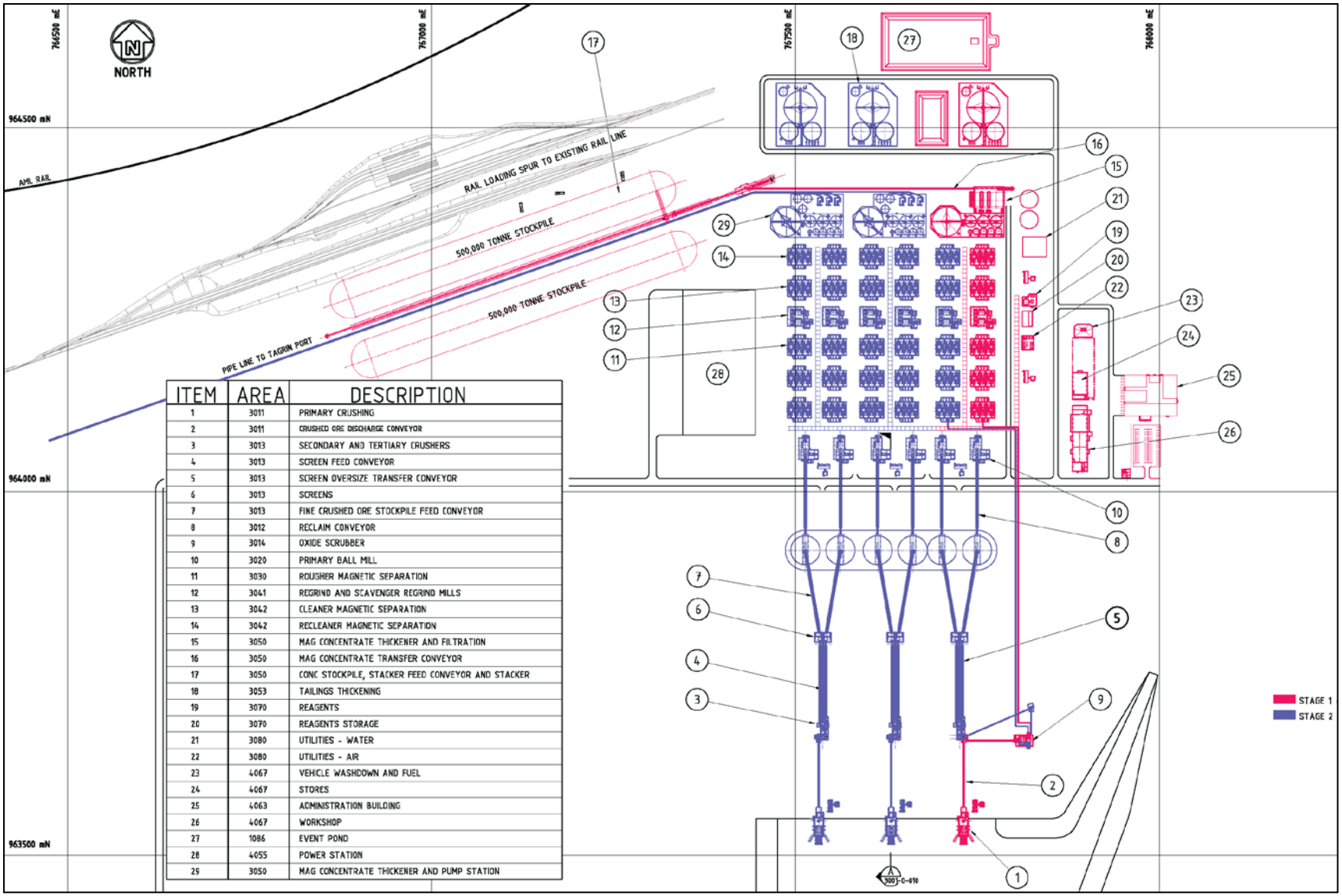
4.3.3 Reagents

As the processing circuit is largely based on physical separation techniques, few chemical reagents are required. The only reagent required is flocculant, which is used to thicken the concentrate and the tailings to accelerate the settling of fine solids out of the slurry. Other materials used in the process are described in Table 4-4. The reagents storage area at the beneficiation plant is shown on Figure 4.11 as item 13 and on Figure 4.12 as item 20.



ITEM	AREA	DESCRIPTION
1	3011	PRIMARY CRUSHING
2	3011	CRUSHED ORE DISCHARGE CONVEYOR
3	3014	OXIDE SCRUBBER
4	3030	ROUGHER MAGNETIC SEPARATION
5	3041	REGRIND AND SCAVENGER REGRIND MILLS
6	3042	CLEANER MAGNETIC SEPARATION
7	3042	RECLEANER MAGNETIC SEPARATION
8	3050	MAG CONCENTRATE THICKENER AND FILTRATION
9	3050	MAG CONCENTRATE TRANSFER CONVEYOR
10	3050	CONC STOCKPILE, STACKER FEED CONVEYOR AND STACKER
11	3053	TAILINGS THICKENING
12	3070	REAGENTS
13	3070	REAGENTS STORAGE
14	3080	UTILITIES - WATER
15	3080	UTILITIES - AIR
16	4067	VEHICLE WASHDOWN AND FUEL
17	4067	STORES
18	4063	ADMINISTRATION BUILDING
19	4067	WORKSHOP
20	1086	EVENT POND
21	4055	POWER STATION

Figure 4.11: Beneficiation plant layout for Stage 1



ITEM	AREA	DESCRIPTION
1	3011	PRIMARY CRUSHING
2	3011	CRUSHED ORE DISCHARGE CONVEYOR
3	3013	SECONDARY AND TERTIARY CRUSHERS
4	3013	SCREEN FEED CONVEYOR
5	3013	SCREEN OVERSIZE TRANSFER CONVEYOR
6	3013	SCREENS
7	3013	FINE CRUSHED ORE STOCKPILE FEED CONVEYOR
8	3012	RECLAIM CONVEYOR
9	3014	OXIDE SCRUBBER
10	3020	PRIMARY BALL MILL
11	3030	ROUGHER MAGNETIC SEPARATION
12	3041	REGRIND AND SCAVENGER REGRIND MILLS
13	3042	CLEANER MAGNETIC SEPARATION
14	3042	RECLEANER MAGNETIC SEPARATION
15	3050	MAG CONCENTRATE THICKENER AND FILTRATION
16	3050	MAG CONCENTRATE TRANSFER CONVEYOR
17	3050	CONC STOCKPILE, STACKER FEED CONVEYOR AND STACKER
18	3053	TAILINGS THICKENING
19	3070	REAGENTS
20	3070	REAGENTS STORAGE
21	3080	UTILITIES - WATER
22	3080	UTILITIES - AIR
23	4067	VEHICLE WASHDOWN AND FUEL
24	4067	STORES
25	4063	ADMINISTRATION BUILDING
26	4067	WORKSHOP
27	1086	EVENT POND
28	4055	POWER STATION
29	3050	MAG CONCENTRATE THICKENER AND PUMP STATION

Figure 4.12: Beneficiation plant layout, showing Stage 2 expansion

Table 4-4: Reagents and other materials likely to be used in the beneficiation plant

Name	Use	Hazard rating*	Quantity used (t/a)	Containers
Flocculant Anionic type	Concentrate thickener– to accelerate solids settling	Non hazardous	20 grams per tonne of solids	1 Tonne Bulk Bags
Flocculant Anionic type	Tailings thickener – to accelerate solids settling process	Non hazardous	20 grams per tonne of solids	1 Tonne Bulk Bags
Equipment oil, coolants and hydraulic fluids	Mobile equipment and vehicles	Hazardous	TBD	200 L drums

* Classification is based on the United Nations (UN) Recommendations on the Transport of Dangerous Goods - Model Regulations (UN, 2009)

4.4 Tailings storage facility

A TSF will be constructed in two phases, as shown in Figure 4.1, and will store tailings for the first 12 years of the operation. Following this period, tailings will be stored within the mined out Matukia Pit.

4.4.1 Tailings and TSF decant water pipelines

Tailings material and TSF decant water will be transported to and from the TSF respectively via HDPE pipelines (1 km pipeline in each direction). The pipelines will be above ground, but buried under a protective soil mound, and if stream crossings are required these will be handled via bridges. No pump stations will be required along the pipelines

4.4.2 TSF design

A conventional multiple cell valley-type TSF will be constructed across three adjacent valleys north of the processing facilities (figures showing the proposed layout of the TSF and embankment wall construction can be found in Appendix E. The final configuration of the facility will cover 750 ha and will have the capacity to store approximately 200 Mt of tailings.

The facility will be constructed in stages, using perimeter embankments around the four sides of the facility along ridgelines. The starter embankments of the TSF will be constructed to a maximum height of 23 m, and will be raised by upstream construction techniques in stages (3 x 5m lifts) to a maximum embankment height of 38 m, with a nominal freeboard of 5 m. The facility will be unlined due to low permeability of in-situ bedrock.

Construction materials for the starter embankment will include clayey gravel sourced from borrow areas within the final TSF footprint. Borrow material from within and outside the footprint will also be used for upstream construction and mine waste may also be used during the later years of the facility life.

A decant system and under drainage will be constructed to recover supernatant water from consolidation of the tailings material. At start-up, the decant system will consist of temporary pumps (land based or floating pontoon mounted). After Year 3 a fixed pump decant within each TSF cell will be utilised for supernatant water recovery. The decant towers will comprise slotted pipes stacked vertically and surrounded by clean filter rock. The decant towers will be raised along with the perimeter embankments. Access to the decant facilities for light vehicles and maintenance equipment will be via a decant access way constructed from gravelly borrow materials or mine waste. Return water will be pumped back to the plant for re-use in the process.

An under drainage system will also be constructed to assist in the recovery of water, reduce the potential for seepage losses and to prevent embankment failure. The under drainage system will comprise a collection trench positioned upstream of the main embankments that will drain to pump sumps. Pumps deployed down an inclined borehole will allow recovery of water. The under drainage lines will typically comprise a shallow geotextile lined trench backfilled with coarse aggregate. At the top of the trench geotextile will be wrapped and stabilized with select rock. Water collected in the under drainage system will be pumped to the decant area and hence back to the plant for re-use in the process.

The TSF will be designed such that upslope catchment areas will be small to limit watershed (clean) run-off into the tailings area. Runoff will be by incident precipitation only. The facility will be designed to contain a 1 in 1000 average recurrence interval three-day precipitation event, whilst maintaining a freeboard of at least 0.3 m. As it is situated on an elevated area relative to its surroundings, stormwater flow will naturally be directed away from the TSF. Management of stormwater on the TSF will therefore not be required.

Table 4-5: TSF design criteria

Design component		**Criteria**
Throughput		22.8 Mtpa (max)
Solids content		60% (by weight)
Density		Dry density 1.5 t/m³
Seismic	Operating basis earthquake loading	0.06g (0.6 m/s^2)
	Post-closure maximum credible earthquake loading	0.1g (0.1 m/s²)
Hydrology	Embankment levels	Will contain design storm event while maintaining 0.3 m freeboard
	Design storm	1 in 1000 year return 3-day precipitation event

4.4.3 TSF operation

Tailings will be deposited using sub-aerial deposition techniques from multiple spigot locations located on the main and saddle embankments. At start-up, tailings deposition will be from the main (northern) embankment, which will lead to the formation of a beach up the valleys, moving in a south westerly direction. Temporary pumps for supernatant water recovery will move up the valleys as the tailings and water levels rise.

The location of tailings spigots will be changed as required to ensure tailings beaches slope towards the decant area and to direct the supernatant water pond away from the containment embankments and maintain it around the decant facilities. The pond will be minimized as far as practicable (while maintaining enough water to keep the tailings material moist and thereby prevent tailings dust generation) to reduce evaporation and maximise water return.

Once the TSF is fully operational, water volumes surplus to plant and site requirements will be removed from the TSF and discharged downstream via silt traps / constructed wetlands. Discharge of water will be required to maintain constructability of the proposed upstream embankment raising construction method and also embankment stability. Embankments, tailings delivery and deposition, and water recovery systems will be inspected frequently by an operator or shift supervisor (at least once per production shift) to limit operational problems. Groundwater quality and quantities will be monitored frequently and the design and operation of the TSF will be inspected by a qualified geotechnical engineer at least once per year.

As the TSF is situated on an elevated area relative to its surroundings, storm water flow will naturally be directed away from the TSF. Management of storm water on the TSF will therefore not be required. An emergency spillway will be installed as part of the TSF design to manage discharge, should this occur.

Geochemical characterisation of the tailings material (ARDML potential) has indicated that it is unlikely to generate acidity, but will also have limited buffering capacity. Net Acid Generation (NAG) test leachate analysis of tailings samples also revealed little potential for leaching of iron or trace metals from the metallurgical samples. For further detail refer to Marampa Iron Ore Project ARDML Baseline Assessment Report (SRK Consulting, 2011), included in SD 6 of Volume 3.

4.5 Power supply

Power will be supplied to the Project using HFO generators, which will be introduced in stages to match the staged development of the Project. A power station will be constructed close to the beneficiation plant and rail spur line (Figure 4.1) and will be sized in accordance with the details in Table 4-6.

Table 4-6: Power station capacity and requirements

Stage 1 (MW)		Stage 2 (MW)	
Demand	Installed	Demand	Installed
22	45	115	145

The average HFO consumption would be approximately 4 t/h, based on an average specific fuel consumption of 190 g/kWh. The HFO will be stored in steel tanks contained within a bunded facility. The tanks will be sized to provide 1 month of total storage capacity (3,000 m^3 for Stage 1 and 15,000 m^3 for Stage 2). HFO will be delivered to site by means or road tankers owned and operated by a third party supplier.

Power will be generated at a medium voltage of 11 kV and will be distributed to the various load centres at the same voltage. Each load centre will consist of a step down transformer(s) and Motor Control Centres (MCC's). The Low Voltage power supply will be reticulated at 550 V.

As the majority of the power usage will be within the beneficiation plant, the power plant will be located as close as possible to minimise the length of transmission lines, and hence maintenance, energy losses and probability of outages.

4.6 Water supply

To reduce the demand on local water sources, the majority of the water used in the process will be sourced from rainfall captured in the TSF. A preliminary water balance established for the Project, indicates that approximately 8,000m^3 of make-up water per day would only be required during the dry season. The maximum demand is estimated at approximately 1250 m^3/hr.

During the dry season the plant make-up water will be pumped from a newly constructed pumping station on the Rokel River, positioned to the south of the plant (exact location yet to be identified). Once the Project is operational, containment, controls and mine dewater input

will provide routine closed cycle use, with top-up from the river supply if and when required.

The pump station at the Rokel River will contain electric pumps that will pump water via a buried HDPE pipeline to the plant site. The water at the plant site will be stored in 2 steel tanks, each 5,000 m^3 capacity, from where it will be distributed.

Raw water will be clarified and filtered for use as potable water. Potable water will be distributed to the plant and to a header tank in the accommodation village.

Details of the proposed water storage facilities for the mine site are provided in Table 4-7. As indicated in Figure 4.13, four settlement ponds (one downstream of each open pit and WRD) are included to manage stormwater runoff. Additional ponds may be required at the beneficiation plant, long-term stockpile area and TSF, but the size and location of these ponds is yet to be confirmed.

Table 4-7: Water storage facilities

Facility	Location	Storage capacity	Structure	Water source(s)	Destination (and final use of water)
Raw water tank	Beneficiation plant	2 x 20,000m^3	Steel tanks	• Pumped from Rokel River	• Beneficiation plant • Potable water treatment system • Fire water system • Mine site fresh water tank
Process water tank	Beneficiation plant	2 x 20,000m^3	Steel tanks	• Raw water Tank • Thickener tank overflow • Reclaim water from tailings dewatering plant • Storm run-off from collection pond/s • Effluent from the sewage treatment plant • Reclaim from TSF	• Plant (process water)
Storm water settlement ponds	Mine pits and WRD; Beneficiation plant, stockpile area and TSF	50m x 200m; Designed to store 1:10 - year, 24-h storm event during operation	Excavated pond	• Storm water runoff (and pit dewatering water in the case of the pit, if required)	• Transferred to the process water tank • Evaporation • Possible discharge if quality suitable
Mine camp potable water tank	Mine camp	TBD	Steel tank	• Potable water treatment plant	• Accommodation camp
Mine site raw water tank/s	Mine area	TBD	Steel tanks	• Raw water tank	• Dust suppression

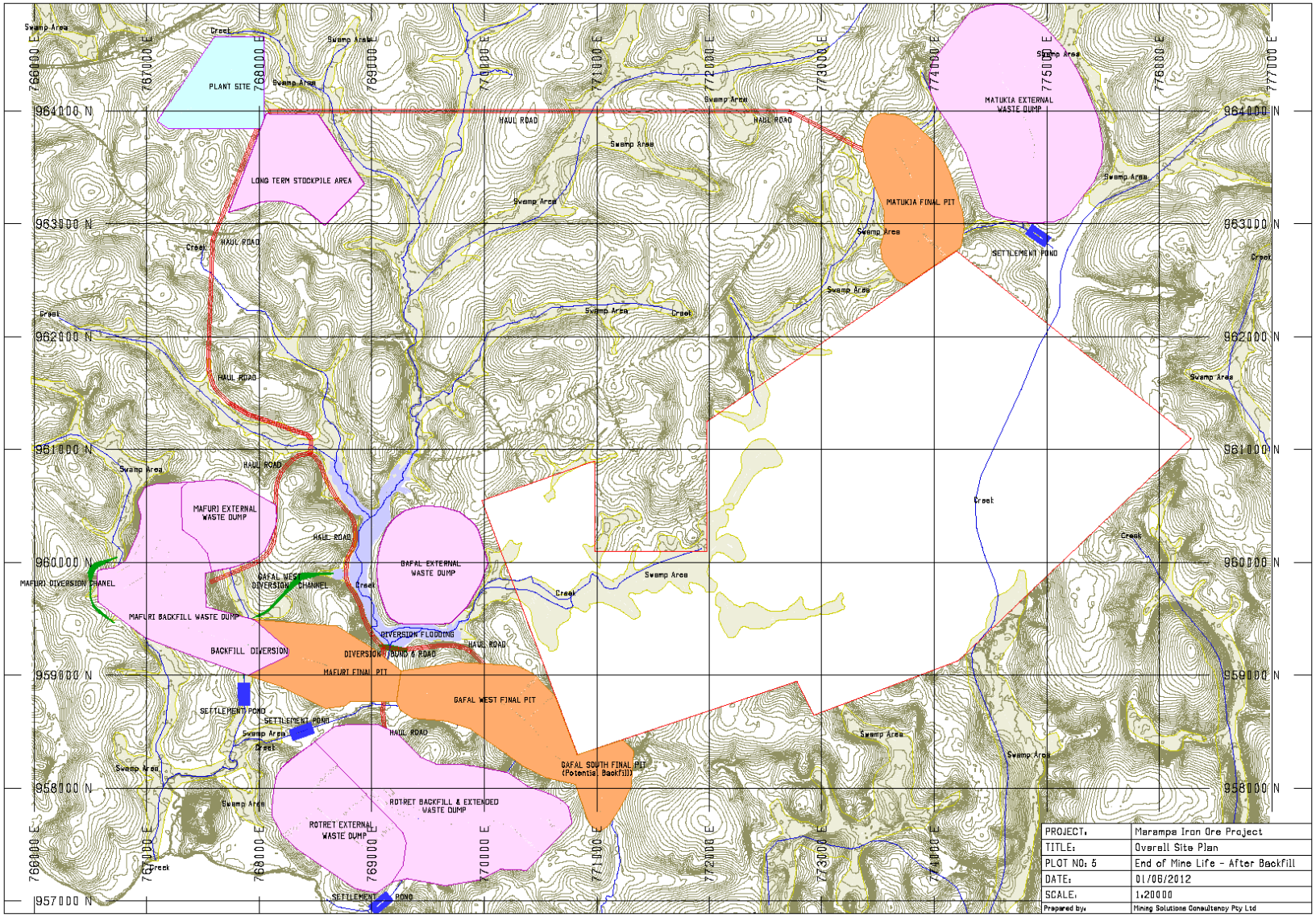


Figure 4.13: Site layout for end of mine showing locations of settlement ponds and water storage reservoir

4.7 Concentrate transport

4.7.1 Stage 1 development

During Stage 1, iron concentrate will be transported from the mine site to the Pepel port by way of an existing railway between Marampa and the port of Pepel. The railway and the port itself have been refurbished and placed back in to operation. Both facilities are owned and operated by African Railways and Port Services Ltd (ARPS), a subsidiary of AML. MIOL has an access agreement with AML for access to the rail and port facilities at Pepel.

Spur line

A 3.0 km spur line (shown in Figure 4.1 with additional detail in Figure 4.11) will be built to connect the Project with the existing railway at chainage 71 km (from Pepel Port). The line will be a single turnout from the main line. Incoming (empty) trains would pass directly through the junction along the spur line and on into the load out siding. A departure loop parallel to the spur line will be required to hold trains awaiting access to the mainline. A 'Points man' station will be required at the north end of the loop to control switching into and out of the main line as well as the switch from the departure loop.

Load out area

Returning empty trains will enter the load out siding head on. The locomotives will be decoupled from the wagons and will continue on a loop to re-join the wagons on the western end. The newly loaded train will leave the load-out area head on and will run to the departure loop prior to being released onto the main line. Switches in the siding area will be operated by manual levers.

The load out area, shown in Figure 4.11, will include an 850 m-long track and a loading apron of 10m width from which front end loaders will load the wagons. The loading apron will be constructed on a suitably compacted sub base. Two 500,000 T linear product stockpiles will located to the rear of the apron parallel to the track. The loaders will take material from the part of the stockpile nearest the wagon being loaded.

Rolling stock

The rolling stock for ore transport will be supplied by AML, as part of the rail and infrastructure agreement with MIOL.

4.7.2 Stage 2 development

During Stage 2, it is anticipated that product export as described for Stage 1 will continue, but that the additional 13.2 Mtpa iron ore concentrate will be pumped to Tagrin Port via pipelines. Details of the pumping system, dewatering and other activities associated with product export will be described in the future amendment of this ESIA document.

4.8 Other site infrastructure and services

4.8.1 Roads and freight

Site roads

Roads will be constructed to connect the various components of the operation. Two large haul roads will be required to transport ore from the Matukia Pit and the Rotret, Mafuri and

Gafal pits to the processing area. Each one of these haul roads will be approximately 6 km long and the routes are shown on Figure 4.13. Smaller roads will also be required at the beneficiation plant for light vehicles.

Two new road crossings will be required where the haul roads from the Gafal Pit and Matukia Pit will cross the Makeni Highway. In these areas the Makeni highway will pass over multi-plate arch culverts, through which the haul trucks will pass (see Figure 4.1 for the locations and design detail of these road crossings).

The roads will be constructed from Laterite, which is naturally occurring in the upper soil profile of the site. Preliminary investigations have confirmed the suitability of the in-situ material for road construction. Water trucks will be used to minimise dust on the haul roads during the dry season.

Freetown-Lunsar road

Inbound freight will travel from Freetown port to Lunsar via an existing sealed road (the Makeni Highway). Specialized equipment will be supplied by the freight forwarder and clearing agent to transport any oversized equipment to the site.

4.8.2 Storm water management

The high rainfall during the wet season will require effective drainage networks for process and accommodation facilities. A water management plan will be developed to provide a strategy for segregating two categories of water, defined either as impacted or non-impacted (clean) water. Impacted water refers to run-off that potentially has low pH (acidic) or contains elevated levels of naturally occurring metals or high sediment loads. Storm water settlement ponds will form part of the drainage network to collect this impacted water. They will be sized in accordance with EHS guidelines.

During normal operations, the sediment ponds will be cleaned out during the dry season, with the collected sediment placed on the waste dumps for long term storage.

4.8.3 Waste management

A waste management plan will be implemented that:

- Minimises waste generation by efficient use of resources;
- Reduces the volume of unavoidable waste through product selection, re-use and recycling;
- Contains and isolates waste from groundwater and surface water, and enables storage, treatment or collection of waste that does not result in long term impacts on the surrounding environment; and
- Minimises the environmental impacts of waste hydrocarbons and chemicals through appropriate storage, handling and disposal.

The types of wastes generated by the Project will include:

- General Waste:
  - Domestic waste (e.g. plastic, paper, workshop wastes and domestic solid and food wastes);
  - Construction and industrial waste (wood, scrap metal, tyres, rubber, lights, batteries);
  - Sewage.
- Hazardous Waste:

- Hydrocarbons (engine oils, lubricants etc.);
- Medical waste;
- Plant maintenance related chemicals (although only in small amounts).

Domestic and industrial waste will be disposed of in a dedicated landfill site built for the purpose. Containerised sewage treatment plants will be used to handle sanitary waste water, which will be installed at the beneficiation plant/office area, as well as the accommodation camp. During construction, the village plant units will serve the construction camp. The sewage treatment plants will be sized to accommodate the number of people working at the Project.

Hazardous materials and waste will be stored in accordance with international standards. Procedures will be prepared for the correct handling and storage of hazardous materials, including the disposal of hazardous waste. Hazardous waste will be removed from site by a licensed contractor for disposal in an approved facility, in accordance with the requirements of controlled waste regulations.

4.8.4 Communications

Initial site communications during the early phases of construction will be via satellite. During construction a mobile phone tower will be installed in a suitable position to enable coverage across the operational mining area including the accommodation village, mining area and beneficiation plant. Telephone and data network cables will service the site and accommodation village and will be buried.

4.8.5 Accommodation

For Stage 1, a 115-man staff village / accommodation camp will be constructed to accommodate operational expatriate and senior national staff. The camp will be expanded to accommodate a total of approximately 210 personnel for Stage 2 of the development. The staff village is shown on Figure 4.1 and will consist of:

- General Manager's quarters;
- Senior Manager quarters;
- Manager quarters;
- Messing and laundry facilities; and
- Recreational facilities.

Operator level and junior supervisors will be sourced and/or housed within the existing facilities in Lunsar. Buses will be utilised to transport personnel to the site. During the construction phase, contractors will make provision for temporary facilities to house their personnel.

4.8.6 Medical services

A clinic will be constructed near the beneficiation plant, to be manned by an expatriate paramedical team, assisted by local medical professionals. The clinic will be fitted out to provide standard general practice patient care and to provide stabilisation of patients who may be injured in an accident. Injured patients, once stabilised, will be taken by ambulance to either the Lunsar hospital or medivac'ed to Freetown to the better equipped hospitals.

Table 4-8: Management of non-mining wastes

Wastes	Temporary storage	Potential waste recycling	Waste treatment	Disposal
Non-hazardous waste				
Domestic waste	Non-hazardous waste transfer station	Paper, wood products, plastics and metals recycling		Landfill
Organic waste	Non-hazardous waste transfer station	Composting		Landfill
Tyres	Non-hazardous waste transfer station	Recycling		
Scrap – such as scrap metal, wood waste, worn conveyor belt, used wear liners	Non-hazardous waste transfer station (specifically demarcated containers)	Recycling		Landfill
Inert construction material and demolition debris	Non-hazardous waste transfer station (stockpiles)	Donate to local community		Landfill
Storage drums	Non-hazardous waste transfer station	Returned to suppliers or recycling		
Sewage sludge	Wastewater treatment systems	None		Landfill
Flue gas desulfurisation waste; spent filter fabric and associated solids from HFO plant	HFO plant	None		
Hazardous waste				
HFO sludge	Hazardous waste storage depot	None		By approved contractor
Spent oil and lubricants	Hazardous waste storage depot	Recycling		
Soils contaminated with hydrocarbons	Hazardous waste storage depot	Use in rehabilitation (once treated)	Bioremediation and then use for rehabilitation	
Clinic waste/ medical waste	In clinic in containers	None		By approved contractor
Hazardous waste from the plant area and laboratory (including empty storage containers)	Hazardous waste storage depot	None		By approved contractor

4.8.7 Fire fighting

Buildings and locations of flammable materials will be fitted with fire extinguishers. A fire water system will be installed consisting of fire hydrants, hose reels, a sectional pressed steel tank, electric fire pumps (one operating, one on standby), an electric jockey pump and a diesel engine driven emergency pump with auto start and control system. The pumps will start automatically in the event of a pressure drop in the pipeline, indicating a hose reel or hydrant valve has been opened. Fire water will be distributed in a ring main to the plant and to the accommodation village.

4.8.8 Mobile Equipment

The following table summarises a preliminary estimate of the number and types of mobile equipment (additional to the mining equipment listed in Table 4-3) allowed for as a permanent fleet:

Table 4-9: Mobile equipment list for site operation

Vehicle	Number provided	
	Stage 1	Stage 2 (additional)
LDV/Utility vehicles	38	14
Fire truck	1	
Ambulance	1	
Mobile crane – 50 t	1	
Mobile crane – 20 t	1	1
Skid steel loader	2	2
Front end loader	4	
Flat bed truck – 5 t	4	
Tractor trailer	2	
Forklift – 5 t	3	2
Buses – 54 seater	4	
Waste skip trailer	1	
Rail load out Front end loaders	3	

4.8.9 Fuel use and storage

Fuel will be stored on site during the construction and operation of the Project. Fuel will be stored in steel tanks at the beneficiation plant (see location on Figure 4.11 (item 16) and Figure 4.12 (item 23)) and contained in bunded enclosures, designed to international standards, to prevent any contamination of the environment. Two types of fuel will be consumed at the site:

- HFO - for the power generating facility (Section 4.5); and
- Diesel fuel - for use in the mining fleet (Section 4.2.4) and mobile fleet (Section 4.8.7).

The storage facilities for HFO and diesel will be designed to provide a minimum of one month operating capacity (3,000 m^3 of each fuel type for Stage 1 and 15,000 m^3 for Stage 2). It is assumed that consumption (and therefore storage capacity) of HFO will approximately equal that of diesel. Fuel will be supplied by road tankers from Freetown using third party suppliers.

4.8.10 Security

- MIOL will provide its own security for the site. The accommodation camp, process plant,

office and workshop areas will be fenced (all other areas will be unfenced).

4.8.11 Ancillary buildings

The following buildings have been allowed for in the design:

- Compressor house;
- Offices / administration building;
- Laboratory (with the capacity to process 100 samples per day, and including areas for sample preparation, equipment and two offices);
- Workshops and maintenance facilities;
- Process equipment store;
- Reagents / oil stores;
- Refreshment and rest room facilities at the plant (for approximately 30 operators, maintenance and warehouse staff);
- Dining / recreation area;
- Change house and laundry;
- Clinic and fire station;
- Communications centre / radio or satellite links; and
- Security entrances – plant and accommodation camp.

4.9 Project implementation

This section outlines how the Project will be successfully implemented if approval to proceed is received from the MIOL board and relevant regulatory authorities.

4.9.1 Project milestones

Subject to raising sufficient funds to finance the construction of the Stage 1 development, it is expected that the Stage 1 operations will commence within 2 to 3 years of the Mining Licence being granted.

While the Stage 1 development is in progress, the Company will conduct a feasibility study on the Stage 2 expansion, with the target, subject to raising of sufficient funds to finance the Stage 2 expansion, to commence construction of Stage 2 immediately after Stage 1 becomes operational.

4.9.2 Operation management

The proposed organisation chart for the Project during operation is given below, though this will be reviewed on an ongoing basis as the Project develops.

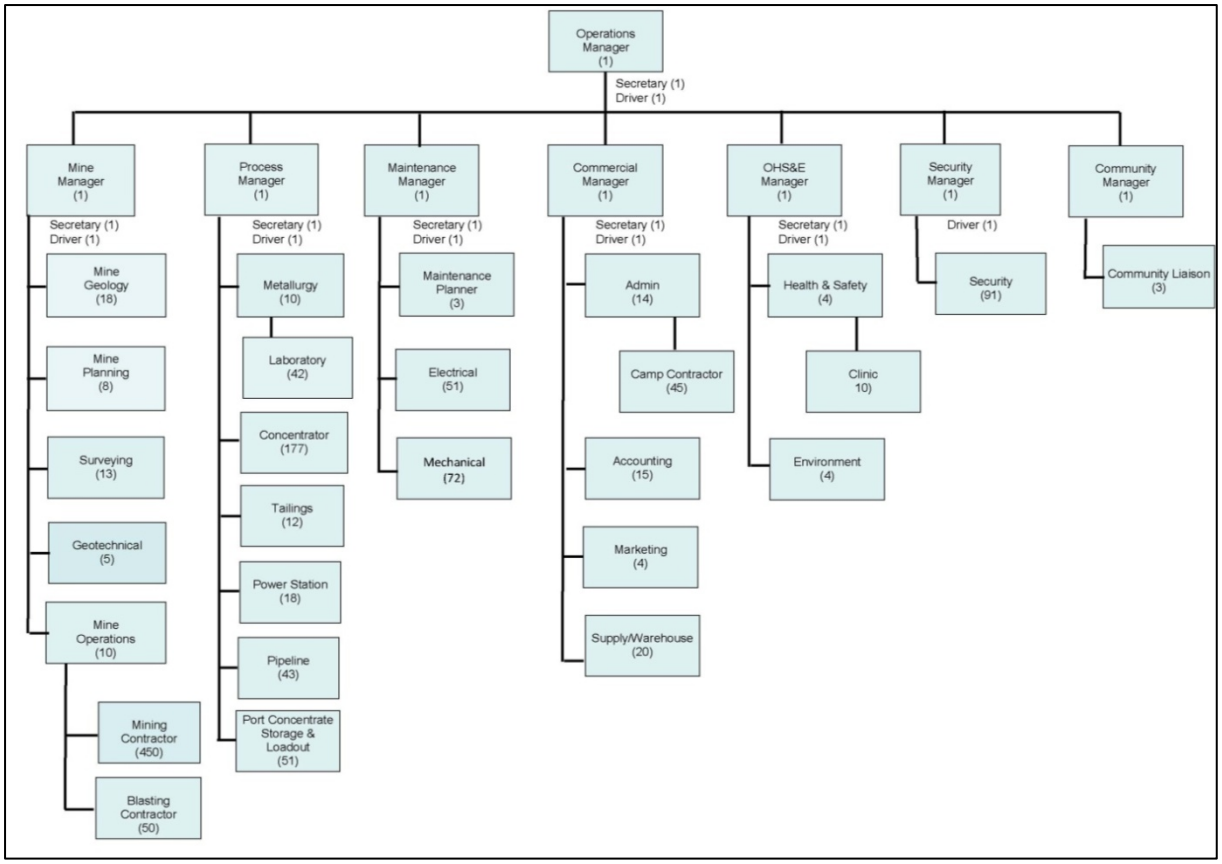


Figure 4.14: Proposed organisation chart for operations

4.9.3 Human resources management

It is likely key management positions will be sourced from Australia, with the remainder of the expatriate personnel sourced from Europe and South Africa. As there is a well-developed mining industry in several other African countries, a selection of personnel could be sourced from these countries as well. Although there is a skilled labour force in Sierra Leone, it is likely that competition between mining operators for this labour will be tight, and that considerable training will be required for local nationals.

For the purposes of design, it has been assumed that expatriates will work a 6 weeks on/ 3 weeks off cycle, and that most national personnel will relocate to Lunsar. It is likely, however, that some senior national staff will be housed in the accommodation village and commute to work.

The estimated numbers and categories of personnel required for the permanent workforce during Stage 1 and Stage 2 operations are shown in Table 4-10 below. Mining at the Project will be undertaken by an experienced mining contractor. A contractor will also be used at the accommodation camp (to provide messing and cleaning services) and for the power station operation. All other personnel will be employed directly by MIOL.

Table 4-10: Estimate of operational personnel requirements

Area	Position	Stage 1	Stage 2
Manager	Operations Manager and Secretarial Support	3	3
Mine	Mine Manager and Staff	3	3
	Mine Technical Services	30	44
	Mine Operations	7	10
	Mining and Blast Contractors	175	500
Process Operations	Process Manager and Staff	3	3
	Metallurgy and Laboratory	21	52
	Concentrator	52	189
	Pipeline	0	43
	Concentrate Storage & Load out	21	51
	Power Station	8	18
Maintenance	Maintenance Manager and Staff	3	3
	Mechanical	26	72
	Electrical	19	51
Commercial	Commercial Manager & Staff	3	3
	Administration, Accounting & Marketing	24	33
	Supply / Warehouse	14	20
	Accommodation Village Contractor	20	45
OHS&E	OHS&E Manager and Staff	3	3
	Health and Safety	10	14
	Environment	4	4
Security	Security Manager & Staff	2	2
	Security	91	91
Community	Community Manager	1	1
	Community Liaison	3	3
Total		**546**	**1261**

4.9.4 Procurement

It is unlikely to be possible to source the necessary goods for construction and operation of the mine from within Sierra Leone, with the exception of minor consumables such as fuel, food, stationary etc. Where possible however, additional goods will be sourced locally.

4.10 Pollution control

The expected emissions and effluents from the main operations are described in Table 4-11 along with the planned pollution control measures included in the Project design.

Table 4-11: Expected emissions and effluents from mining operations

Activity	Sources	Outputs	Planned control
Mining			
Pit excavation	Drilling and blasting	Noise, blasting fumes and vibrations	• Standard blasting controls
	Shovels and front end loader	Dust	• Use of water sprays or other suitable binding agents
		Groundwater inflow and rainfall into pit	• Pump to tailings storage facility or sediment traps prior to release to water courses
		Haulage vehicle emissions	• Vehicle exhausts • Regular maintenance
Waste rock dumps	Dumping of waste rock	Noise	• Hearing protection for operators
		Dust	• Use of water trucks
		Storm water runoff	• Sedimentation ponds
		Seepage	• Ground preparation to minimise seepage
Ore transport	Haul trucks	Dust	• Water sprays or suitable binding agents • Control vehicle speeds
		Oil and waste water from truck shop	• Oil-water separators at vehicle maintenance area / workshop • Settlement ponds for sediment
		Haulage vehicle emissions	• Vehicle exhausts • Regular maintenance
Processing			
Crushing, screening and stockpiling	ROM Ore Stockpile	Dust from mobile equipment movements	• Water trucks • Slope and contour the ROM pad such that run-off water contained on the pad or drained to suitable settlement pond
	Crushing and Screening Modules	Dust	• Dust generation at all transfer points and on all conveyors within these circuits managed using vacuum dust collection systems • Covered conveyors
		Noise	• Hearing protection for operators
	Fine Ore Stockpiles	Dust	• Telescopic chutes to minimise ore drop heights • Fine misting sprays to minimise dust generation
Primary Grinding	Primary Grinding Circuit	Slurry spillage	• Build on an impermeable concrete pad with adequate bunding around the perimeter to contain spillage • Hose slurry spillage into concrete sumps built into the concrete pad • Fit sumps with sump pumps to transfer the material back into the grinding circuit
		Noise	• Hearing protection for operators • Consideration of noise bunding, if required
WHIMS	Rougher, Scavenger, Cleaner and Recleaner Circuits	Slurry spillage and Noise	• As for Primary Grinding Circuit.
	Regrind Milling Circuits	Slurry spillages and Noise	• As for Primary Grinding Circuit.
Reagent Storage	Reagent Storage Warehouse	Dry Flocculant Spillage	• Concrete floor • Regular sweeping of any dry flocculant spillage

Activity	Sources	Outputs	Planned control
Reagent Mixing and Dosing	Flocculant Mixing and Storage	Spills of flocculant	• Impermeable concrete pad with adequate bunding around the perimeter to contain spillage • Hose any spillage into concrete sumps built into the concrete pad • Fit sumps with sump pumps which transfer the material back into the mixing or holding tank
Tailings Dewatering	Tailings Thickener	Tailings Slurry Spill	• As for reagent mixing and dosing
Power supply			
Power generation	HFO transportation	Haulage vehicle emissions	• Require third party suppliers to use regularly maintained vehicles with suitably trained drivers
		Noise	• Exhaust stacks
		Spills of HFO	• Require third party suppliers to provide emergency training to drivers and to have spill kits with each truck
	HFO plant	Emissions	• Standard exhaust systems
		Noise	• Enclosed in a building • Hearing protection for operators
TSF			
Tailing disposal	Overflow from TSF pond	Discharge of tailings supernatant	• None, as supernatant expected to be of suitable quality to meet discharge standards
	TSF dry beach and side walls	Dust	• Revegetate side slopes as soon as practicable after construction • Water sprays if necessary for slopes and dry beach
Tailings and decant water transport	Tailings and decant water pipelines	Spillage of tailings or decant return water	• Regular inspections of pipelines • Leak detection system
Concentrate transport			
Concentrate Dewatering	Concentrate Thickener	Concentrate Spill	• As for reagent mixing and dosing
Concentrate Filtration	Filtration Building	Concentrate Spill	• As for reagent mixing and dosing

4.11 Project closure

The objective once mining operations are completed will be to ensure, as far as practicable, rehabilitation achieves a stable and functioning landform, which is consistent with the surrounding landscape and other environmental values.

The general strategy for the completion of mine development, assuming expansion is possible, is that once mining of fresh ore is completed, the pits may be partially backfilled, allowing for up to 50% of the pit areas to be backfilled with waste and tailings. Once the Rotret Pit and Mafuri Pit are complete, they would be backfilled with waste rock from further expansion of the Gafal Pit and an extension of the Mafuri Pit to the south-east. This will minimise the need for waste rock disposal on surface, reduce the area of land to be disturbed and assist with closure at the end of life of mine. The Matukia Pit may be used to store about 120 Mm^3 of tailings towards the end of the mine life, also reducing surface disturbance and facilitating closure implementation. The final site configuration at the end of mining is shown on Figure 4.8.

Remnants of the mining activities post closure will include:

- Open pit voids and pit lakes - as the Project involves bulk scale iron ore open pit mining

to below the natural water table, the open pits that remain post closure will fill with water and form a lake.

- Waste rock dumps - the WRD constructed during the mining operation will remain post closure. Upon rehabilitation, the waste dumps will not be visually dissimilar to the surrounding environment. Progressive rehabilitation as proposed above may reduce the overall height of the dumps.
- Tailings storage facility - the TSF will remain a permanent feature of the landscape and the contained tailings will drain to an increasingly stable mass. A preliminary water balance analysis of the facility indicates the facility could contain a large water pond area, which would vary between the wet and dry seasons. As part of water management at closure a lined spillway will be constructed to remove excess water from the TSF. Only the top surface that will be permanently above the maximum water level will require rehabilitation.
- Removal of infrastructure - the main infrastructure built for the Project (such as the beneficiation plant, workshops, pipelines, power station etc.) will be removed post closure, with the infrastructure re-used, recycled or disposed of as appropriate.

For general infrastructure, such as general buildings, roads etc., MIOL will first consult with the local authorities to determine what may be left intact for the benefit of the community.

4.12 Project Alternatives

Alternatives considered for the various Project components are discussed in the relevant subsections above, as follows:

4.12.1 Power supply

The power alternatives considered for the Project include:

- the Bumbuna Hydroelectricity generation plant; and
- heavy fuel oil (HFO) power plant.

The Bumbuna hydroelectricity plant has an installed capacity of 50 MW but a stable capacity of only 18 MW during the dry season, which is insufficient for MIOL's requirements. There is also currently no transmission link between the Bumbuna plant and the Project site, and for these reasons this source was eliminated as a possibility and HFO was chosen as the preferred option, as outlined in Section 4.5.

4.12.2 Water supply

Alternatives considered for water supply include the small lake within the London Mining lease area. However, this supply would be inadequate for the purpose and possibly disrupt other water users including villages in the area.

4.12.3 Concentrate transport

Road, rail and pipeline options were considered for the transport of the concentrate to the port. Road transport is expensive, high risk from a community health and safety perspective and challenging due to constraints with the existing national road network. It was therefore determined that rail would be used to transport the concentrate to Pepel port as outlined in Section 4.7.

4.13 Future studies

The current Project description is based on the processing of ore in the Gafal, Rotret, Mafuri and Matukia resource areas to a produce up to 15 Mtpa of iron concentrate. This will be done in two stages. Where Stage 2 (or other additional development of the mine) requires the construction of new facilities not included in the description above and therefore not covered by this ESIA, additional studies and an amendment to this ESIA will be required. Subject to adequate financing being arranged, Stage 2 construction would commence immediately after Stage 1 became operational.

Product transportation and export for Stage 2 is not included in this ESIA. However, it is envisaged that concentrate will be pumped to the Tagrin port, which is planned for development by AML. At Tagrin port, the concentrate will be dewatered and stockpiled, before being recovered and loaded on to Cape Size vessels. Additional infrastructure requirements to accommodate this will be confirmed during detailed feasibility studies, and assessed during the above-mentioned amendment to this ESIA.

Other prospects have also been identified within EL46/2011 during the course of exploration activities, which could (subject to feasibility studies and environmental approval) potentially be exploited in the future. Infrastructure for the Project has therefore been sited to avoid sterilisation of these resources and facilitate additional mine development if this proves feasible.

5 BIOPHYSICAL BASELINE DESCRIPTION

Baseline studies were undertaken for environmental aspects that may be affected by Project activities. The environmental baseline studies provide a database of physical, chemical and biological parameters which are used to predict and monitor the effects of the Project on the environment. The sections below provide a brief summary of the areas studied and methods used to characterize the environmental aspects of the areas potentially affected by Project infrastructure and activities. Detailed methods and findings are included in the full reports, which are presented as supporting documents to the ESIA, in Volume 3.

It is recognised that the site has experienced disturbance due to mining and agricultural practices in the past and therefore cannot be considered to be in a 'natural state'. It should also be noted that due to changes in the Project layout during the course of the ESIA, much of the baseline studies were completed based on the study areas defined under a previous layout, resulting in slight inconsistencies in this regard. This is however considered not to be of consequence to the ESIA due to the relatively minor changes involved, and the fact that the impact assessment has been conducted based on the Project description and layout presented in Chapter 4.

5.1 Physiography and Landscape

Sierra Leone comprises three physiographic regions: a narrow band of coastal lowlands, the interior wooded plains, and the upland plateau which includes scattered mountains and hills to the north-east (Okoni-Williams et al., 2001). The Project is situated in the interior plains, as marked by a red symbol in Figure 5.3.

The region around the Project area is relatively flat and low-lying at a height of approximately 40 to 90 masl and is characterised by gently undulating topography. The topographical variation creates two main drainage regimes within the Area; the majority of the concession area drains southwards into the Rokel River and the north of the Project Area drains westward into the Port Loko Creek. The lowland river valleys are characterised by relatively flat profiles with broad floodplains, which are generally waterlogged during the wet season and often used for rice cultivation, as shown in Figure 5.1 and Figure 5.2 . Villages are generally located on higher ground.

Figure 5.1: Low lying swamp area previously used as rice paddy field

Figure 5.2: River basin to the north west of the Project area

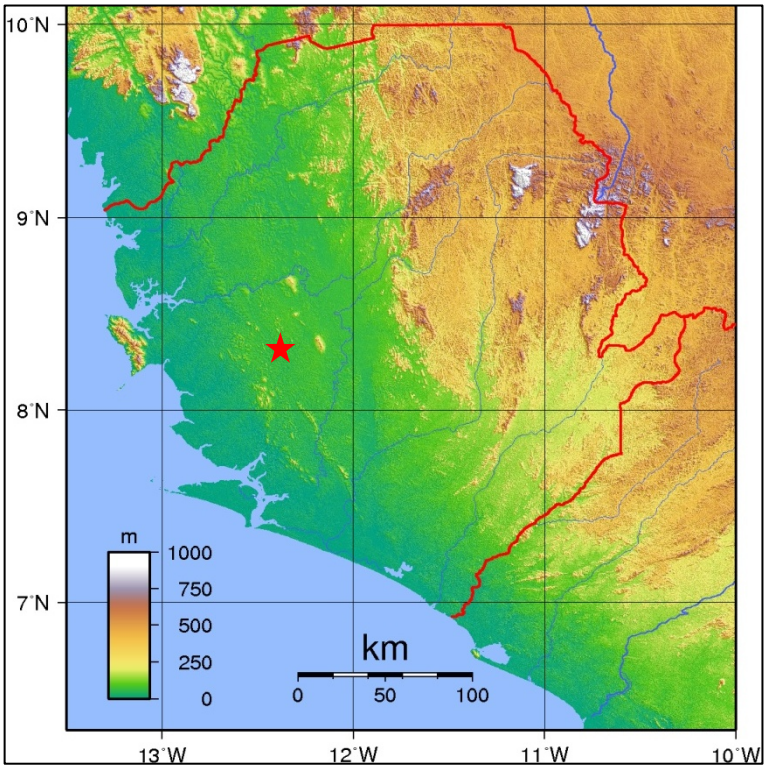


Figure 5.3: Topography of Sierra Leone (red symbol indicates Project location)

5.2 Geology and Geochemistry

5.2.1 Geology

The Project Area covers an area of Archean basement gneiss and granite structurally overlain by rocks of the Marampa Group. The Marampa Group consists of an upper Rokotolon Formation and a lower Matoto Formation. Iron ore mineralization at the Project is hosted in specular hematite quartz mica schists (hematite schist) of the Rokotolon Formation, which is interlayered with quartz-mica-albite schists.

The Marampa Group has been subject to multiple folding events which have imparted a strong foliation in the rock units and resulted in a basin and dome pattern of synforms and

antiforms with iron mineralisation preserved in the synformal areas. Later uplift of the basement has resulted in the current distribution of the hematite schists, with a concentration in the south eastern area and along the eastern margin of the large basement dome.

Intense tropical weathering has produced a laterite cover over much of the Project area, ranging from 2 – 6m in thickness. The laterite consists of a hard massive pisolitic cap preserved on the many low elongate hills of the region. Laterite colluvium is common on the flanks of the hills. Beneath the laterite an oxidised, saprolite zone extends to depths of 10 – 30m below surface.

The iron ore mineralisation occurs as units of hematite schist located within the metapelitic schists of the Rokotolon Formation. Due to the complex folding and lack of outcrop it is uncertain how many individual units of hematite schist occur and how they are related stratigraphically. To date, seven major hematite schist prospects (excluding Gafal Hill and Masaboin Hill) have been identified on the Marampa licence, with individual bodies of mineralisation up to 100m thick and extending over strike lengths of several kilometres. The locations of the seven hematite prospects are shown in Figure 1.3.

5.2.2 Geochemical characterisation

Mining activities result in disturbance and exposure of rock. This increases the surface area and the likelihood of exposure of unoxidised surfaces to air and water, potentially generating acidic conditions and mobilising metals. Although these weathering processes would occur naturally over extensive geological timeframes, the disturbance by mining accelerates this process. A geochemical characterisation study was undertaken by SRK (*ARDML Baseline Assessment for MIOL Project,* SRK, 2012) to classify and quantify the potential acid rock drainage and metal leaching potential (ARDML) contribution to the environment from the deposit rocks. The geochemical characterisation study involved a review of previously collected information, field investigations and an assessment of the ARDML potential of the ore, waste rock, tailings and concentrate material using the following tests:

- mineralogical characterisation using optical microscopy, Scanning Electron Microscopy (SEM) and X-Ray diffraction;
- whole rock assay using Multi-Acid digest and elemental analysis;
- carbon and sulfur analysis, and neutralizing potential analysis for Acid Base Accounting (ABA);
- Neutralisation Potential (NP) to determine the sample's ability to neutralise acidity;
- Net Acid Generation (NAG) testing and NAG test leachate analysis; and
- short-term leach tests.

Sampling was carried out to provide lithological and spatial representation of geological units across the four pits proposed for this ESIA (Rotret, Matukia, Mafuri and Gafal). A total of 64 waste rock samples were selected from diamond drill cores from the four proposed pits, and were prepared on site in the MIOL laboratory. Four of these samples were duplicates for QA/QC analysis. QA/QC results were within reasonable limits expected for the test procedures used and no further analytical reruns were recommended. The IFC Mining Effluent Guidelines (IFC, 2007) and preliminary Sierra Leone Water Supply Guidelines (domestic water quality standards) were used to evaluate the leachates produced.

In addition to the waste rock characterisation, a total of six samples of ore, tailings and concentrate were selected for metallurgical testing.

Acid Rock Drainage Potential

Results from the static acid generation prediction testwork show that the samples tested are predominantly classified as Non Acid Forming (NAF) with a low average sulfur content (compared to average crustal abundance) below 0.1% sulfide sulfur. Only a small portion of the dataset indicated uncertain characteristics with only one extreme sample showing Potentially Acid Forming (PAF) characteristics. The Quartz Mica Schist (QMS) material was found to generally have the highest sulfide content, up to 0.11%. However, in NAG tests, QMS samples were found to produce a NAG pH greater than 7 and as such are still classified as NAF. Only two samples were found to generate acidity in the NAG tests, both of which were taken from the Rotret area and produced low NAG values of approximately 5 kg $CaCO_3$/tonne. Across the Project area, net acid generation from oxidation of waste rock is considered to be unlikely.

Metals Leaching Potential

In the short-term leach tests, metal leaching from the waste rock samples was generally low. Leachates showed a net alkalinity and relatively high pH levels comparable to Project area groundwater. Release of zinc and manganese was observed for highly weathered clay and saprolite samples, and iron and aluminium concentrations were elevated in higher pH samples of unweathered material. Boron release was found to be spread across lithological units and appeared to be solubility controlled.

Results from the NAG leachate analysis, which indicate long-term conditions, indicated elevated chromium, manganese and boron release. Manganese release was associated with the lower NAG pH samples suggesting pH controlled solubility. Boron release was found to be slightly sporadic but correlated with higher concentrations from samples with a higher whole rock boron concentration.

Overall, the potential exists for flushing and release of iron, aluminium, zinc, manganese and boron from the waste rock dumps at concentrations which may require further management if shown to be the case.

Metallurgical samples

Analysis of the ore, concentrate and tailings samples showed that all samples contained negligible levels of sulfides and low levels of carbonate. The ore, concentrate and tailings are therefore unlikely to generate acidity but will also have limited buffering capacity. ABA predictions class all the metallurgical samples as NAF. With respect to metal leaching, there is little potential for leaching of iron, manganese or trace metals from the metallurgical samples although zinc and arsenic release was detected from the tailings material and iron release was observed from the ore concentrate.

5.3 Natural Hazards

Sierra Leone is located on the African tectonic plate in one of the least seismically active zones in Africa. Only five seismic events were reported in the region between 1947 and 1978, and none of these were recorded by the nearest seismological station in Senegal (Nippon Koei, 2005).

The most common natural disasters occurring in Sierra Leone are flooding and disease epidemics (mainly bacterial infectious diseases). From 1996 to 2009 flooding affected 221,000 people in Sierra Leone and 103 people were killed (EM-DAT, 2012). It is estimated

that a disease epidemic occurs every two years in Sierra Leone (Preventionweb, 2012). Between 1985 and 2008, approximately 11,500 people were affected by disease epidemics and approximately 1,000 people died as a result (EM-DAT, 2012).

5.4 Climate

Sierra Leone has a tropical savannah climate with distinct wet and dry seasons controlled by the migration of the Inter-tropical Convergence Zone ("ITCZ") between the northern and southern hemispheres. The movement of this climatic feature creates a wet season from May to October and a dry season from November to April. The dry Harmattan winds usually blow from late November to mid-March transporting dust from the Sahara Desert. These winds bring no precipitation apart from the occasional very light rain. Average wind speeds in Sierra Leone are generally low. There is little seasonal variation in mean air temperatures, with slightly hotter conditions in around midyear.

Historical climate data was available from the Freetown meteorological station; located 90 km west of the Project site, and was used to evaluate long-term climate trends in the area. Historical temperatures average 27 ^{0}C and historic annual rainfall averages 1580.5 mm. The nearest regional meteorological station to the Project area is located at Makeni; however this station has only been recording data since 1990. Annual average temperature between 2002 and 2005 ranges from 25.0°C and 25.5°C and total annual rainfall ranges from 2524.3 mm in 2003 and 3370.8 mm in 2004 (Statistics Sierra Leone, 2008).

As part of the assessment of baseline environmental conditions at the site, an assessment of ambient climatic conditions in the area was undertaken to enable evaluation of any potential Project impacts influenced by to climate. The data was analysed by the air quality specialists as a component of their study (included as SD 2 in Volume 3). Due to the lack of site-specific data for the Project, a weather station was installed at the MIOL Office in Lunsar at a base elevation of 64 m (see Figure 5.4). The parameters listed below were monitored continuously and recorded every 10 minutes with data downloaded every month.

- Wind speed and direction at 10 m above ground.
- Temperature at 1.75 m above ground.
- Solar radiation measurement at 2.5 m.
- Relative humidity at 1.75 m.
- Rainfall at 2.5 m.

Climate data collected from the on-site meteorological station is displayed in Table 5-1. The station has been collecting data since June 2010, however due to malfunctioning of the device between May and December 2011, only data for the 12 month period until May 2011 is presented.

Table 5-1: Climate data from MIOL meteorological station

Month	Daily Temperature Average (°C)	Rainfall (mm)	Number of rainy days
June 2010	27.5	8.8	3
July 2010	25.7	399	23
August 2010	25.4	376.6	29
September 2010	26.0	283.4	25
October 2010	26.3	384.2	27
November 2010	27.2	78.2	12

Month	Daily Temperature Average (°C)	Rainfall (mm)	Number of rainy days
December 2010	27.5	32.4	4
January 2011	26.6	0	0
February 2011	28.7	0	0
March 2011	29.3	24	3
April 2011	29.3	17.4	8
May 2011	28.6	0.1	3
Total	**-**	**1604.1**	**137**

The average temperature recorded at the on-site weather station is 27.34°C, which remains relatively constant year round due to the equatorial location. Rainfall data shows the distinct contrast between the wet season and dry season with rainfall ranging from a minimum of 0 mm in January 2011 and February 2011 to 399 mm in July 2010 (when the highest daily rainfall of 68 mm was also recorded).

The prevailing wind direction is consistent throughout the year, predominantly from the southwest and west-southwest direction. Annual average wind speeds at the 10 m level in Lunsar were 2.63 m/s; however the wind speeds and direction may be affected by tall trees surrounding the weather station. Comparatively the Lunsar meteorological station is representative of the historic temperature and rainfall data obtained from the Freetown weather station.

Figure 5.4: Automatic meteorological station at the MIOL site office

5.5 Water Resources

5.5.1 Hydrology

Surface drainage within the Project area falls within two river catchments; the Rokel and Port Loko Creek (also called Bankasoka River). The Bankasoka is to the North of the Project area

and drains predominantly east to west, before turning south west where it drains into the Freetown Harbour (also known as the Sierra Leone River) at Tumbu Island. The Rokel is Sierra Leone's largest river originating in the Guinea Highlands, from where it flows south west, passing in close proximity to the south of the site. The flow of the Rokel is regulated by a hydroelectric dam (Bumbuna Dam) which is located approximately 100 km upstream of the concession area. The Bumbuna Dam environmental impact assessment indicates flow releases from the dam will be increased compared with the natural flows during the dry season and below natural flow during the wet season, but the overall difference between regulated and natural flows under normal dam operation will not be significant. However, there are no flow-gauging stations on the Rokel downstream of Bumbuna with which to accurately estimate regional flows.

Local drainage in the Project area is dendritic in form with shallow catchments and poorly defined stream channels within flat-lying wide, marshy flood plains. The three rivers located within the Project Area which all drain to the Rokel are the Kagbu, Baki and Batabana. The catchments of these three drainages are shown on Figure 5.5.

Hydrological monitoring commenced at the mine site in June 2010. Surface water flow was measured monthly using a Valeport electromagnetic flow meter at four locations. River level stage gauging was also measured. Calculated flows from these sampling locations are shown in Table 5-2.

The surface water flow monitoring sites MSW028 and MSW029 are located on the Kagbu River with MSW030 located approximately 3.3 km further downstream from MSW028. MSW031 and MSW034 are located on tributaries of the Kagbu River, both of which in a south easterly direction before joining the Kagbu River

River depths were recorded approximately daily and the flow gauging monthly.

Table 5-2: Calculated surface water flows

Sample ID	River Name	Flow (m3/s)
MSW028	Kagbu	0.686
MSW029	Kagbu	0.708
MSW030	Small Tributary	0.573
MSW031	Kagbu	0.175

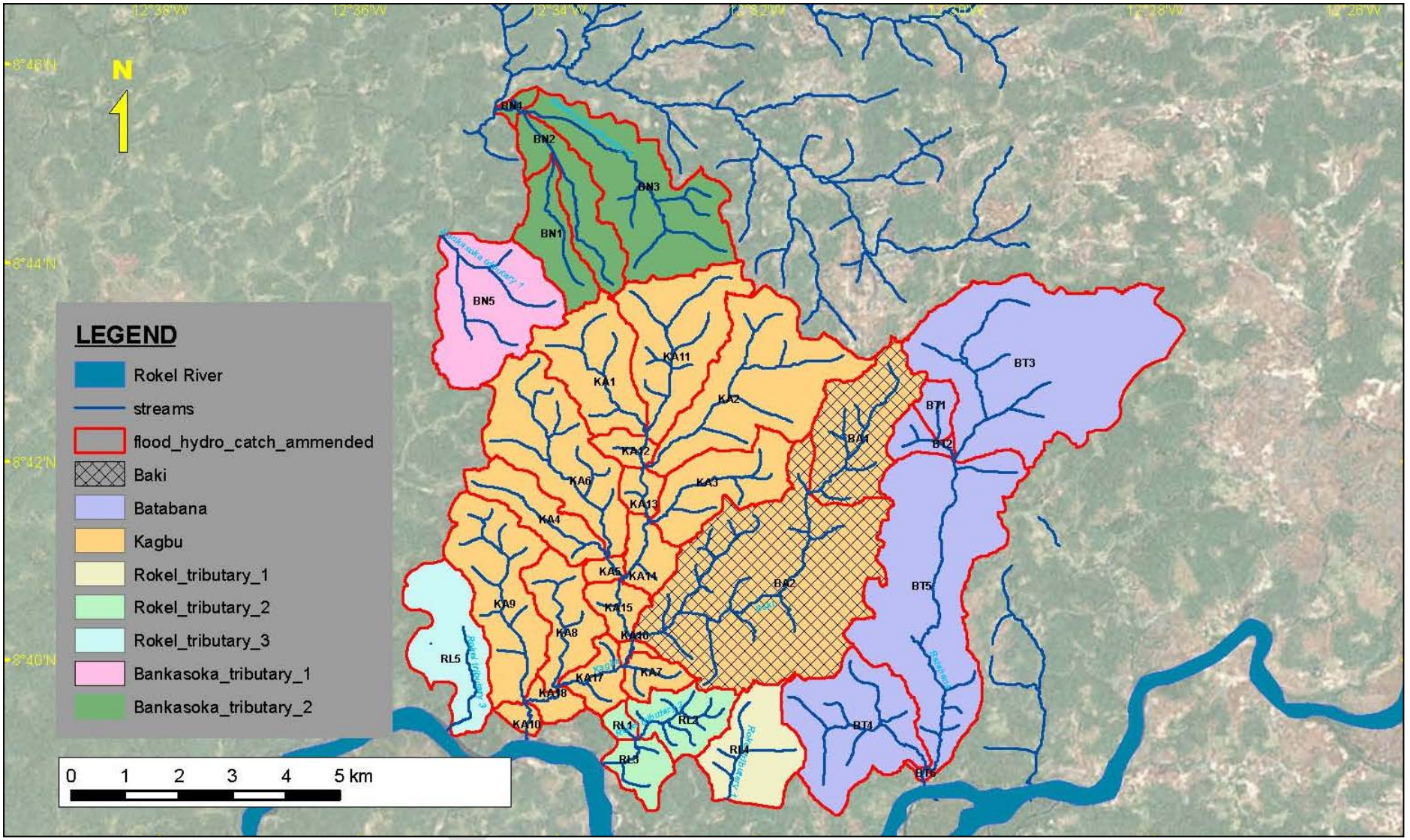


Figure 5.5: Catchments in the Project area

5.5.2 Hydrogeology

An assessment of the hydrogeological conditions at the Gafal and Matukia pits has been undertaken by Coffey Geotechnics Limited. The hydrogeological setting of the Project area is characterised by a shallow, weathered zone overlying fresh rock which supports an unconfined aquifer. Groundwater is likely to be present in three distinct aquifer settings: perched aquifers within the surface laterites, the base of the saprolite zone and the major fracture systems within the fresh rock. The dominant aquifer is likely to be the base of the saprolite to the top of fresh rock zone, supplemented by deeper fracture systems, many of which may prove high yielding.

Groundwater conditions at Marampa are considered to be non-homogeneous and anisotropic, with groundwater levels in individual bores (as well as groundwater yields) possibly controlled by the hydraulic properties and recharge conditions of individual fracture systems with little interconnection between such fractures in some areas.

SRK manually dipped 21 boreholes at Gafal, 6 at Matukia and two village wells to establish the depth of the water table (see groundwater monitoring locations in Figure 5.7). In dry season conditions (March, 2011), the water table was measured at a maximum depth of 16 m below ground level and 7 to 8 m below ground level in the Matukia area (Figure 5.6). Maximum depth in the water table occurs in areas of highest topography and the depth to the water table decreases towards valley locations where it is likely to be coincident with surface water (streams or swampy areas). Shallow groundwater in the Project area therefore provides baseflow to the surface water network, probably on a perennial basis. Village water supply wells and boreholes will most likely extract water from this resource.

Figure 5.6: Measurement of depth to water table using a dip meter

5.5.3 Water quality

One round of water quality sampling was undertaken by SRK during February 2011. Seven

surface water quality samples were collected from the villages of Marunku, Mabungu, Maso, Matukia and Makump, and five groundwater samples were collected from village wells (locations shown on Figure 5.7). As the groundwater samples were collected from actively used community wells the wells were not purged prior to sampling. The samples were sent to Severn Trent Services (STS) in the United Kingdom for analysis of basic parameters, total and dissolved metals and petroleum hydrocarbons. The surface water sample results were compared to the Australian and New Zealand Environmental Conservation Council ("ANZECC") Fresh and Marine Water Quality Guidelines (ANZECC, 2000) to indicate ecosystem disturbance and the groundwater samples were compared to World Health Organization ("WHO") Guidelines for Drinking Water Quality (WHO, 2008) for public health limits.

The surface water sample results showed moderate acidic to near-neutral pH ranging from 4.7 to 6.5 and generally low metal concentrations. Elevated levels of aluminium were recorded, however, exceeding ANZECC guidelines (0.05 mg/l) in 5 out of 7 samples. The average aluminium concentration across the sites was 0.29 mg/l and the maximum reached 0.79 mg/L. Nitrate concentrations were above the ANZECC guideline of 0.7 mg/l at one sampling point (3.9 mg/l) and minor exceedances of ANZECC guidelines were recorded for copper and zinc at three points. Total petroleum hydrocarbons were analysed in four of the surface water samples. Two points were characterised by elevated TPH concentrations. This was mainly found to be the C6-C40 fraction, which is associated with petrol and diesel compounds and the C24-C40 fraction, which is associated with residual fuels (for example fuel oil, lubricating oil, mineral oil and asphalt). In addition, elevated concentrations of the C16-C24 (354 μg/l) and C10-C16 fractions (85 μg/l), associated with diesel range organics, were found at one point.

Groundwater samples showed a moderately acidic to near-neutral pH ranging from 4.7 to 6.7. The electric conductivity of 34 μs/cm to185 μs/cm for the samples indicates low salinity. The groundwater samples were generally characterised by low metal concentrations with parameters falling below the WHO drinking water quality guideline limits. Total petroleum hydrocarbons were below the limit of detection in the samples.

5.6 Soils

The soils of Sierra Leone are recognised as being generally ferrallitic in nature. The soils of the lowland regions in the coastal plains are characterised by seasonal water logging, inadequate drainage and elevated iron and aluminium contents (NSADP, 2009). Soils are generally red to yellow-brown in colour and acidic (pH 4-5) in nature due to frequent water logging. Stobbs et al. (1963) recognise the soils in the lowland regions of Sierra Leone can be classified into one of four groups:

- Oxisols (also referred to as ferrallitic soils) – these highly weathered soils consist primarily of hydrated oxides of iron and aluminium and are characterised by low organic matter content. Their low residual primary mineral content results in a low cation exchange capacity (CEC). The soils are typically red-brown in colour.
- Groundwater laterites – characterised by poor drainage, high acidity and horizons with elevated sesquioxide (iron and aluminium) concentrations. Generally characterised by low organic matter content.
- Acid gleysols (also referred to as hydromorphic soils) - these acidic soils (typically grey in colour) are annually flooded and are characterised by seasonal anoxic conditions.

Hydormorphic processes are dominant and the leaching of soluble ferrous iron from the soil profile results in its distinct grey coloration.

- Alluviosols – these are generally young soils confined to levees and are characterised by a good fertility as a result of the high nutrient content.

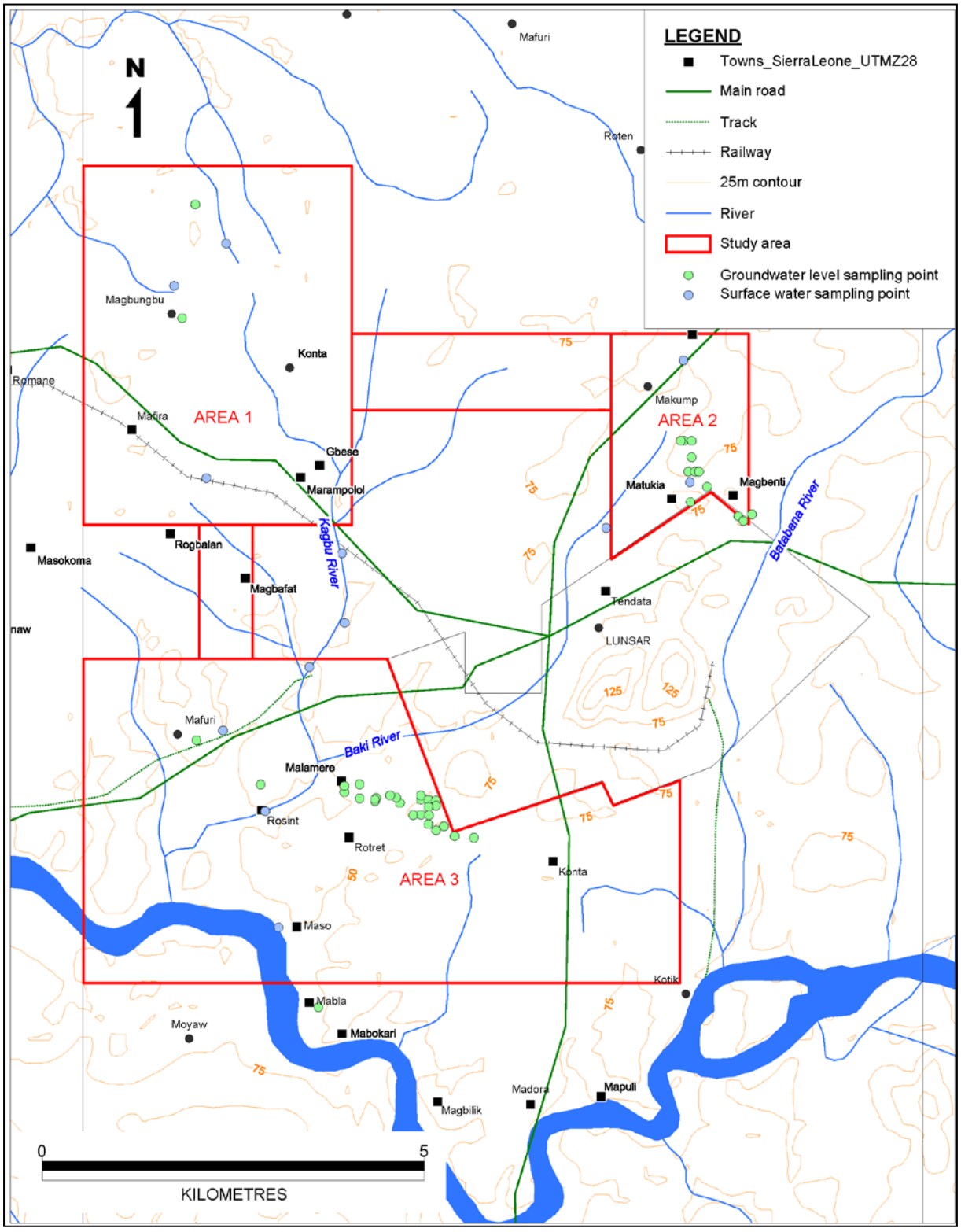


Figure 5.7: Locations of groundwater and surface water monitoring points

The soils in the vicinity of the Marampa region can be broadly classed as ferrallitic soils (oxisols) and have low soil erosion potential, although this may be enhanced by high and intense rainfall, land clearance and removal of vegetation cover.

A soil baseline study was undertaken by SRK (see SD 5 of Volume 3 for full study report) to determine the physical and chemical characteristics of the soil and sediments specifically located within the study area and assess the potential productivity of the soils based on soil structure and nutrient status.

A total of 21 soil samples and 11 sediment samples (including duplicates for QA/QC) were collected for chemical and physical characterisation in March 2011 (Figure 5.8 shows sampling technique and Figure 5.9 the sampling locations). Soil samples were collected from areas likely to be disturbed by the placement of Project-related infrastructure, around the boundary of the London Mining concession, and agricultural areas.

Sediment samples were collected from locations downstream of potential operations or proposed waste storage facilities. The soil and sediment samples (in the <0.05 mm fraction) were analysed at Scientifics laboratory (Burton-on-Trent, UK) for chemical and physical characteristics. Analysis of the >0.05 mm fraction was carried out by Soil Mechanics Ltd (Bristol, UK).

Figure 5.8: Soil sampling using hand auger

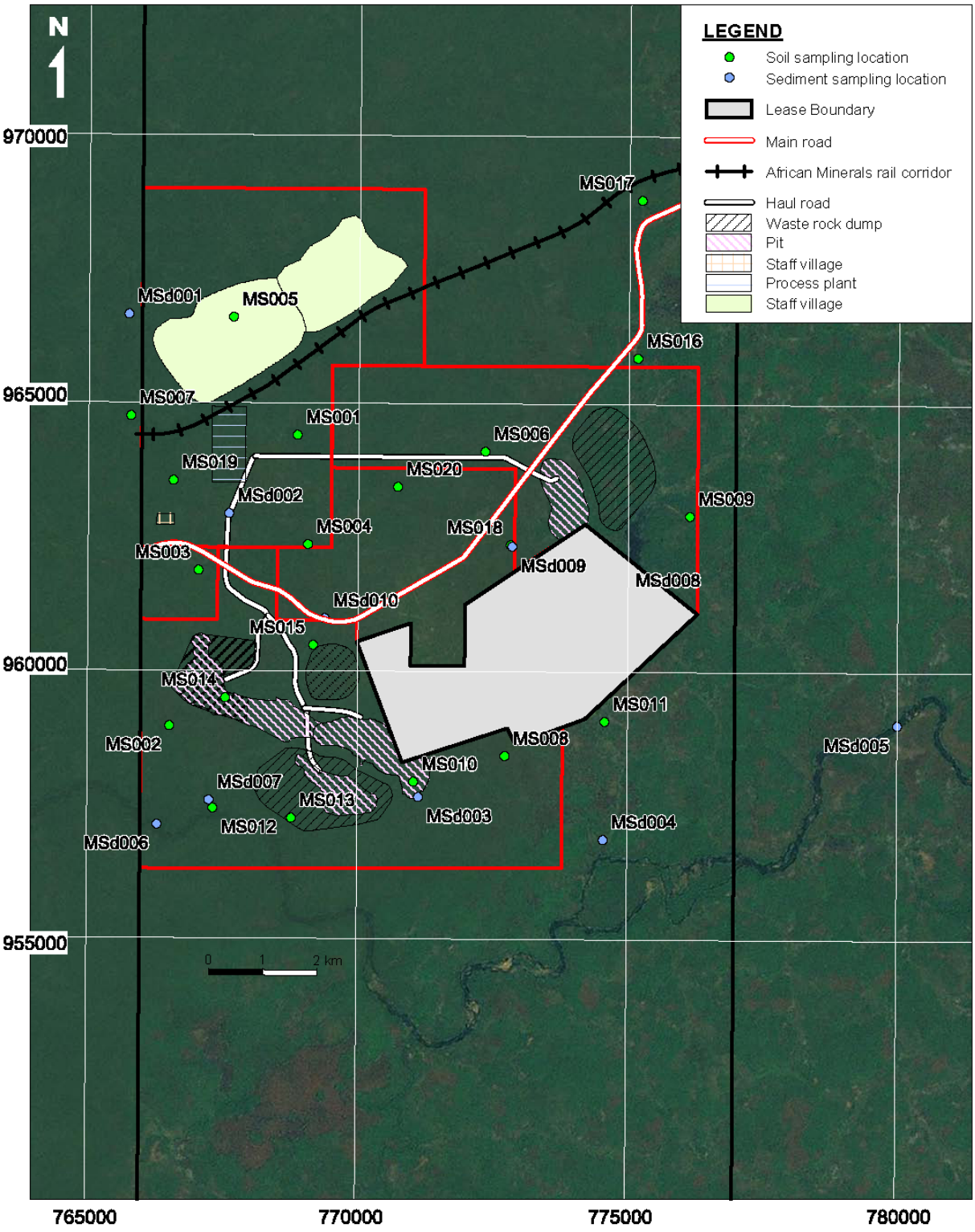


Figure 5.9: Soil and sediment sampling locations

5.6.1 Soil quality

The soils were classified based on particle size using the United States Department of Agriculture ("USDA") soil classification system. The chemical results were compared to three times crustal average abundance of elements (Mason, 1966) and the Canadian Council of Ministers of the Environment, 2007 ("CCME") soil quality guidelines for protection of environmental and human health. The solution chemistry during the leach tests was

compared to IFC EHS guidelines for Mining (2007) to determine whether leaching of the soils is likely to result in release of contaminants at concentrations above international effluent discharge guidelines.

The majority of soil samples collected during the survey were classified as sandy loam (USDA soil classification), due to the large proportion of sand (60%), with smaller proportions of silt (33%) and clay (1.5%). There was limited variation in soil texture across the study area. The moderate proportion (average: 46%) of fine particles (particle sizes < 0.1 mm) in the samples indicated a potential for soil erosion however the moderate organic content indicates the potential for erosion is low.

The soils were found to be moderately acidic in nature (pH 4.7 to 5.8), with a low cation exchange capacity (10.5 to 19.7 meq/100g) and are dominated by iron and aluminium. These are typical characteristics of soils in humid regions of the tropics, where the high chemical weathering rates and high rainfall result in intense leaching of soil bases.

The organic matter content of the soils was found to vary from 1.19% to 5.09%, with cultivated soils generally being characterised by a lower organic matter content (<2%). Levels of the essential plant nutrients nitrogen and phosphorus were found to be generally within typical levels for well drained soils, indicating the soils have good agricultural potential.

The majority of soil parameters were below CCME soil quality guidelines apart from boron, selenium and chromium, but the cause of these exceedances is thought to be natural. The moderately acidic pH of the soils is outside the CCME recommended range of 6 to 8 s.u. in all samples collected.

Soil leachates were circum-neutral (pH 6.6 to 8.0). Most constituents were leached at very low concentrations, with many parameters being at or near analytical detection limits in the leachates. Iron and zinc were the only parameters to exceed IFC standards in the leachates. For iron, exceedances were noted for 12 samples (from a total of 21) in the first stage of leaching and for two samples in the second leaching stage. Exceedances for zinc were observed for three samples in the first stage of leaching. All other parameters were significantly below IFC standards. These low levels of leaching observed in the laboratory tests are likely to be a function of the prevailing environmental conditions in the field; the high levels of rainfall will have pre-flushed the soil column meaning that any readily-mobile constituents will have leached out in-situ. However, iron and zinc showed the potential to be leached from the soils.

5.6.2 Sediment quality

The sediment samples were generally characterised by higher gravel and lower silt content. The particle size distribution is likely to relate to the predominant river flow regime in the location the sample was taken; areas of fast flowing water characterised by gravelly sands and areas of low flow characterised by higher silt content. Sample locations are shown in Figure 5.9.

The sediments were found to be mildly acidic to circum-neutral (pH 5.3 to 6.5) and are dominated by aluminium, manganese and iron, reflecting the geology of the local area. With the exception of boron, all parameters were present at concentrations not exceeding the three times average crustal concentration. In addition all parameters were detected at concentrations lower than CCME sediment quality guidelines, with the exception of chromium which was found to be elevated in two samples (MSd005 and MSd006) collected from the Rokel River.

5.7 Air Quality

An air quality baseline study was undertaken by specialists from SRK (SA) to measure the baseline ambient conditions from which air quality impacts can be predicted (see SD 2 of Volume 3 for the full study report). The monitored pollutants (sulphur dioxide, nitrogen dioxide, particulate matter and dust fallout) were chosen based on the expected emissions from the planned operations and the level of risk to human health posed by these pollutants.

Air quality sampling was carried out at numerous locations around the mine site (Figure 5.10 shows locations of particulate matter, dust fallout and gas monitoring points) for the following parameters as per the programme summarised in Table 5-3.

Table 5-3: Air quality baseline monitoring programme at mine site

Parameter	Sampling locations	Method	Frequency	Analysis
Dust fallout	MIOL Office (Lunsar), Catholic School, Konta Bana, Maso, Matukia, Mafuri, Magbungbu, Marampa Guest House	Sample buckets that were sealed and swapped with new buckets after 30 days.	Monthly (exposure for 4 weeks)	Sealed buckets sent to Mhlathuze Water (South Africa)
Particulate matter (PM_{10} and $PM_{2.5}$)	MIOL Office (Lunsar)		Continuously	Mhlathuze Water (South Africa)
Sulphur dioxide (SO_2)	MIOL Office, Konta Bana, Natukia, Mafuri, Magbungbu	Radiello passive gas monitoring badges with absorbent gas cartridges.	Quarterly (3 monthly) (24-hour exposure period)	M&L Laboratory Services
Nitrogen dioxide (NO_2)	MIOL Office, Konta Bana, Matukia, Mafuri, Magbungbu		Quarterly (3 monthly) (1-hour exposure period)	M&L Laboratory Services

Air quality results were compared to the World Bank/IFC guideline on emissions and ambient air quality, US EPA standard for air quality monitoring and South African National Standards (SANS) for dust deposition, as Sierra Leone does not have a standard for air quality.

The measured NO_2 and SO_2 concentrations are below both IFC and US EPA standards in all locations, except at the MIOL offices in June 2011 were a SO_2 concentration of 21.7 µg/m^3 was measured. This slightly exceeds the World Bank/IFC SO_2 guideline value of 20 µg/m^3 (but falls below the US EPA standard of 370 µg/m^3). The higher SO_2 concentrations in Lunsar, Magbungbu and Mafuri are attributed to higher vehicle circulation in Lunsar town and the villages and other anthropogenic activities. The NO_2 concentrations were very low across the sample locations. The highest concentrations were in Magbungbu, Mafuri and Matukia attributed to biogenic release from the burning of sugar cane plantations, the major agricultural activity in the area. The highest NO_2 concentration measured was 7.05 µg/m^3 in June 2011 at the MIOL offices in Lunsar, falling below the World Bank/IFC Guideline of 200 µg/m^3 and the US EPA standard of 190 µg/m^3. Baseline SO_2 and NO_2 levels suggest the level of these gases in ambient air is low.

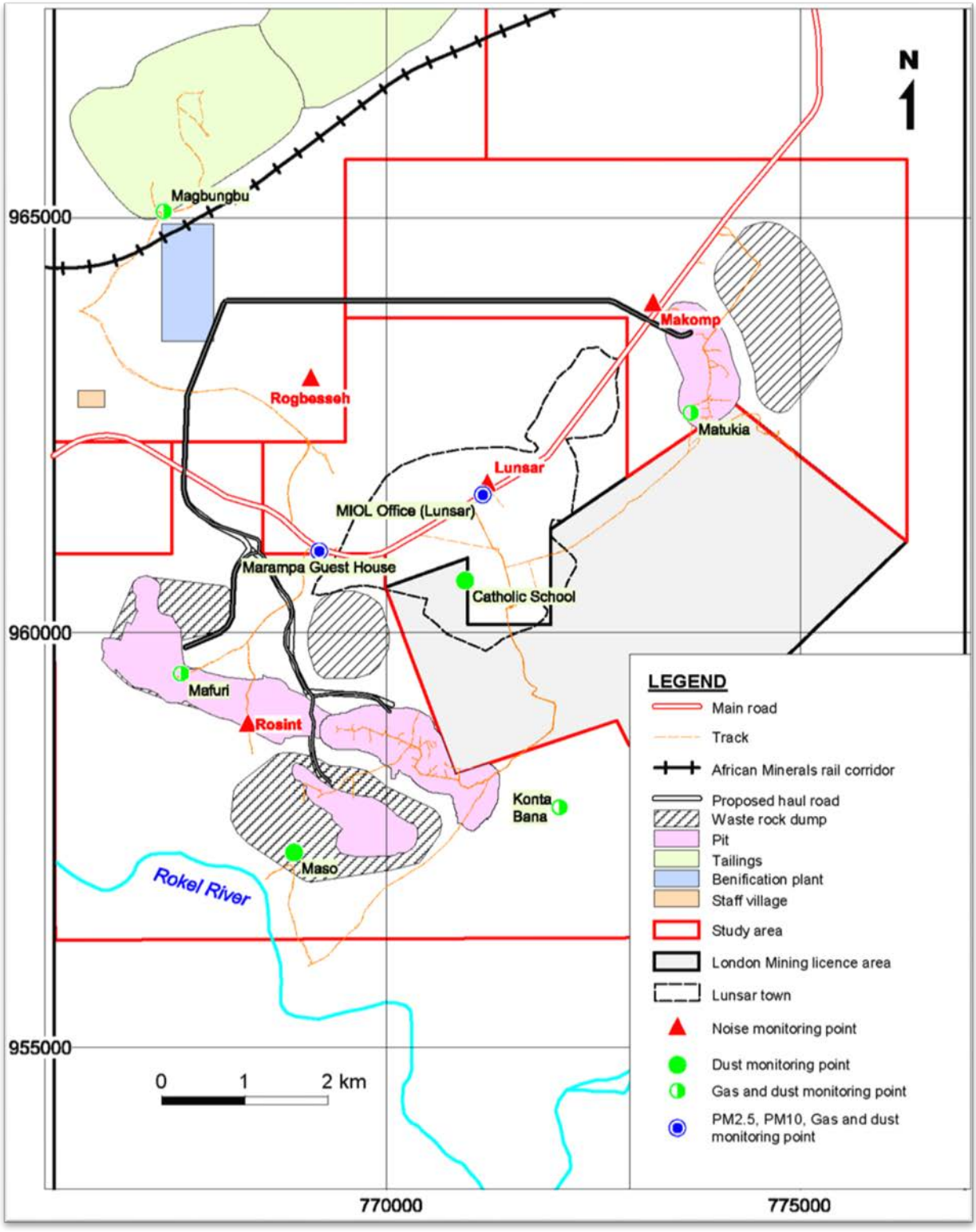


Figure 5.10: Air quality and noise monitoring locations

Eight dust monitors were situated around the study area to determine the spatial coverage of dust fallout. The fallout results for June to November 2011 (corresponding with the wet season) were consistently below the SANS target level of 300 mg/m^3/day at all monitoring locations. Results for December 2011 to March 2012 (corresponding with the dry season) showed a trend of exceedances of the action limits (and in some cases the alert thresholds) at

almost all locations. Most notable were Konta Bana (where a reading of 5,470 mg/m^3/day was obtained for December 2011, exceeding the SANS alert threshold of 2,400 mg/m^3/day), Matukia (where 11,886 mg/m^3/day was recorded in March 2012, again exceeding the alert threshold), and Mafuri (where 1,408 mg/m^3/day was recorded in January 2012, exceeding the Action Industrial threshold of 1,200 mg/m^3/day). These increased dust concentrations could be attributed to increased traffic or construction in these areas (such as the Magbungbu monitoring point, where construction for a railway and road was taking place nearby).

PM_{10} levels were recorded at the MIOL Office in Lunsar between March and April 2012. The samples indicate daily PM_{10} concentrations are below both World Bank/ IFC Guideline and US EPA standards through most of the year. However there were 89 exceedances of 24-hour PM_{10} guideline concentrations of 50 µg/m^3 during the monitoring period, eight of which exceeded the US EPA standard of 150 µg/m^3. All exceedances occurred during the dry season (November 2011 – February 2012), suggesting that dust generating activities increased during that period, and possibly also the influence of the Harmattan winds, which occur at this time of year. Average daily $PM_{2.5}$ concentrations were measured between March and July 2011 (study cut short due to technical errors), and were high (21 to 26 µg/m^3) in March and April, exceeding World Bank/IFC Air Quality Guideline of 20 µg/m^3. This high level is attributed to increased vehicle entrainment of dust and windblown dust from the roadside, during the dry season. Samples from May to July 2011 were below the daily guideline levels. The 24-hour $PM_{2.5}$ concentrations show 37 instances where the 24-hour World Bank/IFC air quality guideline of 20 µg/m^3 was exceeded, over the 127 days of data recording. The US EPA standard of 35 µg/m^3 was exceeded for 6 instances during the period. The highest concentration during the monitoring period was 50 µg/m^3 recorded on the 9 April 2011.

In summary, the air quality around the Project is of a generally good standard with regard to NO_2 and for the majority SO_2 concentrations. Dust fallout and PM_{10} concentrations show a strong seasonal trend, are within acceptable levels for international air quality standards during the wet season but showed exceedances (in some cases exceeding the alert threshold for dust fallout) during the dry season. The high $PM_{2.5}$ concentrations indicate that sensitive human receptors within the study area may be at risk of respiratory diseases as the World Bank/IFC guideline on air quality was exceeded. As these results were only collected at one site (MIOL Office, Lunsar), the rural areas closer to the mine site may differ. Due to the absence of large industrial plants or highways in the area and wind speeds being low, the main air pollution sources were windblown dust (natural pollution) and vehicle entrainment of dust. Vehicular movement was higher around Lunsar than other monitoring stations, evidenced by higher SO_2 levels recorded in Lunsar.

5.8 Noise

Noise surveys were carried out to determine background noise levels and to provide input to predictive noise modelling required to evaluate potential impacts from the Project. The Project area is made up of acoustically soft ground which absorbs sound waves; however the low-lying topography lacks barriers to noise propagation. The main existing noise sources are traffic through Lunsar and the surrounding areas, and community noise (in the villages).

Noise monitoring was conducted by specialists from SRK at four locations, shown in Figure 5.10, in March 2011 (see SD 3 in Volume 3 for the full specialist report). The monitoring sites were selected to represent different parts of the Project area and were located in village or town centres to represent sensitive receptor locations. All measurements were conducted

using Svantek brand Svan 949 model Type-1 sound level meter ("SLM"). The microphone was covered with a sponge protector to reduce wind noise effects and set up 1.5 m above the ground. Automatic measurements were taken on an hourly basis over a 24 hour period at each location. No noise regulations exist in Sierra Leone so the World Bank/IFC noise guidelines for residential, institutional and educational receptors were used.

Table 5-4 shows the IFC night time noise guidance level was exceeded at all locations, and the daytime level was exceeded in Makomp and Rogbesseh. The difference in day and night noise levels appears to be negligible. As no busy highways or industrial establishments are present in the area, the high noise levels are attributed to community noise. Noise levels differ in Lunsar as it is a large town with differing community activity patterns. Although Lunsar is more crowded and active than the villages, the activity is widespread in comparison to small villages where the activities are concentrated. Rosint is the smallest village with the lowest population, which may explain the lower noise levels. The results are based on hourly measurements conducted over 24 hour periods in March 2011 only. Community activities depend on the hour, day of the week and month so further noise measurements should be recorded at a different time of year to observe potential variations in baseline levels.

Table 5-4: Baseline noise level measurements March 2011 (dBA)

Parameter	Period	IFC Guideline (exceedances shown in red)	Lunsar	Makomp	Rogbesseh	Rosint
$L_{A, min}$	24 hours		36.8	31.4	29.8	25.3
$L_{A, 90}$	24 hours		43.5	42.9	40.0	39.6
$L_{A, eq (24h)}$	24 hours		49.8	56.0	54.3	50.6
$L_{A, 10}$	24 hours		51.2	57.9	55.6	53.1
$L_{A, max}$	24 hours		86.3	93.0	93.9	81.9
$L_{A, day}$	07:00 - 22:00	55	50.3	57.6	58.0	52.9
$L_{A, night}$	22:00 - 07:00	45	49.8	53.9	52.6	47.3

5.9 Biodiversity

A rapid biodiversity assessment was undertaken by ECOREX Consulting Ecologists between 18th and 21st October 2010 (wet season) and 21st and 24th February 2011 (dry season) to summarise the baseline conditions of the Project area, which is located within the Western Guinea Lowland Forests terrestrial ecoregion and the Northern Upper Guinea aquatic ecoregion. A further round of dry season aquatic biomonitoring was conducted by Nepid Consultants in February 2012. Full copies of both the aquatic biomonitoring and biodiversity impact assessment reports are included as SD 4 in Volume 3.

IKONOS satellite imagery was used to initially identify and delineate broad habitat types and land-use patterns within the study area, the boundaries of which were ground-truthed during the initial field visit. Sampling methods are described in detail in the specialist study reports. The assessment of terrestrial habitat types and faunal associations included the following activities:

- Vegetation was sampled within each major habitat type using quadrants of 20 x 20 m to measure presence, cover and abundance.
- Mammals were recorded incidentally while surveying vegetation and other faunal groups, through indirect evidence such as spoor or dung, in conjunction with limited visual or

audio confirmation.

- Birds were sampled using the Timed-Species Count Method, identifying species seen or heard using binoculars or a digital recorder.
- Reptiles were sampled through active searching along transects.

The aquatic study focused on measuring biological receptors (benthic diatoms, aquatic invertebrates, and fish) that are sensitive to changes in water quality at different temporal scales, as a measure of aquatic ecosystem health. Data was collected from 16 sampling sites (including five sites identified for long-term biomonitoring) in and around the Project area (Figure 5.5 shows locations). The sampling methods for assessing the aquatic receptors included the following activities:

- Assessment of river flow conditions (to assist with habitat classification),
- Assessment of water quality (major cations, anions and metals),
- Benthic diatoms were assessed using the Specific Pollution Sensitivity Index (SPI),
- Benthic aquatic macro-invertebrates were assessed through the Namibian Scoring System version 2 (NASS2) bio-monitoring method,
- Fish were sampled using a 30 x 30 cm hand-net during the November 2010 sampling round, and seine and double fyke nets during the February 2011 sampling round. Sampling was supplemented by examination of fisherman's catches.

The conservation status of species identified was determined using the IUCN Red List of Threatened Species (IUCN Red List), the Global Biodiversity Information Facility (GBIF) database, Fishbase, and other reference documents for species in the area (Hawthorne & Jongkind, 2008; Kingdon, 1997; Van Cakenberghe et al., 2009; Borrow & Demey, 2002; and Frost, 2010). The presence of critical habitat was determined in accordance with IFC Performance Standards definitions.

5.9.1 Terrestrial habitats and faunal associations

Six types of terrestrial habitats were defined within the study area; secondary forest/ farmbush mosaic, rice wetlands, lowland forests (which includes gallery forest and swamp forest), flooded natural grassland, and secondary savannah. The predominant habitat types are secondary forest / farmbush and rice wetlands, reflecting the transformed and disturbed nature of the habitats within the study area.

Photographs of these six habitat types are shown in Figure 5.11 and the spatial distribution is shown in Figure 5.12. Based on the information available from the surveys, no critical habitat was identified at the locations sampled during the baseline, with respect to home range, feeding, breeding or nesting of the species present.

Secondary forest / farmbush: this habitat type covers approximately 75% of the study area and the present ecological state of this habitat is classified as considerably modified. The state of regeneration is more advanced within some parts of the study area (i.e. Area 3). The secondary vegetation is dominated by Oil Palm (*Elaeis guineensis*) and scattered large Mango (*Mangifera indica*), Kapok (*Ceiba pentandra*) and Gold Coast Bombax (*Bombax buonopozense*) trees. Species composition is dominated by widespread species that are typical colonisers in secondary regrowth. The invasive exotic species Triffid Weed (*Chromolaena odorata*) has become well established in many areas.

Secondary forest / farmbush

Rice wetland

Gallery forest

Flooded natural grassland

Swamp forest

Secondary savannah

Figure 5.11: Photographs of terrestrial habitats within the study area

This habitat supports the most widespread bird assemblage, with 122 bird species observed during the field visits (65% of the species observed). The most abundant species were Blue-spotted Wood Dove, Common Bulbul, Whistling Cisticola, Pied Crow and Red-eyed Dove.

Rice wetlands: this habitat type covers almost all valleys (approximately 15% of the study area) and the present ecological state of this habitat is classified as considerably modified. There are narrow ecotones (regions of transition) between the rice paddies and terrestrial vegetation that contain remnants of original grass flora, of which *Anadelphia leptocoma* is most prominent.

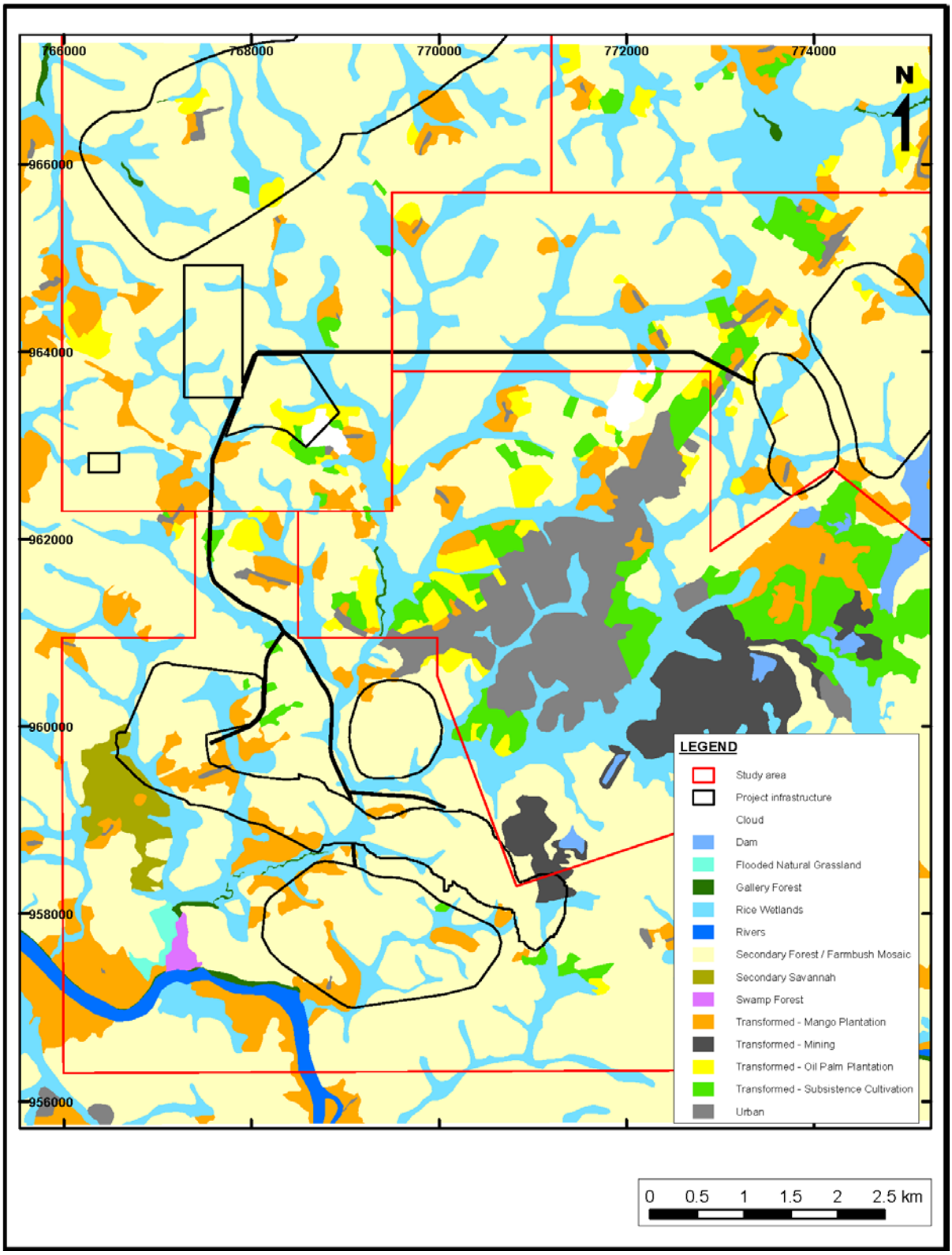


Figure 5.12: Distribution of terrestrial habitats across the study area

The lack of structural diversity in rice monocultures and the lack of open waterbodies reflects the fairly low bird assemblage within this habitat (56 species). Ten species of forbs were identified in the rice wetland habitat, however these are fairly widespread generalist species.

Flooded Natural Grassland: this habitat type is located adjacent to the swamp forest on the northern back of the Rokel River and the present ecological state of this habitat is classified as slightly modified. *Anadelphia leptocoma* is dominant at the slightly drier, higher-lying ground. *Rhytachne rottboellioides* is closely associated with *Anadelphia*, but occupies the flooded part of the wetlands. Where patches of open water are present, floating hydrophytes are common. As the majority of habitats within the study area are highly transformed, this habitat represents the only patch of untransformed natural grassland.

Lowland forest: this habitat includes all gallery or riparian forest and swamp forest. Gallery forest is most developed along the banks of the Rokel River in narrow strips (up to 20-30 m). There are also narrower strips of this gallery forest along other perennial tributaries in the study area; however it is often fragmented and discontinuous. The present ecological state of gallery forest is classified as slightly modified. Gallery Forest is characterised by high species richness and 60% of the plant species found during fieldwork were located in this vegetation community. Gallery forests have high functional value in terms of providing flood attenuation and riverbank stabilisation.

Swamp forests are located along a tributary of the Rokel River in Area 3. The species composition of the swamp forests is similar to that occurring in riparian forest along the Rokel River. The present ecological state of this habitat is classified as moderately modified; largely due to removal of vegetation for fuel and small-scale logging. However, the swamp forest does still have a moderately high functional value, such as providing flood attenuation and riverbank stabilisation. This habitat connects the larger forest along the Rokel River to the gallery forests higher up the main tributary.

A total of 64 bird species were observed with the lowland forest habitats (36% of the species observed). The forest bird species include forest specialists (18 species), forest generalists (29 species) and forest visitors (17 visitors). Forest specialists are considered to have higher conservation significance, as these species are unable to adapt to disturbed forest conditions.

Secondary savannah: this habitat type is located in the northern part of Area 3 and the present ecological state of this habitat is classified as considerably modified. Vegetation structure is Short Open Woodland (sensu Edwards, 1983) with a dense grass understory. The absence of *Elaeis guineense* (Oil Palm), which is an indicator species of former forest conditions when growing in open “savannah” (Bakshi, 1963), means that this community is most likely representative of true savannah. Whilst this habitat type only occupies a small proportion of the study area, it is well represented in large areas between Lunsar and Port Loko.

Within this habitat bird species richness was found to be high, with 85 species observed. The bird assemblage within this habitat is distinctive in species composition and supports a number of species more typical of the Sudan-Guinea savannah biome.

5.9.2 Terrestrial species of conservation significance

During the field visits, the presence of three plant species of conservation significance was confirmed, all of which are restricted to forest habitat. Based on the habitat types within the study area, it is likely that other plant species of conservation significance, including three wetland species, three aquatic species and three forest species, may also be present.

One Near Threatened mammal was confirmed within the study area, the Straw-coloured Fruit Bat, which can range widely over wooded habitat in the study area. Three other species have a high-moderate likelihood of occurrence based on their preference for habitats within the

study area – the Tree Pangolin (found in secondary forest / farmbush), and the Diana Monkey and Sooty Mangabey (both occurring in lowland forest).

No bird species of conservation significance were observed during the field visits. However, five near threatened and one data deficient species have a moderate likelihood of occurrence in the area. Two of these (raptors) are most likely to be associated with over broad grassy valleys, two species are likely to be associated with edges of dense forest, and the fifth species is most likely to occur in flooded natural grassland or along grassy edges of rice wetlands and so could occur anywhere in the drainage lines of the study area.

5.9.3 Aquatic habitats and faunal associations

Five types of aquatic habitats were identified within the study area by Ecorex during their wet season survey; seasonal valley head wetlands, seasonal mid-slope wetlands, perennial mid-slope wetlands, perennial upper foothill streams and perennial lower foothill river. However, following the February 2012 dry season survey by Nepid, due to the absence of flow in rivers previously classified as perennial, the classification of two perennial habitats was changed to seasonal, reducing the number of habitats to four. The classification presented below is therefore the revised classification by Nepid and differs slightly from that presented in the Ecorex report.

Photographs of these habitat types are shown in Figure 5.13 and the spatial distribution is shown in Figure 5.14. Based on the information available from the surveys, no critical habitat was identified at any of the locations sampled during the baseline (due to the fact that the conservation status of one of the species identified is being downgraded).

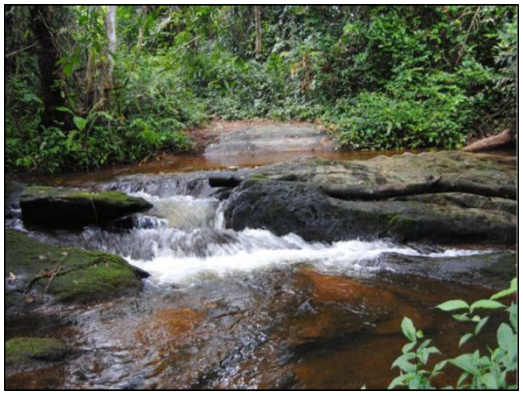
Seasonal valley head wetlands: these are low-gradient, stream-source wetlands. The wetlands within the study area were transformed, mainly by cultivation of rice, however they were structurally intact. There was no evidence of erosion or incision of the main channels. The present ecological state of these wetlands is classified as moderately modified. These wetlands do not provide dry season baseflows, so they are unlikely to be important for streamflow maintenance. The ecological importance of this aquatic habitat is related mainly to high numbers of fish from the families Nothobranchiidae and Poecilidae. Within this habitat 11 species of fish were recorded, the most common being the Nothobranchid *Epiplatys lokoensis*. This species is classified as Endangered by the IUCN, however it appears to be unaffected by rice cultivation and may have even benefited from this change in landuse.

Seasonal mid-slope wetlands: these are low-gradient, mid-slope wetlands, usually with a defined channel and open-canopy riparian margins. The present ecological state of these wetlands is classified as moderately modified. These wetlands do not provide dry season baseflows, so they are unlikely to be important for streamflow maintenance. Most of these wetlands were used for cultivation of rice.

Seasonal valley head wetland (wet season)

Seasonal mid-slope wetland (wet season)

Perenial lower foothill river



Seasonal upper foothill stream (wet season)

Figure 5.13: Photographs of aquatic habitats within the study area

Their ecological importance is related mainly to high numbers of fish from the families Nothobranchiidae and Poecilidae. Eleven species of fish were collected in this habitat type, of which the most common and widespread was the poecilid *Poropanchax normani.*

During their wet season survey, Ecorex also identified Perennial mid-slope wetlands, most prominent along the middle and lower reaches of the Baki Stream. Subsequent revision in this classification by Nepid resulted in the habitat being reclassified as seasonal mid-slope wetlands. Due to slight differences in habitat characteristics and species makeup, a brief description of the perennial mid-slope wetlands as originally identified, is provided. Instream habitats included closed (shaded) and open (sunny), shallow-fast, shallow-slow and deep-slow areas, usually with an abundance and high diversity of submerged and emergent aquatic vegetation.

Their ecological importance is related to the diversity of instream habitats and associated fauna. Twelve species of fish were recorded within this habitat type, with characteristic species being barbs (*Barbus macrops* and *B. leonensis*) and alestids (*Brycinus* spp). Most of these wetlands within the study area had been transformed by deforestation and cultivation of rice.

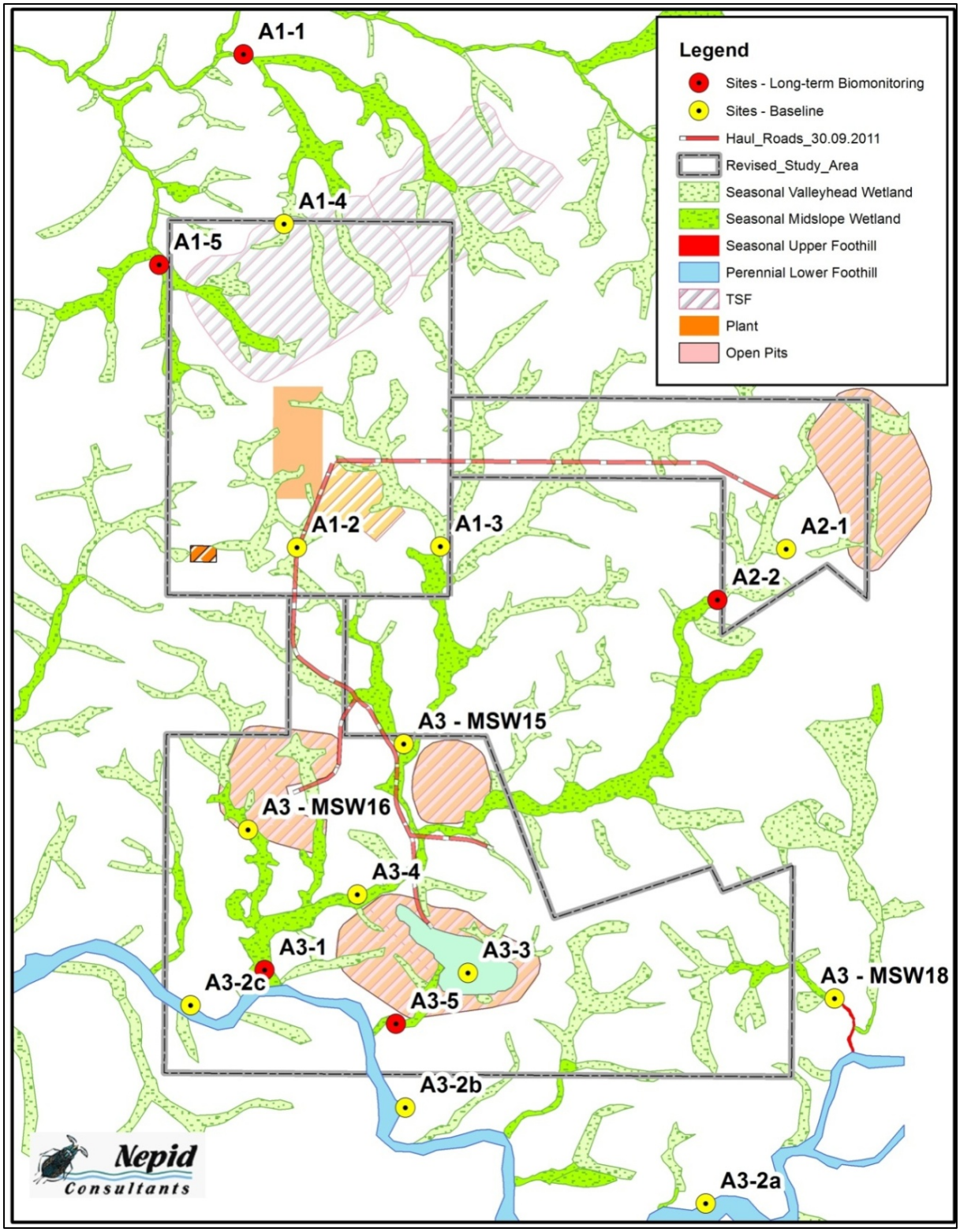


Figure 5.14: Distribution of aquatic habitats across the study area and locations of baseline and biomonitoring sampling sites

Seasonal upper foothill streams: the lower Morea Stream was the only area classified as a Seasonal Upper Foothill Stream. The present ecological state of these wetlands is classified as moderately modified. This stream supports a wide diversity of aquatic habitats, including stones in and out-of-current, deep pools with bedrock substrate, gravel bars, aquatic

vegetation and marginal vegetation in and out-of-current. This stream was originally classified as “perennial” in the Ecorex Biodiversity Impact Assessment Report following the wet season survey but this classification was revised to “seasonal” following the dry season aquatic biomonitoring survey by Nepid. Seven species of fish were recorded in the Morea Stream, with the characteristic species being banded jewelfish (*Hemichromis fasciatus*) and the anabantid (*Ctenopoma kingsleyae*).

Perennial lower foothill river: the Rokel River in the vicinity of the study area is about 130 m wide, and is classified as a Perennial Lower Foothill River. Instream habitats include deep pools, rapids, sand bars, backwaters and margins with tree roots. The Bumbuna Hydroelectric Facility, located about 90 km upstream, could have a significant impact on the river, particularly during the dry-season.

A total of 32 species of fish was recorded in the Rokel River during this study. The most diverse families recorded were cichlids (13 species) and mormyrids (10 species). The high diversity of fish indicates the river is in excellent ecological health.

5.9.4 Aquatic species of conservation concern

During the field visits, the presence of one species of conservation significance was confirmed. This is *Epiplatys Iokoensis* (Endangered), which was found within the seasonal valley head wetlands. The conservation status of this species is currently being downgraded based on more recent information regarding this species.

Based on the habitat types within the study area and previous studies within these areas, other aquatic species of conservation significance may be present. *Marcusenius meronai* (Endangered) has been recorded in the Bagbé and Rokel Rivers; *Tilapia joka* (Vulnerable) has been recorded in the Rokel River; *Sierraia leonensis* (Vulnerable) a species endemic to Sierra Leone; and *Scriptaphyosemion roloffi*, a species found mainly in the shallow and stagnant parts of pools, brooks, swamps and small streams in the coastal rain forest, and is known from the Little Scarcies River drainage system in Western Sierra Leone southward to the drainage system of the Lower Lofa River in Western Liberia (Lalèyè 2006). A number of Endemic species are also likely to be present.

5.9.5 Aquatic ecosystem health

The findings of the February 2012 (dry season) aquatic biomonitoring survey are summarised below. Sampling sites referenced are shown in Figure 5.13.

Water quality: data indicated elevated concentrations of manganese at sampling site A2-2. The other variables analysed were within recommended limits for drinking water and protection of aquatic ecosystems.

Diatom analysis: the biological water quality was indicated to be Natural (Category A) at four of the five sites monitored, and slightly modified at site A3-5, and heavy metal concentrations to be below thresholds for biological concern.

Aquatic invertebrates: the composition and abundance of aquatic invertebrates varied greatly amongst sampling sites and seasons, attributed mainly to differences in surface flow. Limited data regarding existing impacts could be obtained.

Fish: the composition of fish species indicates significant deterioration in ecological conditions (Category B to category E) at Site A2-2 since the October 2010 sampling round. This is attributed to disturbance and sedimentation of the stream due to road construction in

the neighbouring mining concession (see Figure 5.15). Inadequate culvert design in the road was also cited as a problem in terms of fish passage and sedimentation of rivers.

Excessive sediment in the Morea Stream - February 2012.

Poorly constructed culvert with inadequate capacity - February 2012.

Figure 5.15: Impacts on streams due to road construction on neighbouring concession area

6 SOCIO-ECONOMIC BASELINE DESCRIPTION

This Chapter is based on the:

- Socioeconomic Baseline Report, Marampa Iron Ore Project, SRK Consulting (UK) Ltd, February 2012 (SRK 2012ab specialist report in Volume 3, SD8);
- Rural Livelihoods Specialist Study: Phase 1 – dry season survey findings, Wild Resources Ltd, May 2012 (WRL 2012 specialist report in Volume 3, SD8); and
- Cultural Heritage Component of the Environmental and Social Impact Assessment, Marampa, Sierra Leone Nexus Heritage and IFAN, April 2011 (Nexus 2011 specialist report in Volume 3, SD8).

The baseline studies were conducted in adherence with Sierra Leone legislation and international good practice guidelines from The World Bank and the International Finance Corporation ("IFC") on social assessments. The study area for the baseline included three areas; Area 1 covers the potential locations of the processing plant, power generators, auxiliary infrastructure, a tailings storage facility and waste rock dumps; Areas 2 and 3 cover the geological target zones. Two corridors of approximately 100 m will be used for transporting the ore from the potential mining areas in Areas 2 and 3 to the processing infrastructure in Area 1 (Figure 6.1).

Subsequent to the household survey being completed, in March 2011, the Project layout increased in area and the study areas were amended to accommodate these changes. It was discovered that Maso and Magbungbu villages, which were added to the list of affected villages, were not part of the household survey. However as the survey was based on a sample the findings are considered representative of the Project area villages. Maso and Magbungbu were included in the sample for the Rural Livelihoods Specialist (RLS) study survey held in March 2012. The villages covered in the survey for the two studies are presented in Figure 6.1.

6.1 Approach and methodology

The specialist studies are based on primary and secondary sources of information and data. Secondary data was collected from the internet existing reports and articles and is referenced in the footnotes. Primary data was collected directly from community members, local government and non-government functionaries.

For the socio economic study, data collection methods consisted of a household survey, individual interviews, village information sheets, stakeholder group interviews and observations (31 March – 6 April 2011). For the RLS study (phase 1) the data collection methods consisted of village focus group surveys and interviews; field survey, GPS recordings and survey of commercial activities related to natural resource use. Primary data was collected during 14-21 March 2012, in the dry season. The data collection methods, assumptions and limitations are described in the specialist baseline reports.

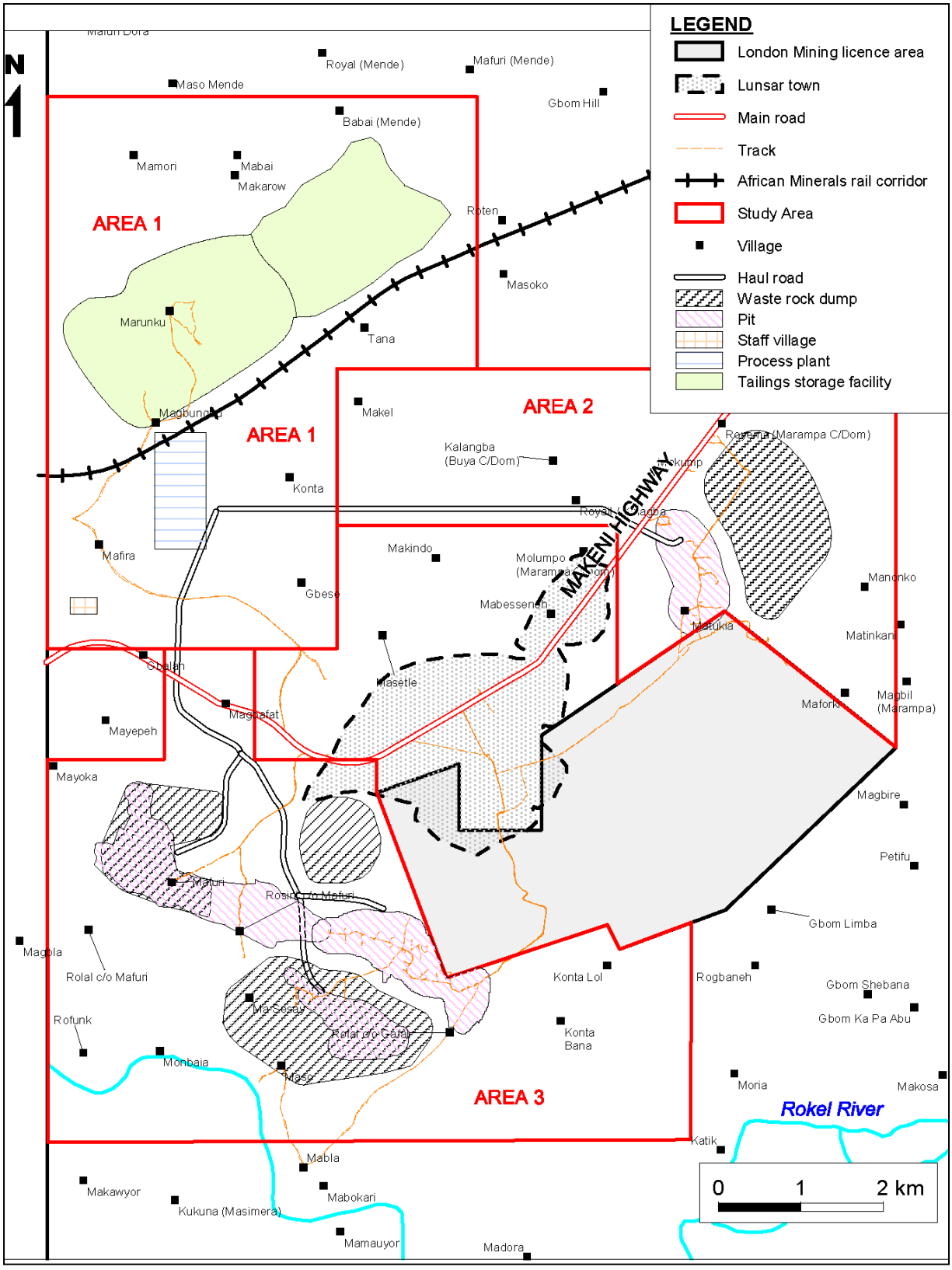


Figure 6.1: Location of villages covered under household survey and rural livelihoods study

6.2 Population

The Port Loko District where the Project is located covers an area of 5,719 km^2 with a population of approximately 478,000. The Project is located in the Marampa Chiefdom, which has a population of approximately 40,000 (2010)[8]. However, the Project's area of influence also covers the, Masimera and Maforki Chiefdoms.

6.2.1 Population in the study area

Population figures for the study area are based on the village survey (Table 6-1).

Table 6-1: Population in the study area villages

Village name	Males	Females	Total Population	Number of households	Average family size
Gbese	120	134	254	23	11
Kalangba	68	65	133	15	9
Katick	171	162	333	35	10
Konta	71	75	146	11	13
Konta Bana	216	187	403	34	12
Konta Lol	19	18	37	7	5
Ma Sesay	4	3	7	2	4
Mafira	53	41	94	15	6
Mafuri	93	85	178	23	8
Magbafat	267	275	542	34	16
Marunku	260	259	519	40	13
Matukia	139	253	392	98	4
Mebesseneh	1208	1227	2435	259	9
Moria	12	5	17	2	9
Rogbaneh	86	84	170	14	12
Rolal c/o Maforay	45	47	92	15	6
Rosint	47	57	104	20	5
Total	2879	2977	5856	647	9

Source: *SRK Village survey April 2011*

The villages have an average size of 38 households, and the average population is 344. 49.2% of the population are males and 50.8% are female, which is indicative of the larger number of males killed in the civil war. The household survey indicated that 42% of the population is below the age of 15, 54% is between the ages of 15 and 64, and 4% is above the age of 64

6.2.2 Ethnicity

There are 16 ethnic groups in Sierra Leone; the two largest groups are the Mende and the Temne. The dominant group in the Project area is Temne other groups include Limba, Mende and Kono. The official language spoken in schools and government administration is English[9], though a majority of people mainly speak Mende, Temne or Krio. The main religions are Islam (60%) and Christianity (30%) and indigenous religions (10%).

[8] *As per the records from the Peripheral Health Unit (PHU), Lunsar (interview 5 April 2011)*
[9] *Britannia Concise Encyclopaedia: Sierra Leone*

6.3 Economy

The main economic activities in the Port Loko District are small scale diamond mining, subsistence farming, production of charcoal, small businesses and small scale fishing. Table 6-2 presents the number of people engaged in different livelihood strategies across the study area villages.

Table 6-2: Distribution of livelihood strategies (aggregated for all study villages)

Village	Total persons	Percentage
Agriculture	2095	82%
Charcoal	955	37%
Animal Husbandry	813	32%
Fishing	714	28%
Plantation	227	9%
Beekeeping	183	7%
Herder	153	6%
Hunting	151	6%
Herbalist	52	2%
Artisan	60	2%
Artisanal mining	52	2%
Driver/mechanic	57	2%
Government employee	18	1%
Brewing	25	1%
Commerce/shop/	7	0.30%

Source: *SRK household survey April 2011*

An overwhelming majority of people are engaged in farming (82%). In most cases other economic activities are undertaken in addition to farming (hence the overlap in percentages in the table). Other popular occupations in the study villages are charcoal making (37%), animal husbandry (32%) and fishing (28%). Further information on the characteristics of different livelihoods strategies is provided in Section 6.3.1.

6.3.1 Description of livelihoods in the study area

This section, based on the rural livelihoods study (WRL, 2012), presents information on the nature of livelihood activities in the study area. It is mainly based on the RLS dry season survey and SRK household survey, and will be further supplemented by a wet season RLS survey in August 2012.

Agriculture

The sale of cash crops is probably the most readily accessible income for most villagers however, most farmers keep what they grow for household consumption. Produce can be sold within the villages, or taken to the daily market in Lunsar or weekly Tuesday market in Foredugu. Some of the generic problems with marketing agricultural produce include the lack of transport. Traders apparently visit the villages with vehicles to buy up larger quantities of produce, usually at relatively low prices and there are also wholesalers based in Lunsar.

The agricultural season begins with preparation of fields in January to March, followed by planting mainly during April to July. Cutting of trees and charcoal making is usually done in April before the start of wet season. Harvesting begins in September thus the hungry period

can last from May to August. The main harvesting goes on till November/December.

The agricultural potential in the Project varies depending on the land type. Topographic relief in the Lunsar area is subdued, and wide, flat river valleys meander across it. The height difference of just a few metres makes a significant difference to soil fertility, wetness and suitability for different crops and farming systems. During focus group discussions it became apparent that there are complex interactions between the use of different landscape units, crops and crop varieties as outlined below.

- **Inland valley swamps:** The flat-bottomed valleys, often termed 'inland valley swamps', are characterised by hydromorphic soils with high clay content and low infiltration rates which, coupled with a shallow gradient, means they are flooded for much of the rainy season. In-wash of nutrients by the river and from valley sides means soils are relatively fertile and suited to rice cultivation. In some places (e.g. Masu) the flow and depth of water is controlled by the installation of contour-bunds. In the narrow, valley-head wetlands, headwater valleys and contour bunds are not used and different varieties of rice are utilised to take advantage of natural water levels. In the dry season, the soil is very difficult to work by hand. Most inland valley swamps are cultivated continuously. Examples are shown in Figure 6.2.

Perennial inland valley swamp with rice

Irrigated mound gardens in runoff zone at end of dry season

Figure 6.2: Photographs of different agricultural methods

- **Runoff zone:** This is the narrow zone where the upland slopes meet the flat valley floor and is called tembe. The soils here are silty and difficult to work when dry. As the flood waters recede, the soil is thrown up using hoes into mounds (m'bof). These mounds are used to grow a variety of crops which are usually planted in March and harvested in June. At the end of the dry season wells are dug into the valley floor to irrigate vegetables on the mounds while cassava is planted as the rains start. As the water rises, the mounds keep the crops from becoming waterlogged.
- **Uplands:** Upland areas are generally covered with trees. The interfluves between the valleys have gravelly clay loam soils which are freely draining, and, are suitable for a range of perennial and rain-fed crops. The farming cycle on the uplands begins with the clearance of a parcel of bush towards the end of the dry season (March/April). Trees are cut at about a metre off the ground and timber removed as needed. Once the rains start the land is sown with rice. Cassava is one of the commonest upland crops and is the only crop routinely grown as a monoculture. The main time for sowing in the uplands is April/May with harvesting in November. If cassava has been planted this may be left for

up to four years and harvested at need. During the fallow years, there is regeneration of secondary forest trees and the resulting poles are used to build houses, used as firewood or turned into charcoal. There is also some differentiation of the uplands. Much of this area has an over storey of oil palm but there are also groves of fruit trees some of which are under planted with shade-bearing crops.

A farmer who has access to these landscape units and uses them to full advantage can reap five harvests of rice a year and ensure a near continuous supply of fresh foodstuffs. Nevertheless there is a 'hungry gap' in August (paya) at the height of the rains when the crops are growing and the previous harvest has been depleted. Cassava and firewood are sold at this time

There are at least 26 crops grown in the study villages (WRL 2012), some examples are given in Figure 6.3. Most are for home consumption but several are also cultivated for sale in Lunsar. This agro-diversity helps the famers take advantage of the different opportunities presented to them. The principal staple crops are rice and cassava with a large number of varieties grown in the area (WRL 2012).

Corn (Maize) and cucumber field

Harvesting palm fruits

Figure 6.3: Photographs of different crops

Commercial farms

A few farmers have capitalised on the opportunity for incomes from farming close to Lunsar and the markets to become commercial farmers. The commercial crops selling at a good price are cassava, aubergine, cucumber, pepper, tomato and pineapples. One farmer reported revenues of Le 200,000 per month and an annual income of over Le 1,000,000 just from cassava. Pineapples are the most valuable commercial crop and retail at 10,000 each, because they are considered to be a curative for typhoid. Peppers sell at Le 150,000 a sack.

Livestock

Livestock owned by the surveyed households is summarised in Table 6-3. 78% of the sample households reported keeping one or more type of livestock. There are dedicated herdsmen, specifically in Mafira Village, while elsewhere livestock is kept near the homestead and tended by the women. The average number of animals kept per household is only indicative as the actual number of animals owned varies according to household.

Table 6-3: Livestock husbandry in the Project area

Animals	Percentage households possessing livestock	Average number livestock per household	Percentage households selling livestock
Goats	41%	3	34%
Ducks	21%	5	17%
Sheep	36%	3	31%
Chickens	79%	19	68%

Source: *SRK household survey April 2011*

- **Poultry**: Chickens were observed free-ranging in all villages and are kept for eggs and meat. Most are for household consumption but some are sold. Poultry cages are made of woven basketwork, or occasionally of metal. One villager mentioned that the parasitic disease coccidiosis is a problem. Ducks (and their eggs) were mentioned as being used in sacrifices in various traditional religious ceremonies.
- **Sheep and Pygmy goats**: Both sheep and goats were seen free-ranging in and around the study villages. There was little indication of any supplementary feeding, though in Matukia women mentioned providing rushes as fodder for livestock. To protect crops from domestic animals, low fences of palm fronds and bamboo are sometimes set up (Figure 6.4).
- **Pigs**: The only pigs seen were on a demonstration farm in Royail. Six sows and six boars were being kept for breeding experiments.
- **Cattle**: There were only a couple of observations of cattle in the study villages. The household survey (SRK 2011) recorded 11 herders in Marunku, 1 in Magbungbu, 6 in Maforay and 15 in Matukia.
- **Dogs**: Dogs were also seen in most villages, kept either as pets, or occasionally used for hunting or driving pests from crops. Owners mentioned using herbal 'charms' to help train their dogs to hunt for certain animal species.

Figure 6.4: Photograph of crops fenced against livestock

Fishing

Fishing is a significant activity in the study area and both locally caught fish and marine fish brought into Lunsar are an important source of animal protein. Although men, women and children are involved in fishing, each group tends to use a different method and it is the women who spend most time engaged in this activity (Figure 6.5). Fishing occurs throughout

the year, though women tend to fish in the dry season and men in the rainy season. The fishing methods used in the study villages include, nets impoundments, traps, hand lines and sieves. When small numbers of fish are caught, these are normally destined for family use. Larger fish, or bigger catches, may be sold fresh in the nearest village, or taken to Lunsar

Impoundments

Fish smoking activity in Gbese Village

Figure 6.5: Photographs of different fishing related activities

Use of wild plants

People in the study villages rely on the resources available in their immediate environment. This means the houses are made from poles cut from farm bush (fallows), wild foods are eaten as snacks or as a source of sustenance in times of famine and extensive use is made of plants in traditional medicine (medicinal use represents 87% of the use of wild plants recorded, as traditional medicine is the primary source of healthcare in the villages).

Estimating the importance of these resources requires measures of the volume consumed and whether there are suitable substitutes. Though there are no data on the quantities required it is possible to make some assumptions based on the nature of the use.

- **Traditional medicine**: Pooling the ECOREX (McCleland & Palmer 2011) and WRL plant species lists gives a total of 241 plants, of which roughly half are used as medicines (Figure 6.6). The majority of medicinal plants are obtained from lowland forest, which is an uncommon habitat in the area and is probably only found within sacred bush. Several informants reported that the dry season is best for gathering medicinal plants. Honey is used as a medicine or tonic. Wild honey is collected once a year, at the end of the dry season (March—April). The typical yield for a hive is 9 - 14 litres. It is sold for Le 5,000 for half a litre. The only medicinal use of animals was a mention of chameleons.
- **Wild foods**: Although the people of the study villages are good farmers they continue to make use of wild foods, which can be an important contribution to food security especially if it is available in gaps between crop harvests. In Marunku the women listed wild foods they collect in the dry season as: Bush yam (wild yam = *Dioscorea* spp), Banga or palm cabbage (unopened bud of palms), matanka (probably *Sorindeia juglandifolia*), malimbo (unidentified) and blakomba (probably *Dialium guineense*).
- **Construction materials**: The material culture of the local people was traditionally entirely derived from local resources (Figure 6.6). Although building materials are changing many houses, especially those of poorer families, are still made using traditional materials. In most villages there were houses being made from mud blocks.

These are made by specialists from outside the village and cost Le 500 each plus food for the workers. The RLS study lists all the species recorded as being used now or in the past for house construction (WRL 2012). A more recent innovation is cutting large forest trees into planks which are then used in building, for furniture and for sale. Exploitation of these tree species is likely to be unsustainable.

Wild leaves used as malaria medicine

Banana fruit as malaria medicine

Construction material for building a small house (walls in progress)

Timber board making

Figure 6.6: Photograph of medicinal plants and plants used for construction

Firewood & charcoal

94% of the sample households reported using wood as the energy source for cooking. The list of species used as firewood includes fruit trees such as guava and mango and indicates there is pressure on the supply of firewood. A typical upland farm patch yields 10-15 bags of charcoal. The prices vary from Le10,000 in the village, Le12,000 in Lunsar to Le15,000 in Freetown. It appears that most of the firewood and charcoal is derived from clearance of fallow land, making it more sustainable. However, there is some evidence that trees in the bush (not associated with farm clearance) are also cut to make charcoal.

Hunting and trapping

To facilitate questioning on hunting activities, a small leaflet and flashcards containing images of 60 species was used. Analysis of the results shows that a small number of species are caught regularly, with a secondary group of species seen regularly by hunters but caught less often (RLS study, WRL 2012). During interviews, villagers drew a distinction between “hunting” and “trapping”. “Hunting” was considered a specialist activity, whilst everybody who

farmed also “trapped” both as a means of providing food, but also to control crop raiding pests. Men, women and children are involved in hunting/ trapping to different degrees. Little evidence of bush meat species was seen during the field visit, which suggested the level of hunting was low.

Specialist hunters hunt throughout the year, but may be busier during the rainy season if providing crop protection to other farmers. The majority of the most frequently hunted species, e.g. Maxwell’s duiker, Brush-tailed Porcupine and Giant Rat can withstand high levels of hunting pressure. At present, it would appear that there are relatively few guns being used by hunters in the Marampa area. In Marunku, farmers mentioned paying young men up to Le100,000 to trap animals on their land. As an indication of the areas that local hunters might cover during a typical trip, one hunter was asked to carry a GPS tracker unit and to follow his normal hunting route. He covered approximately 16 km.

The majority of trapping takes place during the rainy season. Trapping is mainly by wire-cable snares. Two other types of trap were also seen: a home-made dead-fall wooden box-trap used to catch Giant Rats and a spring-loaded break-back trap used for smaller rats and mice (Figure 6.7). Some specialist hunters also use nets and dogs to hunt. It was found that most trapping of animals takes place to protect farm crops. Crop protection is a critical and time-consuming task, particularly bird-scaring which involves children of school-going age. See the RLS study WRL 2012 for more information on hunting and trapping activities.

Dead-fall box trap

Spring break-back traps in market

Figure 6.7: Photographs of different types of traps

Labour

Manual labour is the biggest single input into the farm economy. Labour requirements for inland valley swamps alone can exceed the labour capacity of farm families and a shortage of labour was the most frequent complaint from farmers. The villages utilise labour gangs but with differences in rates paid and descriptions of arrangements. Women also hire men directly to undertake specialist tasks. It will cost a woman Le25,000 to Le30,000 to have men cut trees on an upland plot and Le50,000 to have charcoal made for her.

Trade in wild products

With a few exceptions sales of crops are seasonal, so products listed in Table 6-4 are used to supplement incomes. Other natural resources sold by people in the study are ferrocrete blocks and sand. Commercialisation of wild resources in the study villages is relatively low. The only resources that appear to be threatened by over-exploitation are timber trees.

However, loss of threatened habitats and increasing demand may initiate commercialisation of medicinal plants, which could result in over-exploitation of this resource.

Table 6-4: Traded wild products

Product	Value	Market channels
Nuts of *Cola nitida*	Price Le5,000 to – Le8,000 for 100. Le 30,000 for a 'load'	Wholesale (sold by the hundreds) from villages, retailed in local markets. May reach the ancient pan Saharan trade network for this product.
Leaves of *Hallea stipulosa*, direct or as wrapping for Kola nuts as traditional wedding gift	Le500 per leaf if sold individually	Probably sold within Temne cultural group in Lunsar area
Dried calyx (flower bud scale) of *Xylopia aethiopica* used a tea.	Le2,000 for a handful	Direct retail in Foredugu market. Some wholesale into national markets via Lunsar. Sell (available) in dry season.
Fruit of *Dialium guineense* cooked with sugar to make a sweet	Le1,000 for a fist-sized lump	Sold in Foredugu market
Poles (2 m long) of *Anisophyllea laurina* – 12 poles in a bundle	bundles of 12 sell for Le15,000 in Lunsar	Sold in large volumes for building and scaffolding across Sierra Leone
Firewood – many species – bundles of sticks	Le6,000 – Le7,000	
Charcoal - bag	Le10,000 - Le15,000	Village, Lunsar and national market chains. Prices depend on market and season (higher prices in rainy season)
Fresh fruit of *Sorindeia juglandifolia* and *Diospyros heudelotii*		Sold to bring income to poor families
Honey – wild bee hives	Le5,000 for half litre	Retail in Lunsar and perhaps Foredugu

Sand mining

Sand mining from the Rokel River is a key economic activity (Figure 6.8). It has a high commercial value due to a demand from the construction sector. Men, women and children are engaged in different activities contributing towards collecting sand. Each truck load is sold at between Le300,000 to Le500,000.

Boy collecting sand

Trucks usually take the sand to the markets

Figure 6.8: Photographs of sand mining

6.3.2 Value addition

There is little opportunity to sell most crops in a processed form but there are a few opportunities for value addition as listed below, with some examples shown in Figure 6.9.

Palm oil extraction process

Soap for sale in Foredugu market (the vendor had come from Makene by transport)

Figure 6.9: Photographs of value addition to crops

- **Food preservation and baking**: Drying is an efficient means of preserving perishable foods especially in the dry season. In the case of chillies, processing did not add any value. Fresh chillies retailed at Le1,500 per handful and dried retailed at Le1,200 per handful. Baking can add value however there was no evidence of ovens in the area.
- **Cassava**: Cassava is a crop which perishes quickly therefore much of it is sold processed. A sack of raw cassava tubers sells for Le20,000, while a sack of raw cassava turned into fufu sells for Le50,000.
- **Palm oil**: There are two varieties of oil palm; the tall, wild trees are lower yielding but produce tastier, redder oil preferred by the local people and kept for home consumption. The short Massankey cultivars produce less desirable oil, which is sold as good quality kernel oil. The villagers sell the Massankey nuts to people in Lunsar who use them to make soap. The oil is decanted into yellow gallon containers and sold or stored for household use.
- **Soap making process**: To make soap the oil is boiled with caustic soda bought from the market with Raphia palm leaves. The resultant soap is medium hard soap sold for Le1,000.
- **Charcoal**: Figures from the farm questionnaires suggest it costs Le25,000 to have trees cut, Le50,000 for the charcoal burner to turn a farm plot into 10-15 bags of charcoal which then wholesale for Le10,000 each. This gives a cost of production of Le70,000, for a return of Le100,000 – Le150,000.
- **Artisans and specialist skills**: There were remarkably few artisans encountered in the study villages, the skills of those encountered are described in Table 6-5 and some examples are given in Figure 6.10.

6.4 Land tenure

In Sierra Leone, there are two main systems of land holding: freehold rights in the Western Area and a customary system in the provinces where land is principally owned and controlled by families or traditional leaders. In the study area villages customary land tenure rules apply. According to customary law, chiefdoms and communities hold the ownership of property and therefore a plot of land can never be owned freehold.

Title to land is vested in families based on ‘first settler’ rights with a small number of families

controlling land in each village. Family land is vested in the family as a group, although family land tenure prevails in the area it is locally acknowledged that the Paramount Chief is the custodian of the land. Family land is allocated to individual family members and can also be 'lent' or rented to less privileged families or strangers in need of growing space. Less formal arrangements, whereby a farmer or a family "borrow" land, were observed.

In the context of resettlement, national policy states that, as much as possible, land disposal or acquisition should not render a land title holder (including customary land ownership), his kith, kin and descendants completely landless, save in the case of compulsory acquisition in the public interest.

Table 6-5: Artisans and specialist skills in the study villages

Craft	Resources used	Markets and prices
Broom makers	Mid-ribs of young palm fronds (a common and essentially free resource). The ribs are stripped, tied into bundles and dried. Made by women and men.	• Lunsar 1,000 Le per broom • Village 500 Le per broom
Wood carvers	Mortar carved from Yemani (*Gmelina arborea*) and pestle from K'bap (unidentified). Carver learnt trade by watching people make them.	• Previously sold but now made for household use.
Basket makers	Men weave baskets from *Raphia* leaf stem for use by fish sellers, winnows and mats. Also make large woven granaries (~1.5 m tall x 1 m diameter with lids) to order.	• Baskets 2,000 to 5,000 depending on size • Granary sells for 50,000 Le
Blacksmith	Makes cutlasses from vehicle leaf-springs with handles made from *Holarrina africana* and *Samanea dinklagei*. Skills passed from father to son.	• Village & Lunsar 20,000 Le per cutlass
Drum makers	Body of drum made from Yemani (*Gmelina arborea*). Skill passed from father to son.	• Sold on commission for around 20,000 Le for a drum
Palm wine makers	Almost exclusively done by Limba people. Men work in groups and share equipment. They pay 15,000 Le per month to farmer to tap trees. Taps put into base of young leaves at top of tree and emptied twice a day in morning and evening.	• Wholesale: Plastic jerry can sells for 20,000 Le and costs 13,000 Le to make giving a profit of 7,000 Le for ten litres. • Retail in village: Bottle of palm wine sells for 1,000 Le
Professional hunters	There is an opportunity for specialist hunters, especially those with guns, or groups with nets and trained dogs, to provide pest control on farms on a contract basis.	• Rates seem highly variable (20,000 – 100,000 Le), depending on the services provided. Any animals caught are kept by the hunters.
Fishermen	In villages on the Rokel river there may well be specialist fishermen who use the large dugout canoes and large hand-casting nets to catch fish, though this equipment may available to everyone.	• Numerous small traders were encountered passing from the fishing villages of Mbla & Masu, having purchased fish from fishermen there.

Brooms

Wood carvings

Baskets

Drums

A blacksmith in the Konta Village

Fishing nets (a net takes a week to make and sells for Le 10,000)

Figure 6.10: Photographs of artisanal work

6.5 Living standards

The household survey shows that only 8% of the adult population in the Project area (age 15-60) have a stable regular income. The percentages of households in the survey who obtained income from different sources during the month of April 2011 are presented in Table 6-6. From this it can be seen that the sale of agricultural/farm produce was an important source of income in the study villages.

Table 6-6: Income sources in the study area

Income Source	Percentage of households
Sales of agricultural/farm produce (including livestock)	80%
Self-employment (artisans/trade)	6%
Employment	2%
Remittances	5%

Source: *SRK household survey April 2011*

6.5.1 Possessions and expenditure

Household possessions are generally limited to basic furniture such as tables, beds, chairs/stools and items such as radios cell phones and bicycles, which are considered essential. Table 6-7 shows the average annual household expenditure for the principle items. The average expenditure on food is 44% of total expenditure. Monetised value of food produced further increases this percentage reflecting widespread poverty in the study area. It also shows people are not self-sufficient with regard to food. School fees, clothing, household energy, agricultural equipment, medical care and transport are also significant expenditure items.

Table 6-7: Annual household expenditure in the study area

Item	Average cost per household per year in Le	Average cost per household per year in USD[10]	Percentage of total expenditure
Food	1,836,146	402.8	44.2%
School fees	469,695	103.0	11.3%
Clothing	333,337	73.1	8.0%
Household energy	327,624	71.9	7.9%
Agricultural equipment and inputs	314,796	69.1	7.6%
Medical care	279,914	61.4	6.7%
Transport	227,794	50.0	5.5%
Buildings	158,905	34.9	3.8%
Cellular telephone	77,932	17.1	1.9%
Savings	70,694	15.5	1.7%
Livestock expenses	53,662	11.8	1.3%
Water	3,220	0.7	0.1%
Total	4,153,719	911.3	100%

Source: *SRK household survey April 2011*

6.5.2 Food Security

The diet of local communities in the study area is based on locally produced staple crops and locally grown vegetables. Fish is eaten more regularly than meat, which is eaten occasionally due to its high cost. Decreasing crop yields, an increase in pest related crop failures and reduced availability of food resources from the forest have led to reduced food security[11]. In the household survey, 83% of households indicated they experience food shortages at some stage during the year, predominantly during the period July to September.

[10] *Exchange rate 1 USD=4558sll (September 2011)*
[11] *Food security is considered ranging from 105 kg 157 kg of rice per capita per annum.*

6.5.3 Habitation

People live predominantly in settlements with some scattered housing near the fields for protecting the farms. Traditional housing consists of clay and earth structures, built with a thatch roof (18% of survey households had a traditional house – see Figure 6.11). Modern materials are now often incorporated into the house structures. 17% of survey households did not have a bathroom. Some houses were in bad condition as observed during the survey.

Typical traditional house

Improved traditional house

Figure 6.11: Traditional houses

6.5.4 Energy sources

The energy source for domestic lighting in the study villages was predominantly paraffin lamps (71%), battery operated lights (19%) and candles (10%), with about 17% of the people using a combination of the above three sources.

6.6 Social stratification

Although the majority of the rural population is poor, some stratification exists. There are traditional elite families who can trace their ancestry (usually through the father's line) to a warrior or hunter who first settled in an area. These families control and administer land, people who want to acquire the right to farm must show respect to an elder from this family. Colonial administrators have historically exacerbated this social stratification.

6.7 Vulnerable groups

Vulnerability is defined here as the inability to generate sufficient resources to meet basic human needs). The most vulnerable groups include those who cannot work the land (widows, the elderly and the sick), who have no other means of income generation and no family or other social support network.

6.8 Health

There are six functional Peripheral Health Unit (“PHU”) in the Marampa Chiefdom. Each PHU has its own catchment area and together they cover a population of approximately 20,000 (or 50% of the Chiefdom population) including the population living in Lunsar town. The PHU in Lunsar is headed by nine government staff, a Community Health Officer, Nurse, Maternal and

Child Aides, Nursing Aides, Vaccinator and Cleaners/Labourers.

The study area is also served by other health institutions in Lunsar town:

- The Saint John of God Catholic Hospital (a referral hospital) providing health service to the region at a nominal cost.
- The Baptist Eye Hospital providing specialist services at a nominal cost.

These have a good reputation nationally however the cost of treatment is too high for the majority of the people in the villages to afford. Marunku is the only village in the study area that has a health facility and managed by a Nurse and Traditional Birth Attendants ("TBAs").

Health and hygiene conditions in the study area are generally poor. The household survey showed that 81% of households deposit their household waste in the areas around their homesteads. The water quality was observed to be inferior and wells dry out during the dry season. Villagers often need to walk long distances to fetch water.

According to the PHU in Lunsar, malaria is a leading disease in the chiefdom. Other diseases prevalent in the area are diarrhoea, pneumonia, clinical malnutrition, anaemia, measles, typhoid, skin infections, eye infections and hypertension. The incidence of HIV/AIDS has increased 17 cases in 2011. These 17 cases are receiving treatment from the PHU. STIs are on the increase in the chiefdom and the PHU records 17-18 cases every month. Table 6-8 lists health problems experienced by local residents during the past six months. These are based on symptoms identified by the residents and not necessarily based on professional medical diagnosis.

Table 6-8: Most prevalent health problems in the Project area

Disease	Percentage occurrence
Headache	32%
Malaria	29%
Respiratory Infections	15%
Diarrhoea	9%
Others	9%
Cholera	6%

Source: *SRK household survey April 2011*

The key challenges identified by this PHU are:

- unable to meet the needs of increasing number of patients;
- poor salary for staff and TBAs working with the PHU are currently unpaid; and
- additional transport needed to increase their outreach and coverage.

Self-medication is widely practiced (Section 6.3.1). Data from the household survey for medical care sought by people shows that in 80% of the cases contemporary medicine was used and in 20% traditional healers (Table 6-9). In addition to traditional beliefs, distance and cost are also deciding factors.

Table 6-9: Consultation of medical services in the study area

Medical Care	Number (and percentage) of people seeking services
Health professional (clinic)	51 (80%)
Local traditional healer	13 (20%)

Source: *SRK household survey April 2011*

6.9 Education

The levels of education and literacy are generally low in the study area. Table 6-10 summarises the education level for the population covered by the household survey. During the study, the importance of education was repeatedly stressed by the local population.

Table 6-10: Educational levels in the study area

Education level	Number of people	Percentage of population
No education (>13 years old)	680	47%
Started but did not complete primary school (>13 years old)	308	21%
Completed primary school (>13 years old)	207	14%
Started but did not complete secondary education (>18 years)	168	11%
Completed secondary education (>18 years)	91	6%
Tertiary education (>25 years)	17	1%
Total	1471	100%

Source: *SRK household survey April 2011*

The education sector encounters several challenges, some of which are listed below:

- lack of schools–. Children often have to walk long distances to reach school, resulting in low attendance and large numbers of drop outs;
- shortage of trained and qualified teachers;
- late or no payment of teachers leading to de-motivation;
- dilapidated school buildings and shortage of classrooms, though MIOL has provided assistance to some local schools (Figure 6.12); and
- overcrowded classes.

Broken roof in a classroom

New school build by MIOL in Konta

Figure 6.12: Examples of educational facilities

6.10 Infrastructure

The general infrastructure in the study area is in a poor state of repair. There is no state provided electricity in the area but mobile phone coverage is good. There are few paved roads between the villages, and some villages are accessible only by footpath. The area does benefit from a sealed road to Freetown (Makeni Highway), which provides access to markets

for buying and selling farm products. The main market for the study area villages is Foredugu near Lunsar.

6.11 Ongoing governmental and non-governmental programmes

A large number of non-government organisations (NGOs) are working in Sierra Leone. The Government and private sector combined does not have the capacity to meet basic health, education and welfare needs. Some of the Government and NGO programmes active in the study villages are:

- grain bank Projects run by GoSL in Gbese Village and by Saint John of Paul Church Health Centre (a NGO) in Katik Village;
- training and seed money to women to encourage micro-credit groups of 10 to 20 members by an International NGO, called BRAC - the credit is usually used for farming activities and other small business activities; and
- prevention of harmful practices against women and girls, specifically Female Genital Mutilation ("FGM") by a local NGO called Amazonian Initiative Movement ("AIM").

6.12 Contemporary social system and practices

Land-use rights and most portable forms of wealth are inherited patrilinealy. Decision making in the village is done by the chief and the elders of the landowning families. Youth and women's' organisations are consulted in decision making.

The Project could impact differently on men and women. Due to the many socio-economic disruptions, wars and break-ups of families, gender roles may have become less rigid. An overall picture from the household data shows that:

- women are exclusively involved in cooking, cleaning, tending gardens, selling crops/local produce, and collection of water, firewood and wild flowers;
- men are exclusively involved in cutting trees, clearing farms, making charcoal, building mounds, hunting and housing construction (and also entitled to own/inherit land); and
- both men and women are involved in fishing, managing livestock, land cultivation, processing oil palm, upbringing of children, decision making and purchasing goods, however the extent to which these jobs are shared varies by task and by household.

From FGDs it was learnt that some girls are falling pregnant at the age of 13 years. Parents also complained of changing social values in general and growing indiscipline among the youth.

6.13 Archaeology and cultural heritage

A rapid archaeological scan was conducted in the Project Area in March 2011 (see Nexus 2011 specialist report in Volume 3, SD8). The ethnographic meetings and interviews resulted in the identification of 62 cultural heritage sites (49 sacred sites and 13 archaeological sites). These are shown on Figure 6.13 with detail on each site presented in the specialist study report.

Every village in the area has one or more 'sacred bushes' normally linked to the secret societies within the villages. Most villages also have a burial ground, and where villages have both Muslim and Christian inhabitants, there will usually be two cemeteries. In addition there

are archaeological sites, which the villagers regard as 'ancestral villages' and attach great value to. Local people reportedly feel it is acceptable to relocate and restore the sacred bushes and cemeteries as long as the right procedures are followed

6.14 Community perceptions: needs and apprehensions

Needs and apprehensions were identified through the stakeholder engagement process, as well as through interactions between the baseline specialists and the communities. Development needs and problems in the study area, identified through the focus groups discussions and household survey, are presented below. The key community needs are:

- employment;
- assistance with education fees/scholarships for children;
- improvement of facilities – health, education and roads;
- access to drinking water facilities and electricity;
- assistance with agricultural activities, and
- poverty alleviation in general.

In general, potentially affected people seemed positive towards the Project. A summary of the stakeholder apprehensions, as gathered during the baseline survey is presented below.

- Fear that community members will be marginalised in terms of job opportunities by outsiders (many already complained of jobs being given to outsiders).
- Concerns about being compensated inadequately for loss of land and damage to crops during construction activities.
- Concerns the Project activities will have a negative impact on drinking water sources in terms of contamination and/or reduced availability.
- Concern the vibrations caused by blasting will damage their houses (some cited their experiences from the old Delco operations), and
- Concern building of further roads will disrupt community access routes or connectivity to Lunsar and other villages (some people cited how they were already impacted due to the rail line).

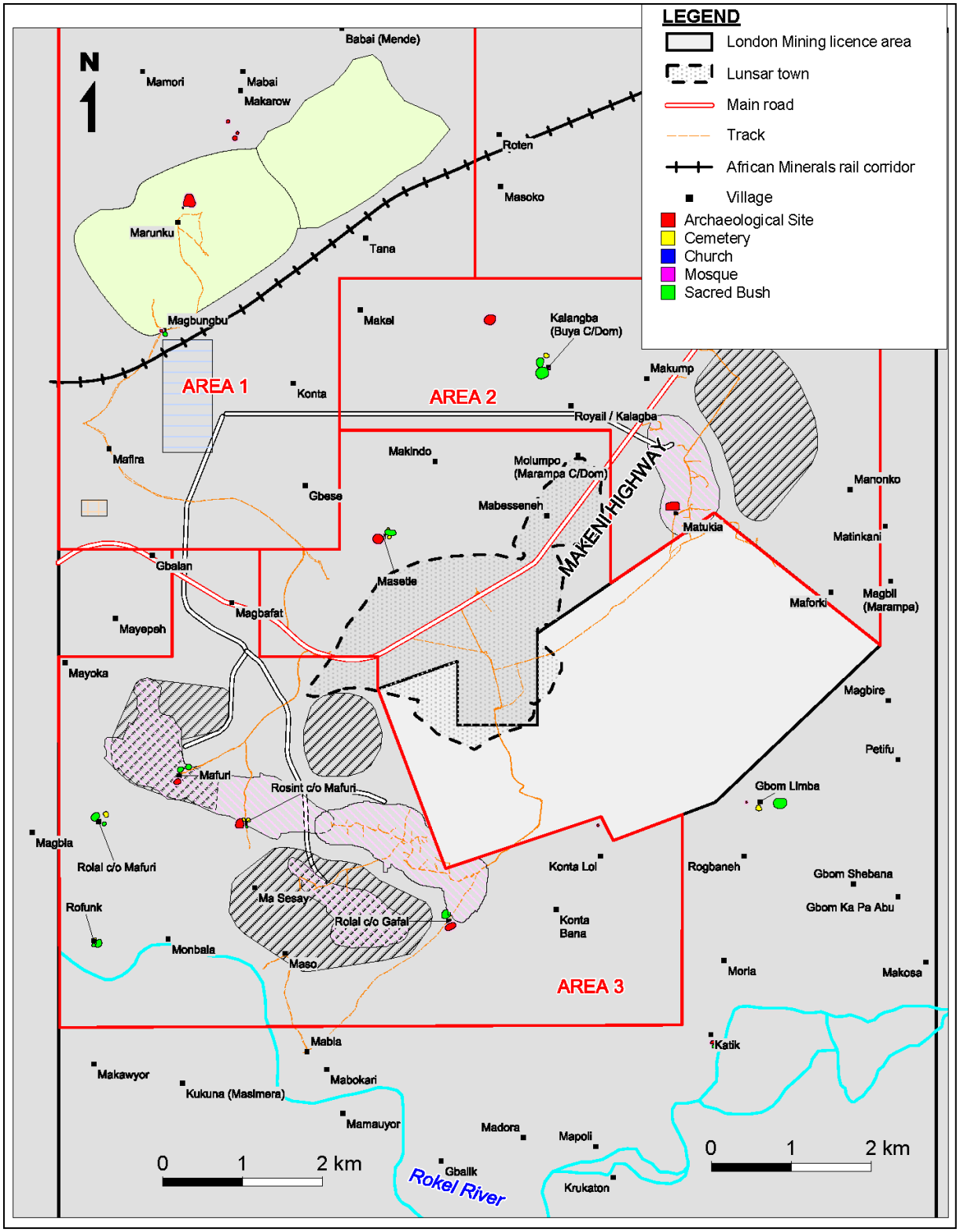


Figure 6.13: Location of archaeological and cultural heritage sites in the study area

7 BIOPHYSICAL IMPACT ASSESSMENT

This Chapter describes the biophysical impacts that could occur as a result of the Project. Socio-economic impacts are described in Chapter 8 and Community Health, Safety and Security risks in Chapter 9. The impacts have been identified based on consideration of the information presented in the preceding chapters. To avoid unnecessary repetition of supporting information, cross referencing to other sections of the report is given where necessary.

The various impacts identified for the Project, as well as an indication of the Project phase (construction, operation, decommissioning and post-closure) in which the impact is expected to occur, are described in the subsections below. The Project phase is indicated by shading bars at the beginning of each impact description – the darker the shading in the bar, the more applicable the impact is to that Project phase.

As the Project is phased over two consecutive development stages (Stages 1 and 2, as described in Chapter 4), the construction phase is assumed to extend in duration through the operation of Stage 1, until Stage 2 construction has been completed. The entire construction phase of the Project is therefore expected to last approximately three and a half years (18 months for construction of Stage 1 followed immediately by 18 to 24 months for construction of Stage 2). In general, operational impacts will commence with Stage 1 and increase in intensity as production capacity increases through Stage 2, and tail off towards decommissioning and closure 14 years later.

A summary of issues or concerns as expressed by stakeholders during the information sharing consultations (Section 3.3.5), and where they are addressed in the various impact sub-headings below is provided in Table 3-7. These issues were considered when identifying and rating the importance or value of possible impacts.

Identified impacts are discussed within impact groups (such as Land Transformation or Water Resources) to organise the discussion and keep it concise. Impact group reference codes have been assigned to help maintain links between the discussion of impacts in this section and the environmental management programme in Appendix F. Each impact group discussion includes the Project activities that may give rise to impacts and, where relevant, generic information supporting the overall impact group discussion. A summary of the impacts evaluated in this section, listed per impact group, is given in Table 7-1. As there are close linkages between a number of the impacts (for example those affecting multiple receptors) and to avoid repetition, these impacts have been listed and rated in the impact group most affected, with cross references to the other linked impacts, both within and between disciplines (biophysical, socio-economic and health and safety).

Table 7-1: Summary of evaluated biophysical impacts

Impact groups	Impact headings
Land transformation	• LT1: Change in land use as a result of mine and related infrastructure limiting use by local communities • LT2: Disruption of community access routes by mine infrastructure, resulting in social disruption • LT3: Mine infrastructure and activities resulting in visual intrusion and loss of 'sense of place' for local communities • LT4: Loss of topsoil through erosion, decreasing land capability • LT5: Fugitive dust resulting in changes in soil chemistry and agricultural land capability

Impact groups	Impact headings
Water resources	• WR1: Pit dewatering potentially resulting in reduced groundwater availability to ecological systems and local communities • WR2: Surface water abstraction affecting downstream users • WR3: Project infrastructure causing altered flow conditions, affecting downstream users • WR4: Surface water diversions causing potentially changes to flood risk to adjacent agricultural areas and communities • WR5: Seepage from mining wastes potentially resulting in deteriorated water quality affecting communities and ecological systems • WR6: Discharge or runoff to surface water potentially resulting in deteriorated water quality affecting communities and ecological systems
Ecology and biodiversity	• EB1: Site clearance and positioning of Project infrastructure potentially resulting in habitat loss and fragmentation, and direct loss of fauna and flora • EB2: Soil disturbance facilitating the establishment and spread of invasive species, affecting indigenous ecosystems • EB3: Project activities potentially resulting in sensory or other disturbance to wildlife • EB4: Mine infrastructure and activities attracting nuisance species, resulting in impacts on indigenous ecosystems

As described in Section 3.3.3, the individual impact discussions are generally concluded with an impact rating table. The header row of the table gives the impact definition. The following rows present the impact characteristics and significance ratings. The final row presents any additional management measures identified as required to appropriately control/enhance the impacts. These would be over and above the inherent management measures incorporated into the Project design and described in Chapter 4. Where such measures are stipulated, a rating for the 'Residual impact' is provided, assuming these measures are successfully implemented. Included in the summary table is a confidence assessment, which provides the reader with an indication of the assurance level placed on the rating process and addresses the concept of uncertainty. An indication is also given as to whether the impact is reversible or not.

In addition to mitigation or enhancement measures, there may be a number of good practice management measures, which are unlikely to change the impact rating but are considered good international practice for managing that impact. These are listed below the summary table, where relevant.

The impacts described in this section are based on normal activities expected during the relevant Project phases (construction, operation, decommissioning and post-closure). Some impacts may be exacerbated or caused by upset conditions due to natural hazards such as seismic events or floods, third party interference such as sabotage, equipment failure or human error. Such events are not considered normal and therefore where relevant the implications of upset conditions on the identified impacts have been described after the rating of normal conditions has been presented in the rating table. Such events would be handled as an emergency or incident as described in Section 11.6.

Although the Project will occur in two development Stages, impacts have been assessed for Stage 2 (full Project) only, as this stage is expected to result in impacts of greater significance than Stage 1, due to the increased production throughput and larger overall footprint disturbed. Where there is some uncertainty regarding impact predictions, such as in situations where all the relevant detail was not available at the time of the impact modelling (specifically for water resources, air quality and noise impacts), a generic worst case reasonably foreseeable scenario has been used. This may result in over-estimation of these impacts, and additional impact modelling, once more accurate Project-specific information becomes

available, may be required for instances where the new information differs significantly from that used for the current impact assessment.

7.1 Land transformation

Development of mine, transportation and associated infrastructure will disturb the land surface and result in a temporary or permanent change to the land and its capability for other uses. The Project area is relatively flat and low-lying and generally densely vegetated, either with cultivated crops or natural vegetation.

Land transformation can occur due to direct modification of the land as the soil is cleared and moved for construction of Project infrastructure or covered by waste rock dumps, or where activities associated with the Project (such as access roads, resettlement areas and expansion of the surrounding residential areas as a result of an influx of job-seekers) affect land outside the immediate footprint area. The severity and extent of land disturbance may be increased beyond the directly disturbed footprint by indirect modification due to erosion, changes in drainage patterns, compaction of soil, chemical spills or leaks, and deposition of sediments by wind and water, affecting soil chemistry and the ability of the land to be beneficially used.

Naturally occurring modification of land by wind and rain (erosion) may be exacerbated by Project related activities, including:

- disturbance of the soil surface vegetation and soil crust (for example by vehicle and equipment use and land clearance for construction) increasing the susceptibility of the soil to wind and water erosion;
- alteration of surface topography by construction of large infrastructure (such as the waste rock dumps) resulting in changes to the wind and stormwater runoff patterns and exposure of larger surface areas to wind and water erosion; and
- changing the route and hydrology of natural drainage lines (such as stream or stormwater runoff diversions around Project infrastructure or to create water storage facilities).

Implementation of good practice measures, such as erosion control and minimising the area and degree of disturbance, may reduce the spatial scale of the impact; nonetheless a relatively large area (>2,000 ha) will be subject to permanent change. These measures are listed in the sections below. Some of the disturbance can be reversed at closure by rehabilitation of disturbed areas and removal of Project infrastructure with no ongoing use.

7.1.1 LT1: Change in land use as a result of mine and related infrastructure limiting use by local communities

Construction	Operation	Decommissioning	Post-Closure

The local communities are heavily reliant on the land for their various livelihood strategies and use the area extensively for subsistence agriculture (including rice cultivation in the floodplains and cultivation of cassava and tropical species such as oil palm, pineapple and mango in the upland and secondary forest areas), as well as harvesting of natural resources (such as wood and wild plants), hunting and fishing. Agriculture is the most significant current land use and livelihood strategy (practiced by 82% of the population) in the area, and intercropping methods are used by local farmers to take full advantage of the available

habitat. Natural vegetation, particularly forest, is also used extensively for the harvesting of wild herbs (primarily for medicinal uses), firewood, and for cultural purposes.

This impact will begin with the clearing of land for construction of the Project infrastructure, increasing in magnitude through operation and decreasing post-closure with rehabilitation of the area, the aim being that communities could eventually resume their use of some of the land for agriculture or some other useful purpose. The recovery of natural vegetation to support harvesting of natural resources is likely to require longer periods and is discussed in Section 7.3.1 (EB1).

The areas that will be directly disturbed through construction of the mine infrastructure, together with the current land uses of these areas, are indicated in Table 7-2. The total area directly transformed due to mine surface infrastructure is approximately 2,200 ha, of which approximately 89% (~1,950 ha) is land currently used for agriculture. This is however an underestimation of the actual land surface area directly impacted, as it does not account for access roads, laydown areas and other minor infrastructure.

Table 7-2: Current use of land[12] directly disturbed by mine infrastructure

Current land use	Approximate area permanently modified (ha)
Gallery Forest	1.2
Secondary Savannah	5.5
Urban	7.8
Transformed - Subsistence Cultivation	7.9
Transformed - mining	8.4
Transformed - Oil Palm Plantation	26.2
Transformed - Mango Plantation	120. 0
Rice Wetlands	326.0
Secondary Forest / Farmbush Mosaic	1,452.0
Total agricultural land	**1,955.0 (89%)**

Loss of agricultural land and habitat for indigenous vegetation - either permanently through construction of Project infrastructure or temporarily through soil compaction and clearing of vegetation from surrounding areas for access routes and lay down areas during construction - is therefore expected to affect these communities in terms of food security and livelihoods (discussed further in RL1 and RL4 in Section 8.2). In a number of cases, whole villages will be directly impacted due to the positioning of Project infrastructure, and relocation of these villages will therefore be necessary. In other cases, land used by villages will be lost or otherwise impacted through land acquisition but the villages themselves will not be relocated. It is estimated that, in general, an area with a radius of approximately 2 km around the village is used for natural resource uses (WRL, 2012). Impacts relating to relocation and land acquisition are addressed separately in Section 8.2 (Impacts RL1 to RL4). The loss or disturbance of sites of cultural heritage (such as sacred bush) is discussed in Section 8.4.1 under impact AC1.

Due to the close association between this impact and Impact RL1 (impoverishment through loss of shelter, land and communal natural resources) in terms of impacts on communities, and to prevent double rating, this impact has not been rated in this section. The rating provided for Impact RL1 in Section 8.2.1 therefore applies. Implementation of the

[12] *Calculated from Ecorex 2011 report, included as SD4 of Volume 3*

management measures listed for Impact RL1, in addition to the good practice measures listed below, is recommended to assist communities in adapting to the change and resuming or adopting new livelihoods more quickly. With rehabilitation, the intention is that the impact will be partially reversed and the land will once again be made available for use by local communities (though post-rehabilitation use may differ from pre-mining land use).

Good practice measures recommended include the following:

- Develop a Construction Management Plan that includes requirements to:
  - Minimise the footprint area disturbed during construction, operation and decommissioning of the Project.
  - Minimise the duration of the disturbance by starting rehabilitation as soon as possible and progressively rehabilitating disturbed areas that are no longer being used for the Project, and making them available for communities to use.
- Prohibit unnecessary off road driving, and use planned and designated access routes and lay-down areas only.
- Review and update the Closure and Rehabilitation Plan periodically to address current site conditions, community expectations, and the results of ongoing routine monitoring.

7.1.2 LT2: Disruption of community access routes by mine infrastructure, potentially resulting in social disruption

Construction	Operation	Decommissioning	Post-Closure

Another factor affecting local communities is the disruption of access routes, resulting from construction of the mine infrastructure blocking these routes. Apart from the beneficiation plant and staff accommodation village, Project infrastructure, including haul roads, will not be fenced allowing for a degree of access across Project areas. However, the presence of large infrastructure such as the TSF, WRD and pits would in itself prevent access or thoroughfare to areas on the other side of it. In cases where access across infrastructure may still be possible, safety (in the case of haul roads and other access roads) or ease of crossing (such as in the case of above ground pipelines) may be compromised.

It is also likely that community members will use the haul roads and other mine access routes making for easier access to Lunsar and the Makeni Highway. This access would however increase the safety risk for community members and their livestock due to mine-related traffic as discussed in Impact TS2.

It is expected mine infrastructure associated with the change in land use will have a negative impact on community access, particularly for more localised routes used between villages, and could ultimately impact on community members' livelihoods and ultimately income generation. Due to the linkages between this impact and the associated social impacts the overall effect on communities is evaluated and rated in Section 8.2 (Impact RL2).

7.1.3 LT3: Mine infrastructure and activities potentially resulting in visual impacts for local communities

Construction	Operation	Decommissioning	Post-Closure

Visual intrusion and loss of a "sense of place" may occur directly as a result of mine infrastructure and changes to the landscape (due primarily to vegetation clearing and construction of the open pits, tailings facility and waste rock dumps). Indirect impacts may also result from dust blown from exposed surfaces and from blasting creating a plume, as well as lighting of site infrastructure in an otherwise relatively unlit environment, both of which could be visible from a considerable distance. Ecological impacts resulting from visual intrusion are discussed in Section 7.3.3 (Impact EB3) and the impacts on road safety in particular resulting from dust are discussed in Section 9.3.1 (Impact TS2). Air quality impacts resulting from dust are discussed separately in Section 9.1 (Impact AQ1).

Non-mining waste such as building rubble and domestic waste, both directly and indirectly (due to increased population and development in the area) related to the Project, is another aspect that could result in a negative change in visual character of the area. Although a waste landfill is planned as part of the Project, indiscriminate dumping of litter and rubble resulting from secondary developments could contribute to visual degradation of the area on a local scale.

The scale or intensity of the visual impact may be perceived differently depending on the sensitivity of the viewer and their location relative to the impact. Sense of place is defined as a person's sense of belonging to a place or area. The screening effects of topography or dense, tall vegetation (such as forest) may reduce the impact slightly, though this is unlikely to have a significant effect due to the generally flat topography and lack of forested areas in the vicinity of the mine infrastructure (these are restricted to a small area along the Rokel River close to the Gafal West waste rock dump).

As the area is not recognised for its scenic beauty or touristic value, combined with the fact that other mining Projects exist in the area (also impacting on the area's visual character) potential viewers are expected to have relatively low sensitivity towards these changes. It is, however, recognised that the perception of a visual impact is by nature highly subjective and, where one viewer may consider the impact to be negative, another might perceive the increased development and lighting of the area positively. For this reason a change to the sense of place of an area is difficult to rate according to standard methodologies. Although local people may associate a particular sense of place with the Marampa area, what is difficult to gauge is the importance people attach to that sense of place and how this will change over time when the cumulative effects of other Projects in the area are considered, together with how potential Project benefits may ameliorate any loss.

Visual disturbance and loss of sense of place impacts are difficult to manage and the loss is theoretically irreversible regardless of post-closure rehabilitation (although this will ameliorate this impact to some degree). The perception of the area may change over time with people becoming accustomed to a new sense of place and thus the actual impact is partially reversed. The closure measures proposed, such as backfilling of the pits with waste rock and tailings material thereby reducing the height and visibility of the WRD and TSF, removal of mine infrastructure with no continuing use and rehabilitation of the site will assist in reducing the impact at closure. The most significant impacts will therefore occur during construction (especially during clearing of vegetation when dust levels will be highest), operation and

decommissioning (when additional earth-movement is expected). As the impact involves differing perceptions by receptors, the confidence in the impact is given as medium.

Due to the relatively degraded current visual nature of the site, local communities are not expected to be highly sensitive to the impact. Without earnest attention to post-closure rehabilitation of the area, however, the changes to the landscape will remain visually intrusive beyond the life of the mine, if not permanently. The development will be visible from outside the direct Project area (e.g. from roads and villages) and, although it is not possible to hide the development and associated infrastructure, it may be possible to reduce the negative visual perceptions associated with the mine and create a more visually harmonious impression post-closure through rehabilitation.

Impact LT3: Mine infrastructure and activities potentially resulting in visual impacts for local communities

Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	*Negative*
Magnitude description	Sensitivity	*Low*	*Low*
	Receptor importance or value	*Low*	*Low*
	Extent of change / threshold compliance	*Moderate*	*Moderate*
	Magnitude rating	*MINOR*	*MINOR*
Timeframe description	Duration	*Long term*	*Medium term*
	Frequency	-	-
	Timeframe rating	*LONG TERM*	*MEDIUM TERM*
Spatial Scale		*INTERMEDIATE*	*INTERMEDIATE*
CONSEQUENCE RATING		*MEDIUM*	*LOW*
PROBABILITY RATING		*POSSIBLE*	*UNLIKELY*
SIGNIFICANCE RATING		*MEDIUM (-ve)*	*LOW (-ve)*
Reversibility / sustainability		*Partially reversible*	
Confidence		*Medium*	

Management measures

- At closure, remove mine infrastructure that does not have a continued use.
- Revegetate and landscape the site on closure, to reflect the surrounding topography and vegetation as much as possible.
- Consider the use of screening tools such as dense vegetation where practical and appropriate to the surroundings.
- Clear vegetation in phases so that only those areas required for immediate development are cleared.
- Develop and implement a waste management plan that includes provision for waste resulting from secondary developments and domestic waste linked to the Project.

Good practice measures:

- Paint buildings and structures or use materials with colours that reflect and complement the natural colour and textures of the surrounding landscape.

- The slopes of the WRD and any other visually intrusive stockpiles should be reduced during closure to be consistent with the surrounding natural topography.
- Use directional lighting in areas operating at night, if communities are affected by lighting.
- Refer to dust control measures under Impact AQ1 (Section 9.1.1).

7.1.4 LT4: Loss of topsoil through erosion, decreasing land capability

Construction	Operation	Decommissioning	Post-Closure

Activities such as vegetation clearing for Project infrastructure, or other damage to vegetation, particularly groundcovers that bind and stabilise the topsoil, will result in large areas of exposed topsoil which will be susceptible to erosion through wind and water if not carefully managed. The soils in the area are broadly characterised as sandy and ferrallitic, typical of tropical regions, and have a reasonable proportion of fine particles (<0.1 mm in size), making them moderately susceptible to erosion. Organic content of the soil is overall moderate to high (due to the dense vegetation cover), but relatively low in cultivated areas (due to harvesting of crops). As organic content would reduce the soil erosion potential, cultivated areas would therefore be more prone to erosion. The longer the exposed area is subject to erosive forces, the more severe the effect. Sloped areas are also more susceptible to erosion through stormwater runoff, with the secondary impact of sedimentation of surface water resources (discussed in Section 7.2.6 (Impact WR6). Whilst the study area is relatively flat, the high annual rainfall and high frequency of severe rain events may also contribute to increased erosion of disturbed areas. Clearing of vegetation, combined with high winds or heavy rainfall, would increase the soil's erosion potential and lead to a reduction in land capability if appropriate management measures to prevent erosion are not implemented.

Topsoil is essential to support vegetation growth as it harbours the required nutrients as well as a natural seed bank reflecting its former vegetation cover. It takes many years to develop and is therefore essentially non-renewable – complete loss of topsoil from an area would require import of topsoil from another area (preferably with similar vegetation makeup) in order to support vegetation growth. Loss of topsoil therefore compromises the capability of the soil to support both agriculture and ecological processes, both of which are important current land uses for local communities in terms of food security. Without appropriate management and preservation of topsoil the area would therefore remain sparsely vegetated and not be suitable for post closure land use (rated below). In addition, it will contribute to dust generation and visual impacts (discussed under Impacts AQ1 and LT3 in Sections 9.1.1 and 7.1.3), and loss or fragmentation of habitat (discussed under Impact EB1 in Section 7.3.1).

Due to the reliance of local communities on land capability for their livelihoods and food security, the pre-management magnitude of the impact is rated as moderate. The impact has the potential to extend beyond the life of the mine as, without the successful implementation of topsoil maintenance and erosion control measures, loss of topsoil could result in increasingly negative impacts on land capability and livelihoods in the area. The spatial scale is restricted to cleared and disturbed areas within the Project footprint. Through appropriate management via implementation of erosion control measures, such as re-vegetation to retain and preserve topsoil, the impact significance could be reduced as the topsoil would be stabilised in a relatively short period of time and loss of topsoil would therefore be less likely. Although the impact could be largely reversed through the import of topsoil material from

outside, this is too costly to be a viable solution for large areas and only leads to negative impacts in the source area.

Impact LT4: Loss of topsoil through erosion, decreasing land capability			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	*Negative*
Magnitude description	Sensitivity	*Medium*	*Medium*
	Receptor importance or value	*Medium*	*Medium*
	Extent of change / threshold compliance	*Medium*	*Medium*
	Magnitude rating	*MODERATE*	*MODERATE*
Timeframe description	Duration	*Long term*	*Medium term*
	Frequency	-	-
	Timeframe rating	*LONG TERM*	*MEDIUM TERM*
Spatial Scale		*SMALL*	*SMALL*
CONSEQUENCE RATING		*MEDIUM*	*MEDIUM*
PROBABILITY RATING		*POSSIBLE*	*UNLIKELY*
SIGNIFICANCE RATING		*MEDIUM (-ve)*	*LOW (-ve)*
Reversibility / sustainability		*Partially reversible*	
Confidence		*High*	

Management measures

- Avoid disturbance of slopes or sensitive areas such as drainage areas, where possible.
- Implement erosion control measures where steep slopes or large unvegetated areas are created, or where sensitive areas such as river banks are disturbed.
- Inspect disturbed, rehabilitated, and sensitive areas such as river banks affected by Project infrastructure for visual signs of erosion and/or deposition affecting either the Project's or community's use of the land. If problems are identified, initiate remedial action.
- Clear and stockpile topsoil separately from subsoil / fill material, for use during rehabilitation.
- Implement rehabilitation and establishment of vegetation cover as soon as possible.

Good practice measures:

- Maintain topsoil stockpiles to prevent their erosion or contamination with subsoil or other materials.
- Ensure stockpiled topsoil is used within two years and is not excessively compacted to preserve a viable seed bank.
- Avoid driving over or otherwise compacting or disturbing topsoil.
- Design roads, pipeline routes and landscape features to minimise disruption of natural drainage patterns.

7.1.5 LT5: Fugitive dust potentially resulting in changes in soil chemistry and agricultural land capability

Construction	Operation	Decommissioning	Post-Closure

During operations, and to a lesser extent during decommissioning and post-closure, there is the potential for some finer tailings dust to be mobilised from the TSF (and later from the Matukia pit, which will be backfilled with tailings) during dry windy conditions (refer to discussion in Impact AQ1). It is however proposed that a pond will be maintained on the TSF, preventing the generation of tailings dust from the surface of the TSF. Some of this dust will be deposited on the land downwind of the tailings storage areas potentially affecting the physical and chemical characteristics of the soils in the deposition areas.

Meteorological data obtained from the site showed the predominant wind direction to be South-westerly and consistent throughout the year. Although the area is subject to the Harmattan winds during the dry season (November to April), the data suggests the region is shielded from the full effects of these winds, possibly by mountain ranges to the northeast of the country (for further detail see the Climate and Air Quality Baseline Report in SD 2 of Volume 3). The most affected areas would therefore be those to the north-east of the Project area.

The soils baseline study (SD 5 in Volume 3) found soils in the area to be moderately acidic (pH 4.7 to 5.8), with a low cation exchange capacity (10.5 to 19.7 meq/100g) and dominated by iron and aluminium. The sediments are predominantly quartz-rich sands and gravels, with a mildly acidic to circum-neutral pH (5.3 to 6.5 s.u.). Sediment chemistry is dominated by aluminium, iron and manganese, which reflects the geology of the deposit, and is generally highly leached, with frequent flushing by water.

Preliminary geochemical ARDML characterisation of the predicted tailings material found arsenic levels to be elevated above the Geochemical Abundance Index in some samples, but the metal leaching and acid generation potentials to be negligible in general (for more detail refer to the full ARDML report in SD 6 of Volume 3).

Windblown tailings deposited on downwind soils will have the potential to increase the concentration of metals and other constituents in the native soils. However, other sources of fugitive dust will mix with the windblown tailings, thereby diluting the deposited material. Changes in the soils downwind of the TSF (and Matukia pit once that is used for tailings storage) from the deposition of windblown tailings have the potential to result in indirect impacts to:

- storm water runoff quality, thereby affecting aquatic ecosystems and community users (refer to Impact WR6 in Section 7.2.6); and
- agricultural and natural vegetation by direct contact (covering foliage) and metal uptake via roots.

Runoff from rain events may remobilise tailings dust from the soil and vegetation and redeposit it in drainage channels where it may accumulate and affect storm water runoff quality. Plants may be affected if their foliage is covered by dust or metals are transported by storm water infiltrating into the root zone. However, the plants in the area appear to be unaffected by existing high fugitive dust levels in the dry season and infiltrating storm water will be diluted through mixing with storm water unaffected by windblown tailings thereby reducing the effects of mobilized tailings on overall plant uptake.

The magnitude of this impact is considered to be minor because, although food security is a critical issue, the predicted tailings material is relatively innocuous and there are already elevated dust levels in the area due to existing land uses. Frequency of occurrence would also be low due to the tropical climate that predominates in the area, with regular rainfall and low wind speeds for most of the year, which results in relatively low levels of windblown dust. Without management of dust from the tailings material, the impact could continue at a low level beyond the life of the mine (if not permanently) and could extend beyond the Project footprint. Provided rehabilitation of the tailings storage areas is successful and the tailings material is protected from erosion, mobilisation of tailings material post-closure would be unlikely, although the process of remobilisation of deposited material may continue after closure.

Impact LT5: Fugitive dust potentially resulting in changes in soil chemistry and agricultural land capability

Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	*Negative*
Magnitude description	Sensitivity	*Low*	*Low*
	Receptor importance or value	*Medium*	*Low*
	Extent of change / threshold compliance	*Low*	*Low*
	Magnitude rating	*MINOR*	*MINOR*
Timeframe description	Duration	*Long term*	*Medium term*
	Frequency	*Low*	*Low*
	Timeframe rating	*LONG TERM*	*MEDIUM TERM*
Spatial Scale		*INTERMEDIATE*	*INTERMEDIATE*
CONSEQUENCE RATING		*MEDIUM*	*MEDIUM*
PROBABILITY RATING		*POSSIBLE*	*UNLIKELY*
SIGNIFICANCE RATING		*MEDIUM (-ve)*	*LOW (-ve)*
Reversibility / sustainability		*Irreversible*	
Confidence		*Medium*	

Management measures

- Implement dust control measures, such as wetting down and maintaining a pond at the tailings storage areas.
- On closure, put in place measures (such as revegetation) to ensure continued erosion control of the tailings material.

Good practice measures:

- Using data collected during the monitoring programme to develop a Soils Management Plan to monitor the effects of blowing tailings dust on soils and determine whether further management measures may be required to mitigate impacts from windblown tailings. The plan should determine:
  - expected incremental increases in metals and effects of dilution;
  - extent and effects of remobilisation;

- potential eco-toxicological effects; and
- removal standards if needed.

7.2 Water resources

Although impacts to water resources are traditionally assessed in environmental impact assessments, water resources themselves are not actual receptors and are rather pathways to receptors or water users. In-keeping with the norm, impacts on water resources are considered and assessed in this report but often the significance of the intrinsic changes to water resources themselves can only be interpreted meaningfully in conjunction with consideration of the affected receptors.

Human water resource users in the Project area include local communities using groundwater as their primary source of drinking water and other domestic uses as well as the use of wetland ecosystems for the cultivation of rice and fishing. Climatic data for the area indicates a clear wet season extending from May to November and a dry season between December and April, when evapotranspiration exceeds rainfall. Availability of water resources would therefore be particularly important for local communities during the dry period.

Ecological receptors include the flora and fauna associated with the aquatic habitats of the rivers and wetlands as well as the riparian habitats along the banks of the rivers. Aquatic habitats in general are expected to be sensitive to change, especially to changes in turbidity and sediment loads, and the majority of surface waters have little or no ability to resist changes to pH from any acid inputs because of a low buffer capacity (Section 5.5.3). Larger rivers, where dilution plays a role, may be more tolerant to minor changes.

The impacts assessed can be divided into two categories – those affecting the flow and availability of water resources and those affecting its quality (via discharges from the mine and related activities).

Impacts affecting water flow and availability can be caused by:

- pit dewatering (Impact WR1);
- surface water abstraction (Impact WR2);
- mine infrastructure causing changes to flow (Impact WR3); and
- surface water diversions altering flood risk in the surrounding area (Impact WR4).

A preliminary water balance established for the Project indicates that, on an annual basis, the plant make-up water averages approximately 62,000 m^3/day with 50,000 m^3/day derived from surplus tailings water and the remainder (approx. 12,000 m^3/day) derived from either pit dewatering and/or abstraction of surface water from the Rokel River.

Discharges to water resources can result from various activities - they can arise directly from point source activities or indirectly from diffuse sources. A point source release generally refers either to a controlled release of wastewater into the environment or to an uncontrolled release arising from an accident or incident (such as a pipeline breakage or a truck overturning). Potential impacts arising from point source releases include the following:

- deterioration in water quality, reducing its potential for utilisation by downstream users; and
- damage to aquatic ecosystems due to substances contained in the released material.

Diffuse pollution occurs over a larger area and is generally more difficult to control than point source pollution. Examples include seepage of process water and surface runoff from mine wastes, such as the TSF, WRDs and low-grade ore stockpiles (Impact WR5).

The impacts that could arise as a result of mine-related pollution are dependent on the type of contaminant contained in the water and thus released. Different users also have different sensitivities to potential pollutant levels. In this case, 'users' refers to both human use of water (for domestic, agricultural or industrial purposes) and ecological use.

Impacts on water resources were modelled based on a range of parameters measured during the water monitoring programme established for the Project, hydrogeological data from Coffey Geotechnics Limited and data from geochemical investigations by SRK. The modelling results and methodologies are described in further detail in the specialist report in SD 7 of Volume 3.

7.2.1 WR1: Pit dewatering potentially resulting in reduced groundwater availability to ecological systems and local communities

Construction	Operation	Decommissioning	Post-Closure

Pit dewatering to ensure dry working conditions for the mine and assist with slope stability will be required to manage rainfall runoff and groundwater inflow. Dewatering is likely to be achieved through a combination of perimeter groundwater abstraction wells and in-pit sump pumping. It may however reduce the availability of this resource to other users through drawdown of the groundwater surface surrounding the pit. In this case, 'users' refers to both human use of water (for domestic, agricultural or industrial purposes) and ecological use. The significance of groundwater drawdown is a function of the extent and duration of drawdown and the presence of receptors (ecological and human) within the zone of influence.

Groundwater levels in the area mimic topography; further detail on the hydrogeology of the Marampa area is provided in Section 5.5.1. Mine inflows are dictated by both direct rainfall and groundwater inflows to the open pits. For the Matukia pit, groundwater inflows are predicted to be in the order of 9,000 m^3/day and surface water inflows are predicted to be 33,000 m^3/day (Coffey, 2011). These figures are for one pit only, and indicate a range of flows based on seasonal conditions. Pit dewatering requirements are dominated by the high surface water inflows (during the wet season); however given the high groundwater yields, groundwater drawdown will occur as a result of pit dewatering.

The extent of groundwater drawdown has been modelled by SRK for the Gafal and Matukia pits[13] based on the input parameters provided in the Coffey Phase 1 Study Groundwater Assessment Report (2011). The analytical model predicts drawdown at the end of Stage 2 of mine development for Gafal West and Matukia pits. Due to uncertainties regarding pit geometry and mining schedules, the following assumptions have been made in the modelling to ensure a conservative approach is maintained in the calculations:

- both pits will reach a final depth of 280m below ground surface (bgs);
- the unsaturated zone extends to 11mbgs at Gafal West and 7mbgl at Matukia;
- hydraulic properties of the bedrock are uniform throughout the full thickness of the pit; and
- the lifetime of each pit is 13 years.

Preliminary estimates (taking into account the likely hydraulic properties of the rock, pit geometry and duration) predict the impact will be limited to villages located within 1000 m of the proposed pits. As would be expected, impacts are predicted to be greatest in the villages

[13] *Rotret and Mafuri pits were not included in Cofey's Phase 1 assessment*

located closest to the pits. Excluding villages proposed for relocation, these would be Rotret (260 m from the Gafal pit) and Makump and Gbila (520 m and 570 m from the Matukia pit respectively). The estimated drawdown ranges from 67 - 100 m at Rotret, 12 – 18 m at Makump and 8 – 12 m at Gbila village, indicating an exponential increase in drawdown closer to the pit.

The drawdown estimations are highly sensitive to changes in hydraulic properties, pit geometry and mining life. Given the current uncertainties regarding these properties further hydrological test work will be undertaken to better constrain the hydraulic properties at Marampa, thus enabling a more robust prediction of likely drawdown around the pits.

Local villages rely on groundwater abstraction, via water supply wells and boreholes, as part of their water supply. In many villages however this supply diminishes or completely ceases during the dry season or the wells are no longer functional and villagers resort to the use of surface water resources (involving walking to the nearest supply area and carrying the water back to the village) for drinking and other domestic purposes. The levels of drawdown predicted could therefore potentially significantly impact on groundwater availability to these villages, as well as surface water resources and wetland ecosystems in the area that are supplemented by groundwater, particularly in the dry season. The impact would affect both domestic and agricultural users, as well as fishing, thereby affecting food security in the area.

As many villages in the area already suffer from limited or no access to groundwater during the dry season, and the impact is likely to diminish their nearby available surface water resources as well, local communities are likely to be highly sensitive to a further reduction in water availability, the pre-management magnitude of the impact is considered to be major. The impact would last for the life of the mine until decommissioning, when pit dewatering will cease and groundwater levels will presumably return to pre-mining levels, though this is likely to take a significant amount of time. Based on predicted pit inflows for the life of mine, preliminary estimations show that it will take up to 200 years for the pit lake to recover and reach an equilibrium with the surrounding groundwater. Through appropriate management (provision of water to affected villages) this impact could be relatively easily reduced to insignificant. Due to the high reliance on assumed input parameters the confidence in the significance is low.

Impact WR1: Pit dewatering potentially resulting in reduced groundwater availability to ecological systems and local communities

Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	*Negative*
Magnitude description	Sensitivity	*High*	*Medium*
	Receptor importance or value	*High*	*Medium*
	Extent of change / threshold compliance	*High*	*Medium*
	Magnitude rating	*MAJOR*	*MODERATE*
Timeframe description	Duration	*Medium term*	*Medium term*
	Frequency	-	-
	Timeframe rating	*MEDIUM TERM*	*MEDIUM TERM*
Spatial Scale		*SMALL*	*SMALL*

Impact WR1: Pit dewatering potentially resulting in reduced groundwater availability to ecological systems and local communities		
CONSEQUENCE RATING	*MEDIUM*	*MEDIUM*
PROBABILITY RATING	*DEFINITE*	*UNLIKELY*
SIGNIFICANCE RATING	*MEDIUM (-ve)*	*LOW (-ve)*
Reversibility / sustainability	*Reversible*	
Confidence	*Low*	

Management measures

- Provide affected villages with adequate water supply (including for irrigation of crops).
- Consider installation of new wells / maintenance or repairs to existing village wells.
- If necessary, make alternative wetland areas available for rice cultivation.

7.2.2 WR2: Surface water abstraction affecting downstream users

Construction	Operation	Decommissioning	Post-Closure

A preliminary water balance established for the Project, indicates approximately 8,000m^3 of make-up water per day would only be required during the dry season (to supplement recycled process water and stormwater collected in the TSF settlement ponds). This make-up water will be pumped directly from the Rokel River at a location south of the beneficiation plant. Once the Project is operational it is anticipated that containment, controls and mine dewater input will provide routine closed cycle use with top-up from the river supply if and when required.

Water abstracted directly from rivers has the potential to reduce the volumes of annual flow, change the seasonal distribution of flows through the year and increase the length of low flow periods. A qualitative assessment of the impact of abstraction from the Rokel River on flow rate has been made by SRK based on baseline data and the abstraction rates estimated in the preliminary mine water balance provided by MIOL.

Under high flow conditions, the abstraction proposed is likely to be negligible compared to the likely flow rates in the river. Assessment of the low flow conditions in the Rokel River reveals the lowest average flow rate near the Project area during the dry season is 6.1m^3/s (around March). The maximum abstraction rate for make-up water for the mine is estimated to be 0.35m^3/s, or 5.7% of the available river flow at the driest recorded conditions (worst case). In terms of constraints on the flow downstream where it might support communities (e.g. for irrigation and drinking) and aquatic ecosystems, the impact of such a reduction is likely to be negligible taking into account contribution to flow from elsewhere in the catchment (outside the concession). This preliminary prediction will be confirmed based on further monitoring of the Rokel River and once abstraction needs for operation are confirmed.

Due to the relatively small proportion of river flow abstracted, the impact is expected to be minor but would extend for the life of the mine, albeit at a low frequency (only in the dry season). As the abstraction is unlikely to impact on downstream users the impact is considered to be of low significance and no management measures are required. Good practice measures are however listed.

Impact WR2: Surface water abstraction affecting downstream users			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	-
Magnitude description	Sensitivity	*Low*	-
	Receptor importance or value	*Low*	-
	Extent of change / threshold compliance	*Low*	-
	Magnitude rating	*MINOR*	-
Timeframe description	Duration	*Medium term -*	-
	Frequency	*Low*	-
	Timeframe rating	*MEDIUM TERM*	-
Spatial Scale		*INTERMEDIATE*	-
CONSEQUENCE RATING		*MEDIUM*	-
PROBABILITY RATING		*UNLIKELY*	-
SIGNIFICANCE RATING		*LOW (-ve)*	-
Reversibility / sustainability		*Reversible*	-
Confidence		*High*	-

Good practice measures:

- Minimise the abstracted volume, as far as practicable.
- Monitor either river stage or flow for the life of the mine to detect any negative impacts to river flow.

7.2.3 WR3: Project infrastructure causing altered surface water flow conditions, affecting downstream users

Construction	Operation	Decommissioning	Post-Closure

The positioning of Project infrastructure will in some cases lead to changes in stormwater runoff regimes over the site, affecting catchment characteristics and responses. The changes that could arise are as follows:

- Alteration to catchment area and characteristics (topographical, land use, slopes)
- Potential alteration in catchment response time and peak flow in rivers and streams associated with reduced catchment areas and altered characteristics

Proposed stormwater management measures at the main mine infrastructure (WRD, TSF and open pits) are described in Chapter 4, and consist mainly of stormwater settlement ponds (to collect water from the WRD and area surrounding the pits). Due to the surrounding topography, stormwater will naturally be directed away from the TSF and additional stormwater management at this site will not be required.

In addition to this, a number of streams run through the area of the proposed Mafuri and Gafal pits (see Figure x). To accommodate pit development, significant alteration of the drainage network via the diversion of the Kagbu River will be required. The river will also be impounded

upstream of the pit area to create a water storage reservoir, the spillway for which will serve as an outflow into the above-mentioned diversion. Preliminary diversion plans are summarised in Section 4.2.2 and described in more detail in the preliminary Surface Water Management Plan for the Project (Mining Solutions, 2012), which is included as Appendix E. The stream diversion and water storage reservoir are expected to cause the most significant impacts on stream flow conditions resulting from the Project, particularly affecting downstream catchments and river flow, as described below and illustrated on Figure 7.1.

Assessment method

A qualitative (and where possible quantitative) assessment of changes to surface flow conditions was performed by SRK using data gathered as part of the baseline water resources study and other relevant reports produced for the Project, as follows:

- Reduction in catchment areas quantified using ArcGIS;
- Expected changes in catchment characteristics modelled (using hydrologic engineering centre's river analysis system (HEC-RAS)) and assessed based on the surface water management plan (Mining Solutions, 2012); and
- 1 in 100 year peak flows calculated (based on rainfall extremes, in the absence of monthly average flow estimates).

The results indicate that sub-catchment areas will be reduced (due to the footprint of the mine pits), but the increase in compacted or impermeable surfaces (through construction of roads, buildings, WRD and any other hard surfaces) would cause an increase in runoff rates. These catchment alterations will result in changes to the rivers' response to rainfall events, with a likely increased susceptibility to flooding. The predicted net effect on river peak flow (for a 1 in 100 year rainfall event) will be a reduction in 26 of the 36 sub-catchments in the area (see Table 7-3), which will be most significant in the subcatchments directly downstream of the water storage reservoir and stream channel diversion around the Mafuri pit (as described in Section 4.2.2, and shown relative to the subcatchments and flow directions in Figure 7.1). The locations of the various catchments and subcatchments are shown on Figure 5.5.

The diversion spillway controlling flow will result in a reduction in flow in subcatchments KA10, KA17 and KA18. In KA17 this reduction (due to a decrease in catchment size from 46.1 km^2 to 0.6 km^2 (99%)) is predicted to be as much as 97% (at 100 year peak flow – under average flow this is likely to be significantly less). A significant increase in peak flow (81%) is predicted in subcatchment KA8 only due to an increase in catchment size (from 2.2 km^2 to 44.1 km^2 (95%)) resulting from the proposed stream diversion flowing into this subcatchment. Subcatchments in other parts of the Project area are also predicted to show significant reductions in peak flow (up to 83%, as shown in Table 7-3) due to the positioning of Project infrastructure, reducing catchment area.

In most cases the predicted proportional reduction in catchment area and peak flow are similar. Changes to flow under average or low flow conditions have however not been determined (due to lack of monthly flow estimates), but are expected to be significantly less than the 100 year peak flow.

Table 7-3: Predicted changes to 1 in 100 year peak flows and catchment areas for sub-catchments in the Project area

Sub-catchment	Maximum predicted increase/decrease (%)[14]	
	Area (%)	Peak flow (%)
KA1	- 15.6	- 16.8
KA2	No change	No change
KA3	No change	No change
KA4	No change	No change
KA5	No change	No change
KA6	No change	No change
KA7	- 65.0	- 65.0
KA8	**+ 95.0**	**+ 81.4**
KA9	- 10.2	- 11.1
KA10	- 8.4	- 62.1
KA11	No change	No change
KA12	- 6.5	- 7.1
KA13	- 3.6	- 3.9
KA14	- 2.8	- 3.1
KA15	- 2.6	- 2.9
KA16	- 4.5	- 5.0
KA17	- 98.6	- 97.3
KA18	- 7.6	- 72.7
BA1	- 16.8	- 18.0
BA2	- 9.3	- 10.2
BT1	- 83.3	- 83.3
BT2	- 65.8	- 66.5
BT3	No change	No change
BT4	No change	No change
BT5	- 8.4	- 9.3
BT6	- 6.9	- 7.6
BN1	- 68.0	- 69.7
BN2	- 53.2	- 55.8
BN3	- 41.0	- 43.6
BN4	- 45.3	- 48.2
BN5	- 36.1	- 38.4
RL1	- 66.7	- 66.7
RL2	- 68.4	- 69.8
RL3	- 61.2	- 63.9
RL4	- 5.0	- 5.3
RL5	No change	No change

Expected impact on other users

The above-mentioned changes in river peak flow could impact on both human and ecological users downstream. Decreases in flows could affect water availability to villages downstream, particularly those in the area of the Gafal and Mafuri pits due to the stream diversion and water storage reservoir as discussed above. However, most of the villages in this area will be

[14] *Indicated by a + (increase) or – (decrease)*

relocated to accommodate the pits, and those remaining are located close to the Rokel River, which it is assumed would provide an alternative surface water resource if necessary. Due to the size of the Rokel River, and the fact that changes to the flow in the Kagbu River under low and average flow conditions at its confluence with the Rokel are likely to be minor, impacts on flow in the Rokel River are considered to be minimal. This will be further assessed and confirmed quantitatively once a further wet season survey (including monitoring of river flow) has been conducted.

The most significant impact is expected to be on aquatic ecosystems in the area, due to habitat loss and/ or alteration caused by the stream diversion. In-stream habitats will be lost from the sections of the streams to be diverted from their natural flow path (approximately 600 m). Most of the affected aquatic ecosystems are seasonal midslope wetlands, and are classified as moderately modified (mainly due to transformation for rice cultivation) and of low-medium ecological importance (Nepid, 2012). Despite the relatively limited diversity of instream habitats, they are characterised by a high diversity of taxa, particularly fish species (Ecorex, 2011); therefore the stream diversions will need to include key habitat features to maintain fish populations during the dry season. A recent decline in fish populations in the area was however observed during the Nepid 2012 dry season survey, and could be attributed to existing disturbance (possibly caused by construction linked to other Projects in the area).

Downstream of the Mafuri pit, the diverted section will reconnect to a tributary of the Kagbu River, which will also be affected due to altered stream flow as described above. The impact will therefore extend beyond the mine footprint area.

Although the pits will be backfilled post-closure, much of the other mine infrastructure will remain in place (including the stream diversion and water storage reservoir). The changes to flow dynamics are therefore considered to be permanent. Management measures are recommended to reduce the likelihood of the impact (through replacement of instream habitats lost) and reduce its significance. Additional studies to determine the impact under low and average flow conditions are required, and the confidence of the impact rating is therefore medium.

Changes to flood risk for surrounding areas due to the above-mentioned water diversion and impoundment is discussed and rated separately in Impact WR4 (Section 7.2.4). Increases in erosion potential associated with increased runoff rates are discussed under Impact LT4 (Section 7.1.4), and the resultant increased sedimentation of surface waters (affecting ecological systems) is discussed under Impact WR6 (Section 7.2.6).

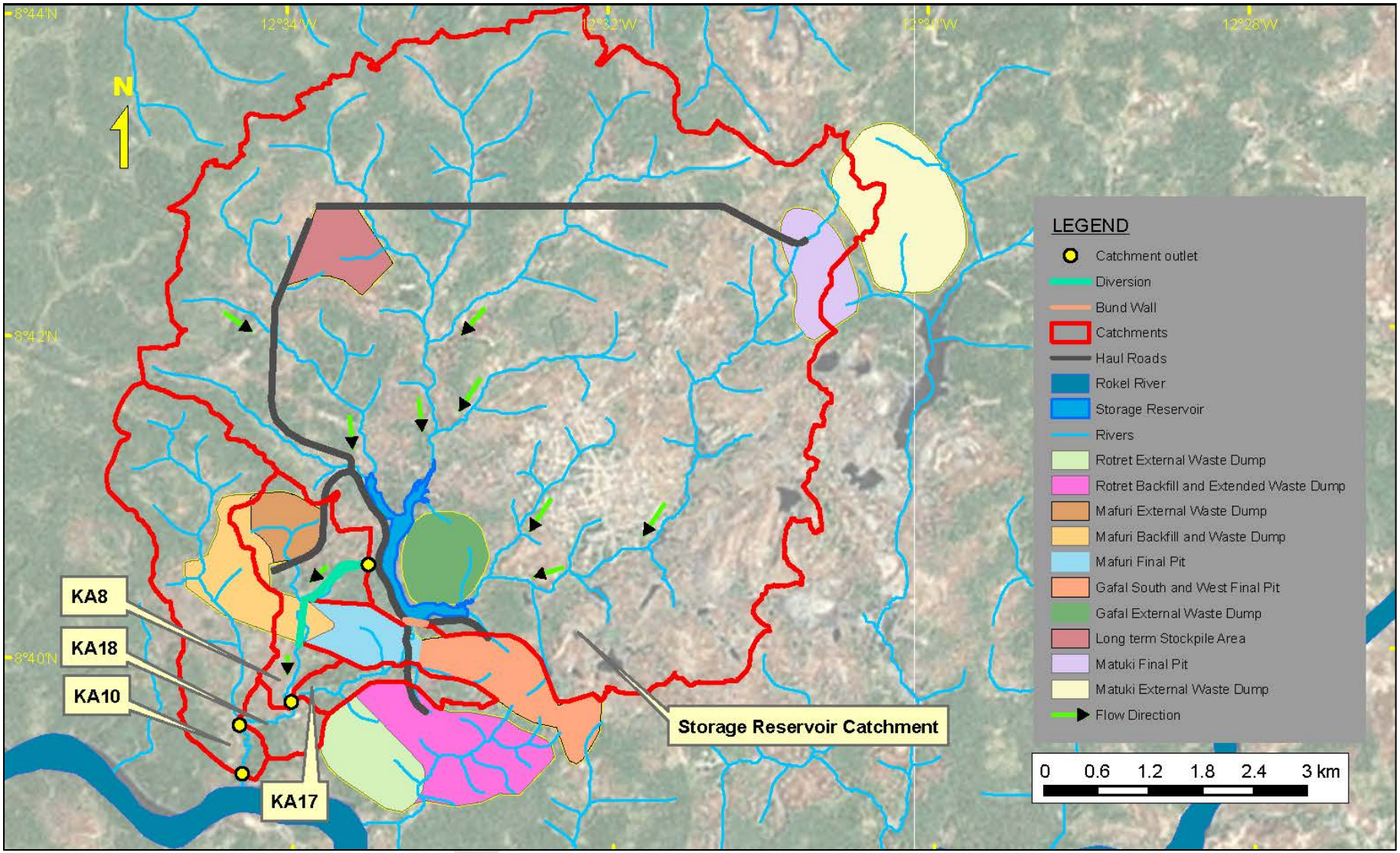


Figure 7.1: Catchment areas affected by surface water diversion and storage infrastructure, indicating flow directions

Impact WR3: Project infrastructure causing altered flow conditions, affecting downstream users			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	*Negative*
Magnitude description	Sensitivity	*High*	*Medium*
	Receptor importance or value	*Medium*	*Medium*
	Extent of change / threshold compliance	*High*	*Medium*
	Magnitude rating	*MAJOR*	*MODERATE*
Timeframe description	Duration	*Long term*	*Long term*
	Frequency	-	-
	Timeframe rating	*LONG TERM*	*LONG TERM*
Spatial Scale		*INTERMEDIATE*	*INTERMEDIATE*
CONSEQUENCE RATING		*HIGH*	*MEDIUM*
PROBABILITY RATING		*DEFINITE*	*POSSIBLE*
SIGNIFICANCE RATING		*HIGH (-ve)*	*MEDIUM (-ve)*
Reversibility		*Irreversible*	
Confidence		*Medium*	
Management measures • Implement erosion control measures listed in LT4. • Design surface water diversion channels to mimic the natural instream habitat as closely as possible, and rehabilitate using indigenous vegetation. □ • Include key instream habitat features, such as deeper pools, to maintain fish populations during the dry season in stream diversion channels.			

Good practice measures:

- Avoid disturbance of drainage lines and riparian zones where possible, through careful routing of roads and servitudes.
- Use semi-permeable materials where possible in preference to impermeable materials for surfaces such as roads and paving.
- Monthly average flow for each river should be measured for at least a year, and used to determine impacts during non-peak river flow.

7.2.4 WR4: Surface water diversions potentially causing changes to flood risk to adjacent agricultural areas and communities

Construction	Operation	Decommissioning	Post-Closure

When changes to a river's course are made (such as the proposed stream diversion to accommodate the Mafuri and Gafal pits), this can alter its flow regime local to that diversion and impacts may occur either upstream or downstream relative to that alteration. In the case of the Kagbu River Diversion (also referred to as the Mafuri West Diversion), the change in

direction of flow and slope and the impact this has on flood risk of the surrounding area have been assessed (through hydraulic modelling by SRK) both upstream and downstream of the diversion itself.

For this particular diversion the likely risk areas are:

- Immediately upstream of the diffluence (upstream connection), where some backing up of water could occur as a result of the rather sharp change in direction of flow caused by the diversion.
- Downstream of the confluence (downstream connection), where the change in flow direction and likely change in bed slope as the diversion re-joins the old river alignment may result in scour of the left bank and some degree of eddying.
- Along the diversion itself, given its close proximity to the Mafuri Pit West (within 50m).

As no specific details for the design of a flow control structure (weir, spillway or sluice) are available at this stage in planning, various assumptions were made when modelling potential impacts, including that flow through the diversion is controlled by the geometry of the new diversion channels. Flood routing and peak outflow through the water storage reservoir were calculated, and used as input for the hydraulic modelling.

Due to the significant increase in catchment area and peak flow of catchment KA8 resulting from the stream diversion (as described in Impact WR3), the area with the greatest flood risk is predicted to be the middle to lower reaches of the diversion. Due to the river size however, change in water level (and therefore flood risk) downstream of the diversion is likely to be low. The HEC-RAS modelling results predict that during a 1 in 100 year flood the water will remain within the banks of the diversion channel, although water level will increase (by 0.31 – 0.59 m) downstream of the diversion. As the modelling is based only on preliminary design data, revised modelling will be required to confirm these results once the design has been finalised. Other subcatchments in the area could also be affected by the diversion (as discussed in Impact WR3 and illustrated on Figure 7.1) but this will be by way of reduced flows and therefore will reduce flood risk in these catchments.

Almost all valleys within the Project area are cultivated, mostly with different varieties of rice. The water storage reservoir created will cover a surface area of approximately 400,000 m^2 and although much of this area is currently river, it will also extend into areas currently used for subsistence agriculture (rice paddies and small patches of mango plantation). However as villages in the area will be relocated it is uncertain whether these areas would still be used for agriculture as the villages may seek to cultivate areas closer to the new village locations (still be determined). The impact on livelihoods associated with loss of access to land and natural resources is discussed in Impact LT1 (Section 7.1.1), and rated in Impact RL1 (Section 8.2.1).

Flooding is one of the most common natural disasters affecting Sierra Leone, and between 1980 and 2010 affected approximately 200,000 people (EM-DAT, 2012). It is therefore expected that local communities will be sensitive to an increased flood risk. The relatively flat topography of the study area and location of villages close to rivers (supporting access to water and use of floodplains for agriculture) both support the notion that local communities are highly susceptible to flooding. However, as most villages in the immediate downstream area of the diversion will be relocated due to positioning of the mine pits, impacts on local communities are considered to be unlikely. Although the stream diversion is likely to be a permanent feature, the frequency of occurrence of the impact would be low (i.e. during flood events only). No management measures are proposed.

Impact WR4: Surface water diversions potentially causing changes to flood risk to adjacent agricultural areas and communities			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	*Negative*
Magnitude description	Sensitivity	*Medium*	-
	Receptor importance or value	*Medium*	-
	Extent of change / threshold compliance	*Medium*	-
	Magnitude rating	*MODERATE*	-
Timeframe description	Duration	-	-
	Frequency	*Low*	-
	Timeframe rating	*LOW FREQUENCY*	-
Spatial Scale		*INTERMEDIATE*	-
CONSEQUENCE RATING		*MEDIUM*	-
PROBABILITY RATING		*UNLIKELY*	-
SIGNIFICANCE RATING		*LOW (-ve)*	-
Reversibility		*Irreversible*	-
Confidence		*Medium*	-

Good practice measures:

- Implement erosion / sedimentation control measures listed in Impacts LT4 and WR7 in and around diversion channels.
- Include flood risk in the Emergency Response and Preparedness Plan and raise awareness with potential affected communities of the risks and what to do in the event of a flood.
- Update the preliminary water management plan.

7.2.5 WR5: Seepage from mining wastes potentially resulting in deteriorated groundwater quality affecting communities and ecological systems

Construction	Operation	Decommissioning	Post-Closure

Groundwater quality has the potential to be negatively impacted due to seepage of process water from mine wastes at the following locations:

- waste rock dumps
- tailings storage facility
- low-grade ore stockpiles

Seepage may occur directly from these facilities or from their associated storm water control facilities, and infiltrate through the soil into the underlying groundwater system, where it would spread through the aquifer. Regional groundwater flow in the area is to the southwest, so any seepage entering the groundwater is most likely to affect users to the southwest of the source. Pit dewatering (as discussed in Impact WR1) may also affect the spread of the seepage-affected groundwater during mining and the post-mining recovery stage, causing

groundwater in the vicinity of the pits to flow towards the pits. Seepage to groundwater occurring within the cone of depression for each pit (estimated to extend up to 1 km from each pit, which includes most of the WRDs), is therefore likely to be drawn into the pits. Dilution effects reduce the concentrations of constituents from the seepage, but even so these could potentially negatively impact on groundwater users in terms of deteriorated water quality.

Many local villages use groundwater drawn from village wells as their primary source of potable water. Deteriorated water quality could therefore potentially impact negatively on the health of local communities. At closure, the TSF and WRDs will continue to be sources of seepage as they are permanent features. These aspects are briefly examined below and qualitatively evaluated based on planned design concepts and the results of geochemical investigations conducted to date.

Waste rock dumps and ore stockpiles

Geochemical investigations have been completed on waste rock samples from the four pits, as well as the expected ore, concentrate and tailings materials. These reveal low potential for acid generation. Leaching of metals from the waste rock is considered unlikely, and as discussed above, the WRDs generally fall within the cone of depression surrounding the pits.

TSF

Geochemical characterisation of the tailings material indicates it is unlikely to generate acidity, but will also have limited buffering capacity. Net acid generation (NAG) test leachate analysis of tailings samples also revealed little potential for leaching of iron or trace metals from the metallurgical samples. A decant system and under drainage will be constructed in the TSF to recover supernatant water from consolidation of the tailings material. This system will also reduce the potential for seepage losses to soil and groundwater.

Based on the discussion above no significant impacts on groundwater quality in the area are expected to result from seepage from mine wastes, and no management measures are therefore proposed. Due to the inherent design measures listed above and the low likelihood of metal leaching or acid generation from the sources examined, seepage from mining wastes is unlikely to occur. The potential for the impact to occur would however last beyond the life of the mine if not permanently as (apart from the ore stockpiles) these sources will remain on the site, and any contaminated groundwater would affect villages beyond the Project footprint. Further geochemical characterisation of the expected waste rock and tailings material is however required to confirm the preliminary findings.

Impact WR5: Seepage from mining wastes potentially resulting in deteriorated water quality affecting communities and ecological systems			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	-
Magnitude description	Sensitivity	*Low*	-
	Receptor importance or value	*Low*	-
	Extent of change / threshold compliance	*Low*	-
	Magnitude rating	*MINOR*	-
Timeframe description	Duration	*Long term*	-
	Frequency	-	-
	Timeframe rating	*LONG TERM*	-
Spatial Scale		*INTERMEDIATE*	-
CONSEQUENCE RATING		*MEDIUM*	-
PROBABILITY RATING		*UNLIKELY*	-
SIGNIFICANCE RATING		*LOW (-ve)*	-
Reversibility / sustainability		*Irreversible*	-
Confidence		*Medium*	-

Good practice measures:

- Further geochemical characterisation of expected waste rock and tailings material to confirm preliminary findings.

7.2.6 WR6: Discharges or runoff to surface water potentially resulting in deteriorated water quality affecting communities and ecological systems

Construction	Operation	Decommissioning	Post-Closure

Impacted discharge waters i.e. mine site run-off that potentially has low (acidic) pH or contains elevated levels of naturally occurring metals or sediment has the potential to be generated in the following areas:

- discharge of excess water from open pit dewatering;
- drainage from waste rock dumps;
- drainage from the tailings storage facility;
- stormwater runoff from exposed surfaces; and
- accidental spills (e.g. from pipelines or during transportation).

Each of these is briefly discussed below and qualitatively evaluated based on planned design concepts. The most significant impact to surface water quality however is expected to arise from mobilisation of soils from exposed surfaces during mining activities at all stages of the Project, and may also be associated with the effluent discharges listed above.

Discharge of excess water from pit dewatering

The excess water from open pit dewatering will be pumped to settlement ponds before release to the natural watercourses draining to the Rokel River, with a proportion directed to the TSF during the dry season. Further monitoring and characterisation of groundwater chemistry in the vicinity of the pits is being undertaken but, based on currently available data, there are no specific contaminants of concern.

Drainage from waste rock dumps

Drainage channels will be constructed around waste rock dumps and through the waste dump slopes, as necessary, to direct the surface water flow to the settlement ponds. The settled water in the ponds will be released to the environment with regular water quality tests performed to monitor the quality of the discharge. If the water in the pond exceeds the agreed water quality standards, it will be contained until it complies or be redirected to the TSF if it cannot meet the required standards.

Drainage from the TSF

A decant system and under drainage will be constructed in the TSF to recover supernatant water from consolidation of the tailings material. This system will also reduce the risk of embankment failure. Water collected in the under drainage system will be pumped back to the plant for re-use during processing. An emergency spillway will also be installed as part of the TSF design to manage discharge under emergency conditions, should this be needed (to ensure the safety of the dam wall – refer to Impact OH2 in Chapter 0).

Stormwater runoff from exposed surfaces

Leaching of metals from exposed soils (via stormwater runoff) may cause chemical changes to surface water systems. The mobile constituents are those that can be easily removed from the soil via rainfall and flood waters, and include both metal ions and soil nutrients. Short-term leaching tests conducted on the soil samples indicate low levels of leaching, with the exception of iron and zinc that are mobile constituents and may be leached from the soils.

Accidental spills

There is a risk of uncontrolled release of ore, waste rock or tailings material, or domestic wastewater (e.g. from the accommodation camp) to surface water resources arising from an accident or incident during transportation of waste or materials on the site (such as a pipeline breakage or a truck overturning). Geochemical characterisation of these materials is discussed above, and provided standard precautionary measures are in place (such as secondary encasement of pipelines crossing watercourses and enforcement of safe driving practice); this impact is not considered to be significance. Product export outside the mine site has not been assessed in this ESIA.

Mobilisation of soils in stormwater runoff

Vegetation stripping and ground exposure makes the soils prone to erosion. Stormwater runoff from disturbed areas may pick up fine particles and other pollutants (such as mobile constituents) which may be discharged into down-gradient surface waters. Changes to surface water flow regimes resulting from changes to stormwater patterns are discussed under Impact WR3. The impact on land use potential as a result of loss of topsoil through erosion is discussed and rated under Impact LT4 (Section 7.1.4). The discussion below will therefore focus on impacts on surface water resources due to increased sedimentation.

Mobilisation of soils is likely to be greatest during the construction phase, as a result of land modification necessary for the construction of the mine pits and associated surface infrastructure. Impacts associated with disturbance of soils are considered to be lower during the operational and closure phases than during construction as exposed ground areas will be minimal, haulage roads will be sealed and traffic movements restricted, stockpile areas stabilised and topsoil reinstated following remediation. Site works during closure for remediation and rehabilitation of the site will result in some exposure of ground areas, but this will be on a much smaller scale than during construction and areas will be re-vegetated.

Particularly due to the high rainfall during the wet season, effective drainage networks will be required to manage stormwater around mine infrastructure. The water management plan for the mine will be further developed to provide a strategy for segregating impacted and non-impacted (clean) water. Storm water settlement ponds will form part of the drainage network to collect impacted water runoff from the mine infrastructure. During normal operations, the sediment ponds will be cleaned out during the dry season, with the collected sediment placed on the waste dumps for long term storage.

Summary

Baseline surface water quality in the area is characterised by low metal concentrations, and moderately acidic to near-neutral pH, with little or no buffering capacity against acid inputs.

Different users also have differing sensitivities to pollutant levels. In this case, both human users of water (for domestic, agricultural or industrial purposes) and downstream ecological systems could be impacted by decreased water quality, causing negative health effects. Due to the inherent design measures in place, and the relatively inert nature of the impact sources, chemical pollution of surface water resources is considered to be unlikely and of minor significance. Sedimentation is therefore considered to be the most significant impact relating to surface water quality, in some cases making it unsuitable for domestic use, and is the impact rated below. As the impact is most likely to occur during the rainy season when groundwater levels are elevated however, domestic users are likely to have access to other water sources, reducing the significance of the impact on them.

Impacts on aquatic ecosystems could however be significant, affecting filter feeding organisms, aquatic vegetation (through reduced light penetration), and predator-prey interactions (through reduced visibility). Increased turbidity and siltation is considered to be the most significant threat to aquatic ecosystems in the area resulting from the Project. Current turbidity levels in local streams are low, resulting in good natural light levels penetrating the water column. Although ecological habitats in the Project area are classified as moderately modified, abundance and diversity of submerged aquatic vegetation and fish species are high, including some species of conservation concern. Impacts on aquatic organisms would in turn affect local communities in terms of decreased stocks and quality of fish and other organisms harvested from local watercourses.

Downstream ecological systems in particular are likely to be highly sensitive to this impact, which is likely to extend in duration until decommissioning has been completed and the area has been rehabilitated. With effective management (primarily via erosion control mechanisms) however, the impact would be unlikely to occur, reducing its significance rating to low.

Impact WR6: Discharge or runoff to surface water potentially resulting in deteriorated water quality affecting communities and ecological systems			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	*Negative*
Magnitude description	Sensitivity	*High*	*High*
	Receptor importance or value	*High*	*High*
	Extent of change / threshold compliance	*High*	*High*
	Magnitude rating	*MAJOR*	*MAJOR*
Timeframe description	Duration	*Medium term*	*Medium term*
	Frequency	-	-
	Timeframe rating	*MEDIUM TERM*	*MEDIUM TERM*
Spatial Scale		*INTERMEDIATE*	*INTERMEDIATE*
CONSEQUENCE RATING		*MEDIUM*	*MEDIUM*
PROBABILITY RATING		*DEFINITE*	*UNLIKELY*
SIGNIFICANCE RATING		*MEDIUM (-ve)*	*LOW (-ve)*
Reversibility / sustainability		*Irreversible*	
Confidence		*High*	

Management measures

- Plan and implement a comprehensive erosion control programme, including erosion and dust control measures listed in Impacts LT4 and AQ1.
- Use sedimentation control techniques such as installation of straw bales buffers in drainage lines downstream of potential sources of increased sediment load.
- Implement a Water Management Plan for the site.
- Implement a comprehensive Rehabilitation and Closure Plan, which includes rehabilitation of the backfilled pits, WRD and TSF to prevent post-closure discharge, and revegetation to ensure continued erosion control.
- Where practicable, separate clean and “dirty” (i.e. with elevated levels of contaminants) stormwater and handle to two categories differently.
- Ensure clean water is piped to the outlet point and not allowed to flow freely where it may cause erosion.

Good practice measures:

- Avoid construction activities in the Bankasoka River catchment area (northern portion of the TSF area), which is ecologically sensitive.
- Implement a water quality monitoring programme (continuing post-closure) to detect changes to surface water quality and take the required remediatory actions.
- Implement a surface water biomonitoring programme (as per the specialist recommendations) to monitor effects on aquatic ecosystems.
- Implement a spill management programme, which includes preventive measures such as secondary containment of pipelines crossing water courses and bunding of hazardous liquids stored on site.

7.3 Ecology and biodiversity

Many of the aspects discussed above which cause impacts to land and water can cause impacts on natural habitats as well, thereby affecting the ecology and biodiversity of the mine footprint and surrounding areas (including aquatic habitat). This includes the following:

- Temporary or permanent surface disturbance (including clearing of vegetation) for construction of Project infrastructure, resulting in direct loss of faunal and floral communities, and proliferation of alien invasive species;
- Haul roads, fences, pipelines or other barriers to movement, resulting in habitat fragmentation;
- Dewatering of pits resulting in groundwater drawdown, affecting wetland and other habitats;
- Noise and vibrations from equipment and blasting, disturbing fauna;
- Illumination of Project infrastructure, disturbing fauna;
- Fugitive dust from Project activities, affecting vegetation and fauna (including aquatic species);
- Surface water abstraction or diversion, affecting availability to downstream aquatic habitats;
- Change in chemical characteristics of water bodies due to discharges;
- Human population influx to the area, resulting in increased pressure on natural resources;
- Decommissioning, reprofiling and rehabilitation of the mine footprint area

Impacts on ecology and biodiversity include direct loss of fauna and flora, both at the individual and community levels as well as fragmentation, modification or loss of habitat, and indirect impacts through various types of disturbance, pollution or sedimentation of water courses. As much of the study area is already transformed, predominantly through subsistence agriculture and previous mining activity in the area, this is taken into account in the rating of the impacts described below. Impacts on both terrestrial and aquatic environments have been assessed.

7.3.1 EB1: Site clearance and positioning of Project infrastructure potentially resulting in habitat loss and fragmentation, and direct loss of fauna and flora

Construction	Operation	Decommissioning	Post-Closure

Habitat loss as a result of the Project is likely to occur through:

- direct modification of land through site clearance for Project infrastructure, as discussed under Impact LT1 (Section 7.1.1);
- indirect modification of land adjacent to cleared areas, resulting in habitat loss due to anthropogenic effects and erosion (discussed under Impact LT4 in Section 7.1.4); and
- indirect loss of wetland habitats through pit dewatering as discussed under Impact WR1 (Section 7.2.1).

In addition to permanent changes to certain footprint areas within the mine area, there will be temporary disturbance during construction (and to a certain extent during decommissioning) of areas for laydown / storage of materials, access tracks and a construction camp. The location and extent of these areas have not yet been determined. Impacts on communities as

a result of loss of agricultural land, areas for hunting, fishing and harvesting or a reduction in land capability is discussed and rated separately under Impact RL1 (Section 8.2.1).

Terrestrial habitats and species of conservation concern

A number of the terrestrial habitat types identified and described in Section 5.9.1 will be affected by Project infrastructure. Some of these habitats (primarily gallery forest but also swamp forest and flooded grassland) are considered to be of high functional value due to their potential for high biodiversity, threatened species and present ecological state. However very little of these habitat types (only a small area of gallery forest) were identified within the direct mine footprint area. As no endangered or critically endangered terrestrial species were confirmed or are likely to occur within the study area, however, the habitat is not considered to be of critical conservation importance. The areas of each habitat type lost due to direct disturbance and construction of the major mine site infrastructure is shown in Table 7-4.

A large proportion of the study area (including wetlands) is already transformed due to subsistence agriculture and shows secondary vegetation re-growth. The diversity of terrestrial mammals is therefore limited in the area. Only the lowland forest along the Rokel River (consisting of gallery and swamp forest, the indigenous habitat type) is of conservation concern, both due to its extremely limited distribution (covering less than 0.1% of the Project study area in excess of 40,000 ha), and the diversity of species it supports (including wild plants used by local communities). Of these, three plant species of conservation significance, one near-threatened mammal and two primate species are present in the gallery forest increasing the significance of the impact of loss of this habitat. Some of this habitat will be directly impacted and indirect impacts associated with changes to hydrogeological regimes are also possible (Impact WR3).

Table 7-4: Area of each habitat type directly impacted by the Project

Natural habitat type	Area directly impacted (ha)
Flooded natural grassland	0
Gallery forest	1.25
Rice wetlands	3,949.15
Secondary forest / farmbush mosaic	35,431.29
Secondary savannah	75.52
Swamp forest	0
Rivers	0

One of the major secondary impacts resulting from vegetation clearance and land disturbance is erosion – both of topsoil, which is discussed under Impact LT4 (Section 7.1.4), as well as erosion along river banks, resulting in further loss of riparian habitat. For this reason it is particularly important that the lowland forest found in narrow strips along the river banks, and providing flood attenuation and bank stabilisation, is not disturbed. This habitat type is however limited in the study area to a very small area along the northern bank of the Rokel River, close to the Rotret WRD, another area west of the Rotret WRD, and an isolated area where the TSF is planned to be located. Except for the TSF, these fall outside the direct mine site footprint.

Habitat fragmentation as a result of the positioning of Project infrastructure and other areas of disturbance is likely to affect movement of fauna between areas for activities such as breeding and foraging or hunting for food and could result in injury or death through crossing infrastructure such as roads.

The area supports a wide diversity of bird species, particularly in the secondary forest / farmbush, which is widespread throughout the study area. Birds are likely to move away from the area and settle in similar habitat nearby once land disturbance begins. In the case of the lowland forest habitat that supports a large number of bird species (18 of which are forest specialists), similar habitat is extremely limited in the surrounding area. What is present in the area is generally close to mine infrastructure (mainly the Rotret waste rock dump) and therefore subject to sensory disturbance (discussed in Impact EB3 (Section 7.3.3)) possibly making it a less attractive habitat for most species. Secondary savannah habitat also supports high biodiversity of bird species. This habitat type is restricted to a small area in the Project area and will be partially lost due to construction of the Mafuri pit.

Land disturbance and clearing of vegetation will lead to a localised reduction in food and habitat for mammals, birds and herpetofauna (reptiles and amphibians). Although much of the fauna would migrate from the area to adjacent undisturbed areas, accidental death of some small mammals and reptiles that are not able to move away prior to preliminary earthworks is expected.

The closure phase is seen as an opportunity to re-establish vegetation consistent with the surrounding area. However, rehabilitation of disturbed areas will require ongoing maintenance (such as watering, erosion control and control of alien invasive vegetation) until the vegetation is established and sufficient groundcover has been achieved. Rehabilitation of the site would also be expected to encourage displaced fauna species to return to the area with time, however a return to the pre-mining ecological state (particularly in forest areas) is unlikely. The permanent features left after mining, such as the waste rock dumps and pits, provide a different habitat to that found pre-disturbance and may encourage slightly different ecosystems to form.

Aquatic habitats and species of conservation concern

As stated in Impact WR1 (Section 7.2.1), groundwater drawdown associated with pit dewatering may desiccate and thereby reduce the extent of wetland ecosystems within the area surrounding the pits (up to 1000 m radius for the Matukia and Gafal pits). Wetland habitat in the study area is important both for agriculture (rice cultivation), covering almost all wetland areas, as well as for supporting indigenous species in habitats such as the flooded natural grassland, swamp and gallery forest habitats. The Rokel River and its associated riparian forest are considered to be the areas of highest conservation importance, due to the species they host. The loss of rice cultivation areas will impact on local communities in terms of food security and is rated in Impact WR1 (Section 7.2.1). The five aquatic habitat types identified in the study area are classified as modified, but the high fish diversity in the Rokel River indicates it to be in good ecological health and thus vulnerable to indirect impacts from changes in the hydrogeological regime. The seasonal valley head wetlands (used mainly for rice cultivation) host high numbers of fish, including species of conservation concern. Two vulnerable, one near-threatened and one endangered species, *Epiplatys lokoensis,* were recorded in the Project area. The conservation status of *E. lokoensis* is however pending downgrading from its current status of “Endangered” to “Vulnerable” (Ecorex, 2011).

Summary

Much of the area is no longer ecologically pristine, and no terrestrial species or habitats of critical conservation importance are present in the area. However, due to the presence of a number of fish species of conservation importance, aquatic habitats in the area are

considered to be of conservation importance (though due to the above-mentioned downgrade in conservation status, this would not be critical). The impact is therefore considered to be of moderate magnitude. Without successful rehabilitation much of the area will remain ecologically impacted beyond the life of the mine, if not permanently. Loss of individuals and habitats will be unavoidable, but is unlikely to significantly affect the ecology outside the area surrounding the Project footprint as the individuals are not highly endemic or specific to a particular area with the exception of the bird species associated with the gallery forest. Effective management (primarily via minimising the disturbance footprint, especially of sensitive areas) could decrease the probability and extent of the impact, thereby decreasing its significance. Due to some uncertainty in the robustness of the ecological system to respond to these changes, the confidence in the rating is given as medium.

Impact EB1: Site clearance and positioning of Project infrastructure potentially resulting in habitat loss and fragmentation, and direct loss of fauna and flora

Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	*Negative*
Magnitude description	Sensitivity	*Medium*	*Medium*
	Receptor importance or value	*Low*	*Low*
	Extent of change / threshold compliance	*Low*	*Low*
	Magnitude rating	*MINOR*	*MINOR*
Timeframe description	Duration	*Long term*	*Long term*
	Frequency	-	-
	Timeframe rating	*LONG TERM*	*LONG TERM*
Spatial Scale		*INTERMEDIATE*	*SMALL*
CONSEQUENCE RATING		*MEDIUM*	*MEDIUM*
PROBABILITY RATING		*DEFINITE*	*UNLIKELY*
SIGNIFICANCE RATING		*MEDIUM (-ve)*	*LOW (-ve)*
Reversibility / sustainability		*Partially reversible*	
Confidence		*Medium*	

Management measures

- Where possible adjust positioning of Project infrastructure during planning to avoid gallery forest and wetland habitats.
- Clear vegetation in phases working progressively in one direction so that fauna have an opportunity to move to adjacent areas.
- Stockpile topsoil and manage topsoil clearing as per the recommendations listed in Impact LT4, for use during rehabilitation.

7.3.2 EB2: Soil disturbance facilitating the establishment and spread of invasive species, potentially affecting indigenous ecosystems

Construction	Operation	Decommissioning	Post-Closure

Clearing or disturbance of vegetation and soil for construction of the mine and associated infrastructure will result in these areas being vulnerable to erosion (discussed in Impact LT4 in Section 7.1.4) as well as to infestation by exotic (or alien – i.e. introduced from elsewhere) and invasive vegetation species. Due to their rapid growth and general resilience, exotic invasive vegetation tends to proliferate in disturbed areas preventing or retarding growth of indigenous vegetation through competition for sunlight, nutrients, space and water. Once established, they seed quickly and multiply rapidly, establishing a seed bank in the soil. Not being indigenous to the area they are often resistant to indigenous biological control organisms and unpalatable to local fauna. Exposed or disturbed soil therefore presents an ideal opportunity for exotic invasive species growing in the vicinity or brought in from outside to spread and proliferate.

For a species to proliferate it would generally need to already be established in the surrounding area. The ecological baseline assessment found significant patches of secondary forest to be infested with the aggressively growing exotic species, *Chromlaena odorata* (Triffid Weed), which is native to North America (see Figure 7.2). This species easily spreads to adjacent vegetation, smothering the plants around it and preventing successful recruitment of forest canopy species, thereby preventing the recovery of secondary forest to its climax ecological state. It is therefore considered to be one of the major threats to biodiversity in the area and is reported to have become well established in secondary vegetation particularly in the southern parts of the Project area, but was also found in Savannah and Swamp Forest areas (Ecorex, 2011).

It is likely that, without adequate management, areas cleared of vegetation or disturbed (primarily during construction and to a lesser extent during decommissioning) will become infested by this species, exacerbating the current problem with alien infestation. Soil erosion and other impacts leading to decreased land capability would also indirectly contribute to the growth of exotic invasive vegetation by retarding the growth of the current vegetation cover. Other development in the area would also increase the likelihood of this impact.

As much of the area is already disturbed and the majority of the vegetation is no longer ecologically pristine, as well as the fact that no habitats of critical conservation importance are present in the area, the impact is expected to be of moderate magnitude. Without management, the invasive vegetation would continue to spread and proliferate within the disturbed areas beyond the life of the mine. Effective management would minimise the spread of invasive alien vegetation, and decrease the significance of the impact to low.

Figure 7.2: The invasive alien plant *Chromlaena odorata* (Triffid Weed)

Impact EB2: Soil disturbance facilitating the establishment and spread of invasive species, potentially affecting indigenous ecosystems			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	*Negative*
Magnitude description	Sensitivity	*Moderate*	*Moderate*
	Receptor importance or value	*Low*	*Low*
	Extent of change / threshold compliance	*Moderate*	*Low*
	Magnitude rating	*MODERATE*	*MINOR*
Timeframe description	Duration	*Long term*	*Long term*
	Frequency	-	-
	Timeframe rating	*LONG TERM*	*LONG TERM*
Spatial Scale		*SMALL*	*SMALL*
CONSEQUENCE RATING		*MEDIUM*	*MEDIUM*
PROBABILITY RATING		*POSSIBLE*	*UNLIKELY*
SIGNIFICANCE RATING		*MEDIUM (-ve)*	*LOW (-ve)*
Reversibility / sustainability		*Reversible*	
Confidence		*High*	

Management measures

- Implement an alien plant control management programme, including training of personnel to implement the programme.
- Implement rehabilitation as soon as possible, and monitor rehabilitated areas for growth of invasive species.
- Implement good practice measures listed in Impact LT1 to minimise the disturbed area.
- Implement erosion control measures as listed in Impact LT4.
- Remove invasive alien plants before they bear seed and dispose of removed plants appropriately.

7.3.3 EB3: Project activities resulting in sensory or other disturbance to wildlife

Construction	Operation	Decommissioning	Post-Closure

The Project will result in a number of potential disturbances to species which may exacerbate the effects of loss of fauna and habitat as well as habitat fragmentation (discussed in Impact EB1). These disturbances include increased noise, vibrations, light, dust and a general increase in human and vehicular activity in the area increasing accidental road kill (discussed in Impact TS2) and hunting. As the operations will run for 24-hours a day, the disturbances will be continuous, affecting both diurnal and nocturnal wildlife, and will extend from construction until decommissioning.

Increases in noise/vibration through blasting or the operation of mining equipment and light may act as a source of sensory disturbance to birds, herpetofauna, mammals and insects. Sensory disturbances may result in temporary avoidance of the area, disruption of feeding and breeding patterns or permanent displacement of individuals from the area. Although disturbance may result in a loss of fauna around the mine site, mobile animals are likely to move to adjacent replacement areas. For generalist species this is not expected to present a problem. However for habitat-specific species (such as forest endemics) the availability of suitable habitat nearby may be a limiting factor which could result in loss of those species to the area. Changes in species distribution could put pressure on the resources and resident species of surrounding habitats, but as densities of wildlife in the area are already low (due to disturbance) this is not expected to pose a significant impact. Note that light sources can also be an attractant (Impact EB4) to insects and their predators.

Project activities during construction and operations will result in increased background dust concentrations and emissions from vehicles and other sources (extent of air quality impacts are discussed in Impacts AQ1 and AQ2). Increased dust deposition on vegetation reduces the photosynthetic capacity of plants and may limit growth and reproductive capacity leading to a decrease in population sizes and potential loss of species, this can be particularly critical for food crops. However, due to high background dust levels in the receiving environment in the dry season, particularly along unpaved roads, the vegetation is likely to be well-adapted to dust and it is unlikely to represent a significant impact.

The Project area is already disturbed – Lunsar town borders on the area and villages are scattered throughout, with their associated livelihood practices such as subsistence farming, fishing and hunting; the Makeni highway and the railway to Pepel pass through the area; and two other mines are in operation in relatively close proximity. Hunting and trapping of wildlife already occurs, possibly contributing to the near absence of larger mammals. Improved access to the site (through access roads and other infrastructure providing access through dense vegetation) and more human activity in the area as a result of the Project may indirectly increase the incidence of hunting. However there are few species of conservation concern, and those that are present are unlikely to remain in the area. It is however strongly recommended that the remaining forest areas are protected from further disturbance (perhaps as formal conservation areas, in consultation with local communities) and mining activities close to these areas are minimised.

Since much of the area is already disturbed, faunal densities are already low and there are few faunal species of conservation concern, the magnitude of the impact is rated as minor.

Disturbances directly related to the Project are likely to decrease during decommissioning, and be largely reversed following closure of the site. Long term impacts are therefore not expected. The disturbance will however be inevitable and will extend beyond the Project footprint to adjacent areas. Due to its low significance, no management measures are proposed, but the implementation of the good practice measures listed is recommended.

Impact EB3: Project activities resulting in sensory or other disturbance to wildlife			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	-
Magnitude description	Sensitivity	*Low*	-
	Receptor importance or value	*Low*	-
	Extent of change / threshold compliance	*Low*	-
	Magnitude rating	*MINOR*	-
Timeframe description	Duration	*Medium term*	-
	Frequency	-	-
	Timeframe rating	*MEDIUM TERM*	-
Spatial Scale		*INTERMEDIATE*	-
CONSEQUENCE RATING		*LOW*	-
PROBABILITY RATING		*DEFINITE*	-
SIGNIFICANCE RATING		*LOW (-ve)*	-
Reversibility / sustainability		*Reversible*	-
Confidence		*High*	-

Good practice measures:

- Develop and implement a Wildlife and Habitat Management Plan that:
  - protects gallery and swamp forest areas from disturbance (see Figure 5.12);
  - provides awareness training to staff and contractors on: prevention of injury of animals; identification of likely species found on site (and those of conservation concern); identifications of animal hazards (such as venomous snakes); and what to do if dangerous animals are encountered;
  - requires personnel to report kills of species of conservation concern to the mine's Environment Management team, who may investigate the incident;
  - encourages personnel to report sightings of wildlife of conservation importance to the mine's Environment Management team; and
  - allows for the monitoring and, if necessary, eradication of any invasive species occurring on site or in surrounding disturbed areas.

7.3.4 EB4: Mine infrastructure and activities attracting nuisance species, potentially resulting in impacts on indigenous ecosystems

Construction	Operational	Decommissioning	Post-Closure

The Project infrastructure will provide new habitat opportunities for fauna. For example, buildings will provide shade and nesting opportunities for small fauna and birds, water storage areas will be an attractant particularly in the dry season, light will attract insects (and their predators) and waste disposal areas have the potential to provide a food source to scavenger animals such as rodents. However, these attractive nuisances are being created in a hazardous environment and will expose fauna to risks.

Domestic waste such as food waste will be produced by the mine site and the accommodation camp and disposed in a landfill area on site which will attract (and pose a potential danger to scavenger animals such as rodents, birds and foxes (and possibly domestic dogs, pigs and goats from nearby villages) if not managed. As a minimum, regular and thorough waste compaction, ensuring wastes are completely covered with soil or other inert material after deposition and fencing of the landfill will be required to keep the presence of scavengers to a minimum.

Construction and operation will result in 24-hour illumination of the mine site. Insects may be attracted to the lights at night and this may attract bats to the area which may be vulnerable to drowning in water storage facilities. Water storage facilities may also provide additional breeding areas for mosquitoes increasing their prevalence (and (in theory) potentially also the prevalence of malaria) in the area.

The habitat opportunities described above will attract specific species towards the site and will increase the exposure of these animals to hazardous environments or situations, such as toxic water and moving machinery or drowning. This can have implications on local ecosystems with an increase in scavenger animals and their predators, however as there is already existing disturbance in the area the ecosystems are unlikely to be significantly affected. New habitat opportunities may result in a change to the diurnal and nocturnal species composition in the area and could, in theory, result in an increase in animal deaths due to the hazards present. Even with proposed management measures, the risk of animal deaths will be difficult to control but will cease on closure.

Any impacts will be restricted to the Project footprint and adjacent disturbed areas. As there is already other developments (creating other sources of attractive nuisance) in the area and species are likely to move away from the area (and therefore are unlikely to be at risk), the magnitude of the impact is rated as minor. Negative impacts that can be directly related to the Project (and not secondary development in the area) would predominantly occur during operation of the site, and will largely cease on decommissioning. Negative impacts are not considered to be of high significance and would be unlikely to occur with effective implementation of the management measures listed.

Impact EB4: Mine infrastructure and activities attracting nuisance species, potentially resulting in impacts on indigenous ecosystems			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	*Negative*
Magnitude description	Sensitivity	*Low*	*Low*
	Receptor importance or value	*Low*	*Low*
	Extent of change / threshold compliance	*Low*	*Low*
	Magnitude rating	*MINOR*	*MINOR*
Timeframe description	Duration	*Medium term*	*Medium term*
	Frequency	-	-
	Timeframe rating	*MEDIUM TERM*	*LONG TERM*
Spatial Scale		*SMALL*	*SMALL*
CONSEQUENCE RATING		*MEDIUM*	*MEDIUM*
PROBABILITY RATING		*POSSIBLE*	*UNLIKELY*
SIGNIFICANCE RATING		*LOW (-ve)*	*LOW (-ve)*
Reversibility / sustainability		*Reversible*	
Confidence		*Medium*	

Management measures

- Develop and implement a waste management plan that accommodates all waste types produced on site, particularly food waste.
- Manage the landfill site in accordance with good practice standards, including access control and fencing.
- Monitor the incidence of drowning in water storage facilities and implement preventive measures if required.
- If required, a pest control programme should be implemented, and should include monitoring of accidental death of non-pest species. Should the use of rodent control measures be required, the use of natural predators, for example raptors should be considered, and pesticides that bio-accumulate should be avoided.

8 SOCIO-ECONOMIC IMPACT ASSESSMENT

As stated in Section 3.3.3 social issues are often unavoidable and the mitigation strategies are generally geared towards managing a social change process. Successful management of a potentially negative social issue usually presents opportunities for social development and improvement in the quality of life of local people. The economic benefits to the community which can be generated by large scale Projects are the key motivations for the community to support the Project. Furthermore, unlike environmental management plans, social management plans have a twofold objective, first aiming at mitigation of negative impacts and secondly aiming at improvement of standard of living.

The potential socio economic impacts (both positive and negative), have been grouped in the categories as shown in Table 8-1.

Table 8-1: Summary of evaluated social impacts

Economic development	Impact ED1: Employment generation by the Project resulting in increased standard of living for the local community
	Impact ED2: Employee training leading to skills development in the local community
	Impact ED3: Increase in government income (from taxes and royalty on mining) potentially leading to social development in the Project area
	Impact ED4: Opportunities for local suppliers and contractors leading to economic growth
Resettlement and loss of land and social and natural resources	Impact RL 1: Impoverishment through loss of shelter, land and communal natural resources
	Impact RL2: Changes to community access as a result of the Project potentially affecting livelihoods, access to communal social services and infrastructure and community cohesion
	Impact RL3: Added pressure on limited host community resources, potentially resulting in food insecurity and malnutrition
Social order	Impact SO1: Influx of job seekers causing increased pressure on government services and infrastructure, potentially resulting in reduced standard of living
	Impact SO2: Increase in social ills/problems
	Impact SO3: Real or perceived unequal distribution of Project benefits leading to social tension
Archaeology and cultural heritage	Impact AC1: Disturbance to sacred bushes and cemeteries leading to loss of community's access cultural resources
Decommissioning and closure	Impact DC1: Closure of mine leading to economic decline

As discussed in Chapter 4, potential socio-economic impacts resulting from export activities and the transport of product (and supplies) are not included in this assessment.

Explanatory notes on the description and rating of the impacts in Chapters 8 is provided in the introductory text in Chapter 7. Potential impacts of the Project on the health and safety of communities in the vicinity of the Project are described in Chapter 9.

8.1 Economic development

The economic benefits of the Project can be classified as direct, indirect and induced impacts. These are described below:

- direct impacts – the immediate economic benefits (jobs and development Projects, revenue paid to the government) generated by the Project;
- indirect impacts – the production, employment and income changes occurring in

businesses that supply inputs or provide services to the Project; and

- induced impacts –the effects of spending by the employees working directly and indirectly for the Project on the local economy.

8.1.1 ED1: Employment generation by the Project resulting in increased standard of living for the local community

Construction	Operation	Decommissioning	Post-Closure

The Project area is characterised by a lack of formal employment opportunities and widespread poverty (Section 6.5). The creation of jobs is regarded by the local population as the most important positive impact. Although a second mining development (by London Mining) is also underway in the Project area, there is still a significant gap between the availability and demand for jobs.

The Project will require a labour force of up to 700 (peak estimate) during construction (over a 3 to 3.5 year period). About 60% are expected to be labour, which can be sourced locally[15]. The specialist construction workers are likely to be sourced outside of Sierra Leone due to the lack of skilled workers in-country (and competition for local skilled labour between mine developments).

The Project will require a work force of up to 550 during the operational phase (15 years). The skill levels needed in this phase will be higher than during the construction phase. Hence it will be difficult to find suitably qualified Sierra Leoneans and therefore it is expected that the number of expatriate employees will initially be relatively high. The number of expatriates will reduce over the life of the mine as Sierra Leonean staff will be trained to take over skilled jobs and management roles. The increased capacity of the national staff will be an added benefit of the Project.

Formal jobs with regular and stable incomes will result in greater financial security for those employed and their families. In the extended family structure typical of rural Sierra Leone each employed person supports a large number of dependents.

The formal jobs at the Project are expected to be well paid in comparison to existing wage levels in the area. The security and stability gained from a formal job may lead to an improvement in nutritional/health status, investment in children's education, investment in income generating assets and general quality of life. However, increased income, if not used constructively, can lead to short term gratification (such as drinking and gambling, often linked to conflicts and divorce) instead of investment in the future. Workers may therefore need training and support in the area of income management and life skills.

The Project will generate indirect jobs, businesses and livelihood opportunities in the ancillary sector. These may include services and supplies directly to the Project or on account of additional spending by the Project workers. SRK's experience on other mining Projects in developing countries and in Africa has shown that the 'employment multiplier effect' can vary from 1.5 to 9 depending on macroeconomic factors. Assuming an average multiplier of four, every direct job created by the Project can result in three additional jobs. Hence the Project can result in 2,100 additional jobs during construction and 1,650 additional jobs during operations, contributing to the national job sector as a whole.

[15] *Local here refers to the directly and indirectly affected villages and Lunsar town.*

If not managed appropriately however, the employment opportunities at the Project have the potential to:

- lead to community resentment against the Project leading to conflict;
- become the cause of inter and intra village conflict on the issue of job distribution (further discussed under Impact SO3); and
- be a major pulling factor for the in-migration of job-seekers potentially leading to a series of other social problems (Impact SO1).

To avoid potential negative consequences, positive impact measures (see enhancement measures proposed below) will focus on increasing local employment opportunities, and ensuring a fair and transparent recruitment strategy. In the table below the impact has been evaluated for the operational phase, as the benefit in terms of increased standard of living will be measurable mainly due to the sustained benefits of regular income over a relatively long period of time.

Employment opportunities created by the Project will cease to exist at the end of the operational phase (see Impact DC1) hence the benefit of the increased standard of living will not be sustainable without the enhancement measures in place. Appropriate management measures (during employment and retrenchment) and community development programmes can mitigate against the standard of living dropping to a pre Project level. However the outcomes of such programmes are difficult to guarantee and hence the confidence rating of the mitigation is medium.

Impact ED1: Employment generation by the Project resulting in increased standard of living for the local community

Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Positive*	*Positive*
Magnitude description	Sensitivity	*High*	*High*
	Receptor importance or value	*High*	*High*
	Extent of change / threshold compliance	*Low*	*Medium*
	Magnitude rating	*MODERATE*	*MODERATE*
Timeframe description	Duration	*Medium term*	*Long term*
	Frequency	-	-
	Timeframe rating	*MEDIUM TERM*	*LONG TERM*
Scale		*INTERMEDIATE*	*INTERMEDIATE*
CONSEQUENCE RATING		*MEDIUM*	*HIGH*
PROBABILITY RATING		*DEFINITE*	*DEFINITE*
SIGNIFICANCE RATING		*MEDIUM (+ve)*	*HIGH (+ve)*
Reversibility/sustainability		*Partially sustainable*	
Confidence		*High*	

Impact ED1: Employment generation by the Project resulting in increased standard of living for the local community
Enhancement measures • Develop a local employment strategy giving preference to local candidates, provided they meet the required eligibility criteria. • Develop a fair and transparent local recruitment plan • Require contractors (by means of their contract) to give preference to local employees, provided they meet the required eligibility criteria. • Organise training for workers on management of household incomes. • Develop a programme for gradual 'indigenisation' of the workforce. This includes a general and technical skills training programme • Develop and implement a construction and operational phase stakeholder engagement plan (SEP). As part of this SEP document and disclose the recruitment process to manage community expectations (also related to Impact SO2).

Good practice measures:

- Give preference to people directly affected by land acquisition to reduce the magnitude of impacts described in Section 8.2, and
- develop a programme of training prior to Project start up to maximise potential for local employment.

8.1.2 ED2: Employee training leading to skills development in the local community

Construction	Operation	Decommissioning	Post-Closure

Education and skills levels in the Project area are low (Section 6.9). There is limited exposure of the local population to modern technology, technical skills and a formal employment culture (for instance safe working practices). The Project workforce (including local people and other Sierra Leone nationals) will receive both formal and informal training, gaining them skills and competences in different work streams relevant to the Project (Section 4.9.3). The acquired skills will enhance their opportunities to gain alternative employment after mine closure. It is also likely that some of the skills acquired at the workplace, such as health and safety measures, financial management, communication and interpersonal skills will be transferred to a certain extent, to domestic and personal settings leading to an enhanced quality of life.

During construction, training will be limited to on-the-job training and safety briefs. Systematic training including technical training will be organised mainly for the operations workforce. It is expected that with enhancement measures the benefit of training will sustain beyond the Project life. However the confidence in the prediction of optimised impact is medium as it is difficult to fully ascertain the ability of workers to benefit from training.

Impact ED2: Employee training leading to skills development in the local community			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Positive*	*Positive*
Magnitude description	Sensitivity	*High*	*High*
	Receptor importance or value	*High*	*High*
	Extent of change / threshold compliance	*Low*	*Medium*
	Magnitude rating	*MODERATE*	*MODERATE*
Timeframe description	Duration	*Medium term*	*Long term*
	Frequency	-	-
	Timeframe rating	*MEDIUM TERM*	*LONG TERM*
Scale		*INTERMEDIATE*	*INTERMEDIATE*
CONSEQUENCE RATING		*MEDIUM*	*HIGH*
PROBABILITY RATING		*DEFINITE*	*DEFINITE*
SIGNIFICANCE RATING		*MEDIUM (+ve)*	*HIGH (+ve)*
Reversibility/sustainability		*Sustainable*	
Confidence		*Medium*	

Enhancement measures

- Prepare and implement a training and skills development plan for ongoing skills development of the Project workforce including contractors' personnel.
- Support a 'vocational training programme' to assist local people to qualify for semi-skilled positions.
- Encourage workers to introduce the learned skills and practices in their homes.

Good practice measures:

- Continue technical and financial support to educational institutions and students.

8.1.3 ED3: Increase in government income (from taxes and royalty on mining) potentially leading to social development in Project area

Construction	Operation	Decommissioning	Post-Closure

Sierra Leone is a candidate country for membership of the Extractive Industry Transparency Initiative (EITI). The EITI promotes transparency in flow of revenue from industry to the government to enhance utilisation of revenues for sustainable development in local communities affected by Projects. It is therefore expected that part of the revenue earned from the Project will be used by the Government for social development in the vicinity of the Project.

The Government of Sierra Leone is expected to earn revenue from the Project as a result of taxation on profits, excise duties on imports, payroll taxes and value added tax. The increased government income, if allocated back to the Port Loko District for development, may to lead to enhanced social infrastructure and services. However the Project has no

control over this benefit as the allocation of government spending will be determined by the Government of Sierra Leone. To increase the probability of this benefit materialising the Project should focus on liaison with the government at the local and national levels to support the implementation of EITI principles.

Impact ED3: Increase in government income (from taxes and royalty on mining) potentially leading to social development in Project area			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Positive*	*Positive*
Magnitude description	Sensitivity	*High*	*High*
	Receptor importance or value	*High*	*High*
	Extent of change / threshold compliance	*Medium*	*Medium*
	Magnitude rating	*MODERATE*	*MODERATE*
Timeframe description	Duration	*Medium*	*Medium*
	Frequency	-	-
	Timeframe rating	*MEDIUM TERM*	*MEDIUM TERM*
Scale		*SMALL*	*SMALL*
CONSEQUENCE RATING		*MEDIUM*	*MEDIUM*
PROBABILITY RATING		*UNLIKELY*	*POSSIBLE*
SIGNIFICANCE RATING		*LOW (+ve)*	*MEDIUM (+ve)*
Reversibility/sustainability		*Not sustainable*	
Confidence		*Low*	

Good practice measures:

- disclose information on Project's payment to government to the local communities and other interested stakeholders as part of the SEP, and
- liaise with government to promote the use of revenue from the Project in the Project's area of influence for local development.

8.1.4 ED4: Opportunities for local suppliers and contractors leading to local economic growth

Construction	Operation	Decommissioning	Post-Closure

The construction of the mine and associated infrastructure will require a capital investment of about USD 2.4 billion during the construction phase, whereas the operational cost is estimated to be approximately USD 9.5 billion. Over the life of mine this translates to approximately USD 12 billion. This spending provides economic opportunities for suppliers of equipment, goods and services. The supply market in Sierra Leone is currently not capable to meet the demands of this type and scale of Project. Hence the Project is unlikely to source the majority of goods and services from within Sierra Leone, with the exception of consumables such as fuel, food and stationary. Where possible however, additional goods should be sourced within Sierra Leone which would lead to economic growth at local and the national levels.

The probability of this benefit from occurring will depend on the Project's efforts to increase engagement of local suppliers by implementing the measures listed below in the table. The local purchase opportunities will be greatest in the construction phase, will diminish and stabilise during the operational phase and may continue into the decommissioning phase. The benefit will cease to exist after closure. Confidence in this benefit materialising is medium as there is limited capacity in Sierra Leone to meet the needs of the Project.

Impact ED4: Opportunities for local suppliers and contractors leading to stimulation of local economic growth

Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Positive*	*Positive*
Magnitude description	Sensitivity	*High*	*High*
	Receptor importance or value	*High*	*High*
	Extent of change / threshold compliance	*Low*	*Medium*
	Magnitude rating	*MINOR*	*MINOR*
Timeframe description	Duration	*Medium term*	*Medium term*
	Frequency	-	-
	Timeframe rating	*MEDIUM TERM*	*MEDIUM TERM*
Scale		*EXTENSIVE*	*EXTENSIVE*
CONSEQUENCE RATING		*MEDIUM*	*MEDIUM*
PROBABILITY RATING		*UNLIKELY*	*POSSIBLE*
SIGNIFICANCE RATING		*LOW (+ve)*	*MEDIUM (+ve)*
Reversibility/sustainability		*Not sustainable*	
Confidence		*Medium*	

Enhancement measures

- Identify the types of goods and services required and those that can be sourced from within Sierra Leone.
- Develop a procurement programme to maximise the use of local suppliers.

Good practice measures:

- Develop a supplier and contractor database, along with a process to review, monitor and strengthen capabilities of local suppliers and contractors.

8.2 Resettlement and loss of land, social and natural resources

The Project's foot print area at the mine site (open pits, TSF, WRD, processing areas and haul roads) is estimated to be at least 1,900 Ha. This area is currently in use by local residents for village settlements (housing and social infrastructure), farming (permanent and shifting), collection of wild plants, charcoal production, grazing, fishing and hunting.

Although the location of the Project facilities have been designed to minimise direct impacts on existing villages it will lead to displacement of 10 villages (namely Marunku, Magbungbu,

Konta, Gbese, Mafuri, Rosint, Ma Sesay, Maso, Rolal c/o Gafal and Matukia). These villages will lose houses and community structures, access to farmland, plantations, irrigation structures, roads and other land based resources. These villages will therefore need to be resettled and compensated in accordance with the Resettlement Action Plan (RAP) based on the Resettlement Framework presented in Appendix D.

In addition to this, 13 other villages (namely Makel, Mafira, Magbafat, Rolal c/o Mafuri, Monbaia, Konta Bana, Konta Lol, Manonko, Molumpo, Royail, Kalangba, Royema and Matoko) on the peripheries of the footprint area may not need to be resettled but may face impacts due to loss of land, access to natural resources and loss of social support networks resulting from relocation of neighbouring villages. These villages may also need to be considered in the RAP.

Sacred sites and grave sites within the Project footprint area will also require relocation (see Impact AC1).

In the absence of mitigation measures, physical and or economic displacement can result in long-term impacts on the social and economic wellbeing of affected populations. Therefore mitigation measures will be planned for the management of the following potential impacts:

- relocation of households (Impact RL1)
- loss of income and livelihood opportunities (Impact RL1);
- reduced access to communal facilities such as wells, irrigation works, schools, and health clinics) (Impact RL2);
- breakdown of social support networks such as access to farm labour and credit (impact RL3); and
- loss of sacred sites (see Impact AC1).

Resettlement of affected households to a new area could result in positive and negative impacts on the host community[16](if applicable) or communities close to the resettled villages.. These would need to be assessed once resettlement sites are identified (Impact RL4)

8.2.1 RL1: Impoverishment through loss of shelter, land and communal natural resources

Construction	Operation	Decommissioning	Post-Closure

Preliminary assessment of the potentially impacted population reveals that:

- 10 villages, comprising of 162 households (or 1,780 people) will require replacement housing and access to alternative land for farming and collection of natural resources to sustain their livelihoods; and
- an additional 13 villages, comprising of 270 households (or 2,936 people), who are affected by partial loss of land used for farming and collection of natural resources, will require replacement land and access to communal natural resources for sustaining their livelihoods.

In total approximately 432 households (4,716 people) will lose some access to land based resources. In addition, some absentee landowners, who live in Freetown, may also be impacted by the land acquisition process.

[16] *Who is receiving the resettled people.*

The RLS study shows that there could be possible impacts on communities further away from the directly impacted villages due to changes to flood regimes and traders dependant on the supply of products from displaced villages.

The impacts will occur during the construction phase. However their effects can be long term if not mitigated against. The impacts will be mitigated using a resettlement programme that includes:

- provision of improved standard replacement housing and community structures , in consultation with the affected local communities;
- compensation for land in the form of cash or preferably in the form of replacement land for long term sustainability of livelihoods;
- cash compensation for loss of any standing crops, plantations and trees;
- assistance for redevelopment of farms and plantations on new land; and
- livelihood restoration for people facing loss of income or livelihood opportunities.

Special attention will be needed in the RAP for the issues listed below:

- Due to depletion of natural resources and sub-optimal methods of farming, food insecurity is an issue in the area, with households lacking adequate food supplies for between one and four months every year (Section 6.5). Hence the mitigation measures will need to focus on alternative livelihood options (such as employment by the Project) and improving farming methods. Some communal resources, such as palm oil trees (for palm wine trapping or commercial harvesting) are leased to people outside the identified villages. Hence the mitigation measures will need to consider the impact on people potentially affected due to severance of such leasing arrangements.
- Replacing access to communal natural resource areas with areas of similar value will be difficult due to general depletion of natural resources in the larger area. Loss of wild plants, which are largely restricted to degraded patches of communal forest (protected in the form of sacred bush), would impact on the traditional system of medicine and could be difficult to replace.

Hence a combination of mitigation measures will be needed to compensate for loss of access to natural resources. These will need to be explored with the affected people, but could include: planting of medicinal plants, providing support to farmers and exploring alternative livelihood options with an objective to enhance food security.

Impact RL1: Impoverishment through loss of shelter, land and communal natural resources			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	*Negative*
Magnitude description	Sensitivity	*High*	*High*
	Receptor importance or value	*High*	*High*
	Extent of change / threshold compliance	*High*	*Low*
	Magnitude rating	*MAJOR*	*MODERATE*

Impact RL1: Impoverishment through loss of shelter, land and communal natural resources			
Timeframe description	Duration	*Permanent*	*Short to Medium term*
	Frequency	-	-
	Timeframe rating	*LONG TERM*	*MEDIUM TERM*
Scale		*SMALL*	*SMALL*
CONSEQUENCE RATING		*HIGH*	*MEDIUM*
PROBABILITY RATING		*DEFINITE*	*DEFINITE*
SIGNIFICANCE RATING		*HIGH (-ve)*	*MEDIUM (-ve)*
Reversibility		*Reversible*	
Confidence		*High*	

Mitigation measures

- Prepare a Resettlement Action Plan (RAP) in agreement with affected population, the Paramount Chief and key government and non-government stakeholders as per the RF (Appendix D). The plan should provide details of:
- affected people;
- entitlements (cash or preferably in the form of replacement land for long term sustainability of livelihoods);
- cash compensation for loss of any standing crops, plantations and trees;
- assistance for redevelopment of farms and plantations on new land;
- provision of improved replacement residential and community structures as per the preference of local communities.
- Build alternative access routes in consultation with users of affected routes.
- Undertake a community development programme for people facing loss of livelihood opportunities.
- Iteratively consult with affected people to identify and resolve their issues in a timely manner.
- Implement a grievance mechanism for identification of resettlement related issues and address them in a timely manner.
- Undertake post resettlement monitoring of affected parties to timeously detect issues and take action if necessary.

Good practice measures:

- Preferentially employ eligible members from directly affected families.

8.2.2 RL2: Changes to community access as a result of the Project potentially affecting livelihoods, access to communal social services and infrastructure and community cohesion

Construction	Operation	Decommissioning	Post-Closure

Local communities live in small villages scattered throughout the Project area many of which are only accessible on foot. Close social linkages exist between these villages, as well as linkages through trade and shared natural resource use. Community members therefore travel on foot on a regular basis between villages, water access points, farming, fishing, hunting or harvesting areas, places of community service (schools, clinics) and areas of cultural importance (such as sacred bush). Due to the dense vegetation, many of these

routes are not visible from aerial photographs of the area. The most direct and easiest access routes would preferentially be used and in many cases the use of alternative available routes would add significantly to the journey time and effort which, in turn, would cut into time available for other livelihood practices. In some cases, positioning of Project infrastructure may intersect these preferred routes blocking or disrupting access.

The communal social infrastructure available to villagers mainly comprises facilities such as schools, health centres, churches, grain banks, hand pumps and access roads. Land reduced by the Project would lead to loss of communal social infrastructure in the 10 directly affected villages, although this is mitigated by resettlement of those villages.

The RAP will plan for replacement of lost facilities at the relocation sites, which should improve the affected people's standard of living. Making an inventory of impacted infrastructure and planning for their replacement will be part of the RAP (Impact RL1). Relocation of some facilities that have a larger catchment area (such as the Health centre in Marunku) could also impact several neighbouring villages currently using the facility. This aspect may need to be assessed during the resettlement planning process and included in the mitigation measures. Given the Project area is characterised by a low density of social infrastructure, the resettlement programme will provide an opportunity for net improvement in the situation. Hence it is reasonable to expect that the post mitigation the impact would be minor, last for a shorter duration and be reversible.

Displaced communities (and to a lesser extent the villages left behind) that are relocated too far from their present location can also be affected by a loss of non-tangible community resources such as: reciprocal labour sharing arrangements (usually spread across 3-4 villages), links with traders and access to social networks (neighbours, friends, relatives) that form the social support within the village community. To mitigate loss of social networks, consideration will be given to relocation of certain households so as to preserve the social ties and networks and reduce the potential severity and duration of the impact. As with Impacts RL1 this aspect will be further investigated during RAP process and addressed through identification of measures using community knowledge and preferences.

Due to the local communities' reliance on access routes between villages and other areas, the pre-management magnitude of the impact is rated as moderate. The impact will be felt beyond the life of the mine, if not permanently, and will affect communities beyond the direct Project footprint area, either directly or indirectly, through disruption or loss of connectivity with areas outside the village that are commonly frequented. Through appropriate management, the impact significance could be reduced as communities would be assisted by way of developing suitable route alternatives, having alternative facilities provided and the period of route disruptions could be minimised. Positive impacts resulting from the provision of safe and easy new access routes together with a reduction in travel time and vehicle maintenance costs (through the improvement in road condition) would also contribute to the reduction in significance of this negative impact. As the impact relates to communities perceptions of the change, the confidence in the rating is given as medium.

Impact RL2: Reduced access to communal social services and infrastructure			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	*Negative*
Magnitude description	Sensitivity	*High*	*Low*
	Receptor importance or value	*High*	*Medium*
	Extent of change / threshold compliance	*High*	*Low*
	Magnitude rating	*MAJOR*	*LOW*
Timeframe description	Duration	*Long term*	*Short term*
	Frequency	-	-
	Timeframe rating	*LONG TERM*	*SHORT TERM*
Scale		*SMALL*	*SMALL*
CONSEQUENCE RATING		*HIGH*	*LOW*
PROBABILITY RATING		*DEFINITE*	*POSSIBLE*
SIGNIFICANCE RATING		*HIGH (-ve)*	*LOW (-ve)*
Reversibility/Sustainability		*Reversible and potentially sustainable*	
Confidence		*Medium*	

Mitigation measures

- Implement measures under Impact RL1 relating to resettlement planning.
- Provide safe crossing points across or around mine infrastructure where existing tracks are affected.
- Liaise with the affected communities to determine alternate routes around mine area that cannot be crossed.
- Maintain the selected bypass roads in the vicinity of the mine operations for the duration of the life of the operation.
- At closure, liaise with communities to determine if previous routes should be restored.

8.2.3 RL3: Added pressure on limited host community resources potentially resulting in food insecurity and malnutrition

Construction	Operation	Decommissioning	Post-Closure

The communities at the host site may experience added pressure on land and natural resources due to the increase in population on account of relocation of Project affected people. To mitigate this potential impact the resettlement plan would assess the host site in terms of potential shortage of food resources, increased pressure on social infrastructure and other community resources that can lead to impoverishment in the host community.

The host community may also experience positive impacts from influx of resettled people for instance local businesses may increase their customer base.

The scale, intensity and nature of impacts (both positive and negative) will depend on the characteristics of the host site in terms of its impact bearing capacity and ability to

accommodate population influx. Other determining aspects could be the number of host sites chosen, magnitude of population to be resettled at each site, all of which have not currently been identified. It is therefore not feasible to further describe and evaluate this impact at this stage. Impacts on the host site will be assessed and appropriate management measures designed as part of the RAP process.

8.3 Social order

The Project is expected to create changes in the existing social systems and practices. One of the main potential impacts on the existing social order may be is the sudden increase in population caused by arrival of Project workers and speculative job seekers driven by direct and indirect employment and business opportunities. The inflow of workers (and associated migration) is expected to start and peak in the construction phase with the start of construction activities. The influx of job seekers during operations is expected to slow down. The potential impacts and risks associated with increase in population are further described in Sections 8.3.1 and 8.3.2. By identifying and understanding these changes the Project would have the opportunity to mitigate the negative impacts on affected communities.

8.3.1 SO1: Influx of job seekers causing increased pressure on government services and infrastructure, potentially resulting in reduced standard of living

Construction	Operation	Decommissioning	Post-Closure

The economic opportunities created by the Project are expected to lead to an influx of workers and job seekers. With the ongoing development of the London Mining Project in the immediate vicinity, some in-migration has already taken place. With the start of the Project, Lunsar town and surrounding areas could potentially be perceived as employment hotspots increasing further in-migration. This has been observed as a phenomenon at recent Projects in rural Sierra Leone (for instance AML's Tonkolili Iron Ore Project).

Currently the local communities perceive in-migration and growth of human settlements as a positive indicator because it represents growth in the consumer base. In the long term however, the increase in population due to in-migration can exacerbate secondary impacts, contributing to deterioration in standard of living. These include;

- pressure on local social infrastructure;
- pressure on natural resources (which are already rapidly depleting);
- increase in the cost of living; and
- encroachment on the limited Project related opportunities for unskilled labour by immigrants leading to resentment among the local community members (this aspect is further discussed under Impact SO3).

All the above factors can cause a build-up of resentment among the community ultimately manifesting as conflict.

The Project cannot keep people from moving into the area. However, indirect measures to pre-empt and discourage the flow of migrants into the area can be employed. A preferential local recruitment and procurement policy may discourage potential in-migrants from moving into the area. Nevertheless some in-migration will still take place and will add pressure on existing resources. The Project could provide support to the government to build additional infrastructure, as well as to local NGOs to deal with any potential social issues emanating

from increases in population (Impact SO2).

Population influx is an indirect impact and the Project has limited control on the outcome of mitigation measures, hence the confidence in residual impacts ratings is medium.

Impact SO1: Influx of job seekers causing increased pressure on government services and infrastructure, potentially resulting in reduced standard of living			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	*Negative*
Magnitude description	Sensitivity	*Medium*	*Medium*
	Receptor importance or value	*Medium*	*Medium*
	Extent of change / threshold compliance	*Medium*	*Low*
	Magnitude rating	*MODERATE*	*MINOR*
Timeframe description	Duration	*Long term*	*Medium term*
	Frequency	-	-
	Timeframe rating	*LONG TERM*	*MEDIUM TERM*
Scale		*SMALL*	*SMALL*
CONSEQUENCE RATING		*MEDIUM*	*LOW*
PROBABILITY RATING		*DEFINITE*	*POSSIBLE*
SIGNIFICANCE RATING		*MEDIUM (-ve)*	*LOW (-ve)*
Reversibility		*Partially reversible*	
Confidence		*Medium*	
Mitigation measures • Encourage local recruitment and procurement (see Impact ED1 and ED4). • Encourage local communities to use the grievance procedure for resolving their concerns.			

Good practice measures:

- Facilitate joint planning with other industries, local government, Paramount Chief and other stakeholders to minimise speculative migration.

8.3.2 SO2: Increase in social ills/problems

Construction	Operation	Decommissioning	Post-Closure

The presence of Project workers (including expatriates and workers from other parts of Sierra Leone) and influx of speculative job seekers (predominantly single males) may result in an increase in the following social ills typically seen in other mining Projects in developing countries:

- increases in crime such as theft and robbery due to income and economic disparity between mine workers and others;
- increases in alcohol and drug abuse, which is sometimes associated with an increase in violence;

- increases in prostitution and promiscuous sexual activities due to presence of single males with disposable incomes (as a consequence, a potential increase in communicable diseases (including TB, HIV and other STDs) among the local population and Project workers (Impact SR2); and
- erosion of traditional cultural values.
- To prevent or mitigate the above problems the Project will:
- aim to prevent economic disparity by maximising local people's participation in the Project workforce and provide access to other benefits implemented through community development programmes (through measures under Impact ED1); and
- support education and awareness programmes for workers and community members that would cover topics such as: life skills for responsible use of increased incomes; prevention measure against communicable diseases; cultural sensitivity for expatriates and visitors; and conflict management for local leaders.

If not managed the impacts would start manifesting in the construction phase and continue beyond the Project life. With a combination of the mitigation measures listed above the extent and duration of the impacts can be reduced as shown in the ratings table. However the ratings after mitigation are made with medium confidence, since it is difficult to make firm predictions about behavioural change as a result of information campaigns.

Impact SO2: Increase in social ills/problems			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	*Negative*
Magnitude description	Sensitivity	*High*	*Medium*
	Receptor importance or value	*High*	*Medium*
	Extent of change / threshold compliance	*Moderate*	*Low*
	Magnitude rating	*MODERATE*	*MINOR*
Timeframe description	Duration	*Long term*	*Medium term*
	Frequency	-	-
	Timeframe rating	*LONG TERM*	*MEDIUM TERM*
Scale		*SMALL*	*SMALL*
CONSEQUENCE RATING		*MEDIUM*	*LOW*
PROBABILITY RATING		*DEFINITE*	*POSSIBLE*
SIGNIFICANCE RATING		*MEDIUM (-ve)*	*LOW (-ve)*
Reversibility		*Partially reversible*	
Confidence		Medium	

Mitigation measures

- Undertake awareness and educational campaigns (directly or through existing institutions) for prevention of social ills.
- Provide employees and visitors to the site with cultural awareness training.
- Provide assistance to the local health department (and NGOs) to strengthen programmes for control of communicable diseases.
- Implement the management measures given under Impact SO1.

8.3.3 SO3: Real or perceived unequal distribution of Project benefits potentially leading to social tension

Construction	Operation	Decommissioning	Post-Closure

Some discontent due to perceived unequal distribution of jobs, development aid benefits and unfulfilled expectations been raised by areas of the community. Further tensions may arise in the local community as the Project moves into the implementation phase. Some of the specific triggers for such tension are likely to be:

- real or perceived unfair compensation for land and assets (tangible and non-tangible);
- real or perceived unfair recruitment policy and/or practices;
- encroachment by outsiders/in-migrants depriving the local workers and affected people of job opportunities;
- potential corruption of local leaders and Project staff influencing recruitment;
- real or perceived unfair procurement and supply practices;
- real or perceived unfair access to the Project's social development Projects; and
- increased economic disparities between those with jobs and those without.

Mitigation of the potential impacts will include:

- management of people's expectations and perceptions during the resettlement through effective implementation of the RAP focused consultation meetings;
- an appropriate and transparent grievance mechanism; and
- a local employment policy and transparent recruitment strategy.

Without mitigation measures it is expected that the frequency of unresolved complaints would be high, this can be brought down to low frequency by an active grievance mechanism and effective implementation of the measures for maximising the participation of locals in the jobs (Impact ED1) and decreasing the in-migration (Impact SO1) which would further minimise grievances and conflicts. Overall the mitigation measures also aim to reduce the extent and severity of the impacts, the majority of which are reversible if managed diligently.

Impact SO3: Real or perceived unequal distribution of Project benefits potentially leading to social tension			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	*Negative*
Magnitude description	Sensitivity	*High*	*High*
	Receptor importance or value	*High*	*High*
	Extent of change / threshold compliance	*High*	*Moderate*
	Magnitude rating	*HIGH*	*MODERATE*
Timeframe description	Duration	-	-
	Frequency	*High frequency*	*Low frequency*
	Timeframe rating	*HIGH*	*LOW*
Scale		*SMALL*	*SMALL*
CONSEQUENCE RATING		*HIGH*	*MEDIUM*
PROBABILITY RATING		*DEFINITE*	*POSSIBLE*
SIGNIFICANCE RATING		*HIGH (-ve)*	*MEDIUM (-ve)*
Reversibility		*Reversible*	
Confidence		*High*	

Mitigation measures

- Maintain transparency in the recruitment process.
- Maintain regular communication with local communities and other stakeholders to minimise tensions.
- Maintain and monitor grievance mechanism for timely resolution of community grievances.
- Implement measures under Impacts SO1, ED1 and ED4 to minimise population influx.

8.4 Archaeology and cultural heritage

8.4.1 AC1: Possible disturbance to sacred bushes and cemeteries leading to loss of community's access to cultural resources

Construction	Operation	Decommissioning	Post-Closure

Acquisition of land, for the Project resulting in relocation of 10 villages, will cause the loss of access to sacred bushes and burial grounds, which play an important role in the cultural life of the local population. Loss of access to and potential destruction of the sacred bushes may negatively impact on people's emotional wellbeing.

To mitigate the impact, the sacred bushes and burial grounds will require relocation near resettlement site(s). The cultural specialist study (Section 6.13) indicates local people feel it is acceptable to relocate and restore the sacred bushes and cemeteries as long as the right procedures are followed. The relocation process will be part of the RAP and will be preceded by sufficient formal consultation with sacred society members (both male and female) on the rituals needed for transfer of sacred qualities to the relocation site, and the botanical requirements for selection of the new sacred bush sites. The exact numbers of sacred bushes

and cemeteries will be estimated as part of the census conducted during the resettlement planning process.

There is evidence of the presence of archaeological remains of ancestral villages in the area. However the reconnaissance study does not provide any evidence of the presence of sites of sufficient importance as to merit preservation. Nevertheless a chance find procedure will be put in place for the areas disturbed by construction activities. Additional management recommendations may be identified through the RAP process.

If mitigation measures are implemented the severity and duration of the impact on cultural sites will be significantly reduced. However there is no guarantee that the new sacred sites will fully replace the historically spiritual value of the original sites hence the impact is only partially reversible.

Impact AC1: Possible disturbance to sacred bushes and cemeteries leading to loss of community's access to cultural resources

Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	*Negative*
Magnitude description	Sensitivity	*High*	*Medium*
	Receptor importance or value	*High*	*Medium*
	Extent of change / threshold compliance	*Major*	*Low*
	Magnitude rating	*MAJOR*	*MODERATE*
Timeframe description	Duration	*Long term*	*Short term*
	Frequency	-	-
	Timeframe rating	*LONG TERM*	*SHORT TERM*
Scale		*SMALL*	*SMALL*
CONSEQUENCE RATING		*HIGH*	*LOW*
PROBABILITY RATING		*DEFINITE*	*POSSIBLE*
SIGNIFICANCE RATING		*HIGH (-ve)*	*LOW (-ve)*
Reversibility		*Partly Reversible*	
Confidence		*High*	

Mitigation measures

- Implement measures in Impact RL1 regarding protection of natural resources.
- Record mythological stories associated with specific sacred sites as part of their relocation.

8.5 Decommissioning and closure

As the Project is likely to be a key contributor to the local economy (and to some degree national economy) over a period of at least 15 years, its closure may cause economic decline with impacts on the retrenched workers, the local society and the local economy.

8.5.1 DC1: Closure of the mine leading to economic decline

Construction	Operation	Decommissioning	Post-Closure

Closure of the mine will lead to loss of income for the workers (with accompanying decline in their purchasing power), the secondary industries dependent on the mine and loss of revenue for the government. The loss of business in the secondary and support industry will also lead to further job losses and impact on the economy. Thus there is a correlation between loss of income and economic slowdown, one exacerbating the other. As it is difficult to predict the socio economic environment in which the mine closure will take place, the Project would start planning for the closure phase three to five years in advance.

Other closure related impacts could include:

- out-migration of skilled workers from the Project area leading to erosion of the local skills and consumer base and impacting on the local business sector; and
- psychological impacts on individuals manifesting in depression, apathy, helplessness and a sense of inadequacy.

Closure of the mine will also result in a reduction in the revenue base of the government leading to a reduction in the allocation of funds for provision of social infrastructure and services with a corresponding deterioration in quality of life.

A more detailed assessment of potential impacts from the Project's closure will be identified during closure planning However key mitigation strategies are expected to include:

- allocation of closure funds at least 3 years prior to closure of the Project;
- retraining of retrenched workers;
- sustainable livelihoods programme for the local community;
- counselling support for community members and staff; and
- handover of any suitable social infrastructure and services provided by the Project.

The mitigation measures of the closure plan aim at building the capacity of the community to adapt to the changes caused by Project closure and to sustain some of the economic benefits created by the Project. The confidence in assessing the impacts, mitigation measures and the residual impact is medium due to the premature nature of the assessment.

Impact DC1: Closure of mine leading to economic decline			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	*Negative*
Magnitude description	Sensitivity	*High*	*High*
	Receptor importance or value	*High*	*High*
	Extent of change / threshold compliance	*Major*	*Moderate*
	Magnitude rating	*MAJOR*	*MAJOR*
Timeframe description	Duration	*Long term*	*Short to medium term*
	Frequency	-	-
	Timeframe rating	*LONG TERM*	*SHORT TO MEDIUM TERM*

Impact DC1: Closure of mine leading to economic decline		
Scale	*SMALL*	*SMALL*
CONSEQUENCE RATING	*HIGH*	*MEDIUM*
PROBABILITY RATING	*DEFINITE*	*POSSIBLE*
SIGNIFICANCE RATING	*HIGH (-ve)*	*MEDIUM (-ve)*
Reversibility	*Partly Reversible*	
Confidence	*Medium*	

Mitigation measures

- Conduct an independent social impact assessment prior to closure.
- Develop a social closure plan including the following:
  - design and implement a retrenchment policy and strategy in consultation with workers and other stakeholders; and
  - plan for post-Project sustainability of community development activities.
- Allocate funds (in advance) for implementation of the social closure plan.
- Re-train workers for increasing their chances for re-employment elsewhere after Project closure.
- Conduct stakeholder consultations on closure issues as part of the ongoing stakeholder engagement process.

Good practice measures:

- Consider re-training of staff (voluntary training after hours) so they build skills to work in other sectors following closure of the mine.
- Promote and support building the capacity of local suppliers to diversify their customer base and move beyond the Project area.

9 COMMUNITY HEALTH, SAFETY AND SECURITY IMPACT ASSESSMENT

This section covers health, safety and security impacts on communities as a result of the Project, and includes “nuisance” impacts as well as health impacts and safety/security issues posing a physical risk of injury, if not fatality, to the public (and in some cases also livestock and wildlife).

Nuisance impacts include those that do not result in direct and proven consequences to human health, but are nonetheless generally considered to be unpleasant (such as small increases in ambient noise or unpleasant odours). Health impacts in contrast could potentially cause harm to human health and include air quality issues and exposure to communicable diseases.

Security impacts can include matters arising from conflict between communities and also those arising from the use of security at the mine.

Usually safety issues or hazards would occur on an infrequent basis, as a result of an accident or unexpected event. Unexpected events that may lead to health and safety risks for local communities include:

- Road accidents;
- Engineering structural failure;
- Accidental spillage of hazardous or toxic materials;
- Uncontrolled fires;
- Fly rock due to blasting; and
- Human error.

The most significant Project hazards are discussed in more detail under Section 9.5. Because of the number of variables affecting the consequence and probability of such events, accurate significance rating of possible impacts should the risk materialise is not possible. Significance ratings have therefore been provided for impacts only (Sections 9.1 to 9.4), and not for hazards. Explanatory notes on the description and rating of the impacts are provided in the introductory text in Section 7.

Impacts on villages that are proposed to be relocated due to positioning of Project infrastructure (as listed in Section 8.2) have not been assessed. The impact ratings provided therefore apply only to those villages that will not be relocated. Each event must be evaluated on an individual basis, in accordance with the Company’s standard event reporting system.

For the purposes of this assessment it is assumed health, safety and security risks to employees of the Project, both during construction and operations, will be addressed through an occupational health and safety plan, and are therefore not included in the discussion below. The Project developers will also prepare an Emergency Preparedness, Response and Recovery Plan (EPR&R) to identify and prevent potential emergency situations, plan responses and recovery from emergency events (Section 11.6).

Table 9-1: Summary of evaluated community health and safety impacts or risks

Impact groups	Impact headings
Air quality	• AQ1: Dust emissions causing nuisance and health impacts on local communities
Noise and vibration	• NV1: Blasting causing air overpressure and vibrations, resulting in disturbance of local communities • NV2: Operation of mining equipment and vehicles resulting in increase in background noise levels for local communities
Traffic safety	• TS1: Increase in Project-related traffic on local and national roads causing increased wear and tear and risk of road accidents • TS2: Use of mine site roads by local communities causing increased safety risks due to road accidents
Security/Social risks	• SR1: Risk of human rights abuses due to conflict with communities • SR2: Increased exposure to communicable diseases due to an influx of workers, resulting in a deterioration in public health
Other hazards potentially resulting in injury	• OH1: Blasting, resulting in fly rock • OH2: Community exposure to toxic or hazardous substances • OH3: Fire or explosions due to storage of explosives and use of combustible materials • OH4: Failure of the TSF

9.1 Air quality

As in the case of water resources, impacts on air quality are traditionally assessed in environmental impact assessments, although the air itself is not the receptor but merely the pathway by which the source of the impact would reach the receptor (in this case humans breathing in the air). Impacts on air quality are considered and assessed in this report, and are interpreted in terms of the relevant international guidelines considered appropriate by the specialist, in conjunction with consideration of the potentially affected receptors. The focus of this impact assessment is on public health issues potentially resulting from Project-related releases to the air. Therefore, with the exception of the accommodation camp, ambient air quality inside the mine footprint area has not been included in this assessment. The health of workers inside the mine site boundary is regulated by Sierra Leone and international occupational health and safety standards and guidelines.

Air pollutant emissions take place in particulate and gaseous forms. Gaseous pollutants emitted by the Project are mainly sulfur oxides (SO_x) and nitrogen oxides (NO_x). Lesser pollutant emissions may include carbon monoxide, volatile organic compounds and unburned hydrocarbons. Particulate matter (PM) refers to airborne particles, and includes dust, smoke and soot. PM is defined by size, with coarse particles being between 2.5-10 microns, fine particles less than 2.5 microns, and ultrafine particles less than 0.1 microns in aerodynamic diameter. PM below 10 µm (PM_{10}) is referred to as inhalable particulates, and also includes the $PM_{2.5}$ fine particulates.

Based on the Project as described in Chapter 4, dust (PM_{10}, $PM_{2.5}$ and dust fallout) is considered to be the main potential pollutant of concern and has therefore been assessed in this study. While gases such as SO_2 and NO_2 have also been identified as potential pollutants, they are considered to be minor pollutants that are unlikely to have a major impact on the Project environment. Dispersion of these gasses therefore has not been modelled, and impacts relating to them have not been assessed.

PM may have adverse effects on humans such as respiratory illnesses (asthma and bronchitis) or cardiovascular diseases. $PM_{2.5}$ can be breathed deep into the lungs, and therefore presents higher health risks. PM can also affect vegetation in two ways, namely, by inhibiting the plant's photosynthetic properties by coating the leaves thereby blocking light

penetration. Secondly, from the deposition onto soils of various metals in the particulate matter which are absorbed by vegetation thereby hindering plant growth. The uptake of metals by plants has the potential to contaminate vegetables and fruit that may be consumed by humans and animals. Impacts on vegetation are discussed under impact LT4 however and are not included in the impact assessment below. Disturbance of wildlife resulting from dust generation is rated under impact EB3 (Section 7.3.4). Increased dust emissions in the area of unpaved roads (such as haul roads) will reduce visibility for drivers and pedestrians on these roads, contributing to traffic safety risks, which are discussed and rated in impact TS2 (Section 9.3.2).

$PM_{2.5}$ can be generated both as a primary and secondary pollutant. Primary pollutants are those directly emitted into the atmosphere, for example power generation and mobile equipment generate $PM_{2.5}$ as a result of combustion processes. Secondary pollutants form through physico-chemical reactions such as phase change, adsorption on solids, chemical reactions etc. $PM_{2.5}$ has extended atmospheric residence times (days to weeks) and therefore can be transported long-ranges (100's to 1,000's km). In contrast, the coarse particulates have short residence times (minutes to hours) and are removed within short ranges (1 to 10's km) via dry deposition.

9.1.1 AQ1: Dust emissions causing nuisance and health impacts on local communities

Construction	Operation	Decommissioning	Post-Closure

Potential sources of dust resulting from the Project include the following:

- Drilling and blasting;
- Fugitive dust from grading, mining and waste material handling and storage;
- Wind erosion of areas disturbed or cleared during construction and decommissioning;
- Wind erosion of tailings material; and
- Road dust caused by vehicle movement on unpaved roads (vehicle entrainment).

Materials handling, wind erosion (e.g. from the TSF and waste rock dumps) and vehicle-entrainment of dust from unpaved roadways are expected to be the main sources of dust in the area during operation of the mine.

Changes to air quality resulting from the Project and compliance with the relevant ambient air quality standards and guidelines were assessed and modelled by specialists from SRK (SA) using dispersion modelling software. Predicted maximum daily and annual average concentrations for PM_{10}, $PM_{2.5}$, and TSP were simulated using the US-EPA approved AERMOD (AMS/EPA Regulatory Model) model.

Worst case predicted concentrations of PM_{10}, $PM_{2.5}$ and TSP resulting from the operation of the mine were then determined and mapped (via concentration contours or isopleths) for the surrounding area, and compared against the World Bank (WB) IFC guidelines[17], the US EPA standards for ambient air quality and the South African National Standards (SANS 1929:2005) for dust deposition. Dust deposition is a measure of nuisance dust and exceedances of the SANS 1929:2005 guideline levels suggests an increase in nuisance levels for the various defined categories. The South African standard was selected for the impact assessment as it

[17] *As published in the Environmental, Health and Safety General Guidelines document of 2007*

has been designed to accommodate areas close to mines. Further detail on these standards and the modelling and assessment of impacts on air quality are provided in the Air Quality Impact Assessment Report included in SD2 of Volume 3.

Source emissions

Source emission data modelling predicted the sources responsible for the highest dust emissions after mitigation to be unpaved roads, followed by the tailings storage facility (assuming one third dry beach) and the active operational areas of the waste rock facility. The open pits were excluded as a potential dust source as they were confirmed (through additional modelling for three different pit depths) to be an insignificant contributor to dust emissions for the Project. This is due to the topography of the area, and the finding that dust generated would remain within the pit and not rise above ground level. Crushing and grinding were not included in the dispersion modelling as dust generation from these activities is considered to be negligible. Similarly, drilling and blasting were also not included as they would be non-routine and short-term activities. Construction, decommissioning and post-closure phase dust emissions also were not included as they are considered to make a minor contribution to air emissions (due to their relatively short-term nature in the case of decommissioning and construction phases).

Due to the highly seasonal nature of rainfall in the area (with approximately six months of the year falling in the dry season), dust generation is also expected to follow a seasonal trend (as the baseline monitoring results described in Section 5.7 have shown). Dust emissions (predicted maximum daily and annual average concentrations for PM_{10}, $PM_{2.5}$, and TSP) were modelled for two scenarios during mine operation, to predict the impact before and after the implementation of management measures (such as wetting down or use of chemical dust suppressants on unpaved roads).

It is noted that the scenarios model what can be considered worst case environmental conditions in terms of dust generation (i.e. during the dry season, under windy conditions), which in reality are likely to be relatively rare. A conservative approach was also taken with regard to the predictions of average 24-hour concentrations – the highest average concentration over the three-year simulation period has been used for the assessment. The 98^{th} percentile values are reported for predicted PM_{10} concentrations, as per accepted statistical methodology, to exclude anomalous concentrations.

Dispersion modelling results

Ambient ground level concentration isopleths for PM_{10} before and after successful implementation of mitigation measures are shown in Figure 9.1 and Figure 9.2 and represent interpolated values from the concentrations predicted by the AERMOD model. Similar isopleths for $PM_{2.5}$ and dust fallout concentrations are included in the Air Quality Impact Assessment report (SRK, 2012), included in SD2 of Volume 3.

Predicted maximum concentrations of PM10, PM2.5 and dust fallout at local villages before and after implementation of mitigation measures are shown in Table 9-2 with exceedances of the relevant guideline levels highlighted. Villages that are planned to be relocated (due to positioning of Project infrastructure) are highlighted in bold text, and have been excluded from the impact assessment and rating. The results reveal a reduction in predicted dust emissions by approximately 50% when management measures are implemented.

As expected, the maximum predicted dust (PM10, PM2.5 and dust fallout) concentrations are predicted to occur around the mine activities and decrease with distance from these sources.

With management measures in place, PM10 emission concentrations resulting from the Project are predicted to remain below 150 µg/m³ (the US EPA guideline level) at all local villages except Mafuri and Royail Kalagba, both of which are scheduled for relocation, though the more stringent World Bank guideline is exceeded for a number of locations (note that the World Bank Guideline, which is based on World Health Organisation guidelines, also includes interim guidelines which are less stringent). PM2.5 emission concentrations are predicted to remain below 20 µg/m³ (the World Bank guideline level) at all villages except for Royail Kalagba, and dust fallout concentrations are predicted to be below 300 mg/m2/day (the SANS 1929:2005 target level) at all villages except those scheduled for relocation, as well as Konta, where a slight exceedance of the residential limit is predicted, and Magbafat, where the target level may be exceeded.

Cumulative concentration was calculated by adding the maximum 24-hour baseline monitored concentration at a point (as described in Section 5.7) to the maximum concentration (with mitigation measures implemented) predicted to result from the operation of the Project. The cumulative PM10 concentration at the MIOL site office is 117.1 µg/m³, and the PM2.5 concentration is 23 µg/m³, both of which fall above the World Bank/IFC guideline but below the US EPA guideline levels. As PM concentration was not monitored at other locations in the Project area, quantitative predictions of cumulative concentrations cannot be provided.

Predicted cumulative dust fallout concentrations were calculated for eight dust fallout monitoring locations (see Air Quality Impact Assessment Report in SD2 of Volume 3 for results). The SANS 1929:2005 target limit was exceeded at all monitored locations except the MIOL site office in Lunsar. The residential limit was exceeded at Konta Bana, Matukia and Mafuri, the latter two of which will be relocated, as well as Maso, where the industrial limit will be exceeded. It is noted however that average daily monitored concentration at Konta Bana already exceeds this limit, and the predicted additional contribution due to the mine is less than 10%. At the Catholic School (in Lunsar), the relative contribution predicted to result from the mine is also less than the baseline contribution by approximately 50%.

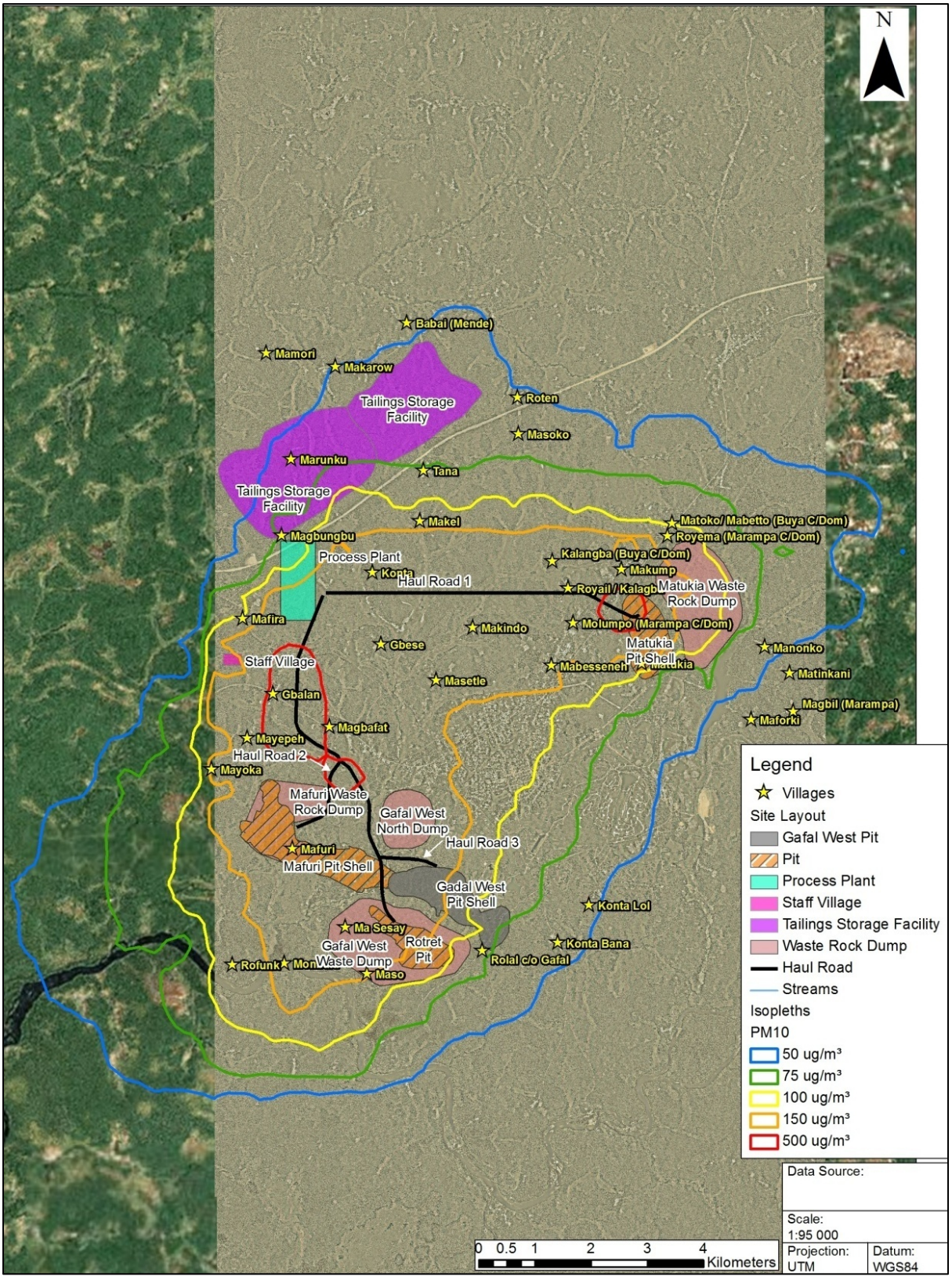


Figure 9.1: Maximum predicted 98th percentile PM10 concentrations over the Project area, without management

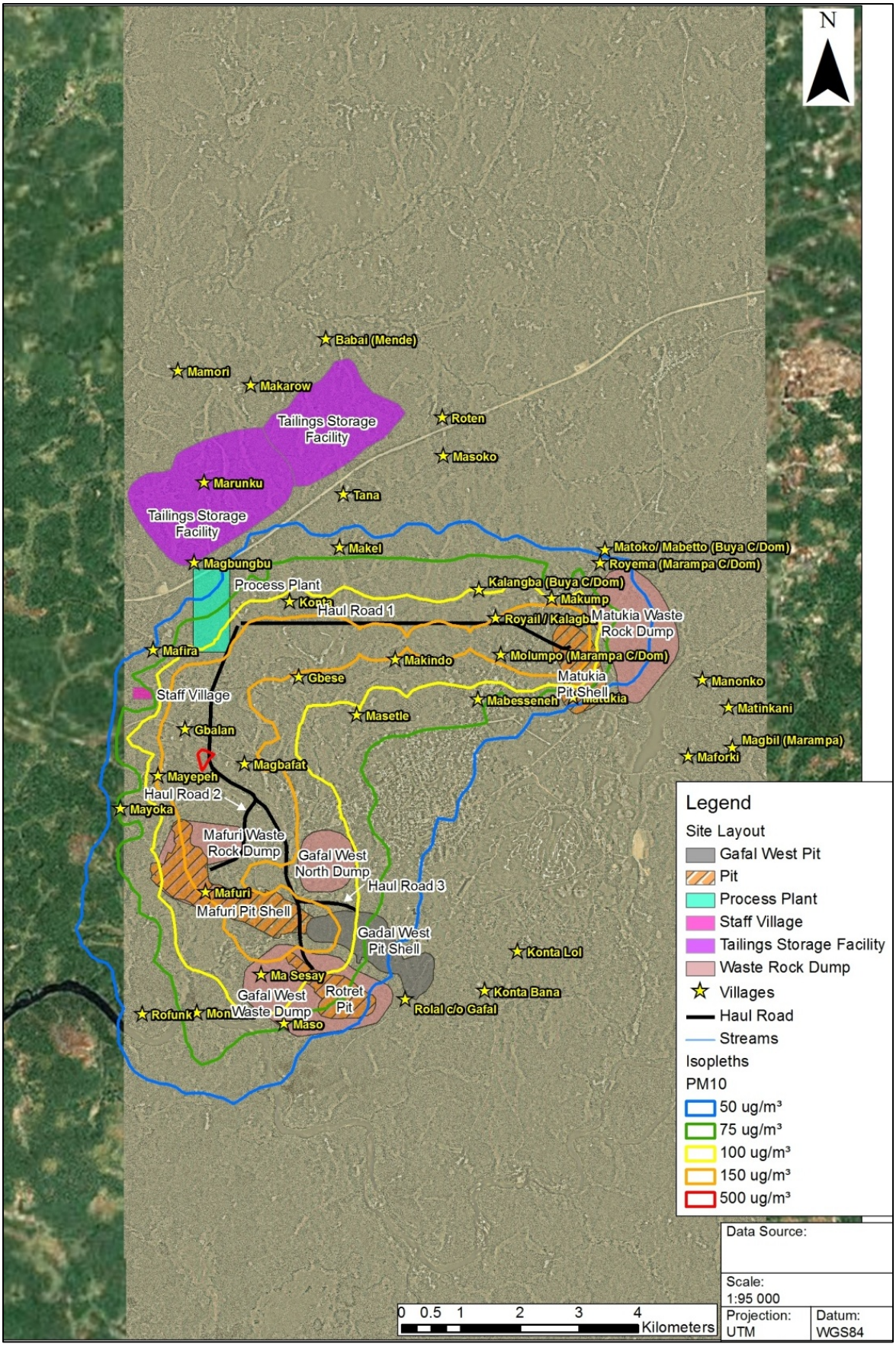


Figure 9.2: Maximum predicted 98th percentile PM10 concentrations over the Project area, with management

Cumulative concentrations are useful for providing an indication of the relative contributions of baseline and predicted concentrations to ambient air quality, as well as for determining ambient air quality as experienced by the receptor, regardless of the source. However, as cumulative concentration is reliant on data obtained from monitoring at points on site, and takes into account sources of dust other than the Project, the impact on air quality has been assessed based on the predicted maximum concentrations at local villages rather than cumulative concentrations.

The specialist report concluded that the dust dispersion results showed the TSF and WRD to be well located with regard to air quality impacts, as the topography of the surrounding area will reduce the likelihood of windblown dust from these sources affecting local villages. The locations of the haul roads (predicted to be the main sources of dust) are also concluded to be suitable provided mitigation measures are implemented to prevent vehicle entrainment of dust.

Table 9-2: Predicted 24-hour dust concentrations at local villages[18]

Village	Predicted 24 hour concentrations					
	98th Percentile PM_{10} concentration ($\mu g/m^3$)		Maximum $PM_{2.5}$ concentration ($\mu g/m^3$)		Maximum Dust fallout concentration ($mg/m^2/day$)	
	Before mgt	Post-mgt	Before mgt	Post-mgt	Before mgt	Post-mgt
Gbalan	226.4	113.0	29.9	8.6	477.9	228.4
Gbese	249.9	124.0	31.4	9.9	425.3	154.7
Konta	253.3	126.4	28.1	14.8	1229.4	614.4
Konta Bana	56.3	26.0	12.4	4.2	132.4	50.6
Konta Lol	56.5	27.6	12.8	4.5	119.0	51.5
Lunsar	129.5	63.3	20.4	7.0	212.3	91.1
Ma Sesay	290.3	143.4	43.7	5.4	5070.9	275.2
Mabesseneh	122.8	60.6	18.2	6.2	241.4	99.3
Mafira	98.3	48.5	13.7	4.2	356.1	77.7
Mafuri	**334.5**	**166.9**	**46.1**	**5.1**	**534.0**	**309.0**
Magbafat	261.5	129.3	36.7	16.6	1123.9	524.2
Magbungbu	**64.0**	**31.1**	**13.3**	**4.4**	**4548.2**	**98.0**
Makel	105.8	52.2	16.4	7.0	763.6	266.9
Makindo	294.5	146.1	36.8	9.4	440.3	179.8
Makump	178.1	86.9	24.1	10.9	510.6	248.9
Manonko	56.7	25.1	22.3	4.5	440.6	69.0
Masetle	173.8	86.1	23.7	7.9	275.7	121.3
Maso	**211.6**	**102.8**	**31.3**	**3.8**	**4443.5**	**493.0**
Matinkani	49.7	22.0	16.9	4.0	176.0	50.6
Matukia	**84.7**	**40.2**	**14.5**	**5.3**	**213.0**	**91.3**
Mayepeh	170.0	84.7	21.7	4.2	213.0	88.3
Mayoka	132.9	66.3	16.8	2.9	143.9	63.8

[18] *Villages planned to be relocated due to positioning of Project infrastructure are indicated in bold text*

Village	Predicted 24 hour concentrations					
	98th Percentile PM_{10} concentration (µg/m³)		Maximum $PM_{2.5}$ concentration (µg/m³)		Maximum Dust fallout concentration (mg/m²/day)	
	Before mgt	Post-mgt	Before mgt	Post-mgt	Before mgt	Post-mgt
Molumpo Marampa	157.4	78.1	22.1	7.2	486.3	221.1
Monbaia	172.9	86.1	21.6	2.2	91.5	39.6
Rofunk	101.4	50.3	13.9	1.5	72.4	28.1
Rogbaneh	31.4	14.9	9.6	2.8	73.1	30.6
Rolal c/o Gafal	**74.6**	**34.3**	**18.1**	**5.9**	**284.4**	**87.3**
Rolal c/o Mafuri	182.9	91.3	22.9	2.1	118.4	44.6
Rosint c/o Mafuri	**264.4**	**131.1**	**38.2**	**6.8**	**403.2**	**118.3**
Royail Kalagba	**539.8**	**268.2**	**64.3**	**31.1**	**3078.2**	**1533.4**
Royema Marampa	105.1	48.3	20.5	7.7	779.6	133.3
Applicable guideline	**PM_{10} (µg/m³)**		**$PM_{2.5}$ (µg/m³)**		**Dust fallout (mg/m²/day)**	
World Bank / IFC[19]	>50		>25		Not specified	
US EPA	>150		>35		Not specified	
SANS 1929:2005	Not specified				300 (Target)	1,200 (Industrial)
					600 (Residential)	2,400 (Alert)

The worst-case dust concentrations reported are highly conservative estimates, and the actual concentrations generated will (under normal operating conditions) be much lower – this has been considered in the assessment of signficance. Without management, the guideline limits will be exceeded at most villages directly surrounding the Project site, resulting in potential nuisance or health impacts on the inhabitants. However the management proposed by MIOL should decrease the extent and likelihood of dust generation, so recommended limits are likely to be met at almost all villages except those to be relocated (which have therefore been excluded from the impact significance rating). The impact will continue until the site has been rehabilitated post-closure, and will affect receptors within a radius of up to a few kilometres.

[19] The World Bank Standards are based on the World Health Organisation Air Quality Guidelines Global Update, 2005. As well as the overall guideline of 50 for PM10, the guidelines include interim targets at 75, 100 and 150. For PM2.5 the interim targets are 37.5, 50 and 75.

Impact AQ1: Dust emissions causing nuisance and health impacts on local communities			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		Negative	Negative
Magnitude description	Sensitivity	*High*	*High*
	Receptor importance or value	*High*	*High*
	Extent of change / threshold compliance	*High*	*Moderate*
	Magnitude rating	*MAJOR*	*MAJOR*
Timeframe description	Duration	*Medium term*	*Medium term*
	Frequency	*Low*	*Low*
	Timeframe rating	*MEDIUM TERM*	*MEDIUM TERM*
Spatial Scale		*INTERMEDIATE*	*INTERMEDIATE*
CONSEQUENCE RATING		*MEDIUM*	*MEDIUM*
PROBABILITY RATING		*DEFINITE*	*UNLIKELY*
SIGNIFICANCE RATING		*MEDIUM (-ve)*	*LOW (-ve)*
Reversibility		*Partially reversible*	
Confidence		*Medium*	

Management measures

- Refer to the erosion control measures listed under Impact LT4.
- Maintain or reduce vehicle speeds on unpaved roads to 40 km/hr, especially on roads passing near villages.
- Implement dust suppression measures in areas close to receptors, such as wetting, use of chemical dust suppressant and / or paving, on roads with high vehicular activity (e.g. haul roads).
- Control dust emissions on ore stockpiles through use of water spraying and/ or wind breaks.
- Use dust suppression measures such as rock cladding or grassing, on the side walls of the TSF and other exposed built up areas.
- Minimise the dry beach area of the TSF and wet the TSF surface if monitoring results indicate dust generation from this source.
- Minimize lengths of access roads and eliminate unnecessary traffic.

Good practice measures:

- Investigate and respond to any air quality complaints picked up by the Grievance Mechanism.
- Provide site workers with appropriate Personal Protective Equipment (PPE), and implement standard international occupational health and safety procedures.
- Limit vehicle idling and keep vehicles well maintained.

9.2 Noise and vibrations

An assessment of the noise and vibrations predicted to result from the Project was undertaken by Eddie Jewell Acoustics, using diurnal and nocturnal baseline noise monitoring

data collected at four villages in the Project area by a noise expert from SRK (Turkey). Meteorological data for the Project area was obtained from an automated weather station at the MIOL office Lunsar, as described in Section 5.8. The methodology used and findings of the baseline noise study are summarised in Section 5.8, and full copies of the baseline and the impact assessment reports are included in SD3 of Volume 3.

Potential sources of noise and vibrations resulting from the Project include the following:

- Mining equipment
- Construction equipment (also used during decommissioning)
- Processing equipment
- Materials handling
- Drilling and blasting
- Pumps (e.g. for water supply)
- Power generation equipment (HFO generators)
- Vehicle related noise and vibrations (construction and operation)

Although the primary receptors for noise and vibrations will be staff working at the mine, this is an occupational health and safety issue and therefore has not been included in the impact assessment. The use of the appropriate Personal Protective Equipment (PPE) by mine site workers is however recommended. The identified receptors for the purposes of the impact assessment are therefore the local villages in the Project area.

In the absence of applicable guidelines or standards specific to Sierra Leone, the assessment of impacts on these villages has been made in accordance with the following references and standards, which are internationally accepted and used:

- The IFC Environmental, Health and Safety Guidelines – Section 1.7: Noise;
- Australian Standard (AS) 2187:2-2006 Explosives – Storage and use – Part 2: Use of explosives;
- ISO9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.

Where the degree of Project detail required for accurate prediction of impacts has not been available, reasonable assumptions have been made (particularly with regard to blasting), which may result in overly conservative assessment of potential noise impacts. It is noted also that a number of villages will be relocated due to positioning of the Project infrastructure. As expected, given their close proximity to the impact sources, these villages would be the most severely impacted by noise and vibrations, as reported in the Noise Impact Assessment report (Eddie Jewell Acoustics, 2012) in SD3 of Volume 3. However, as they will be relocated, impacts on these villages have not been included in the assessment.

9.2.1 NV1: Blasting causing air overpressure and vibrations, potentially resulting in disturbance of local communities

Construction	Operation	Decommissioning	Post-Closure

Blasting for construction (earth works) and operations (mining) results in noise, air overpressure (transient air transmitted sound pressure waves moving outwards from an exploding charge) and vibrations that cannot be confined to the site, and may be experienced over large areas. As blasting is an occasional activity it does not affect the ambient noise limits evaluated, but can be disturbing to local communities with short-term noise exceeding

10 dB(A). Although each incident is short term in nature, the repetitiveness of the impact may give rise to complaints if not managed sensitively. The subjective reaction to a single disturbing event will depend on the activities being undertaken by the receptor and the manner in which the programme for blasting events is communicated to identified receptors. For example, a large blasting event at night time may give rise to complaints, where at any other time it would be accepted.

The Australian Standard, AS 2187:2-2006, sets limits for ground vibration and air overpressure from blasting activities, separating them into two categories; those causing human discomfort and those with the potential for causing damage to structures. For the purposes of this assessment, criteria relating ground vibration and air overpressure which causes human discomfort have been used, as these levels are generally less than those likely to cause damage to structures. Apart from the villages that are to be relocated, it is also considered unlikely that there are substantive buildings or structures close to the mine site. Impacts on structures in the area resulting from blasting for the Project are therefore considered to be insignificant. These criteria specify a peak particle velocity (PPV) of 5 mm/s for 95% of blasts, and air overpressure not exceeding 115 dBL for 95% of blasts. AS 2187:2-2006 cautions however that air overpressure and vibrations within these levels may still be noticeable, but are likely to be tolerated. As such, the impacts on local inhabitants are expected to be related specifically to annoyance (and therefore complaints) rather than detrimental health impacts. Disturbance of wildlife and domestic animals resulting from blasting are assessed in Impact EB3.

The level of ground vibration is measured by the Peak Particle Velocity (PPV) and is directly related to the size of the blast and the distance from the blast - the closer to the blast the greater the vibration. Human sensitivity to vibration varies significantly between individuals, though a person will generally become aware of blast induced vibration at PPV levels of around 0.15 mm/s. Individuals have been found to be poor at distinguishing between vibrations of differing magnitudes. Air overpressure is reported as decibels (linear) or dBL, as opposed to sound pressure level, which is reported as decibels (dB) a logarithmic unit.

At the time of writing, specific details regarding the proposed blasting regime required to accurately calculate air overpressure and ground vibration are not available. As such, an indicative assessment of the maximum permissible mass charge per delay at each of the mine pits was undertaken (see Impact Assessment Report in SD3 of Volume 3 for results), making reasonable assumptions, and refinement of the predictions is recommended once the required detail is available. It should be noted that the nearest noise sensitive receptors selected as part of the assessment for each pit exclude the villages proposed for relocation. Based on the calculated maximum permissible mass charge per day, air overpressure and ground vibration could be determined for the villages surrounding each pit, and assessed against the AS 2187:2-2006 limits.

The assessment concluded that the ground vibration and air overpressure at local villages (except those to be relocated) will not exceed the AS 2187:2-2006 criteria when the maximum permissible mass charge per delays, detailed in the Impact Assessment Report (SD3 in Volume 3), are adhered to.

Blasting disturbances will occur throughout operation and during daytime only, and at a lower level during construction, and are not reversible. However, the degree of annoyance may decrease over time as people become accustomed to the blasting. Although the effects of blasting will extend to villages outside the direct Project footprint (i.e. those that will not be

relocated), these are unlikely to constitute a negative impact on residents of these villages, as demonstrated by the air overpressure and ground vibration levels predicted (see the Impact Assessment Report in SD3 of Volume 3). Due to the low significance of the impact, no management measures are proposed, but a number of good practice measures are recommended. It is noted however that as Project-specific detail was not available at the time of the assessment, confidence in the prediction is low and more detailed assessment is recommended to confirm the results reported, prior to actual blasting.

Impact NV1: Blasting causing air overpressure and vibrations, potentially resulting in disturbance of local communities

Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		Negative	-
Magnitude description	Sensitivity	*Medium*	-
	Receptor importance or value	*Medium*	-
	Extent of change / threshold compliance	*Medium*	-
	Magnitude rating	*MODERATE*	-
Timeframe description	Duration	*Medium term*	-
	Frequency	*Medium*	-
	Timeframe rating	*MEDIUM TERM*	-
Spatial Scale		*INTERMEDIATE*	-
CONSEQUENCE RATING		*MEDIUM*	-
PROBABILITY RATING		*UNLIKELY*	-
SIGNIFICANCE RATING		*LOW (-ve)*	-
Reversibility / sustainability		*Irreversible*	-
Confidence		*Low*	-

Good practice procedures:

- Re-assess impacts once detail regarding blasting regime is available.
- Monitor initial blasting to ensure compliance with specified air overpressure and vibration criteria.
- Schedule blasting outside of hours when people are most disturbed by noise (such as at night).
- Inform local communities of blasting timetable in advance and provide adequate notice of when blasts are required outside of the planned schedule.
- Maintain records of each blast (including location of blast holes, design, measured overpressure and vibration)

9.2.2 NV2: Operation of mining equipment and vehicles potentially resulting in increase in background noise levels for local communities

Construction	Operation	Decommissioning	Post-Closure

The increase in ambient noise levels resulting from operation of vehicles and mining equipment could cause disturbance to sensitive receptors (villages in the Project area). As the increase in ambient noise levels during construction and decommissioning is expected to be less than that for operations (due to significantly lower levels of mobile equipment activity), the impact predictions were not conducted for these phases. The most significant sources of noise during operation will be mining equipment, vehicles, and blasting. The pits, primary crushers and waste rock dumps are areas expected to contribute the most to noise impacts.

Noise impacts on the inhabitants of local villages have been assessed qualitatively via predictive modelling of the increase in ambient noise levels expected to result from the above-mentioned Project-relates sources, for mining rates of 45 to 100 Mtpa (i.e. up to the maximum proposed rate). As noise generation is directly dependent on mining rate, with lower mining rates resulting in lower noise impacts, only results relating to mining at a rate of 100 Mtpa are included in this impact assessment.

Brüel & Kjær Predictor environmental noise prediction software was used for the modelling, taking into account factors that may influence noise attenuation such as geometrical divergence (which includes distance), atmospheric conditions, topography, weather conditions and screening (incorporating pit depth). A conservative approach was adopted in the characterisation of these factors, as well as certain assumptions regarding operation (such as that all pits will be mined, and all machinery will be operated, simultaneously), resulting in what may be considered a worst case scenario with regard to the increase in ambient noise. Noise contour maps (shown in Figure 9.3 and Figure 9.4) were created to show the distribution and magnitude of potential noise impacts over the Project area, relative to local villages and the mine infrastructure. The predictions are reported to be accurate to ±3 dB for distances up to 1000 m from the source.

The predicted A-weighted broadband sound pressure levels (LAeq) at local villages during daytime and night time were assessed relative to the IFC noise guideline levels. According to these guidelines, a noise source should not result in a maximum increase in background noise levels of 3 dB, and noise emissions from the proposed mine should be equal to or less than the existing ambient noise level, at the nearest noise sensitive receptor, up to the criteria stated. These criteria, outlined in WHO Guidelines for Community Noise (1999), which have been derived based on research on health impacts resulting from noise emissions, specify a LAeq of up to 55 dB during the day or 45 dB at night in residential, institutional or educational areas (the appropriate category for the local villages).

Noise impacts on local communities are usually experienced as an annoyance, especially when they occur during the night, when they may disturb sleep, resulting in stress and other related health impacts. The increase in ambient noise can be expected to be experienced by local communities as follows:

- increase of 3 dB(A): a person with average hearing will just be able to detect this;
- increase of 5 dB(A): community reaction to the increase in noise may be expected;
- increase of 10 dB(A): corresponds to doubling of the subjective loudness of noise and community would consider this ‘disturbing’.

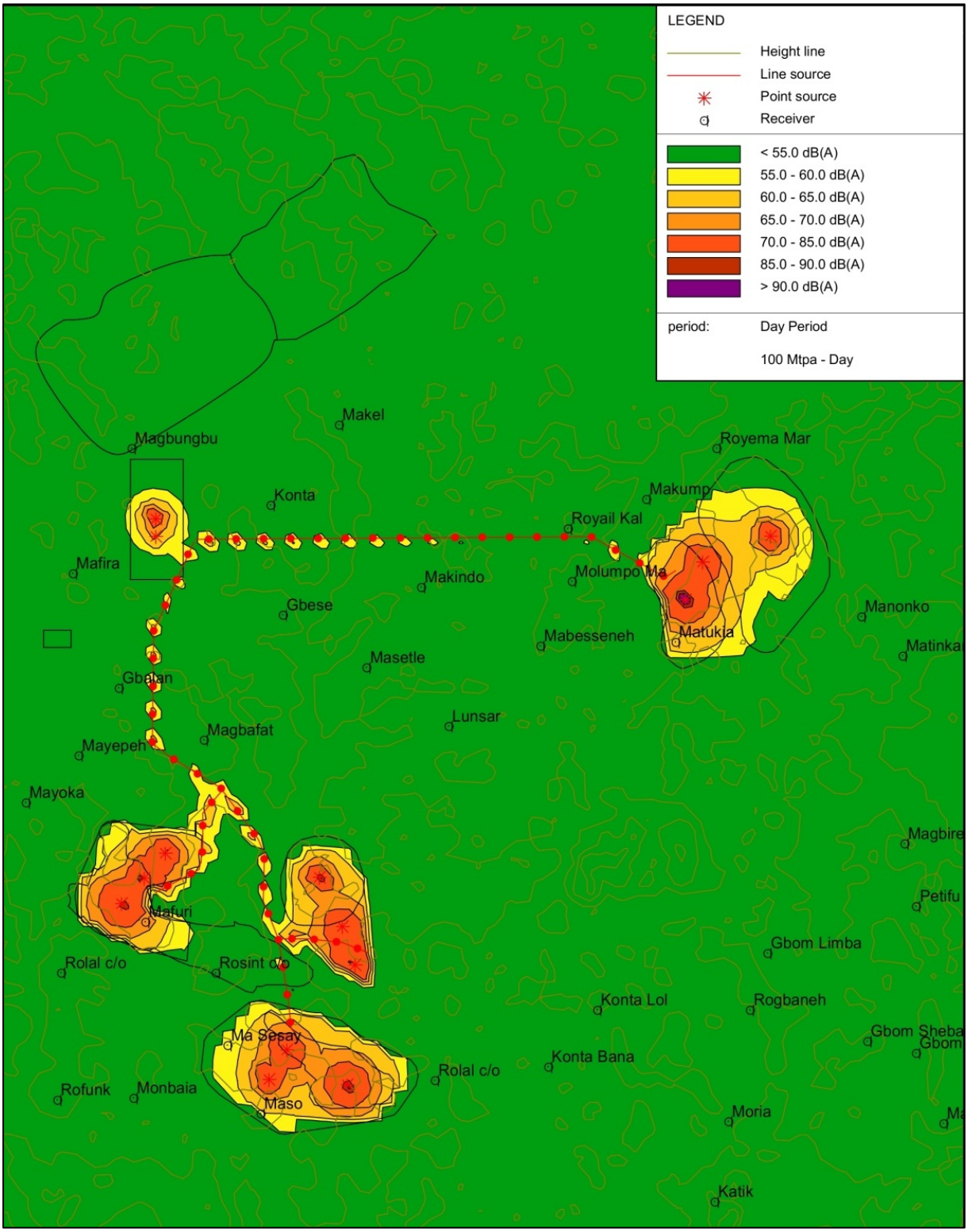


Figure 9.3: Noise contour map at day time for 100 Mtpa mining rate, relative to local villages

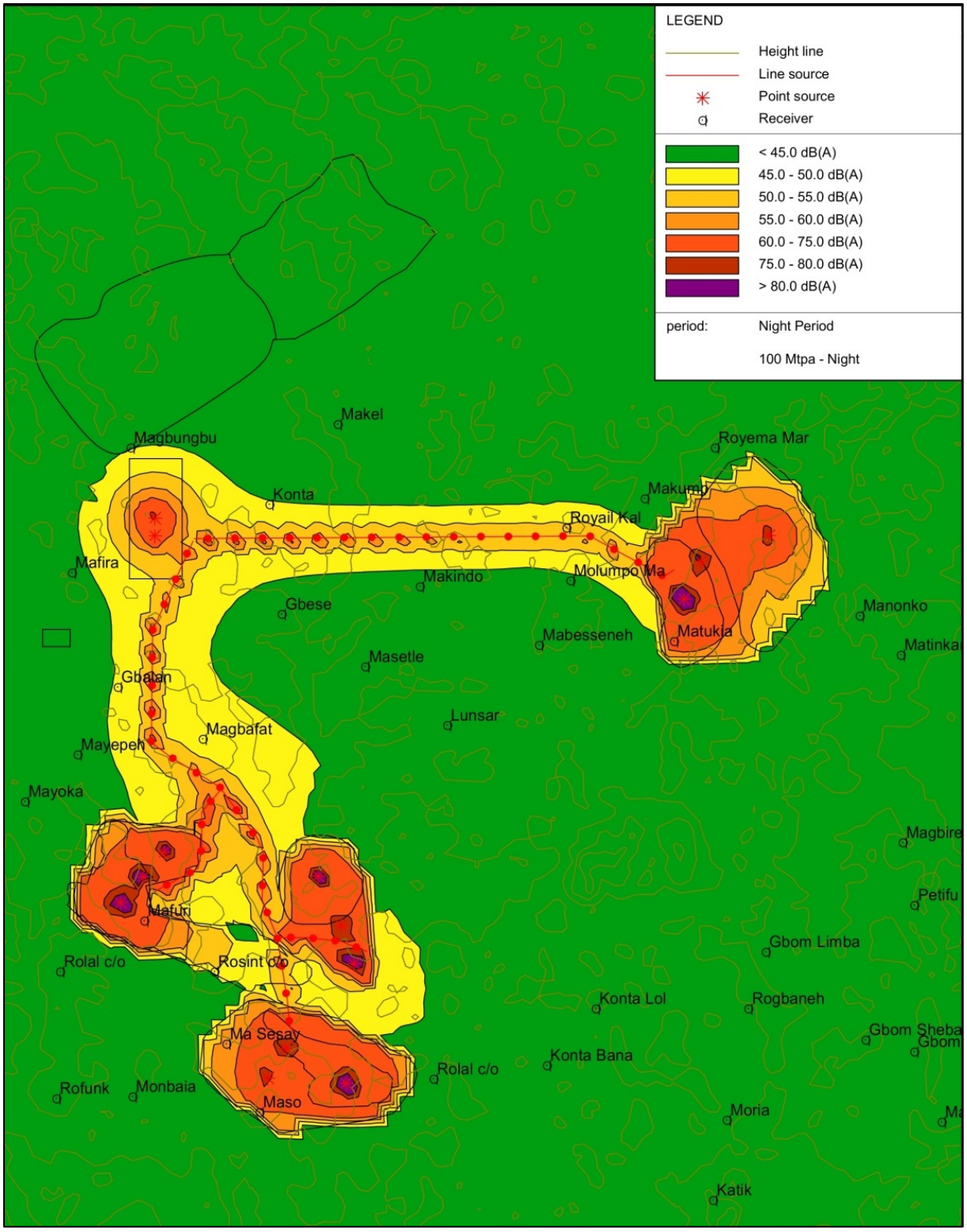


Figure 9.4: Noise contour map at night time for 100 Mtpa mining rate, relative to local villages

Impacts on mine workers are not included in this impact assessment. However, the close proximity of workers to noise emission sources could lead to exposure above threshold levels for health and safety for periods which are longer than recommended, potentially resulting in direct health impacts through impairment of hearing. Therefore, mine workers should be

provided with suitable PPE in the form of ear protection (plugs, muffs etc.,) based on the nature of the emission sources (frequency, duration, etc.) to prevent long term degeneration of hearing.

The noise impact predictions (as shown in Figure 9.3 and Figure 9.4) indicated that the day and night time maximum noise level criteria (as per the IFC guidelines) will be met at all local villages, except for a few that have already been identified for relocation (generally due to proximity to the proposed pits or infrastructure). Of the villages proposed for relocation, night time noise levels for Ma Sesay, Mafuri, Maso, Matukia, Rosint c/o Mafuri, Royail Kalagba and Konta, and daytime noise levels for Ma Sesay, Mafuri, Maso and Matukia are predicted to exceed the IFC noise guideline levels (by between 0.1 and 21.9 dB(A) – see Impact Assessment Report in SD3 of Volume 3 for details).

This impact is not reversible but will cease post-closure. Due to uncertainties and assumptions made regarding certain details of the Project description required for the impact modeling, the confidence of the impact rating is rated as medium. Although no formal management measures are required, it is recommended that good practice measures, as outlined below, are adopted to ensure as minimal impact on the receptors as is practical.

Impact NV2: Operation of mining equipment and vehicles potentially resulting in increase in background noise levels for local communities

Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		Negative	-
Magnitude description	Sensitivity	*Low*	-
	Receptor importance or value	*Low*	-
	Extent of change / threshold compliance	*Low*	-
	Magnitude rating	*MINOR*	-
Timeframe description	Duration	*Medium term*	-
	Frequency	-	-
	Timeframe rating	*MEDIUM TERM*	-
Spatial Scale		*INTERMEDIATE*	-
CONSEQUENCE RATING		*LOW*	-
PROBABILITY RATING		*POSSIBLE*	-
SIGNIFICANCE RATING		*LOW (-ve)*	-
Reversibility / sustainability		*Irreversible*	-
Confidence		*Medium*	-

Good practice measures:

- Maintain vehicles and equipment in accordance with manufacturer's instructions to minimise noise.
- Avoid unnecessary revving of engines and switch off equipment when it is not required.

- Start up vehicles and plant sequentially rather than simultaneously.
- Fit vehicles with broadband reversing alarms.
- Undertake standardised noise measurements on major items of equipment upon delivery to provide a noise reference against which regular checks can be compared.
- When plant equipment is due for replacement, the replacement equipment should have a sound power level equal to or less than the plant that it is replacing.
- Plan for operating times of noisy activities to be outside of hours when people are most disturbed by increased noise levels (such as at night).
- Promptly investigate and respond to any noise complaints picked up by the Grievance Mechanism.
- Routine noise monitoring should be carried out at the surrounding receptors, and records thereof maintained.
- Keep haul routes well maintained and avoid steep gradients.
- Minimize the drop height for materials.

9.3 Traffic safety

The nature of the mining operation at this site, and the means of transportation of the processed ore (rail only in Stage 1, and a combination of rail and slurry pipeline in Stage 2) means that potential impacts from Project related traffic on local road networks will mainly be concentrated in, and will peak during, the construction and decommissioning phases of the mine. These are the periods when construction and infrastructure engineering traffic will have most impact on the local public road network. Transportation of fuel supply to the mine will be via road tankers, but as this will be managed by a third party it has been excluded from the assessment of impacts in this ESIA. As most staff will either be housed on the mine site (at the accommodation camp) or will be sourced locally from Lunsar or surrounding villages, large volumes of traffic commuting daily to and from the site are not expected.

Impacts relating to traffic safety during the operational phase will primarily be associated with mobile equipment travelling on mine site roads (such as haul roads), and contractor traffic visiting the site, the day to day movements of site staff and freight and service vehicles on local roads. Although the haul route for the loaded ore transportation trucks from the pits to the beneficiation plant will cross the route of the Makeni highway at two points, this will be affected by the construction of multi-plate arch culverts for the haul roads to pass under the highway as described in Section 4.8.1. As a result, mine site traffic will not come into direct conflict with highway traffic, and will not make use of local roads infrastructure during the mine's operation

9.3.1 TS1: Increase in Project-related traffic on local and national roads causing increased wear and tear and risk of road accidents

Construction	Operation	Decommissioning	Post-Closure

Traffic volumes on local and national roads, such as the Makeni Highway (which connects Lunsar to Freetown and therefore will be used by vehicles transporting goods and materials from the port or capital to the mine site) will increase during construction, decommissioning and operation of the mine. This could affect road safety for other road users through increased wear and tear on the roads (as well as increasing vehicle maintenance costs) and risk of road accidents. The impact of traffic associated with a mining site on local road safety

is generally a function of the following three factors:

- The nature of the traffic generated by the mine (HGV's, dump trucks, oversize loads, freight vehicles, cars, light vans, etc.) and the frequency of movements of these;
- The nature and density of the existing traffic and other road users on the roads affected by the mine traffic; and
- The condition and suitability of the roads to cope with the nature of the mine traffic.

In the case of this Project, the majority of the mine-related traffic will be limited to the mine's daily operation and servicing by various freight and light vehicles and its construction and decommissioning (i.e. construction related traffic) as mentioned above. The operation of the mine in terms of on-site transportation of crushed rock, ore, waste rock, processed ore and soil movements will be on dedicated haul and mine site roads and will not generally affect the local road network. Traffic safety impacts relating to use of haul roads by communities during operation of the Project are discussed separately in Section 9.3.2 (impact TS2).

The Makeni Highway is an engineered tarmac highway, and the current level of usage of the road includes usage relating to other mining activities in the area. The additional traffic which the mine will generate will therefore be broadly of a nature which is in-keeping with the type of traffic currently utilising the highway, being mainly light vehicles (cars, vans and light transporter vehicles) with some heavy goods vehicles (HGVs). During the construction and decommissioning phases of the mine, over-size loads could be expected to be travelling to and from the site. However, the relatively good standard of the Makeni Highway's construction and the relatively low level of existing traffic upon it mean that such occasional loads can be accommodated by the existing traffic-highway system. The appropriate marking of over-size loads and ensuring that they are accompanied by 'pilot' vehicles is a management measure which can also be readily implemented to minimise road safety hazards from the movements of such loads on the public highway.

The risk of materials or items falling from construction vehicles, light freight and HGV's and causing a safety hazard is always present during construction of large developments. It can however be readily managed by ensuring vehicles conveying construction and fabrication materials are appropriately sheeted and that loads are securely placed and attached, as is generally standard practice. Freight and goods vehicles delivering essential supplies and maintenance equipment to the site will, similarly, be either of tanker design (on the case of liquids, (fuels, beneficiation plant chemicals, etc.,) or rigid body design (in the case of freight and service vehicles) thereby minimising the risk of objects falling from them and causing a safety hazard.

Impacts on road surface condition and maintenance through wear and tear resulting from increased road use by heavy vehicles may include potholes and erosion of the road edge. Both of these can become progressively worse with time and are exacerbated by rainy conditions, which contribute to erosion of the road's subsurface layers by washing away the fine soil particles responsible for cohesion of the larger particles. Road wear and tear increases maintenance costs (both for vehicle owners and the authority responsible for maintenance of the road) and, if not timeously repaired, increases safety risks for vehicles using the road. As the nature of the traffic to be generated for the mine is generally similar to that already using the highway, the additional impact on safety and road maintenance is considered to be low. Impacts on public roads more local to the site (which are presumably designed to accommodate predominantly lighter vehicles) are expected to be higher, and redesign of these roads to accommodate the additional mine-related traffic may be required.

The impact on roads and traffic will last from the inception of site construction activities through to the end of the decommissioning phase. Although the impact could potentially be experienced over the length of the highway over which mine-generated traffic travels, this would be substantially 'diluted' by the mine-generated traffic's inclusion in the general traffic flow. Therefore the area in which the greater part of the risk occurs is more local to the site, in particular district or local roads used to access the site after exiting the Makeni highway. Careful timing of delivery of oversize loads, for example, and ensuring that delivery vehicles are appropriately sheeted and that loads are correctly distributed and fastened in accordance with standard health and safety procedures, as well as contribution to road maintenance in the area, could reduce the safety risk and therefore the significance of the impact. As numerous uncertainties remain, especially when rating the significance of safety risks, the confidence in the rating is medium. Although impacts on road conditions are reversible, safety impacts on other road users are not.

Impact TS1: Increase in Project-related traffic on local and national roads causing increased wear and tear and risk of road accidents

Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		Negative	Negative
Magnitude description	Sensitivity	*Medium*	*Medium*
	Receptor importance or value	*Medium*	*Low*
	Extent of change / threshold compliance	*Medium*	*Low*
	Magnitude rating	*MODERATE*	*MINOR*
Timeframe description	Duration	*Medium term*	*Medium term*
	Frequency	*Low*	*Low*
	Timeframe rating	*MEDIUM TERM*	*MEDIUM TERM*
Spatial Scale		*INTERMEDIATE*	*INTERMEDIATE*
CONSEQUENCE RATING		*MEDIUM*	*LOW*
PROBABILITY RATING		*DEFINITE*	*POSSIBLE*
SIGNIFICANCE RATING		*MEDIUM (-ve)*	*LOW (-ve)*
Reversibility / sustainability		*Irreversible*	
Confidence		*Medium*	

Management measures

- Appropriately sign-post the site entrance and access to the Makeni highway.
- Design site roads to a standard suitable for mine and construction traffic, and maintain the roads to this standard.
- Assess the condition of local roads and their capacity to accommodate the mine-specific traffic and if necessary upgrade the roads prior to mine construction.
- In conjunction with the Government of Sierra Leone, devise and implement a road maintenance programme for roads affected by the Project.

Good practice measures:

- Design and implement sheeting and correct positioning and securing of loads on vehicles

in line with international health and safety procedures.

- Control delivery of oversize loads to site during times of minimal highway traffic as far as possible, and minimise travel outside daylight hours.
- Minimise travel by heavy vehicles during heavy rains.

9.3.2 TS2: Use of mine site roads by local communities and their livestock causing increased safety risks due to road accidents

Construction	Operation	Decommissioning	Post-Closure

A potential source of safety impact to local communities and their livestock is the use of mine site roads (such as haul roads, which will not be fenced) as access routes, either for crossing or travelling along as an easier alternative to the informal access routes currently used (see discussion in Section 7.1.2 – Impact LT2). This creates a risk of injury or fatality resulting from collision with pedestrians or livestock, or objects falling from trucks onto pedestrians. As it is expected that the haul roads and other on-site roads will intersect current access paths used by communities, crossing points are likely to be created, both for use by communities, for example when accessing other villages, and possibly also their livestock. This uncontrolled crossing over working mine site roads will pose an obvious safety risk if safe alternative crossing points are not provided, and crossing at other points is prevented.

An additional aspect of the risk is the use of haul roads (or other mine site roads) themselves, as an alternative to the current access tracks, many of which are in bad condition and are only passable on foot. Despite being limited to areas accessible from the mine site roads, this would be an attractive option particularly for transportation of goods to markets or other villages, as it would make mechanical transportation of the load a more viable option. The possibility of objects falling from mine site vehicles and causing a safety hazard for pedestrians is another potential risk, particularly so where ore, rock or mining equipment are transported.

Based on the estimation of 300 mining days per year, it is estimated that up to about 85 kt ore would need to be transported per day along haul roads from the pit to the beneficiation plant, requiring approximately 350 movements in a 240 tonne truck, and 120 kt rock waste per day requiring approximately 500 truck movements between the pits and the waste rock dumps. Total truck movements would effectively be doubled to account for the return empty truck journey, resulting in approximately 700 movements per day (or one truck every two minutes) on the haul roads, and 1000 movements per day (or one truck every 1.5 minutes) between the pits and the WRD. These numbers do not however account for other mine traffic on the site roads so the numbers are likely to be higher. Vehicle entrainment of dust would decrease visibility, thereby increasing the safety risk. The impact would peak during operation, but continue until the end of decommissioning, when mine-related traffic would no longer use the site. The implementation of the management measures listed below could decrease the probability of accidents occurring, thereby reducing the significance rating of this impact. As the extent to which local communities will use or cross the mine site roads has not been established, the impact cannot be rated with a high level of confidence.

Impact TS2: Use of mine site roads by local communities causing increased safety risks due to road accidents			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		Negative	Negative
Magnitude description	Sensitivity	*Medium*	*Medium*
	Receptor importance or value	*Medium*	*Medium*
	Extent of change / threshold compliance	*Medium*	*Medium*
	Magnitude rating	*MODERATE*	*MODERATE*
Timeframe description	Duration	*Medium term*	*Medium term*
	Frequency	*High*	*High*
	Timeframe rating	*MEDIUM TERM*	*MEDIUM TERM*
Spatial Scale		*SMALL*	*SMALL*
CONSEQUENCE RATING		*MEDIUM*	*LOW*
PROBABILITY RATING		*DEFINITE*	*UNLIKELY*
SIGNIFICANCE RATING		*MEDIUM (-ve)*	*LOW (-ve)*
Reversibility / sustainability		*Irreversible*	
Confidence		*Medium*	

Management measures

- In agreement with local communities, establish safe road crossing points at selected localities.
- Enforce speed limits and safe diving practice.
- Educate local communities on traffic safety.
- Implement dust control measures on unpaved roads and manage sources of dust close to roads to maintain visibility and traffic safety.
- Consider providing and maintaining access paths alongside roads for key access area.

9.4 Security and Social risks

Protection of human rights and ensuring health and safety of both the community and the workers is a responsibility of the Project developers. Potential impacts and risks to human rights, security and community health and safety are discussed below.

9.4.1 SR1: Risk of human rights abuses due to conflict with the communities

Construction	Operation	Decommissioning	Post-Closure

Conflicts which are dealt with through force (including armed force) either by local police (on request of the Project proponent) or private security guards employed by the Project can lead to violation of human rights, particularly the right to freedom, freedom of expression and health (and safety). There have been recent incidents, on other Sierra Leone mining Projects, of police using force (lock ups and open firing leading to death or injury of members of the public) hence there is a need to manage this risk/potential impact.

Potential tension between the community and the Project as well as potential for intra and

inter village conflict due to perceived or real unequal access to Project related benefits (as discussed in Impact SO3, Section 8.3.3) can lead to human rights abuse if not prevented or managed appropriately.

The prevention and management measures will be guided by the Voluntary Principles on Security and Human Rights (VPSHR) that provide guidance on the roles and responsibilities of companies (in the extractive sector) and civil society. A culturally appropriate programme for stakeholder consultation with regular dissemination of information and an active mechanism for recording and resolving community grievances in a timely manner will be necessary for managing this impact. The Project community relations team will monitor the human rights situation to assess if the possibility of this impact occurring is decreasing or increasing and plan accordingly (as needed).

The impact has the highest probability of manifesting during construction and operations, with reduced probability during decommissioning. The mitigation measures largely focus on eliminating the possibility of human rights violation and on reducing the severity of the impact if anything does go wrong. Any deterioration in the human rights situation is difficult to manage but reversible. A strong policy and programme by MIOL for protection of human rights can effectively prevent this impact hence the higher confidence rating.

Impact SR1: Risk of human rights abuses due to conflict with communities			
Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	*Negative*
Magnitude description	Sensitivity	*High*	*High*
	Receptor importance or value	*High*	*High*
	Extent of change / threshold compliance	*Major*	*Minor*
	Magnitude rating	*MAJOR*	*MODERATE*
Timeframe description	Duration	*Long term*	*Long term*
	Frequency	-	-
	Timeframe rating	*LONG TERM*	*LONG TERM*
Scale		*SMALL*	*SMALL*
CONSEQUENCE RATING		*HIGH*	*MEDIUM*
PROBABILITY RATING		*POSSIBLE*	*UNLIKELY*
SIGNIFICANCE RATING		*HIGH (-ve)*	*LOW (-ve)*
Reversibility		*Reversible*	
Confidence		*High*	
Mitigation measures • Provide training to MIOL security staff and local police on the Voluntary Principles on Security and Human Rights. • Maintain the grievance procedure, and encourage and facilitate stakeholders to use the mechanism to express concerns.			

9.4.2 SR2: Increased exposure to communicable diseases due to an influx of workers, potentially resulting in a deterioration in public health

Construction	Operation	Decommissioning	Post-Closure

As per the Lunsar Peripheral Health Unit (PHU) records since 2005 communicable diseases, particularly Sexually Transmitted Infections (STIs) and HIV/AIDS are on the increase in the Chiefdom. Factors such as the arrival of a predominantly male workforce (Project related as well as speculative job seekers) and increase in disposable incomes can lead to further increase in local prostitution and arrival of commercial sex workers in the Lunsar area. The incidence of HIV/AIDS amongst commercial sex workers is estimated at 10% against the incidence among the general population at 1.6%. Mixing between outsiders and locals can also cause an increase in the incidence of other communicable diseases such as tuberculosis, malaria, respiratory infections and diarrhoea.

Management measures, implemented by the Project clinic for the mine employees and by the PHU's for the community, will focus on prevention and control to minimise the extent and probability and on early diagnosis and treatment to minimise the duration. This impact would manifest mainly during the construction phase, when the influx in population would be at its peak, however it can continue into the operation phase as well with slightly less intensity. The confidence is medium as other factors, unrelated to the Project, may influence the overall impact experienced in the area.

Impact SR2: Increased exposure to communicable diseases due to an influx of workers, potentially resulting in a deterioration in public health

Impact characteristics		**Initial impact**	**Residual or optimised impact (taking cognisance of management measures)**
Type (+ / - /neutral)		*Negative*	*Negative*
Magnitude description	Sensitivity	*High*	*High*
	Receptor importance or value	*High*	*High*
	Extent of change / threshold compliance	*Moderate*	*Minor*
	Magnitude rating	*MODERATE*	*MINOR*
Timeframe description	Duration	*Long term*	*Medium term*
	Frequency	-	-
	Timeframe rating	*LONG TERM*	*MEDIUM TERM*
Scale		*SMALL*	*SMALL*
CONSEQUENCE RATING		*MEDIUM*	*LOW*
PROBABILITY RATING		*DEFINITE*	*POSSIBLE*
SIGNIFICANCE RATING		*MEDIUM (-ve)*	*LOW (-ve)*
Reversibility		*Partially Reversible*	
Confidence		*Medium*	

Impact SR2: Increased exposure to communicable diseases due to an influx of workers, potentially resulting in a deterioration in public health
Mitigation measures • Develop and implement management policies for HIV/AIDS, tuberculosis and other potential communicable diseases focusing on prevention, control, diagnosis and treatment in coordination with NGOs and local government. • Provide health awareness programmes and counselling services to employees. • Promote use and availability of condoms at the workers camp. • Undertake routine health screening of employees to detect and treat diseases early.

9.5 Other hazards potentially resulting in injury

The additional hazards discussed below were identified as those most pertinent to the Project. In this section 'hazard' is defined as the potential to cause harm; risk is the probability of harm arising from that hazard. The risk may only materialise under a certain set of circumstances. Therefore although risk is characterised in a similar way to impacts (consequence and probability), generally the probability of such risks occurring is much lower than the impacts discussed in the previous sections due to standard controls implemented to minimise the identified risks.

Mines, roads and associated infrastructure are inherently dangerous facilities, with physical, chemical and electrical hazards with potential to harm people or wildlife. The risk of injury or harm and the significance of resulting impacts relate to a number of factors including:

- type of hazard;
- when, where and how the event materialises;
- number of people injured or the extent of ecological damage;
- duration of the harmful exposure;
- frequency with which the hazard causes injury or harm; and
- extent to which injury or harm could have been prevented (for example with suitable management plans in place).

The most significant Project hazards are discussed in more detail below. Because of the number of variables affecting the consequence and probability of such events, accurate significance rating of possible impacts should the risk materialise is not possible. Each event must be evaluated on an individual basis, in accordance with the incident reporting system outlined in Section 11.3.2.

9.5.1 OH1: Blasting resulting in fly rock potentially harming people or their possessions

Fly rock refers to uncontrolled rock flung into the air as a result of blasting. It may result in death or serious injury on impact with humans or animals within the area around the pits and is one of the most common causes of injury related to blasting. To reduce the risk of injury the Project will conduct blasting in accordance with international safety standards. Open pit blasting will be conducted using standard mining industry practices and procedures for securing personnel and equipment. This includes the development and implementation of standard operating procedures, blasting rules and a safety management plan that:

- Delineates the danger zone associated with each blast of at least 400m and clear

workers from this zone before, during and after each blast; and
- Provides an audible warning at least three minutes before a blast is fired.

9.5.2 OH2: Community exposure to toxic or hazardous substances

Community exposure to toxic or hazardous substances is most likely to occur as a result of two factors. The first is accidental spills of these substances to the environment during handling, storage, disposal or transportation. The second is via landfill disposal of substances in proximity to communities. Spills may occur during construction and operation, or decommissioning (when any hazardous substances stored on site would be removed and either disposed of or used elsewhere). Hazardous substances that will be stored and used on the mine site include fuels (both HFO and diesel), oil, coolant and hydraulic fluid for mining equipment (stored in 200 l drums). Impacts resulting from spills of product or tailings material to water resources are discussed and rated under Impact WR6.

The potential impact associated with each release will depend on the source of material released, its inherent hazard potential (toxic, acidic, flammable etc.), the volume released, the extent of release and sensitivity of any human or ecological receptors. Particularly spills close to water courses (or other water resources) could result in significant ecological and health impacts due to the rapid spread of contaminants in water, affecting downstream users. .

In terms of exposure to potentially hazardous substances in the landfill associated with the mine, it is important to note that the landfill at the site will be solely for domestic (non-mining) type wastes generated by activities associated with the mining operations. Wastes strictly defined as ‘toxic’ or ‘hazardous’ in accordance with international definitions will be removed from the mine site to an appropriately licensed waste facility. However, the risk of exposure of communities to decaying (and potentially toxic) organic matter in the landfill remains, but can be effectively mitigated by implementation of the management measures listed under Impact EB4 (Section 7.3.4), with particular attention to the following:

- Implementation of standard management practices such as ensuring appropriate site security and fencing, to prevent unauthorised access to the waste landfill site.
- Thorough and regular compaction and covering of wastes with inert materials (at least weekly). This would also greatly reduce the likelihood of pests being attracted to the landfill, and the associated health hazards.

The potential impacts associated with spills of toxic or hazardous materials can be reduced through the implementation of standard management measures, which aim to minimise the risk of spills occurring and the extent of any damage should a spill occur. Recommended general good practice measures include the following:

- Design hazardous material containment structures taking into consideration natural hazards and the implications of these on structural integrity of the containment facilities.
- Size containment areas to contain 110% of the contents of the largest tank within the facility or provide facilities to direct excess volume to an alternative spill containment facility.
- Pave (with an impermeable surface such as concrete) mine site fuel delivery and dispensing pump areas and designed these areas to drain into the adjacent storage tank containment areas.
- Prohibit construction of hazardous material facilities (including temporary and permanent refuelling areas) within drainage lines or the 1 on 100 year flood lines of watercourses.
- Treat (for example with an oil separator), evaporate or dispose of as a hazardous

material any polluted water collected in hazardous material containment facilities.

- Require vehicle maintenance to be undertaken in the designated workshops where appropriate pollution control measures are provided to prevent leaks or spills of fuel or lubricants reaching the environment.
- Develop and implement a spill prevention and control system as part of the Emergency Preparedness and Response Plan for the mine site (Section 11.6).

9.5.3 OH3: Fire or explosions due to storage of explosives and use of combustible materials

The storage and use of both fuels (and other combustible materials) and explosives poses an inherent fire, and therefore safety, risk to workers on site and surrounding communities. To minimise the risk, standard international good practice will be followed with regard to storage and handling of these materials, and occupational health and safety guidelines with regard to safe working conditions and the use of PPE will be adhered to. As detailed in Section 4.8.7, fire extinguishers will be available at storage areas for flammable substances, and a fire water system will be installed, servicing the beneficiation plant and accommodation areas.

9.5.4 OH4: Failure of the TSF resulting in pollution or harm to individuals

The most significant potential safety and environmental hazard resulting from failure of mine workings is structural failure of the TSF (such as foundation failures, containment wall collapse, or failure of the tailings pipeline). This could typically be caused by seismic activity, and may result in contamination of surface water, groundwater or soils in the surrounding areas, with tailings material. However, as described in Section 5.3, the Project site is located in one of the least seismically active zones in Africa, and is therefore considered to be in a low seismic hazard area. The TSF is designed to withstand an operating basis earthquake loading of 0.06g (0.6 m/s^2) and a post-closure maximum credible earthquake loading of 0.1g (0.1 m/s^2).

The design of the TSF is in accordance with the internationally accepted Australian National Committee on Large Dams Incorporated (ANCOLD) Guidelines on Tailings Dam Design, Construction and Operation, published in 1999. It is based on a tailings concentration of 60% (solids by mass), a deposited dry density of1.5 t/m^3 and is designed to contain a 1 in 1000 average recurrence interval three-day rainfall event, whilst maintaining a freeboard of at least 0.3 m. Thickening of tailings, as proposed by the design engineers, has the advantage of reduced water content over conventional methods of tailings disposal, as it decreases the likelihood of tailings and process fluid leaks, and the widespread release and downstream spread thereof in the event of leaks. Following closure the TSF will be rehabilitated and excess water will drain, as the tailings material becomes increasingly solid and stable. A pond will remain on the TSF, and beach areas above the pond surface will be capped by covering with soil and rock. Further detail regarding rehabilitation and capping of the TSF will be confirmed after geochemical characterisation of the tailings material has taken place. Further detail on the design of the TSF is available in the *Tailings Storage Facility Design Interim Scoping Level Report* (August 2011) by Coffey, which is included in Appendix E.

Due to the low seismicity of the area and inherent design precautions in the TSF design, the likelihood of its failure is considered to be low. The relatively inert nature of the predicted tailings material implies that, should TSF failure occur, the impacts on human health resulting from exposure to tailings, contaminated surface water, groundwater or soil are not expected to be significant. However this would of course depend on the amount of tailings material released. No additional good practice measures are recommended.

10 CUMULATIVE IMPACTS

For the purposes of this assessment, the definition of cumulative impacts provided in the IFC's Glossary of Terms (IFC, 2006) has been used: '*the combination of multiple impacts from existing Projects, the proposed Project and/or anticipated future Projects that may result in significant adverse and/or beneficial impacts that would not be expected in case of a stand-alone Project.*' The aim of this preliminary assessment is therefore to identify, and if necessary lay the groundwork for possible issues requiring co-ordinated actions by a number of agencies or groups.

The assessment considers the most significant impacts and risks identified for the Project (those rated high in Chapters 7, 8 and 9) and overlays them in time and space with known or possible impacts or risks from other current, planned or reasonably foreseeable activities. In the case of the Project, there has been prior development in the area, mainly linked to mining, and at the time of writing this ESIA SRK there are two other iron ore mining Projects in the country (one by London Mining and the other by AML), with the London Mining (LM) Project being immediately adjacent to MIOL and AML sharing infrastructure with MIOL. The cumulative impact assessment is therefore predominantly based on the likely impacts of the London Mining and MIOL, as well as the AML mining Project and Bumbuna Dam hydroelectric Project on the Rokel River upstream of the MIOL Project. Emphasis is on significant impacts that are additive or synergistic in nature.

The cumulative assessment consists of the following steps:

- Using knowledge gained from the baseline studies and from stakeholder consultation, the past, present and reasonably foreseeable future activities from sources external to the Project but occurring in the Project's area of influence are identified (Table 10-1). This includes the possible future expansion of the MIOL Project, including product export infrastructure, which is not otherwise covered by this impact assessment (Section 3.2).
- Based on the results of the impact assessment (Chapters 7, 8 and 9), a preliminary judgement is made on whether cumulative impacts on specific environmental or social components are possible or likely – the results are given in Table 10-1.
- Where potential cumulative impacts are identified in Table 10-1, significant Project impacts (rated high in Chapters 7, 8 and 9) are evaluated for their potential additive or synergistic interaction with potential future developments in the following sub-sections.

The process outlined above yielded a number of types of potentially significant cumulative impacts, as described below.

Table 10-1: Past, present and reasonably foreseeable activities in Project affected area potentially resulting in cumulative impacts

Project component (and area affected)	Past and present activities causing significant impacts	Reasonably foreseeable future activities	Potentially significant cumulative impacts						
			Land transformation	Water resources	Air quality	Ecological systems	Distur-bance[(a)]	Economic growth	Social change[(b)]
Mine site and water supply	• LM mine (construction and development)	• Bumbuna dam hydroelectric Project • MIOL/LM future expansions	Possible	Likely	Possible	Possible	Possible	Likely	Likely
Concentrate export (Stage 2) from mine site	• AML railway line (along which MIOL pipeline will run) and port facilities at Pepel (then possibly Tagrin)	• Construction and operation of MIOL product export pipeline for Stage 2 expansion • Product dewatering at port	Possible	Possible	None	Possible	Possible	Possible	Possible
National and Local Road usage	• Traffic associated with construction and operation of AML and LM mines • Traffic associated with other development in the Lunsar area	• Traffic increases in Lunsar as a result of growth in local population (due to development in the area) • MIOL/LM future expansions • Construction of Bumbuna dam hydroelectric Project	None	None	Possible	None	Possible	Possible	Possible
Relocation of local communities	• Development of LM mines	• Additional relocations and land acquisition required (due to MIOL Project expansion and other Projects)	Possible	Possible	None	Possible	Possible	Possible	Likely

(a) Includes: noise, visual, vibrations and traffic

(b) Includes: equity issues, access to services, deterioration in health, social ills, food and water security, pressure on infrastructure and services, etc.

Based on the evaluation above the most significant cumulative impacts are likely to be those on water resources, economic growth and social change, and are discussed in Sections 10.1 to 10.3 below. The following cumulative impacts could also occur, but MIOL's contribution is unlikely to significantly change the overall impact to the area:

- Land transformation: the cumulative effect of other developments in the area may increase the extent of disturbed areas from those in and around the Project footprint to the general surroundings. This would place added pressure on non-disturbed areas for agricultural land and natural resources; cause more widespread disruption of community access routes and changes in the visual character of the general area and more widespread erosion of topsoil, affecting land capability.
- Air quality: MIOL's proposed current and future developments, along with London Mining's operations, AML's railway and the general development of the central part of Sierra Leone will result in increased contributions of gaseous and particulate matter to the local air quality catchment. MIOL's contribution to this is moderate at most and this regional issue can only be managed with co-ordination from government bodies to ensure ambient air quality is monitored on an ongoing basis and controls put in place to minimise long term health risks to communities in the area.
- Ecological systems: Cumulative impacts on ecological systems would result primarily from the other cumulative impacts discussed here. These include land transformation, which would place undisturbed areas under increased pressure; disturbance of wildlife; and impacts on water resources, reducing the amount of wetland habitat available (e.g. through groundwater drawdown), and reducing instream habitats through altered stream flow.
- Disturbance: MIOL will slightly contribute to the already increasing noise, visual and vibration disturbance in the Lunsar area. Other forms of disturbance potentially resulting in cumulative effects include lighting (of other mines or developments in the area), and traffic, affecting road safety and condition in the general Project area.

10.1 Water resources

Cumulative impacts on water resources are expected to affect both surface and groundwater resources, which are used by local communities for domestic purposes, agriculture and industry and are important for the riverine ecological systems. It is understood the first phase of the nearby London Mining operation involves re-processing of tailings material from previous mining rather than mining of fresh ore, and it is therefore assumed pit dewatering would initially not be required. However, an expansion of the operation to mine fresh ore is proposed, and may require pit dewatering. The MIOL impacts of groundwater drawdown on water supply to local communities is currently only of medium to low significance however given community reliance on groundwater and the proposed future expansions of both MIOL and LM pit dewatering could further increase risks to domestic groundwater supply and agricultural/ecological systems reliant on groundwater fed wetlands in the area.

The use or impoundment of surface water from local resources by MIOL, LM and developing area of Lunsar could have significant cumulative impacts on river flow patterns and surface water availability in the area. These local impacts may cumulatively impact the Rokel River which although not currently significantly impacted, may in future be influenced by the proposed expansion of the Bumbuna dam hydroelectric Project, located upstream on the Rokel River.

10.2 Economic growth

The significant Project impacts associated with economic growth and development are assessed in Chapter 8 (Impacts ED1 to ED4). Development of other Projects in the area could potentially result in significant positive synergistic effects in the local economy, benefiting local communities and Lunsar town, if not Sierra Leone as a whole. This growth would result from:

- direct employment and skills development from the Project and other developments during both construction and operation;
- outsourcing opportunities for local suppliers; and
- increase in government revenue potentially resulting in investment in social development.

Initial Project related economic growth and development would result from MIOL capacity-building programmes as employees are trained and gain experience. Parallel employment and training would occur for the Project's support services in the area. Other mining and industrial developments within the Marampa area could significantly add to the critical mass and make this growth self-sustaining, fuelling further economic growth, for example:

- experienced employees would have the opportunity to increase their earning potential by seeking employment at other developments;
- other businesses would develop to provide services to the local population leading to the creation of alternative livelihoods;
- increased development and employment would increase the tax base, which could lead to other educational and training opportunities;
- increased social services from the local governments;
- capacitated communities may be more able to express their wishes or concerns; and
- vulnerable groups, such as women and the elderly, may become more empowered if they can be involved in both Project and other economic activities.

Cumulative impacts between the Project and other developments have the potential to contribute to significant synergistic effects on the macro-economy of the area. The Project may therefore be a contributor to growth in the area, encouraging other unrelated industry to develop. Successful regional development will mitigate negative impacts associated with the cessation of a single activity (such as when the Project closes). Other developments in the area will then be able to absorb trained workers, potentially use Project infrastructure (such as the power station, accommodation camp and associated facilities, and rail spur line) and make use of the support services, so that the closure of any one development will not necessarily translate into a regional economic downswing but instead provide added local resources to support further sustainable development.

10.3 Social change associated with population increase due to in-migration

The significant Project-related impacts associated with population increase due to in-migration are discussed in Chapter 8 (Impact SO1), and include competition for jobs and resources. Additional development in the Lunsar area, such as other mines and secondary development, is likely to trigger further in-migration of job seekers (some has already been observed as result of London Mining's operations). If not effectively mitigated, this could lead to proliferation of informal settlements and social issues relating to unemployment in the area.

This will also put increased pressure on existing infrastructure and services, food security and water supply, all of which are already under strain at times to meet the needs of the current population. Mitigation measures for this potential cumulative impact, beyond those defined for the Project, will require coordinated management by a number of private and public sector parties and therefore cannot be defined at this time and as such are not included in the EMP (Appendix F). However, it is important these issues are addressed in a timely manner as population increase through in-migration could indirectly increase the magnitude of other Project related impacts on local communities.

11 ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM

This document describes the framework for the Environmental and Social Management System (ESMS) for the Project. The framework has been developed with consideration of the requirements of Sierra Leone's legislation and guidelines, the IFC's Performance Standard 1 and the main principles in the International Standards Organisation (ISO) 14001 Standard (ISO 14001:2004, 2004). Some organisations use different terms for an ESMS, for example the International Standards Organisation (ISO) uses "environmental management system" or "EMS". For the purposes of this document, the terms are synonymous.

The IFC Performance Standards state the objectives of an ESMS are to:

- identify and assess social and environmental impacts, both adverse and beneficial;
- avoid, or where avoidance is not possible, minimize, mitigate or compensate for adverse impacts on workers, affected communities, and the environment;
- ensure that affected communities are engaged on issues that could potentially affect them; and
- promote improved social and environmental performance of companies through the effective use of management systems.

IFC Performance Standard 1 goes on to explain an ESMS has the features listed below.

- it is a dynamic, continuous process initiated by management and involving communication between the Project owner, its workers, and the local communities directly affected by the Project;
- it is based on the business management process of "plan-do-check-act" (this is the same basic process used in ISO14001);
- it entails the thorough assessment of potential environmental and social impacts and risks from the early stages of Project development; and
- it provides order and consistency for mitigating and managing these on an ongoing basis throughout the life of the Project.

The basic elements of the ESMS for the Project are outlined in Table 11-1 with more detail on each element, and how it applies, given in the following sub-sections. The elements of the ESMS are discussed under the headings of the "plan-do-check-act" business performance improvement cycle. Stakeholder engagement is an element of the ESMS that applies to all steps of the "plan-do-check-act" cycle as shown in Table 11-1.

An important component of the ESMS is the Environmental and Social Management Programme (ESMP). As with the ESMS, the ESMP may be known by different names, but in this instance is considered synonymous with the term "Environmental Management Programme" (EMP) used in certain jurisdictions, including Sierra Leone and which has therefore been used in this report. The EMP presents MIOL's commitments to manage the impacts identified by the impact assessment process (Section 3.3.3). The EMP falls under the element of the ESMS entitled "objectives, targets and plans for management".

Table 11-1: Elements of the ESMS

Steps of the "plan-do-check-act" cycle	Elements of the ESMS for the Project			
	Elements	**Primary function**	**Elements applying to all steps of the cycle**	
Plan (Section 11.1)	**Leadership and accountability**	• Produce and communicate a statement of corporate commitment to environmental and social management (e.g. policy statement) • Establish, document, implement, maintain and improve the Project ESMS	**Stakeholder engagement (Section 9.5)** An ongoing process, throughout the life of the Project. Serves to build and maintain a constructive relationship with communities affected by the Project	**Emergency planning, response and recovery (Section 9.6)** Maintain emergency response preparedness through the identification of potential environmental emergencies, development of response plans and allocation of response and recovery resources.
	Legal and other requirements	• Identify and provide access to legal requirements and other obligations		
	Aspect identification and impact assessment	• Identify aspects ("mechanisms" by which Project activities impact on the environment) and assess associated impacts throughout the Project life (the ESIA falls under this element of the ESMS)		
	Objectives, targets and plans	• Define objectives, targets, criteria and actions for the management of potential impacts (the EMP falls under this element of the ESMS)		
Do (Section 11.2)	**Roles and responsibility**	• Provide sufficient management sponsorship of human and financial resources • Establish roles and responsibilities for implementation		
	Contractors, suppliers and vendors	• Consider environmental and social impact management and performance in the selection and management of third party services		
	Competence, training and awareness	• Make personnel aware of their responsibilities and enable them to be capable and competent in meeting their responsibilities		
	Communication	• Maintain internal and external communications to enable effective environmental management		
	Operational controls and maintenance	• Implement operational controls and maintain equipment to uphold environmental performance and compliance and to manage impacts and risks		
	Documentation and record keeping	• Control and maintain documents and records associated with environmental and social management		
Check (Section 11.3)	**Assessing, correcting and improving performance**	• Monitor environmental and social management and performance and take measures to continually improve performance		
	Non-conformance and incident reporting	• Promptly report non-conformances and incidents are promptly reported and take corrective and preventative actions to reduce the likelihood of recurrence		
	EMP and ESMS reporting	• Report on compliance with the EMP and ESMS performance to senior management, regulatory authorities and affected communities		
Act (Section 11.4)	**Governance/ management review**	• Require site, regional and senior management to review the suitability, adequacy and effectiveness of the ESMS and identify improvement actions to facilitate continuous improvement		
	Management of change	• Modify the ESMS in response to changes in the Project and to changes in the organisation, personnel, operations and processes		

⟷ *The arrows show where there is integral relationship between stakeholder engagement and other elements of the ESMS.*

11.1 Planning elements

11.1.1 Leadership and accountability

Policy

The Project will be undertaken in accordance with MIOL's corporate policies, which are attached as Appendix H. This will include as a minimum the following policies: Environment Policy, Health and Safety Policy, Human Resources Policy and Community Policy. MIOL will periodically review the scope and effectiveness of its policies (Section 11.4.1). The policies will be documented, maintained, implemented and communicated to MIOL employees, contractors, suppliers and the public.

As a subsidiary of Cape Lambert Resources Limited, MIOL is committed to operating in accordance with the policies of its parent company, which operates according to stated principles of Environment, Health and Safety (EHS) and Corporate Social Responsibility (CSR).

ESMS

MIOL will establish, document, implement, maintain and continually improve an ESMS for the Project. The ESMS will be in place prior to construction.

11.1.2 Legal requirements and other obligations

The Project's ESMS takes account of both legal and other obligations imposed on the Project. The various types of obligations considered are shown conceptually in Figure 11.1.

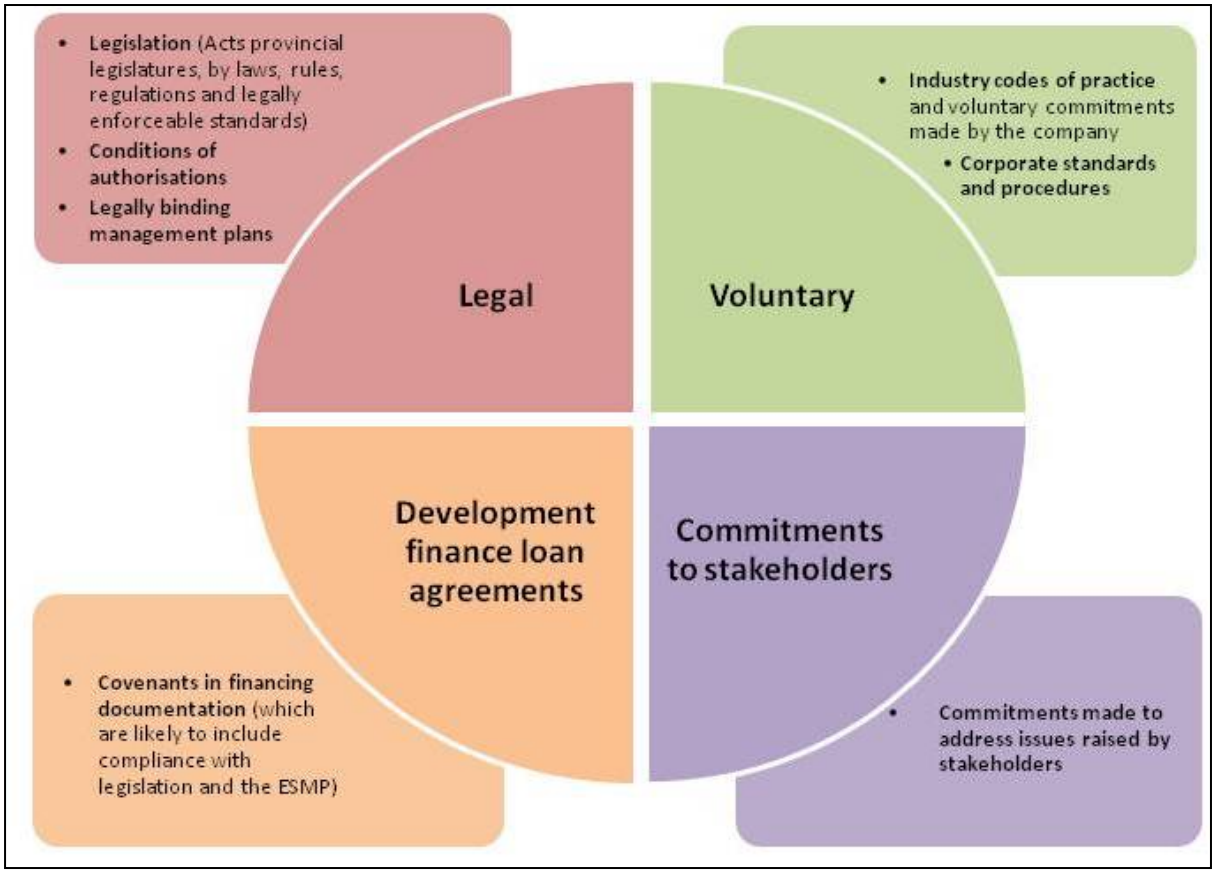


Figure 11.1: Types of obligations relevant to the ESMS

MIOL will identify, document and maintain a register of legal requirements and other obligations applicable to the Project. It will also:

- track developing legislation and regulations that may apply to operations and activities to anticipate and prepare for compliance;
- inform employees and others working on behalf of the company of existing and emerging obligations that apply to their job responsibilities; and
- consider the register in the setting and review of objectives, targets and plans for management of impacts.

11.1.3 Aspect identification and impact assessment throughout the Project life

A key element of the ESMS is identification of aspects and assessment impacts. The impact assessment documented in this report is the initial stage of this element of the ESMS. Procedures will be set up, implemented and maintained for the ongoing identification of any new environmental (or social) aspects. These will be evaluated using impact and risk assessments on an ongoing basis through the Project life, probably in the form of regular workshops attended by the environment and community teams, as well as the various engineering and operating teams. The reviews will address:

- significant aspects not covered by this ESIA;
- any impact arising that was not predicted by the ESIA or did not develop as predicted by the ESIA;
- any changes in the Project or new developments arising subsequent to the completion of this ESIA (Section 11.4.1).

11.1.4 Objectives, targets and plans for management throughout the life of the Project

This element of the ESMS pertains to the setting of objectives and targets for environmental and social management, and plans for the achievement of these objectives and targets at corporate and Project/ site levels. The EMP[20] described below embodies this element of the ESMS at the Project level.

The primary purpose of the EMP is to guide environmental and social management throughout the life of the Project. The core of the EMP is a statement of environmental and social management objectives and associated management measures. The EMP will be supported by other documentation, such as the original Project design (described in Section 4) and specific management plans and operating procedures.

The preliminary EMP commitments presented in tabular formal in Appendix F are derived from the following sources within the ESIS:

- inherent design or management measures described in the Project Description in Chapter 4;
- mitigation and enhancement measures identified in Chapters 7, 8 and 9, which are required to manage identified impacts; and
- good practice management measures presented in Chapters 7, 8 and 9, which may not significantly alter the impact rating but are considered standard industry practice for the management of such impacts and have been voluntarily adopted by MIOL.

[20] *For the purposes of this report EMP includes measures related to social management and could equally be known as the environmental and social management plan or ESMP.*

During the Project life, the EMP may need to be amended to address a specific requirement, such as those included in the obligations register (Section 11.1.2). Therefore, in subsequent updates of the EMP, a column entitled 'Source' may be needed to indicate additional sources of commitments, for example conditions of approval included in permits, or commitments made to stakeholders.

Management plans and other forms of supporting documentation will be developed by MIOL or its contractors, where needed, to provide further detail on how key actions identified in the EMP will be executed. The need for supporting management plans or other supporting documents has been determined initially during the ESIA, based on the risk posed by or complexity of the impact/s or area requiring management. Consideration is also given to the regulatory requirements of Sierra Leone.

Recognising the EMP could become legally binding, by means of the conditions of approval attached to authorisations (licences/ permits), it is considered desirable that the supporting documentation is separated from the EMP. This allows for flexibility in meeting the objectives and commitments in the EMP; the EMP supporting documents can be dynamic documents, adaptable to changing circumstances, and can be modified (without necessarily requiring regulatory approval of each modification) providing the changes are in compliance with the stated objectives in the EMP.

Supporting documents identified as a result of the ESIA or Sierra Leone regulations include the following plans:

- Environmental Management Programme and Social Management Programme (Appendix F);
- Stakeholder Engagement Plan (Appendix C); and
- Resettlement Framework (Appendix D).
- Additional plans to be prepared during Stage 1 detailed design for construction include (note these may be individual or combined plans):
    - construction management plan (addressing land clearance, water/waste management, air quality, noise, vibrations and other environmental impacts associated with construction);
    - community development plan;
    - recruitment plan
    - training and skills development plan;
    - grievance management plan;
    - occupational health and safety plan;
    - security management plan;
    - closure and rehabilitation plan.
- Additional plans to be prepared and/or reviewed during the construction phase ready for operation include (note these may be individual or combined plans):
    - community health and safety plan;
    - water management plan;
    - waste management plan;

- soil management plan;
- air quality management plan;
- wildlife and habitat management plan
- emergency preparedness and response plan;
- spill prevention control and countermeasure plan;
- hazardous materials management plan; and
- closure and rehabilitation plan.

The supporting documentation may need to be presented differently, depending on the target audience and Project requirements, for example:

- an issues-driven format is often required to facilitate communication with regulatory authorities and stakeholders (for example community development plan); and
- an area/activity-driven format is needed for ease of application by the parties responsible for Project execution (for example construction management plan, waste rock dump management plan, spill prevention plans etc.).

11.2 Implementation (Do) elements

Effective implementation and functioning of the EMP depends on adequate human and financial resources, clearly defined responsibilities for environmental and social management, appropriate training and good communication. An outline of how these features will be managed for the Project is presented below.

11.2.1 Roles and responsibility

MIOL will define, document and communicate the environmental and social management roles and responsibilities of Project personnel, including contractors and others working on behalf of the company, in all phases of Project implementation from detailed design through to closure. Personnel with specific roles and responsibilities will have the authority, and be held accountable for, carrying out these.

The basic roles required to implement the EMP, and establish and maintain the ESMS, are shown in Table 11-2. These roles need to be reviewed and incorporated into the organisational structures for the various phases of the Project from detailed design through to closure. A key requirement is for the senior environmental management professional to report directly to the on-site senior manager (the General Manager).

11.2.2 Contractors, suppliers and vendors

Environmental and social performance, programmes and risk management will be considered in the selection and management of contractors, suppliers and vendors. Contracts will address potential environmental and social liabilities and responsibilities including the following:

- use of competent, trained staff, including subcontractors;
- consequences for failing to meet obligations;
- monitoring of performance;
- required job-specific, site-specific training;
- compliance with MIOL policies and site standards and applicable legal requirements;

- responsibility for chemicals and hazardous materials brought on-site and wastes generated on-site, including closure activities where appropriate; and
- identification of a lead responsible person for both MIOL and the contractor.

Contractors, including their employees and associated subcontractors, will be made aware of the environmental risks, associated controls, procedures and standards relevant to their work on-site (Section 11.2.3), probably through the imposing of contracting clauses. The activities and performance of contractors will be monitored by MIOL against the terms of the contracts.

Table 11-2: Key Roles for Environmental and Social Management

Roles	Relevant Responsibilities
Chief executive officer (CEO)	• Endorse the environmental and social management policy and require it to be communicated to the public. • Allocate adequate human and financial resources to enable effective functioning and continual improvement of the ESMS. • Establish and maintain a governance system.
Top management	**Policy** • Develop, review and update MIOL's policy/s on environmental and social management. • Incorporate principles of MIOL's policy/s in business decisions. **Compliance** • Confirm necessary authorisations (licences/ permits) have been obtained for the Project. • Confirm compliance with legal requirements and other obligations pertaining to environmental and social management. • Commit contractors and suppliers to meeting relevant environmental and social obligations by means of specific conditions in the contracts of appointment. **Roles and responsibility** • Define, document and communicate environmental and social management roles, responsibilities and authorities. • Provide sufficient appropriately trained human resources and adequate financial resources to enable effective functioning and continual improvement of the ESMS. • Hold personnel responsible for meeting their assigned responsibilities. **Communication and reporting** • Confirm there is adequate ongoing stakeholder engagement. • Confirm obligations for reporting to regulatory authorities, development financiers and affected communities are met. **Management review** • Provide leadership in the pursuit of environmental and social management. • Examine and review the ESMS periodically to determine its suitability, adequacy and effectiveness. • Support action to enhance the ESMS and make improvements in environmental and social management performance.

Roles	Relevant Responsibilities
Environmental management team	**ESMS** • Establish the ESMS, with assistance from the senior management, division managers and community relations managers. • Liaise with division managers regarding environmental management roles, responsibilities and authorities throughout operational divisions. • Coordinate monitoring and evaluation activities and confirm corrective actions (an action taken to address a non-conformance) are taken to address incidents and non-conformances (a failure to comply with the Project's ESMS). • Report progress in implementation and functioning of the ESMS to senior management, development financiers, regulatory authorities and stakeholders. **EMP and obligations register** • Keep the EMP and obligations register up to date and confirm they address all relevant environmental and social obligations. • Present the EMP in an appropriate format for communication with regulatory authorities and other stakeholders. • Present the EMP in an appropriate format for communication with parties responsible for Project execution. • Compile EMP compliance reports. • "Sign-off" actions in the EMP and non-conformances once they have been completed.
Government and community relations team	• Assist the Environmental Management team with ongoing reporting to stakeholders on EMP and supporting management plans, and progress with implementation of management measures. • Assist Environmental Manager and division managers with stakeholder communication where awareness and/ or co-operation of stakeholders are required to implement management measures • Manage the grievance mechanism
Operations management team	• Confirm the ESMS and EMP are established, communicated, implemented and maintained in their respective areas • Provide leadership in the pursuit of environmental and social management • Identify ways to improve environmental and social performance through daily monitoring of their activities and evaluating implementation • Review monitoring results, incidents and corrective actions taken • Evaluate adequacy and effectiveness of awareness and skills training programmes pertinent to environmental and social management • Maintain internal communication of environmental and social matters between the Environmental Manager, Community Relations Manager and other personnel, and promote environmental and social awareness.
All personnel and contractors	• Comply with MIOL policies, site standards and applicable legal requirements. • Work in accordance with the EMP and supporting documents. • Report problems or deviations from the ESMS or EMP to division managers and/or environmental managers, as instructed.

11.2.3 Training

Personnel, including contractors' personnel, working for or on behalf of the Project will receive training to maintain awareness of relevant environmental and social aspects, impacts and risks associated with the Project and corresponding controls. The training will also maintain awareness of the environmental benefits of improved personal performance and the potential consequences of departure from specified procedures. Visitors to Project sites will receive relevant environmental and social awareness training as part of site induction training.

Personnel, including contractors' personnel, will be made aware of the particular environmental and social management responsibilities that apply specifically to their jobs. Training needs analyses will be undertaken and personnel will be given adequate training to meet these responsibilities.

The training programme should comprise the following elements:

- identification of training needs for employees specific to their varying responsibilities;

- development of a training plan and schedule to address defined needs;
- verification of training programs to confirm consistency with organisational requirements;
- training of target employees and documentation of training received;
- evaluation of training effectiveness; and
- review and modification of training programmes, as required.

Personnel with direct responsibility for implementation of the EMP and functioning of the ESMS should receive additional training to:

- provide them with the knowledge and skills necessary to perform their work;
- maintain their knowledge of relevant environmental and social obligations; and
- enable them to implement specific measures required under the EMP in a competent and efficient manner.

Training requirements and completed training will be documented. Procedures to evaluate the effectiveness of such training will be implemented.

11.2.4 Communication

To effectively implement environmental and social management, the relevant managers will maintain lines of internal communication and provide information regarding the EMP, ESMS and environmental and social management performance, incidents, good practices, lessons learned and concerns to personnel electronically, on notice boards and/or in newsletters. Such communication will be used to inform the personnel of their individual responsibilities with respect to the ESMS and to raise awareness on specific matters. External stakeholder engagement is discussed in Section 11.4.

A grievance mechanism will be established (Section 11.4) and will provide a means for Project personnel, including contractors' personnel, to anonymously raise environmental and social concerns (this grievance mechanism will be separate from the system dealing with employee grievances that need to be handled by the human resources department).

11.2.5 Operational controls

Operational controls will be implemented to maintain performance and compliance, and to manage impacts and risks. Operational controls may include:

- administrative controls such as performance standards;
- standard operating procedures and work instructions; and
- engineered controls such as pollution control equipment.

Written operational controls are required where their absence could lead to deviation from environmental obligations or objectives and targets. Written operational controls will be part of the EMP supporting documentation (Section 11.1.4).

The adequacy, suitability, and effectiveness of operational controls will be reviewed regularly.

Documentation on the design basis and operating criteria/limits for equipment having the potential to impact environmental performance will be maintained.

Operating equipment, as well as environmental monitoring and measurement devices, will be maintained consistent with manufacturers' specifications and good management practice to reduce the potential for environmental incidents and adverse environmental impacts.

11.2.6 Documentation and record keeping

Elements of the ESMS will be documented and controlled in accordance with a document control system. Records demonstrating compliance with legal requirements and conformance with the ESMS will also be maintained. MIOL will establish, implement and maintain procedures for:

- ESMS document control detailing how the creation, review and updating of various types of documents will be managed and who will be responsible; and
- record identification, storage, protection, retrieval, retention and disposal.

Documentation and record keeping controls will include:

- measures to enable relevant documents (including those of external origin deemed necessary for planning and operation of the ESMS) and records to be readily available and identifiable (labelled, dated and properly filed), legible and protected from damage;
- periodic review, revision and approval of documents for adequacy by authorised personnel;
- making current versions of relevant documents available at locations where operations essential to the effective functioning of the ESMS are performed;
- suitably identifying obsolete documents retained for legal and knowledge preservation purposes; and
- identification and segregation of confidential and privileged information.

11.3 Monitoring and reporting (Check) elements

To confirm effective implementation of the ESMS and conformance with the EMP, monitoring of performance is required. Checks include monitoring, site inspections and formal audits. Linked to this, measures need to be taken to remedy non-conformances and to continually improve environmental performance. These activities fall under the heading “assessing, correcting and improving performance” (11.3.1). Incident reporting (Section 11.3.2) and reporting on the effectiveness of the ESMS and compliance with the EMP (Section 11.3.3) are also classified as “check” elements of the ESMS.

11.3.1 Assessing, correcting and improving performance

Monitoring programmes

The aim of monitoring programmes is to:

- provide measurements of environmental and social impacts of the Project;
- ascertain and demonstrate compliance with conditions of approval and other legislation;
- provide sufficient evidence to address any claims made against the Project in respect of environmental and social matters;
- track performance of the ESMS and progress in the implementation of the EMP;
- track and measure key indicators and other performance measures over time to improve the Project’s performance and reduce the likelihood of environmental incidents; and
- inform decision processes for determining management actions.

The monitoring programmes cover the physical, biological and social components of the operation and are integrally linked with the assessment criteria stated in the EMP. Preliminary monitoring programmes have been prepared and are included in Appendix G. Where appropriate and possible, the sampling parameters and locations used in the ESIA

baseline studies have been retained to provide data continuity.

The monitoring programme identifies monitoring parameters, sampling locations, sampling frequency and duration and detection limits (where appropriate). It includes control sites, where relevant. The focus and extent of monitoring is commensurate with the risk of impacts occurring, the sensitivity of the surrounding areas and the affected communities' perceptions of risks to their health and environment. For some types of monitoring, thresholds or targets are available (and included in the environmental or social management programmes described above). In other cases, the monitoring results will be compared to the baseline data set gathered as part of this ESIA. Lastly, where neither thresholds nor baseline data are available, the initial data collection may form the baseline for future data collection.

Data will be documented and interpreted. Temporal and spatial trends in the data will be discerned and compliance with relevant thresholds will be evaluated. Monitoring reports will be produced to meet internal and external reporting requirements (Section 11.3.2). If monitoring results indicate non-conformance with stipulated thresholds or if a significant deteriorating trend is observed, it will be recorded as a non-conformance and handled by the non-conformance and incident procedure (Section 11.3.2).

The preliminary monitoring programmes in Appendix G provide a framework of monitoring to evaluate performance and assist in predicting and managing impacts. In conjunction with the development of supporting documentation for the EMP (Section 11.1.4), detailed monitoring plans, with appropriate sampling protocols where relevant, may need to be developed. These more detailed supporting documents would include the criteria against which the monitoring results will be compared and the actions required if the criteria or thresholds are exceeded. The supporting documents may also cover:

- sample or data collection methods;
- sample handling, storage and preservation;
- sample or data documentation;
- quality control;
- data reliability (calibration of instruments, test equipment, and software and hardware sampling);
- data storage and backup, and data protection;
- interpretation and reporting of results; and
- verification of monitoring information by qualified and experienced external experts.

The frequencies and locations of monitoring may need to be adjusted depending on final Project design and ongoing review of results obtained by the monitoring programmes. Therefore the programmes will be reviewed on a regular basis (at least annually) and adjusted, where necessary (Section 11.4.1). Changes to the EMP or obligations register may also result in changes to the monitoring programme.

Site inspections

Site inspections will be undertaken regularly in relevant areas of the Project. The inspections will focus on compliance with the EMP and conformance with the ESMS. The inspections will play an important role in increasing awareness of EMP and ESMS requirements.

Minor non-conformances will be discussed during the inspection and recorded as a finding in the inspection report. Serious non-conformances will be reported as incidents (Section 11.3.2). Inspection results will be disclosed at management meetings.

Formal audits

Formal audits of both the EMP and the functioning of the ESMS will be undertaken at planned intervals in accordance with the requirements of MIOL and regulatory authorities. Procedures for audits will be established, implemented and maintained. These will cover the audit criteria, scope, frequency and methods, and will address the responsibilities and requirements for planning and conducting audits, reporting results and retaining associated records.

Audits will include both internal and external audits, as well as regulatory audits required by SLEPA. Internal audits will be undertaken frequently and may include review of contractors, evaluation of implementation of a specific supporting document or evaluation of one area of site against the relevant EMP conditions. External audits occur less frequently (for example every one or two years) and are likely to focus on the EMP, though more detailed audits could be commissioned if considered necessary.

Negative findings arising from an audit will be dealt with in accordance with the non-conformance and incident procedure (11.3.2). Results from audits and evaluations of compliance with legal requirements will be reported to site and senior management and subject to management reviews (Section 11.4.1).

11.3.2 Non-conformances and incident reporting

Non-conformances include the following:

- exceedances of relevant thresholds as identified during routine monitoring;
- non-conformances with the requirements of the EMP or supporting documentation identified during an internal inspection;
- non-conformances identified during an audit or by regulatory authorities, including legal non-conformances;
- events, such as spills, resulting in environmental harm;
- events that did or could result in risks to community health and safety; and
- significant complaints or grievances received from any source.

A process will be established for the identification, investigation and tracking of non-conformances, including:

- prioritising and classifying non-conformances based on the type and severity of the non-conformance;
- recording of non-conformances and the results of corrective and/or preventive actions, including the actions necessary to mitigate or remedy any associated impacts;
- defining results expected from the corrective and/or preventative actions;
- confirming the corrective and/or preventive actions taken to eliminate the causes of the non-conformance are appropriate to the magnitude of problem and commensurate with the impacts encountered;
- reviewing the effectiveness of the corrective and/or preventive actions taken; and
- implementing and recording required changes in the EMP or monitoring programme resulting from corrective and preventive action.

Serious non-conformances will be classified as incidents. Incidents will be promptly reported to appropriate management. MIOL will prepare a guideline on:

- the types of incidents reportable to internal management at the site, Project and corporate levels, as well as to regulatory authorities and other external stakeholders; and

- standards to be observed when reporting incidents.

The investigation of incidents and evaluation of effectiveness of existing controls and response actions will be undertaken at a level commensurate with the severity of the incident.

11.3.3 EMP and ESMS Reporting

Progress on compliance with the EMP will be reported to:

- Project site and MIOL senior management;
- regulatory authorities, as required; and
- affected communities and other stakeholders who have an interest in the Project (Section 11.5).

In addition, the formal audit reports on compliance with the EMP and the functioning of the ESMS will be made available to site and corporate management.

11.4 Act elements

11.4.1 Governance/ Management review

Project site management and MIOL senior management will review the EMP and ESMS on a periodic basis to determine its suitability, adequacy and effectiveness. Each management review will initiate a new plan-do-check-act cycle with enhancement of the ESMS and continuous improvements in environmental and social management performance. The management review will cover:

- progress and closure of actions from previous management reviews;
- monitoring programmes findings/ the extent to which objectives and targets have been met;
- findings of audits (Section 11.3.1);
- incidents and the status of corrective and/or preventative actions (Section 11.3.2);
- impact and risks assessments (Sections 11.1.3 and 11.4.2);
- changing circumstances, including changes to operations, Sierra Leone legislation or guidelines, ownership, socio-political circumstances (Section 11.1.2);
- legal compliance and compliance with other obligations (Section 11.1.2);
- stakeholder concerns, requests or complaints (Section 11.5);
- adequacy of policies, EMP, monitoring plans, support documents and overall functioning of the ESMS to meet operational and corporate requirements; and
- recommendations for improvement.

11.4.2 Management of change

Changes to the Project can be expected throughout the life of the Project. These can range from changes to operations and infrastructure, new developments (such as an expansion), changes to personnel and the Company, changes in legislation and changes to the environment of the Project (such as a new settlement established near Project infrastructure). These changes could result in changes to the significance of environmental and social impacts and risks, or identification of new aspects or impacts (Section 11.1.3). This may necessitate updates to existing authorisations/ permits, changes to the EMP (which may have to be approved by regulatory authorities), changes to supporting documentation including monitoring programmes and general changes to the ESMS framework.

A procedure for the management of change will be established and maintained by MIOL. This will:

- observe the corporate owners' requirements for the management of change;
- identify proposed changes that could alter environmental or social impacts and risks and/ or require new authorisations/ permits or changes to existing authorisations/ permits; and
- define the impact and risk assessments appropriate to different types of changes, which need to be undertaken by competent personnel.

Changes will not be made without the required authorisations/ permits in place. The measures identified as necessary to mitigate impacts and risks will be implemented. The various elements of the ESMS will be modified as required in response to the change,

A procedure specifically for changes to the policy/s, EMP, monitoring programmes and supporting documentation will be established. This will detail:

- how the changes are to be recorded;
- who has responsibility for overseeing changes and checking they do not conflict with any planning conditions or other obligations;
- the process of review and sign off in response to changes; and
- how changes to the EMP should be communicated internally and externally.

11.5 Stakeholder engagement

Stakeholder engagement provides stakeholders with opportunities to express their views on Project risks, impacts and impact mitigation measures and involves appropriate consideration of the views and responses by Project management (IFC 2012). Table 11-1 shows stakeholder engagement applies to each of the steps of ESMS "plan-do-check-act" cycle and is an integral part of several ESMS elements. The relationship between stakeholder engagement and these elements is explained further in Table 11-3.

MIOL will establish a programme of stakeholder engagement for the Project that builds on the consultation undertaken for the ESIA. This will continue throughout the life of the Project. When the Project enters the construction phase, and throughout the remaining life of the Project, stakeholder engagement will include:

- reporting on the implementation of the EMP and relevant supporting management plans;
- opportunities for stakeholders to respond to the information received; and
- constructive dialogue on environmental and social issues and performance.

The stakeholder engagement process will be documented, including:

- maintenance of a stakeholder database with stakeholder details;
- records of information disclosed to stakeholders;
- records of stakeholder engagements; and
- records of inputs from stakeholders and responses to these.

Table 11-3: Relationship between stakeholder engagement and the ESMS elements

Steps of the "plan-do-check-act" cycle	ESMS elements that stakeholder engagement is integral to	
	ESMS elements	**Role of stakeholder engagement**
Plan	ESIA	During the ESIA, the focus of stakeholder engagement has been the involvement of stakeholders in Project-planning and Project-approval decision-making processes. It facilitated identification of stakeholder's concerns so they could be addressed in the Project design and/or EMP. It forms the basis for stakeholder engagement throughout the life of the Project.
	EMP	Stakeholders will be involved in the review and approval of the preliminary EMP. Throughout the life of the Project, there should be ongoing reporting to stakeholders on progress in the implementation of the EMP and supporting management plans that are of interest to them. The EMP and supporting management plans may need to be revised in response to stakeholders' concerns.
Do	Communication	Communication with stakeholders will be required to implement some management actions. The communication will be required to raise awareness and/or co-operation of potentially affected communities and other stakeholders. MIOL will determine effective communication methods for making affected communities aware of actions they may need to take to avoid exposure to operation-related hazards and how they can maximise on opportunities resulting from the operation.
Check	Assessing, correcting and improving performance	Participatory monitoring is desirable. This entails involvement of stakeholders, particularly affected communities, in monitoring and verifying information to check that impact mitigation measures are appropriate.
		Grievances will be handled as incidents and managed through the incident procedure to enable the grievance to be received, documented, addressed and results fed back to the complainants. This procedure will protect the confidentiality of the persons raising the complaint, where necessary. The feedback will be easily accessible and understandable to members of the affected community and/or staff.
	Reporting	Stakeholders affected by the Project will be informed of progress in the implementation of the management plans and of the effectiveness of management measures.

11.6 Emergency preparedness and response

The Project will implement and maintain an Emergency Preparedness Response and Recovery Plan (EPR&R). The plan will be in place prior to construction. The purpose of the EPR&R is to provide a framework for a comprehensive system to:

- establish a process to identify potential emergency situations prior to their occurrence;
- take steps to prevent or minimize the impact of potential emergencies;
- train personnel to appropriately identify, report and respond to emergencies;
- provide and maintain emergency response resources and equipment to mitigate potential emergencies;
- define detailed procedural steps to respond and manage various types of potential emergencies;
- provide information to and consult with the surrounding community regarding environmental risks and response measures;
- co-ordinate with external emergency response organizations;
- test communications, emergency procedures and equipment on a periodic basis;
- contain, where practicable, any emergencies and their effects within Project site boundaries;

- safely return to normal operations following an emergency;
- identify the cause(s) of an emergency event and the corrective and preventative measure to avoid a reoccurrence; and
- review and update plans and procedures based on lessons learned from tests and responses to actual emergencies.

The EP&R will be prepared in accordance with:

- IFC Performance Standards (PS) PS3 Resource Efficiency and Pollution Prevention and PS4 Community Health, Safety and Security, which require that a plan is in place to effectively respond to emergencies associated with Project hazards and that local communities are involved in the planning process (IFC, 2012);
- WBG General EHS Guidelines, Volume 3 Community Health and Safety, Section 3.7 Emergency Preparedness and Response and the equivalent sections of the Sectoral EHS Guidelines relevant to the Project (WBG, 2007/8);
- United Nations Environment Programme (UNEP) guidelines for Awareness and Preparedness for Emergencies at Local Level (APELL), including the guidelines for mining (UNEP, 2001), port areas (UNEP and the International Maritime Organisation, 1996) and dangerous goods transport (UNEP, 2000); and
- the ICMM and UNEP guideline on good practice in emergency preparedness and response (2005).

For the purposes of the EPR&R, the term “emergency” will refer to an unplanned event when a Project operation loses control, or could lose control, of a situation that may result in risks to human health, property or the environment. The EPR&R will not cover safe work practices for frequent upsets or events, which will be covered by occupational health and safety plans.

The EPR&R will contain the following elements:

- **administration** (relevant policy, purpose, distribution, definitions, scope, criteria for triggering the EP&R, date and frequency of updates);
- **organisation of emergency areas** (for example command centres and medical stations);
- roles and responsibilities;
- **communication systems** (worker notification and communication, community notification, media contacts and media relations strategy);
- **emergency resources** (finance and emergency funds, fire services and medical services, mutual aid agreements provide a clear basis for response by mutual aid providers, contact list);
- **emergency equipment** (such as location of isolation valves, helicopters and equipment for fire fighting, toxicity testing, personal protection and pollution prevention equipment);
- training and drills;
- **updating** (to account for changes in equipment, personnel, and facilities);
- **checklists** (role and action list and equipment checklist);
- **business continuity and contingency** (including measures to allow business continuity following an emergency, back-ups of critical information in a secure location to expedite the return to normal operations following an emergency and alternative supplies of resources such as water); and
- **clean up** (options and procedures for clean-up following accidents);
- **emergency scenarios and risks** (identified scenarios, people and environments at risk,

maps of risk areas, locations of hazardous substances and properties of hazardous substances);

- **emergency response procedures for each emergency scenario** (with specific information on specific procedure triggers, response actions, equipment, relevant notification procedures, relevant communication procedures, alarm systems, relevant evacuation procedures, relevant media procedures, medical procedures, assessment, monitoring and recording of the progress of the accident, procedures for operational shut down if necessary, relevant procedures for clean-up, recording of actions taken to respond and de-activation of the procedure); and
- **review** (to identify missing or weak elements, consistency with any regional and national disasters plans and compliance with relevant legislation and codes).

The emergency scenarios covered by the EPR&R will be determined by means of risk assessments. Procedures will be developed for at least the following events:

- off-site chemical, oil or fuel spills;
- on-site chemical, oil or fuel spills;
- slope failure at the tailings storage facilities, waste rock facilities or mine workings;
- concentrate pipeline failure;
- emergencies arising from natural hazards such as earthquakes, sandstorms, extreme heat/cold, flash floods, monsoons, moving sand dunes, and extreme precipitation;
- security incidents such as lost contact/ missing person, sabotage or a threat to kill/injure employees;
- vehicle or equipment accidents;
- medical emergencies;
- fire; and
- blasting and explosives accidents.

The EPR&R will distinguish between two types of emergencies as follows:

- Type 1 – emergencies contained within Project site boundaries requiring use of MIOL's emergency resources, but not requiring external resources;
- Type 2 – emergencies not contained within the Project site boundaries and/ or requiring involvement of external resources.

Type 2 emergencies require application of relevant APELL guidelines. The primary goals of APELL are:

- to raise awareness of local communities living close to industrial activities on how to react if an accident happens; and
- to establish adequate coordination and communication in situations where the public might be affected by accidents and emergencies arising from natural hazards (such as floods).

APELL is a multi-stakeholder dialogue working through a stepwise process comprising the 10 steps listed in the textbox below.

The APELL process

- Step 1 – identify emergency response participants and establish their roles, resources and concerns;
- Step 2 – evaluate risks and hazards that may result in emergency situations in the community and define options for risk reduction;
- Step 3 – have participants review their own emergency plan, including communication for adequacy relative to a coordinated response;
- Step 4 – identify the required response tasks not covered by existing plans;
- Step 5 – match to resources available from the identified participants;
- Step 6 – make changes necessary to improve existing emergency plans, integrate them into an overall community plan and gain agreement;
- Step 7 – commit the integrated community plan to writing and obtain endorsement for it and relevant approvals;
- Step 8 – communicate final version of integrated plan to participating groups and ensure that all emergency responders are trained;
- Step 9 – establish procedures for periodic testing, review and updating of the plan; and
- Step 10 – communicate the integrated plan to the general community.

12 CONCLUSIONS AND OVERALL ASSESSMENT

This report documents the ESIA process undertaken on behalf of MIOL for the Marampa Iron Ore Project in the Marampa area of Sierra Leone. The ESIA has been prepared in accordance with the Environment Protection Agency Act No. 11 of 2008 (EPA Act 2008). The assessment of environmental and social impacts has been conducted in consideration of input received through a comprehensive stakeholder consultation process.

The Project is being developed by MIOL, and involves four open pits for mining of iron ore (in two Stages of development), the associated mining waste storage areas, haul roads, beneficiation plant and accommodation areas. Infrastructure for export of product, over and above that which will be transported via rail to Pepel port is excluded from this ESIA. Export of product through Tagrin Point will require additional infrastructure, which will be handled under an amendment to this ESIA, once the details thereof are known.

A Project of this scale has the potential to cause multiple impacts, both negative and positive. This report was prepared to inform decision-makers regarding the 'triple bottom line' (economic, environment and social) of the Project, by providing an objective and comprehensive analysis of the potential impacts and benefits. It has examined the Project design information and drawn on both available (secondary) and specifically collected (primary) baseline data (including local knowledge), as well as the discussions with stakeholders, to identify and evaluate environmental and socio-economic impacts of the proposed Project. This analysis has created a framework for the formulation of appropriate management measures.

This ESIA report incorporates the following components:

- an overview of the legal, regulatory and policy framework within which the Project has been developed and will operate (Chapter 2);
- a description of the ESIA process undertaken, including the associated stakeholder consultation processes (Chapter 3 and Appendix C);
- a description of the Project's activities and the associated environmental control measures that are inherent in the design, along with an overview of the alternatives considered by the Project team (Chapter 4);
- a description of the environmental and social setting of the Project (Chapters 5 and 6);
- an analysis of the potential environmental and social impacts and risks arising as a result of the Project along with the management measures necessary to prevent, minimise or optimise the impacts, as necessary (Chapters 7, 8 and 9, and Appendix F); an analysis of the potential cumulative impacts resulting from the Project (Chapter 10)
- a proposed environmental and social management system (ESMS) framework to enable the identified management measures to be successfully implemented and compliance evaluated (Chapter 11, and Appendix F).

The scope and timing of the various baseline studies undertaken to provide data for the impact assessment were developed and adapted to address the shifting focus of the Project design with regard to spatial extent and production capacity. Due to the relatively early stage of Project development, the Project description is based on the findings of the technical scoping study, rather than more detailed pre-feasibility or feasibility studies. This required certain assumptions to be made, particularly for the studies involving predictive impact modelling. These assumptions (as well as any limitations) are clearly stated in the discussions regarding the impact ratings concerned, and may have resulted in overly conservative impact

ratings for these impacts. The lack of specific detail regarding certain aspects of the Project description (such as use of explosives) is therefore not considered to compromise the integrity of the ESIA, provided any changes to the Project description (such as the inclusion of facilities for product export during Stage 2) are assessed via an amendment to this ESIA.

Although the ESIA is currently intended to meet in-country requirements only, it has been compiled with international standards in mind. Thus, wherever possible, data which may be required for an internationally compliant ESIA have been included (for example, additional seasonally dependent studies such as natural resource use and aquatic biodiversity). Additionally, wet season rounds of natural resource use and surface water hydrology studies are planned for Q3 of 2012.

The final phase of the ESIA process is regulatory review. As part of this process, this document will be made available to interested stakeholders in accordance with the Stakeholder Engagement Plan (Appendix C). Feedback received during this process will be provided to the regulatory authorities.

The ESMS presented in Chapter 11 is an adaptable tool, able to respond to changes and refinements in the Project description, as well as the social development plan. The robustness of the supporting management programmes, along with implementation, assurance and continual improvement functions, are fundamental to enabling the successful implementation of management measures by MIOL, its contractors and sub-contractors.

By its nature, impact assessment can disaggregate the effects of a Project and, although it is necessary to examine the significance of individual impacts, an overly intensive focus on such impacts can detract from a more holistic assessment. As a result, the potential cumulative impacts of the Project in its developmental environmental context have been examined in Chapter 10.

In association with Chapter 10, this concluding section aims to provide this more holistic view – a qualitative re-aggregation and synthesis of impacts, both negative and positive, which recognises the Project will result in some negative impacts, but that there will be significant social and economic benefits too.

A summary of the potential impacts is given in the Table 12-1 below, including the consequence and probability, as well as the overall significance and confidence rating. The significance is colour coded, with red indicating negative impacts and green positive. Where consequential mitigation or enhancement measures are proposed, the residual impact ratings are also given. For those impacts of potentially higher significance, mitigation measures are defined and committed to in order to lower their significance to acceptable levels; this is shown in the residual impact column. With the implementation of the mitigation measures listed in the individual impact rating tables (and summarised in the EMP in Appendix F), the significance of all negative impacts assessed is predicted to decrease to medium or low. As committed to in the Project's ESMS, these impacts will be reviewed periodically to determine if they are still relevant and if so whether the impact significance has changed.

Most of the Project's biophysical impacts are predicted to be of medium to low significance due to a combination of inherent design and natural mitigation. The most significant biophysical impacts are expected to relate to land transformation (affecting use of the land and access by local communities) and changes to surface water flow. Socioeconomic impacts of the Project are predicted to be wide ranging, and potentially significant, both positive and negative.

The Project's combined economic benefits to local communities as well as Sierra Leone as a whole, including increased employment, economic growth, infrastructure development, and direct and indirect fiscal receipts, will be significant (particularly with the recommended enhancement measures). The economic growth expected to result from the Project may have the potential to negatively affect some communities, particularly more vulnerable groups, but, in the majority of cases, will benefit the host communities.

Land acquisition and relocation of a number of villages (approximately 10) due to positioning of the Project infrastructure and impacts such as noise and dust emissions, will result in some negative impacts on local communities, particularly in terms of their livelihoods and access to natural resources, and, potentially, social order. Negative impacts on community health, safety and security, are predicted to be low to medium for communities other than those that will be relocated. However, the implementation of a resettlement action plan, agreed to by the affected stakeholders, has the potential to result in equal or potentially better situations for the affected people.

The overall conclusion of this ESIA is that the negative potential impacts assessed can be reduced to acceptable levels with effective mitigation and management measures, which MIOL is strongly committed to implementing. In addition, the positive economic development impacts of the Project can be expected to be significant, not only at the local and regional level, but also at the national level. For the local communities, this will be manifested in areas such as employment and resultant wealth generation; training and skills development; potential for enhanced government investment towards social development in the Project areas as a result of tax and royalties derived from the mining operation; and the stimulation of local economic growth in general as a result of Project generated opportunities for local suppliers and contractors. Finally, MIOL is committed to supporting community development, continuing to undertake stakeholder consultation and information disclosure, and monitoring the effectiveness of its environmental and social management programmes throughout the Project life cycle to international standards of implementation.

Table 12-1: Preliminary summary of environmental, socio-economic and health and safety impact ratings

Impact groups	Identified impacts	Significance rating		Confidence
		Initial impact	Residual/ enhanced impact	
Biophysical Impacts				
Land transformation	**Impact LT1:** Change in land use as a result of mine and related infrastructure limiting use by local communities	Refer to Impact RL1		
	Impact LT2: Disruption of community access routes by mine infrastructure, resulting in social disruption	Refer to Impact RL2		
	Impact LT3: Mine infrastructure and activities resulting in visual intrusion and loss of 'sense of place' for local communities	MEDIUM	LOW	Medium
	Impact LT4: Loss of topsoil through erosion, decreasing land capability	MEDIUM	LOW	High
	Impact LT5: Fugitive dust resulting in changes in soil chemistry and agricultural land capability	MEDIUM	LOW	Medium
Water resources	**Impact WR1:** Pit dewatering potentially resulting in reduced groundwater availability to ecological systems and local communities	MEDIUM	LOW	Low
	Impact WR2: Surface water abstraction affecting downstream users	LOW	No Residual Impact	High
	Impact WR3: Project infrastructure causing altered flow conditions, affecting downstream users	HIGH	MEDIUM	Medium
	Impact WR4: Surface water diversions potentially causing changes to flood risk to adjacent agricultural areas and communities	LOW	No Residual Impact	Medium
	Impact WR5: Seepage from mining wastes potentially resulting in deteriorated water quality affecting communities and ecological systems	LOW	No Residual Impact	Medium
	Impact WR6: Discharge or runoff to surface water potentially resulting in deteriorated water quality affecting communities and ecological systems	MEDIUM	LOW	High
Ecology and biodiversity	**Impact EB1:** Site clearance and positioning of Project infrastructure potentially resulting in habitat loss and fragmentation, and direct loss of fauna and flora	MEDIUM	LOW	Medium
	Impact EB2: Soil disturbance facilitating the establishment and spread of invasive species, affecting indigenous ecosystems	MEDIUM	LOW	High
	Impact EB3: Project activities potentially resulting in sensory or other disturbance to wildlife	LOW	No Residual Impact	High
	Impact EB4: Mine infrastructure and activities attracting nuisance species, resulting in impacts on indigenous ecosystems	LOW	LOW	Medium

Impact groups	Identified impacts	Significance rating		Confidence
		Initial impact	Residual/ enhanced impact	
Socio-economic Impacts				
Economic development	**Impact ED1:** Employment generation by the Project resulting in increased standard of living for the local community	MEDIUM	HIGH	High
	Impact ED2: Employee training leading to skills development in the local community	MEDIUM	HIGH	Medium
	Impact ED3: Increase in government income (from taxes and royalty on mining) potentially leading to social development in the Project area	LOW	MEDIUM	Low
	Impact ED4: Opportunities for local suppliers and contractors leading to economic growth	LOW	MEDIUM	Medium
Resettlement and loss of land and social and natural resources	**Impact RL1:** Impoverishment through loss of shelter, land and communal natural resources	HIGH	MEDIUM	High
	Impact RL2: Changes to community as a result of the Project potentially affecting livelihoods, access to communal social services and infrastructure and community cohesion	HIGH	LOW	Medium
	Impact RL4: Added pressure on limited host community resources, potentially resulting in food insecurity and malnutrition	Impact not rated as it is dependent on the characteristics of the host community, which has not yet been decided.		
Social order	**Impact SO1:** Influx of job seekers causing increased pressure on government services and infrastructure, potentially resulting in reduced standard of living	MEDIUM	LOW	Medium
	Impact SO2: Increase in social ills/problems	MEDIUM	LOW	Medium
	Impact SO3: Real or perceived unequal distribution of Project benefits leading to social tension	HIGH	MEDIUM	High
Cultural heritage	**Impact AC1:** Disturbance to sacred bushes and cemeteries leading to loss of community's access cultural resources	HIGH	LOW	High
Decom-missioning and closure	**Impact DC1:** Closure of mine leading to economic decline	HIGH	MEDIUM	Medium
Community health, safety and Security Impacts				
Air quality	**Impact AQ1:** Dust emissions causing nuisance and health impacts on local communities	MEDIUM	LOW	Medium
Noise and vibrations	**Impact NV1:** Blasting causing air overpressure and vibrations, resulting in disturbance of local communities	LOW	No Residual Impact	Low
	Impact NV2: Operation of mining equipment and vehicles resulting in increase in background noise levels for local communities	LOW	No Residual Impact	Medium
Traffic safety	**Impact TS1:** Increase in Project-related traffic on local and national roads causing increased wear and tear and risk of road accidents	MEDIUM	LOW	Medium
	Impact TS2: Use of mine site roads by local communities causing increased safety risks due to road accidents	MEDIUM	LOW	Medium

Impact groups	Identified impacts	Significance rating		Confidence
		Initial impact	Residual/ enhanced impact	
Social risks	**Impact SR1:** Risk of human rights abuses due to conflict with communities	HIGH	LOW	High
	Impact SR2: Increased exposure to communicable diseases due to an influx of workers, resulting in a deterioration in public health	MEDIUM	LOW	Medium
Other hazards potentially resulting in injury				
Hazards	**Impact OH1:** Blasting resulting in fly rock potentially harming people or their belongings	Because of the number of variables affecting the consequence and probability of such events, accurate significance rating of possible impacts should the risk materialise is not possible. Each event must be evaluated on an individual basis		
	Impact OH2: Community exposure to toxic or hazardous substances			
	Impact OH3: Fire or explosions due to storage of explosives and use of combustible materials			
	Impact OH4: Failure of the TSF resulting in pollution or harm to individuals			

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Glossary

TERM	EXPLANATION
Aquifer	An underground layer of water-bearing permeable rock, or unconsolidated materials (gravel, sand, silt, or clay) from which groundwater can be usefully extracted using a water well.
Background or baseline conditions	The level or concentration of the substance or compound being measured, prior to additional activity.
Baseline data	Data gathered during the Social and Environmental Assessment used to describe the relevant existing conditions of the project, such as physical, biological, socio-economic, and labour conditions, including any changes before the project commences.
Bioaccumulation	Means to accumulate in a biological system and is commonly taken to measure the uptake over time of a substance, called a bioaccumulant, that can accumulate in a biological system
Biodiversity	An integrating concept that includes the ecosystems within which the people of the world live, as well as the multitude of species that are used by humankind for food, fibre, medicines, clothing and shelter. Biodiversity is the variety of life in all its forms, including genetic, species and ecosystem diversity.
Catchment	The total area from which a river or waterway collects surface water runoff.
Consultation	Consultation involves two-way communication between the client and the affected communities. The consultation process should be undertaken in a manner that is inclusive and culturally appropriate and that provides the affected communities with opportunities to express their views on projects risks, impacts and mitigations measures, and allows the client to consider and respond to them. The consultation process will ensure free, prior and informed consultation.
Cultural heritage	A unique and non-renewable resource that possesses cultural, scientific, spiritual or religious value and includes moveable or immoveable objects, sites structures, groups of structures, natural features, or landscapes that have archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values, as well as unique natural environmental features that embody cultural values, such as sacred groves.
Cumulative impacts	Impacts associated with the proposed project in combination with the impacts of other past, existing and proposed developments in the area.
Deposit	An anomalous occurrence of a specific mineral or minerals within the earth's crust
Downstream	The direction toward which groundwater is moving under natural conditions: from higher to lower piezometric heads
Effluent	Wastewater (treated or untreated) that flows out of a treatment plant, sewer, or industrial outfall; generally refers to wastes discharged into surface waters.
Endangered species	Species that are under threat of extinction.
Environmental impacts	Are the consequences of project activities or aspects on environmental resources or receptors of particular value or sensitivity.
Fault	A planar rock fracture which show evidence of relative movement
Feasibility study	A definitive engineering study addressing the economic viability of bringing a deposit to the production stage; taking into consideration all associated costs, revenues and risks
Geomorphology	The scientific study of landforms and the processes that shape them.
Greenhouse gases (GHGs)	The six greenhouse gases that form the Kyoto Protocol to the United Nations Framework Convention on Climate Change i.e. Carbon Dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_20), Hydro fluorocarbons (HFCs),

TERM	EXPLANATION
	Perfluorocarbons (PFCs), Sulphur hexafluoride (SF_6). Some greenhouse gases occur naturally in the atmosphere, while others result from human activities.
Groundwater	The part of the subsurface water that is the zone of saturation, including underground streams
Groundwater table	The level below the earth's surface at which the ground becomes saturated with water. The water table is set where hydrostatic pressure equals atmospheric pressure
Hazardous waste	Substances classified as hazardous wastes possess at least one of four characteristics- ignitability, corrosivity, reactivity, or toxicity - or appear on special lists.
Information disclosure (also Public Disclosure)	The process of providing information to the affected communities and other stakeholders that is timely, accessible, understandable, and in the appropriate language(s). For projects with potential adverse impacts, information on the purpose, nature and scale of the project, the duration of proposed project activities, and any potential risks to and potential impacts on such communities should be included.
Infrastructure	The supporting installations and services that supply the needs of the project.
Land capability	The ability of the land to support a particular land use. Classification is based on an assessment of the land's biophysical characteristics, the extent of which these will limit particular land uses, the current management technology available and soil erosion hazard.
Leachate	The liquid that can appear from beneath waste rock or ore/tailings deposits. Leachate can sometimes contain dissolved minerals, metals or chemicals leached out of ore, rock or soils.
Local community	Community within a project's area of influence.
Mitigation measures	The measures attempting to prevent hazards from developing into disasters altogether, or to reduce the effects of disasters when they occur
Open pit	Mine excavation produced by quarrying or other surface earthmoving equipment.
Ore	Accumulation of minerals containing a substance which can be economically recovered.
Ore body	The column of rock contained the mineral resource
Permeability	Degree to which fluids can move through rock or soil.
Pollution	Refers to both hazardous and non-hazardous pollutants in the solid, liquid, or gaseous forms, and is intended to include other forms such as nuisance odours, noise, vibration, radiation, electromagnetic energy, and the creation of potential visual impacts including light.
Pre-feasibility Study	The initial stage of the feasibility study in which the accuracy of the factors involved such as costs and revenues is ± 25%.
Receptors	Comprise people or human-made systems, such as local residents, communities and social infrastructure.
Resources	Components of the biophysical, socio-cultural and economic environment that can be used for some purpose.
Run-off	That part of precipitation, snow melt, or irrigation water that drains or flows off the land into streams or other surface waters
Seepage	The escape of liquids downward through the soil
Significance of impact	The significance of the unmanaged and managed impacts taking into consideration the probability of the impact occurring, the extent over which the impact will be experienced, and the intensity/severity of the impact.
Stakeholder	A person or group that has an investment, share, or interest in something, as a business or industry.

TERM	EXPLANATION
Stakeholder engagement	Engagement is an on-going process involving disclosure of information, consultation with affected communities, and the establishment of a grievance mechanism.
Tailings	Material rejected from treatment plant after the recoverable valuable minerals have been extracted.
Waste rock	Rock excavated from pit, no longer required and placed in a waste pile
Working conditions	Conditions in the workplace and treatment of workers. Conditions in the workplace include the physical environmental, health and safety precautions and access to sanitary facilities. Treatment of workers includes disciplinary practices, reasons and process for termination of workers and respect for the worker's personal dignity.

Abbreviations

AML	African Minerals Limited
ANFO	Ammonium nitrate-fuel oil
ANZECC	Australian and New Zealand Environmental Conservation Council
ARPS	African Railways and Port Services Ltd
ARDML	Acid Rock Drainage Mineral Leaching
Bateman	Bateman Engineering Pty Ltd – authors of the Mining Scoping Study
BID	Background Information Document
Cape Lambert	Cape Lambert Resources Limited
CBO	Community Based Organisation
DELCO	Sierra Leone Development Company Ltd
DoE	Department of Environment
EHS	Environmental, Health and Safety
EMP	Environmental Management Programme
EPA	Environmental Protection Agency (also known as SLEPA)
EPCM	Engineering, Procurement and Construction Management
EPR&R	Emergency Preparedness, Response and Recovery Plan
ESIA	Environmental and Social Impact Assessment
ESMS	Environmental and Social Management System
ESS	Environmental Scoping Study
FEL	Frontend Loader
GDP	Gross Domestic Product
GIIP	Good International Industry Practice
GoS	Government of Sierra Leone
HDPE	High Density Polyethylene
HEC-RAS	Hydrologic Engineering Centre's River Analysis System
HFO	Heavy Fuel Oil
IFC	International Finance Commission
IFC PS	International Finance Corporation Performance Standards on Social and Environmental Sustainability
London Mining	London Mining plc
MCC	Motor Control Centre
MIOL	Marampa Iron Ore Limited
MLCPE	Ministry of Lands, Country Planning and the Environment
MMR	Ministry of Mineral Resources

NACEF	National Environmental and Forestry Commission
NAF	Non Acid Forming
NAG	Net Acid Generation
NGO	Non-government Organisation
PAP	Project Affected People
QA/QC	Quality Assurance / Quality Control
ROM	Run of Mine
RWG	Resettlement Working Group
SD	Supporting Document
SEP	Stakeholder Engagement Plan
SLEPA	Sierra Leone Environmental Protection Agency (also known as EPA)
SRK	SRK Consulting (UK) Ltd
ToR	Terms of Reference
TSF	Tailings Storage Facility
UNEP	United Nations Environment Programme
WHIMS	Wet High Intensity Magnetic Separation
WHO	World Health Organisation
WRD	Waste Rock Dump

Units

Mt	Million metric tonnes
Masl	Metres above sea level
Mtpa	Million metric tonnes per anum
Mbgl	Metres below ground level
Ha	Hectares
bcm	Bank cubic metre
kt	Kilo tonne
µm	Micrometres
kV	Kilovolts
MW	Megawatt
°C	Degrees Celcius

APPENDIX A

A SUMMARY OF APPLICABLE LEGISLATION AND INTERNATIONAL GUIDELINES

Appendix A: Relevant Legislation and International Standards

1 INTRODUCTION

This appendix outlines legislation, standards and codes of practice influencing the approach to the ESIA for the Marampa Project and will continue to influence management practices throughout the life of the project. The focus is on legal instruments and guidelines applicable to biological, physical and social dimensions of the environment and sustainable development. Relevant legislation in Sierra Leone is outlined in Section 2. The influences and obligations arising from international law, standards and codes of practice are considered in Section 3.

2 NATIONAL LAW

This section identifies legislation relevant to the environment (Section 2.1) and then focuses on the regulatory framework for environmental management in Sierra Leone, including relevant environmental impact assessment (EIA) legislation and guidelines (Section 2.2) and environmental provisions in mining legislation (Section 2.3). It also provides brief background on the status of legislation pertaining to use of forest resources, water resources, and land resources (Sections 2.4, 2.5 and2.6, respectively).

2.1 Introduction and overview

Since Sierra Leone's emergence from the civil war in 2002, much effort is being directed into the reform of law to improve governance and promote security, peace and development. All legislation pertinent to resources such as minerals, water and land is under review. The revisions are generally being made to promote good governance and address the lack of institutional capacity and monitoring mechanisms. The revisions are also geared to encourage foreign and local investment and development that will be socially and economically beneficial for the country. Furthermore, the revisions are being undertaken to meet the requirements of the many international treaties that Sierra Leone has signed in the last decade.

A summary of current legislation pertinent to the environment and to sustainable development needing to be taken into account in the planning and implementation of the Marampa Project is listed in Table 2-1.

Table 2-1: Sierra Leone legislation pertinent to the environment and sustainable development of the Marampa Project

Primary subject	Policy	Legislation
Environment and sustainable development	National Environmental Policy (1994)	• The Environment Protection Agency Act, 2008 (No. 11 of 2008)
Mineral resources and mining	Core Mineral Policy of the Government of Sierra Leone (2008)	• National Reconstruction and Development Act, 1999 (No. 5 of 1999) • Mines and Minerals Act,1994
Water	National Water and Sanitation Policy (August 2008)	• The Water (Control and Supply) Act, 1963 • Sierra Leone Water Company Act, 2001 (No. 6 of 2001)
Biodiversity and biological resources	National Biodiversity Strategy and Action Plan (developed in accordance with the requirements of the	• Wildlife Conservation Act, 1972 (No. 27 of 1972)
Forestry		• Forestry Regulations, 1989 (P.N. No. 17 of 1990) • Forestry Act, 1988

Primary subject	Policy	Legislation
Fishing and marine resources		• Sierra Leone Fisheries (Management and Development) (Amendment) Act, 2007 (No. 10 of 2007) • Fisheries Regulations, 1995 • Fisheries (Management and Development) Decree, 1994 • Fisheries (Amendment) Regulations, 1994 (P. N. No. 4 of 1994) • Fisheries Management and Development (Amendment) Act, 1992 (No. 7 of 1992) • Fisheries Regulations, 1990 (Public Notice No. 15 of 1990) • Fisheries Management and Development (Amendment) Act, 1990 (Act No. 9 of 1990) • Fisheries Management and Development Act, 1988 (Act No. 4) • Fisheries (Operation of Foreign Motor Fishing Vessels) Regulations, 1985 (P.N. No. 1 of 1986)
Land	National Lands Policy (2005)	• Devolution of Estates Act, 2007 (No. 21 of 2007) • Land Commission Act (not promulgated yet) • Commercial Lands Act (not promulgated yet)
Radiation		• Protection from Radiation Act, 2001 (No. 14 of 2001)
Occupational environment		• The Factories Act, 1974 (1974)
Local government		• Local Government Act, 2004 (2004): An Act which provides for decentralisation and devolution of functions, powers and services to local councils.

2.2 Legislative and regulatory framework for environmental management

2.2.1 National Environmental Policy

A National Environmental Policy was developed for Sierra Leone in 1994. The goals, objectives and strategies of the policy are outlined in Table 2-2.

Table 2-2: Outline of the National Environmental Policy

Aspect	Commitments
Goal	• To achieve sustainable development in Sierra Leone through sound environmental management.
Objectives	• To secure for all Sierra Leoneans a quality of environment adequate for their health and well being; • To conserve and use the environmental and natural resources for the benefit of present a future generations; • To restore, maintain and enhance the ecosystems and ecological processes essential for the functioning of the biosphere; to preserve biological diversity and the principle of optimum sustainable yield in the use of living natural resources and ecosystems; and • To raise public awareness and promote understanding of the essential linkages between environment development and to encourage individual and community participation in environmental improvement efforts.
Strategies	• To establish and/or strengthen environmental protection standards, monitor changes in, and publish relevant data on, environmental quality and resource use; • To promote prior EIA of proposed activities which may significantly affect the environment or use of a natural resource and to provide relevant information, in a timely manner, to persons likely to be significantly affected by a planned activity and to grant them equal access and due process in administrative and judicial proceedings; and • To promote environmental management through the creation of administrative and infrastructural support with appropriate financial backing; • To cooperate in good faith with other countries and agencies to achieve optimal use of transboundary natural resources and effective prevention or abatement of transboundary environmental protection.

2.2.2 Government agencies responsible for the environment

The Environment Protection Agency Act (No. 11 of 2008), promulgated in September 2008, provides for the establishment of an Environment Protection Agency (EPA). The EPA will take over responsibility for environmental matters from other institutions that have held these responsibilities in the last decade. These institutions are:

- the Department of Environment (DOE), within the Ministry of Lands, Country Planning and the Environment (MLCPE);
- the National Environment Protection Board; and
- the National Environmental and Forestry Commission (NACEF), which was established in 2005 by the President (President Ahmad Tejan Kabbah), and which was later referred to as the Environment Commission (according to the National Water and Sanitation Policy, published by the Ministry of Energy and Power, August 2008).

The responsibilities of the DOE and National Environmental Protection Board were defined in the Environment Protection Act (No. 2 of 2000), which was repealed with the promulgation of the EPA Act 2008. It is understood NACEF/ the Environment Commission was a precursor to the EPA. The administrative staff and structures of the DOE were reported to function within the NACEF/ Environment Commission framework in 2008 (University of Sierra Leone, 2008).

In terms of the new EPA Act 2008 (Sections 3 to 5 and 13), the governing body of the EPA is a Board of Directors, which comprises a chairman and senior representatives of several ministries with an interest in environmental matters, three people knowledgeable in commence, finance and law, and the Executive Director of the EPA. The Board has control and supervision of the EPA and is responsible for ensuring efficient implementation of the functions of the EPA. The EPA is not subject to the direction or control of any person or authority other than the EPA Board.

The Act names the ministries to be represented on the EPA Board[1] as follows: Ministry of the Environment; Ministry of Local Government; Ministry of Mineral Resources; Ministry of Marine Resources; Ministry of Agriculture and Forestry; Ministry of Tourism; Ministry of Trade and Industry; Ministry of Transport; Ministry of Health; and Petroleum Unit.

The EPA is required to advise “the Minister” on the formulation of policies on all aspects of the environment, co-ordinate the activities of bodies concerned with the environment and serve as a channel of communication between such bodies and the Minister. The Act defines “the Minister” as “the Minister charged with responsibility for the environment”. It also states “the Ministry shall be construed accordingly”.

Additional functions of the EPA are to:

- ensure compliance EIA procedures;
- issue environmental permits, pollution abatement notices, directives, procedures and warnings;
- prescribe environmental standards and guidelines;

[1] *The titles of the named Ministries are not the same as the official names of the equivalent ministries. For example, at present there is no “Ministry of Environment” and no “Ministry of Agriculture and Forestry”. In addition, there is no reference to a water authority.*

- co-ordinate the activities of such bodies as it considers appropriate for the purposes of controlling waste handling and disposal;
- collaborate and coordinate with such foreign and international bodies;
- coordinate with Government Ministries, local councils and other agencies on matters relating to environmental protection and management;
- promote studies, research for protection of the environment;
- develop a comprehensive database on the environment; and
- promote public awareness of the environment and its importance.

2.2.3 The Environment Protection Agency Act (No. 11 of 2008)

The EPA Act 2008 forms the legal basis for environmental management and protection in Sierra Leone. The Act states the term "environment" applies to the biophysical and social components of the environment[2]. As outlined in the above section, the EPA Act provides for the establishment of an EPA, which has a wide range of environmental management functions including coordination of the activities of government agencies and other agencies on matters relating to environmental protection and management.

The Act also requires that licences are obtained for projects with potential to have significant impacts. No project of the type listed in the First Schedule of the Act may be undertaken without an environmental impact assessment (EIA) licence. The Act charts the procedure to obtain an EIA licence briefly, with emphasis on the responsibilities of the EPA and the EPA Board, as outlined in Section 2.2.4.

Transfer of EIA licences is not automatic according to Section 35 of the Act. If there is a change in ownership of the project, both the previous owner and the new must notify the EPA of the change. The EPA will transfer the licence to the new owner subject to endorsement of the licence conditions by the new owner.

The EPA is required to monitor projects for which licences have been issued, in terms of Section 37 of the Act, in order to determine their effect on the environment and ascertain compliance with the Act.

The Board can make regulations, in terms of Section 62 of the Act, to facilitate implementation of the Act. These regulations can cover subjects such as financial security to be maintained in respect of specified activities and standards, guidelines or methods for preventing or minimising pollution.

A significant portion of the Act (Sections 40 to 52) deals with the control of ozone-depleting substances.

2.2.4 EIA procedure specified in the EPA Act 2008

SRK understands the main steps in the procedure are as follows:

- An application must be made to the EPA for a licence, accompanied with a description of the proposed project;
- The EPA will decide (within 14 days) whether an EIA is required;
- If required, the applicant should then prepare an EIA;

[2] *The EPA Act 2008 explains that the term "environment" includes "land, air, water and all plants, animals and human beings living therein and the inter-relationship which exists among these."*

- On receipt of the EIA report, the EPA will circulate it to professional bodies or associations, Government Ministries and non-governmental organisations (NGOs) for review;
- The EPA will also open the EIA report for public inspection and comment and will notify the public of this in two issues of the Gazette (consecutive issues) and two issues of a newspaper (with an interval of at least seven days between the publications);
- The EPA will submit the comments on the EIA, together with the EIA report, to the Board;
- If the Board approves the EIA, it will instruct the Executive Director of the EPA to issue an EIA licence;
- The EPA will issue a licence to undertake the activity/ project. The licence will have a period of validity and contain conditions for the protection of the environment.

The EIA licence procedure presented in the EPA Act 2008 is the same as that presented in the now repealed Environment Protection Act 2000, except the agencies responsible for implementation of the EIA provisions have changed.

2.2.5 Guidelines on EIA procedures

Guidelines on EIA procedures were published by the Ministry of Lands, Country Planning and the Environment (MLCPE) in July 1999. The same guidelines were re-issued by the MLCPE in July 2002. The guidelines were originally intended to facilitate implementation of the EIA provisions in the old Environment Protection Act 2000 and are considered by the MCLPE to be valid for the EIA provisions in the new EPA Act, 2008. The guidelines are summarised in Table 2-3, with emphasis on the relative responsibilities of the developer and the EPA.

The guidelines assign considerable responsibility to the EPA[3] for the EIA process including responsibility for formulation of the EIA terms of reference (TOR) and for key public consultation activities. Usually (in most countries) responsibility for such tasks are assigned to the developer.

References to public consultation during the EIA process are sparse in the EIA guidelines. The various references are listed below:

- The EIA process is consultative at all stages as it requires welcomed input from all segments of society (Section 2 of the ESIA Procedures);
- In line with the transparent and consultative principles of the EIA process, the developer is required, after the EPA has decided the project requires an EIA, to inform the public about and make representations to the EPA on the project. The EPA determines the most appropriate means of public notification in each case (Section 3.1 of the ESIA Procedures).
- At the time of submission of the Draft environmental impact statement (EIS) for review, the developer should make the Draft EIS available for public review and make the necessary advertisements and arrangements for this (Section 3.4 of the ESIA Procedures).

[3] *The guideline actually refers to the DOE (and the Environment Protection Department/ Director of this department) rather than the EPA.*

- The EPA must prepare a Review Report that collates comments on the Draft EIS, (Section 3.4 of the ESIA Procedures).
- The EPA must keep a register of the EIS, all related comments and decisions for public reference and scrutiny (Section 3.7 of the ESIA Procedures).
- The public have a role in environmental auditing – members of the public are encouraged to step forward to inform the EPA of environmental offences and the EPA must investigate these and take action (Section 3.8.3 of the ESIA Procedures).
- The Technical/Working Group is composed of representatives from the private sector, non-governmental organisations (NGOs), community groups, as well as a wide range of government entities. The Technical/ Working group ensures different views are heard and collaboration is encouraged (Section 2 of the ESIA Procedures).

Table 2-3: Sierra Leone EIA Procedures (MCLPE, 1999 and 2002)

EIA steps and purpose	Developer and EIA team		EPA[4]	
	Task	**Deliverable**	**Task**	**Deliverable**
Screening To determine whether the project will have significant impacts and if a full EIA process is required	Complete a standardised project brief using the Screening Form (Annex 2, EIA Procedures) and submit to the EPA (note that the MMR[5] must be involved).	Completed screening form	Based on the information in the screening form, a systematic review is undertaken by the EPA to determine whether an EIA is required.	The Executive Director of the EPA informs the developer of the decision taken.
			The EPA takes a decision on required level of public notification.	Unspecified
Tasks under the heading of "screening" in the EIA Procedures, but could be classified as "EIA scoping" tasks.	Developer is required to inform the public about and make representations to the EPA on the project	Unspecified		
	A preliminary study or series of investigations may be undertaken to identify issues that need to be addressed in the full EIA.	Unspecified		
EIA Scoping To determine the scope of the EIA			A scoping meeting is convened to identify issues of importance to decision makers. Members of affected community may be invited to the meeting. The developer and its consultant shall be invited to meeting. The Terms of Reference (TOR) for the EIA are prepared by a Working Group constituted by the EPA – comprising government administrators and the developer.	Approved TOR for the EIA
EIA	Conduct studies of issues in accordance with the approved TOR. Produce an draft environmental impact statement (EIS)	Draft EIS[6]	Initial check of the Draft EIS by the Executive Director of the EPA to ensure it is ready for review.	

[4] The guideline actually refers to the DOE (and the Environment Protection Department/ Director of this department) rather than the EPA
[5] The MMR is the "Lead Sectoral Ministry (LSM)" in terms of the EIA Procedures (MLCPE, 1999 and 2002). When the developer initiates discussions with the MMR, the MMR must inform the developer of the prescribed EIA procedures. The MMR is obliged to forward the developer's completed Screening Form to the EPA.
[6] According to the EIA Procedure (MLCPE, 1999 and 2002), the EIS is referred to a Draft EIS initially because it represents findings and views of the developer. When the EIS has been approved, it is referred to as a Final EIS

EIA steps and purpose	Developer and EIA team		EPA[4]	
	Task	**Deliverable**	**Task**	**Deliverable**
Review of the EIS		Up to 15 copies of the Draft EIS	Review of the Draft EIS by the EPA and Working Group[7]. Review process may not exceed 90 days.	Reviewers may request additional information
	Developer makes the Draft EIS available for public review and advertises this to the public		The EPA opens the Draft EIS for public inspection and comment [8]and gives notice in two consecutive issues of the Gazette and two issues of a newspaper (with an interval of at least seven days between the publications). The Working Group and members of the public consulted should forward written comments to the EPA. EPA compiles a Review Report for the Working Group/ Board[9]. This report collates the comments of all recipients of the Draft EIS and also comments from members of the public.	Review Report containing comments on the EIS
Public hearing	The EPA and/or the developer may decide to convene a public hearing if there is sufficient opposition to the project.		The EPA will co-ordinate the public hearing and the Board will appoint a mediator.	Record of the public hearing
Environmental approval			EPA issues environmental approval when satisfied that the proposed mitigating measures will effectively reduce the environmental risk.	Environmental approval, with or without conditions
	Incorporate the Environmental Approval into the EIS	Final EIS (3 copies to the EPA)		
	Notify the general public of the final decision through public notice such as newspapers		Keep a register of the EIS, all related comments and decisions for public reference and scrutiny.	
Environmental auditing	Submit monitoring reports to the EPA in accordance with commitments in the monitoring and evaluation section of the EIS. If the project is out of compliance with environmental regulations, implement remedial measures. Submit environmental management records to the EPA.		Carry out periodic audits of each project to ensure that all agreements that were made and conditions of approval are being implemented.	

[7] The new EPA Act 2008 refers to professional bodies, Government Ministries and NGOs rather than a "Working Group".
[8] The guidelines on EIA procedure suggest that the developer makes the EIA available for public review and the Act states that EPA is responsible for this.
[9] The new Act 2008 requires that comments go to the EPA Board.

2.3 Environmental management provisions in mining legislation

The Ministry of Mineral Resources (MMR) controls mining and mining-related matters by means of the Mines and Minerals Act 2009. Provisions in this Act that are pertinent to environmental and social management in general and to the ESIA for the Marampa Project are identified Table 2-4. The Act repeals the Mines and Minerals Act 1994. A key feature of the new Act is that it directly addresses environmental protection, community development and health and safety and it makes performance in all of these areas a condition for obtaining and keeping a mineral rights licence

Table 2-4: Provisions in the Mines and Minerals Act 2009 pertinent to environmental and social impact assessment and management

Subjects	Key provisions	Relevant sections
	General	
Types of mineral rights	The Act distinguishes the following mineral rights: • a reconnaissance licence; • an exploration licence; • an artisanal mining licence; • a small-scale mining licence; and • a large-scale mining licence.	Article 22
Surrender, suspension and cancellation of mineral rights	The Act specifies the processes and conditions under which a mineral right can be suspended and/or cancelled. The Minister may suspend or cancel a mineral right if the mineral right holder: • grossly violates health and safety regulations or causes environmental harm; • employs child labour; • fails to submit required reports; • violates any provision of the Act; • fails to substantially comply with the terms of the community development agreement.	Articles 50 to 55
	Relationship between mineral rights and surface rights (Part V, Articles 32 to 38)	
Written consents required from authorities	The Act restricts the mineral right holder to exercise their rights on the following without a consent from the responsible authority: • land dedicated for public purposes (such as cemeteries, parks and roads); • land reserved for a railway, highway or waterway; • land within 200 m metres of any township.	Article 32
Written consents from landowners/ occupiers	To exercise mineral rights, the holder of a mineral right must obtain written consent from the landowners/ occupiers for: • land dedicated as a place of burial or which is a place of religious or cultural significance; • land on or within 200 metres of any inhabited, occupied or temporarily unoccupied dwelling; • land within 50 metres of land which has been cleared or ploughed for agriculture including the growing of crops; • land within 100 metres of any cattle dip, tank, dam, or other body of water. The Minister may judge consent is being unreasonably withheld and allow the holder of a mineral right to exercise those rights.	Article 32
Rights to graze stock and cultivate land	The Act makes provisions for rights to graze stock and cultivate land as long as this activity does not interfere with the use of the area for mining operations.	Article 33
	No holder of a mineral right shall create unprotected pits, hazardous waste dumps or other hazards that may endanger the stock, crops or other activity of the land owner or occupier.	Article 33
Surface lease agreements	The Act requires mining companies to enter into surface lease arrangements with the Government or landowners. If agreement cannot be reached between the parties, the Minister may determine the agreement upon the advice of the Minerals Advisory Board.	Article 34
Compensation	The Act provides for payment of fair and reasonable compensation for disturbances foreseen by operations and damage done to the surface of the land. If the holder of a mineral right fails to pay compensation when demanded, or if the owner/occupier of the land is dissatisfied with any compensation offered, such compensation may be determined by the Minister on the advice of the Minerals	Articles 35 to 37

Subjects	Key provisions	Relevant sections
	Advisory Board.	
Resettlement	The Act introduces an explicit sub-section on the right to resettlement for affected parties by clarifying the rights and responsibilities of communities and mining companies.	Article 38
	Large-scale mining licences (Part XII, Articles 105 to 119)	
An application for a large-scale mining must include environmental and social information	An application for a large-scale mining licence must include the following environmental and social information: • proposals for the progressive reclamation and rehabilitation of land disturbed by mining; • effects of the mining operations on the environment and on the local population and the proposals for mitigation, compensation and resettlement measures; • a list of interested and affected parties including land owners and occupiers of the area; • details of consultation with interested and affected parties; • a report on the goods and services required for the mining operations which can be obtained within Sierra Leone; • proposals for the employment and training of citizens of Sierra Leone; • proposals for insurance cover including health and life insurance cover for employees; and • an environmental impact assessment licence for the project and an environmental management programme (EMP).	Article 106
Terms and conditions of the licence	The following will be appended to the large-scale mining licence as binding obligations on the licence holder: • the programme of mining operations approved by the Director; • a certified copy of the agreement between the applicant and the owners of the land over which the large-scale mining licence is granted; • particulars of the programme for the employment and training of citizens of Sierra Leone; • a certified copy of the approved EMP; and • particulars of the applicant's proposals with respect to the procurement of goods and services obtainable within Sierra Leone.	Article 110
Obligations	The holder of the mining licence is also obliged to substantially comply with the community development agreement.	Article 115
Amendments to licences	Subject to Minister approval, the holder of a large-scale mining licence may make amendments to: • the programme of mining operations; • the environment management programme; and • the programme of employment and training of Sierra Leone citizens.	Article 113
Rights to other resources	Subject to the provisions of this Act and any other law holders of a large-scale mining licence shall have the exclusive right to carry on operations and establish infrastructure, including mine residue disposal facilities, in the licence area and may utilize the water and timber as necessary for mining operations.	Article 114
	Protection of the Environment (Part XV, Sections 131 to 137)	
Environmental impact assessment licence	All small and large-scale mining licence holders must acquire environmental impact assessment licences, in accordance with the Environmental Protection Act 2000 (it is necessary to undertake an environmental impact assessment and produce an EMP to obtain this licence).	Article 131
Environmental impact assessment	The environmental impact assessment must be based on environmental baseline work and include the following: • detailed description of the environment supported by relevant measurements; • detailed description of the project including all phases of development, operations, reclamation and closure, and including o detailed resource requirements and emissions; o identification of the likely major environmental impacts; o review of residual and immitigable environmental impacts; o broad and detailed objectives regarding each environmental impact and means for achieving them; o predicted effect of each environmental mitigation activity; o budget and timetables for implementation; o identification of likely major social impacts and mitigation measures; o methodologies to be used for monitoring potential negative impacts and the source of funding for monitoring; o identification of people/ agencies responsible for implementation of	Article 133

Subjects	Key provisions	Relevant sections
	environmental management and monitoring; and o an EMP	
Public consultation	An applicant for a mining licence that is required to submit an environmental impact assessment must consult the public to introduce the project and verify possible impacts.	Article 133
	The environmental impact assessment, EMP and annual status reports are considered to public documents and will be made available for public review	Articles 133 and 134
Updating of the EMP	The EMP must be updated and submitted for approval whenever there is a change in mining operations	Article 133
Annual progress/ status report	An annual report on progress in the implementation of the EMP is required. The Director of Mines may suspend the licence if it is decided that the programme is not succeeding.	Article 134
Rehabilitation	Conditions relating to rehabilitation may be included in a mineral right granted under the Act.	Article 136
Financial assurance	All small-scale and large-scale licence holders must provide financial assurance for the performance against any obligations originating from an environmental impact assessment and management plan. To strengthen the Government's ability to manage environmental issues associated with mining, the Act empowers the Minister to make specific rehabilitation activities a condition of a mineral right. If the company does not comply and the Government has to undertake work to remedy, the amount expended will be considered a debt to the Government and recoverable in court. Eligible forms of financial assurance include one or a combination of the following: • surety bond; • trust fund with pay-in period; • insurance policy; • cash deposit; and • annuities.	Article 136
	Community development (Part XVI, Articles 138 to 141)	
Obligation to promote community development	The holder of a small-scale or large-scale mining licence must assist in the development of mining communities affected by its operations to promote sustainable development, enhance the general welfare and the quality of life of the inhabitants, and shall recognize and respect the rights, customs, traditions and religion of local communities.	Article 138
Community development agreement	A community development agreement must be prepared where: • underground mines moving more than 100,000 tonnes/ year and open pit mines moving more than 250,000 tonnes/ year. • mines employing/ contracting more than 100 workers on a typical day. The primary host community is the single community of persons mutually agreed by the holder of the small-scale or large-scale mining licence and the local council. If there is no community of persons residing within 30 km of any boundary defining the mining licence area, the primary host community shall be the local council. While a community development agreement is formed between the mining company and community, the Minister is required to approve the plan. The minimum expenditure for the implementation of the agreement by the holder of the mineral right of 0.1% of gross annual revenue for the implementation of the agreement.	Article 139

Subjects	Key provisions	Relevant sections
Contents of the agreement	The community development agreement must identify the primary host community and include: • objectives of the agreement; • obligations of the licence-holder to the community; • obligations of the primary host community; • means for review of the agreement; • consultative and monitoring frameworks and means by which the community can participate in planning, implementation, management and monitoring of activities carried out under the agreement; and • a statement defining the process through which disputes will be resolved (including the involvement of the local authority and the Minister).	Article 140
Types of projects to be considered in the agreement	Types of projects that should be considered in the agreement are: • educational scholarship, apprenticeship, technical training and employment opportunities for the community; • financial and other forms of contributions towards infrastructural development and maintenance involving education, health, roads, water, power and other community services; • assistance towards the creation and development of small and micro sized enterprises; • agricultural product marketing; and • methods and procedures of environment and socio-economic management and local governance enhancement.	Article 140
	The agreements may not address: • imposition of additional taxes/ fees/ rent for the benefit of the primary host community; • provision of vehicles to the community unless it is for a specialised purpose (such as an ambulance or bus); or • provision of money, goods or facilities for the sole benefit of an individual or single family unit.	Article 140
Approval of the agreement	All agreements entered into by large-scale mining licence holders and communities must be approved by the Minister and the Act empowers the Minister to make determinations where parties cannot come to agreement.	Article 141
	Health and safety (Part XVII, Articles 142 to 147)	
Duties of mineral rights holders	• Provide and promote conditions for safe operation and a healthy working environment. • Initiate measures necessary to secure, maintain and enhance health and safety. • Ensure the mine is operated and maintained in such a way that workers can perform their work without endangering the health and safety of themselves or others. • Ensure that persons who are not employees but who may be directly affected by activities at the mine are not exposed to any health and safety hazards. • Ensure that all persons working at the mine have the necessary skills and resources to undertake their work safely. • Take all reasonable steps to continuously prevent injury or loss of life when the mine is not being worked. • Establish a policy for the compensation of injured workers.	Article 142
Duties of workers	• Comply with all measures and procedures established by the mineral right holder to ensure health and safety at the mine. • Take reasonable care to protect their own health and safety and that of other persons. • Take proper care of all health and safety facilities and equipment. • Report promptly any situation which he believes could present a risk to health and safety. • Any worker shall have the right to leave the mine if he believes that circumstances pose a serious danger to their own health and safety.	Article 143
Health and safety regulations	The Act obligates the Minister to make regulations for securing, as far as possible, the health and safety of employees involved in any operation associated with a mineral right.	Article 147

Subjects	Key provisions	Relevant sections
	Financial (Part XVIII, Articles 148 to 162)	
Transparency in the extractive industry: disclosure of revenues and payments	The Minister must: • develop a framework for transparency in the reporting and disclosure of revenue due to or paid to Government; • request, from any person engaged in the extractive industry, an accurate record of the cost of production and volume of sale of minerals extracted; • request, from any person engaged in the extractive industry, an accurate account of money paid by and received from such person at any period; • ensure that all payments due to the Government from a person engaged in the extractive industry, including taxes, royalties, dividends, bonuses, penalties, and levies, are made; and • disseminate information concerning the revenue of the Government from the extractive industry at least annually.	Article 159
	Miscellaneous (Part XIX, Articles 163 to 175)	
Preferential procurement of Sierra Leonean goods and services	Companies must preferentially procure goods made in Sierra Leone and services from agencies in Sierra Leone and owned by Sierra Leoneans or companies registered in Sierra Leone or Public Corporations.	Article 163
Preferential employment of Sierra Leoneans	Companies must give employment preference to Sierra Leonean citizens; holders of small and large scale mining licences must undertake a scheme of training to ensure the advancement of Sierra Leoneans in skilled, technical, supervisory, administrative and managerial positions.	Article 164
Reporting on employment and training	Small- and large-scale mining licence holders are also required to submit annual reports on employment and training, failure to do so shall be considered material breach of licence.	Article 164

Core Mineral Policy of the Government of Sierra Leone 2008

The Core Mineral Policy (CMP) of the Government of Sierra Leone has been designed to create an investor-friendly business environment in order to attract much needed foreign and local investments into the minerals sector. It is designed to enhance the social and economic benefits for the country and the communities affected by mining activities. The sector is expected to make important contributions towards industrial, social, economic and infrastructure development. It is also expected to provide new employment opportunities, generate foreign exchange earnings and contribute significantly to government revenue. The CMP aims to ensure tht the development of the minerals sector is achieved in ways that will protect the environment and that are socially responsible and economically viable.

National Reconstruction and Development Act, 1999 (No. 5 of 1999)

This Act establishes a Commission to secure and monitor the legitimate exploitation of Sierra Leone's' gold and diamonds, and other resources that are determined to be of strategic importance for national security and welfare as well as to cater for post-war rehabilitation and reconstruction. It states the commission will supervise and develop the exploration and exploitation of precious metals and diamonds and other natural resources of Sierra Leone.

2.4 Legislation pertaining to disturbance of forests

2.4.1 Forestry Act, 1988

This Act focuses on forests, but includes provisions for the declaration of protected areas for soil, water, flora or fauna conservation and protected trees anywhere in Sierra Leone. Most of provisions of the Act apply only to classified forests, which may be either national or community forest. A classified forest may have protection or production as its primary

purpose, but in both cases it is to be managed for the maximum combination of benefits compatible with the primary purpose. The clauses of relevance to the environmental and social assessment and management are listed below.

- There is a general prohibition against logging and other activities in classified forests, except as authorized under the Act.
- The Chief Conservator of Forest, with the directives of the minister, is responsible for the management of the forest resources of the country. The Chief Conservator is required to compile a national inventory of forest resources and a national forest management plan.
- A national forest is required to be on state-owned or -leased land. Community forests on chiefdom lands are created by agreement between chiefdom authorities and the Chief Conservator (Part V, Section 18). The agreement must delineate the area and describe the the forest resources and potential of the area.
- Management of community forests may be provided by the Forestry Division, by the chiefdom or local authority, or by non-governmental organizations. Utilization may be permitted to community members or others, and may be subject to fees and other conditions
- Detailed inventories of classified forests may be required by regulation.
- Detailed management plans are encouraged for all classified forests, although they are only required in the case of a concession for a national forest.
- Utilization of national forests may be authorized by licence or concession, which is subject to the payment of prescribed fees and to management, reforestation and working plans prepared or approved by the Chief Conservator.
- No classified forest may be cut, burned, uprooted, damaged or destroyed, except with a written permission from the Chief Conservator of the forest (Part VI, Section 21 Subsection 2). Failure to observe this is an offence punishable with a fine.
- Any one permitted to fell timber is liable to paying a reforestation fee (Section 17), which is to be paid to the Chief Conservator and will be paid into a reforestation fund established under the Act. Mining companies can have this fee refunded where it undertakes reforestation in the rehabilitation of disturbed land.

2.4.2 The Forestry Regulations, 1989

No classified/ protected forest can be used or disturbed without written permission from the Chief Conservator of the forest. A licence may be issued by an inspector of the Forestry Division authorising the holder of the mining lease, to clear land in a classified forest for the purpose of mining (Section 15, Subsection 1).

A holder of a licence for deforestation of, or vegetation removal from the environment, must observe conditions in Section 15, Subsection 3, which include the following conditions:

- removal of vegetation, can be done for mining operations only within an area licenced for this purpose;
- specified land area, shall be cleared within a stated time, but trees requested not to be felled, removed or damaged, are to be left standing;
- trees to be felled shall be identified, except where total felling is authorised;
- a forest severance fee and a minor forest produce fee, shall be paid in respect of all forest produce that is merchantable, which may be removed by clearance of vegetation;

- at the completion of mining, the area shall be replanted with approved crops or trees by the mining company, or provision made for this to be done by payment of the estimated reforestation cost; and
- required method of cultivation and silviculture, specified by the Chief Conservator, must be employed.

No land between the high and low water marks, nor those above the high water mark on both sides of the bank of any waterway, covering a distance of one hundred feet (approximately 33 m), shall be cleared of any vegetation except permitted by a clearance licence (Part XI, Section 38).

Sacred bushes are protected by the stipulated regulations of Section 40, whereby clearance of vegetation from land designated as sacred bush, is prohibited except by clearance authority from the Chief Conservator.

2.5 Water law

2.5.1 Current legislation

With the exception of legislation pertaining to water supply and sanitation, there is no water management legislation in Sierra Leone. Existing legislation pertaining to water supply and sanitation includes:

- The Guma Valley Water Act (1961), which deals with water supply services to the city of Freetown.
- The Water (Control and Supply) Act (1963), which deals with water supply services in urban centres except for Freetown as well as rural areas in the country. The responsible authority is the Water Supply Division (WSD) of the Ministry of Energy and Power.
- The Sierra Leone Water Company Act (2001) which establishes the Sierra Leone Water Company (SALWACO) to provide water supply services in the district towns of Bo, Kenema, Koidu, Makeni, Kabala and the International Airport at Lungi (thus some of the responsibilities of WSD are transferred to SALWACO).

It has reportedly been recognised that the existing legislation is inadequate and high priority has been given to the development of a National Water and Sanitation Policy.

2.5.2 National Water and Sanitation Policy

The latest version of the policy was published by the Ministry of Energy and Power in August 2008. The policy covers the following subjects:

- water resources management
- urban water supply and sewerage
- rural water supply
- hygiene and sanitation; and
- legal, regulatory and institutional framework.

Water resources management

Specific policy objectives relevant to water resources management include:

- to vest in the State all water in the country and provide every citizen equal right to access and use the nation's natural water resources;

- to ensure effectiveness and efficiency of water resources utilization;
- to promote management of water conservation and quality standards of water resources;
- to develop a water management system that protects the environment, ecological system and biodiversity;
- to develop appropriate and sustainable procedures for water resources assessment;
- to develop sustainable integrated plans for water resources development;
- to develop a database and information for development of water projects;
- to carry out research and technological development;
- to undertake training and human resources development;
- to develop disaster prevention and management plans;
- to promote regional and international cooperation on utilization of trans-boundary water resources;
- to increase utilisation of groundwater resources; and
- to develop sustainable financing of water resources management activities.

The NWSP states future water management approaches will focus on how water is best used beneficially and efficiently. Accordingly, water should be prioritised as follows:

- Adequate quantity and acceptable quality water for basic human needs will receive first priority.
- Water for the environment to protect the ecosystems that underpin the country's water resources, now and in the future will attain second priority and will be reserved.
- Other uses such as agriculture, industrial production, hydropower production, mining, livestock keeping, fish production and processing, fish farming etc will be subject to social and economic criteria which will be reviewed from time to time.
- Utilisation of trans-boundary water resources will be based on the principle of equity, right and rationality in accordance with agreements among the riparian states, and by respecting the principles of international obligations on trans-boundary water resources.

The Ministry of Lands, in collaboration with the National Water Resources Board (NWRB), will carry out resource mapping to support better allocation and use, and the need to protect sources and resources. And the following issues are addressed:

- Water use permits will only be issued for a determined beneficial water use. Procedures, criteria and guidelines for issuing the permits will be prepared and made operational by the NWRB.
- Trading of water rights, application of economic incentives and pricing for water use shall be gradually built into the management system as a means for managing demand requirements.
- The "polluter pays" principle shall apply in conjunction with other legal and administrative actions. Environmental standards for in-stream flows, industrial effluents and other waste discharges for meeting environmental objectives will be developed and enforced.

Future regulatory bodies/ institutions

With respect to the legal, regulatory and institutional framework, key objectives are listed below.

- Enact new unified water legislation (Water Law) which creates a level playing field for all those involved in the sector, public and private, present and future.
- Create a transparent and independent regulatory regime including the establishment of an independent regulatory authority with appropriately qualified personnel for regulating the water supply and waste disposal activities.
- Ensure the roles and responsibilities of stakeholders involved in the water and sanitation sector are clearly defined and allow for coordination and collaboration between stakeholders for the benefit of the national economy and the population of Sierra Leone.

A NWRB will be established and become the overall responsible institution for the water resources management continuum from upstream freshwater sources to freshwater-seawater interface. It will be responsible for implementing the water resources management strategies. Core functions will include: water resources exploration, water resources assessment both in quantity and quality, monitoring and evaluation, water allocation, pollution control, and other cross-sector activities such as catchments management, planning and development.

The Ministry of Marine Resources, in collaboration with the NWRB, will continue to be responsible for planning, developing, managing and conservation of all living and non-living aquatic resources including fisheries and fish culture and regulates activities for both in-land water and marine fishing.

Local Councils will be responsible for implementing water resources plans, protection and conservation of natural resources at district level, establishment of bye-laws on the management of water resources, and conflict resolution in accordance with established laws and regulations. District Water and Sanitation (WATSAN) Committees will be statutorily established, comprising water and sanitation sector stakeholders to carry out the above-mentioned tasks

Participation of communities in decision-making, planning, management and implementation of water resources management and development will be enhanced through statutory establishing village/community water and sanitation committees.

2.5.3 Water permits needing to be obtained

Currently, there are no water permits to be obtained for the Project because there is no legislation controlling:

- abstraction of water from water resources;
- water use for industrial purposes;
- effluent discharges or other discharges to watercourses;
- impounding of water; and
- diversion of watercourses.

2.6 Legislation pertaining to land tenure

Rural land in Sierra Leone is held by landowning families (extended families or lineages) with chieftaincy structure playing a significant administrative and custodian role. Extended families are attached to particular areas within chiefdom. While there are section chiefs at different administrative levels, the paramount chief is particularly important in land matters. At present, the sale of land is virtually impossible and leasing of land is tricky. Property

boundaries have not been surveyed, written deeds do not exist and both chiefs and recognised representatives of land owning families have to be involved decisions on leasing of land. Furthermore, both national legislation and customary law apply, and the relevant national legislation is under revision and the relevant customary law is unwritten. A detailed review of this predicament is presented in a paper by the Food and Agriculture Organization (FAO) of the United Nations (2006).

According to the FAO (2006), the formal legal environment regarding land in Sierra Leone is currently undergoing significant change and the primary pieces of legislation regarding land are:

- The Land Policy. The new National Lands Policy (2005) articulates sufficiently the urgent need for a more coherent approach to land administration since the war. Statement of the policy appears to support the inalienability of land with regard to the landowning families and the role of descendants in claiming rights to land. In addition policy does acknowledge that land is sold in urban areas in the provinces.

- The Land Commission Act. The overall purpose of this Act is to establish a Lands Commission with offices at the federal, provincial and district levels in order to grant rights to lands, impose restrictions, implement policies on land and rural development, advise government local councils and traditional authorities on the policy framework for the development of particular areas, recognize and establish the content of land tenure rights as well as transform ownership rights of such lands; advice and assist in the execution of a registration programme and perform other functions as necessary.

- The Commercial Lands Act. The law project to formulate legislation on the commercial use of land was the first major activity of the Law Reform Commission. The purpose of the project was to find approaches to modernizing the laws dealing with commercial use of land, particularly in the provinces where customary law predominates, with the purpose to attract foreign and local investment to set up large scale commercial activities involving land.

Neither the Land Commission Act nor the Commercial Lands Act have been promulgated yet. The recent Devolution of Estates Act, 2007 (No. 21 of 2007) deals with land ownership and inheritance. This Act makes provision with respect to intestate succession and succession by will of estates including land and land-related rights. The Act sets out rules relative to inheritance and related distribution of estates in the case a person dies without having made a will. The Act also defines offences against persons entitled to inheritance or related to the deceased person.

2.7 The Factories Act – 1974

This Act deals with the safety, security and welfare of factory employees. It requires every factory to be kept in a clean state and free from effluent arising from any drain, sanitary convenience or nuisance. This part of the Act also states that for overall safety of all employees, the factory must not be overcrowded, must be effectively ventilated, and provided with suitable lighting systems. Every care must be taken by the factory holder, to secure the health, safety and welfare of all employees. The Act also covers reporting of all injuries, accidents, diseases and death and the powers of inspectors.

3 INTERNATIONAL LAW, STANDARDS AND CODES OF CONDUCT

An overview of the main international initiatives having influenced approaches to ESIA in the last two decades are outlined in Figure 3-1. They include the 1992 Rio Declaration; 2000 United Nations Millennium Declaration; the 2000 United Nations Global Compact; and the 2002 Millennium Development Goals. For the mining industry, further impetus has been added by the findings of research projects from 2000 to 2005 – including the Global Mining Initiative; the Mining, Minerals and Sustainable Development Project, and the World Bank Extractive Industries Review. The International Finance Corporation's (IFC) Performance Standards, which were published in April 2006, reflect these developments. The International Council on Mining and Metals' (ICMM) Sustainable Development Framework also reflects and reinforces these developments.

International law, standards and codes of conduct concerning environmental management and sustainable development that are of relevance to the Marampa Project are discussed in this section under the following headings:

- international law (Section 3.2);
- conditioning of project finance – Equator Principles and IFC Performance Standards (Section 3.3); and
- self-regulation in the mining sector (Section 3.4).

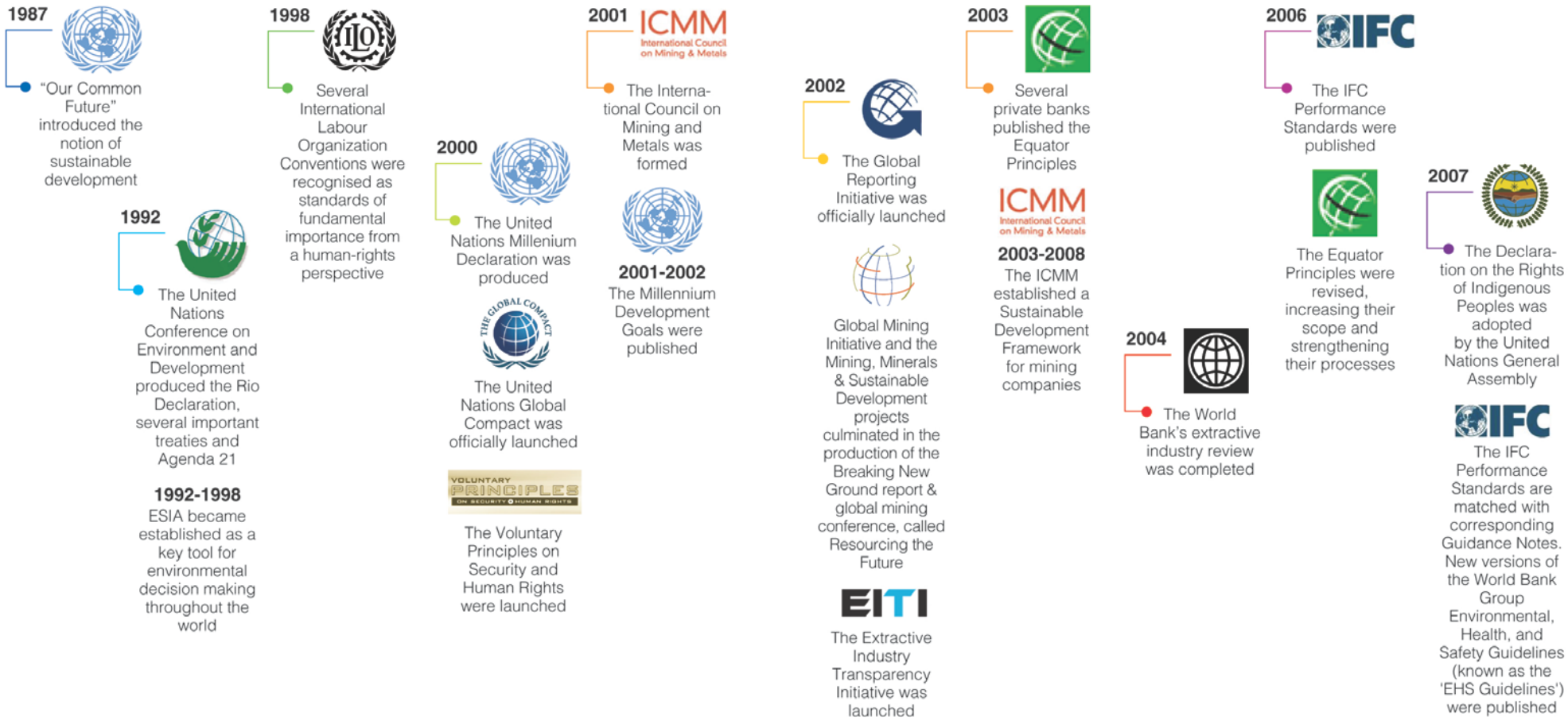
3.1 International law

International law pertinent to the environment and sustainable development comprises:

- customary international law, which is applicable to all states and it results from general and consistent practice followed by states out of a sense of legal obligation, so much so that it becomes custom;
- treaties (the term "treaty" encompasses "agreements, covenants, conventions, pacts, protocols, and statutes"), which are generally intended to be implemented through enactment and enforcement of laws at national levels; and
- judicial decisions of international courts and tribunals.

International practices pertaining to environmental management and sustainable development are strongly influenced by declarations and treaties as outlined below. Declarations are generally not immediately legally binding but can acquire the force of international customary law if they continue to express an international consensus which states adhere to over time.

Figure 3-1: International initiatives influencing the scope of and approaches to ESIA



3.1.1 Declarations and customary law

Declarations influencing international practice in the fields of environmental management and sustainable development are listed below in order of their relative importance to these fields:

- The 1992 Declaration on Environment and Development (referred to as the "Rio Declaration);
- The 1972 Declaration on the Human Environment (referred to as the "Stockholm Declaration");
- The 1948 Universal Declaration of Human Rights;
- The 2000 United Nations Millennium Declaration;
- The 2007 Declaration on the Rights of Indigenous Peoples; and
- The 1998 Declaration on Fundamental Principles and Rights at Work.

The Rio Declaration is of major importance because it reinforced the notion of sustainable development. Many of the principles in the Rio Declaration are acquiring the force of international customary law according to UNEP (2005).

In the last decade, the set of concerns addressed under the heading "sustainable development" has been extended to include:

- human rights – up-holding and supporting universal human rights;
- labour standards – up-holding labour standards, particularly those that pertain to human rights.
- working against corruption of all forms, including extortion and bribery.

Key initiatives influencing this are the 2000 United Nations Millennium Declaration and 2002 Millennium Development Goals. The Millennium Declaration Goals recognise explicitly the interdependence between sustainable development, growth and poverty reduction. They comprise eight international development goals that 189 United Nations member states have agreed to achieve by the year 2015. They were developed out of the United Nations Millennium Declaration and synthesise, in a single package, many of the most important commitments made separately at the international conferences and summits of the 1990s. They also acknowledge that development rests on the foundations of democratic governance, the rule of law, respect for human rights and peace and security.

All principles contained in the Universal Declaration of Human Rights are considered to be international customary law and do not require signature or ratification by the state to be recognised as a legal standard (UNEP, 2005).

The Declaration on the Rights of Indigenous Peoples, which was adopted by the United Nations General Assembly in September 2007 (United Nations website, March 2009), has high profile in the realm of sustainable development. The Declaration sets out the rights of indigenous peoples, prohibits discrimination against indigenous peoples and promotes their full and effective participation in all matters that concern them.

The 1998 Declaration on Fundamental Principles and Rights at Work requires both states and businesses to observe International Labour Organisation (ILO) Conventions that are of fundamental importance from a human rights perspective. These conventions pertain to:

- Freedom of association, collective bargaining, and industrial relations;

- Forced labour;
- Elimination of child labour and protection of children and young persons; and
- Equality of opportunity and treatment/ elimination of discrimination in respect of employment and occupation.

3.1.2 Multilateral treaties

Multilateral treaties pertinent to the environment and sustainable development include numerous environmental treaties, some human rights treaties and some workplace treaties. The treaties are officially recorded as follows:

- Environment and human rights treaties are recorded in the United Nations Treaty Series (March 2009) under the headings “Environment (Chapter 27)” and “Human Rights (Chapter 4)”.
- Workplace treaties are better known as ILO conventions because they are promulgated by ILO, an agency of the United Nations. They are recorded on the ILO’s ILOLEX website (ILOLEX, March 2009).

Environmental treaties

Most international environmental treaties that are considered to be important by the United Nations Environmental Programme (UNEP, 2005) are in force in Sierra Leone. These treaties are listed in Table 3-1. The Government of Sierra Leone has secured funding from the Global Environment Facility (GEF) to facilitate the fulfilment of the treaty mandates and to develop strategic action plans that link country action to the broader global environmental management and sustainable development. The United Nations Development Programme is providing provides supervisory and management support with this (Sierra Leone Information System, 2009).

Table 3-1: International environmental treaties endorsed by Sierra Leone

Topic	Convention		In force in Sierra Leone
	Title	Date	
Climate change and the ozone layer	United Nations Framework Convention on Climate Change	1992	1995
	Kyoto Protocol to the United Nations Framework Convention on Climate Change	1997	2007
	Convention for the Protection of the Ozone Layer	1985	2001
	Montreal Protocol on Substances that Deplete the Ozone Layer	1987	2001
	Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer	1990	2001
	Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer	1992	2001
	Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer	1997	2001
	Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer	1999	2002
Hazardous chemicals, waste and pollution	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	1989	
	Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa	1991	Signed in 2003, not in force
	Stockholm Convention on Persistent Organic Pollutants	2001	2004

Topic	Convention		In force in Sierra Leone
	Title	Date	
	Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	1998	
Desertification	International Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, particularly in Africa	1994	1997
Biodiversity and the protection of plants and animals	African Convention on the Conservation of Nature and Natural Resources (Revised Version)	2003	Signed in 2003, not in force
	African Convention on the Conservation of Nature and Natural Resources	1968	Signed in 1968, not in force
	Convention on Biological Diversity	1992	1995
	Cartagena Protocol on Biosafety to the Convention on Biological Diversity	2000	
	Convention on the Conservation of Migratory Species of Wild Animals	1979	
	Memorandum of Understanding concerning Conservation Measures for Marine Turtles of the Atlantic Coast of Africa	1999	2002
	Memorandum of Understanding concerning Conservation Measures for the West African Populations of the African Elephant	2005	Signed in 2005, not in force
	Convention on International Trade in Endangered Species of Wild Fauna and Flora	1973	1995
	Amendment to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (Art.XI)	1979	1995
	Convention on Wetlands of International Importance especially as Waterfowl Habitat	1971	2000
	Protocol to amend the Convention on Wetlands of International Importance especially as Waterfowl Habitat	1982	2000
	Amendments to Articles 6 and 7 of the Convention on Wetlands of International Importance especially as Waterfowl Habitat	1987	2000
Cultural heritage	Convention concerning the Protection of the World Cultural and Natural Heritage	1972	1994

Human rights treaties

Of the 25 United Nations treaties on human rights that are listed in the United Nations Treaty Series (March 2009), 14 have been signed by Sierra Leone (Table 3-3).

Table 3-2: United Nations treaties on human rights and endorsement of these by Sierra Leone

United Nations Treaties (List from from the United Nations Treaty Series (http://untreaty.un.org/)	**Date**	**In force**	**Endorsement by Sierra Leone** Ratification, Accession (a), Signature (s)
1. Convention on the Prevention and Punishment of the Crime of Genocide	1948	1951	
2. International Convention on the Elimination of All Forms of Racial Discrimination	1966	1969	1967
2.a. Amendment to article 8 of the International Convention on the Elimination of All Forms of Racial Discrimination	1992	Not yet	
3. International Covenant on Economic, Social and Cultural Rights	1966	1976	1996(a)

United Nations Treaties (List from from the United Nations Treaty Series (http://untreaty.un.org/)	**Date**	**In force**	**Endorsement by Sierra Leone** Ratification, Accession (a), Signature (s)
4. International Covenant on Civil and Political Rights	1966	1976	1996(a)
5. Optional Protocol to the International Covenant on Civil and Political Right	1966	1976	1996(a)
6. Convention on the non-applicability of statutory limitations to war crimes and crimes against humanity	1968	1970	
7. International Convention on the Suppression and Punishment of the Crime of Apartheid	1973	1976	
8. Convention on the Elimination of All Forms of Discrimination against Women	1979	1981	1998
8.a. Amendment to article 20, paragraph 1 of the Convention on the Elimination of All Forms of Discrimination against Women	1995	Not yet	
8.b. Optional Protocol to the Convention on the Elimination of All Forms of Discrimination against Women	1999	Not yet	2000 (s)
9. Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment	1984	1987	2001
9.a. Amendments to articles 17 (7) and 18 (5) of the Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment	1992	1987	
9.b. Optional Protocol to the Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment	2002	Not yet	2003 (s)
10. International Convention against Apartheid in Sports	1985	1988	1986 (s)
11. Convention on the Rights of the Child	1989	1990	1990
11.a. Amendment to article 43 (2) of the Convention on the Rights of the Child	1995	2002	2001 (a)
11.b. Optional Protocol to the Convention on the Rights of the Child on the involvement of children in armed conflict	2000	2002	2002
11.c. Optional Protocol to the Convention on the Rights of the Child on the sale of children, child prostitution and child pornography	2000	2002	2001
12. Second Optional Protocol to the International Covenant on Civil and Political Rights, aiming at the abolition of the death penalty	1989	1991	2001
13. International Convention on the Protection of the Rights of All Migrant Workers and Members of their Families	1990		
14. Agreement establishing the Fund for the Development of the Indigenous Peoples of Latin America and the Caribbean	1992	1993	
15. Convention on the Rights of Persons with Disabilities	2006	Not yet	2007 (s)
15.a. Optional Protocol to the Convention on the Rights of Persons with Disabilities	2006	Not yet	2007 (s)
16. International Convention for the Protection of All Persons from Enforced Disappearance	2006	Not yet	2007 (s)

Workplace treaties/ ILO Conventions

ILO Conventions are treaties and they are subject to ratification by member states. According to the ILO ILOLEX website (ILOLEX, March 2009), Sierra Leone has ratified 17 ILO conventions (ILO, August 2008).

The ILO Conventions of relevance to the ESIA for the Marampa Project are listed in Table 3-1 . Sierra Leone ratified many of the ILO Conventions that are considered to be important

in terms of the 1998 Declaration on Fundamental Principles and Rights at Work (Section 3.2.1) in the 1960s. It has not yet ratified those pertaining to forced labour.

Table 3-3: ILO Conventions of relevance to the ESIA for the Marampa Project

ILO Conventions			**Importance**		**Ratified by Sierra Leone**
Grouping	**Conventions**		**Human rights[10]**	**Mining[11]**	
Freedom of association, collective bargaining, and industrial relations	Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)		X	X	1961
	Right to Organise and Collective Bargaining Convention, 1949 (No. 98)		X	X	1961
Forced labour	Forced Labour Convention, 1930 (No. 29)		X	X	1961
	Abolition of Forced Labour Convention, 1957 (No. 105)				1961
Elimination of child labour and protection of children	Minimum Age Convention, 1973 (No. 138)		X	X	
	Worst Forms of Child Labour Convention, 1999 (No. 182)		X	X	
Equality of opportunity and treatment	Equal Remuneration Convention, 1951 (No 100)		X	X	1968
	Discrimination (Employment and Occupation) Convention, 1958 (No 111)		X	X	1966
Occupational safety and health	Occupational Safety and Health Convention, 1981 (No. 155)			X	
	Protection against specific risks	Working Environment (Air Pollution, Noise and Vibration) Convention, 1977 (No. 148)			
		Chemicals Convention, 1990 (No. 170)			
		Prevention of Major Industrial Accidents Convention, 1993 (No. 174)			
	Protection in specific branches of activity	Safety and Health in Construction Convention, 1988 (No. 167)			
		Safety and Health in Mines Convention, 1995 (No. 176)		X	
Indigenous and tribal peoples		Indigenous and Tribal Peoples Convention, 1989 (No. 169)		X	

The ILO Indigenous and Tribal Peoples Convention, 1989 (No 169), is considered important from the environmental and social perspectives (UNEP, 2005). It requires the adoption of special measures to protect and preserve the environment of indigenous and tribal people. It contains numerous references to lands, resources and the environment of indigenous people.

[10] *ILO Conventions recognised as being of fundamental importance from a human rights perspective in terms of the 1998 Declaration on Fundamental Principles and Rights at Work (Section 3.2.1).*
[11] *Conventions considered to be important by the International Council on Mining and Metals (ICMM, March 2009).*

3.1.3 Regional treaties influencing international practice

Some conventions of the United Nations Economic Commission for Europe (UNECE) are considered to have global significance, even though their field of application is regional. These are listed in Table 3-5.

Table 3-4: UNECE conventions that are considered to have global importance

UNECE Conventions	Global importance
Convention on Long-range Transboundary Air Pollution (CLTRAP, 1989)	Addresses long-range transboundary air pollution.
Convention on Environmental Impact Assessment in a Trans-boundary Context (Espoo, 1991)	Set an international precedent on transboundary EIA and public involvement.
Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention, 1992)	Laid down the principles of transboundary cooperation within river basins for the first time under international law.
Convention on Access to Information, Public Participation in Decision Making and Access to Justice in International Environmental Matters (Aarhus, 1998)	Considered to be of global importance as an elaboration of Principle 10 of the Rio Declaration.

3.2 Conditioning of project finance: Equator Principles and the IFC Performance Standards and World Bank EHS Guidelines

Development financiers play a major role in the development and enforcement of international sustainable development standards through the conditioning their loans. This conditionality comes in two forms: (1) the use of ESIA to screen projects in advance of loan approval and (2) actual loan conditions imposed on projects.

3.2.1 Introduction to the Equator Principles

The Equator Principles require that financial institutions to condition their loans. They were published in June 2003, by several private banks and the International Finance Corporation (IFC), and were updated in July 2006. By February 2009, 65 financial institutions had adopted the Equator Principles (Equator Principles website, March 2009).

The founding banks chose to model the Equator Principles on the environmental and social standards of the World Bank Group. When the Equator Principles were first published, the IFC invested in rigorous updating of the standards. The products of this exercise are the IFC Performance Standards on Social and Environmental Sustainability (IFC Performance Standards), which were published in April 2006 and are recognised as being the best and most comprehensive standards available to international finance institutions working with the private sector. The revised Equator Principles were published largely in response to the publication of the IFC Performance Standards.

The 2006 Equator Principles require observance of the new International Finance Corporation (IFC) Performance Standards and the World Bank Group Environmental, Health and Safety (EHS) Guidelines (Equator Principles, March 2009).

A summary of the Equator Principles is presented in Table 3-6.

Table 3-5: Overview of the Equator Principles

Title	Outline
Principle 1: Review and	Determine the screening category the project belongs to. Most mines fall in Category A (Projects with potential significant adverse social or

Title	Outline
Categorisation	environmental impacts that are diverse, irreversible or unprecedented)
Principle 2: Social and Environmental Assessment	An ESIA must be completed for each project assessed as being either Category A or Category B.
Principle 3: Applicable Social and Environmental Standards	The ESIA must establish the project's overall compliance with, or justified deviation from, applicable IFC Performance Standards and World Bank Group Environmental, Health and Safety (EHS) Guidelines. The ESIA must address compliance with relevant host country laws, regulations and permits that pertain to social and environmental matters.
Principle 4: Action Plan and Management System	An Action Plan that addresses the relevant findings, and draws on the conclusions of the ESIA must be prepared. This must describe and prioritise the actions needed to implement mitigation measures, corrective actions and monitoring measures necessary to manage the impacts and risks identified in the ESIA. Establish an Environmental and Social Management System (ESMS) that addresses the management of identified impacts.
Principle 5: Consultation and Disclosure	There must be consultation with project affected communities in a structured and culturally appropriate manner. The process, results of the consultation and any actions agreed resulting from the consultation must be documented.
Principle 6: Grievance Mechanism	Establish a grievance mechanism to ensure that consultation, disclosure and community engagement continues throughout construction and operation of the project. Inform the affected communities about the mechanism.
Principle 7: Independent Review	For all Category A projects and, as appropriate, for Category B projects, an independent social or environmental expert should review the assessment, action plan and consultation process documentation to assess Equator Principles compliance.
Principle 8: Covenants	The borrower will covenant in financing documentation: a) to comply with all relevant host country social and environmental laws and permits; b) to comply with the action plan; c) to provide periodic reports (not less than annually) by in-house staff or third party experts that document compliance; d) to decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan. If the borrower fails to comply, development financiers reserve the right to exercise remedies, as they consider appropriate.
Principle 9: Independent Monitoring and Reporting	Monitoring information to be shared with development financiers must be verified by an independent expert or qualified and experienced external experts retained by the borrower.
Principle 10: Equator Principle Financial Institutions (EPFI) Reporting	Each EPFI adopting the Equator Principles commits to report publicly at least annually about its Equator Principles implementation processes and experience, taking into account appropriate confidentiality considerations.

3.2.2 Introduction to the IFC Performance Standards

The IFC Performance Standards are matched with corresponding Guidance Notes that provide guidance on the requirements contained in the standards and on good sustainability practices to help clients improve project performance. These Guidance Notes are updated on a regular basis. The most recent versions were published in July 2007 with a new set expected early in 2011.

The IFC Performance Standards (April 2006) are entitled:

- 1: Social and Environmental Assessment and Management System;
- 2: Labour and Working Conditions;
- 3: Pollution Prevention and Abatement;
- 4: Community Health, Safety and Security;
- 5: Land Acquisition and Involuntary Resettlement;
- 6: Biodiversity Conservation and Sustainable Natural Resource Management;
- 7: Indigenous Peoples; and
- 8: Cultural Heritage.

IFC Performance Standard 1 establishes the importance of:

- integrated assessment to identify the social and environmental impacts, risks, and opportunities of projects;
- effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them ; and
- the client's management of social and environmental performance throughout the life of the project.

IFC Performance Standards 2 through 8 establish requirements to avoid, reduce, mitigate or compensate for impacts on people and the environment, and to improve conditions where appropriate. Where social or environmental impacts are anticipated, the client is required to manage them through its Social and Environmental Management System consistent with Performance Standard 1 (IFC website, March 2009). Figure 3-2. illustrates an ESIA procedure in terms of IFC Performance Standard 1. More background on this procedure is provided in Table 3-7.

The IFC recommends that assessment should begin as early as possible, as collection of baseline data required for definition of impacts may require months or even years and potential impacts can be identified and avoided or mitigated in the earliest stages of planning.

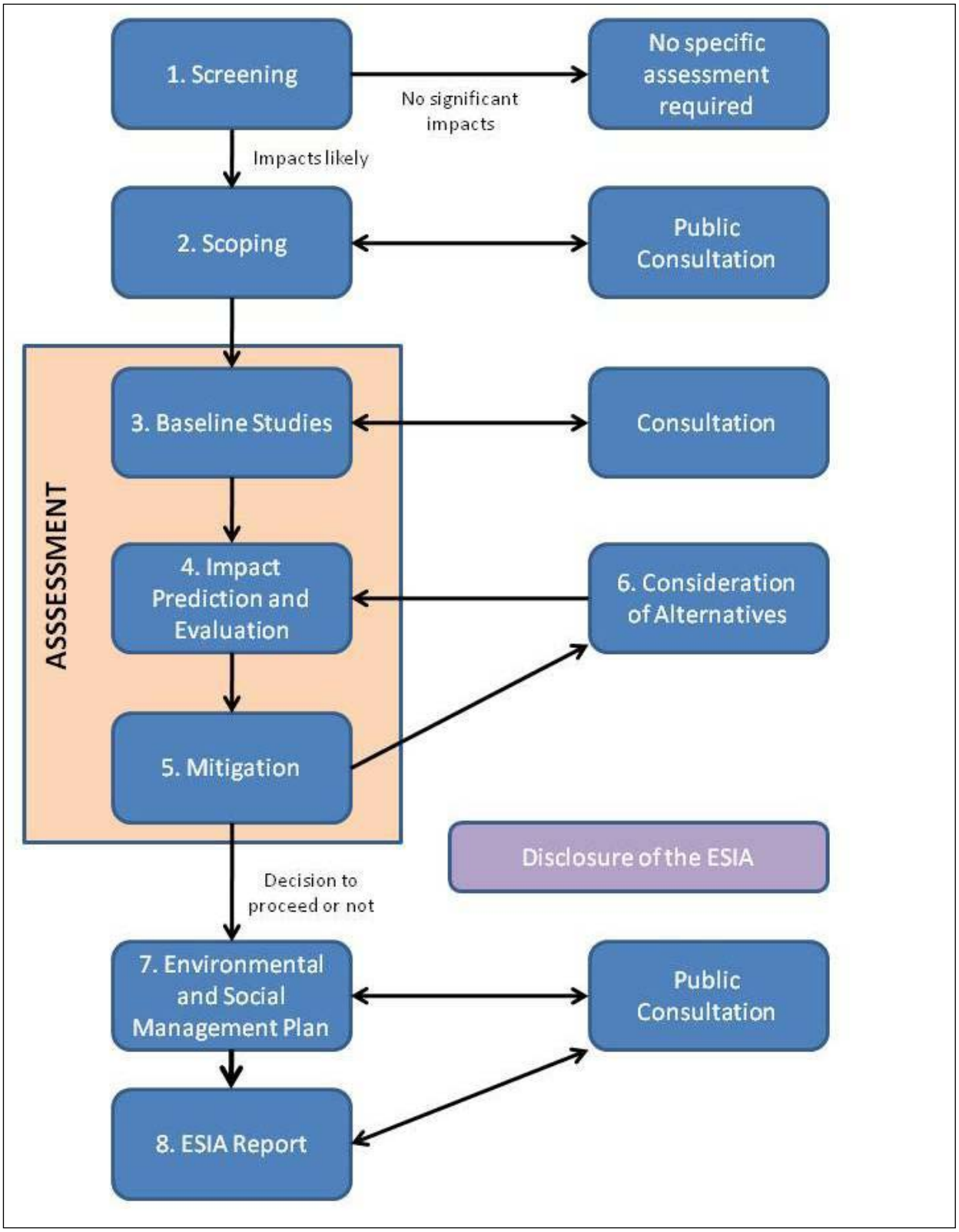


Figure 3-2: ESIA[12] procedure in terms of the IFC Performance Standard 1

[12] *The IFC Performance Standards use the term "social and environmental assessment (SEA)" instead of ESIA –ESIA has been used here for the purposes of consistency with the rest of the document.*

Table 3-6: ESIA[13] procedure in terms of the IFC Performance Standard 1[14]

Steps	Description of activities
Screening	Screening is a quick, high-level analysis to determine whether a full ESIA is necessary.
Scoping	Scoping produces a plan for the assessment. It determines • which impacts are likely to be significant and should become the main focus of the assessments; • data availability and gaps; • the appropriate spatial and temporal scopes for the assessment; and suitable survey and research methodologies. Stakeholders – including government officials and local communities – are consulted to help identify key impacts and input to the assessment plan.
Baseline studies	Baseline studies provide a reference point against which any future changes associated with a project can be assessed and offer information for subsequent monitoring of performance. It may be necessary to commission lengthy field-based studies to fully capture seasonal trends. The first step in conducting a baseline study is creating a map of the potentially affected area. Additional survey work and consultation with local experts is usually required to get a full picture of an area. It is important to remember that baseline information is often not sufficient to determine impacts; the information forms the basis of subsequent impact assessment activities.
Impact prediction and evaluation	Impact prediction and evaluation is the heart of the ESIA. Impact prediction requires professional judgment, and will require input from relevant experts. Once the potential impacts are more fully understood, it is necessary to judge the significance of each impact, to determine whether it is acceptable, requires mitigation or is unacceptable. Determining the significance of impacts is a complex and subjective process. Consultation with local stakeholders is vital at this stage, and particular attention should be given to vulnerable or disadvantaged communities.
Mitigation	Mitigation aims to eliminate or reduce negative impacts. Mitigation options should generally be considered in the following order of preference: 1. Avoidance of impacts altogether 2. Reduction of impacts where unavoidable 3. Restoration of disturbed areas to their original state 4. Relocation of affected communities 5. Compensation for any residual, unavoidable damage
Consideration of alternatives	When all mitigation measures have been identified, a comparison of alternatives will allow identification of the least damaging option. This is an iterative process of comparing potential impacts and mitigation options of a series of alternative designs, locations, technologies and operations to identify the optimal configuration that meets or exceeds the requirements of national legislation and any funding agencies.

[13] The IFC Performance Standards use the term "social and environmental assessment (SEA)" instead of ESIA –ESIA has been used here for the purposes of consistency with the rest of the document.
[14] Source: IFC, March 2006. A Guide to Biodiversity for the Private Sector: The Social and Environmental Impact Assessment Process. (http://www.ifc.org/ifcext/sustainability.nsf/AttachmentsByTitle/BiodivGuide_ESIA/$FILE/ESIA.pdf)

Steps	Description of activities
Environmental and Social Management Plan (ESMP)[15]	Also called an Action Plan, an ESMP defines resources, roles and responsibilities required to manage impacts and implement mitigation measures. The ESMP forms a link between the ESIA and the Environmental and Social Management System (ESMS[16]). The central elements of a ESMP should include a prioritized description of the activities planned to mitigate impacts, a time line and identification of resources to ensure the ESMP can be delivered, and a communication plan that indicates how progress in the implementation of the ESMP will be disclosed. The ESMP should also define monitoring requirements to determine whether mitigation is successful. Monitoring is important for providing evidence of compliance with ESMP and the effective implementation of management measures.
Environmental and Social Impact Statement (ESIS)/ Environmental and Social Impact Report (ESIR)	The ESIS/ ESIR is the physical report on the ESIA process and findings. The ESIA should provide a clear, jargon-free review of potential impacts and how they have been and will be mitigated. The report often forms the basis of public consultation activities and is the document that is presented to regulatory authorities and others, including IFC, as the basis for decision making. Public disclosure helps affected communities understand risks, impacts and opportunities related to potential projects.

Introduction to the World Bank Group EHS Guidelines

The World Bank Group Environmental, Health, and Safety Guidelines (known as the 'EHS Guidelines') were published in 2007 and 2008. The EHS Guidelines are intended to be living documents, and will be updated on a regular basis. The EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP), as defined in IFC's Performance Standard 3 on Pollution Prevention and Abatement. The World Bank Group EHS Guidelines that may apply to the Marampa Project are listed in Table 3-8.

Table 3-7: EHS Guidelines that may be relevant to the Marampa Project

Sector	Standard or guideline name
General	EHS General Guidelines
Mining and processing	EHS Guidelines for Mining
Power plant & distribution	EHS Guidelines for Electric Power Transmission and Distribution
	Draft EHS Guideline for Thermal Power Plants
Non-mining waste	EHS Guidelines for Waste Management Facilities
Water supply and sewage	EHS Guidelines for Water and Sanitation Facilities

[15] *The IFC uses the term "social and environmental management plan (ESMP)".*

[16] *The IFC uses the term "social and environmental management system (SEMS)".*

3.3 Self regulation in the mining sector

In addition to international and national law, there are rules and regulations created by businesses themselves for self-regulation in the business community and for voluntary regulation by individual companies. These exist in the form of business charters, codes of conduct/ ethics/ practice and good-practice guidelines. Those of particular importance to environmental management and sustainable development in the mining sector are identified in this section. The IFC Performance Standards and EHS Guidelines do encourage observance of the codes and guidelines.

3.3.1 United Nations Global Compact and the Global Reporting Initiative

The United Nations Global Compact is a corporate governance initiative, launched in July 2000, that aims to mainstream ten principles in business activities around the world and to catalyse actions in support of broader United Nations goals, such as the Millennium Development Goals. The Global Compact's ten principles are derived from:

- The 1948 Universal Declaration of Human Rights;
- The 1998 Declaration on Fundamental Principles and Rights at Work;
- The 1992 Rio Declaration; and
- The 2003 United Nations Convention against Corruption (the tenth principle was added to the Global Compact in 2004 in response to this convention).

The United Nations Global Compact has been given impetus by the Global Reporting Initiative (GRI). The GRI has established a sustainability reporting framework that sets out the principles and indicators that organizations can use to measure and report their economic, environmental, and social performance. The GRI reporting framework is strongly influenced by the UN Global Compact and is widely used by corporations. GRI reporting by the mining sector is discussed further in Section 3.4.2.

On the subject of human rights, the United Nations Global Compact requires that businesses support and respect the protection of internationally proclaimed human rights and make sure that they are not complicit in human rights abuses.

3.3.2 International Council on Mining and Metals Sustainable Development Framework

The International Council on Mining and Metals (ICCM) was formed in 2001 to represent the world's leading companies in the mining and metals industry and to advance their commitment to sustainable development. The ICCM has a Sustainable Development Framework that comprises three elements: a set of ten principles (including a set of supporting position statements); public reporting; and independent assurance (ICCM website, March 2009).

The ICMM Sustainable Development Framework has been influenced by:

- the 1992 Rio Declaration (Section 3.2.1);
- the United Nations Global Compact (Section 3.2.1);
- the Global Reporting Initiative (Section 3.2.1);
- Voluntary Principles on Security and Human Rights (Section 3.4.3);
- the Global Mining Initiative, which was undertaken by nine large mining companies in order to prepare the sector for the World Summit on Sustainable Development (WSSD) in 2002;

- the Mining, Minerals and Sustainable Development (MMSD) project and the MMSD's Breaking New Ground report, which was published in 2002; and
- the World Bank's Extractive Industries Review (EIR), which was undertaken in 2004 and ended with focus on sustainable development and poverty alleviation.

The ten ICCM principles are as follows:

1. Implement and maintain ethical business practices and sound systems of corporate governance;

2. Integrate sustainable development considerations within the corporate decision-making process;

3. Uphold fundamental human rights and respect cultures, customs and values in dealings with employees and others who are affected by our activities;

4. Implement risk management strategies based on valid data and sound science;

5. Seek continual improvement of our health and safety performance;

6. Seek continual improvement of our environmental performance;

7. Contribute to conservation of biodiversity and integrated approaches to land use planning;

8. Facilitate and encourage responsible product design, use, re-use, recycling and disposal of our products;

9. Contribute to the social, economic and institutional development of the communities in which we operate; and

10. Implement effective and transparent engagement, communication and independently verified reporting arrangements with our stakeholders.

The principles listed above were first published in May 2003 and have since been complemented with a number of position statements that give greater clarity to the commitments implicit in the principles. ICMM corporate members have to implement the principles and measure their performance against the principles. They also have to undertake public reporting in accordance with the Global Reporting Initiative's Sustainability Reporting Guidelines and Mining and Metals Sector Supplement (ICCM website, March 2009)[17]. The ICMM Assurance Procedure, which was approved in May 2008, must be implemented by all ICMM members in relation to their sustainability reports for the financial year ending December 2009 or March 2010 (ICCM website, March 2009).

3.3.3 Voluntary Principles on Security and Human Rights

The Voluntary Principles on Security and Human Rights address the negative impacts that company security could have on the human rights of local communities (Voluntary Principles website, March 2009). The principles were launched in the year 2000 and were developed through dialogue between multinational companies in the extractive and energy sectors,

[17] The Global Reporting Initiative (GRI) is a sustainability reporting framework that sets out the principles and indicators that organizations can use to measure and report their economic, environmental, and social performance. The GRI reporting framework is strongly influenced by the UN Global Compact and is widely used by corporations.

human rights non-governmental organisations (NGOs) and the United States and British governments.

The principles guide companies in maintaining the safety and security of their operations within an operating framework that ensures respect for human rights and fundamental freedoms. A significant number of large multinational companies have now adopted or adhere to the principles (Voluntary Principles website, March 2009).

3.3.4 The Extractive Industry Transparency Initiative

The Extractive Industries Transparency Initiative (EITI) aims to increase transparency over payments by companies to governments and government-linked entities, as well as transparency over revenues by those host country governments (EITI website, Voluntary Principles website, March 2009). The United Kingdom's Department for International Development (DFID) plays an important role in the promotion and coordination on the initiative.

To date, no countries have completed EITI validation, although preparations are well advanced in several EITI candidate countries (EITI website, March 2009). EITI supporting companies are those that have endorsed the EITI Principles and Criteria and contribute to implementation in EITI implementing countries. About 40 of the world's largest oil, gas and mining companies support and actively participate in the EITI process.

3.3.5 Mining and Metals Sector Good Practice website

A website called "Good Practice: Sustainable Development in the Mining and Metals Sector" (Good Practice website) has recently been developed by the ICCM, together with the United Nations Conference of Trade and Development (UNCTAD), UNEP and the UK Department for International Development (DFID). This website is intended to provide access to a library of good practice guidelines, standards, case studies, legislation and other relevant material that are leading examples of their kind globally (Good Practice website, March 2009).

The target audience for the website is people who are directly and indirectly involved in the design, operation and regulation of mining and metals facilities. The site is intended to support the implementation and effective achievement of the ICMM Sustainable Development Principles. It will also encompass a host of additional issues lying outside the scope of these principles (Good Practice website, March 2009).

The Tailings Good Practice website was launched October 2005 by the ICCM and the International Commission on Large Dams (ICOLD). It has been is linked to the broader Good Practice site. It was developed to provide a resource on all aspects of tailings in the context of good practice in the mining and metals sector (Good Practice website, March 2009).

The following guidelines are of interest to the Marampa Project:

- Good Practice Guidance on HIV/AIDS, TB and Malaria;
- Planning for Integrated Mine Closure: Toolkit;
- Metals Environmental Risk Assessment Guidance;
- Good Practice Guidance for Mining and Biodiversity;
- Good Practice in Emergency Preparedness and Response; and
- Community Development Toolkit.

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APPENDIX B

B SLEPA APPLICATION FORM AND SUPPORTING CORRESPONDENCE

17 August 2010

Ref: MP.20.10.01.02 – 02

Mr Momodu A. Bah - Acting Deputy Director,
Sierra Leone Environmental Protection Agency
3rd Floor, Youyi Building, Brookfields
Freetown, Sierra Leone

Dear Mr Bah,

Ref: Marampa Iron Ore Project
Submission of Environmental Impact Assessment Application and Screening Forms

Marampa Iron Ore (SL) Limited (Company) submits with this letter the Environmental Impact Assessment (EIA) application and screening forms for the Marampa Iron Ore Project (Project), for categorisation of the Project according to Sierra Leone EIA Regulations.

It should be noted that the Project is at a very early stage and many studies are still required before the Company can determine whether development of the Project will be technically and economically feasible. The Company acknowledges the importance of obtaining environmental and social baseline information, however, and therefore wishes to initiate these studies at an early stage. Due to the early stage of the Project, only limited information regarding certain aspects of the topics covered in the screening form is available at this time. However, the Company trusts that sufficient information has been provided for the Sierra Leone Environment Protection Agency (SLEPA) to categorise the Project.

In accordance with the Environmental Protection Agency Act, 2008, the Company understands that should a full EIA be required for the Project then the Government's EIA Working Group would have the responsibility of defining the Terms of Reference (ToR) for the Environmental and Social Impact Study. If this was the case, then the Company offers to submit a draft ToR, based on the requirements for similar projects, for consideration, review and use by the Working Group.

We look forward to your response to the screening form and categorisation of the Project. Should you have any queries, or require further information, then please do not hesitate to contact the undersigned.

Yours sincerely,
Marampa Iron Ore (SL) Limited

Chris Gbyl
Country Manager

Encl. : Environmental Impact Assessment Application Form
: Environmental Impact Assessment Screening Form

APPLICATION FORM FOR AN ENVIRONMENTAL IMPACT ASSESSMENT (EIA) LICENCE

1. Name of Institution / Company:

Marampa Iron Ore (SL) Limited

2. Type of Business

Mining Exploration

3. Business Registration No.

CF/175/2007

4. Contact Address

49J Spur Rd
Lumley, Freetown

5. Nationality

Sierra Leonne

6. Proposed Development

Marampa Iron Ore Project

7. Proposed Location

In vicinity of Lunsar Townsite, Port Loko District, Sierra Leone.

8. Cost of Proposal

USD 500 Million

9. Estimated Duration for Development Activities

3 years

10. State the Impact of Activities on the Following:

	Tick the Appropriate Columns	POSITIVE	NEGATIVE
a)	**Substantial Impact on Ecosystem of the locality**		√
b)	**Social**	√	
c)	**Aesthetic**		√
d)	**Scientific**	√	
e)	**Historical**	√	
f)	**State Other:**	√	

The Project provides a positive social impact not only on the immediate locality but also surrounding areas due to the hiring of employees, and the use of suppliers and contractors from other areas within Sierra Leone.

ENVIRONMENTAL IMPACT ASSESSMENT SCREENING FORM

SECTION 1: INFORMATION ON THE CONTACT PERSON

Name:	Chris Gbyl
Institutional Affiliation:	Marampa Iron Ore (SL) Limited
Business Title / Position:	Country Manager
Telephone:	+ 232 (0) 33 294188
Email:	Chris.Gbyl@miolb.com

SECTION 2: DESCRIPTION OF THE INDUSTRY/FACTORY/COMPANY/PROJECT AND OR PROPOSED PROJECT

Due to the early stage of Project development, the information provided by Marampa Iron Ore (SL) Ltd in this form is preliminary and is subject to change throughout Project development.

Name:	Marampa Iron Ore Project (the Project)
Date operations started:	Construction of the Project is subject to technical and economic studies and is not expected to commence before 2012.
Location of establishment and/or Project:	The Project is located 90 km northeast of Freetown near the town of Lunsar in the Port Loko District (Figure 1)
Location of proposed project:	See above
Land area:	The total land area to be disturbed by the Project has not yet been determined due to the early stage of Project development. The current exploration licence area EXPL09/06 covers 305 km^2 however the Project will not cover this entire area. At present, Marampa Iron Ore (SL) Ltd (the Company) has identified three areas that may be affected by the Project (Figure 2). Area 1 has been identified as a potential infrastructure location and Areas 2 and 3 have been identified as potential mining areas. These three areas represent the environmental and social "area of interest" at this stage of the Project and cover a total of 30.4 km^2.

Attach a map or maps covering the proposed site and surrounding 5 km radius

Figure 1 shows the general location of the Project and Figure 2 shows the three environmental and social areas of interest.

CURRENT LAND USE

Describe how the land is being used at present

The area of interest is a mosaic of cleared areas or secondary growth, interspersed with floodplain subsistence cultivation along river courses, isolated settlements and small areas of palm plantations. The crops grown within the floodplains include cassava, ground nut, rice and potato, and are largely for subsistence use. Small villages and minor roads and tracks occur within the area of interest but there are no other major commercial or industrial operations within the boundaries of the area of interest.

Describe any possible alternative site(s)

The location of the mining operations is determined by underlying geology therefore no alternative sites are possible. The infrastructure location is determined by its proximity to the existing railway line.

Describe other types of industries or facilities (including health centers and schools), which are located within 100 metres of the site, or are proposed to be located near the facility. Indicate the proximity of the industrial, factory or project site and or proposed site to residential areas, national parks or areas of ecological, historical or cultural importance.

There are no industries or facilities located within 100 m of the area of interest.

The area of interest is located near the town of Lunsar which has a population of 23,387 according to the 2008 census. Lunsar has approximately 10 primary schools, 8 secondary schools and two hospitals. There is no sanitation system in the town and water is either obtained from groundwater wells or surface water sources such as the Rokel River.

The area of interest is located adjacent to a 10 km^2 mining licence area (ML02/05) held by London Mining (Figure 2). The London Mining lease is located within 100 m of the boundary of the area of interest however the Company will not carry out activities within the London Mining lease.

The area of interest includes small villages, mostly within the Masimera and Marampa chiefdoms. The houses in the villages are largely made out of mud with palm leaf or corrugated iron roofs. Most villages have a hand-pump well for water supply but do not have a formal drainage system. Some villages contain small schools which service the children of the local communities.

It is currently understood that there are no sites of ecological or cultural importance located within 100 m of the area of interest, with the exception of society bush, however this assumption will be confirmed during the Environmental Impact Assessment (EIA). There are no protected areas located within EXPL09/06, although there is a forest reserve 20 km to the east of the exploration licence area.

Indicate whether adequate infrastructure exists at the location and/or proposed location and whether old or new buildings, roads, electricity and water lines or drainage systems exist at the location and/or proposed site.

New Project-specific infrastructure will be built at the site; including a processing plant, on-site power generator and distribution network, water storage and supply infrastructure, storm water systems, waste management facilities, site haulage roads, auxiliary buildings and an accommodation camp.

SECTION 3: EMPLOYEES AND LABOURERS

Number of people employed: At this stage in the planning of the Project, there is no exact indication of the number of people to be employed throughout the life of the Project. Numbers will vary between the different Project phases; operation employment requirements are potentially to be more than 500.

Employees and labourers	During Construction	During Operation
Full Time	300+	500+
Part Time	Unknown at present	Unknown at present

Indicate whether you have or plan to construct housing / sanitation facilities for temporary or permanent workers

An on-site accommodation camp will be provided for non local staff during work periods and a temporary construction camp may also be required during the construction phase of the Project. The camps will include appropriate sewerage treatment and waste management systems though details of these are not yet available.

SECTION 4: DESCRIPTION OF INDUSTRIAL PROCESS

Briefly describe the type and nature of industrial processes at the installation and / or proposed installation.

The Project will include open pit mining of specular hematite (iron ore) and on-site beneficiation including crushing, grinding, and concentrate cleaning via wet high-intensity magnetic separation.

State the type and quantity of energy used (including the origin of the energy i.e. public utility, on site generator, wood, solar, wind etc.)

Type (s)	Quantity	Period (per day/week etc.)
On-site generator (large)	Unknown at present but the generator will be designed to provide all Project power requirements	Power requirements will be continual but Project will aim to be self-sufficient

Estimate the quantity of water used

Use(s) of water	Quantity	Period	Source
Cooling	None	NA	NA
Steam generation	None	NA	NA
Production process	~10,000 m^3 per day	Continuous	Unknown (possibly Rokel River and reclaim from tailings facility and dewatered pits)
Other (e.g. potable water, dust suppression, vehicle washing)	Unknown	Continuous	

List the type and quantity of raw material(s) used per year in the production process (including soil, sand, cement, aggregates, wood, animals etc). Identify the source(s) of raw material(s)

Type (s)	Quantity	Source
Large quantities of raw materials will be required for the construction and operation of the Project although at this stage of the Project, details regarding the quantities and source of the raw materials have not been determined. Materials will be sourced from local suppliers where feasible.		

List all of the chemical(s) used in the production process or expected to be used for any aspect of the production process (a separate list may be attached with more detailed information).

Type (s)	Description	Quantity
At this stage of the project, specific chemicals and quantities required have not been identified however as the beneficiation process is mainly physical, so use of toxic chemicals are unlikely. Possible chemicals that may be required include explosives, lubricants, dust control agents and water treatment chemicals		

SECTION 5: PRODUCTS

Briefly state the nature of the product(s) or output of the facility and or proposed facility, and the expected quantities on a quarterly or annual basis. Indicate the use and or intended use of the product(s).

Name	Description of uses	Output
Iron concentrate (~65% Fe)	Steel production (by third parties outside Sierra Leone)	5 Mtpa concentrate

SECTION 6: BY PRODUCTS, WASTE MANAGEMENT AND DISPOSAL

Specify the nature of each waste or by-product and the quantity generated or to be generated.

Type (s)	Description	Quantity in 1g per weeks
Solid (bulk)	Waste rock from mining process	20 Mtpa
	Tailings from concentrator	10 Mtpa
Solid particulate	Dust and blasting fumes	Unknown at present
Liquid	Unknown at present (dependent on processing activities)	Unknown at present
Gaseous	Haulage vehicle emissions Generator emissions	Unknown at present

State the method of disposal or management (e.g. dump site, burning, bury etc)

Details of waste management strategies have not yet been developed, however all hazardous and non-hazardous wastes will be collected, transported, processed, recycled or disposed of in a manner that meets national requirements and good international industry practice.

Type of waste	Method of disposal/management
Waste rock	Waste stockpiles located adjacent to pits
Tailings	Within a facility consisting of rock wall embankments
Non hazardous	Recycled, incinerated or landfill
Hazardous	Options for disposal and management of hazardous waste have not yet been determined but measures will meet national requirements and good international industry practice

Indicate the sources of noise pollution, the type / quality of noise (i.e. machinery / repetitive pounding etc)

Sources of noise	Type of noise
Mining	Drilling, blasting, heavy vehicles
Processing	Crushing and grinding
On-site generators	Engine noise

SECTION 7: ENVIRONMENTAL IMPACTS

Please indicate environmental impact (s) that may occur as a result of the factory / industrial process and or the process of proposed project.

The potential impacts of the Marampa Project have been identified at a preliminary level in the following table. The impacts were identified through consideration of limited information on the Project, its environmental and social setting and taking account previous experience gained on similar projects. The impact assessment will evaluate if these potential impacts are likely to occur and if so, to what extent. This list of impacts may change during the period of Project development and the ESIA will evaluate new impacts identified.

Nature of impact	Brief description of the anticipated impacts
Land transformation and landscape	Modification of land by mining activities and infrastructure limiting use by local communities
	Disturbance of transport routes by Project infrastructure affecting local communities
	Mining activities and infrastructure causing visual intrusion leading to loss of sense of place for local communities
	Disturbance to sites considered to be of archaeological, historic or cultural importance by local communities
Soil	Surface erosion by wind and water leading to degradation and/or loss of soil resulting in reduced land capability
	Uncontrolled or accidental discharges leading to deterioration of soil quality
Air Quality	Release of fugitive dust and particulate emissions leading to increase in background particulate concentrations creating nuisance or health risks to local communities
	Release of gaseous emissions (SO_2, NO_x and Volatile Organic Compounds) leading to increases in background gaseous concentrations causing potential health effects to local communities
	Release of greenhouse gas emissions contributing to increasing global greenhouse gas concentrations
Surface Water	Diversion of surface water drainage channels resulting in changes to water availability for downstream users and ecosystems
	Abstraction of water for the mine resulting in reduced availability of water to other water users
	Dewatering of the mine workings leading to reduced availability of water to other water users
	Discharges from the Project during storm events leading to contamination of local waterways resulting in water quality impacts downstream of the mine site
	Deteriorated water quality in mine water holding facilities posing risks to people and wildlife
	Mobilisation of soils due to erosion process leading to sedimentation of local waterways potentially affecting site drainage, aquatic fauna and downstream water users
Groundwater	Seepage from mine and mineral-processing residue disposal facilities or tailings storage facility or waste rock dump failure (e.g. due to liner leakage) leading to contamination of groundwater aquifer impacting downgradient water users
	Mine consumption and dewatering leading to reduction in available groundwater to downgradient users
	Potential pit lake formation following closure of mine and possible impact of pit lake water on the downstream groundwater quality
Noise and vibrations	Project activities resulting in unacceptable increases in background noise levels for local communities
	Blasting leading to vibration disturbance to local communities

Nature of impact	Brief description of the anticipated impacts
Ecology	Land disturbance leading to loss of habitat and individuals.
	Habitat disturbance and animal displacement due to mining activities and vehicles resulting in changes to biodiversity.
	Displacement of natural fauna due to disturbance from mining activities and vehicles
Socio-economic	Direct and indirect employment, training and business opportunities and training, leading to improved economy
	Social investment leading to improved infrastructure and quality of life
	Influx of job seekers and mine related activities increasing pressure on local resources and services and demographic changes leading to changes in community health
	Sudden decrease in demand for workers and services, after completion of construction phase, leading to increase in unemployment and slowing down of local economy
	Retrenchment at end of construction phase and mine closure leading to loss of employment, income and slowing down of economy
	Loss of land leading to loss of income and livelihood opportunities, relocation of households or villages leading to long term poverty
Hazardous incidents	Exposure to fly rock, slope failure of the tailings dam or waste rock dumps, explosion or fire, petrochemical spills, vehicle accidents.

SECTION 8: PROPOSED MITIGATION MEASURES

Indicate the measures(s) employed to mitigate against damage likely to be caused by the factory / industrial process and / or proposed project to humans and /or the environment.

At this stage of the Project, only a preliminary identification of potential environmental and social impacts has been undertaken. As baseline studies and impact assessments have not been carried out, the potential risks/impacts cannot be quantified, therefore mitigation measures have not been proposed at this stage, however these types of impacts are typical for mining projects and considered manageable. Following the findings of the impact assessment, specific mitigation and management measures will be included as part of an Environmental and Social Management System (ESMS) in the final EIA report and will be in accordance with IFC Performance Standards and World Bank Environmental, Health and Safety Guidelines for Mining.

State any and all experience you have with implementing the above mentioned mitigation measure(s). If you do not have prior experience, what skill (s) do you possess to implement these mitigation measures?

The Company's management has considerable experience in managing and operating mining operations similar to that proposed for the Project. The EIA will be conducted by environmental consulting firm SRK Consulting (SRK). SRK has considerable experience in conducting EIA processes globally across all regions of the world. A list of recent environmental and social projects conducted by SRK Consulting (UK) is attached which involved the development and implementation of mitigation and management measures for large mining operations.

What staff training is provided or will be provided to ensure compliance with health and environmental safety standards?

Training on health, safety and environmental issues will be provided by the Company to ensure that all activities associated with the Project are undertaken in accordance with national requirements and good international industry practice. Health, safety and environmental training will be compulsory for all employees, prior to commencing any work.

SRK Consulting
Engineers and Scientists

Selected Environmental and Social Projects

Project Name	Client	Timing	Country	Description
Kiaka	Volta Resources	2010 – Ongoing	Burkina Faso	Environmental and Social scanning study. Approval for Scoping phase of ESIA process, as well as installation of meteorological station and monitoring system with a preliminary scoping of water resources and surface water hydrology.
Thar Coal	Engro Power	2009 - ongoing	Pakistan	Environmental and social input compliant to host country and international standards into the feasibilty study for a open cast coal mine.
Bozshakol ESIA	Kazakhmys	2008-ongoing	Kazakhstan	Environmental and Social Impact Assessment for a copper project conforming to EP/PS, host country requirements and owner standards. Input to pre-feasibility.
Reko Diq ESIA	Tethyan Copper Company (Barrick/Antofogast JV)	2007-Ongoing	Pakistan	Environmental and Social Impact Assessment for a copper/gold project conforming to EP/PS, host country requirements and owner standards. Input to pre-feasibility and feasibility studies.
Fedorovo	CJSC Fedorovo (Barrick)	2007-ongoing	Russia	Environmental and Social Impact Assessment for a nickel/PGM project conforming to EP/PS, host country requirements and Barrick Standards. Input to pre-feasibility and feasibility studies.
Nimba Mountains Concept Study	SMFG (Rio Tinto/Newmont JV)	2007	Guinea	Development of plan of study for environmental and social impact assessment for an iron ore project to conform with EP/PS and BHP Billiton/Newmont Standards as input to project development Concept Study.
Corantijn River Dredging Project ESIA	NV BHP Billiton Maatschappij Suriname (BHP Billiton)	2007 - 2008	Suriname	Environmental and social impact assessment process of river dredging project.
Suriname River Dredging ESIA	NV BHP Billiton Maatschappij Suriname (BHP Billiton)	2006-2008	Suriname	Environmental and Social Impact Assessment conforming to EP/PS and BHP Billiton Standards.
Ghurayyah Scoping Study	Tertiary (Middle East) Ltd	2006-2007	Saudi Arabia	Environmental and social impact assessment and input into pre-feasibility study.
Malmbjerg ESIA	International Molybdenum plc	2005-2007	Greenland	Environmental and social impact assessment and input into Feasibility Study for a molybdenum project to meet Greenlandic requirements.
Voskhod ESIA	Oriel Resources Plc	2006-2007	Kazakhstan	Environmental and Social Impact Assessment to comply with EP/PS undertaken in parallel with feasibility study.
Bulghah ESIA (Ma'Aden)	Bulghah ESIA (Ma'Aden)	2005-2007	Saudi Arabia	Environmental and social impact assessment.
Bakhuis Transport ESIA	NV BHP Billiton Maatschappij Suriname (BHP Billiton)	2006-Ongoing	Suriname	Environmental and Social Impact Assessment conforming to EP/PS and BHP Billiton Standards for the transport and processing aspects of Bakhuis bauxite project.
Kolwezi EIA	Adastra/Congo Mineral Developments Limited (CMD)	2004-2005	DRC	Equator Principles standard environmental and social Impact assessment for a tailing reprocessing project.

SECTION 9: TESTIMONY

I confirm that the information provided herein is accurate to the best of my knowledge. I will also endeavour to provide additional information and facilitate a site visit if required.

For Official Use Only	
Reviewed by:	**Date:**
Classified A B C	
Reasons for the classification:	
Endorsed by:	**Date:**
Approved by Director:	**Date:**

SIERRA LEONE GOVERNMENT

Sierra Leone Environment Protection Agency
3rd Floor, Youyi Building, Freetown

20th August, 2010

Chris Gbyl
Country Manager
Marampa Iron Ore (SL) Limited
49J Spur Road
Lumely, Freetown.

Dear Sir,

RE: MARAMPA IRON ORE PROJECT: SUBMISSION OF ENVIRONMENTAL IMPACT ASSSESSMENT APPLICATION AND SCREENING FORMS

I write to acknowledge receipt of your application and screening forms and letter dated 17th August, 2010 for the issuance of an environmental impact assessment (EIA) licence to enable your Company undertake impact studies after resource estimation.

After a careful look at the application and screening forms your project has been classified under category A. In view of this, you are required to carry out an Environmental, Social and Health Impact Assessment (ESHIA) Study within the project location and its environs.

Upon completion of the EIA Studies, you are required to submit eighteen hard and electronic copies of the ESHIA Report with management plans including the environmental management plan (EMP) and Community Development Action Plan (CDAP) to the office of the Director of the Sierra Leone Environment Protection Agency in a bid to facilitate the process of issuance of an EIA Licence to the Company.

We count on your cooperation.

Yours sincerely,

Momodu A. Bah
Acting Deputy Director, in charge of EIAs, Field Operations & Extension

APPENDIX C

C STAKEHOLDER ENGAGEMENT PLAN

MARAMPA IRON ORE PROJECT: STAKEHOLDER ENGAGEMENT PLAN FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

Prepared For

MARAMPA IRON ORE (S.L.) LTD

Report Prepared by

SRK Consulting (UK) Limited

UK3823

SRK Legal Entity:		SRK Consulting (UK) Limited
SRK Address:		5th Floor Churchill House 17 Churchill Way City and County of Cardiff, CF10 2HH Wales, United Kingdom.
Date:		August, 2012
Project Number:		UK3823
SRK Project Director and Project Manager:	Fiona Cessford	Corporate Consultant (Environmental)
Client Legal Entity:		Marampa Iron Ore Ltd
Client Address:		Victoria Place 31 Victoria Street Hamilton Bermuda HM10

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MARAMPA IRON ORE PROJECT: STAKEHOLDER ENGAGEMENT PLAN FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT – EXECUTIVE SUMMARY

SRK Consulting (UK) Limited (SRK) has been appointed by Marampa Iron Ore (SL) Limited (MIOL) to undertake an Environmental and Social Impact Assessment (ESIA) for the proposed Marampa Iron Ore Project (the Project) in Sierra Leone. This document presents the Stakeholder Engagement Plan (SEP) used to guide the process of information disclosure and stakeholder consultations during the environmental and social assessment studies. The SEP is a dynamic document that will be updated at different stages of the Project.

The consultation programme outlined in this SEP is based on the requirements of the Sierra Leone national legislation and where practical, the International Finance Corporation (IFC) performance standards.

The specific objectives of this SEP are to:

- provide an identification and analysis of potential Project stakeholders;
- describe relevant Sierra Leone legal requirements and international standards;
- document the community engagement process to date;
- describe the methodology used for consulting with relevant key stakeholders and document their feedback; and
- propose the grievance mechanism.

Based on a visit to the Project site, assessment of the potential Project footprint area and meetings with government agencies, SRK compiled a list of potential Project stakeholders and analysed their interest in and influence on the Project. The stakeholders are categorised as: government authorities, residents of the villages around the mine site, community based organisations, non government organisations and other civil society groups.

The stakeholder consultations comprised:

- meetings with SLEPA and other relevant ministries to notify formal start of the ESIA process and understand their expectations; and
- formal scoping meetings with local communities and other stakeholders to record their concerns and expectations.

The approach to the consultation and disclosure activities undertaken in support of the ESIA process followed the commonly accepted international principles to maximise participation of all sections of the society including any marginalised groups.

The outcomes of the meetings are summarised in the form of list of stakeholder issues and expectations which were;

- Local people/youth (born in the area) and land owners should be involved in the employment and development process to avoid conflict.
- Concerns over the decline in people working in agricultural production reducing the availability of farm workers and increasing pressure on food resources.

- Women must be considered for employment and child labour be avoided.
- Apprehensions about noise pollution, air pollution, flora and fauna biodiversity loss. How will MIOL mitigate these issues?
- Apprehension about depletion of water table, which needs to be addressed.
- Concern over the inappropriate disposal of tailings.
- MIOL should develop tangible structures instead of just giving out money.
- Preference towards local businesses and shops for purchase of provisions and supplies.
- Resettlement is a key issue and MIOL must do this sensitively and properly where they should buy land and build houses for them.
- The authority of Paramount Chiefs is now declining MIOL and should not rely on them too much. The Company should identify other leaders and communicate directly with community members. Dialogue with the community should be sustained
- The Community Liaison Officer (CLO) will be the key person for community outreach.
- MIOL should hold monthly meetings with the community.
- What will MIOL do about tailing storage facilities?
- Landowners should be treated fairly whereby they receive the true money value of their land.
- The rehabilitation of mined out areas is very crucial for the sustainability in agriculture.
- Concerns over the effect of air pollution and dust from vehicles will have on human health
- Concerns over heavy machines shaking nearby houses and blasting activity damaging their houses as structures are weak.
- Concerns over increases in accidents due to an increase in traffic and the safety of people when crossing railways and roads.
- Toilet facilities and clean water supply should be provided.

Future stakeholder consultations on completion of the ESIA report (in the form of an Environmental and Social Impact Statement or ESIS) will comprise of:

- feedback consultations to update the stakeholders on predicted impacts and proposed mitigation measures; and
- a public hearing meeting by SLEPA to assess public opinion on the Project.

For managing community relations MIOL will need a mechanism for effective and speedy resolution of stakeholder complaints and problems and also to provide a satisfactory response to their queries and issues on an ongoing basis. The mechanism will be developed in consultation with stakeholders for transparency.

Table of Contents

List of Tables

List of Figures

List of Technical Appendices

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MARAMPA IRON ORE PROJECT: STAKEHOLDER ENGAGEMENT PLAN FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

1 INTRODUCTION

SRK Consulting (UK) Limited ("SRK") has been appointed by Marampa Iron Ore (SL) Limited (MIOL) to undertake the Environmental and Social Impact Assessment (ESIA) for the proposed Marampa Iron Ore Project (the Project) located in Sierra Leone. This document presents the Stakeholder Engagement Plan (SEP), required as part of the above study, to guide the process of information disclosure and stakeholder consultations during the ESIA process. The SEP is a dynamic document that will be updated at different stages of the Project. This version of the SEP presents the findings and methodology of the stakeholder consultations undertaken during the scoping phase of the ESIA process and its outcomes. It also provides the plan for further consultations as part of the ESIA process.

1.1 Project background

The Lunsar area was the focus of significant mining operations run by DELCO between 1933 and 1975. This mining operation, which is located within ML02/05, mined both the lateritic cap from Masaboin and Gafal Hills, and the underlying specular hematite schists. The specular hematite was concentrated by crushing, coarse grinding and gravity separation, with production reaching approximately 2.5 million tonnes per annum ("Mtpa") of concentrate in the late 1960s (Cape Lambert, 2009). DELCO constructed a railway and port loading facility at Pepel Port for transport of the product to worldwide markets.

During the DELCO period of operation, a large community and related infrastructure was established, which included hospitals, schools, community halls and sports facilities for use by employees and the local community. The health centre was a recognised training centre for student nurses and an apprentice scheme for young men was also established. The Delco mining operation closed in 1975, following a drop in iron ore prices, resulting in significant job losses. Smaller-scale operations started up again in 1981, which involved dredging of the tailings by Austrian company, Austromineral GMBH. This operation was abandoned in 1985 due to increasing production costs.

Recent exploration by MIOL, within its Exploration Licences EL46/2011-A and EL46/2011-B (Figure 1-1), has identified six priority areas and is currently focussing on the development of the Gafal, Rotret, Mafuri and Matukia Prospects for the current ESIA and mining licence application.

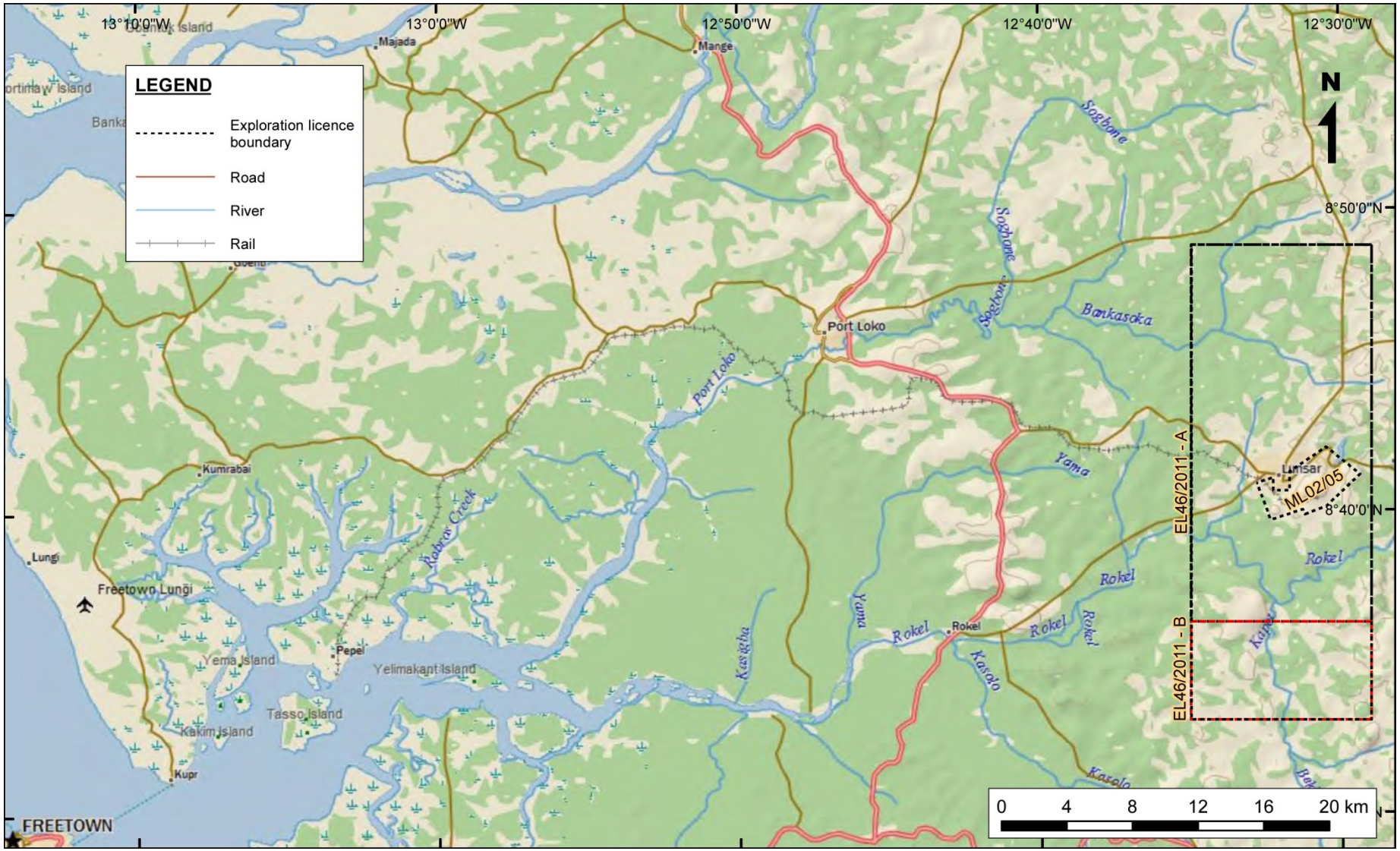

Figure 1-1: Location of the exploration area

1.2 Structure of the document

This document consists of the following sections:

- Section 1: introduction and background to the Project;
- Section 2: Project description;
- Section 4: regulatory requirements and guidelines;
- Section 3: purpose and scope of the SEP;
- Section 5: potential Project stakeholders';
- Section 6: consultations undertaken to date;
- Section 7: future consultations; and
- Section 8: grievance mechanism.

2 PROJECT DESCRIPTION

The Company has completed initial exploration drilling of specular hematite deposits at the Gafal, Rotret, Mafuri and Matukia Prospects. A preliminary mining scoping study conducted by Bateman Engineering Pty Ltd ("Bateman") concluded that mining at a capacity of up to 15Mtpa is technically feasible, and financial estimates to date are positive. The Project Mineral Resource is estimated at 680 million tonnes with an in-situ grade of 28.2% Fe (15% Fe cut-off grade) and, with processing, could generate a high quality saleable iron concentrate (~65% Fe), with low levels of deleterious elements.

The Project involves the construction of facilities and infrastructure to produce up to 15 Mtpa[1] of iron concentrate. This will be done in two stages. Stage 1 will involve the construction of facilities to produce 2.5 Mtpa of iron concentrate through the mining of oxide ore only. Stage 2 (an extension to Stage 1) involves expanding these facilities, and the construction of additional facilities, to enable the production of a total of up to 15 Mtpa of iron concentrate through the mining of oxide and/or fresh ore. While the development plan of Stage 2 of the Project is reasonably known at this time, it will be the subject of a detailed feasibility study moving forward.

Access to existing rail and port infrastructure, which was recently upgraded and returned to operation by African Minerals Limited (AML), offers the advantage of lower capital investment start-up costs and Project lead time, as well as significant environmental advantages, as opposed to construction of a new port and rail. Open pit mining is the preferred mineral extraction method, further reducing capital development costs.

The main Project components included in this ESIA and indicated relative to the local villages on Figure 2-1 are listed below:

- Four open pits (Matukia, Gafal, Rotret and Mafuri) and four associated waste rock dumps ("WRD")
- Run of mine ("ROM") and low grade stockpiles
- Beneficiation plant, comprising:
  - crushing;
  - stockpiling;
  - ore reclamation;

[1] *It should be noted that references to concentrate production rates refer to dry metric tonnes. The moisture content of the product may range between 8-10%, which will increase the actual tonnage of concentrate produced, transported and exported accordingly (wet metric tonnes).*

  - scrubbing / grinding;
  - rougher / scavenger magnetic separation;
  - rougher / scavenger concentrate regrind;
  - cleaner and recleaner magnetic separation;
  - concentrate thickening and filtration;
  - tailings thickening;
  - reagent storage and use; and
  - supporting utilities.
- Tailings storage facility (“TSF”)
- Power generation and distribution facilities
- Water supply facilities
- Stormwater management facilities
- Waste water management systems
- Communications systems
- Accommodation
- Medical and emergency services
- Utilities (potable water supply, fire water system, air compressor systems)
- Mobile equipment (vehicles etc)
- Buildings for storage, offices, workshop, laboratory, etc
- A rail spur and head, connecting to the existing Pepel railway line
- Use of existing road routes for transport of supplies to the mine (including the existing Makeni Highway, connecting Freetown to Lunsar) and some new on-site roads to connect Project infrastructure

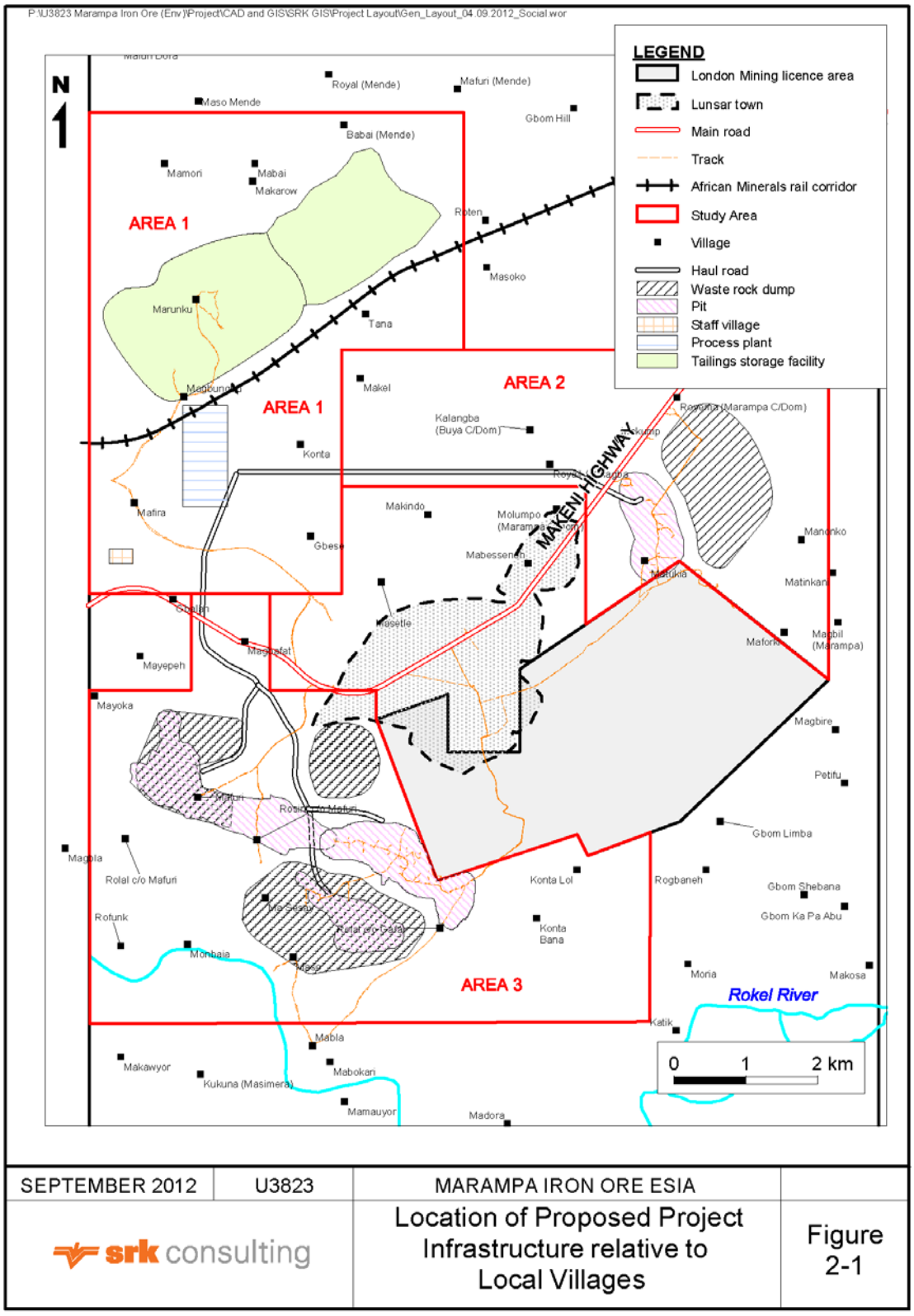

Figure 2-1: Location of proposed Project infrastructure relative to local villages

3 REGULATORY REQUIREMENTS AND GUIDELINES

This section describes both Sierra Leone requirements and international guidelines for conducting stakeholder consultation and disclosure activities during the ESIA process and throughout Project operation.

3.1 Sierra Leone national policy guidelines

Current Sierra Leone legislation most relevant to the ESIA process is:

- the Environment Protection Agency Act No. 11 of 2008 (EPA Act 2008); and
- the Mines and Minerals Act 2009.

Each of these is briefly described in the sections below.

3.1.1 Environmental Protection Agency Act, 2008

The EPA Act 2008,, Sections 27 (1) and (2) stipulate the procedure for release of the ESIA report to the public for review and invites their comments. It includes:

- circulation of the ESIA report to professional bodies or associations, Government Ministries and non-government organisations by SLEPA;
- notice by SLEPA in two consecutive issues of the Gazette to open the ESIA report for public inspection and comments; and
- notice by the Company in two issues of newspapers, with an interval of seven days between first and second publication, inviting public inspection and comments.

Any public comments received within fourteen days of the last publication in the Gazette or newspaper should be compiled by the company and reported to SLEPA.

3.1.2 Mines and Minerals Act, 2009

The Mines and Minerals Act (2009), Part XV (Protection of the Environment), Section 133 (2) corroborates the provisions of the EPA Act (2008). It states that a mining licence applicant, applying for an environmental licence, shall consult with the public to introduce the Project and to verify possible impacts of the Project from stakeholders' perspectives.

Subsection (3) further states that a copy of the ESIA report shall be considered non-confidential and shall be made available to the public at the Mining Cadastre Office.

3.2 International standards and guidelines

The IFC's Performance Standards (PS) published in January 2012 are regarded as a benchmark for large private sector Projects. The PS are also at the core of the revised Equator Principles, a code of practice applied by international financial organisations involved in the financing of such Projects. The stakeholder consultation programme for the Project will be guided by the standards and guidelines, modified to reflect the nature and scale of the Project and other relevant factors.

The specific requirements for public consultation are contained in IFC's Performance Standard 1: Social and Environmental Assessment and Management Systems. The requirements for consultation are further elaborated in the corresponding Guidance Notes. The concept of free, prior and informed consultation is explained in the same table.

For Category A Projects (such as the Marampa Project), the Project proponent is required to consult with relevant stakeholders at least twice. First, during the scoping phase, before the Terms of Reference (ToR) for the assessment and baseline studies are finalised, and next on completion of the ESIA process to feedback on the potential impacts and resultant management plans. The consultation process then continues throughout the Project

construction, operation and closure phases, as necessary, to address relevant stakeholder issues and concerns which are shown in table 3.1.

In addition, the Equator Principles and Performance Standards require Project proponents to set up a system to address grievances in a prompt manner. This system should be understandable, transparent, culturally appropriate, easily accessible and should be at no cost to the affected people.

Table 3-1: IFC Performance Standards: key principles for undertaking public consultations

Reference/guidance	Key Principles/concepts
PS 1: Social and Environmental Assessment and Management System	Public consultation and disclosure should: • be free of external manipulation, interference, coercion or intimidation; • be inclusive of all segments of the affected communities (including women, children, the elderly, etc.); • be informed by preliminary stakeholder analysis; • entail both open (public) community meetings and discussions with community leaders; • clearly communicate potential Project-related risks and impacts; • start during early scoping (especially for Projects with significant impacts); • be based on timely, relevant, understandable and accessible information – this requires information to be provided in the languages and methods preferred by the affected communities; • inform the terms of reference (TOR) for social and environmental assessment; • allow time and opportunities for collective decision-making (especially for indigenous peoples) and for contextually appropriate feedback mechanisms; • lead to 'broad community support' defined as 'a collection of expressions by the affected communities, through individuals and their recognised representatives, in support of the Project'. • entail a clear action plan based on the environmental and social management plan; and • accompany all significant changes to Project planning, scope and execution.
Free, Prior and Informed Consultation	As per the IFC Guidance Note 1: Social and Environmental Assessment and Management Systems, Free, Prior and Informed Consultation means that the: *'…consultation should be "free" (free of intimidation or coercion), "prior" (timely disclosure of information) and "informed" (relevant, understandable and accessible information)'* and should lead to *'…broad community support for the Project by the affected communities'.* Broad community support is defined as 'a collection of expressions by the affected communities, through individuals and their recognised representatives, in support of the Project'.

4 PURPOSE OF THE SEP

The purpose of the SEP is to ensure the views, interests and concerns of Project stakeholders are taken into consideration during environmental and social impact assessment process. The specific objectives of the SEP therefore are to:

- identify potential Project stakeholders and analyse their interest/influence on the Project;
- describe relevant Sierra Leone legal requirements and international standards;
- present the approach and methodology for consultation and disclosure activities;
- consult with Project stakeholders and document their feedback;
- document the stakeholder engagement process to date; and
- propose a framework for grievance mechanism.

4.1 Overview of Marampa consultation process

An overview of the Marampa stakeholder engagement process is presented in Figure 4-1. The overall programme is closely linked to different stages the ESIA process so as to complement each other.

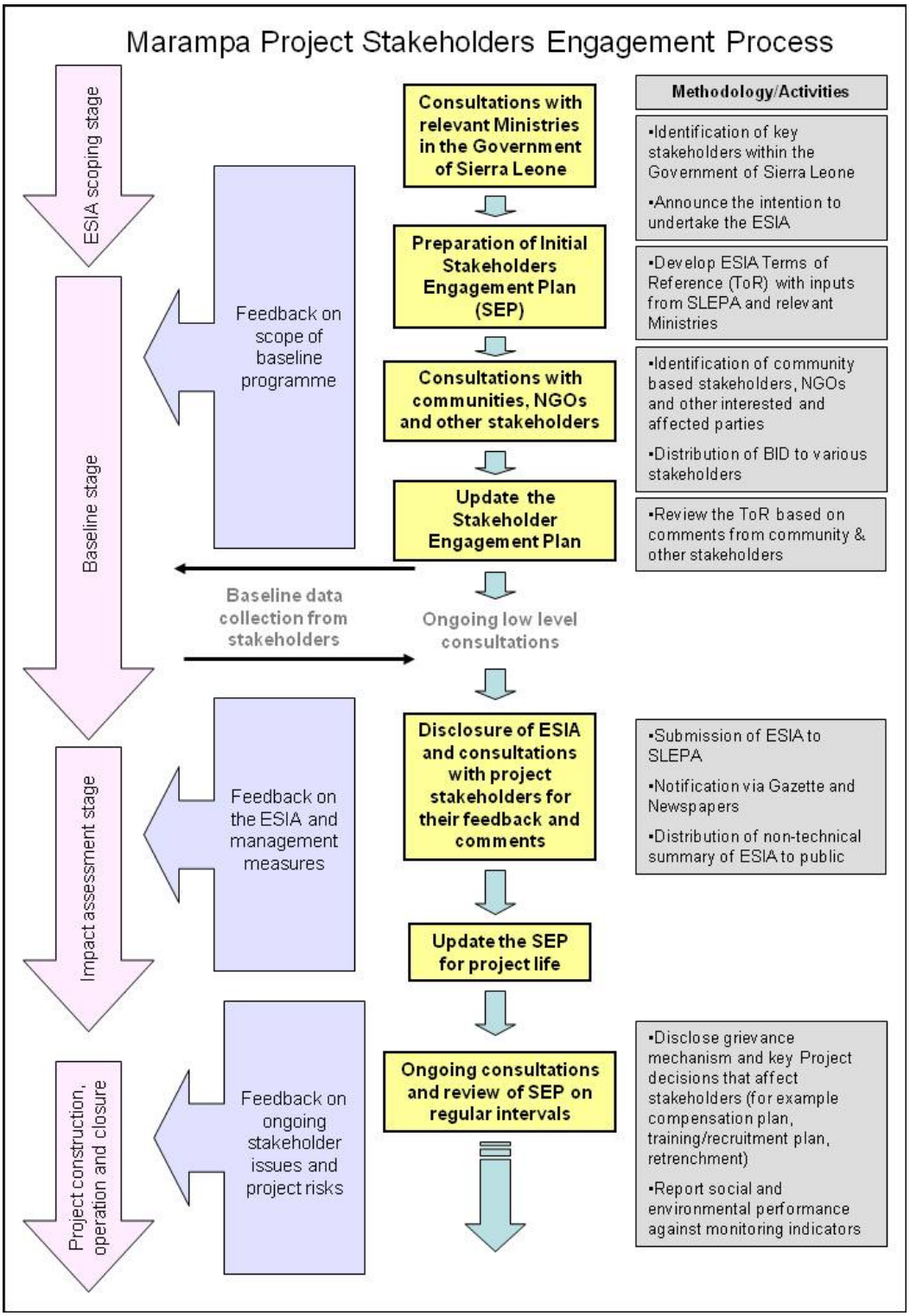

Figure 4-1: Marampa ESIA stakeholder engagement process

5 PROJECT STAKEHOLDERS

Project stakeholders are defined as those groups or individuals that 'will be directly or indirectly affected, positively or negatively, by the Project and who can contribute to or hinder its success' (IFC, 2012).

Identification of potential stakeholders including vulnerable groups/individuals was undertaken as a first step while preparation of the initial SEP during July 2010. The initial list of stakeholders was drawn based on meetings with the Project staff (at the site and in Freetown) and assessment of the potential Project footprint area. Government representatives met during July 2010 were asked to provide further information on names of potential stakeholders. Each stakeholder met during the scoping process was asked to provide further information on potential stakeholders. Hence the current list of stakeholders was developed as a snowballing process and is presented in Appendix 1. The list of interested NGOs and other interest groups was drawn using SRK's prior experience of working in Sierra Leone and in discussion with the in-country social specialist. Typically identification of stakeholders is an on-going and iterative process and more stakeholders are expected to be identified as the Project develops.

The analysis of stakeholders involved stakeholder categorisation in terms of their potential interest in the Project, how they could be affected by the Project and to what degree, issues and concerns they have with the Project and what influence they may have on the Project. Mode and frequency of communication was suggested for each stakeholder or group. Table 5-1 presents the stakeholder analysis conducted after the scoping consultations. Updating the stakeholder analysis is also an on-going process and should be repeated after each round of stakeholder engagement.

Table 5-1: Identification and analysis of stakeholders/ groups

Stakeholder category	Stakeholder (group)/ profile	(STAKEHOLDER PROFILE) Potential concerns and expectations from the Project	Impact/benefit from Project	Degree of influence over Project	Communication strategy
Government and regulatory authorities	• Port Loko District • Paramount Chiefs (Masimera, Marampa and Maforki) • Lunsar Town Administration	• Increased revenue for development programmes • Expect benefits to local communities and economy • Concerned about in increase in population due to migration of skilled and other workers	Medium	Medium	Information dissemination
	• Sierra Leone Environment Protection Agency (SLEPA)	• SLEPA is responsible for issuing EIA licences which are needed for the Project to be approved. • Concerned about potential environmental and social impacts	Low	High	Two way communication and negotiation
	• Ministry of Minerals (Mining Division)	• National government ministry for mines and minerals formulates and presents policies and legislation for the consideration of Parliament • The **Mines Division** administers the regulations made under the mines and minerals Act and the explosive Act. These regulations include the issue of all mineral rights and the administration and supervision of all activities under these rights. • The **Geological Survey Division** advises Government on all matters of geological nature. This enables the government to grant mineral rights to interested investors with Government's aim in pursuing a more creative mining development policy • Want to know the scale of and nature of mining operation and revenues	Medium	High	Two way communication
	• Ministry of Local Government	• Expects investment for community development	Medium	Low	Information dissemination
	• Ministry of Land Country Planning and Forests (Departments of Forests and Wildlife)	• Concerned about endemic species which are also vulnerable to hunting and illegal trade	Medium	High	Two way communication
	• Ministry of Agriculture and Food Security	• Concerned that the Project will bring many people into the area and those who don't get jobs will resolve to charcoal burning and fuel wood, thus exploiting the forest further. Expects the company to help develop the forest. • Already problems of low water levels and desertification, concerned these will be exacerbated.			Information dissemination

Stakeholder category	Stakeholder (group)/ profile	(STAKEHOLDER PROFILE) Potential concerns and expectations from the Project	Impact/benefit from Project	Degree of influence over Project	Communication strategy
Affected communities	• Villages falling within the potential Project footprint area; villages impacted by restricted access to land other natural resources; villages downstream of water supply area; host resettlement areas	• Expectation of jobs, business opportunities, training, improvement in physical infrastructure such as – schools, health centre, water supply, roads, electricity and other facilities	High	Medium	Two way communication
	• Land owners/farmers	• Concerned about loss of shelter and access to land and other natural resources • Concerned about the potential stress and trauma related to resettlement and displacement • Expectations of replacement houses, fair compensation for land (and crops, trees) • Expectations of support in livelihood restoration and financial support during transition period	High	Medium	Two way communication and negotiation
	• Lunsar residents	• Expect expansion in consumer base and increase in business and growth of town • Concerned about pressure on infrastructure as a result of influx of job seekers	Medium	Low	Information dissemination
	• Foreroad Baka women's association and Mabesene women's association	• Expectations in terms of opportunities for education and employment for females; and upward social mobility. Women should not be ignored in potential employment opportunities • Would like help to tackle pests destroying their crops • Expects assistance for business activities and for building up a storage facility for crops and produce. • Concerned blasting activities will damage their houses • Would like local people to be employed • Creation of toilet facilities and water supplies • Concerned about dust causing illness and increase in accidents due to traffic	High	Low	
	• Youth groups	• Concerned about community development • Concerned about wildlife protection and forest conservation	Medium	Low	Two way communication

Stakeholder category	Stakeholder (group)/ profile	(STAKEHOLDER PROFILE) Potential concerns and expectations from the Project	Impact/benefit from Project	Degree of influence over Project	Communication strategy
Non-government Organisations (NGOs) and special interest groups	• Network Movement for Justice and Development (NMJD)	NMJD is engaged in various rights based campaigns on the issues of mining in Sierra Leone. They build the capacity of community members and organisations on mining law and their rights to enable them negotiate and work with mining companies in a non-violent manner. They summarise mining and ESIA documents into simple language for community to understand as part of community. They are also working with the government to strengthen governance and accountability • Worried moving too fast could create problems • Communities should know what is happening at each stage to minimise impacts • Concerned about rights of local people	Low	Medium	Two way communication
	• Green Scenery	• Green Scenery is a local NGO involved in environmental promotion and protection; livelihood security; human rights and governance; and peace building and conflict resolution. • Worried company won't complete all stages prior to ESIA and just do enough to gain licence • Company should design programmes to engage with communities, talking to people is not enough • Chiefs are no longer in control of everything so company should engage with all people including youths • Re-vegetation is important • Concerned over change of ownership, a bond should be left for new companies to take up • Concerned about resettlement and land allocation • Concerned about how company will tackle climate change	Low	Medium	Information dissemination

Stakeholder category	Stakeholder (group)/ profile	(STAKEHOLDER PROFILE) Potential concerns and expectations from the Project	Impact/benefit from Project	Degree of influence over Project	Communication strategy
	• Environmental Forum for Action (ENFORAC)	• ENFORAC are a consortium of environmental NGOs, community groups and academic institutions who work together to protect and advocate for Sierra Leone's natural resources. Their main aims are: • Natural resource management; • Policy reforms and enforcement; • Land use planning; • Water catchments management; • Waste management; • Biodiversity management research; • Sustainable development; and • Mass environmental education and information campaigns. • ENFORAC raised concerns about visual impacts as the landscape will be destroyed, future disaster and digging of pits Want to know what the company will do about • Noise and air pollution • Tailing storage facilities • Drilling/blasting –effects on workers and the communities • Flora and fauna • Budget for mitigation	Low	Medium	Information dissemination
	• Cotton Tree Foundation	• Focuses on business agriculture, environmental rehabilitation (how the environment can be rehabilitated), food security and education. • Concerned about impacts on water and on agriculture • Expects the company to show respect for all local people, and to engage with different groups especially youths	Low	Medium	Information dissemination
	• Amazonian Initiative Movement	• The organisation campaigns against harmful practices against women and girls. They specifically campaign against Female Genital Mutilation (FGM). • Concerned about HIV and AIDS with foreigners/employees coming from outside not being aware of the problem.	Low	Medium	Information dissemination

Stakeholder category	Stakeholder (group)/ profile	(STAKEHOLDER PROFILE) Potential concerns and expectations from the Project	Impact/benefit from Project	Degree of influence over Project	Communication strategy
		• Concerned about young girls being brought into prostitution. • Expected preference to be given to locals in terms of employment. • Expects company to provide proper safety gear for employees. • Other concerns are with women, child labour and human resources			
Other stakeholders and stakeholder groups	• Journalist, Universal Radio (Media)	• Local and national newspapers, radio and T.V. • Eager to cover issues relevant to the interests of its audience and constituency • Looks for negative aspects of the Projects	Low	High	Information dissemination
	• Marampa Community Bank	• The Bank was re-established after the war in 2002 by the Government of Sierra Leone and started operating on 7th February 2003 to provide financial services to the Marampa community. • Expects the company to put a percentage of their money into the bank • Expects the company to do local banking and pay wages through the bank	Low	Low	Information dissemination
	• District Medical Officer (DMO) Port Loko	• DMO based in the district hospital in Lunsar • Problems with local people having to use unclean water from upstream • HIV/AIDS is prevalent in the area, concerned this may get worse with influx of people • Concerned about dust causing illness	Medium	Low	Two way communication
	• Port Loko Teachers College (PLTC) Administration	• Concerned about biodiversity and soil depletion and toxicity causing damage to plants • Expects company to plant economic trees for the local people to enhance livelihoods • Concerned in migration may cause an increase health and social problems such as crime • Expects assistance for tertiary institutions as well as primary and secondary schools • Concerned with rail /roads and transport causing accidents. • Believes that if the company help the schools then there will be a ripple effect, they can develop training	Medium	Low	Information dissemination

Stakeholder category	Stakeholder (group)/ profile	(STAKEHOLDER PROFILE) Potential concerns and expectations from the Project	Impact/benefit from Project	Degree of influence over Project	Communication strategy
		facilities to help people get jobs in the mine e.g. catering			
	• Murialdo Secondary School	• Concerned teachers may leave the school to get better paid jobs with the Project, the company should check employment records in interview • Concerned pupils may leave education to get work instead of staying in school • Expects MIOL to talk with and discipline employees who hassle the school girls. • Would like consultation to be a continuous process • Worried about demand on food, and people turning the theft if they cannot get work. • Would like MIOL to take part in school activities • Would like MIOL to give university scholarships to some pupils	High	Low	Two way communication

6 SUMMARY OF PREVIOUS CONSULTATIONS

This section provides a summary of the stakeholder consultation activities undertaken during this ESIA process (until March 2011).

6.1 Initial community engagement by MIOL

Prior to the start of stakeholder consultations as part of the ESIA by SRK, MIOL were involved in meetings with the local community members and their leaders as part of the on-going exploration activities and its on-going community support programme. The meetings generally took the form of open public meetings in a communal venue in Lunsar. No formal records are available of these meetings. Based on discussions with MIOL staff SRK has noted two key meetings held during 2010. These are presented in Table 6-1.

Table 6-1: MIOL's meetings with the communities in 2010

Place & Date	Stakeholder(s)	Meeting topics
Town Hall, Lunsar, April 2010	General Public and community representatives (about 800 participants)	• The Company presented an update on the Project progress and ongoing community development programmes undertaken by MIOL • The community wanted to know when the Project would start and make employment opportunities available
Primary School, Konta Village, 9 July 2010	Village residents, school children, First Lady of Sierra Leone, local administration, community representatives and general pubic	• The Primary School built with assistance from the Company was formally inaugurated by the First Lady on behalf of the people of Sierra Leone • Scholarships were distributed to selected students to support them in the continuation of their education

6.2 Scoping consultations with key government ministries

On start of the ESIA process, SRK conducted meetings with the key government agencies (mining, environment, forestry and the local government) during July 2010.

The purpose of meetings was to:

- formally initiate the ESIA process with SLEPA; and
- to announce the intention to develop the proposed Project among other relevant ministries;
- to seek inputs in the stakeholder identification process to identify additional Project stakeholders; and
- to document the issues and concerns of Project stakeholders for consideration in the ESIA process.

The meetings were held on a one-to-one basis in the ministry offices and were attended by a representative from MIOL. Meeting minutes were recorded for each meeting. Table 6-2 presents a summary of all the meetings held. Appendix 2 presents the records taken at the meetings.

A Background Information Document (BID) outlining the status of the Project was prepared as a disclosure document and provided to Ministry representatives at the time of the meetings. A copy of the BID is provided in Appendix 3.

Table 6-2: Summary of stakeholder meetings held in July 2010

Place & Date	Stakeholder(s)	Meeting topics	Follow up action by / MIOL/SRK
Mining Cadastre Office, 1 July 2010	Eugene Norman (Assistant Government Mining Engineer) Alusine Timbo (Assistant Government Mining Engineer),	• MIOL introduced the Project and announced the intention to start the ESIA. • Project Background Information Document was provided. • The Ministry representative asked that the ESIA requirements be discussed with SLEPA.	Consultation with SLEPA
SLEPA office, 2 July 2010	Momodu A Bah, Acting Deputy Executive Director (In-charge of EIA, Field operations & Extensions), SLEPA	• MIOL introduced the Project and announced the intention to start the ESIA. • Project Background Information Document was provided. • Mr Bah explained the steps leading to an ESIA licence and asked for a letter from the Company as formal notice to start the ESIA process.	Send letter to SLEPA as formal notice of intention to undertake the ESIA and request supply of application form and screening form.
Office of the Forestry Department, 2 July 2010	Mr Abdul-Abib F Conteh, Deputy Director, Forestry Division	• MIOL introduced the Project and announced the intention to start the ESIA. • Project Background Information Document was provided. • Mr Conteh provided information on the protected areas and asked for a formal letter to the Ministry for permission to proceed with the Project if it does not interfere with any protected areas.	Letter to the Ministry for permission to proceed, once the Project footprint area is defined.
Office of the Ministry of the Local Government, 2 July 2010	Director, Ministry of the Local Government	• MIOL introduced the Project and announced the intention to start the ESIA. • Project Background Information Document was provided. • The Director explained the role of the ministry representative on the Minerals Advisory Board and in negotiation between land owners and mining companies (if required).	Formal letter to the Ministry to seek community cooperation in the development of Project.

6.3 Scoping consultations with various stakeholders groups (March 2011)

Following meetings with the key stakeholders (Section 6.2) SRK conducted consultation meetings with a full range of Project stakeholders in March 2011. It included meetings with community groups, local government, NGOs and other interest groups.

6.3.1 Methodology used for consultation and disclosure activities

The methodology used for consultation meetings was based on analysis of the Project area and stakeholders. It took into consideration specific needs of the different stakeholders/groups (including vulnerable groups) and the following factors:

- literacy level and capacity to understand technical information;
- cultural background;
- gender;
- geographic location;
- vulnerability to potential Project impacts; and
- level of interest in and influence over the proposed Project;

Communication tools

Table 6-3 presents appropriate communication methods used with different stakeholder groups.

Table 6-3: Stakeholder consultation methods used

Methods:	Stakeholders:
One-on-one meetings	• Key Government stakeholders • NGOs • Paramount Chiefs
Public hearing/ meetings / open days	• Affected communities • General public
Focus group meetings/ workshops/ village meetings	• Vulnerable groups in communities (eg. women, the elderly) • NGOs • Special interest groups
Telephone conversations	• Government stakeholders • NGOs • Community Leaders
Fax, E-mail	• Government stakeholders • NGOs
Media	• All stakeholders • General public
Distribution of disclosure documents	• All stakeholders • Affected communities (non-technical summaries) (examples of disclosure materials are presented in Appendix 3)

Invitations for the meetings

Invitations for the consultation meetings were sent to institutional stakeholders 7-10 days in advance. Community groups were notified 3-4 days in advance of meetings, as longer notice periods tend to result in lower attendance levels in villages. Local communities were notified in person whereas Invitations/notices to other stakeholders were sent out either by letter, fax or email.

Disclosure documents

The BID and a fact sheet by MIOL was distributed among the stakeholders prior to and during the meetings. For community meetings posters were used to explain the proposed Project and aid the discussion. For meetings with the institutional stakeholders presentation slides were used to aid the consultation process. Appendix 3 shows the different disclosure documents used during scoping consultations.

Location of community meetings

The community meetings were held at each village within the study area[2]. Within the villages, meetings were held at centrally located open public areas to enable easy access by different

[2] *Study area is defined in the social baseline study (SRK, 2012)*

stakeholders including participation of women, youth, elderly and any minority groups. The meetings were held in locally popular language – Temne with translation into English for MIOL and SRK representatives.

In addition, a public meeting was held at Lunsar town which was open to the general public. Public notices were issued for participation in the meetings. This meeting was attended by about 1000 people from the Lunsar town and various villages in the vicinity of proposed Project site. It was also attended by the local leaders (both traditional and administrative). The meeting provide a forum for different sections of the society to exchange their opinion on the proposed Project which was largely in favour of the development.

Documentation

Record of stakeholder issues was kept at all meetings. These were compiled into an issues and response table, which shows how these were addressed during the ESIA process (Appendix 5). Copies of meeting minutes held during March 2011 (and example attendance register) are presented in Appendix 2. Selected photos from the meetings held in March 2011 are provided in Appendix 4.

6.3.2 List of stakeholders consulted

Table 6-2 presents the list of stakeholders consulted during March 2011, along with a date-wise schedule of the various meetings conducted.

Table 6-4: Meetings with various stakeholder groups in March 2011

Date	Place/venue	Stakeholder(s)
9 March 2011	49 Main Motor Road, Brookfields, Freetown	• Aminata Lamin (Programme Director) -Mining and Extractive, Network Movement for Justice and Development (NMJD)
9 March 2011	Soldier Street, Freetown	• Joseph Rahall (Director) - Green Scenery
9 March 2011	Upper Brook Street, Freetown	• Abdul Conteh (Director) and Ansumana LM Swaray, (National Coordinator) -Environmental Forum for Action
9 March 2011	Cotton Tree Foundation Office, King Street, Freetown	• Michael Kamara (Executive Director) - Cotton Tree Foundation
10 March 2011	Lunsar-Makeni Highway, Lunsar	• Osman Kargbo (Administrative Officer), Luisa (Intern Plan Officer) and 9 other staff members - • Amazonian Initiative Movement
11 March 2011	Office of the Marampa Community Bank, Lunsar	• Aiah Fomba (Manager) - Marampa Community Bank
11 March 2011	Office of Port Loko District Council	• Abdul Koroma (Deputy Chief Administrator), • Sheik A M Gibril (Rural Development Officer), • Hassan Bruce (Journalist, Universal Radio)
11 March 2011	District Agriculture Officer's Office, Ministry of Agriculture and Food Security, Port Loko District	• Ministry of Agriculture and Food Security
12 March 2011	Town Hall, Lunsar	Open Public Meeting, attended by: • General public, • Paramount Chief, • local villagers, • Village Chiefs,

		• land owners, • Provincial Secretary, • Member of Parliament, • Deputy Minister of Local Government and Internal Affairs, • AIG North, • Religious leaders, • Youth Groups, • Women's Groups, • Port Loko District Council, • NGOs, • Chiefdom Council, • MIOL/Cape Lambert
13 March 2011	Foreroad Baka Village, Lunsar	Foreroad Baka Women's Association
13 March 2011	Mabesene Village, Lunsar	Mabesene Women's Association
14 March 2011	DMO's office, Port Loko Government Hospital, Hospital Road, Port Loko	Dr Victor Max-Lebbie - District Medical Officer
14 March 2011	PLTC Campus, Lungi Road, Prot Loko	Ahmed A Koroma (Vice Principal and Director of Studies) - Port Loko Teachers College (PLTC) Administration
14 March 2011	Murialdo Secondary School, Lunsar	Fr. Giuliano Pini (Principal), Fr Emmanuel Koroma, Mr Ambrose Bangura (Vice Principal) - Murialdo Secondary School

6.3.3 Outcomes of the consultation meetings

The outcomes of the consultation meetings, in the form of list of key issues, concerns and expectations raised the stakeholders, is provided below. The issues were divided into categories for ease of understanding and dealing with them. Appendix 4 presents the complete list of the issues, concerns and expectations recorded during the consultation meetings.

Employment

- Local people/youth (born in the area) and land owners should be involved in the employment and development process to avoid conflict.
- Concerns over the decline in people working in agricultural production reducing the availability of farm workers and increasing pressure on food resources.
- Expect the Company to apply preferential employment of local people over outsiders.
- Women must be considered for employment and child labour be avoided.
- Concerned that the teachers and some senior students in the local schools may leave the school to work for the Project. What can MIOL do to prevent this?
- Rumours that one has to pay 200,000 to 400,000 Leones to get a job at the Project.

Environment

- Apprehensions about noise pollution, air pollution, flora and fauna biodiversity loss. How will MIOL mitigate these issues?
- Apprehension about depletion of water table, which needs to be addressed.
- Company should choose the vegetation species for rehabilitation, Gethropha is detrimental to local water.
- Concern over the inappropriate disposal of tailings.

Corporate Social Responsibility

- Communities should be involved in rehabilitation programmes
- Local people, should benefit from mining operations in their area
- MIOL should develop tangible structures instead of just giving out money
- Safe drinking water should be provided to the communities.
- Preference towards local businesses and shops for purchase of provisions and supplies.
- MIOL should use Marampa Community Bank for domestic banking and to pay staff salaries as this will allow for an improvement in community infrastructure

Stakeholder consultation process and participation

- The authority of Paramount Chiefs is now declining MIOL should not rely on them too much. Company should identify other leaders and communicate directly with community members. Dialogue with the community should be sustained
- The Community Liaison Officer (CLO) will be the key person for community outreach.
- MIOL should hold monthly meetings with the community.

Mining operations

- What will MIOL do about tailing storage facilities?
- There needs to be sufficient distance between the use of explosives and the communities.

Resettlement and livelihoods restoration

- Resettlement is a key issue and MIOL must do this sensitively and properly where they should buy land for them and build houses for them.
- MIOL should negotiate with plantation owners and the names of the landowners should be recorded in the deal.
- Landowners should be treated fairly, whereby they receive the true money value of their land.
- The rehabilitation of mined out areas is very crucial for the sustainability in agriculture.
- A request for assistance and support in business activities and the construction of a storage facility for crops and produce and agricultural expansion.

Health and Safety

- Concerns over the effect of air pollution and dust from vehicles will have on human health
- Concerns over heavy machines shaking nearby houses and blasting activity damaging their houses as structures are weak.
- Concerns over increases in accidents due to an increase in traffic and the safety of people when crossing railways and roads.
- Toilet facilities and clean water supply should be provided.

7 FUTURE CONSULTATIONS

The stakeholder consultations that will take place on completion of the draft ESIA report will comprise:

- feedback consultations to update the stakeholders on predicted impacts and proposed

mitigation measures; and
- a public hearing meeting by SLEPA to assess public opinion on the Project.

The approach and methodology for the feedback consultations will be similar to the scoping consultations as described in Section 6.3.1. The location and methodology for the public hearing meeting will be decided in consultation with SLEPA.

7.1.1 Consultations beyond the ESIA process

Beyond the ESIA process, consultations with the stakeholders will be continued by MIOL to build and maintain mutually beneficial relationship with the Project stakeholders. This will serve to maintain the dialogue and facilitate resolution of issues raised by stakeholders on an on-going basis throughout the life of the Project. This SEP will be updated to reflect the changing needs of the Project as it develops.

8 GRIEVANCE MECHANISM

For managing community relations MIOL will establish a mechanism for effective and speedy resolution of stakeholder complaints and problems and also to provide a satisfactory response to their queries and issues on an ongoing basis. Key features that MIOL would consider in development of a grievance mechanism are provided below.

- representatives from different stakeholder groups should be encouraged to participate in the development of the grievance mechanism to ensure transparency in the process;
- stakeholders should be informed about the existence and functioning of the grievance mechanism to promote its utility;
- the paramount chiefs and district officials should be invited to be part of a committee for handling grievances;
- responses should be provided to all queries and grievances in a time bound manner with a commitment to a time frame for resolving the issues; and
- when a dispute cannot be resolved, within a reasonable period, the grieving party should be free to take the matter to courts as a final resort (in other words the mechanism should not replace existing legal process but should, based on consensus, seek to resolve the issues quickly without resorting to expensive and time-consuming legal actions.

9 REFERENCES

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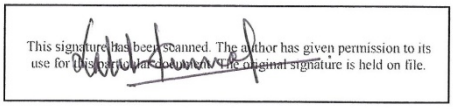
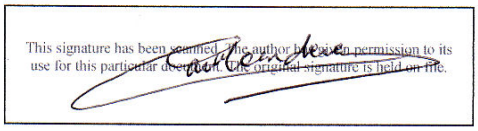
For and on behalf of SRK Consulting (UK) Limited



Lalit Kumar,
Senior Consultant, Social
SRK Consulting (UK) Limited



Hilde van Vlaenderen,
Principal Consultant, Social
SRK Consulting (UK) Limited

GLOSSARY OF TERMS

TERM	EXPLANATION
Affected Community	Local communities that are subject to risks or impacts from a Project.
Consultation	Consultation involves two-way communication between the client and the affected communities. The consultation process should be undertaken in a manner that is inclusive and culturally appropriate and that provides the affected communities with opportunities to express their views on Projects risks, impacts and mitigations measures, and allows the client to consider and respond to them. The consultation process will ensure free, prior and informed consultation.
Information Consultation and Disclosure	The process of providing information to the affected communities and other stakeholders that is timely, accessible, understandable, and in the appropriate language(s). For Projects with potential adverse impacts, information on the purpose, nature and scale of the Project, the duration of proposed Project activities, and any potential risks to and potential impacts on such communities should be included.
Local Community	Community within a Project's area of influence.
Management measures	Remedial measures used to reduce the level of risk
Project (the)	The Marampa Iron Ore Project
Settlement	a groups of houses, similar to a village or hamlet
Stakeholder	groups or individuals that are *'directly or indirectly affected by a Project as well as …… may have interests in a Project and/or ability to influence its outcome either positively or negatively'*

ACRONYMS

BID	Background Information Document
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
IFC	International Financial Corporation
NGO	Non-governmental organisation
PS	Performance Standards
SEP	Stakeholder Engagement Plan
SL	Sierra Leone
SLEPA	Sierra Leone Environmental Protection Agency
SRK	SRK Consulting (UK) Limited
ToR	Terms of Reference
UK	United Kingdom

APPENDIX

1. STAKEHOLDER DETAILS

Appendix 1: Stakeholders details

Stakeholder category	Stakeholder name	Address	Telephone	Email
Government and regulatory authorities	Port Loko District Council	Chief Administrator's Office, Port Loko District Council, Port Loko		
	Paramount Chiefs (Masimera, Marampa and Maforki)	Marampa Paramount Chief's residence is on Lunsar Makeni Highway; other chiefs are in their respective chiefdoms (exact location to be checked with PROs)		
	Lunsar Town Administration	Lunsar, Port Loko		
	Sierra Leone Environment Protection Agency (SLEPA)	SLEPA Office, 3rd Floor Youyi Building, Brookfields, Freetown. Contact: Mr Momodu A. Bah, Acting Deputy Director Incharge of EIAs, Field operations & extensions, SLEPA, 3rd Floor, Youyi Building, Brookfields, Freetown, Sierra Leone	Mobile number: 078350627, 076668698, 088351725	modbah@yahoo.com
	Ministry of Minerals (Mining Division)	Mining Cadastre Office, Ministry of Mineral Resources, 5th Floor Youyi Building, Brookfields, Freetown		
	Ministry of Local Government	Ministry of Local Government, Youyi Building, Brookfields, Freetown		
	Ministry of Land Country Planning and Forests (Departments of Forests and Wildlife)	Forestry Department, 1st Floor, Youyi Building, Brookfields, Freetown		
	Ministry of Agriculture and Food Security	District Agriculture Officer's Office, MAFS, Port Loko		
Affected communities	Villages falling within the potential Project footprint area; villages impacted by restricted access to land other natural resources; villages downstream of water supply area; host resettlement areas	Affected villages		
	Land owners/farmers	Affected villages		
	Foreroad Baka and Mabesene Women's Association	Foreroad Baka Village, Lunsar (suburb)		
	Lunsar residents	Lunsar town		

Stakeholder category	Stakeholder name	Address	Telephone	Email
	Youth Groups	Lunsar town and affected villages		
	Religious Leaders	Lunsar town		
Non-government Organisations (NGOs) and special interest groups	Network Movement for Justice and Development (NMJD)	NMJD Office, 49 Main Motor Road, Brookfields, Freetown	+(232)26204036 +(232)76645314	nmjd@nmjd.org
	Green Scenery	Soldier Street, Freetown		**gscenery@yahoo.co.uk**
	Environmental Forum for Action (ENFORAC)	51 Upper Brook Street Freetown, Sierra Leone West Africa, P. O. Box 1145	Mr. Ansumana Swarray National Coordinator + 232 (0) 76 463 653 Mr. Abdulai Conteh Deputy Chairman + 232 (0) 33 407 164	enforac@yahoo.com
	Cotton Tree Foundation	Cotton Tree Foundation Office, King Street, Freetown		
	Amazonian Initiative Movement	Lunsar-Makeni Highway, Lunsar 24 New Makeni Road, PO Box 77 Lunsar, Marampa Chiefdom, Port Loko District Sierra Leone	+232-76-738517	aimgn2001@yahoo.co.uk aimsl2001@yahoo.co.uk
Other stakeholders and stakeholder groups	Port Loko Teachers College (PLTC) Administration	PLTC Campus, Lungi Road, Port Loko		
	Murialdo Secondary School	Murialdo Secondary School, Lunsar		
	District Medical Officer	DMO's office, Port Loko Government Hospital, Hospital Road, Port Loko		
	Marampa Community Bank	The Manager's Office, Marampa Community Bank, Lunsar		
	Journalist, Universal Radio (Media)	Port Loko town		

APPENDIX

2. MEETING MINUTES

Marampa Meeting Minutes

March 2011

Network Movement for Justice and Development (NMJD)

Meeting location: NMJD Office, 49 Main Motor Road, Brookfields, Freetown
Date and Time: 9th March 2011 at 08:06 hours
Attendees: Aminata Lamin (Programme Director, Mining and Extractive, NMJD), Simon Elson (Cape Lambert) representing the Marampa Iron Ore Limited (MIOL), Aminata Kamara and Lalit Kumar (SRK)

Simon Elson gave an introduction to the proposed project and the Marampa Iron Ore (Sierra Leone) Limited (MIOL). A copy of the Background Information Document on the proposed project was presented. Lalit Kumar explained the ESIA process, the stakeholder consultation process and invited the participants to express their issues and concerns. The following key points were raised:

- Aminata Lamin provided an over view of NMJD:
    - Mining and extractives is one of focus area for NMJD, which is engaged in various rights based campaigns on the issues of mining in Sierra Leone
    - They build capacity of community members and organisations on mining law and their rights to enable them negotiate and work with mining companies in a non-violent manner
    - They summarise the mining legislation and ESIA documents into simple language for community to understand as part of community capacity building
    - They are also working with the government to strengthen governance and accountability
- NMJD engages with the ministry of mines
- Most mining companies do not like talking with communities and NGOs to avoid conflict but this approach is short sighted. The companies should maintain direct contact with communities to prevent conflict.
- NMJD is member of the steering committee for EITI and she encouraged MIOL to become a member of EITI and to join the chamber of commerce.
- Aminata informed that due to weak governance mining companies in Sierra Leone are violating the laws and people's rights. She thinks that where national laws are weak, companies should use international standards.
- She thinks that cost of resettlement of people, compensation for crops and community infrastructure should be factored in the project cost.
- Communities do not have negotiating power. They are negotiating with the government that 1% of the profits should go directly to the affected community for their development.
- She informed that the authority of Paramount chiefs is now declining and hence the company should not rely on them too much. Instead MIOL should identify other leaders and communicate directly with community members. The dialogue with the community should be sustained.
- NMJD is supporting another NGO called Campaign for Just Mining in Lunsar. This campaign is focused on capacity building of the community members on the topics of mining laws and their rights.
- She was not clear on the relationship between MIOL and Africa Minerals Limited (this was clarified by Simon).

- She enquired if MIOL is active in Kambia District as one of their partner organisation 'Conscience International' that is active in the district has asked then for sensitisation programme.
- She reiterated that their organisation uses the right based approach – people should know what is happening around them so that ever impact will be minimised. Flying fast could create problems

Green Scenery Email: gscenery@yahoo.co.uk

Meeting location: Soldier Street, Freetown
Date and Time: 9th March 2011 at 09:25 hours
Attendees: Joseph Rahall (Director, Green Scenery), Simon Elson (Cape Lambert) representing the Marampa Iron Ore Limited (MIOL), Aminata Kamara and Lalit Kumar (SRK)

Simon Elson gave an introduction to the proposed project and the Marampa Iron Ore (Sierra Leone) Limited (MIOL). A copy of the Background Information Document on the proposed project was presented. Lalit Kumar explained the ESIA process, the stakeholder consultation process and invited the participants to express their issues and concerns. The following key points were raised:

- Purpose of meeting, overview
- Small organisation but make a lot of noise
- He said that it is not doing the ESIA but it is about companies not following procedures. This ignites community conflict giving the example of African Minerals Limited (AML) at Ferengbeya
- He said that companies jump all other stages/procedures and obtain the ESIA process; procedures make a company legitimate.
- Talking to the people is not enough; companies should design programmes with the communities and identify their needs and there are different needs.
- His experience with community work is that people change their ideas, support and messages passed on to them. When they change, they should be engaged.
- Advised MIOL to carefully study the community dynamics and the Chiefs. The Chiefs are sometimes a problem; hence the Company should engage the people.
- Take time to study the community and talk to critical people in the community. Chiefs are no longer in total control of everything.
- Regarding the work GS does, they do a 360^0; they look at the environment from an angle of right, livelihood and conflict.
- Green Scenery works in coalition with National Coalition on Extractives (NACE)
- Examine technical issues. He said that NMJD deals with resettlement, social and compensation issues.
- GS advises companies where issues and conflict may arise.
- Consultants may do a good job but after ESIA phase companies may oversight all steps e.g. chemical disposal, tailings, water pollution, clearing of vegetation, possible restoration etc.
- On the issue of implementation, Consultants should design a framework on how to monitor and include as an annex. He recommends that MIOL devices a framework on reporting their performance. He cited Sierra Rutile Limited (SRL) and said that they have not been able to present their annual environmental report and draw up a reporting template as guideline to go by what the law says.

- He asked whether the Company can include activities to cope with climate impact.
- Further more, Mr Rahall said that the work of MIOL will clear swamps and forests. He asked how MIOL will assist with communities coping with climate change – machines pollutants, carbon absorption, etc. This is not in the SLEPA 2008 but for good practice round the world.
- The Director asked about the relationship between London Mining, African Minerals and MIOL. Simeon Elson gave historical background of the Company
- He asked how the Company will manage the environment and development of people. The Company is in an area of stark poverty. There is potential for conflict when the community people see physical wealth in their area and see some youths being employed. Youths do like each other (jealousy).
- The Company should therefore establish good relations with the communities and with youths.
- Resettlement is a big issue. Government does not have a resettlement policy but companies need to do it properly.
- Re-vegetation is important – NGOs have been fighting with Sierra Rutile Limited (SRL) on this issue. He reiterated the issue of companies moving fast with their operations and leaving the procedures.
- He also highlighted the issue of change of ownership. When companies sell, the new ones do not usually take up liabilities of the old companies, e.g. SRL and Koidu Holdings (KH). He asked if a bond will be left behind for new companies to take up. Government does not have the capacity to monitor liabilities and risks and this is where the NGOs intervene.
- He said that the ESIA should not only be sent to SLEPA but should be made available to other stakeholder groups to share their concerns before the ESIA disclosure.
- He suggested that the communities should be involved in rehabilitation programmes e.g. tree planting, as this will provide employment.
- Communities should be engaged and educated to avoid threats. This may not involve too many resources but will induce creative thinking.
- MIOL is to keep a balance between community expectations and the Company.
- Communities always see mining companies as government
- The Community Liaison Officer (CLO) will be key person for community outreach.
- On the relationship with NACE, Mr Rahall said that it is a coalition and Green Scenery is hosting the Secretariat. Other members are NMJD, Christian Aid, Talking Drum, Anti-Corruption Commission, Action Aid, Commission for Democracy and Human Rights and MADAM- they help to sensitize the communities.
- He also said that livelihood will be a big issue e.g. farmers may not have much land any more.
- He also mentioned resettlement – Where a village is relocated the chief will meet another chief in the new area of location. He may not have the powers of a chief.

Environmental Forum for Action (ENFORAC)

Meeting location: Upper Brook Street, Freetown
Date and Time: 9th March 2011 at 10:29 hours
Attendees: Abdul Conteh (Director, ENFORAC), Ansumana LM Swaray (National Coordinator, ENFORAC), Simon Elson (Cape Lambert) representing the Marampa Iron Ore Limited (MIOL), Aminata Kamara and Lalit Kumar (SRK)

Simon Elson gave an introduction to the proposed project and the Marampa Iron Ore (Sierra Leone) Limited (MIOL). A copy of the Background Information Document on the proposed project was presented. Lalit Kumar explained the ESIA process, the stakeholder consultation process and invited the participants to express their issues and concerns. The following key points were raised:

- **Ansumana Mansaray** introduced the organisation comprising a consortium of environmental NGOs, academic groups. They want to see change in management of resources for a better Sierra Leone. Sierra Leone is endowed with abundant resources but the country has been exploited without benefit to the people and the country.
- He said that MIOL are in the right direction. AML came to their office in 2010, two (2) days to the disclosure. He said that their public participation is very poor; they rushed with license procedures. He said that there will be a lot of Green House Effect from the 5 billion tons of potential iron ore. 200million tons of carbon dioxide will cost US$2.3 billion but only a fraction is being accounted for.
- Companies may get away with their responsibilities now but in the long run it will come back to them.
- He stated that they are negotiating with SLEPA for international consultants to participate with local consultants
- He said that social benefits in other mining companies are very poor.
- He raised concerns about visual impacts as the landscape will be destroyed, future disaster and digging of pits.
- **Abdul Conteh** asked about what MIOL is doing for:
    - Noise and air pollution
    - Tailing storage facilities
    - Drilling/blasting –effects on workers and the communities
    - Flora and fauna
    - Budget for mitigation

- He said that they will make noise if the companies go political. He mentioned the Equator Principles
- He also mentioned KEPCO, an international Korean Company.
- Other issues include water – there is water crisis in the project area. He asked which type of explosives/blasters that will be used, training of staff to use explosives safely and the distance from the communities.
- **Mr. Swaray** raised that there is heavy concentration on iron ore exploitation. He asked if AML, LML and MIOL will work together to combat the impacts.
- **Mr. Swaray** said that he cannot stop companies from mining but would not want the cost of rehabilitation to be left on the Government.
- He warned that Government connection is not enough; communities should be involved.
- He would like to see the Mine Reclamation Plan as there is a lot of emphasis on this.
- Abdul mentioned about the kind of plant species to be used as gethropha plant is not good for local water bodies.
- Mr. Swaray further said that monitoring is a grey area and that IUCM is interested in to do State of Environment on monitoring. He said that companies do not like to be monitored but advised companies to abide by international standards.
- **Mr Swaray** said that ENFORAC has the legal mandate to monitor and are working with SLEPA.
- He advised MIOL not to depend on one or two guys but should work on national interest.
- He expressed that ENFORAC would like to be part of the process; they do not want to be informed. He said that their work is support organisations, ensure that community needs

are addressed and to develop sustainable environment. He asked MIOL to work with them.

- **Mr. Swaray** said that ENFORAC is a member of the Green Actors of West Africa and ECOWAS Parliament.
- In conclusion, he said that there is no Act on the Environment and there are many gaps on EPA 2008 and the Mines and Minerals Act and the legal act is weak.

Cotton Tree Foundation

Meeting location: Cotton Tree Foundation Office, King Street, Freetown
Date and Time: 9th March 2011 at 11:40: hours
Attendees: Michael Kamara (Executive Director), Simon Elson (Cape Lambert) representing the Marampa Iron Ore Limited (MIOL), Aminata Kamara and Lalit Kumar (SRK)

Simon Elson gave an introduction to the proposed project and the Marampa Iron Ore (Sierra Leone) Limited (MIOL). A copy of the Background Information Document on the proposed project was presented. Lalit Kumar explained the ESIA process, the stakeholder consultation process and invited the participants to express their issues and concerns. The following key points were raised:

- Michael Kamara said that his organisation had held a meeting with London Mining
- The organisation is multi-sector, focussing on business agriculture, environment (how the environment can be rehabilitated), social (food security)
- He said that mining will have impact on the environment. He gave example of SRL which he said had become a water body and created small rivers.
- He encouraged intervention in agriculture and recommended the use of plants to rehabilitate the soil.
- He said that mining may bring in more people into the area but this might live less people in the agriculture production.
- Cotton Tree Foundation has an agriculture centre which is based in Lunsar. Since 2005, the organisation is supporting 5,000 families in agribusiness to date. The organisation was established in 2003. There has been increase in labour cost.
- He cautioned on the problem to manage expectations.
- He said that business should maintain some distance from the Government as dependence on government could create more problems. He cited that London Mining landed into problems with providing jobs that are resulting into huge running cost as a result of political influence. If the Company wants to work with the politicians, this is dangerous.
- He also cautioned on dependence on the Paramount Chiefs and encouraged discussions at grassroots levels.
- In agriculture, he wants to see how the agribusiness could impact on the project. The organisation provides farmers with inputs, seeds at 25% interest.
- They do fruit project and ginger. The problem was access to market but they started exporting sesame to Japan.
- They also engage in rice mechanisation. Although rice is the staple food, cassava and groundnut are also cultivated. As he intends to improve on revenue, ginger and cashew are also part of the project.
- He stated education as the second core area of business. The organisation collaborates with other actors to promote education. They help in training teachers, provide standard buildings and good learning materials. They concentrate on primary, secondary and

vocational skill training. He said that many people are trained as academicians but are not trained as business people.

- He cautioned that few educated people in the project area might inject some negative influence. The Company should ass the level of reasoning of chiefs, councillors and youths.
- Understanding the people, culture and values is critical.
- Company should show respect for those in the communities
- The Director said that the organisation also mainstreams HIV/AIDS into the project.
- He encouraged MIOL to network with the right actors
- Cotton Tree has established contacts with some European partners for business expansion.

Amazonian Initiative Movement (AIM)

Meeting location: Lunsar-Makeni Highway, Lunsar
Date and Time: 10th March 2011 at 08:06 hours
Attendees: Osman Kargbo, Administrative Officer AIM, Luisa, Intern from Italy, Plan Officer and 9 others), Simeon Elson (Cape Lambert) Marampa Iron Ore Limited (MIOL), Aminata Kamara and Lalit Kumar (SRK)

Simon Elson gave an introduction to the proposed project and the Marampa Iron Ore (Sierra Leone) Limited (MIOL). A copy of the Background Information Document on the proposed project was presented. Lalit Kumar explained the ESIA process, the stakeholder consultation process and invited the participants to express their issues and concerns. The following key points were raised:

- Osman Kargbo said that the organisation campaigns against harmful practices against women and girls. They are operating in 5 (five0 chiefdoms targeting 30 villages. They are specifically campaigning against Female Genital Mutilation (FGM). Campaign against FGM is difficult in the area. The project is a pilot and in its third year.
- The Programme is supported by Plan International (SL) and a German organisation.
- Their campaign slogan is “Breaking the silence for the rights of women and girls.
- In sharing his experience, Osman said that the people find it hard to stop the FGM practice because it is hard rooted tradition. Initial campaign was very challenging but intense sensitisation has created awareness.
- Training programmes are conducted and those who feel convinced go through an award ceremony. The people, children and elderly can now openly talk about FGM; myths about FGM are taken away.
- Initial challenges included spells, threats and black magic.
- The Paramount Chief (PC) put a band on the campaign when they started in 2000.
- With intense campaign on human right issues, the PC can now condemn the practice openly. Some practitioners of FGM have abandoned it.
- They have groups in schools. Children are informed that they have the right to take part in decisions that affects them. No child should be initiated before 18 years.
- The challenge is alternative source of livelihood to traditional practitioners and how to support children who do not want to go through the FGM. Some children are neglected
- AIM wants to help but lack funds
- Tools used in sensitisation are films shows and meeting of all local authorities.
- There are about 300 to 400 practitioners and children are also trained.

- Another challenge is how to distract the chiefs who give authority/licences to the practitioners.
- Some children go back to the act if they are not supported
- Osman further said that they are using positive deviance approach. The are people/ ”ambassadors” that go out to campaign against FGM.
- Other human right violations which Osman said are rampant in the area include:
    - Child abuse to wife battering.
    - Teenage pregnancy,
    - Child labour and,
    - Early marriage/forced marriage
- Many children in the area do not go to school especially on Tuesdays when there is a weekly trade fair at Feredugu. Some children who go to such market never return and end up in the streets.
- The campaign is limited to 6 chiefdoms but the above situation is the same in other communities.
- Cecelia (Plan International) raised the issue on HIV and AIDS. She is concerned about foreigners/employees coming from outside; the girl child getting into early sex. He cautioned workers to be aware of HIV and AIDS.
- Cecelia said that some chiefs/headmen complain about land grabbing.
- Osman stated that some landowners do not receive the real money value due to the communities. He mentioned that EITI and NACE sensitise the communities.
- He also said that the landowners are not treated fairly.
- Osman expressed dissatisfaction on the manner of recruitment, wherein the contract is terminated without notice after 2 or 3 months. Outsiders get jobs overnight while people in the area are left without jobs. He suggested that preference be given to indigenes.
- Osman cited the demonstration by youths on LMC. The Ministry of Mines and other government officials had to intervene.
- Benefit should be given to people who are sacked as this has psychological impact.
- Some workers do not have the proper gears. Company should give appropriate safety gears especially workers involved in drilling.
- Margaret stated that some people have lived in the quarters built by Delco for over 30 years but LMC has threatened to remove them. The people suggested for building of new houses.
- It is difficult to get rooms for rent in Lunsar due to influx.
- Cecelia said that people have raised concern about chemicals used; the boreholes dug and distance from the chemical to the well is short.
- Abdul said that blasting could be too close to the township. Demolishing the houses left by Delco could create tension; amicable decision should be reached.
- Cecelia said that they would not like to what happened with KH. She said that some companies do not want to talk to the communities; only top ranking in society. MIOL should negotiate with the grassroots / land owners at all stages.
- Plantation destruction- there is some conflict as names are written without assessment. MIOL have to negotiate with plantation owners.
- “Why can’t all three companies come together to construct one route, road, railway, etc?”
- The relationship between AML and MIOL was asked and felt that the communities are cheated for carrying the same exploration license.
- When will mining start?
- Other concerns are with women, child labour and human resources

- Luisa asked about how MIOL will do the monitoring and which areas of influence; how long does it take to monitor.
- How will MIOL address urgent hazards e.g. blasting- noise if it affects people.

Marampa Community Bank

Meeting location: The Manager's Office, Marampa Community Bank, Lunsar
Date and Time: 11th March 2011 at 09:46 hours
Attendees: Aiah Fomba, Manager), Simon Elson (Cape Lambert) representing the Marampa Iron Ore Limited (MIOL), Aminata Kamara and Lalit Kumar (SRK)

Simon Elson gave an introduction to the proposed project and the Marampa Iron Ore (Sierra Leone) Limited (MIOL). A copy of the Background Information Document on the proposed project was presented. Lalit Kumar explained the ESIA process, the stakeholder consultation process and invited the participants to express their issues and concerns. The following key points were raised:

- The bank had operated before the war- it was a rural bank, private owned.
- The Bank was re-established in 2002 by the Government of Sierra Leone and started operating on 7th February 2003 to provide financial services to the Marampa community.
- It is a limited liability that was given to the community on loan which is to be paid over 40 years period.
- One hundred million leones was given as initial capital part of which was used to offset running costs.
- The community people are poor; initial they had no money to open accounts.
- Women who petty traders and bread winners- they found it difficult to pay back.
- There were bad debts when the loan scheme started.
- The bank got loan fro NACSA (National Commission for Social Action) and MITAF.
- Number of accounts increased in 2004 when the Government decided to pay teachers and other workers through the bank.
- Loan scheme for teachers was established and this proved successful.
- Salary loans have helped many families to pay fees, travel abroad, start new businesses, etc.
- The Authorities in Marampa (MP, PC and District Chairman) should work to promote the Bank.
- There are over 80,000 shares to sell but there is no money for the people, little farming, trading and transport.
- Mr Fomba welcomes the Company to do their domestic banking and to pay staff salaries through the Marampa Community Bank. He wants the companies to come together to improve community infrastructure.
- Over 70 MIOL staff members are banking with them and have taken loans.
- If the Bank becomes profitable, the profit will be ploughed back to the community. MIOL have opened and impress account but looking forward to MIOL depositing some of their money to expand their services. He said that they are partners in development; they cannot develop if they depend solely on the community.
- IFAD (International Finance on Agriculture and Development) wants to come on board to assist farmers.
- His concern is that the big banks will swallow them up.

- He is aware of their limited capacity; but wishes MIOL should put percentage of their money in the Bank. They cannot handle the foreign exchange.
- The Manager suggested that authorities should take the lead to advocate for their communities and not only for themselves. If MIOL helps the Bank to develop, they in turn will help the communities.

Port Loko District Council

Meeting location: Chief Administrator's Office, Port Loko District Council, Port Loko
Date and Time: 11th March 2011 at 12:02 hours
Attendees: Abdul Koroma (Deputy Chief Administrator, Sheik A M Gibril, Rural Development Officer), Hassan Bruce, (Journalist, Universal Radio) Simon Elson (Cape Lambert) representing the Marampa Iron Ore Limited (MIOL), Aminata Kamara and Lalit Kumar (SRK)

Simon Elson gave an introduction to the proposed project and the Marampa Iron Ore (Sierra Leone) Limited (MIOL). A copy of the Background Information Document on the proposed project was presented. Lalit Kumar explained the ESIA process, the stakeholder consultation process and invited the participants to express their issues and concerns. The following key points were raised:

- The Deputy Chief Administrator (DCA) Thanked the Visiting Team and said that such disclosures have been done by other companies.
- The project will be economically viable because it will bring benefit to the communities. He also said that the country's as a whole will benefit but communities should benefit also.
- He shared the experience he has had with AML and LMC. And cautioned MIOL to help the communities and not to take away only.
- The DCA mentioned assistance in terms of health, trees, air pollution, and dust due to vehicle movement.
- He said that MIOL should go by local laws. MIOL should incorporate facilities in their social programmes such as PHU (Peripheral Health Units), hospitals, etc. MIOL should develop tangible structures instead of giving out money.
- Employment – Community people should benefit. In line with the Mining Act, priority should be given to the communities. He stressed that local labour should come from the communities.
- Employment/requirement of technical labour could be explained during disclosure. When the Company employs those on the ground, they feel part of the project; they own it and act as securities.
- Sheik Gilbil said that MIOL needs to recognise basic development principles/corporate social responsibilities, which some companies often neglect.
- Sheik Gibril advised that for any development programme, e.g. building a school, the beneficiaries have to be involved in the initial planning.
- MIOL should have community development personnel to guide them on development principles. He thanked MIOL for involving them and hopes to get feedback.
- Hassan Bruce (Journalist) said that from his experience, all mining companies share similar issues- community interests are the same. Youths will be interested in employment, expectations of unskilled labour, scholarships to disable students, etc.
- Council should be involved in all development programmes. He cited an example of upgrading a bridge in Feredugu section, wherein the Councillor of the area had to stop the project because he was not informed.
- Local youths, indigenes and land owners should be involved.

- The DCA asked about MIOL's relationship / future with other companies. He said that there is a notion that LMC is part of MIOL. He asked about MIOL's concession area.
- He asked how MIOL intends to cope with youth employment as it is a critical issue and asked whether vacancies are advertised.
- The DCA reiterated that the Company should contact the Council for community programmes to avoid duplication.
- He also said that people who are affected directly should be the first to benefit.
- He said that companies get problems because they avoid the Councils. Company information will be disseminated to the Government and other agencies.
- Stakeholders present commended MIOL for this approach (involvement at initial stage).

Ministry of Agriculture and Food Security (MAFS), Port Loko District

Meeting location: District Agriculture Officer's Office, MAFS, Port Loko
Date and Time: 11th March 2011 at 12:50 hours
Attendees: Aminata Lamin (Programme Director, Mining and Extractive, NMJD), Simon Elson (Cape Lambert) representing the Marampa Iron Ore Limited (MIOL), Aminata Kamara and Lalit Kumar (SRK)

Simon Elson gave an introduction to the proposed project and the Marampa Iron Ore (Sierra Leone) Limited (MIOL). A copy of the Background Information Document on the proposed project was presented. Lalit Kumar explained the ESIA process, the stakeholder consultation process and invited the participants to express their issues and concerns. The following key points were raised:

- Philip Conteh said he was confused about LMC, MIOL and AML. He said that he has seen environmental degradation around Mange Acre (a village beyond the project area). He recommended planting of fast growing trees such as tactual grandis and acacia which can grow big within two to three years.
- He said that cutting down tree decreases the water level and causes irregular rainfall.
- MAFS once established a nursery but it was destroyed by fire
- He said there is need to work closely with community youths and chiefs. The youth should take responsibility. Trees will make effective fire belts.
- He expressed that MAFS (Port Loko) want to work in partnership in reforestation programmes.
- Mr Conteh further said that the Company will bring many people to Port Loko in search of jobs. He said that some of those who will not get jobs resolve to charcoal burning and fuel wood, thus exploiting the forest further. He recommended the replanting of wood lot. He said that effort should be made to develop the forest.
- The forest division is the smallest because MAFS concentrates more on crops and livestock. Less emphasis is placed on forestry which could be another source of livelihood.
- He expressed that the level of the water table is a serious problem as it is rapidly being depleted. Women find it difficult to get water for their vegetable gardens.
- Some rivers have become extinct, so they need to have trees that provide canopy to maintain the water level.
- Prot Loko is not like Kailahun (Eastern Province) where there are cash crops like kola nut, cocoa, and coffee. The only suitable plantation in Port Loko is cashew.

- Desertification is moving very close to the area because of increased activities in forest exploitation.
- Influx of youths in Port Loko results to criminal acts, thieving; the police to provide records. Some ex-combatants had engaged in bike riding.
- Swamps and low lying areas should be developed for increased production.
- The DAO also said that water management should be developed and trees to be planted for availability of water. MAFS is interested in intensive farming rather that extensive.
- Sensitisation has begun in Mange.
- He said that the slash and burn is giving pressure on land.
- The MAFS is encouraging farmers to increase production. IFAD and AFSAD were developing something. There were problems with funding and procedures.
- The Land and Water Division is responsible to train farmers on how to develop swamp.
- MAFS also has a programme with WFP on food and safety nets.
- Communities are being sensitised on the benefits of improved agriculture; with increased in production, they can sell.
- The Company will create access to market. An effective market can bring indirect benefits.
- Port Loko is a low income area (very dry. There are many inland valley swamps in Port Loko. Lowland agriculture will reduce slash and burn.
- Valuation of trees and crops is by MAFS
- MAFS works with the Ministry of Interior and Local Government on matters of land compensation
- In closing, Philip Conteh said that rehabilitation of mined out areas is very crucial for sustainability in agriculture.

District Medical Officer (DMO) Port Loko

Meeting location: DMO's office, Port Loko Government Hospital, Hospital Road, Port Loko
Date and Time: 14th March 2011
Attendees: Dr Victor Max-Lebbie (DMO, Port Loko), Simon Elson (Cape Lambert) representing the Marampa Iron Ore Limited (MIOL), Aminata Kamara and Lalit Kumar (SRK)

Simon Elson gave an introduction to the proposed project and the Marampa Iron Ore (Sierra Leone) Limited (MIOL). A copy of the Background Information Document on the proposed project was presented. Lalit Kumar explained the ESIA process, the stakeholder consultation process and invited the participants to express their issues and concerns. The following key points were raised:

- The DMO mentioned dust in mining areas.
- Waterborne diseases also do occur as many people depend on wells and rivers (which dry up in the dry season) for drinking and other domestic uses.
- People use water coming from upstream which is already contaminated by users up stream as washing of dirty things and defecation is done there.
- Cholera and diarrhoea occur in the district although there has been no outbreak of cholera in the district for the past six years.
- There is existence of disease surveillance in the district.

- There was lassa fever case at Buya Romende which killed one pregnant woman; there were cases in Makeni also. Lassa fever is endemic in the Eastern province.
- Lassa fever is also found in the grassland/farmland in the North. Lassa is in urine, faeces of a long mouth rat.
- Laboratory/blood services are very basic. Sometimes samples are taken to Abidjan.
- STIs and HIV/AIDS do occur. HIV and AIDS is about 1.3%.
- Polio has been kicked out in children.
- Consultants should talk to Lunsar office for more details.
- The DMO cautioned on the water system and artificial lakes. He said that the Company should take the environment into consideration.
- He mentioned blasting – this might cause noise and houses might be affected.
- He advise the Company to engage with the youths as it could be political
- Unemployment – People may not have the relevant skills but might make noise for people who come from outside.
- Idle youth, dependent culture and inadequate skills were also mentioned.
- He mentioned that Port Loko has fertile land.
- The DMO said his door will be opened if there is anything in the health sector.

Port Loko Teachers College (PLTC) Administration

Meeting location: PLTC Campus, Lungi Road, Prot Loko
Date and Time: 14th March 2011 at 12:09 hours
Attendees: Ahmed A Koroma (Vice Principal and Director of Studies, PLTC), Simon Elson (Cape Lambert) representing the Marampa Iron Ore Limited (MIOL), Aminata Kamara and Lalit Kumar (SRK)

Simon Elson gave an introduction to the proposed project and the Marampa Iron Ore (Sierra Leone) Limited (MIOL). A copy of the Background Information Document on the proposed project was presented. Lalit Kumar explained the ESIA process, the stakeholder consultation process and invited the participants to express their issues and concerns. The following key points were raised:

- Mr Koroma said that Delco came up with good package of corporate social responsibility. However, they reeled during operations. He welcomes MIOL as Sierra Leone cannot process the iron ore.
- Companies provide employment (direct and indirect) apart from revenue that goes to the Government.
- He said that biodiversity depletion can divert water to villages and get them extinct by relocation.
- Soil depletion – good soils can no longer be fertile.
- Toxicity – plants may not do well.
- Operations may include removal of vegetation. No reforestation is done although it is in the package. Companies concentrate on the quantity of ore rather than what they should follow.
- Mr Ahmed Koroma asked how much the company pays for economic trees e.g. mangoes.
- Lease amounts depreciate - He asked what adjustments the Company makes to meet with the rate of inflation.
- Planting economic trees will enable livelihoods for some people.

- He also mentioned on the policy of the Company. He said that companies come with the Managing Director, accountants, etc. He said that less will be spent on salaries if Sierra Leoneans are employed for jobs they can do.
- Congestion may bring health and social problems such as thieving. Those who seek employment and do not get jobs resort to crime.
- He said that mining companies usually concentrate assistance in primary and secondary schools and leave the tertiary institutions.
- He appealed for support stating that they had sent a proposal to MIOL for a generator and electrification but there has been no reply.
- The College intends to develop a technical institution.
- Whatever benefit the College receives will be advertised and he believes that it will have a ripple effect.
- Blasting may destroy the houses
- The company will occupy farmland
- Mr Koroma also asked about who determines what is compensated to the people. He said that it should be reasonable and adjustable.
- He also mentioned destruction of land and land reclamation. The Company should consider reforestation, reclamation and economic trees.
- He reiterated that they lack the structures. Caterers could be trained under their technical department (they currently do community health and business administration). He stated that helping PLTC is helping the district.
- Company should consider assistance in the education sector.
- Safety aspect was also mentioned. Sharing his experience with Europe, he said that the rail-road crossing could cause accidents.

Murialdo Secondary School

Meeting location Murialdo Secondary School, Lunsar
Date and Time: 14th March 2011 at 14:50 hours
Attendees: Fr. Giuliano Pini (Principal), Fr Emmanuel Koroma, Mr Ambrose Bangura (Vice Principal), Simon Elson (Cape Lambert) representing the Marampa Iron Ore Limited (MIOL), Aminata Kamara and Lalit Kumar (SRK)

Simon Elson gave an introduction to the proposed project and the Marampa Iron Ore (Sierra Leone) Limited (MIOL). A copy of the Background Information Document on the proposed project was presented. Lalit Kumar explained the ESIA process, the stakeholder consultation process and invited the participants to express their issues and concerns. The following key points were raised:

- Children suffer when a teacher leaves during school session.
- School teachers might leave. Mar Bangura asked if MIOL will fist find out about employment records if a teacher applies for job.
- What incentive will be given to the school for teachers to stay?
- Teachers who want to leave should notify the school.
- Fr Emmanuel said that it is difficult to stop teachers.
- At Sierra Rutile, NGOs lobby companies to give incentives to teachers.

- There are lots of graduates in the area. Company should be careful not to sideline the trained personnel. If chiefs select those that they like and are employed, even if they are not trained, tensions might crop up.
- Chiefs to campaign.
- Pupils might leave school to work for the Company. Parents depend on the Catholic mission for education; but if they get jobs and if teachers do not teach well, pupils might leave.
- MIOL should follow the employment process.
- On the issue of salary payment, people lament that they get less salary than what they sign for, a percentage is taken from their monthly salaries. MIOL to make follow ups rather than leaving all the processes in the local authorities.
- Categorise the kind of jobs, do a test and apply the process to wipe out those who are not qualified.
- Company should create avenues for incentives – scholarships should be given for university and create support and assurance of employment when they return.
- Workers interfere with girls in senior secondary school. MIOL to talk to employees/ discipline
- Method of extraction will be similar to Delco- noise, dust, washer, etc.
- The agric sector will be affected. Mining will interfere with swamps.
- How will the Company store the concentrate?
- There will be more demand on food. The soil is good as long as people plant on time and get good seeds.
- The environment to be protected.
- There is technical vocational institute. LMC come to Murialdo's institute for workers. There should be collaboration- teachers to give notice to the school.
- The rate of unemployment is high and it was one of the causes of the war. MIOL should try to employ the young people but child labour should be avoided.
- Assistance to the school was promised but never given. MIOL never takes part in the activities of this school.
- They hoped that this consultation will be a continuous process.
- People are sent out of houses because of increase in rent. Teachers cannot cope with increase in rent. There are delays in salaries of teachers,
- Job seekers who do not get jobs result to stealing.

Marampa Scoping Consultations- Ministries

March 2011

Ministry for Mineral Resources

Meeting location: Mining Cadastre Office, Ministry of Mineral Resources, 5th Floor Youyi Building, Brookfields, Freetown
Date and Time: 1st July 2010 at 10.30 am
Attendees: Eugene Norman (Assistant Government Mining Engineer) and Alusine Timbo (Assistant Government Mining Engineer), Simon Elson (Cape Lambert) representing the Marampa Iron Ore Limited (MIOL), Emily Robinson and Lalit Kumar (SRK)

- Simon Elson began by giving an introduction to the Marampa Iron Ore Limited (MIOL) and explaining the status of the Marampa Mining Project. A Background Information Document on the proposed project was presented to the Ministry representatives.
- Mr Norman explained that the new Mining and Minerals Act had been implemented since March 2010 and provided us with a document entitled "A Guide for License Holders and Applicants".
- Emily Robinson explained that Cape Lambert intend to undertake an EIA as part of the mining application and asked for any areas that the Ministry would like to be included.
- Mr Norman explained that the EIA requirements should be discussed with SLEPA but that from the Ministries perspective, the requirements will depend on the concession. The areas he mentioned specifically that should be covered included landscape, geology and social issues such as resettlement, economic considerations and community development. The new Act provides guidance on social issues.
- Mr Norman also explained the role of regional mining engineers in visiting sites and monitoring/auditing the operations from a technical, environmental, social and health and safety perspective, in line with the new act.

Sierra Leone Environmental Protection Agency (SLEPA)

Meeting location: SLEPA Office, 3rd Floor Youyi Building, Brookfields, Freetown
Date and Time: 2nd July 2010 at 10.15 am
Attendees: Momodu A Bah, Acting Deputy Executive Director (In-charge of EIA, Field operations & Extensions), SLEPA, Simon Elson (Cape Lambert) representing the Marampa Iron Ore Limited (MIOL), and Lalit Kumar (SRK)

- Simon Elson explained the status of the Marampa Project and the Background Information Document was presented to Mr Bah (SLEPA).
- Mr Bah explained the steps leading to applying for the EIA licence. Which involved the following (in sequence):
    - Marampa Iron Ore Limited (MIOL) should give a formal letter to SLEPA providing an introduction to the MIOL and a brief profile of the proposed project. SLEPA will respond by opening a file for the project and sending application and screening form to MIOL (the cost of forms is Le 200,000).
    - MIOL should send filled in application and screening forms to SLEPA for categorisation. Being a mining project the Marampa Project will classify as category A project, hence SLEPA will send a formal letter to conduct the EIA.
    - MIOL should provide draft Terms of Reference (ToR) for the EIA programme, which SLEPA will review, discuss with MIOL/SRK and approve.

- On completion of the EIA as per the approved ToR, MIOL should provide 15 hardcopies of the completed EIA report to SLEPA along with electronic version. SLEPA will send the EIA report to relevant ministries for review. SLEPA will also issue notification in gazette about the EIA and provide a format to MIOL for announcement in a local newspaper. MIOL should issue an advertisement in the newspapers as per the format received from SLEPA.
- SLEPA will allow 14 days disclosure period to receive feedback from stakeholders. On completion of the EIA, MIOL should organise consultation meetings with stakeholders which should be held in the presence of SLEPA representatives.
- On completion of the stakeholder meetings, MIOL should submit a disclosure report to SLEPA.
- On completion of the 14 days disclosure period and receipt of disclosure report, SLEPA will send the EIA to its board for approval. The board comprises of experts from different ministries. Based on board's review the EIA licence is issued which may be subject to fulfilling certain terms and conditions. The EIA licence is non-transferable.

- Mr Bah provided his contact address as follows:
  Mr Momodu A. Bah, Acting Deputy Director
  Incharge of EIAs, Field operations & extensions, SLEPA,
  3rd Floor, Youyi Building, Brookfields, Freetown, Sierra Leone
  Mobile number: 078350627, 076668698, 088351725
  Email: modbah@yahoo.com
- Mr Bah confirmed that the most recent regulations were contained in the EPA Act 2008 and the guidelines on EIA procedures issued in 2002 were still valid.
- Mr Bah also informed that SLEPA has started the process of preparing sector specific EIA guidelines with technical assistance from EU. However until these are ready MIOL/SRK could refer to World Bank's guidelines for the mining and other relevant sectors.
- SRK informed Mr Bah that it has installed a meteorological monitoring station at MIOL's project office in Lunsar. Mr Bah suggested that MIOL should formally inform the Meteorological Department about installation of the monitoring station.

Forestry Department, Ministry of Agriculture

Meeting location: Forestry Department, 1st Floor, Youyi Building, Brookfields, Freetown
Date and Time: 2nd July 2010 at 11.30 am
Attendees: Mr Abdul-Abib F Conteh, Deputy Director, Forestry Division, Simon Elson (Cape Lambert) representing the Marampa Iron Ore Limited (MIOL), and Lalit Kumar (SRK)

- Simon Elson explained the status of the Marampa Project and the Background Information Document was presented to Mr Conteh.
- Mr Conteh informed that the Forestry Act 1988 was currently in the last stages of review by the Law Reform Commission. It was due for presenting to the parliament and may come into force in next 6 months. In the meantime he suggested that MIOL should refer to the existing Act to comply with national regulations.
- Mr Conteh asked MIOL to procure, from the office of Sierra Leone Information System (SLIS), an official copy of the map showing boundaries of national parks, forest estates,

and wetland conservation sites in Sierra Leone to check if the project area was not interfering with any protected areas.

- Although the proposed project was unlikely to interfere with any existing protected area, Mr Conteh suggested that MIOL should still send a formal letter to Minister of Agriculture (and Forestry) informing about the intention to develop the Marampa project. The letter should describe the location and project footprint area on the map and provide names of villages and chiefdoms that are likely to be within the project footprint area.
- The minister will send the above letter to Director of Forestry and other relevant departments for review and issue permission to proceed with the proposed project.

Ministry of Internal Affairs, Local Government and Rural Development

Meeting location: Ministry of Local Government, Youyi Building, Brookfields, Freetown
Date and Time: 2nd July 2010 at 12.30 pm
Attendees: Director, Ministry of Local Government, Simon Elson (Cape Lambert) representing the Marampa Iron Ore Limited (MIOL), and Lalit Kumar (SRK)

- Simon Elson explained the status of the Marampa Project and the Background Information Document was presented to the Director.
- The Director explained that the role of the ministry representative on the Minerals Advisory Board was to oversee (if required) the agreement between land owners and mining companies. This role has been given to the ministry as the Paramount Chiefs and other community chiefs come under its jurisdiction. This becomes necessary because land in provinces is held in community trust through the Paramount Chiefs. While the right over minerals can be passed by the government on to the mining companies it still needs permission from the community to mine.
- He also informed that in the new Minerals Act (2009) there is provision for mining companies to discuss with local community and agree upon its corporate responsibility in terms of what developmental assistance will be given to community. The Ministry and the Paramount Chiefs are usually key players in such negotiations.
- It is Ministry's intention to help create cordial environment between project developers and communities for peaceful co-existence.
- The Director asked MIOL to send a formal letter to the Ministry to inform its intention to develop the Marampa Mining Project and seek its cooperation in community relations.

Marampa Scoping Consultations- Stakeholders

March 2011

1. Foreroad Baka Women's Association

Meeting location: Foreroad Baka Village, Lunsar (suburb)
Date and Time: 13th March 2011, 11 AM
Attendees: See attached (scanned) for list of group members, Simon Elson (representing the Marampa Iron Ore (SL) Limited, Aminata Kamara and Lalit Kumar (both SRK)

Intro para

- General introduction about the group (by the chair):
    - There are many women's organisations in Lunsar
    - Appreciate the current employment opportunities by MIOL
    - Women carry majority of burden at household level, most men don't help with household duties or in vegetable farming
    - Women don't have formal education, they are skilled only in farming and gardening
    - Food insecurity is a key challenge faced by the members
    - Vegetable farms are affected by brown coloured ants which damage the crops
    - 13 women among those present for the meeting are single (are widow or do not have support from men), however they have children to support
    - There are three women in the group who can read and write
    - The group is three years old, it has 51 members, meets twice a month and collect Le2000 on monthly basis
    - it last year received assistance from MIOL in the form of seeds for cultivating groundnut
- Some women want to work at the mine but are not considered for jobs. They expect MIOL not to ignore women in the potential employment opportunities.
- Expect assistance/support for business activities and with building up of a storage facility for crops/produce.

2. Mabesene Women's Association

Meeting location: Mabesene Village, Lunsar
Date and Time: 13th March 2011, 1 PM
Attendees: See attached (scanned) for list of group members, Simon Elson (representing the Marampa Iron Ore (SL) Limited, Aminata Kamara and Lalit Kumar (both SRK)

Intro para

- General introduction about the group (by the chair):
    - The group had received support from MIOL for Cassava growing project on farm if 3 Acres, but it did not succeed as the grasshoppers destroyed the crops
    - Now the group is trying to cultivate leafy vegetables in the swamp areas
    - The group was started in 1998 but had to leave the area during the war, on its returned it was faced with difficulty of bringing people together

    - Besides farming the group also does weaving and gara-tie dyeing (some women also know sewing)
- Expect MIOL to:
    - continue supporting the group with seed supply for cassava and groundnut
    - assistance in fighting with the problem of grasshoppers and other pests
    - toilet facilities, water supply and expansion of agricultural assistance
- They are happy that some people are getting jobs but none of their own family members have succeeded in getting job. In order to get a job one has to pay 200 to 400 thousand Leones.
- Concerned that the blasting activity will damage their houses as the house structures are already weak and some have cracks. Remember that during Delco operations the vibrations due to blasting had caused damaged to houses. Sometimes stones/debris would fly and land into the village.
- The Magbenkte Village is experiencing increase in water level. It is surrounded by old Dleco Lake, where some digging is being undertaken (not clear if this is in LM area). Hence there is fear of flooding.
- Other apprehensions are:
    - Illness due to dust
    - Heavy machines may shake houses
    - Increase in accidents due to increase in traffic
    - Jobs will be taken by outsiders as is the current practice

MARAMPA IRON ORE (SL) LIMITED

Attendance For Scoping Meeting With Stakeholders

Date: Saturday 12th March 2011, at 10:30 at the Town Hall, Lunsar

Nr.	Name	Town/ Village/Organisation	Position	Phone /Email	Signature
	Alie Kamara	Mabal	Head man		
	Sorie Sesay	Lunsar		077700044	
	Alusine Kamu	Lunsar			
	Mohamed A.B. Sesay	Lunsar	Elders Committee	088490546	
	Mohamed Kabia	Lunsar	Elders Committee		
	Osman Sannoh	Lunsar	Landowner		
	Sorie Tarawalie	Lunsar	Headman	077661201	
	Brima Koroma	Lunsar	Headman		
	Abu Kamara	~~Mabole~~ Romasuel	Landowner	076888871	
	Issa Kamara	Rochain Come	Landowner		
	OSMAN M KARGBO	LUNSAR	—	077373649	
	FODAY KOBOMA	Lunsar		088616818	
	Mohamed Kabia	Mabalo	Landowner		
	Abdulai Sofuwah	Kontha Bana	Landowner		
	Ibrahim Sofuwah	Kontha Bana	Landowner	088343627	
	Abdulai Kamu	Lunsar	Chiefdom Councillor	076531043	

APPENDIX

3. DISCLOSURE MATERIAL

MARAMPA IRON ORE PROJECT
BACKGROUND INFORMATION DOCUMENT
March 2011

This document provides information on the proposed Marampa Iron Ore Project and explains the Environmental and Social Impact Assessment (ESIA) process that is being undertaken.

1. Background

The Marampa Iron Ore Project (the Project) is a hematite iron ore project which is currently at the exploration and evaluation stage. The Project is owned by Marampa Iron Ore (SL) Limited (the Company), which is 100% owned by Marampa Iron Ore Limited, a wholly owned subsidiary of Australian company Cape Lambert Resources Limited. The Project is located on exploration license EXPL09/06, which covers a 305 km^2 at Lunsar, in the Port Loko District of Sierra Leone. The license area encloses but excludes the closed and abandoned Marampa mine, which was operated by Delco until 1975 and is now owned by London Mining Plc.

The Company is currently studying the area from a technical perspective and they have appointed SRK Consulting (UK) Ltd (SRK) to commence an Environmental and Social Impact Assessment (ESIA) process, known as an EIA in Sierra Leone, which, during the course of the study, will assess potential impacts of the construction and operational phase of the proposed mine. This assessment process will interact with the technical studies as much as possible.

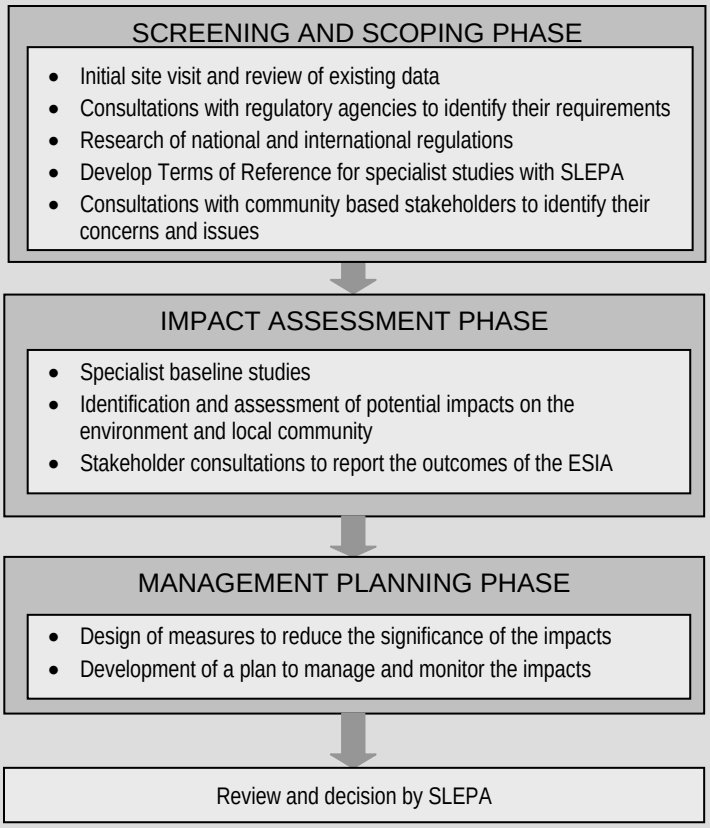
Figure 1: Location of the Marampa Iron Ore Project

2. Project Description

The Company has completed initial exploration drilling of specular hematite deposits at the Gafal West Prospect and the Matukia Prospect (see tentative project layout in Figure 2). The maiden Project mineral resource has been estimated at 197 million tonnes by Golder Associates Pty Ltd in accordance with the JORC Code. There is potential to mine this resource by open pit mining methods, including drilling, blasting, loading and hauling operations, and processed at an on-site beneficiation plant comprising; crushing, grinding, and concentrate cleaning via wet high-intensity magnetic separation. Waste material will be stored in waste rock dumps and a tailings storage facility. The Company has undertaken a preliminary engineering and infrastructure study in 2010, and is continuing with a pre-feasibility study as well as further drilling of the two prospects through 2011. Construction of the Project, if determined feasible, would not occur until 2012 at the earliest. Based on preliminary assumptions, water for the Project will be supplied via a pump from the nearby Rokel River and power will be supplied from a purpose-built on-site power station. Other site infrastructure, such as the beneficiation plant, offices, workshops and accommodation, will also need to be constructed. The ore would be transported from the site via the 84 km existing railway to Pepel Port. The railway and port are currently in the process of being refurbished by others, and will be operated and maintained by a third party.

3. Regulatory framework and ESIA process

The ESIA process is being undertaken in accordance with Sierra Leone laws and regulations, as well as internationally accepted best practices. The process follows three main steps (see below). The Screening and Scoping Phase is to decide if an ESIA is required and defines the contents of the assessment. The Impact Assessment Phase rates the significance of the potential impacts to assess whether there will be any unacceptable impacts resulting from the Project that cannot be managed. The ESIA team will also assess project alternatives and will provide environmental input into the Project decision-making processes.



Specialist studies are being undertaken to determine the current environmental and social conditions of the study area. The type of studies required has been determined from the screening and scoping phase, and include assessment of potential impacts on climate and air quality, water resources (including surface water, groundwater and water chemistry), soils, geochemistry, noise, landscape (visual impacts), ecology and biodiversity (flora and fauna), socio-economic factors, archaeology and cultural heritage.

5. Consultation Process

Consulting with the Project stakeholders (the interested and affected parties) is a very important part of the ESIA process, so that the Project developers and decision makers can take account of their views. For the Project, SRK intend to consult with stakeholders at least twice; firstly during the Screening and Scoping Phase to identify potential issues and concerns of the Project stakeholders and secondly on completion of the ESIA to report back findings of the assessment process. As the Project becomes more definitive, stakeholders will also be able to make comments throughout the life of the Project through a recognized pathway.

The scoping consultations are further split into two rounds, the first round with key governmental stakeholders was completed in July 2010 and the second one covering the potentially affected community members, relevant Paramount Chiefs, Village Chiefs, general public and any other stakeholders will take place in March 2011.

6. Issues and Concerns

Any issue and concerns raised by stakeholders, as well as the responses to them, will be recorded throughout the assessment process and will be included in the final ESIA report. If you have any comments, please contact **Chris Gybl** (Marampa Iron Ore (SL) Limited) email Information@miolb.com) or **Nicola Rump** (SRK Consulting email nrump@srk.co.uk).

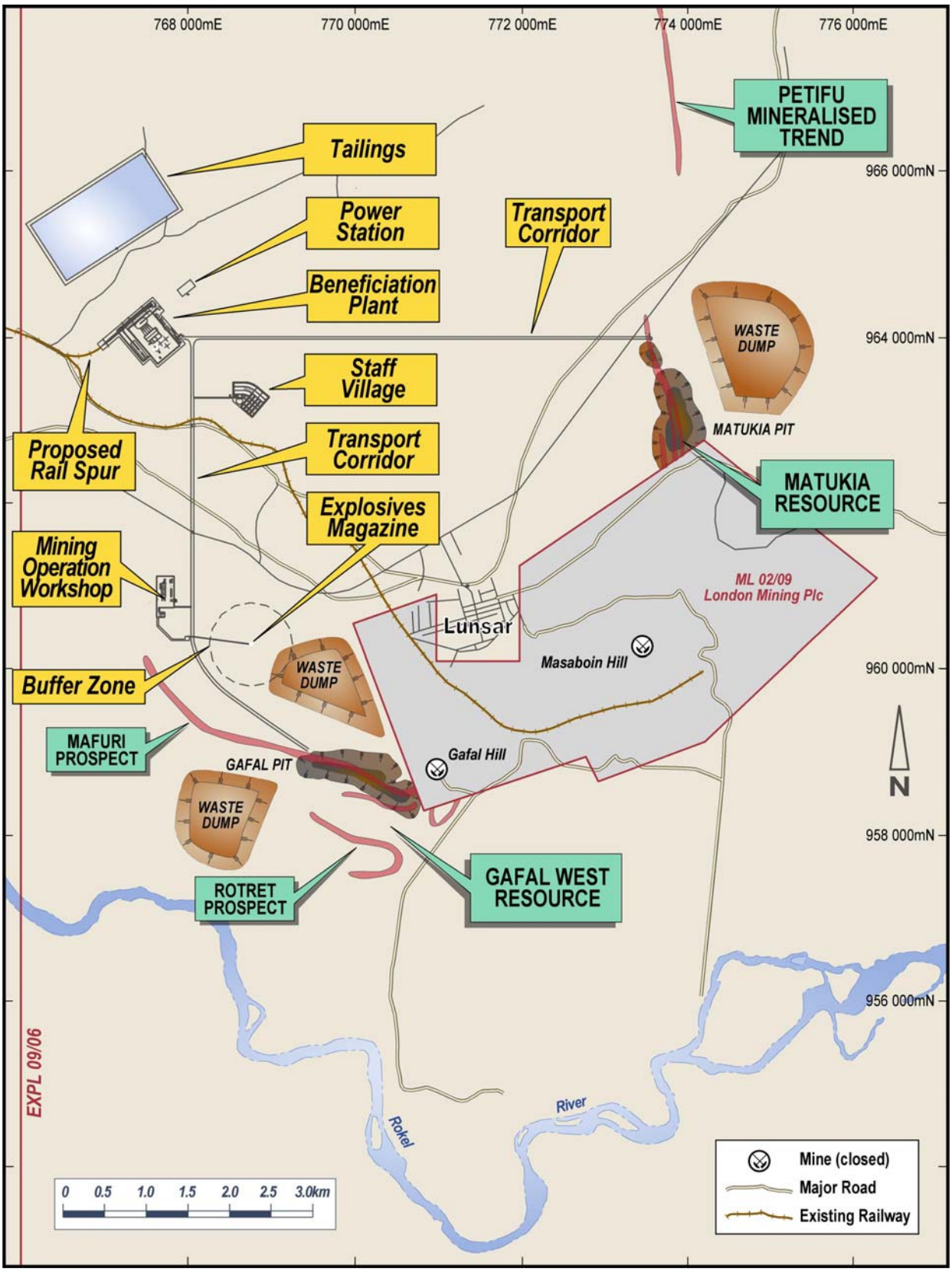
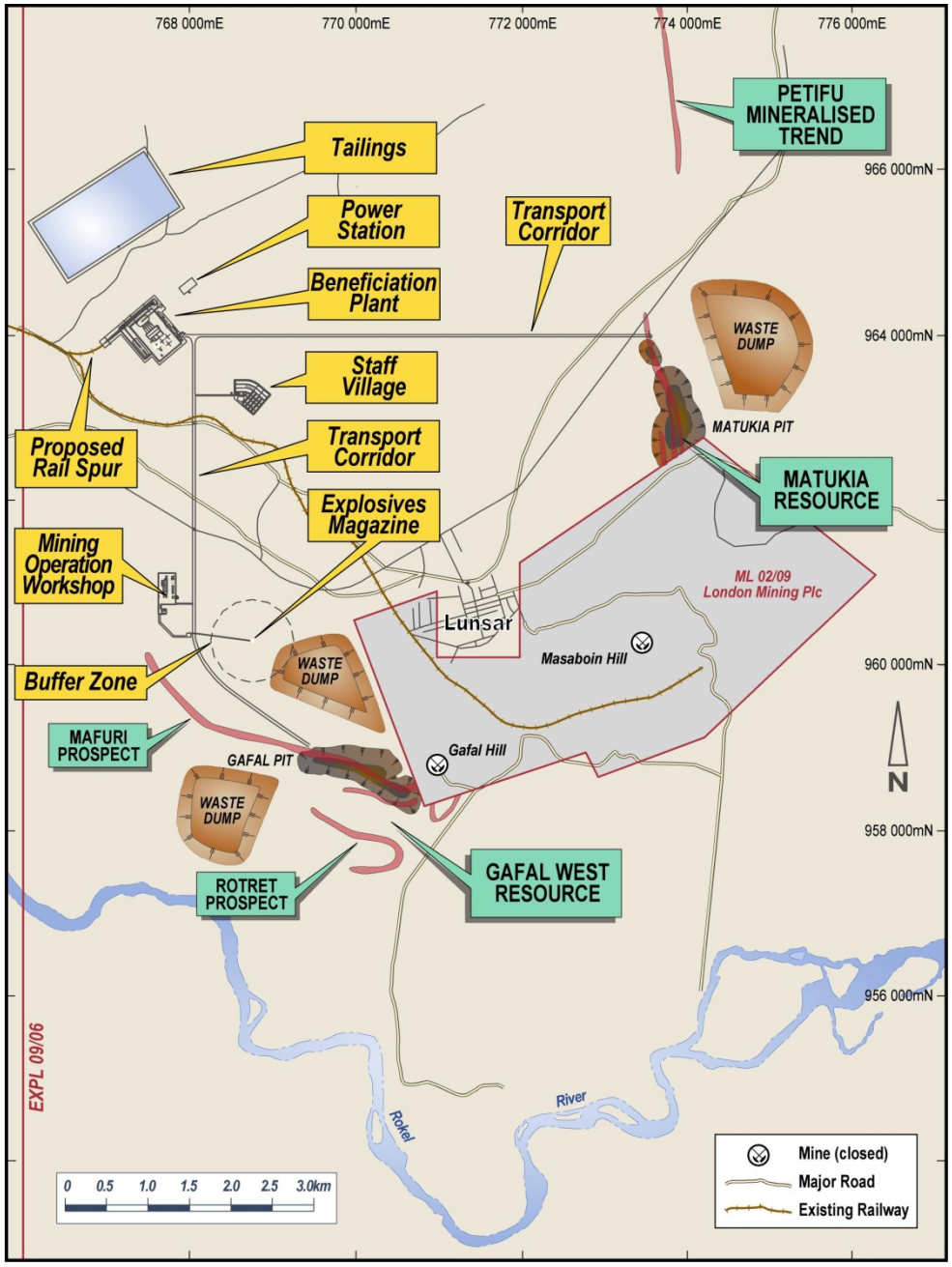


Figure 2: Tentative Project Layout



Nominal Project Layout

Cape Lambert
Marampa Iron Ore (SL) Limited

Marampa Iron Ore Project

General Fact Sheet

Updated: March 2011

Contact: information@miolb.com

Project

Mineral Resource

- 197.2 Mt @ 28.5% Fe
  As at 12 November 2010
- Drilling continues to target 500 Mt

Production

- Initial 5 Mtpa
- Plant Expandable to 10 Mtpa

Capital Investment – US$

Civil	$ 34 M
Mining	$ 8 M
Process Plant	$ 307 M
Infrastructure	$ 95 M
Mobile Fleet	$ 10 M
Indirect Costs	$ 91 M
Contingency	$ 200 M
Total	**$ 655 M**

Key Milestones Targetted

ESHIA Licence	2011
Mining Lease	2012
Feasibility Study	2012
Detailed Engineering	2012
Project Finance	2011 / 12
Construction	2012
First Production	2013

Engineering Studies

Engineering Studies being conducted:

- Metallurgical Testwork
- Process Plant Development and Layout
- Geotechnical
- Hydrology
- Power Assessment

Environmental and Social Studies

Baseline Studies being undertaken for ESHIA

- Geomorphology and Soils Assessment
- Geochemistry
- Climate and Air Quality
- Noise Assessment.
- Ecology and Biodiversity Assessment (Stage 1 Complete)
- Water Resources
- Socio Economic
- Archaeology and cultural heritage

Economic Impact

Total Construction workforce: 800

Permanent Workforce: 630

Indirect Jobs: ~ 2,000

Export Revenue: LoM Nominally USD 7 Billion

Royalties: 3% of Revenue

Infrastructure

Railway and Port

- Access agreement in place to Pepel Railway and Port

Water

- Source from Rokel River

Power

- Construct standalone Heavy Fuel Oil Power Station nominally 70 MW for 5 Mtpa plant

Legend

ESHIA	Environmental, Social and Health Impact Assessment
Fe	Iron
M	Million
Mt	Million Tonnes
Mtpa	Million Tonnes per Annum
MW	Mega Watts
US$	United States Dollars
LoM	Life of Mine

MARAMPA PROJECT DEVELOPMENT OVERVIEW

DRILLING

STUDY AND RESEARCH

EXPLORATION 2-3 YEARS

FEASIBILITY STUDIES 2011

NO

FURTHER STUDIES OR NO PROJECT

IF POSITIVE?

YES

CONSTRUCTION 2012

MINING

TRANSPORTATION

MINING OPERATIONS LATE 2013

RESOURCE ESTIMATION

PUBLIC CONSULTATIONS

CONSTRUCTION

PROCESSING

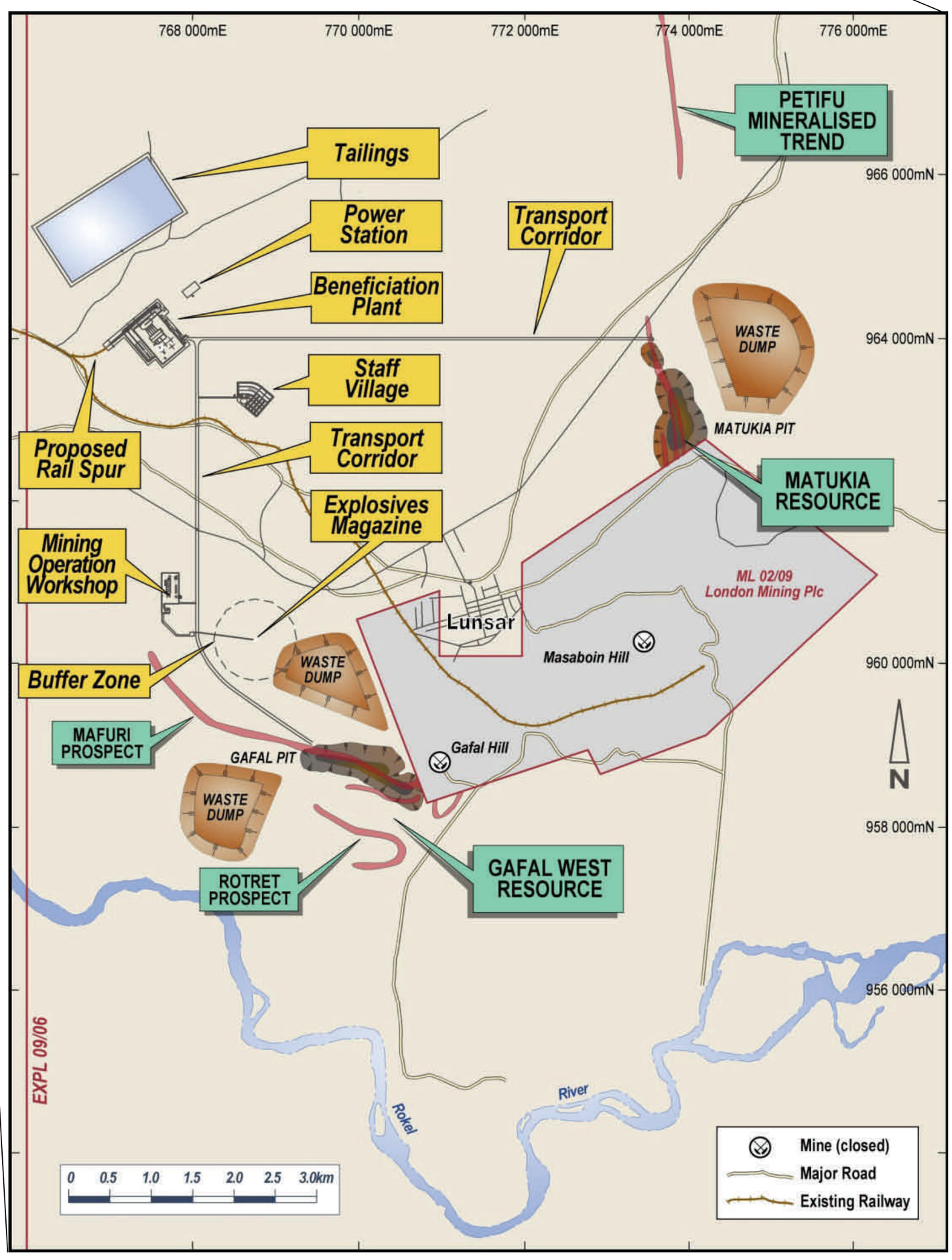
COMMUNITY DEVELOPMENT

Cape Lambert
Marampa Iron Ore (SL) Limited

MARCH 2011

SRK Consulting
Engineers and Scientists

LOCATION OF THE MARAMPA PROJECT IN SIERRA LEONE



NOMINAL PROJECT LAYOUT

Cape Lambert
Marampa Iron Ore (SL) Limited

MARCH 2011

SRK Consulting
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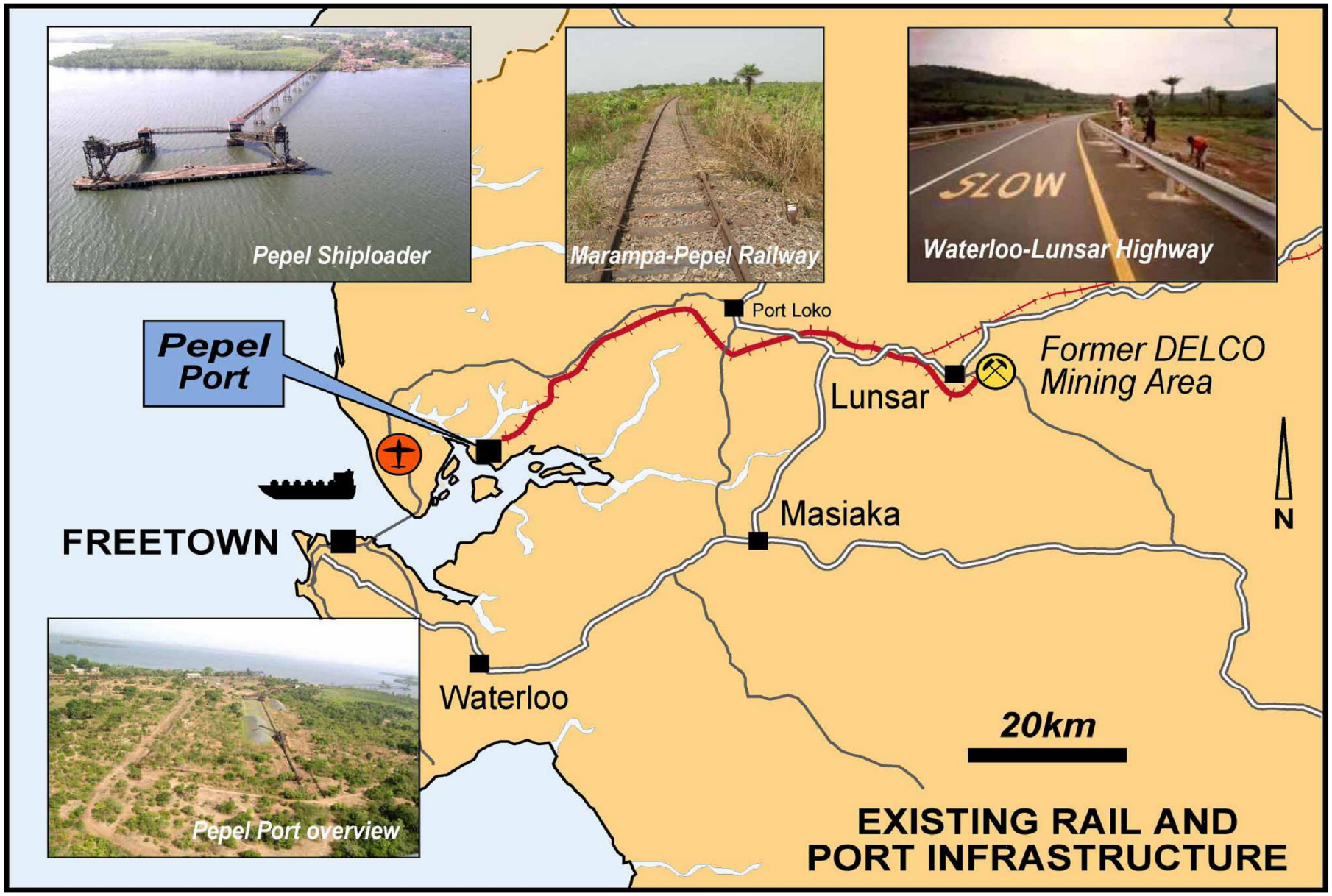
EXISTING RAIL AND PORT INFRASTRUCTURE: MARAMPA PROJECT



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MARCH 2011

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SCOPING CONSULTATIONS WITH PROJECT STAKEHOLDERS

Environmental and Social Impact Assessment (ESIA)

Marampa Iron Ore Mining Project

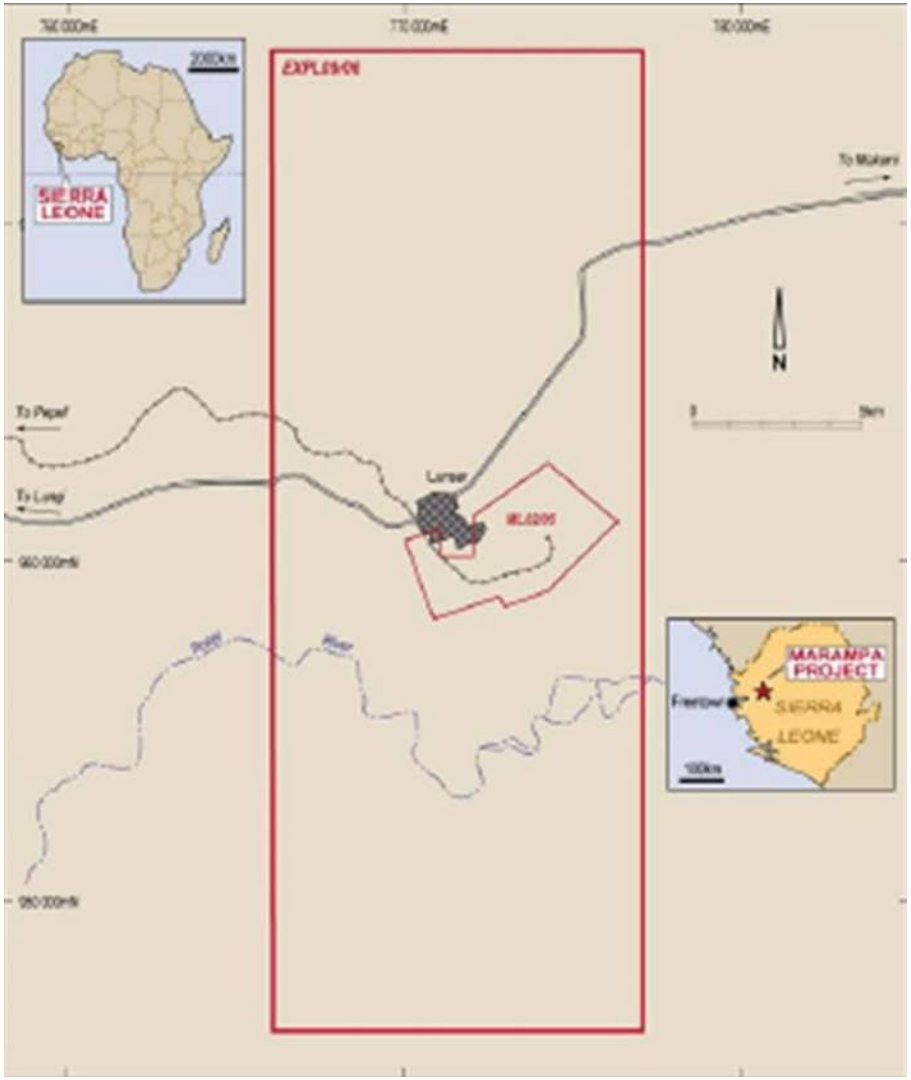
Cape Lambert
Marampa Iron Ore (SL) Limited

SRK Consulting
Engineers and Scientists

PROJECT INTRODUCTION

- The project is owned by Marampa Iron Ore (Sierra Leone) Limited, which in turn is owned by Cape Lambert of Australia

- Exploration license EXPL09/06



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PROJECT FACTS

Key facts

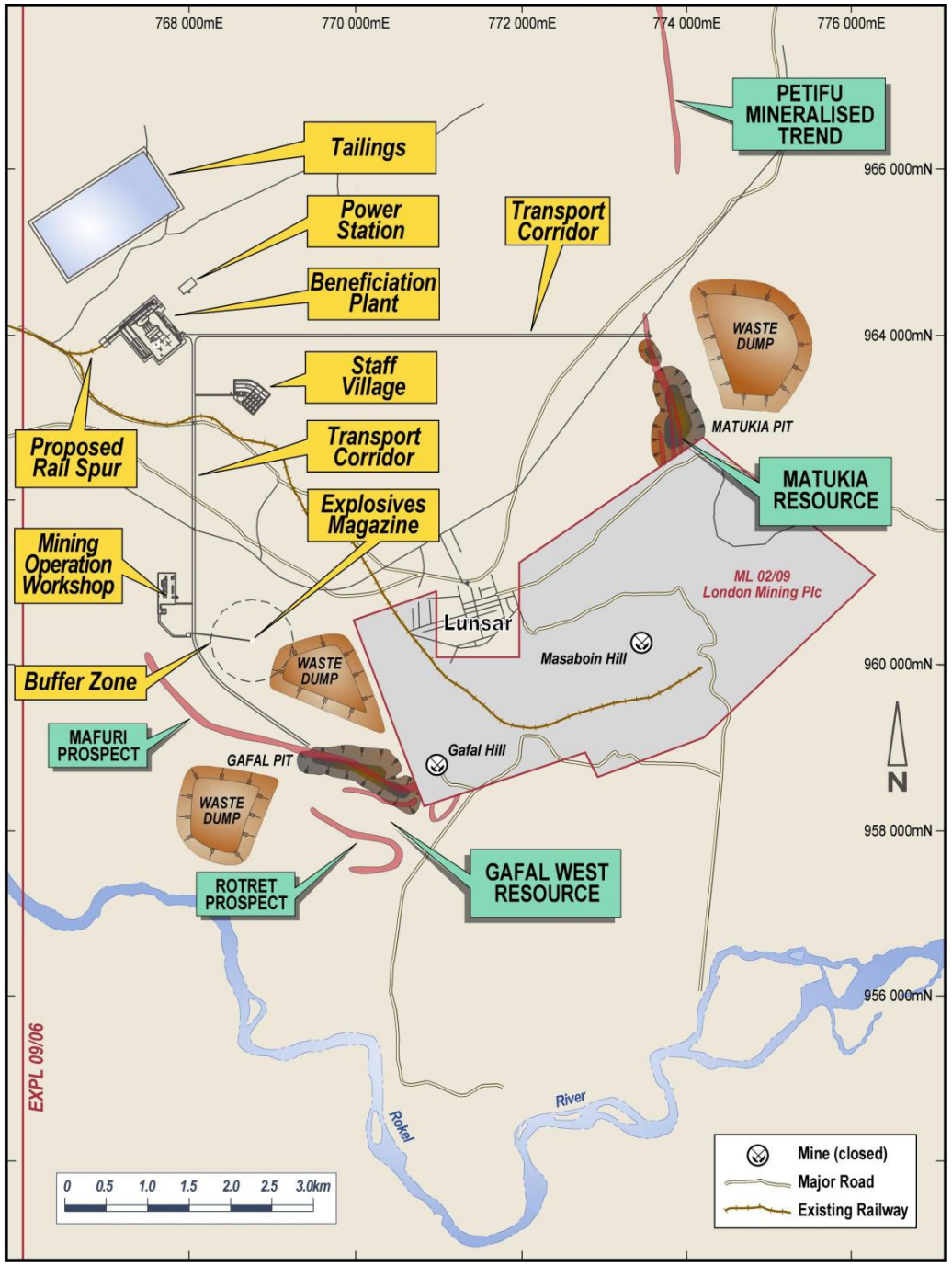
- 197.2 Mt (Nov 2010)
- Target 500 Mt
- Initial production 5Mtpa raise to 10 Mtpa

Water

- Source from Rokel River

Power

- Standalone Heavy Fuel Oil Power Station : 70MW for 5 Mtpa



Nominal Project Layout

EXISTING RAIL AND PORT INFRASTRUCTURE: MARAMPA PROJECT

MARAMPA PROJECT DEVELOPMENT OVERVIEW

DRILLING

RESOURCE ESTIMATION

EXPLORATION 2-3 YEARS

STUDY AND RESEARCH

FEASIBILITY STUDIES 2011

PUBLIC CONSULTATIONS

CONSTRUCTION

NO

FURTHER STUDIES OR NO PROJECT

IF POSITIVE?

YES

CONSTRUCTION 2012

MINING

PROCESSING

MINING OPERATIONS LATE 2013

TRANSPORTATION

COMMUNITY DEVELOPMENT

Cape Lambert
Marampa Iron Ore (SL) Limited

MARCH 2011

SRK Consulting
Engineers and Scientists

ECONOMIC IMPACTS

- Total investment: $655 M
- Construction workforce: 800
- Operation workforce: 630
- Royalties 3% of revenue

Cape Lambert
Marampa Iron Ore (SL) Limited

SRK Consulting
Engineers and Scientists

Environmental and Social Impact Assessment Process

- Sierra Leone Environmental Protection Agency Act 2008
- International standards and best practices

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LIST OF ENVIRONMENTAL AND SOCIAL BASELINE STUDIES

- Ecology and biodiversity (flora and fauna)
- Socio-economic
- Water resources
- Climate & air quality
- Soils & Geochemistry
- Noise
- Landscape (visual impacts)
- Archaeology and cultural heritage

ESIA AND CONSULTATION PROCESS

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IDENTIFICATION OF STAKEHOLDER ISSUES AND CONCERNS

QUESTIONS AND FEEDBACK FROM THE STAKEHOLDERS

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APPENDIX

4. PHOTOS

Open Pubilc Meeting, Lunsar

Open Public Meeting, Lunsar

Meeting with Amazonian Initiative Movement (AIM), Lunsar

Meeting with Mabesene Women's Group

Meeting with Foreroad Baka Women's Association

Village meeting in Mafira

APPENDIX

5. ISSUES AND RESPONSE RECORD

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
Employment					
16, 81, 92, 157, 133, 80	09-Mar-11 11-Mar-11 12-Mar-11 14-Mar-11	Soldier Street, Freetown/ Chief Administrator's Office, Port Loko District Council, Port Loko /Town Hall, Lunsar / Murialdo Secondary School, Lunsar	Green Scenery, Port Loko District Council, Public Meeting, Murialdo Secondary School, District Medical Officer Port Loko	Local youths, indigenes and land owners should be involved in the employment and development process. This will avoid conflict. How will this be undertaken? Will vacancies be advertised?	MIOL appreciates it is important to establish good relations with the communities (including the youth) and is committed to preferential employment of local people (see Impact ED1 in the ESIS). A Recruitment Plan will be developed to address this issue (see enhancement measures listed for Impact ED1 in the ESIS)
46	09-Mar-11	Cotton Tree Foundation Office, King Street, Freetown	Cotton Tree Foundation	Concerns over the decline in people working in agricultural production due to employment opportunities in mining. This will reduce the availability of farm workers and increase pressure on food resources.	
54, 74, 130	10-Mar-11 11-Mar-11 13-Mar-11	Lunsar-Makeni Highway, Lunsar / Chief Administrator's Office, Port Loko District Council, Port Loko /Mabesene Village, Lunsar	Amazonian Initiative Movement, Port Loko District Council, Mabesene Women's Association, Public Meeting	Preferential employment of local people over outsiders.	

[3] *Where actions over and above the commitments stipulated in the ESIA and specific to the comment raised are required, these are indicated in* italics *and will be followed up as part of the implementation of the ESMS outlined in the ESIS.*

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
55	10-Mar-11	Lunsar-Makeni Highway, Lunsar	Amazonian Initiative Movement	Compensation should be given to employees who are made redundant as this can have a psychological impact.	This will be part of the employment contract. Impacts relating to retrenchment are assessed in the ESIS (see Impact DC1) and MIOL has committed to the mitigation measures listed.
63, 119, 157	10-Mar-11 13-Mar-11	Lunsar-Makeni Highway, Lunsar /Foreroad Baka Village, Lunsar (suburb)	Amazonian Initiative Movement, Foreroad Baka Women's Association, Murialdo Secondary School	Women must be considered for employment and child labour must be avoided.	Agreed and this will be reflected in the Human Resources policy to be developed by MIOL (Section 11.1.1 of ESIS) and Recruitment Plan (see enhancement measures for Impact ED1 in the ESIS).
63 a, 94	10-Mar-11	Lunsar-Makeni Highway, Lunsar	Amazonian Initiative Movement, Public Meeting	Human resources must be carried out in a legitimate manner. An appropriate recruitment process should be undertaken.	See above (Impact ED1 and associated management measures)
93	12-Mar-11	Town Hall, Lunsar	Public Meeting Chairman - Hon Alhaji O Daramy	Local stakeholders should be contacted because they have technical and educated youths that are capable of doing any company job.	See above (Impact ED1 and associated management measures)
149	14-Mar-11	PLTC Campus, Lungi Road, Prot Loko	Port Loko Teachers College	Mining employees should be trained through the technical department of the college.	MIOL is committed to developing a training and skills development plan as part of its Recruitment Plan (see enhancement measures listed for Impact ED1). *MIOL will consider inclusion of use of the technical department in the training and skills development plan.*
150, 117	14-Mar-11 12-Mar-11	Murialdo Secondary School, Lunsar / Town Hall, Lunsar	Murialdo Secondary School, Public Meeting	Concerns teachers will leave the school to work in mining. This will disrupt the pupils progress. What incentive will be given for teachers to stay?	Noted. *MIOL will continue dialogue with the school to keep track of the problem and if necessary jointly identify measures to address it.*

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
152	14-Mar-11	Murialdo Secondary School, Lunsar	Murialdo Secondary School	Concerns that children will leave school to work for the mining company.	Child labour will not permitted as part of the Human Resources Policy.
153	14-Mar-11	Murialdo Secondary School, Lunsar	Murialdo Secondary School	Concern over inconsistency between employees monthly salary and the salary they were initially told. A percentage may be taken from their monthly salaries. MIOL should deal with salary payments, not the local authorities.	Noted. See above (Impact ED1 and associated management measures) and *MIOL human resources manager to follow up on the issue of salaries.*
154	14-Mar-11	Murialdo Secondary School, Lunsar	Murialdo Secondary School	Concern about foreigners/employees coming from outside and increasing the vulnerability of young girls to becoming involved in the sex industry. MIOL need to talk to employees about this.	This has been identified and assessed as a potential impact in the ESIS (Impact SO2) and MIOL has committed to the mitigation measures listed.
143			Port Loko Teachers College	Mining companies concentrate assistance in primary and secondary schools. Tertiary institutions should be considered.	Noted. *MIOL will consider inclusion in the Community Development programme.*
141	14-Mar-11	PLTC Campus, Lungi Road, Prot Loko	Port Loko Teachers College	Money can be saved if jobs higher up can be given to Sierra Leoneans.	Noted and see above (Impact ED1 and associated management measures), where suitable skill levels exist local people will be employed.
131	13-Mar-11	Mabesene Village, Lunsar	Mabesene Women's Association	Alleged concerns that in order to get a job one has to pay 200 to 400 thousand Leones.	Noted and see above (Impact ED1 and associated management measures). *MIOL will investigate allegations and develop a fair and transparent recruitment plan.*

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
109	12-Mar-11	Town Hall, Lunsar	Public Meeting attendee	Request for employment of local youth.	Noted and see above (Impact ED1 and associated management measures).
Environment					
14, 18, 146	09-Mar-11 14-Mar-11	Soldier Street, Freetown / PLTC Campus, Lungi Road, Prot Loko	Green Scenery, Port Loko Teachers College	Concerns over mining operations clearing swamps and forests. Reforestation and economic trees should be provided.	The preliminary Project layout has taken these areas into account and where possible they have been avoided. Only a small area of gallery forest (1.25 ha) and no swamp forest will be cleared. Impacts on habitat are assessed in the ESIS (Impact EB1) and appropriate compensation for losses to local communities will be addressed through a Resettlement Action Plan (see mitigation measures listed for Impact RL1).
30	09-Mar-11	Upper Brook Street, Freetown	Environmental Forum for Action	Concerns over the greenhouse effect from iron ore mining. Will MIOL include activities for communities to cope with climate change?	Noted. The contribution of the Project to greenhouse gases or climate change has not been included in the ESIA but is considered to be negligible.
32c	09-Mar-11	Upper Brook Street, Freetown	Environmental Forum for Action	What will MIOL do about flora and fauna biodiversity loss from mining activities?	Assessment of the impacts on biodiversity resulting from the Project is included in the ESIS (Impacts EB1-4), and MIOL has committed to the mitigation measures listed.
33	09-Mar-11	Upper Brook Street, Freetown	Environmental Forum for Action	The level of the water table is a serious problem as it is rapidly being depleted. This needs to be addressed.	Impacts on groundwater levels resulting from pit dewatering have been assessed in Impact WR1 of the ESIS. MIOL has committed to the mitigation measures listed, which include provision of water to affected communities if required. MIOL will continue to actively consult with affected communities in accordance with this SEP.
31	09-Mar-11	Upper Brook Street, Freetown	Environmental Forum for Action	Concerns about visual impacts as the landscape will be destroyed.	Visual impacts are assessed in the ESIS (Impact LT3). MIOL has committed to the mitigation measures listed to minimise

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
					visual impacts.
41	09-Mar-11	Upper Brook Street, Freetown	Environmental Forum for Action	The Company should choose the vegetation species for rehabilitation carefully, as *Gethropha* is detrimental to local water bodies.	*Local indigenous species will be used for rehabilitation where possible, and expert advice will be sought in this regard. Consideration of this will be included in the Rehabilitation Plan.*
45	09-Mar-11	Cotton Tree Foundation Office, King Street, Freetown	Cotton Tree Foundation	Agricultural support should be provided as plantations can help rehabilitate the soil.	MIOL has committed to supporting various livelihood strategies for affected communities (see mitigation measures listed for Impact RL1 in the ESIS). *MIOL will consider inclusion of agricultural support in Community Development programme.*
71	11-Mar-11	Chief Administrator's Office, Port Loko District Council, Port Loko	Port Loko District Council	Concerns over air pollution and the effect dust pollution will have on the environment.	Specialists have quantitatively modelled the potential impacts on air quality in the surrounding area, the results of which are summarised in Impact AQ1 of the ESIS. MIOL has committed to the mitigation measures listed.
58	10-Mar-11	Lunsar-Makeni Highway, Lunsar	Amazonian Initiative Movement	Concerns over the chemicals used in boreholes and the distance from these to the wells. A sufficient distance should be provided.	No chemicals will be used in boreholes. A water quality monitoring programme is in place to monitor changes to water quality on an ongoing basis.
155	14-Mar-11	Murialdo Secondary School, Lunsar	Murialdo Secondary School	Mining will interfere with the swamps and the agricultural sector.	Impacts on wetland areas resulting from pit dewatering and changes to surface water flow have been assessed in Impacts WR1 and WR3 of the ESIS. MIOL has committed to the mitigation measures listed, which include making alternative wetland areas available. Compensation for land lost will be addressed through the RAP (see Impact RL1).

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
146	14-Mar-11	PLTC Campus, Lungi Road, Prot Loko	Port Loko Teachers College	Concerns over the destruction of land and land reclamation.	Impacts due to land acquisition and relocation are assessed in Impact RL1 in the ESIA. MIOL has committed to the mitigation measures listed, which include preparation of a RAP in consultation with communities. The concerns will be addressed through the RAP.
136	14-Mar-11	PLTC Campus, Lungi Road, Prot Loko	Port Loko Teachers College	Concerns over infertile soil and depletion, resulting in plants not being able to grow due to toxicity.	Impacts relating to soil erosion and land capability are assessed in Impacts LT4 and LT5. Changes in soil chemistry resulting from fugitive dust are not expected, and MIOL has committed to the mitigation measures listed.
135	14-Mar-11	PLTC Campus, Lungi Road, Prot Loko	Port Loko Teachers College	Changes in the water table can result in biodiversity loss.	Agreed. Impacts on wetland areas resulting from pit dewatering have been assessed in Impact WR1 of the ESIS. MIOL has committed to the mitigation measures listed.
122	13-Mar-11	Mabesene Village, Lunsar	Mabesene Women's Association	A request for assistance in the termination of grasshoppers and other pests.	Request noted. MIOL is yet to decide which community development initiatives to support in consultation with communities. *MIOL will consider inclusion in Community Development Programme.*
118	12-Mar-11	Town Hall, Lunsar	Public Meeting attendee	Concerns about the sludge which will damage the swamps and directly affect agriculture.	Waste will not be deposited in wetlands or any other natural areas. Sewage sludge will be deposited in a landfill after appropriate treatment, and sludge from HFO's will be removed from site for appropriate disposal. MIOL will develop a Waste Management Plan (Section 11.1.4 of the ESIS) detailing the management of wastes produced.

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
85	11-Mar-11	District Agriculture Officer's Office, MAFS, Port Loko	Ministry of Agriculture and Food Security	Environmental degradation around Mange Acre (a village beyond the Project area) has occurred and planting fast growing trees such as *tectona grandis* (Teak) and *acacia* should be undertaken for prevention of soil erosion.	Noted. Impacts relating to soil erosion due to clearing of vegetation have been assessed in the ESIA as Impact LT4, and MIOL has committed to the mitigation measures listed, which include revegetation of disturbed areas as soon as possible. *Expert advice will be sought and recommendations regarding suitable species for use during revegetation will be included in the Rehabilitation Plan (Section 11.1.4 of the ESIS).*
86	11-Mar-11	District Agriculture Officer's Office, MAFS, Port Loko	Ministry of Agriculture and Food Security	Trees should not be cut down as this interrupts the water table which is currently a serious problem.	Noted. *Disturbance of trees and particularly indigenous forest habitat will minimised – measures to this effect will be included in the Construction Management Plan (Section 11.1.4 of the ESIS).*
88	11-Mar-11	District Agriculture Officer's Office, MAFS, Port Loko	Ministry of Agriculture and Food Security	MAFS (Port Loko) want to work in partnership in reforestation programmes.	Noted. *MIOL will engage in further consultation with MAFS in this regard.*
11	09-Mar-11	Soldier Street, Freetown	Green Scenery	Concern over the inappropriate disposal of tailings.	Tailings material will be disposed of in a dedicated and appropriately designed Tailings Storage Facility (see detail in Section 4.4 of the ESIS and Appendix 5), and used to backfill Matukia pit, with suitable design requirements in place. No tailings material will be disposed of elsewhere.
CSR					
3	09-Mar-11	NMJD Office, 49 Main Motor Road, Brookfields, Freetown	Network Movement for Justice and Development	Allocation of 1% of revenues for local development.	Noted. *MIOL will investigate options for investment in local development through a Community Development Plan (Section 11.1.4 of the ESIS).*

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
13	09-Mar-11	Soldier Street, Freetown	Green Scenery, Environmental Forum for Action	Communities should be helped to cope with climatic impact.	Noted. However no impacts on climate resulting from the Project are anticipated.
22	09-Mar-11	Soldier Street, Freetown	Green Scenery	Communities should be involved in rehabilitation programmes, such as tree planting, as this will provide employment.	Chapter 8 of the ESIA proposes a Livelihood Restoration Plan. MIOL will consider the inclusion of specific Projects in the livelihood restoration measures included in the Community Development Plan (Section 11.1.4 of the ESIS) in consultation with community members
27, 70, 97	09-Mar-11 11-Mar-11 12-Mar-11	Upper Brook Street, Freetown /Chief Administrator's Office, Port Loko District Council, Port Loko / Town Hall, Lunsar	Environmental Forum for Action, Port Loko District Council, Public Meeting	Local people, landowners and children should benefit from mining operations in their area and help should be provided to the communities.	Noted. The Project's contribution to local economic development has been assessed in the ESIA (Section 8.1) and MIOL has committed to the enhancement measures listed, to improve benefits to local communities.
32d	09-Mar-11	Upper Brook Street, Freetown	Environmental Forum for Action	What will the budget be for environmental/community strategies which mitigate the effect mining operations will have.	The budget estimate will be an outcome of the detailed management action planning if the Project goes ahead. *MIOL will devise a detailed management action plan, including budgetary estimations.*
73	11-Mar-11	Chief Administrator's Office, Port Loko District Council, Port Loko	Port Loko District Council	MIOL should develop tangible structures instead of just giving out money, such as incorporating facilities into their social programmes such as Peripheral Health Units and hospitals.	Noted. *MIOL will include this in the Community Development Plan (Section 11.1.4 of the ESIS).*
76	11-Mar-11	Chief Administrator's Office, Port Loko District Council, Port Loko	Port Loko District Council	MIOL needs to recognise basic development principles/corporate social responsibilities.	Noted. MIOL has committed to developing a Community Development Plan in consultation with local communities.

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
98	12-Mar-11	Town Hall, Lunsar	Public Meeting attendee	Medical assistance should be provided through facilities and especially a malaria control programme as mosquitoes breed in the ponds and pits mining companies have produced.	Noted. *MIOL will consider inclusion in Community Development Plan (Section 11.1.4 of the ESIS).*
104	12-Mar-11	Town Hall, Lunsar	Public Meeting attendee	A request to give children scholarships.	This is an ongoing programme and could be expanded if the Project goes ahead. *MIOL will consider inclusion in Community Development Plan (Section 11.1.4 of the ESIS).*
100, 105	12-Mar-11	Town Hall, Lunsar	Public Meeting attendee	High quality schools, hospitals and roads should be built.	This is not MIOL's but government's responsibility.
106	12-Mar-11	Town Hall, Lunsar	Public Meeting attendee	Safe drinking water should be provided to the communities.	MIOL will provide safe drinking water to Project-affected communities if impacts are shown to occur, currently no impacts on water quality are predicted (Impact WR6).
91	12-Mar-11	Town Hall, Lunsar	Public Meeting attendee	Delco left houses, therefore the Company has no right to destroy them without building new ones.	*Replacement housing will be built for affected community members under the RAP.*
96	12-Mar-11	Town Hall, Lunsar	Public Meeting attendee	Preference towards local businesses and shops for purchase of provisions and supplies.	This is acknowledged in Chapter 8 of the ESIS, which includes enhancement measures MIOL has committed to, to maximise benefits to local suppliers (Impact ED4 and associated management measures).
101	12-Mar-11	Town Hall, Lunsar	Public Meeting attendee	Programmes in which women can become involved should go directly to them giving them the opportunity to participate.	Noted. Impacts on vulnerable groups (including women) are acknowledged in Chapter 8 of the ESIA. *MIOL will consider vulnerable groups in the Community Development Plan (Section 11.1.4 of the ESIS).*

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
83	11-Mar-11	Chief Administrator's Office, Port Loko District Council, Port Loko	Port Loko District Council	People who are affected directly should be the first to benefit	Noted. This is acknowledged in the ESIA, and MIOL has committed to the enhancement measures listed in Section 8.1, which focus on benefits to affected communities.
57	10-Mar-11	Lunsar-Makeni Highway, Lunsar	Amazonian Initiative Movement	Concerns over displacement as LMC has threatened to move the people who are living in the quarters built by Delco. Will new houses be built? Demolition will create tension therefore an amicable decision should be reached.	Impacts relating to other Projects are beyond the scope of this ESIA or MIOL's area of influence. Relocation of communities affected by MIOL's Project will be addressed via the RAP (Impact RL1).
82	11-Mar-11	Chief Administrator's Office, Port Loko District Council, Port Loko	Port Loko District Council	MIOL should contact the Council for community programmes to avoid duplication.	Agreed. *MIOL will follow up with the local council in this regard when preparing the Community Development Plan (Section 11.1.4 of the ESIS).*
144	14-Mar-11	PLTC Campus, Lungi Road, Prot Loko	Port Loko Teachers College	A proposal has been sent to MIOL for a generator and electrification but there has been no reply.	Noted. *MIOL will take up the proposal for consideration as part of the Community Development Plan.*
2	09-Mar-11	NMJD Office, 49 Main Motor Road, Brookfields, Freetown	Network Movement for Justice and Development	The Project cost should include the cost of resettlement, compensation for crops and community infrastructure. Despite the Government not currently having a resettlement policy, it is important that companies go about resettlement correctly.	Agreed. Cost for resettlement will be included. MIOL has committed to a RAP (Impact RL1), which will include this.
Business Operations					

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
1, 116	09/03/2011, 12/03/2011	NMJD Office, 49 Main Motor Road, Brookfields, Freetown / Town Hall, Lunsar	Network Movement for Justice and Development, Public Meeting	Mining companies should use international laws as national laws are weak.	Agreed. MIOL is using not just national laws but referring to international standards as well for the ESIA process (Section 2.2 of ESIS).
5,15	09-Mar-11	NMJD Office, 49 Main Motor Road, Brookfields, Freetown	Network Movement for Justice and Development, Green Scenery	What is the relationship between London Mining, MIOL and African Minerals Limited?	There is no relationship with London Mining and African Minerals, except that African Minerals is a shareholder in Cape Lambert who own MIOL.
7	09-Mar-11	Soldier Street, Freetown	Green Scenery	Concerns over companies moving fast with their operations and procedures not being followed properly.	Noted. MIOL is strongly committed to following the correct procedures.
20	09-Mar-11	Soldier Street, Freetown	Green Scenery	Concern over the issue of change in company ownership resulting in a displacement of liabilities. Will a bond be left behind for new companies to take up? When companies sell on mining Projects, the new owners do not usually take on the liabilities of the old companies (example Sierra Rutile and Koidu Holdings). In such situations the government does not have the capacity to monitor liabilities, and NGOs tend to become involved.	Noted. International good practice, which MIOL has committed to requires the company to make provision for rehabilitation should it decide to close the operation.
72	11-Mar-11	Chief Administrator's Office, Port Loko District Council, Port	Port Loko District Council	It is important for MIOL to conform to local laws.	Agreed. MIOL is committed to conforming to all national laws and also to international good practice.

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
		Loko			
61	10-Mar-11	Lunsar-Makeni Highway, Lunsar	Amazonian Initiative Movement	All three mining companies (MIOL, AML and LMC) should come together to construct one road and railway.	Noted. A degree of collaboration in this regard between AML and MIOL with regard to shared use of rail (and possibly port) infrastructure for product export has been agreed to (Section 4 of the ESIS).
69	11-Mar-11	The Manager's Office, Marampa Community Bank, Lunsar	Marampa Community Bank	MIOL should use Marampa Community Bank for domestic banking and to pay staff salaries as this will allow for an improvement in community infrastructure.	Noted.
84	11-Mar-11	Chief Administrator's Office, Port Loko District Council, Port Loko	Port Loko District Council	Company information will be disseminated to the Government and other agencies.	MIOL will provide the legally required documents to relevant authorities and communicate to stakeholders as specified in this SEP.
139	14-Mar-11	PLTC Campus, Lungi Road, Prot Loko	Port Loko Teachers College	What adjustments do MIOL make in order to meet with the rate of inflation?	This level of detail has not yet been determined.
115	12-Mar-11	Town Hall, Lunsar	Public Meeting attendee	Rev JS Mans also recommended that, in order to ensure justice, the Headquarter/ administrative office of MIOL should be located in Lunsar and not in Freetown	Noted. However, the Company has decided that its head office will remain in Freetown at this stage.
112	12-Mar-11	Town Hall, Lunsar	Public Meeting attendee	All grievances should be reported to the authorities or the Police.	Noted. *MIOL will report relevant problems/ grievances, if criminal in nature, to the police or relevant authorities. Reference to this will be included in the Grievance Management Plan (Section 11.1.4 of the ESIS).*

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
12	09-Mar-11	Soldier Street, Freetown	Green Scenery	Issue of implementation: Consultants should design a framework on how to monitor and include as an annex. A framework on reporting their performance should be constructed.	Agreed. The Environmental and Social Management System in Chapter 11 of the ESIS includes specifications for monitoring and reporting. An environmental management programme (EMP) is included in Appendix F of the ESIS.
145	14-Mar-11	PLTC Campus, Lungi Road, Prot Loko	Port Loko Teachers College	Who determines what is compensated to the people?	Government will make final decisions on the compensation- decisions will be based on current Sierra Leone legislation, international good practice and local prices. Details on compensation will be specified in the RAP (Impact RL1).
17	09-Mar-11	Soldier Street, Freetown	Green Scenery, Public Meeting	Resettlement is a key issue and companies must do this sensitively and properly where they should buy land for communities and build houses for them.	Impacts relating to resettlement have been assessed in Section 8.2 of the ESIS (Impact RL1). These issues will be addressed more thoroughly in the RF (Appendix D of the ESIA) and RAP.
Stakeholder Consultation Process and Participation					
4, 9, 48, 60	09-Mar-11	NMJD Office, 49 Main Motor Road, Brookfields, Freetown, Soldier Street, Freetown	Network Movement for Justice and Development, Green Scenery, Cotton Tree Foundation, Amazonian Initiative Movement	The authority of Paramount Chiefs is now declining and hence MIOL should not rely on them too much. Instead the Company should identify other leaders and communicate directly with community members. The dialogue with the community should be sustained even after permitting.	Noted. MIOL will ensure continuous dialogue between the company and stakeholders throughout the Project life cycle, as described in this SEP.
8	09-Mar-11	Soldier Street, Freetown	Green Scenery	A programme should be designed which identifies communities needs.	A Community Development Plan is committed to and this will include evaluation of community needs (Section 11.1.4 of the ESIS).

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
21	09-Mar-11	Soldier Street, Freetown	Green Scenery	The ESIA should not only be sent to SLEPA but should be made available to other stakeholder groups as well to share their concerns before the ESIA disclosure.	When the ESIS is made public it will be available to stakeholder groups, as per the required SEP (Section 3.3.5 of the ESIA).
23	09-Mar-11	Soldier Street, Freetown	Green Scenery	Communities should be engaged and educated to avoid threats.	Agreed. Community engagement will take place throughout the Project life cycle and after closure as set out in the SEP.
24	09-Mar-11	Soldier Street, Freetown	Green Scenery	A balance between the community and company's expectations should be kept.	Agreed. Continued community engagement throughout the Project is set out in the SEP.
25	09-Mar-11	Soldier Street, Freetown	Green Scenery	The Community Liaison Officer (CLO) will be the key person for community outreach.	Agreed.
28	09-Mar-11	Upper Brook Street, Freetown	Environmental Forum for Action	Concern over MIOL's public participation in 2010 as it was very poor. They do not want a repeat of this.	Noted. MIOL is strongly committed to following good practice procedures, especially with regard to community consultation. *MIOL to follow up on reasons for this comment.*
49	09-Mar-11	Cotton Tree Foundation Office, King Street, Freetown	Cotton Tree Foundation	MIOL should beware of the uneducated people in the Project area, as they can have a negative impact.	Agreed. *The company will have a dedicated non-technical summary report of the ESIA for disclosure of relevant Project related information to communities as outlined in this SEP. Consultations will take place throughout the Project life cycle to ensure communities are kept up to date with information. The community liaison officer will also facilitate dissemination of information to communities.*

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
50	09-Mar-11	Cotton Tree Foundation Office, King Street, Freetown	Cotton Tree Foundation	MIOL should understand the people, culture, values and show respect to the local communities through involving them.	Agreed. Communities will be engaged with at each step of the Project cycle as outlined in this SEP. Dedicated social and natural resource studies have taken place to gain understanding of the local culture and values (Section 6 of the ESIS).
79	11-Mar-11	Chief Administrator's Office, Port Loko District Council, Port Loko	Port Loko District Council	Sheik Gibril requests feedback from the meeting.	Noted. *MIOL will follow up and ensure the requested feedback has been provided.*
78	11-Mar-11	Chief Administrator's Office, Port Loko District Council, Port Loko	Port Loko District Council	The council should be involved in all development programmes.	Government and governmental agencies will be involved in community development as laid out in the RF.
159, 99	14-Mar-11	Murialdo Secondary School, Lunsar	Murialdo Secondary School, Public Meeting	Will this consultation be a continuous process? Engagement with stakeholders should continue.	Engagement with stakeholders will continue throughout the Project life as outlined in this SEP.
113	12-Mar-11	Town Hall, Lunsar	Public Meeting attendee	A request for similar meetings to be held by MIOL every month.	Noted. If the Project proceeds the frequency of meetings will be reviewed and if necessary the SEP updated to reflect the needs of the community.
87	11-Mar-11	District Agriculture Officer's Office, MAFS, Port Loko	Ministry of Agriculture and Food Security	It is important that work is undertaken with community youths and chiefs.	Noted.
77	11-Mar-11	Chief Administrator's Office, Port Loko District	Port Loko District Council	MIOL should have community development personnel to guide them on development principles.	A Community Development Plan is committed to and this will include input from relevant specialists (Section 11.1.4 of the ESIS).

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
		Council, Port Loko			
Mining Operations					
32	09-Mar-11	Upper Brook Street, Freetown	Environmental Forum for Action	International consultants have a history of ignoring their recommendations (eg. on chemical disposal, tailings, pollution prevention, clearing of vegetation and restoration) given in management plans.	Noted. MIOL is committed to implementing the measures listed in the EMP (Appendix F of the ESIS). Adherence to the EMP may be a condition of the Project's environmental authorisation.
32a	09-Mar-11	Upper Brook Street, Freetown	Environmental Forum for Action	What will MIOL do about tailings storage facilities?	Tailings material will be disposed of in a dedicated and appropriately designed Tailings Storage Facility (see Section 4.4 of the ESIS and Appendix E), and used to backfill Matukia pit (with appropriate design in place).
37	09-Mar-11	Upper Brook Street, Freetown	Environmental Forum for Action	Will AML, LML and MIOL work together to mitigate impacts of iron ore exploration?	Noted. No formal arrangement in this regard has been reached yet. Cumulative impacts (in most cases resulting from the multiple mining Projects in the area) have been assessed in Chapter 10 of the ESIS. *MIOL will consider approaching AML and LMC in this regard.*
38	09-Mar-11	Upper Brook Street, Freetown	Environmental Forum for Action	The cost of rehabilitation should not be to be left on the government.	Agreed. MIOL will be responsible for the cost of rehabilitation of the site, as described in Section 4.11, and specified in the EMP (Appendix F).
40	09-Mar-11	Upper Brook Street, Freetown	Environmental Forum for Action	Request to see the Mine Reclamation Plan.	A Closure and Rehabilitation Plan will be developed if the Project proceeds and will be made available upon request to stakeholders.
43	09-Mar-11	Upper Brook Street,	Environmental Forum for Action	ENFORAC has the legal mandate to monitor and are working with	Noted.

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
		Freetown		SLEPA.	
44	09-Mar-11	Upper Brook Street, Freetown	Environmental Forum for Action	ENFORAC have requested to be part of the process and that MIOL should work with them.	Noted. ENFORAC are registered as stakeholders and will be consulted in future as outlined in this SEP.
156	14-Mar-11	Murialdo Secondary School, Lunsar	Murialdo Secondary School	How will the concentrate be stored?	Concentrate will be stored in stockpiles at the rail loading spur before being exported from the site. See Section 4.3 of the ESIS.
62	10-Mar-11	Lunsar-Makeni Highway, Lunsar	Amazonian Initiative Movement	When will mining start?	Stage 1 (oxide ore) mining is scheduled to start in Q$ of 2014 subject to the Company receiving financing.
64	10-Mar-11	Lunsar-Makeni Highway, Lunsar	Amazonian Initiative Movement	How will MIOL undertake monitoring and which areas are of influence? How long does it take to monitor?	MIOL will undertake monitoring as per the requirements of the Environmental and Social Management System (Section 11.3 of the ESIA). Monitoring programmes recommended by specialists are included in the specialist study reports (Volume 3 of the ESIS). Monitoring will in most cases be ongoing through the life of mine.
Livelihoods (Agri schemes)					
66, 52	10-Mar-11	Lunsar-Makeni Highway, Lunsar	Amazonian Initiative Movement	MIOL should negotiate with plantation owners and the names of the landowners should be recorded in the deal. Landowners should be treated fairly whereby they receive the true money value of their land.	MIOL will make the decision on compensation in consultation with affected land owners and government in line with Sierra Leone legislation and international standards. Landowners will be paid compensation at full replacement value. *Further detail on compensation will be determined via the RAP (Impact RL1 in the ESIS).*
123 a	13-Mar-11	Mabesene Village, Lunsar	Mabesene Women's Association	Assistance for agricultural expansion should be provided.	Noted. Decisions on community development programmes will be made during the development of the RAP. *MIOL will consider inclusion in the community development programme.*

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
140, 138	14-Mar-11	PLTC Campus, Lungi Road, Prot Loko	Port Loko Teachers College	Economic trees such as Mango trees, should be planted as these provide livelihoods. How much would MIOL pay for these?	Economically important trees lost through land acquisition will be compensated (detail will be determined via the RAP), and community development plans will be decided in consultation with the community. *MIOL will consider inclusion in the Community Development Plan (Section 11.1.4 of the ESIS)*
120	13-Mar-11	Foreroad Baka Village, Lunsar (suburb)	Foreroad Baka Women's Association	A request for assistance and support in business activities and the construction of a storage facility for crops and produce.	Noted. Decisions on community development programmes will be made in consultation with the community members. *MIOL will consider inclusion in the Community Development Plan (Section 11.1.4 of the ESIS)*
121	13-Mar-11	Mabesene Village, Lunsar	Mabesene Women's Association	MIOL is expected to continue in supporting this group with seed supply for cassava and groundnut.	
103	12-Mar-11	Town Hall, Lunsar	Public Meeting attendee	What will happen if MIOL relocates landowners?	MIOL will buy land for them and build them houses, in accordance with a RAP (Impact RL1), which will be developed in consultation with the community.
107	12-Mar-11	Town Hall, Lunsar	Public Meeting attendee	What will happen to their land after MIOL has left?	The land will be rehabilitated and handed back to the community (Section 4.11).
108	12-Mar-11	Town Hall, Lunsar	Public Meeting attendee	When MIOL pay the landowners their surface rent, they should tell them then what will happen to their land once the company has left.	Noted. Engagement with stakeholders on issues such as this will continue throughout the Project life as outlined in this SEP.
111	12-Mar-11	Town Hall, Lunsar	Public Meeting attendee	MIOL should address the relocation of communities and crop compensation.	This is being addressed in the resettlement planning process (see RF in Appendix D and Impact RL1) and will further be addressed via the RAP.
90	11-Mar-11	District Agriculture Officer's Office, MAFS, Port	Ministry of Agriculture and Food Security	The rehabilitation of mined out areas is crucial for the sustainability of agriculture.	Disturbed areas will be rehabilitated, but not necessarily to their original use. MIOL will devise a Rehabilitation and Closure Plan (Section 11.1.4 of the ESIS).

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
		Loko			
89	11-Mar-11	District Agriculture Officer's Office, MAFS, Port Loko	Ministry of Agriculture and Food Security	Swamps and low lying areas should be developed for increased agricultural production.	Suggested noted. Wetland areas also serve important ecological functions, which need to be maintained.
26	09-Mar-11	Soldier Street, Freetown	Green Scenery	The issue of livelihood. Farmers may not have much land anymore.	Noted. The issue of livelihoods is discussed in Section 8.2 of the ESIS.
Health and Safety					
71, 127	11-Mar-11	Chief Administrator's Office, Port Loko District Council, Port Loko / Mabesene Village, Lunsar	Port Loko District Council, Mabesene Women's Association	Concerns over the effect air pollution and dust from vehicles will have on human health.	Impacts on air quality (including those resulting from dust from vehicles) were assessed by a specialist, the findings of which are summarised in the ESIS (Section 9.1). MIOL has committed to the mitigation measures listed.
128, 124	13-Mar-11	Mabesene Village, Lunsar	Mabesene Women's Association	Concerns over heavy machines shaking nearby houses and blasting activity damaging their houses as structures are weak.	Impacts resulting from vibrations and air overpressure have been modelled assessed in the ESIS (Impact NV1). Impacts on built structures are expected to be insignificant (and lower than those on humans).
129, 148	13-Mar-11	Mabesene Village, Lunsar	Mabesene Women's Association, Port Loko Teachers College	Concerns over increases in accidents due to an increase in traffic and the safety of people when crossing railways and roads.	Traffic safety risks are assessed in the ESIS as Impacts TS1 and TS2. MIOL has committed to the mitigation measures listed, including provision of safe crossing points where possible.

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
132	14-Mar-11	DMO's office, Port Loko Government Hospital, Hospital Road, Port Loko	District Medical Officer Port Loko	Concerns over the water system and artificial lakes as waterborne diseases can be transmitted.	Noted. Impacts on surface water quality resulting from discharges are assessed in Impact WR6 of the ESIA, and MIOL has committed to the mitigation measures listed. *Ongoing water quality monitoring will take place to timeously detect issues.*
125	13-Mar-11	Mabesene Village, Lunsar	Mabesene Women's Association	Safety measures need to ensure debris and stones do not fly into the village from blasting activities.	Agreed, and addressed in Impact OH1 of the ESIA. *MIOL will ensure good practice safety measures are in place during blasting operations.*
123	13-Mar-11	Mabesene Village, Lunsar	Mabesene Women's Association	Toilet facilities and clean water supply should be provided.	MIOL cannot provide what usually is government responsibility. However this request would be considered during ongoing consultations with community as part of the Community Development Plan (Section 11.1.4 of the ESIS).
126	13-Mar-11	Mabesene Village, Lunsar	Mabesene Women's Association	There is a fear of flooding due to Magbenkte Village being surrounded by old Delco Lake where some digging is being undertaken (not clear if this is in London Mining area).	Changes to flood risk have been assessed in the ESIS in Impact WR4, and is predicted to be of low significance. Various good practice measures are recommended to further decrease any negative impacts on local villages.
142	14-Mar-11	PLTC Campus, Lungi Road, Prot Loko	Port Loko Teachers College	Concerns over health and social issues associated with congestion.	This risk is assessed in Impacts SR2, and SO1-3 of the ESIS and MIOL has committed to the measures proposed for mitigating them.
114	12-Mar-11	Town Hall, Lunsar	Public Meeting attendee - Dr. Rev. Joseph Saidu Mans	It is requested that employees use the St John of God Hospital and the Baptist Eye Hospital for medical tests and examination.	Noted. *MIOL will follow up in this regard at the appropriate time.*

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
65	10-Mar-11	Lunsar-Makeni Highway, Lunsar	Amazonian Initiative Movement	External workers should be aware of an increased risk of HIV and AIDS.	Workers will be made aware of risks and preventative measures on commencement of employment, as part of the health awareness programme committed to by MIOL, which are likely to be captured in a Community Health and Safety Plan (Impact SR2 of the ESIS). HIV awareness will be included.
68	10-Mar-11	Lunsar-Makeni Highway, Lunsar	Amazonian Initiative Movement	How will MIOL address hazards such as the effect blasting noise will have on people.	This impact has been assessed by a noise specialist, and reported as Impact NV1 in the ESIS. The impact on local communities is predicted to be of low significance, and no mitigation measures are required. Impacts on mine workers are an occupational health and safety issue, and the appropriate PPE will be used.
56	10-Mar-11	Lunsar-Makeni Highway, Lunsar	Amazonian Initiative Movement	Will appropriate safety gear be supplied to the employees?	Yes, appropriate health and safety measures will be followed with relevant safety gear (PPE) being provided to all employees with the expectation it will be worn at all times
32	09-Mar-11	Upper Brook Street, Freetown	Environmental Forum for Action	What will MIOL do about noise and air pollution?	Specialists have quantitatively modelled the potential impacts on air quality and noise in the surrounding area, the results of which are summarised in Impacts AQ1 and NV2 of the ESIS. MIOL has committed to the mitigation measures listed to manage these impacts.
34	09-Mar-11	Upper Brook Street, Freetown	Environmental Forum for Action	Which type of explosives/blasters will be used? Will staff be trained to use explosives safely?	The type of explosives is yet to be determined. MIOL staff will be appropriately trained and the appropriate safety measures will be in place.

Issue No.	Date	Meeting venue	Stakeholder	Description of Issue/Concern	Responses provided and required action (if any)[3]
32b	09-Mar-11	Upper Brook Street, Freetown	Environmental Forum for Action	What will MIOL do about the drilling/blasting effects on workers and the communities?	This impact has been assessed by a noise specialist, and reported in Impact NV1 of the ESIS. The impact on local communities is predicted to be of low significance, and no mitigation measures are required. Impacts on mine workers are an occupational health and safety issue, and the appropriate PPE will be used.
35, 59	09-Mar-11	Upper Brook Street, Freetown	Environmental Forum for Action, Amazonian Initiative Movement	There needs to be sufficient distance between to use of explosives and the communities.	Staff will be appropriately trained in the use of explosives and the appropriate safety measures will be in place.

APPENDIX D

D RESETTLEMENT FRAMEWORK

A RESETTLEMENT FRAMEWORK FOR THE MARAMPA IRON ORE PROJECT, SIERRA LEONE

Prepared For

MARAMPA IRON ORE (SL) LIMITED

Report Prepared by

SRK Consulting (UK) Limited

UK3823

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A RESETTLEMENT FRAMEWORK FOR THE MARAMPA IRON ORE PROJECT, SIERRA LEONE – EXECUTIVE SUMMARY

1. INTRODUCTION

Marampa Iron Ore Limited (MIOL) intends to develop an open pit iron ore mine in the vicinity of Lunsar. The Project will require land acquisition and as a result some people will need to be physically and/or economically displaced from the Project area. SRK Consulting (UK) Limited ("SRK") has been requested by Marampa Iron Ore Limited ("MIOL", hereinafter also referred to as the "Company" or the "Client") to prepare a Resettlement Framework ("RF").

Of the total area (2 173 ha) potentially impacted by Project infrastructure, approximately 89% is currently used for agriculture. It is estimated 10 villages (162 households and 1780 people) will require relocation and could lose some or all access to agricultural land, natural resources, social infrastructure, sacred sites and access routes. In addition to the above villages, 13 villages (270 households and 2936), which are on the outskirts of the Project footprint, may lose some access to land and natural resources.

The RF is based on relevant Sierra Leone national laws and international best practices for compensation and resettlement. In particular the IFC Performance Standard (PS) 5 on Land Acquisition and Involuntary Resettlement is used as a guideline for this framework. A comparison between the Sierra Leone laws and the international guidelines shows the latter are more stringent in terms of: replacement value of lost assets, emphasis on compensation in kind rather than cash, requiring more intensive consultations with Project Affected People (PAP), recognising informal land owners/users (those who lack legal title), placing special emphasis on vulnerable groups and providing for a cut-off date for eligibility for compensation.

IFC PS 5 on resettlement and land acquisition requires that any resettlement of households only occurs if all possible measures have been exhausted to avoid resettlement. Where resettlement cannot be avoided it must be minimised as far as practicably possible. In line with IFC PS 5 this RF provides an approach for the development of a Resettlement Action Plan (RAP) and provides guidelines for compensation of those who will be physically and/or economically displaced by the Project land acquisition. The RF:

- outlines international best practice (IBP) guidelines and national legal requirements for compensation for loss of property, livelihood and relocation;
- describes the social context of those who will be resettled; and
- defines the tasks and steps which should be undertaken to plan the resettlement; including identification of PAPs.

2. RESETTLEMENT PLANNING ACTIONS

The development of a RAP involves the following key actions:

- identification and implementation of measures for minimising resettlement;
- identification of affected people and assessment of eligibility for compensation;
- development of an entitlement framework, outlining compensation criteria and rates;
- identification of host areas for resettlement;
- identification of procedures for monitoring and evaluating; and
- identification of institutional arrangements for the execution of the resettlement and compensation process.

A census and assets inventory will be undertaken to fully understand the current baseline

conditions of PAP and assess potential losses in terms of private and communal assets. Following the survey a cut-off date will be announced to prevent opportunistic claims for compensation. An agreement will need to be reached with the local authorities and the affected communities on the procedures to be used in the event of disputes.

An entitlement framework, which describes the compensation for different impacts, will be compiled. It will be based on valuation methods derived from both international best practice and Sierra Leone national laws. Valuation rates should be ratified by a Resettlement Working Group (RWG), relevant authorities and the affected stakeholders. The valuation process will take cognisance of the compensation rates used by recent projects in Sierra Leone, such as the London Mining Project and Addax Biofuel Project.

Resettlement will require the identification of a single large area or multiple smaller host areas for residential resettlement purposes (for those physically displaced) and identification of multiple areas of agricultural land for those economically displaced. Ideally for each affected household several options will be explored. Assessment of different options will be conducted in consultation with the affected villages and the RWG in terms of legal aspects and perceived advantages and disadvantages of the various options.

Once the feasibility of the host areas has been established a detailed plan of the host areas will be developed indicating any existing dwellings and infrastructure as well as the areas allocated to new dwellings, additional infrastructure, agricultural land and the existing transport network.

Both internal and external monitoring should be conducted to ensure the resettlement process meets its set objectives and standards.

3. STAKEHOLDER ENGAGEMENT

Engagement with stakeholders facing involuntary resettlement is one of the main requirements of IFC PS5. Consultations will comprise initial meetings with PAP at the start of the resettlement process to gather their inputs and meetings at the completion of the planning process to disclose the RAP. Consultations with PAP will be ongoing during the planning process through the RWG and the Community Resettlement Committees (CRCs).

The RWG will comprise representation from MIOL, local government, affected people and NGOs and is expected to take the lead on negotiations, reaching agreements and resolving grievances. The CRCs will comprise affected people and be established in each (cluster or single) village(s). These will assist with the implementation of the census and assets survey and be involved in the negotiations and identification of the host areas.

The resettlement process will also need an effective grievance mechanism for the PAP to resolve their issues. The mechanism should work in tandem with the RWG.

4. COMPANY RESPONSIBILITIES

MIOL is responsible for financing the resettlement and compensation activities, managerial and technical resources and expertise. The Company will develop a Resettlement Unit which will be managed by the Social Manager who is responsible for reporting to the General Manager. MIOL may decide to contract out their resettlement responsibilities to an external contractor with specific expertise in the area.

A detailed budget will be developed. The key components of the budget are:

- the cost of replacement land;

- the cost of building replacement housing and community structures such as schools, churches, grain banks, etc;
- cash compensation for the crops/ trees and relocation;
- the cost of implementing a livelihoods restoration programme for the directly affected people; and
- monitoring and evaluation costs.

The resettlement schedule should be linked with the Project's construction schedule to ensure timely availability of land for start of different Project activities.

Table of Contents

List of Tables

List of Figures

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A RESETTLEMENT FRAMEWORK FOR THE MARAMPA IRON ORE PROJECT, SIERRA LEONE

1 INTRODUCTION

SRK Consulting (UK) Limited ("SRK") has been requested by Marampa Iron Ore Limited ("MIOL", hereinafter also referred to as the "Company" or the "Client") to prepare a Resettlement Framework "RF" on the Mineral Assets of the Company comprising the Marampa Iron Ore Project (The Project) located in Sierra Leone. MIOL intends to develop an open pit iron ore mine in the vicinity of Lunsar. During the development of the Project land acquisition and resettlement will be required.

This RF provides an approach for the development of a Resettlement Action Plan (RAP) and provides guidelines for compensation of those who will be physically and/or economically displaced by the Project land acquisition. This RF:

- outlines international best practice (IBP) guidelines and national legal requirements for compensation for loss of property, livelihood and relocation;
- describes the social context of those who will be resettled; and
- defines the tasks and steps which should be undertaken to plan the resettlement; including identification of PAPs.

2 PROJECT DESCRIPTION

MIOL has an exploration licence for an area of 305.12 km^2. The proposed Project footprint/development area is 52.3 km^2. The Project will be conducted in two stages; Stage one will involve the construction of facilities to produce 2.5 Mtpa of iron concentrate through the mining of oxide ore and Stage two will involve the expansion of these facilities and construction of new facilities to enable the production of up to 15Mtpa of iron concentrate. The expected life of the mine is a minimum of 14 years.

The construction period for the Project will be approximately 3 – 3 ½ years and during this time temporary facilities will be provided to house construction personnel. The location of this site is currently unknown. A fenced construction laydown area will be built in proximity of the camp to store construction materials. Aside from the construction camp facilities the Project infrastructure will be developed within the Project exploration limit.

3 POTENTIAL DISPLACEMENT

The Project needs to acquire land for the development of MIOL's mining infrastructure and operations. As a result local people will be both physically and economically displaced from the Project area. In line with international standards, any economic or physical displacement of Project affected peoples (PAPs) requires the application of IFC Performance Standard (PS5) on land acquisition and involuntary resettlement as well as compliance with Sierra Leone requirements. According to PS5, involuntary resettlement refers to physical and economic displacement as a result of Project-related land acquisition and/or restrictions on land use. Of the total area (2 173 ha) that will be impacted by Project infrastructure, approximately 89% is currently used for agriculture (Section 7, ESIA).

The scale of displacement is determined by the requirement for land by the main Project components as presented in Table 3-1. Based on these estimates, the scope of both physical and economic displacement is described in the following sub-sections.

Table 3-1: Approximate area of disturbance by main Project components

Project component	Disturbed area (ha)
Pits (four open pits)	550
Tailings Storage Facility (TSF)	695
Waste Rock Disposal (WRD)	800
Processing areas	113
Haul roads*	15
Total	**2 173**

**Based on a 10 m wide haul road*

3.1 Physical Displacement

It is estimated that 10 villages will require relocation and will lose some or all access to agricultural land. Table 3-2 provides information on the villages to be relocated (see also Figure 3-1). Assuming there is one main structure per household a total of 162 private structures and some community structures will be affected.

Table 3-2: Villages potentially requiring resettlement

Village Name	Population	Total Number of Households	Reason for relocation
Gbese	254	23	Near Run Of Mine (ROM) pad
Konta	146	11	Near Matukia haul road and plant (noise and dust)
Ma Sesay	7	2	Near Rotret Pit
Mafuri	178	23	On Mafuri Pit
Magbungbu	100	7	On the edge of TSF
Marunku	519	40	On TSF
Maso	175	13	Near Gafal Pit
Matukia	271	19	On Matukia Pit
Rolal c/o Gafal	26	4	Near Gafal Pit
Rosint	104	20	On Mafuri Pit
Total	**1780**	**162**	

Source: MIOL town population survey 2010 and SRK primary survey 2010

3.2 Economic Displacement

In addition to the above villages, the villages in Table 3-3 below, which are on the outskirts of

the Project footprint, may lose access to land and natural resources. Table 3-2 and Table 3-3 indicate that a total of 432 households will be impacted by land acquisition required by the Project.

Table 3-3: Villages which will lose access to land/ resources

Village	Population	Total Number of Households
Makel	153	18
Mafira	94	15
Magbafat	542	34
Rolal-co-Mafuri	89	9
Monbaia	17	2
Matoko	328	37
Konta Bana	403	34
Manonko	446	31
Molumpo	137	12
Kalangba	133	15
Royema	449	44
Royail	108	12
Konta Loi	37	7
Total	**2936**	**270**

Source: MIOL town population survey 2010 and SRK primary survey

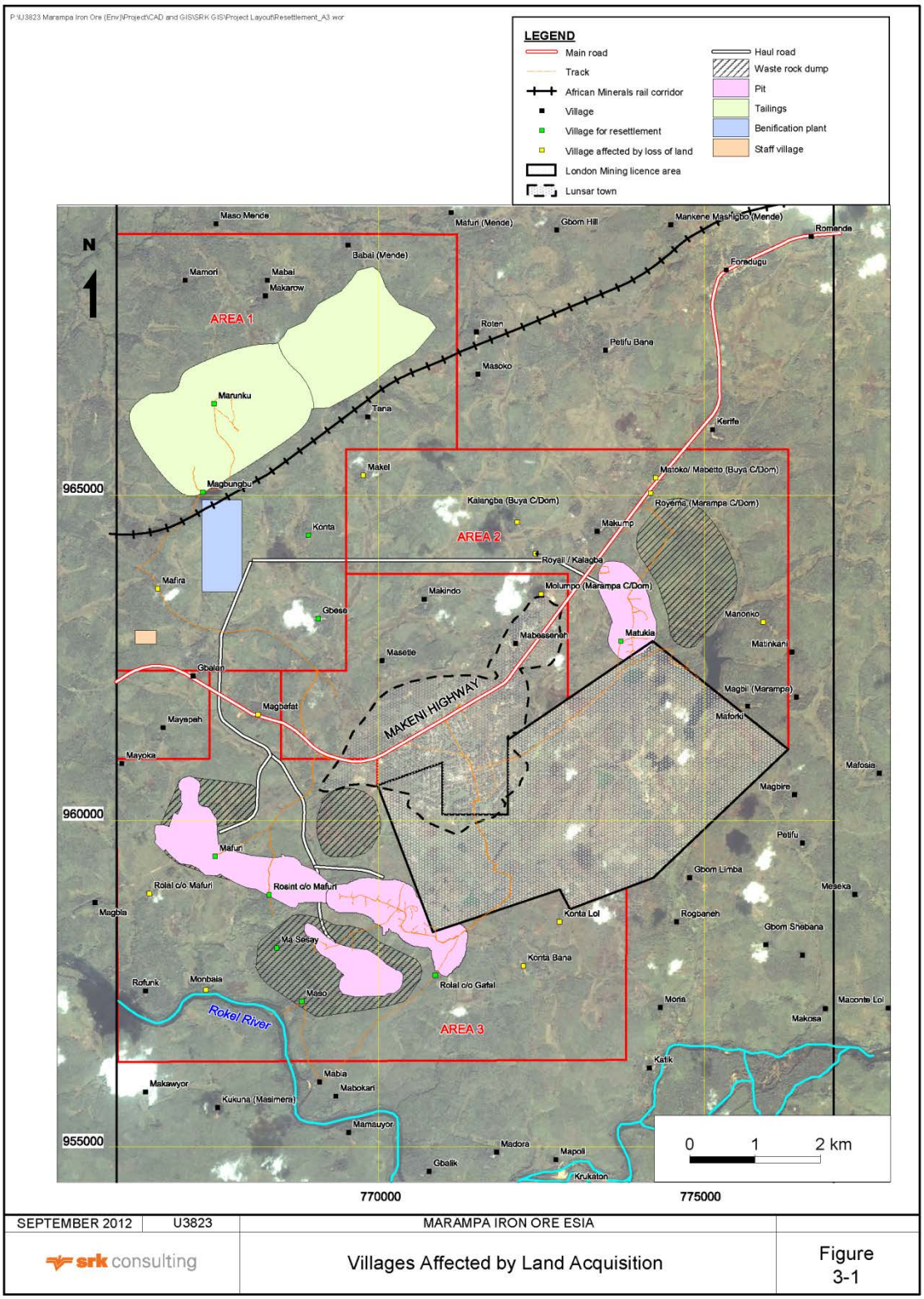

Figure 3-1: Villages affected by land acquisition

4 LEGISLATIVE FRAMEWORK

The Sierra Leone national legislation and IBP for compensation and resettlement are described in this chapter.

4.1 Sierra Leone Legislation

4.1.1 Land Acquisition law

The Provinces Land Act, Chapter 122 of the Law of Sierra Leone (1960) relates to land acquisition. Section 4 of the Provinces Act states a non-native cannot own free hold land. A non-native can lease land in the provinces, but the initial lease cannot be for a period exceeding 50 years; it can however subsequently be renewed for periods of up to 21 years.

A lease is defined in the Act as "*a grant of the possession of land by the tribal authority (now known as the 'Chiefdom Council'), as lessor, to a non-native, as lessee, for a term of years or other fixed period with a reservation of a rent*". The lease agreement is required to state:

- the rent;
- the term of years;
- the purpose for which the land is to be used;
- whether the interest is assignable;
- whether buildings or permanent structures are to be erected and the rights of the parties on the expiration/determination of the lease; and
- that the rent is subject to review every seven years by the District Officer/Chief Administration office (when the lease term exceeds seven years).

The lease must be made between the chiefdom council and the lessee. The lease requires the rent to be split in accordance with the traditional approach of one-third being retained by the Chief Administrative Officer, one-third being paid to the Chiefdom Council and one-third being paid to the traditional landowners of the leased land.

4.1.2 The Mines and Minerals Act

The Sierra Leone Mines and Minerals Act 2009 outlines the legislation in terms of occupation of land, resettlement and compensation. The relevant sections are outlined below:

Section 32

The holder of a mineral right shall not exercise any of his rights under the mineral right, except with the written consent of the owner or lawful occupier or his duly authorised agent, in respect of:

- any land dedicated as a place of burial or which is a place of religious or other cultural significance;
- any land which is the site of, or which is within two hundred metres or such greater distance as may be prescribed, of any inhabited, occupied or temporarily unoccupied house or building;
- any land which is within fifty metres or such greater distance as may be prescribed, of land which has been cleared or ploughed or otherwise bona fide prepared for the growing of, or upon which there are growing agricultural crops;
- any land which is the site of, or within one hundred metres or such greater distance as may be prescribed, of any cattle dip, tank, dam, or other body of water;
- in respect of any land within any township, or within two hundred metres or such

greater distance as may be prescribed, of the boundaries of any township, except with the written consent of the local authority having control over the township.

Section 33

- The owner or lawful occupier of any land which within an area that is the subject of a mineral right shall retain the right to graze stock upon or to cultivate the surface of such land in so far as such grazing or cultivation does not interfere with the proper use of such area for reconnaissance, exploration, or mining operations.
- The rights conferred by a mineral right shall be exercised reasonably so as to affect as little as possible the interests of any owner or lawful occupier of the land on which such rights are exercised consistent with the reasonable and proper conduct of the operations concerned.

Section 34

Subject to the provisions of any law relating to the acquisition of land titles[1] and Section 38, the holder of a *large*-scale mining license shall obtain a land lease or other rights to use the land upon such terms as to the rents to be paid for the license, the duration or the extent or area of the land to which such license shall relate, as may be agreed between such holder and such owner or lawful user of the land or failing that, such agreement as may be determined by the Minister on the advice of the Minerals Advisory Board.

Section 35

1. The holder of a mineral right shall on demand being made by the owner or lawful occupier of any land subject to such rights pay such owner or lawful occupier fair and reasonable compensation for any disturbance of the rights of such owner or occupier and for any damage done to the surface of the land by his operations and shall on demand being made by the owner of any crops, trees, buildings or works damaged during the course of such operations pay compensation for such damage subject to the following:

    a) subject to Section 38, payment of rent under the provisions of Section 34 shall be deemed to be adequate compensation for deprivation of the use of land to which such rent relates;
    b) in assessing compensation payable under this section, account shall be taken of any improvement effected by the holder of the mineral right or by his predecessor in title the benefit of which has or will inure to the owner or lawful occupier;
    c) the basis upon which compensation shall be payable for damage to the surface of any land shall be the extent to which the market value of the land (for which purpose it shall be deemed saleable) upon which the damage has occurred has been reduced by reason of such damage, but without taking into account any enhanced value due to the presence of minerals;
    d) no compensation shall be payable to the occupier of a state grant of land in respect of any operations under a mineral right existing at the date of such grant; and

[1] See below: Provinces Land Act, Chapter 122 of the Laws of Sierra Leone, 1960. Section 4.

e) no demand made in terms of this subsection shall entitle the owner or lawful occupier to prevent or hinder the exercise by the holder of a mineral right of his rights thereunder pending the determination of compensation to be paid:

2. If the holder of a mineral right fails to pay compensation when so demanded under the provisions of this section, or if the owner or lawful occupier of any land is dissatisfied with any compensation offered, such compensation may be determined by the Minister on the advice of the Mineral Advisory Board.

3. A claim for compensation under the provisions of subsection (1) shall be made within a period of two years from the date when the compensation became due failing which, notwithstanding the provisions of any other enactment, such claim shall not be enforceable.

Section 36

1. The Government may, by order published in the Gazette, compulsorily acquire in the name of the Republic, private land or rights over private land for use by the holder of a large scale mining licence.

2. Before making an order under subsection (1) the Government shall be satisfied that:

   a) the holder of a large-scale mining licence has taken all reasonable steps to acquire on reasonable terms by agreement with the owner, the land which he wishes to use or the right which he wishes to exercise and has been unable to do so; and

   b) the acquisition of such land or right is necessary for mining purposes or for purposes ancillary to mining.

Section 37

1. Subject to Section 38, when land is acquired compulsorily pursuant to Section 36, those persons having an interest in or rights over the land concerned shall be paid adequate compensation by the holder of the mineral right determined on the same basis as compensation for disturbance of rights pursuant to Section 35.

2. The holder of a large-scale mining licence shall, before entering into possession for enjoyment of any land or before exercising any right over the land, make payment of compensation as determined in accordance with subsection (1) to the person or persons concerned or if the whereabouts of the person or persons concerned or any of them are unknown, give such undertakings concerning the payment of compensation as the Government may require.

Section 38

1. The Minister shall ensure that all owners or lawful occupiers of land who prefer to be compensated by way of resettlement as a result of being displaced by a proposed mining operation are resettled on suitable alternate land, with due regard to their economic well-being and social and cultural value so that their circumstances are similar to or improved when compared to their circumstances before resettlement, and the resettlement is carried out in accordance with the relevant planning laws.

2. The cost of resettlement shall be borne by the holder of the mineral right:

a) as agreed by the holder and the owner or lawful occupier of land or by separate agreement with the Minister, or

b) in accordance with a determination by the Minister, except that where the holder elects to delay or abandon the proposed mining operation which will necessitate resettlement, the obligation to bear the cost of resettlement shall only arise upon the holder actually proceeding with the mining operation.

3. Subject to this section, the Minister and a person authorised by the Minister may take the necessary action to give effect to a resettlement agreement or determination.

4.1.3 ENVIRONMENTAL AND SOCIAL REGULATIONS FOR THE MINERALS SECTOR

In 2011 the Sierra Leone government released draft regulations on environmental impact assessments. Article 34 relates specifically to projects which involve resettlement. This article states:

- A new inter-ministerial committee entitled the "Resettlement Committee" dealing with resettlement related issues shall be established in accordance with the provisions contained in any law relating to the resettlement of local communities and to further implement the objectives of Section 38 of the Mines and Minerals Act 2009;
- Where a Category A project application involves the potential for resettlement, the Executive Chairman or its Authorised Officer shall refer the Social Impact Assessment (SIA) and the Social Management Principles (SMP) to the Resettlement Committee for its consideration;
- The Resettlement Committee shall review the SIA, the SMP and the Resettlement Management Plan (RMP, internationally known as the RAP) in accordance with the criteria set out in any law relating to the resettlement of local communities and make recommendations in accordance with the procedures described therein; and
- For a Category A project involving potential resettlement the board shall consider the SIA in the light of comments and recommendations provided by the Resettlement Committee.

4.2 International Best Practice

World Bank Operational Policy (OP) 4.12[2] (World Bank, 2004) is regarded internationally as the standard for resettlement guidance. The objective of resettlement planning is to avoid resettlement whenever feasible and to explore all viable alternatives, and when resettlement is unavoidable, to minimise its extent.

IFC PS5 Land Acquisition and Involuntary Resettlement (IFC, 2012) was developed by the IFC (as part of the World Bank group) from OP 4.12 and provides internationally accepted policies and guidelines for resettlement. PS5 is deemed relevant as the Project development will involve land acquisition and relocation of communities. PS5 applies to both physical and economic displacement which results from the following land transactions:

- land rights or land use rights acquired through expropriation or other compulsory procedures in accordance with the legal system of the host country;
- land rights or land use rights acquired through negotiated settlements with property owners or those with legal rights to the land if failure to reach settlement would have resulted in expropriation or other compulsory procedures;

[2] (www.worldbank.org) and in the World Bank's Resettlement and Rehabilitation Guidebook.

- project situations where involuntary restrictions on land use and access to natural resources cause a community to lose access to resource usage;
- certain situations requiring evictions of people occupying land without rights; or
- restriction on access to land or use of other resources.

The main objectives of PS5 in relation to resettlement and land acquisition include the following:

- Avoid, or when not possible to avoid minimise displacement by exploring alternative project designs.
- Avoid forced eviction.
- Minimise adverse social and economic impacts by:

    a) providing compensation for loss of assets at replacement cost; and ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected;
    b) improving or at least restoring the livelihoods and standards of living of displaced persons; and
    c) improving living conditions among displaced persons through provision of adequate housing with security of tenure at resettlement sites.

- Prepare a RAP and have it accepted by the relevant authorities prior to implementing resettlement activities. The RF is a stepping stone towards the RAP which can be developed once the Project land acquisition impacts are more clearly defined.
- Ensure provision of compensation and the restoration of livelihoods of those affected prior to any actual resettlement. In particular, the policy requires that possession of land for Project activities may take place only after compensation has been paid, or alternatively, if adequate guarantees of compensation have been made to the PAP's satisfaction. If the latter is chosen, compensation payments must not be delayed once resettlement has taken place. Resettlement sites, new homes and related infrastructure, public services and moving allowances must be provided to the affected persons in accordance with the provisions of the RAP.
- Pay attention to the needs of vulnerable groups, generally defined as:

    a) those below the poverty line;
    b) the landless;
    c) the elderly;
    d) women and children;
    e) indigenous groups;
    f) ethnic minorities;
    g) orphans;
    h) disabled people, and
    i) other disadvantaged persons.

4.3 Comparison of Sierra Leone Legislation and International Standards

This RF is based on both Sierra Leone national laws on mining projects, and resettlement and international best practice guidelines set by the World Bank and IFC. A comparison between the Sierra Leone laws and the international guidelines is presented in Table 4-1 below. In many areas the national laws and international guidelines are similar. In cases where one set of guidelines is more stringent than the other, such as in the cases of resettlement assistance, monitoring, consultation with directly affected parties, payment of compensation for land and

special provision for vulnerable groups, the more stringent should be followed. In addition to the above, IFC standards make provision for a cut-off date for claiming eligibility for compensation.

Table 4-1: Comparison of Sierra Leone national legislations and international standards

Area	Sierra Leone legislation	IFC PS 5	Preferred approach
Calculation of compensation	Negotiated	Replacement costs or more	Replacement costs or more
Compensation	Compensation can be in any form	Strongly recommends in-kind compensation, (replacement housing and replacement land especially for those with land based livelihoods)	Recommend in-kind compensation, but is negotiable
Consultation with PAP and host	Provides for participation of local authorities insofar as negotiation for compensation arises	All affected parties should be involved in planning and implementing resettlement programmes. Displaced persons and host areas are provided timely and relevant info	All affected parties and stakeholders need to be consulted
Cut-off date	No moratorium provided by the Government	If no moratorium is provided by the Government, the Project should establish and disseminate a cut-off date. No compensation is provided for those affected after the cut-off date	A cut-off date needs to be established and disseminated. No compensation for PAPs after cut-off date
Eligibility for compensation criteria	Those who have legal rights to the land and those who do not have formal legal rights but have claim to such land or assets provided that such claims are recognised under the law	All those who are physically and/or economically-displaced, including those without legal status to occupy land	All those who are physically and/or economically-displaced, including those without legal status to occupy land
Monitoring	No specific legislation	The Project is responsible for monitoring of the resettlement activities	The Project is responsible for monitoring of the resettlement activities
Payment of compensation for land	Land lease is paid to local authorities / not directly to the landowners	Payment should involve directly affected parties	Paid to local authorities but with mechanism to safeguard compensation of directly affected
Resettlement	Optional depending on choice of affected	Recommended if affected parties' livelihoods are land based	Recommended if affected parties' livelihoods are land based
Resettlement assistance	No specific legislation	Compulsory	Compulsory
Resettlement decision	Negotiated between Project and affected parties. If negotiation is not successful forced removal is possible	Negotiated between Project and affected parties	Negotiated between Project and affected parties
Vulnerable groups	No specific provisions for vulnerable groups	Require special attention and monitoring of vulnerable groups.	Special attention for vulnerable groups required

5 SOCIO-ECONOMIC PROFILE OF AFFECTED AREAS

A short description of the socio-economic baseline of the Project area is presented to contextualise the resettlement process. A detailed description of the social baseline conditions of the Project area can be found in the Social Baseline report (SRK, 2012).

The Project is located in the northwest of Sierra Leone within the Port Loko District which covers an area of 5,719km^2, has a population of approximately 478,000 and has ten chiefdoms. The Project is located across three chiefdoms – Marampa, Masimera and Maforki. The Project is situated in a rural area but close to the town of Lunsar, which is the largest town in the area and is an important administrative, social and commercial centre for the local people.

5.1 Demography

In the Project area people are settled in villages differing greatly in size from as small as 2 to 259 households. The average household per village is 38 and the average village population is 344. There is a slight gender imbalance in the local population with 49.2% being male and 50.8% female. The household survey indicated that, 42% of the population is below the age of 15; 54% between 15 and 64, and 4% over 64. The main ethnic groups in area are the Temne, followed by the Fula and the Susu, The population is largely Muslim.

5.2 Livelihood Strategies

The most important livelihood strategy in the Project area is subsistence farming, It is practiced by 82% of households (SRK Household survey, 2011). The sale of surplus crops is the most readily accessible income for most villagers. Some of the other important economic activities in the district are small scale fishing, small businesses, small scale diamond mining, charcoal production making and animal husbandry.

Access to natural resources is also important to villagers who are reliant on the land for access to construction materials, firewood, wild foods and plants.

5.3 Access to Land

Access to land for farming and collection of natural resources is important for the livelihoods of the local population. In Sierra Leone, there are two main systems of land holding: freehold rights in the Western Area and a customary system in the provinces where land is principally owned and controlled by families or traditional leaders.

In the Project area villages the customary land tenure rules, which were established in 1965 under Section 76 (1) of the Courts Act, apply. However, the validity of customary law is dependent on its compatibility with statutory law. The following statutes are relevant to customary landholding practices in Sierra Leone:

- The Provinces Lands Act (Cap 122).
- The Chiefdom Councils Act – (Cap 61).
- The Local Government Act – 1994.

According to customary law, families, chiefdoms and communities hold the ownership of property and therefore a plot of land can never be owned freehold. Land always belongs to the communities or families/clans and is used by individuals under different forms of tenure laid out by customary law. This principle is established by the Chiefdom Councils Act as well

as by Section 28 (d) of the Local Government Act 1994 (Ajei, 2008)[3]. The Paramount Chief is the custodian of the land on behalf of the entire chiefdom and ultimately grants access to land to households besides mediating any land disputes.

In the context of resettlement, a national policy states that, as much as possible, land disposal or acquisition of any kind should not render a land title holder (including customary land ownership), his kith and kin and descendants completely landless, nor tenants on the land to which they originally had legitimate title, save in the case of compulsory acquisition in the public interest.

5.4 Standard of Living

The standard of living in the Project area is poor with only 8% of families, included in the SRK household survey conducted in terms of the ESIA baseline, receiving a stable and regular income. 80% of houses in the Project area consist of clay and earth. Houses typically have two or three internal rooms and an outdoor cooking area. Approximately 15% of households do not have bathrooms. 71% of households use paraffin lamps for lighting and 94% of households use wood for cooking. Water quality in the study area was observed to be poor and wells often dry out, causing villagers to have to walk long distances to collect water. The SRK household survey also revealed that 81% of households deposit waste in areas close to their homesteads.

5.5 Health

Health conditions are poor in the area and life expectancy in the district is 49 years. Prevalent diseases in the area include malaria, diarrhoea, pneumonia/ respiratory infections and malnutrition. Incidences of Sexually transmitted diseases and HIV/AIDS are on the increase. The district has nine community health centres, four hospitals, 23 community health posts and 58 maternal child health posts. In addition to the health centres, there are six peripheral health units (“PHU’s”) in Marampa Chiefdom, which provide primary health care. However the units are understaffed and running costs are high. Education

In line with poverty and poor health conditions, education and literacy levels are also poor in the area with 47% of people being illiterate (SRK Household survey 2011). Local people understand the importance of education; however education is a risky investment for families as it is expensive and there is no guarantee families will see a return on their investment. Very few people in the area complete secondary school.

6 RESETTLEMENT PLANNING ACTIONS

To develop a RAP the following actions will be undertaken;

- identification and implementation of measures to minimise resettlement;
- identification of affected people;
- assessment of eligibility for compensation;
- execution of a census and assets register;
- development of an entitlement framework, outlining compensation criteria and rates;
- identification of host areas for resettlement;
- development of procedures for resettlement and compensation;

[3] Ajei, M.O (2008). Government of Sierra Leone/World Bank Mining Sector Technical Assistance Project Resettlement Policy Framework Final Draft. Nimba Research & Consulting Co. Ltd.

- identification of procedures for monitoring and evaluating the resettlement process; and
- identification of institutional arrangements for the execution of the resettlement and compensation process.

6.1 Minimising Resettlement

IFC PS 5 on resettlement and land acquisition requires that any resettlement of households only occurs if all possible measures have been exhausted to avoid resettlement. Where resettlement cannot be avoided it must be minimised as far as practicably possible. The location of open pits is determined by the ore body. The relocation of the villages that are located directly on the proposed open pits or in close proximity to them therefore cannot be avoided. However the location of other infrastructure such as the TSF, the WRD and the plant has, together with other technical factors, been determined so as to minimise any direct impacts on existing villages. The alignment of the haul road also takes into consideration the location of existing villages. Further exploitation of measures to minimise resettlement will be undertaken during the RAP process.

6.1.1 Project Affected People

Project affected people (PAP) can be divided into two categories:

- **Affected households:** households are affected if one or more of the household members are impacted by physical or economic displacement including loss of assets, land and property, and/or access to natural/economic/social resources.
- **Host area households:** host area households refer to those households in the area(s) where displaced peoples will be resettled. These area(s) will be selected prior to any resettlement based on thorough investigation of suitable options. Households in the selected host area(s) may be impacted by increased population pressure on social and/or natural resources due to.

6.1.2 Types of Loss

It is anticipated that PAPs are expected to experience a loss or disruption of access to the assets and resources outlined in Table 6-1. A detailed description of the number and type of affected people in terms of the various eligibility criteria will need to be provided in the RAP.

Table 6-1: Types of assets and resources impacted

Category of loss	Description
Homesteads	It is estimated 10 villages (comprising 162 households, 1,780 people) within will need to be entirely resettled.
Agricultural Land	It is estimated the 10 villages to be resettled will also lose their agricultural land. In addition a further 13 villages (270 households (or 2,936 people)) may experience partial loss of access to land which is currently being used for agricultural purposes.
Sacred sites	Sacred sites including places/ features such as forests and bushes which are important for customary rituals and culture, graves and cemeteries may also be lost (or access to them may be disrupted).
Natural resources	Areas used by local inhabitants for harvesting of natural resources including hunting, collecting of firewood or wild plants will be lost. Approximately 432 households will lose access to land based resources.

Small enterprises	Small businesses such as shops and kiosks which are operating in directly or indirectly affected villages may experience loss of customer base or suppliers.
Social infrastructure	Communal infrastructures in the 10 directly affected villages including schools, health centres, religious and community buildings will be lost. This may also affect neighbouring villages that are not relocated but share the use of those resources.
Access routes	Access routes to natural resources, markets and other villages may be impacted.

6.2 Eligibility: Cut-Off Date

Eligibility for compensation is defined in terms of PAPs affected by the categories of loss described above and whether they were present before an eligibility cut-off date. A cut-off date signifies a date after which any building work or improvements on affected land will not be compensated for. This includes new households moving into the area or current households improving their houses. This cut-off date needs to be made public to all those affected through a public consultation process and be well advertised throughout the Project area. Sierra Leone national law does not make provision for the declaration of a cut-off date (or moratorium); however it is required by IFC PS5.

MIOL will be responsible for identifying and effectively publicising the cut-off date. An agreement will need to be reached with the local authorities and the affected communities on the procedures to be used in the event of claims being submitted after the cut-off date, as well as in the event of counter-claims and disputes.

6.3 Census and Assets Inventory

To develop the RAP a thorough understanding of the existing socio-economic context of the affected households and an inventory of their assets are required. The process for achieving this is set out in the following sections.

6.3.1 Census

A census will be undertaken of all households which will lose access to land for agriculture and/or be physically displaced to fully understand their current baseline conditions. The census should include:

- demographics of each household;
- illness amongst household members in the past year;
- deaths and births within the household in the past year;
- usage of communal social infrastructure;
- access to land and access to resources on communal land;
- livestock ownership;
- household economic activities;
- household income and sources;
- details of loans / savings;
- expenditure;
- food availability, and
- ownership of a predetermined collection of material possessions to be used as indicators in ascertaining the socio-economic status of the households.

6.3.2 Assets Inventory

Inventories will need to be made of affected household and of communal assets. Aspects for inclusion are outlined below.

Individual Household Assets

The assets inventory will record both permanent and temporary losses of physical infrastructure and natural resources including:

- homesteads and homestead structures including the number of buildings their size and the condition (photographic evidence should also be taken);
- family business-related structures;
- graves associated with the household;
- agricultural fields owned/rented/ leased, or given for use;
- crops; and
- economically beneficial trees, within the homestead and plantations.

The census and assets inventory provides a register of the legitimate beneficiaries within the Project area prior to the cut-off date and also provides a baseline for monitoring.

Communal Infrastructure

An inventory of communal infrastructure in the affected area will also be required. This should include:

- schools;
- health centres;
- community toilets;
- market areas;
- churches/ religious buildings;
- grain banks;
- food drying areas;
- sites of cultural or historical importance.
- administrative buildings; and
- recreational buildings or sports facilities.

6.3.3 Census and Inventory Asset Methodology

The following steps will be undertaken in the execution of the census, household assets survey and community infrastructure audit:

- recruitment and training of local fieldworkers;
- design and piloting of the census and asset survey;
- meeting with PAPs to explain the purpose and method of the surveys;
- provision of an ID number to all households/individuals involved in the census. The household head will be photographed with the ID number in front of his homestead /affected structures/area;
- photographing of all structures, with GPS coordinates of the main building;
- interviewing the PAPs. Ensure the household head is present during the interview and that he/she countersigns the inventory sheets as proof that he/she agrees to the assets that have been recorded (Note: the signature of the household head does not signify acceptance of a compensation package only recognition that the data were correct when collected);ensure a community representative, also signs the inventory sheets as a witness to the recording exercise, and

- entry of data from the census and assets register and photographs in an electronic database for record keeping and analysis.

6.4 Entitlement Framework

6.4.1 Valuation

Valuation will be based on both international best practice guidance and Sierra Leone national law. Valuation rates and the process should be ratified by a Resettlement Working Group (RWG) (see Section 7.1 below), relevant authorities and the affected stakeholders. The valuation process should take cognisance of the compensation rates used by the London Mining Project due to its close proximity.

6.4.2 Compensation for Loss of Homesteads and Fixed Structures

There are two options to compensate PAPs for loss of homesteads and fixed structures. These are:

Option 1: Compensation for all homestead structures is provided in cash, that covers replacement costs of materials, cost for transportation away from current homestead to the new home and cost for labour to construct the new homestead.

Option 2: Compensation is provided by replacement (to the same or better standard) of the primary structures of the homestead in an identified host area. It is recommended that a local contractor is hired to build the houses and that local labour is employed, whilst MIOL ensures quality control. In this option cash compensation will be given for secondary structures that will not be replaced. Any of the structures which can be deconstructed and removed are allowed to be taken to the new homestead. MIOL will undertake the transportation of removable items to the new home.

Option 2 is the recommended option. In accordance with IFC PS 5 cash compensation for structures is discouraged to avoid the risk cash is not spent on housing (which would leave households without shelter). Compensation should be provided for loss of materials in the case of incomplete structures but no compensation will be offered for abandoned structures.

6.4.3 Compensation for loss of Land

The Project will require the lease of land, which will be guided by Sierra Leone's Provinces Land Act, Chapter 122 of the Laws of Sierra Leone, 1960 (section 4.1.1). A land lease contract will be required for the affected land in the Marampa, Maforki and Masimera Districts. Lease rent will be paid. Government guidelines are US$3.60 per acre, with one third paid to the Chiefdom council, one third to the District Council and one third to the respective traditional landowners. It is the task of the District Council to pay out the fees to the respective parties.

The process of paying out compensation for loss of land can be complex because:

- land is not individually owned rather it belongs to family clans/ villages;
- land has generally not been surveyed and no records of ownership exist and disputes over land are common;
- people using the land are either a member of a landowning family or rent land from the land owning family, therefore tenants will be a vulnerable group as they will not receive lease rent, and
- land lease infers that land will be returned on completion or termination of the lease agreement. In some instances land will not be returned and this should be taken into

account.

Affected households will be provided assistance to access alternative land. Livelihood restoration programmes to enhance agricultural productivity will also be included in the RAP.

6.4.4 Compensation for Crops and Trees

Standing crops will be compensated for. The main crops are rice, cassava, groundnuts, maize and sweet potatoes. Only exotic trees belonging to households or communities which have been specifically planted and are used for food or other economic benefits will qualify for compensation. The most common trees used for food and as a source of income are palm trees, mangoes, bananas, oranges and pineapple.

The quantity of affected crops needs to be measured and number of trees counted by a team including the affected person, a company representative, a representative of the Ministry of Agriculture and a representative of the local chiefdom. The numbers of trees and areas of crops will be included in the assets inventory.

According to IFC PS 5, crops and trees need to be compensated in line with the market rates. The Government of Sierra Leone provides compensation rates, but these were determined in 2006 and are regarded as out-dated (see Table 6-2). It is therefore recommended the compensation rates are guided by the recent rates identified for the Addax Biofuel Project in Sierra Leone (See Table 6-2) and those use by London Mining and AML (if these can be obtained from the relevant companies).

Table 6-2: Proposed Compensation Rates

Item	Government Value 2006-2007 (SL Leones)	Value 2010 (Addax Project) (SL Leones)
Banana tree	20,000	26,620
Bread fruit tree	40,000	53,240
Cabbage ½acre	35,000	46,585
Cashew tree	50,000	148,000
Cassava ½ acre	150,000	350,000
Cassava ½ acre immature	50,000	175,000
Cassava not dense - grown in heaps ½ acre mature		200,000
Cassava not dense - grown in heaps ½ acre immature		100,000
Citrus tree	50,000	72,500
Cocoa tree	45,000	73,500
Coconut tree	40,000	73,500
Coffee 1 acre	35,000	46,585
Cucumber ½ acre	30,000	39,930
Economic tree (Timber individually owned)	20,000	54,400
Groundnut ½ acre	150,000	199,650
Guava ½ acre	15,000	19,965
Hot pepper ½ acre	30,000	39,930
Kola nut tree	40,000	76,400
Krain krain ½ acre	50,000	66,550
Lettuce ½ acre	35,000	46,585
Maize ½ acre	100,000	133,100
Mango tree improved	50,000	66,550
Millet ½ acre	100,000	133,100

Item	Government Value 2006-2007 (SL Leones)	Value 2010 (Addax Project) (SL Leones)
Oil palm tree	25,000	33,275
Oil palm tree improved	40,000	57,000
Okra ½ acre	40,000	53,240
Paw paw tree	10,000	13,310
Pear / avocado tree	60,000	79,860
Pineapple plant	1,000	1,331
Plantain tree	20,000	26,620
Plum tree	50,000	66,550
Pumpkin ½ acre	30,000	39,930
Rice (inland valley swamp) ½ acre	200,000	266,200
Rice (upland) ½ acre	200,000	266,200
Sweet pepper ½ acre	36,000	47,916
Tomatoes ½ acre	35,000	46,585
Water melon ½ acre	40,000	53,240

Note: *At the time of the writing of the report US$1 = 4,368 SLL*

The crop/tree owner will be paid the agreed rate multiplied by the acres of crops/number of plants/trees lost. This compensation fee is a one off payment. However the loss of fruits over a period of time, until new seedlings are of fruit bearing age needs to be taken into account for the calculation of the compensation fees. If the farmer does not own the land, the crop compensation will still be paid to the farmer while any land compensation is paid to the owner of the land. In line with IFC PS5 the Company will provide replacement seedlings to replace the trees lost. According to IFC PS5 replacement seedlings will only be provided for fruit/nut trees and not for timber trees.

6.4.5 Compensation for Disturbance of Graves and Sites of Cultural, Historical or Religious Importance

There are three options for compensation for disturbance of graves:

- homesteads may choose to re-bury remains of the deceased on or near their resettlement plot,
- communal re-burial may be arranged with local entities (municipality, and traditional leaders, as well as religious leaders). In such cases an appropriate piece of land is to be identified in consultation with the local authorities, and
- homesteads may choose not to relocate graves, but may instead hold a ceremony in accordance with local customs.

In the first two options appropriate timing and arrangements for the relocation and re-burial of the deceased will be agreed upon with all stakeholders. The Company will meet associated costs, which may include:

- exhumation including permit (if required), transport and re-burial (re-interment) of the deceased;
- provision of a coffin from an approved supplier;
- provision of a flat rate per grave to satisfy any customary cost;
- all works associated with the burial; and
- all reasonable costs associated with a ceremony if not relocating the grave.

Affected households/religious leaders are responsible for organising the appropriate ceremonies in accordance with their religious beliefs and/or customs.

In terms of communal sacred sites or cultural heritage, a process for appeasement of disturbance of the site and potentially the establishment of a new site will be negotiated with affected communities. MIOL will cover the cost of obtaining the new site and the appropriate ceremonies. Local communities and religious leaders will be responsible for organising the ceremonies.

6.4.6 Compensation for Loss of Natural Resources

The extent and nature of loss of access to different types of natural resources will be assessed in the RAP census and compensation strategies for each type of loss negotiated with local communities and in the RWG. These may include:

- development of wood lots in case of loss of timber and firewood;
- development of nurseries for lost plants (especially wild herbs);
- development of alternative livelihoods for those relying on natural resource production; and
- identification and arrangement of alternative grazing areas.

6.4.7 Compensation for Affected Businesses

Loss of local businesses will be compensated. For the valuation of the loss of an enterprise its function, intensity of use (average monthly income), location, importance and market catchment areas will be determined. Valuation will be based on the cost of re-establishing the commercial activity at a new location. This may include costs for:

- acquisition of new land;
- material and construction costs of replacement structures;
- compensation for lost stock;
- compensation of lost income during period of closure during resettlement; and
- compensation for loss of staff wages.

6.4.8 Compensation for Loss of Communal Social Infrastructure

The most important requirement of the IFC PS 5 is to ensur resettled households are not worse off after the resettlement process. This may require the upgrading of existing social infrastructure or building of new infrastructure in the host areas. Infrastructure should be equal to or better than that being replaced. Community structures or resources to be upgraded or developed may include:

- health centres (including the clinic at Marunku);
- community halls;
- markets;
- schools;
- religious buildings;
- village grain banks and drying floors or structures, and
- wells/boreholes.

The valuation of community infrastructure and resources will require consultation with community leaders, committees or individuals that have responsibility for community structures of both the resettled community and the host community. The valuation will be based on replacement costs of materials, buildings costs and the acquisition of additional land. Not all community structures will need to be replaced - religious buildings are often not rebuilt by companies, however compensation will be provided.

6.5 Identification and Evaluation of Resettlement Sites/host areas

Resettlement will require the identification of a single large area or multiple smaller areas for residential purposes (for those physically displaced) and identification of multiple areas of agricultural land for those economically displaced. Ideally for each affected household several options will be explored. In order to assess the feasibility of different options the following is required:

- assessment of land ownership and tenure rights;
- assessment of the need for improvement of infrastructure to accommodate additional inhabitants;
- assessment of the impact of resettlement on small businesses in resettled communities and host community;
- assessment of available agricultural land in the vicinity of the resettled communities;.
- assessment of access to natural resources ;
- assessment of access to livelihood strategies, and
- assessment of disturbance of community and family support networks.

The assessment should be conducted:

- in consultation with the affected villages, and
- in consultation with the RWG in terms of legal aspects, perceived advantages and disadvantages of the various options.

The process will involve:

- pre-selection of candidate sites;
- visits to pre-selected resettlement sites with affected community members;
- selection of preferred sites in collaboration with relevant authorities;
- conducting an Environmental and Social Impact Assessment (ESIA) to assess the impacts on the selected sites, and
- validation of the choice in general community meetings;

Once the feasibility of the host areas has been established a detailed plan for the host areas will be developed indicating any existing dwellings and infrastructure as well as the areas allocated to new dwellings, additional infrastructure, agricultural land and the existing transport network.

6.6 Support provision

IFC PS 5 states that additional support may be required for PAPs during the resettlement period. Depending on the timing of the resettlement, it is possible that households will not be able to farm during a particular period. Others may need time to develop new livelihood strategies. These households will require support and support packages will be developed together with the affected households. It is recommended that this is done in cooperation with competent organisations and in consultation with the RWG.

6.7 Income Restoration and Sustainable Development Initiatives

Besides the loss of assets, resettlement may lead to permanent disruptions of income-earning or subsistence capacity. IFC PS 5 resettlement guidelines require that if Project-related impacts are significant (with a 10% or greater loss), livelihood restoration needs to be included in the RAP.

To restore livelihoods for the affected people, there may be a need to assist with the

preparation of new land and the provision of agricultural support and extension programme. This may include:

- provision of training on improved agricultural techniques, and
- support for the purchase of agricultural equipment, fertilisers and improved seeds.

Skills replacement training will be provided for households in which the continuation of an agricultural lifestyle is not possible or desired. The primary objective of the skills replacement training will be to teach skills that could be of value in the local economy and could replace agriculture in terms of income generated. Potential skills to be taught include building; carpentry; plumbing; welding, Partnerships can be established with NGOs and other relevant agencies to run the skills training.

6.8 Vulnerable Individuals and Households

Vulnerable individuals, households and groups need to be identified and receive specific attention throughout the RAP in line with international best practice. Vulnerable groups are those who are likely to be more affected by resettlement than the rest of the population as they are less likely to have the capacity to deal with negative impacts, and to benefit from enhancement measures. The groups listed below are generally defined as vulnerable; however the Project should seek to identify specific vulnerable groups in their area:

- the extremely poor (those below the general level of poverty which exists in the area);
- female or child headed households;
- households without access to land;
- elderly, specifically households where no members are below the age of 60;
- disabled or sickly people or those who cannot work land;
- internally displaced and orphaned children, and
- groups suffering social or economic discrimination such as indigenous groups.

It is often observed that vulnerable people do not participate in community life to the same extent as the general population and therefore may be invisible to the Project. Efforts need to be made to identify the vulnerable people. Vulnerable groups should be given specific assistance at all stages of the Project but in particular during the resettlement process. These groups should also be monitored and offered further assistance once they have been compensated/ resettled. Specific assistance for vulnerable groups may take one or several of the following forms:

- provision for separate and confidential consultation;
- priority in site selection in the host area;
- relocation near to kin and former neighbours;
- assistance with gathering materials from their home which can be moved to the new site;
- assistance with moving to the new site;
- assistance with building structures and collection of materials;
- assistance with compensation payment procedure;
- priority access to mitigation and development assistance during the post-resettlement period, particularly if the support networks that the vulnerable person was relying on have been affected, and
- access to health care if required during the resettlement and transition periods.

6.9 Community Development Initiatives

To comply with international best practice, Projects which involve involuntary resettlement - either physical or economic - should seek to implement community development initiatives. The aims of community development initiatives are to:

- stimulate long-term community, economic and social development programmes; and
- assist in building relationships between the company and other community development programmes running in the Project area of influence.

Community Development Plans (CDP) should be developed using the data collected during the census and as part of the social impact assessment process. Community development benefits will apply to everyone living within the Project area of influence; however people directly impacted by physical and or economic displacement and host communities should receive priority in terms of development initiatives.

6.10 Resettlement Process

When relocated families take occupation of the new homestead the following points are recommended best practice:

- a reasonable and agreed time period should be allowed prior to relocating people so they have time to salvage building materials from their old homestead;
- transport should be provided for each homestead to move themselves and their belongings to the new home including livestock, food and personal furniture,
- households need to sign a document to forego all rights to the old homestead once they have collected all of their belongings. The old residence should be demolished as soon as possible to remove the risk of squatters; and
- a company representative should visit households a month after they have moved in to assess the new structure and note potential defects and arrange for repairs, the company should provide a 5 year structural warrantee for the dwelling to cover design, workmanship and material defects.

7 STAKEHOLDER ENGAGEMENT

Engagement with stakeholders facing involuntary resettlement is one of the main requirements of IFC PS5. PAPs should have ample opportunity to participate in the planning and execution of the resettlement programme which affect them.

Engagement should include a two way exchange of information allowing the Project staff to provide the PAPs with timely information but also for the Project staff to listen to stakeholders' concerns and opinions on the resettlement plan. The stakeholder engagement approach should build upon the existing Stakeholder Engagement Plan (SEP) prepared by SRK for the ESIA process.

7.1 The Resettlement Working Group (RWG)

The Project will assist in the development of a RWG to take charge of the resettlement preparation and execution. The RWG should consist of:

- a representative of MIOL;
- representatives from relevant provincial government departments;
- representatives from the traditional and community leadership;
- representatives of directly affected land owners;
- representatives of directly affected tenants;
- a representative of local women's organisations;

- a representative of local youth organisations;
- relevant local NGOs;
- a representative of the District Council, and
- a representative of the chiefdom council;

The main objectives of the RWG are:

- to identify and approve the host area(s) where people will be resettled to;
- to act as the primary channel of communication between the various stakeholders involved in the resettlement process particularly between PAPs and the Project;
- to act as a forum at which MIOL can consult on various resettlement aspects, i.e. debate the Entitlement Framework (EF) that is generated for the RAP, and
- to deal with grievances that arise during the resettlement process.

7.2 Community Resettlement Committees

Community Resettlement Committees (CRCs) will also need to be established in each (cluster or single) village(s). The CRC should be made up of:

- the village chief(s);
- a representative of the tenants of the village;
- a representative of the landowners of the village;
- a representative of the youth organisation of the village, and
- a representative of women's organisations of the village.

The CRCs should meet on a regular basis to ensure the timely and effective flow of communication between the Project and the communities. The CRCs should also assist with the implementation of the census and assets survey and be involved in the negotiation of identifying host areas.

7.3 Public Consultation

In addition to the RWG and the CRCs regular meetings, public meetings should take place with the PAPs in the local areas. An initial meeting will need to take place before the RAP is developed to ensure people are aware of the resettlement process. In this initial meeting PAPs should be informed about the census and assets inventory which all households will need to complete.

A second round of public meetings should occur after the RAP has been developed. This second round of meetings is to disclose the RAP to the PAPs. Appropriate documentation should be provided to PAPs and they should be allowed time to read the information and be given opportunity to express their concerns and opinions.

7.4 Grievance Mechanism

IFC guidelines require a grievance mechanism, which should be an effective, accessible method for individuals or groups of PAPs to raise grievances with the Project through an official channel. PAPs should be able to raise grievances during community meetings, through the Company community liaison officer or the RWG or CRC. The grievance mechanism should follow the steps outlined below:

Step 1: Receipt of Grievance

Grievances received through any of the channels outlined above should be passed to the community liaison officer who should enter the complaints into a complaints register. There

should be a register in each of the community liaison offices around the Project area (if more than one) and grievances should be entered in English and Krio. Once the grievance has been submitted a receipt should be supplied to the complainant.

Step 2: Assessment of the Grievance

The community liaison officer should initially attempt to resolve the grievance locally. If not able to resolve the grievance it should be communicated to the Project's social manager.

Step 3: Acknowledgement of Complaint/Grievance

The decision on how the issue will be resolved should be communicated to the complainant both verbally and in writing. It should also be explained what the expected time frame for resolving the grievance will be.

Step 4: Investigation and Resolution of Grievance

The Project should undertake an internal investigation to determine the underlying cause of any grievance and if required make changes to internal systems to prevent the grievance reoccurring. In order to fully investigate and resolve the grievance it may be necessary for the Project to hold a meeting with the complainant. This should be done in consultation with the RWG.

Once the investigation has been completed and necessary measures been taken, the results will be communicated to the complainant and entered in the register. The complainant will be asked to sign that he/she accepts as the 'solution'.

The action to correct the grievance should be verified by the community liaison officer as appropriate to the complainant. If the complainant disagrees with the decided course of action, further corrective actions should be agreed and carried out by MIOL, or the complainant should be advised of the next step in logging his/ her grievance e.g. elevating the complaint to local or central government. If a complainant decides to open a legal case against the company, MIOL should not obstruct this decision.

8 COMPANY RESPONSIBILITIES

In addition to the RWG and CRC, the Company has specific responsibilities for ensuring the RAP is developed and executed in line with Sierra Leone national law and international best practice. MIOL is responsible for all financial responsibilities, managerial and technical resources and expertise. The Company should develop a Resettlement Unit which should be managed by the Social Manager who is responsible for reporting to the General Manager.

MIOL may decide to contract out their resettlement responsibilities to an external contractor with specific expertise in the area, in which case the steps listed below will be undertaken by the contractor, who will report to the Social Manager. During development of the RAP, MIOL (or the contractor) will:

- develop a Terms of Reference for resettlement;
- identify PAP who qualify for compensation;
- develop an entitlement framework;
- arrange for a cut-off date for compensation;
- conduct the census and develop an assets register;
- develop and execute a stakeholder engagement plan for the resettlement planning;
- identify any specific vulnerable groups within the Project area (*see 7.73*);

- coordinate the selection of alternative resettlement sites;
- Project manage the development of the land-use plan for any host resettlement areas;
- present, discuss and obtain approval for any developed land-use plans with relevant government authorities;
- ensure the RWG remains in operation after the RAP is finalised and until the Project is implemented;
- provide a representative to be part of the RWG meetings, and
- provide administrative, managerial and technical support as required by the PAPs, RWG or CRC.

During the implementation of the RAP, MIOL (or the selected contractor) will be responsible for:

- developing offer documents and discussing the terms and conditions with each individual affected household;
- planning and monitoring the replacement of communal social infrastructure;
- planning and supervising the compensation activities;
- providing transportation and assistance for moving people and belongings into new houses;
- design and implement community development and monitoring programmes to ensure affected households are not worse off once they have been resettled;
- providing continued assistance and monitoring of vulnerable groups;
- establishing a monitoring programme to ensure PAPs are not worse off post resettlement;
- monitoring and reporting on the construction of replacement structures; and
- managing of the grievance mechanism.

9 MONITORING

Monitoring of the resettlement process, which is an IFC PS5 requirement, enables the Company to assess whether the procedures and objectives laid out in the RAP are being accomplished. Monitoring should be both internal and external to ensure it meets international standards.

9.1 Internal Monitoring

Internal monitoring should be implemented to allow the company (or contractor) to measure the resettlement process against goals set out in the RAP. Internal monitoring will include interviews with PAPs and MIOL staff involved in resettlement and compensation, review of resettlement and compensation documents, surveys with resettled peoples and host communities and observations in the villages. Internal monitoring will:

- ensure that valuation and compensation has been carried out in line with national laws and international best practice;
- ensure stakeholders have received adequate notification of Project stages;
- confirm all land-acquisition issues are resolved;
- ensure the census has been carried out and has covered all PAP;
- ensure all grievances are appropriately recorded and resolved;
- ensure all agreed resettlement measures are implemented in accordance with the RAP;

- confirm that the funds required to implement resettlement activities are provided in a timely manner, are sufficient for purpose, and are spent in accordance with the RAP; and
- submit monitoring and evaluation reports periodically.

Monitoring will take place periodically both during the resettlement period and after resettlement has taken place to ensure resettlement has not left the resettled people, or host communities, worse off than pre resettlement.

9.2 External Independent evaluation /audit

In addition to internal monitoring, external monitoring should be conducted by an independent group, the main aim being to assess the impact of resettlement and the resettlement process and to ensure the objectives set out in the RAP have been executed. Monitoring should be conducted twice a year for at least three years after resettlement has taken place. The initial monitoring will evaluate the resettlement process and subsequent monitoring after the first year will monitor conditions against baseline data collected in the census including:

- housing - quality of roof, walls, floor;
- agricultural yields;
- possession of livestock;
- land lease rent;
- access to safe water;
- distance to water source;
- ownership of material assets;
- patterns of employment and income generation activities;
- income/expenditure/debts per household;
- improvement in production/income for women/youths;
- capacity building, skills / vocational training;
- community infrastructure and access to transport routes/ public transport services;
- children in school by age and sex;
- distance to primary school;
- access to sanitation;
- incidence of disease;
- distance to health centre, and
- HIV/AIDS and STD prevalence aggregated by gender and age.

Once the external monitoring report has been completed MIOL will need to meet with the RWG to discuss the findings and put in place remedial plans were necessary.

10 BUDGET

A resettlement action plan should provide an estimate of the budgetary requirements for implementation of the resettlement measures. This section identifies the components that will form part of the overall budget.

The key components of the overall budget should typically be:

- the cost of replacement land;
- the cost of building replacement housing and community structures such as schools, churches, grain banks, etc;
- cash compensation for the crops/ trees and relocation;

- the cost of implementing a livelihoods restoration programme for the directly affected people;
- implementation costs (e.g. salaries, overheads and the cost of stakeholder consultations);
- the cost of training for the project implementation team; and
- monitoring and evaluation costs.

11 TIMING

The resettlement schedule should define timing of the key steps and activities in the process. These should be linked with the Project's construction schedule to ensure timely availability of land for start of different Project activities. The full schedule will be developed as part of the RAP, however it should at least include the following activities/tasks:

- create the RWG;
- explore opportunities for minimising resettlement;
- conduct census survey;
- declare moratorium;
- develop entitlement framework;
- identify relocation sites;
- negotiate entitlements; and
- consultations with PAPs (on ongoing basis)

12 CONCLUSION

The RF provides an outline, which is in compliance with IFC PS 5 and Sierra Leone requirements on land acquisition and resettlement, to ensure planning for an effective resettlement programme for the affected parties. The RFP provides a basis for a Project specific RAP to be produced.

13 REFERENCES

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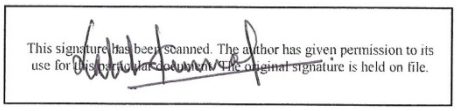
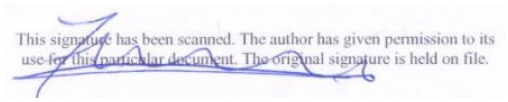
For and on behalf of SRK Consulting (UK) Limited





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[4] (www.worldbank.org) and in the World Bank's Resettlement and Rehabilitation Guidebook.

APPENDIX E
E PRELIMINARY PROJECT DESIGN DRAWINGS

APPENDIX E1: PRELIMINARY WATER MANAGEMENT PLAN

mining solutions

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INTEROFFICE MEMORANDUM

To:	Jeff Hamilton	***Date:***	5 April 2011
Co.:	Marampa Iron Ore Limited	***Ref:***	
Cc.:	Tony Boucher		
From:	Tamer Dincer		

Re: Marampa Iron Ore Project – Preliminary Mine Surface Water Management Plan

Introduction

The Marampa Iron Ore Project (Project) site is situated in a topographically low lying area with numerous streams and swamps located at or close to the location of the proposed open pits and waste dumps. Figure 1 shows the location of the proposed open pits in relation to the streams, swamp areas and topography contours at 5m intervals.

The general direction of the surface water natural drainage at the project site is to the south (Figure 1). The is no major drainage routes crossing through the Gafal and Rotret open pits as they are located mostly at the higher ground. No significant flows are expected through the two streams crossing the Matukia pit as the catchment areas feeding these streams are small.

The major stream crossing the Mafuri pit at the east (MFE) will be critical in the development of the open pits as the catchment area is significant with limited drainage diversion options due to the alignment of the hills in this area. Although relatively limited flows are expected, the stream crossing the western end of the Mafuri pit (MFW) will also need diverting before the start of mining MAfuri pit first in this area. The flows through the smallest stream at the centre of the Mafuri pit (MFC) will be insignificant due to the small upstream catchment area.

Proposed Mining Strategy

The plan views of the preliminary mine site layout shown in Figures 2 and 3 summarise the preliminary mining plan in two major phases. After building external waste dumps from the earlier mined pit stages (Figure 2), the proposed mine development strategy facilitates the backfilling of the earlier mined areas with the waste from the later mined pit areas (Figure 3).

The strategy will allow approximately 50% of the pit areas backfilled with waste and tailings, significantly reducing the area otherwise required for the external waste dumps. The mining and backfilling sequence can be further summarised as follows:

- Development of the western part of the Mafuri pit earlier, which will be available for waste backfilling after 2020 from the development of eastern pit areas (first concentrate shipment planned for early 2015),
- Completion of Rotret ultimate pit by 2025, which will be available for waste backfilling from later pit stages developed in the Gafal West and Mafuri East areas,
- Completion of Matukia ultimate pit by 2024, which will be available for tailings storage for the rest of mine life, and
- Completion of Mafuri eastern and Gafal western pit boundaries (joining boundaries) latest will delay the MFE stream diversion towards the end of mine life.

In terms of surface water drainage, the timing and staging of the pit development in the Mafuri central and eastern areas will be critical through mine life. The development of Mafuri pit stages from west to east and Gafal pit stages generally from east to west will allow flexibility in planning and construction of the major MFE stream diversion. As indicated by the preliminary economic analyses, this strategy also provides favourable cash flow profile for the project from an economic point of view.

The proposed external waste dumps for the open pits will not be affect the natural surface water drainage generally as the waste dumps are generally located at the higher ground.

Surface Water Management Plan

The flat lying topography, the orientation of the hills and the general topographic inclination at the site require that any diversion of surface water should also directed to the south while preventing any significant rise of the accumulated water level in the catchment. Accumulated water levels above approximately 70mRL will cover a relatively large area, potentially affecting some road crossings and other structures during the rainy season.

The major drainage works in the area required for the development of Mafuri pit in stages can be summarised as follows (Figures 2 and 3).

1. Excavation of the drainage channel and bund construction will be required to divert the MFW stream before the start of mining Mafuri oxide pits (2016 Q3). The channel to the west of pit boundary will be generally shallow except a ~200m section cutting thorough a hill. Some sections will require only the construction of bunds to keep water away from the pit. The drainage as shown in Figure 2 is located relatively close to the pit crest considering the limited flows expected and waste backfilling of this section of the pit relatively early in mine life.
2. Excavation of a major drainage channel will be required at the north of the Mafuri pit to divert the water from the largest MFE stream before the development of last stages of Mafuri and Gafal pits (~2023, Q4). The excavation of this channel with a maximum depth of 10-12m and length of 600m will be the largest drainage work for the management of surface water drainage for mining at the site.
3. As the channel excavation at the north of Mafuri (2) is completed, mining and waste backfilling of the Mafuri pit in the central area needs to be finalised to allow diverted water to cross the Mafuri pit area (west of 768,000mE). Although drainage over the backfill material is not ideal, this would be the most feasible option considering the topography constraints. Suitable materials and construction methods will be required to seal the channel as much as possible over the waste backfill.

4. After the construction of the channels in 2 and 3 above, the water flow in the main MFW stream can be diverted with a bund constructed along 959,150mN (~Year 2023, Q4). This will accumulate approximately 3-4m deep water in the lower catchment as the water level rise and flow through the newly excavated channel further north. The approximate areal extent of water accumulation to the north of the proposed bund can be seen in Figure 3.

The above is a summary of the major drainage works for scoping purposes based on a review of the available data without undertaking any site visit. Mine water management plan for earlier mine life needs further detailing in the feasibility study (and later during operations), including:

- Properties of the ore and waste rocks with respect to exposure to water and drainage may affect the mine design and water management plan.
- Further minor drainage channel and bund construction may be required across the pit and waste dump areas as necessary subject to local conditions and detailed mine design.
- Planning for water drainage on the waste dump surfaces, direction, treatment and discharge of water flow from the waste dumps will be required as the mining operations advance.
- Planning for direction, treatment and discharge of the water dewatered from the pit stages will be required as the mining and backfilling operations advance.
- The proposed haul roads will require more detailed planning based on local variations and detailed mine design & mining plan.
- Although the topography and the location of the pits are the main factors for major drainage works and a significant change is not expected, there might be social and infrastructure limitations that may need incorporation in the feasibility study plans.

Disclaimer

Figure 1: Marampa Project Site: Major Streams, Swamps and Pit Areas

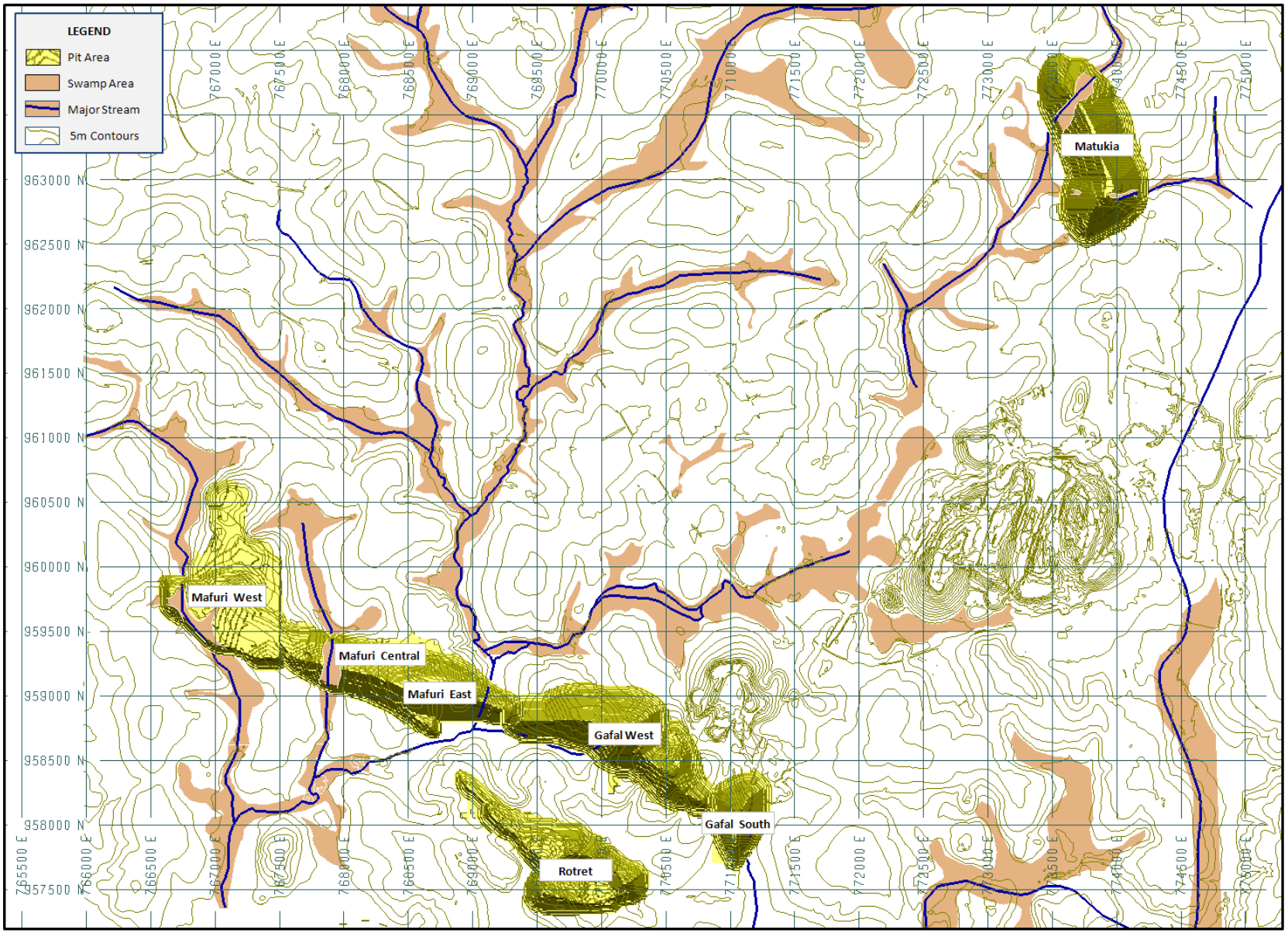


Figure 2: Site Layout before Waste Backfilling Rotret and Mafuri West

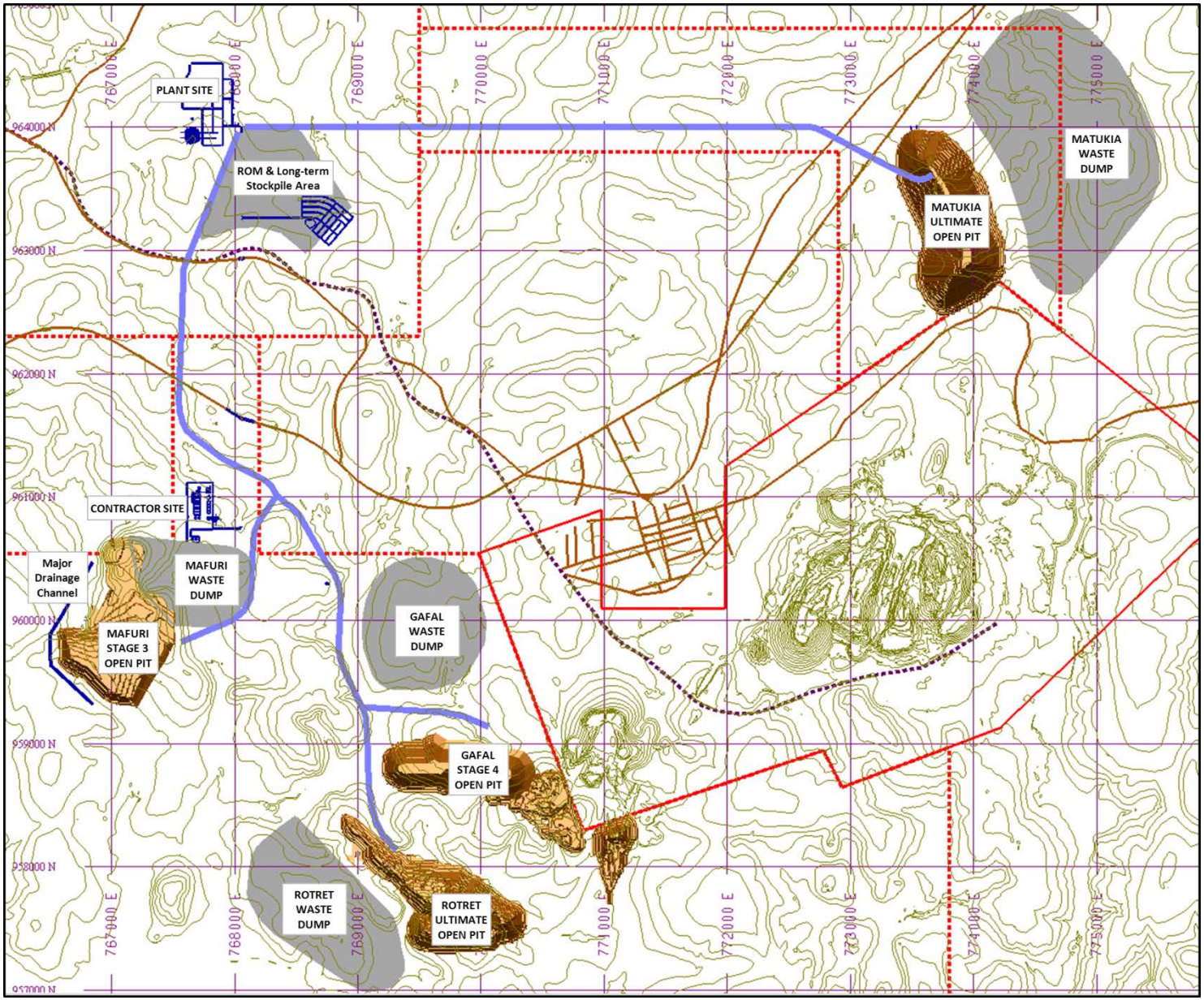
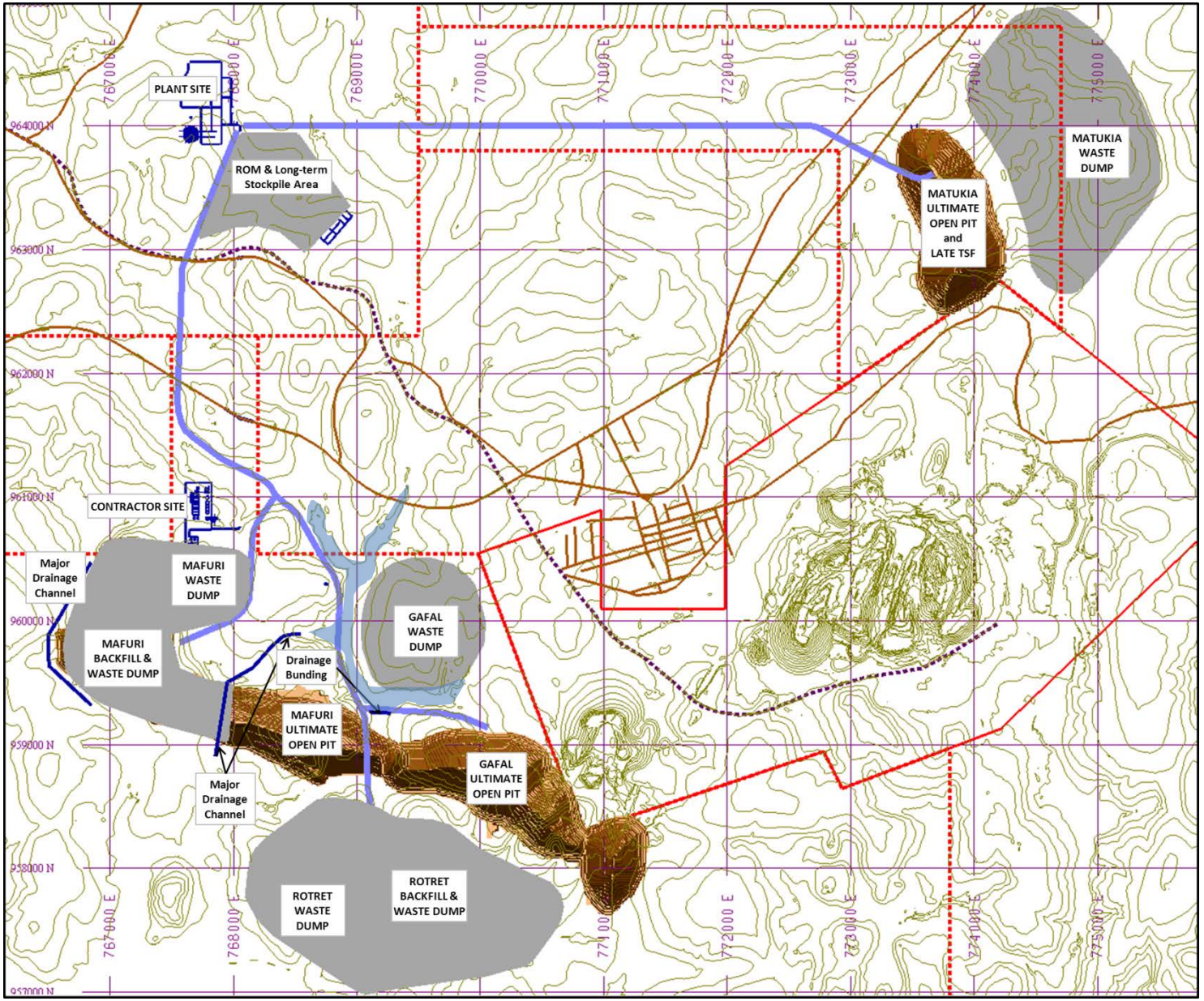


Figure 3: Site Layout after Rotret and Mafuri West Covered with Waste Dumps



APPENDIX E2: PRELIMINARY PROCESS FLOW DIAGRAMS

ROM BIN FOG SPRAY WATER
30XX-PU-00X
- P120-0000-500x

GAFAL WEST ROM PAD
- MINING

MATUKIA ROM PAD
- MINING

MAFURI ROM PAD
- MINING

ROTRET ROM PAD
- MINING

NOTES:

1. THIS FLOWSHEET APPLIES TO STAGE 1.
2. STAGE 2 REQUIRES AN ADDITIONAL TWO CIRCUITS, EXCLUDING THE DIVERSION TO AN OXIDE SCRUBBING CIRCUIT.

3011-CTV-101
BN-101
CAMERA

3011-RB-101
ROCK BREAKER

3011-GR-101
ROM BIN GRIZZLY

3011-CN-101
PRIMARY
CRUSHING AREA
MAINTENANCE CRANE

ORE TRUCK

ORE TRUCK

FEL

3011-BN-101
ROM BIN

3011-FD-101
SIZER
APRON FEEDER

3011-CH-101
FD-101
DISCHARGE
CHUTE

3011-CH-104
FD-101
DRIBBLE UNDERPAN

3011-CH-102
SIZER
FEED CHUTE

3011-CR-101
MMD SIZER

3011-SS-191
PRIMARY CRUSHING
AREA
SAFETY EYE BATH

3011-CH-105
CV-101
TRANSFER
CHUTE

3011-CH-103
SIZER DISCHARGE
CHUTE

3011-CV-101
DISCHARGE CONVEYOR

3011-CH-106
CV-101
DISCHARGE
CHUTE

MOBILE SUMP

3011-PU-191
PRIMARY
CRUSHING AREA
SUMP PUMP

3011-CH-107
CV-102
TRANSFER
CHUTE

3011-CV-102
CRUSHED ORE
DISCHARGE CONVEYOR

3011-MG-101
BELT MAGNET

M

3011-DC-101
PRIMARY
CRUSHING AREA
DUST EXTRACTION

M

M

3011-DT-101
METAL DETECTOR

3011-CH-108
CV-102
DISCHARGE
CHUTE

3011-CH-109
DEFLECTOR
CHUTE

OXIDE SCRUBBING
3014-CV-101
1 P120-3014-5001

COARSE ORE BIN
3013-BN-101
2 P120-3013-5001

NOT FOR CONSTRUCTION

REFERENCE DRAWINGS

DRAWING No	DRAWING TITLE

REVISIONS

No	DATE	DESCRIPTION	BY	CKD	ENG
D	08.03.12	ISSUED FOR CLEINT REVIEW	MIM	PB	GL
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B	08.08.11	BASIS OF ESTIMATE	JCM	MRW	
A	30.06.11	ISSUED FOR DESIGN REVIEW	JCM		

DRAWN	MIM		08.03.2012
CHECKED			
DESIGNED	GL		08.03.2012
DESIGN CHECK			
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ENGINEERING MAN.			
PROJECT MAN.			
	BY	SIGN	DATE

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BATEMAN ENGINEERING PTY LTD
(ABN 67 009 001 558)

A MEMBER OF THE BATEMAN ENGINEERING NV GROUP

CLIENT MARAMPA IRON ORE LIMITED

PROJECT MARAMPA IRON ORE PROJECT

TITLE 15 Mtpa SCOPING STUDY - AREA 3011
PRIMARY CRUSHING
PROCESS FLOW DIAGRAM

SCALE NTS | A1 | DRAWING No M6037-P120-3011-5001 | REV D

NOTES:

1. THIS CIRCUIT IS NOT REQUIRED FOR STAGE 1.
2. THE CIRCUIT SHOWN APPLIES TO 2.5 Mtpa PRODUCTION.
3. A TOTAL OF SIX STOCKPILE CIRCUITS ARE REQUIRED.

3013-CV-103
2 | P120-3013-5002

1312-SP-101
FINE CRUSHED ORE
STOCKPILE

3012-CH-101
RECLAIM TUNNEL 1
DISCHARGE CHUTE 1

3012-CH-102
RECLAIM TUNNEL 1
DISCHARGE CHUTE 2

3012-CH-103
FD-101
HEAD CHUTE

3012-CH-104
FD-102
HEAD CHUTE

3012-FD-101
RECLAIM TUNNEL 1
APRON FEEDER 1

3012-FD-102
RECLAIM TUNNEL 1
APRON FEEDER 2

3012-FN-101
RECLAIM TUNNEL 1
VENTILATION FAN

3012-CH-105
CV-101
FEED CHUTE 1

3012-CV-101
RECLAIM CONVEYOR 1

3012-CH-106
CV-101
FEED CHUTE 2

M
3012-DC-101
RECLAIM TUNNEL 1
DUST EXTRACTION

RECLAIM TUNNEL No.1

M

3012-CH-107
CV-101
HEAD CHUTE

3012-WE-101
CV-101
WEIGHTOMETER

MOBILE SUMP

3020-DB-101
1 | P120-3020-5001

M
3012-PU-191
STOCKPILE
TUNNEL
SUMP PUMP

3012-SS-191
RECLAIM TUNNEL 1
AREA
SAFETY EYE BATH

NOT FOR CONSTRUCTION

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DESIGNED	GL		08.03.2012
DESIGN CHECK			
DISCIPLINE APPR.			
ENGINEERING MAN.			
PROJECT MAN.			

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CLIENT: MARAMPA IRON ORE LIMITED
PROJECT: MARAMPA IRON ORE PROJECT
TITLE: 15 Mtpa SCOPING STUDY - AREA 3012
FINES STOCKPILE
PROCESS FLOW DIAGRAM

SCALE: NTS | A1 | DRAWING No: M6037-P120-3012-5001 | REV: D

3013-CV-103
3 | P120-3013-5002

3013-CV-102
1 | P120-3013-5002

3014-CV-103
1 | P120-3014-5001

3011-CV-102
2 | P120-3011-5001

3013-BN-101
COARSE
ORE BIN

3013-BN-102
CRUSHED
ORE BIN

3013-CH-101
COARSE ORE BIN
DISCHARGE
CHUTE

3013-FD-101
SECONDARY CRUSHER
VIBRATING
FEEDER

3013-CH-102
SECONDARY CRUSHER
FEED CHUTE

3013-CH-105
CRUSHED ORE BIN
DISCHARGE
CHUTE 1

3013-FD-102
TERTIARY CRUSHER 1
VIBRATING
FEEDER

3013-CH-106
TERTIARY CRUSHER 1
FEED CHUTE

3013-CH-109
CRUSHED ORE BIN
DISCHARGE
CHUTE 2

3013-FD-103
TERTIARY CRUSHER 2
VIBRATING
FEEDER

3013-CH-110
TERTIARY CRUSHER 2
FEED CHUTE

3013-DC-101
SECONDARY & TERTIARY
CRUSHING AREA
DUST EXTRACTION

3013-CR-101
SECONDARY
CONE
CRUSHER 1

3013-CR-102
TERTIARY
CONE
CRUSHER 1

3013-CR-103
TERTIARY
CONE
CRUSHER 2

3013-CH-103
SECONDARY CRUSHER
DISCHARGE CHUTE

3013-CH-107
TERTIARY CRUSHER 1
DISCHARGE CHUTE

3013-CH-111
TERTIARY CRUSHER 2
DISCHARGE CHUTE

3013-CV-101
SCREEN FEED
CONVEYOR

3013-CH-113
CV-101
HEAD
CHUTE

3013-CH-114
SPLITTER
CHUTE

3013-SC-101 TRAIN 1
1 | P120-3013-5002

3013-SC-201 TRAIN 2
REFER NOTES ON 3013-5002

3013-SS-191
SECONDARY AND TERTIARY
CRUSHING AREA
SAFETY EYE BATH

3013-CH-104
CV-101
TRANSFER CHUTE 1

3013-CH-108
CV-101
TRANSFER CHUTE 2

3013-CH-112
CV-101
TRANSFER CHUTE 3

MOBILE SUMP

3013-WE-101
SECONDARY CRUSHER
WEIGHTOMETER

3013-WE-102
SCREEN FEED
WEIGHTOMETER

3013-PU-191
2'ARY AND 3'ARY
CRUSHING AREA
SUMP PUMP

NOTES:

1. THIS CIRCUIT IS NOT REQUIRED FOR STAGE 1.
2. THE CRUSHING CIRCUIT SHOWN APPLIES TO 5 Mtpa CONCENTRATE PRODUCTION.
3. FOR 15 Mtpa, THREE OFF CRUSHING CIRCUITS WILL BE REQUIRED.

NOT FOR CONSTRUCTION

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DRAWN	MIM		08.03.2012
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DESIGNED	GL		08.03.2012
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ENGINEERING MAN.			
PROJECT MAN.			

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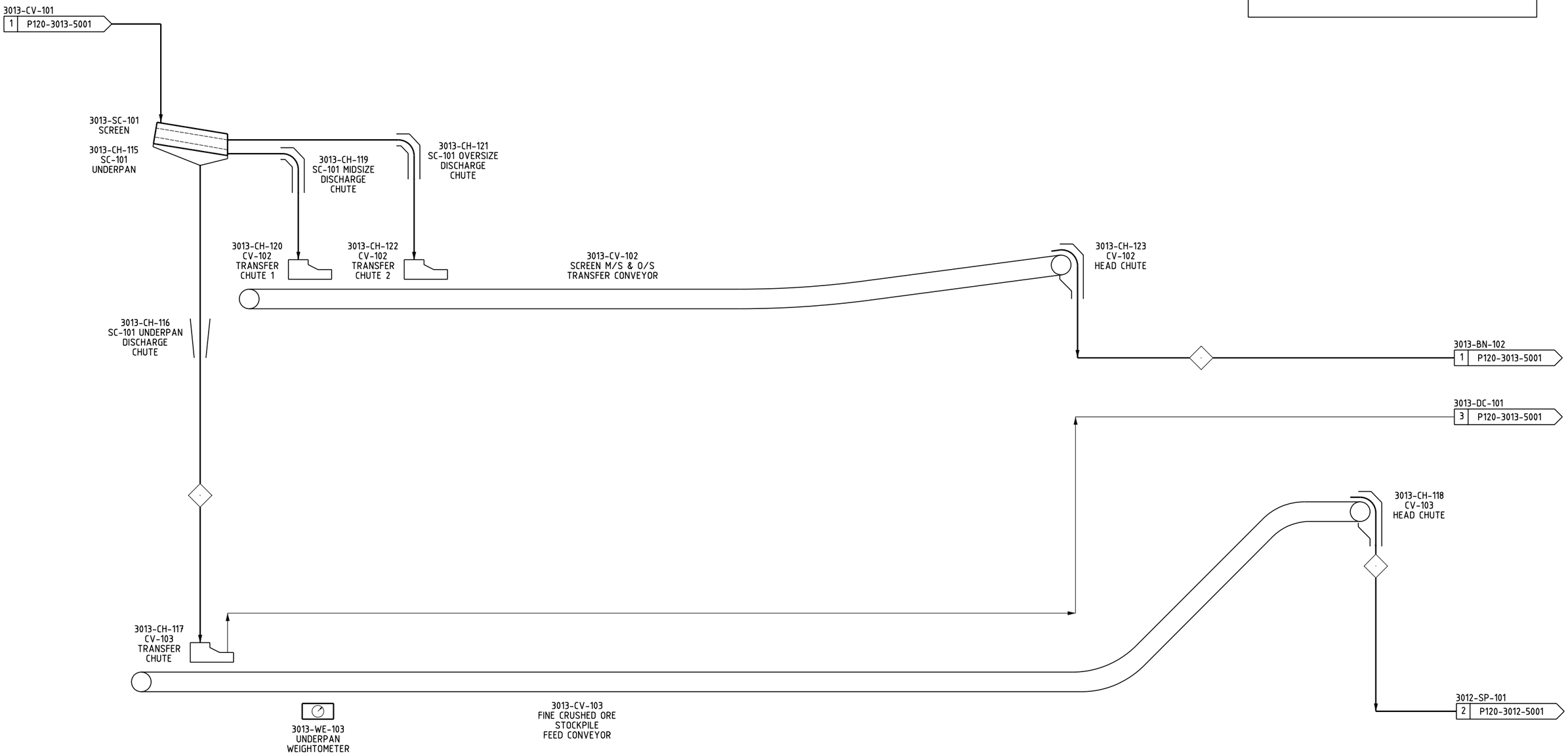
PROJECT: MARAMPA IRON ORE PROJECT

TITLE: 15 Mtpa SCOPING STUDY - AREA 3013
SECONDARY AND TERTIARY CRUSHING
PROCESS FLOW DIAGRAM - SHEET 1 OF 2

SCALE: NTS | A1 | DRAWING No: M6037-P120-3013-5001 | REV: D

NOTES:

1. THIS CIRCUIT IS NOT REQUIRED FOR STAGE 1.
2. THE CIRCUIT SHOWN APPLIES TO A SINGLE, 2.5 Mtpa CONCENTRATE PRODUCTION TRAIN..
3. FOR 15Mtpa OPTION, SIX OFF TRAINS WILL BE REQUIRED



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DESIGNED	GL		08.03.2012
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ENGINEERING MAN.			
PROJECT MAN.			
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PROJECT: MARAMPA IRON ORE PROJECT

TITLE: 15 Mtpa SCOPING STUDY - AREA 3013
SECONDARY AND TERTIARY CRUSHING
PROCESS FLOW DIAGRAM - SHEET 2 OF 2

SCALE		DRAWING No	REV
NTS	A1	M6037-P120-3013-5002	D

RAW WATER
1 | P120-3080-5002

CRUSHED ORE 3011-CV-102
1 | P120-3011-5001
NOTE 1

3014-CH-101
CV-101
TRANSFER
CHUTE

3014-CV-101
SCRUBBER FEED
CONVEYOR

3014-CH-102
CV-101
DISCHARGE CHUTE

3014-PK-201
OXIDE SCRUBBER
VENDOR PACKAGE

SCRUBBER
DISCHARGE
TROMMEL 60mm

3014-SR-201
OXIDE SCRUBBER

3014-CH-112
SR-201
FEED SPOUT

3014-CH-113
TROMMEL
OVERSIZE 60mm
CHUTE

3014-CH-114
SR-201
DISCHARGE
CHUTE

3014-SC-201
SR-201
DISCHARGE SCREEN

3014-CH-115
SC-201
UNDERSIZE UNDERPAN

3014-CH-116
SC-201
OVERSIZE 25mm
CHUTE

3014-CH-117
SC-201 MIDSIZE
850 micron
CHUTE

3014-CN-101
SCRUBBER AREA
MAINTENANCE CRANE

NOTE:

1. THIS FLOWSHEET REPRESENTS THE PRODUCTION OF 5mtpa FROM OXIDE ORE.
2. STAGE 1 ONLY REQUIRES ONE SCRUBBER CIRCUIT
3. PFD AS DRAWN SHOWS STAGE 2 PLANT

3014-PK-101
OXIDE SCRUBBER
VENDOR PACKAGE

3014-CH-103
SR-101
FEED SPOUT

SCRUBBER
DISCHARGE
TROMMEL 60mm

3014-SR-101
OXIDE SCRUBBER

3014-CH-104
TROMMEL
OVERSIZE 60mm
CHUTE

3014-CH-108
SR-101
DISCHARGE
CHUTE

3014-HP-201
SC-201
UNDERSIZE HOPPER

3014-PU-201A
SC-201
UNDERSIZE PUMP

3014-PU-201B
SC-201
UNDERSIZE PUMP

ROUGHER MAG SEPS
3030-DB-101
3 | P120-3030-5001

3014-CH-105
CV-102
DISCHARGE
CHUTE

3014-DT-101
METAL DETECTOR

3014-CH-107
CV-103
DISCHARGE
CHUTE

3014-MG-101
BELT MAGNET

3014-CH-106
CV-103
TRANSFER
CHUTE

5mpta OXIDE
STAGE 2

3013-BN-101
1 | P120-3013-5001

3014-SC-101
SR-101
DISCHARGE
SCREEN

3014-CH-109
SC-101
OVERSIZE 25mm
CHUTE

3014-CH-111
SC-101
UNDERSIZE
UNDERPAN

3014-CH-110
SC-101 MIDSIZE
850 micron
CHUTE

3014-CV-102
SCRUBBER O/SIZE
TRANSFER
CONVEYOR No 1

3014-CV-103
SCRUBBER O/SIZE
TRANSFER
CONVEYOR No 2

3014-PU-191
OXIDE
SCRUBBING AREA
SUMP PUMP

3014-PU-101A
SC-101
UNDERSIZE PUMP

3014-PU-101B
SC-101
UNDERSIZE PUMP

ROUGHER MAG SEPS
3030-DB-101
2 | P120-3030-5001

3014-HP-101
SC-101
UNDERSIZE HOPPER

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REFERENCE DRAWINGS

DRAWING No	DRAWING TITLE

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DISCIPLINE APPR.			
ENGINEERING MAN.			
PROJECT MAN.			

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CLIENT: MARAMPA IRON ORE LIMITED

PROJECT: MARAMPA IRON ORE PROJECT

TITLE: 15 Mtpa SCOPING STUDY - AREA 3014
OXIDE SCRUBBING PLANT
PROCESS FLOW DIAGRAM

SCALE		DRAWING No	REV
NTS	A1	M6037-P120-3014-5001	D

RAW WATER
1 | P120-3080-5002
3012-CV-101
2 | P120-3012-5001
CLEANER TAILS 3042-PU-101
2 | P120-3042-5001
CLEANER TAILS 3042-PU-102
6 | P120-3042-5001
COARSE SAMPLING 3042-AO-101
1 | P120-3042-5003

NOTES:
1. THE CIRCUIT SHOWN APPLIES TO STAGE 1 FOR A 2.5 Mtpa CONCENTRATE PRODUCTION TRAIN.
2. FOR STAGE 2 - 15 Mtpa, SIX CIRCUITS WILL BE REQUIRED.

3020-DB-101 SC-101 FEED BOX
3020-SC-101 ML-101 SCREEN 1mm
3020-CH-101 SC-101 UNDERSIZE UNDERPAN
3020-CH-102 SC-101 OVERSIZE CHUTE
3020-HO-101 BALL HOIST
3020-XE-101 BALL CHARGE KIBBLE
3020-ML-101 PRIMARY BALL MILL TRAIN 1
15mm APERTURE
SCATS BUNKER
3020-LU-101 LUBRICATION UNIT
3020-PU-104A ML-101 DISCHARGE PUMP
3020-PU-104B ML-101 DISCHARGE PUMP (STANDBY)
3020-HP-104 ML-101 DISCHARGE HOPPER
3020-PU-191 PRIMARY GRINDING AREA SUMP PUMP
3020-CY-101 DEWATERING CYCLONE TRAIN 1
3020-DB-102 CYCLONE O/F SPLITTER BOX
3020-SC-102 LINEAR SCREEN
3020-SC-103 LINEAR SCREEN
0.85mm
3020-CH-105 SC-101 OVERSIZE CHUTE
3020-CH-103 LINEAR SCREEN UNDERPAN
3020-CH-106 SC-103 OVERSIZE CHUTE
3020-CH-104 LINEAR SCREEN UNDERPAN
3020-PU-105A SC-102 OVERSIZE PUMP
3020-PU-105B SC-102 OVERSIZE PUMP (STANDBY)
3020-HP-105 SC-102 OVERSIZE HOPPER
3020-HP-106 SC-102 UNDERSIZE HOPPER
3020-PU-106A SC-102 UNDERSIZE PUMP
3020-PU-106B SC-102 UNDERSIZE PUMP (STANDBY)
ROUGHER MAG SEPS 3030-DB-101
1 | P120-3030-5001
BALL MILL PRODUCT 3042-AO-101
2 | P120-3042-5003
3020-SA-101 PRIMARY GRINDING SAMPLER
3020-HP-103 CY-101 UNDERFLOW HOPPER
3020-PU-103A CY-101 UNDERFLOW PUMP
3020-PU-103B CY-101 UNDERFLOW PUMP (STANDBY)
3020-SS-191 PRIMARY GRINDING AREA SAFETY EYE BATH

NOT FOR CONSTRUCTION

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DESIGNED	GL		08.03.2012
DESIGN CHECK			
DISCIPLINE APPR.			
ENGINEERING MAN.			
PROJECT MAN.			
	BY	SIGN	DATE

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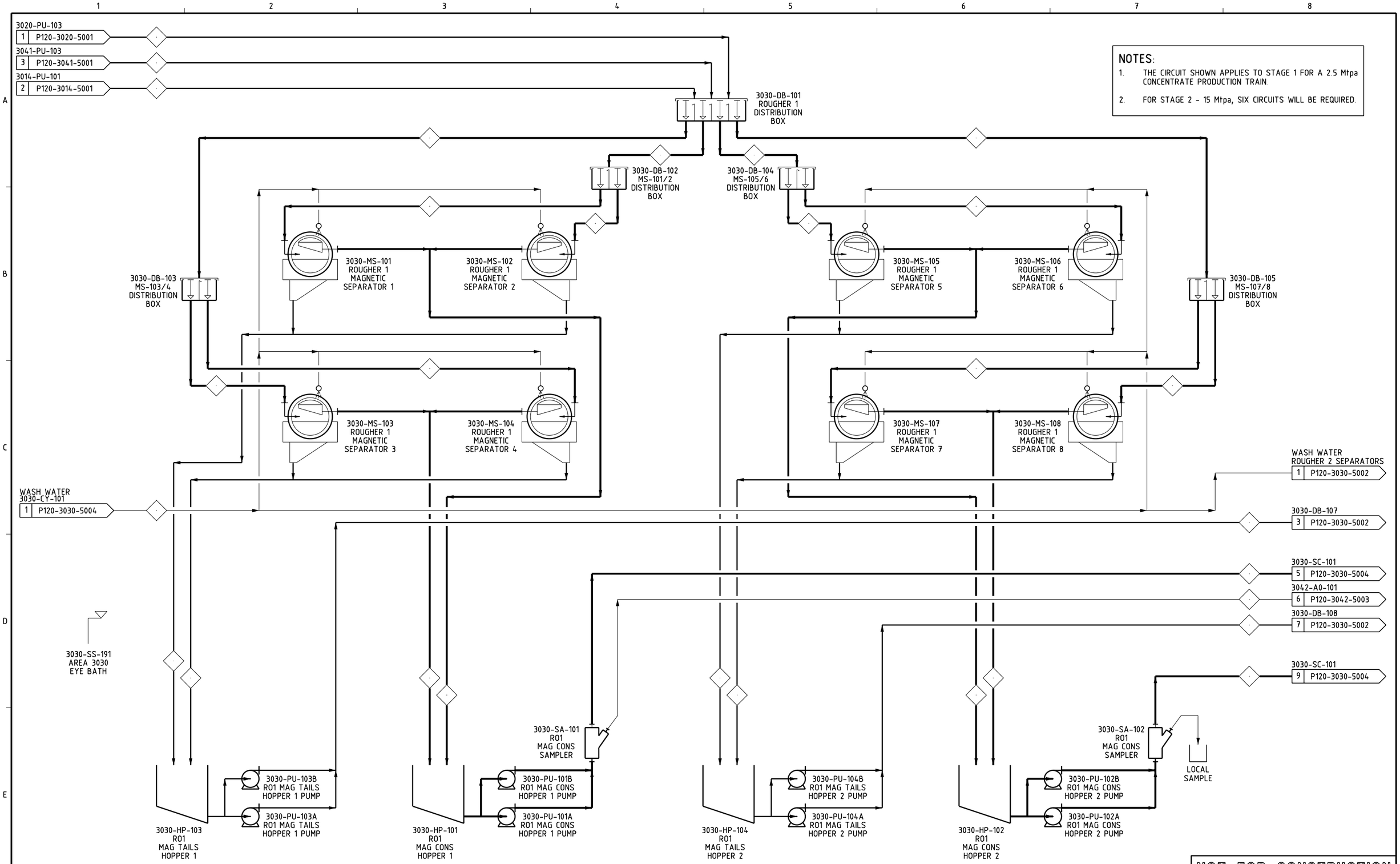
CLIENT: MARAMPA IRON ORE LIMITED
PROJECT: MARAMPA IRON ORE PROJECT
TITLE: 15 Mtpa SCOPING STUDY - AREA 3020 PRIMARY GRINDING PROCESS FLOW DIAGRAM
SCALE: NTS | A1 | DRAWING No: M6037-P120-3020-5001 | REV: D



NOT FOR CONSTRUCTION

REFERENCE DRAWINGS

DRAWING No	DRAWING TITLE

REVISIONS

No	DATE	DESCRIPTION	BY	CKD	ENG
D	08.03.12	ISSUED FOR CLIENT REVIEW	MIM	PB	GL
C	26.08.11	BASIS OF ESTIMATE UPDATED	JCM	PB	
B	08.08.11	BASIS OF ESTIMATE	JCM	MRW	
A	30.06.11	ISSUED FOR DESIGN REVIEW	JCM		

	BY	SIGN	DATE
DRAWN	MIM		08.03.2012
CHECKED			
DESIGNED	GL		08.03.2012
DESIGN CHECK			
DISCIPLINE APPR.			
ENGINEERING MAN.			
PROJECT MAN.			

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BATEMAN ENGINEERING PTY LTD
(ABN 67 009 001 558)

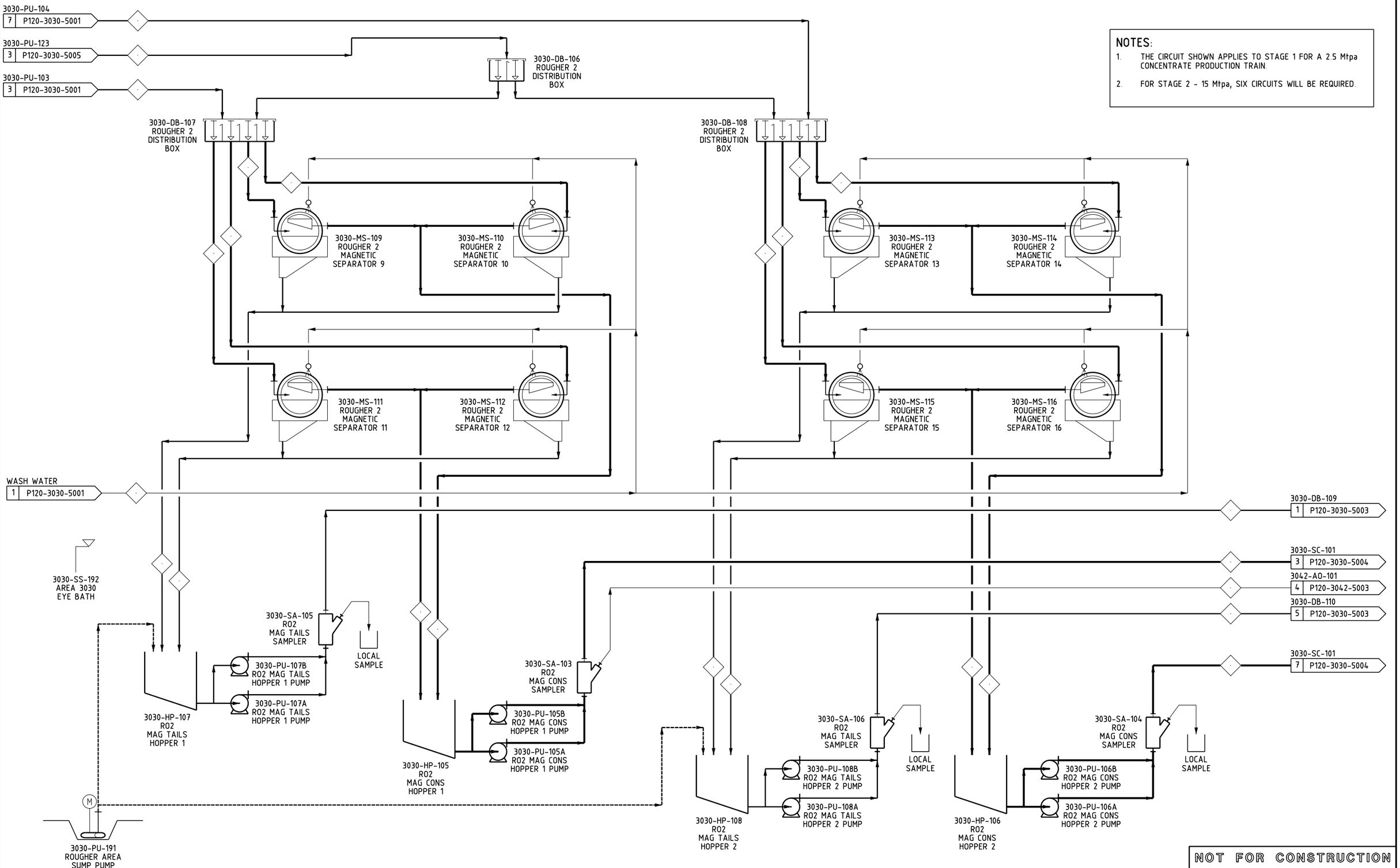
A MEMBER OF THE BATEMAN ENGINEERING NV GROUP

CLIENT: MARAMPA IRON ORE LIMITED

PROJECT: MARAMPA IRON ORE PROJECT

TITLE: 15 Mtpa SCOPING STUDY - AREA 3030
ROUGHER MAGNETIC SEPARATION
PROCESS FLOW DIAGRAM - SHEET 1 OF 2

SCALE		DRAWING No	REV
NTS	A1	M6037-P120-3030-5001	D



NOTES:

1. THE CIRCUIT SHOWN APPLIES TO STAGE 1 FOR A 2.5 Mtpa CONCENTRATE PRODUCTION TRAIN.
2. FOR STAGE 2 - 15 Mtpa, SIX CIRCUITS WILL BE REQUIRED.

NOT FOR CONSTRUCTION

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	BY	SIGN	DATE
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DESIGNED	GL		08.03.2012
DESIGN CHECK			
DISCIPLINE APPR.			
ENGINEERING MAN.			
PROJECT MAN.			

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CLIENT: MARAMPA IRON ORE LIMITED

PROJECT: MARAMPA IRON ORE PROJECT

TITLE: 15 Mtpa SCOPING STUDY - AREA 3030 ROUGHER MAGNETIC SEPARATION PROCESS FLOW DIAGRAM - SHEET 2 OF 2

SCALE: NTS | A1 | DRAWING No: M6037-P120-3030-5002 | REV: D

M6037

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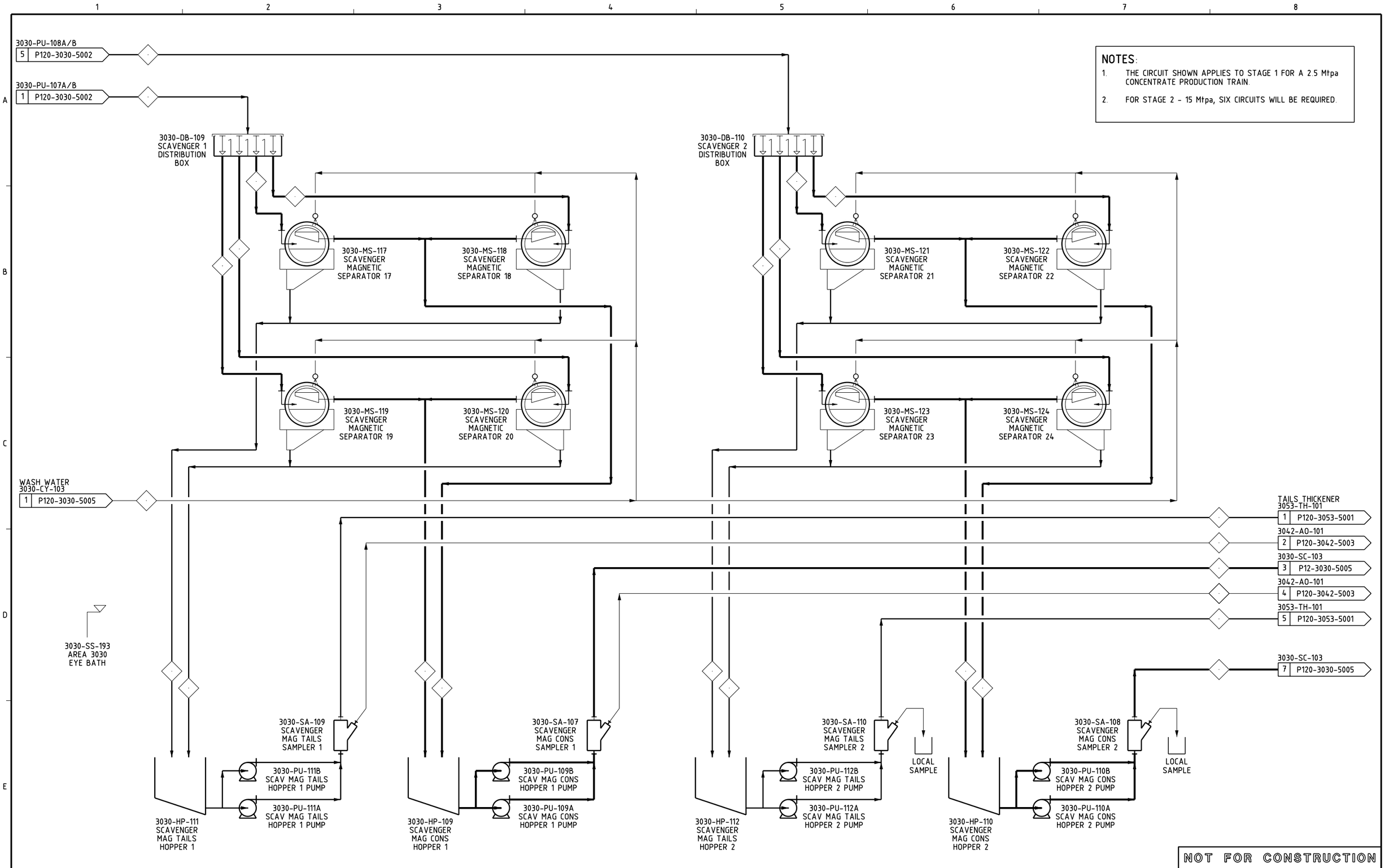

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A	30.06.11	ISSUED FOR DESIGN REVIEW	JCM		

DRAWN	MIM		08.03.2012
CHECKED			
DESIGNED	GL		08.03.2012
DESIGN CHECK			
DISCIPLINE APPR.			
ENGINEERING MAN.			
PROJECT MAN.			

BY SIGN DATE

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CLIENT MARAMPA IRON ORE LIMITED

PROJECT MARAMPA IRON ORE PROJECT

TITLE 15 Mtpa SCOPING STUDY - AREA 3030
SCAVENGER MAGNETIC SEPARATION
PROCESS FLOW DIAGRAM

SCALE NTS | A1 | DRAWING No M6037-P120-3030-5003 | REV D

M6037
6/08/2012 3:43:07 PM - K:\Projects\M6037\3001 General\PFD\M6037-P120-3030-5003.dgn -

RAW WATER
1 | P120-3080-5002

REGRIND SCREEN O/S
3041-PU-101
1 | P120-3041-5001

ROUGHER 1 MAGS
3030-PU-102
9 | P120-3030-5001

ROUGHER 2 MAGS
3030-PU-106
7 | P120-3030-5002

ROUGHER 1 MAGS
3030-PU-101
5 | P120-3030-5001

ROUGHER 2 MAGS
3030-PU-105
3 | P120-3030-5002

3030-DB-101
SC-101
FEED BOX

3030-SC-102
RO2 MAG SCREEN
0.25mm

3030-SC-101
RO1 MAG SCREEN
0.25mm

3030-CH-104
SC-102
OVERSIZE CHUTE

3030-CH-103
SC-102
UNDERSIZE
UNDERPAN

3030-CH-101
SC-101
UNDERSIZE
UNDERPAN

3030-CH-102
SC-101
OVERSIZE CHUTE

3030-PU-116B
RO2 MAG SCREEN
O/S HOPPER 2 PUMP

3030-PU-116A
RO2 MAG SCREEN
O/S HOPPER 2 PUMP

3030-HP-116
RO2
MAG SCREEN
O/S HOPPER 2

3030-HP-115
RO1
MAG SCREEN
OVERSIZE HOPPER 1

3030-PU-115B
RO1 MAG SCREEN
O/S HOPPER 1 PUMP

3030-PU-115A
RO1 MAG SCREEN
O/S HOPPER 1 PUMP

3030-PU-122B
RO1 MAG SCREEN
U/S HOPPER 2 PUMP

3030-PU-122A
RO1 MAG SCREEN
U/S HOPPER 2 PUMP

3030-HP-122
RO1
MAG SCREEN
U/S HOPPER 2

3030-HP-121
RO1
MAG SCREEN
U/S HOPPER 1

3030-PU-121B
RO1 MAG SCREEN
U/S HOPPER 1 PUMP

3030-PU-121A
RO1 MAG SCREEN
U/S HOPPER 1 PUMP

M

3030-PU-192
ROUGHERS AREA
SUMP PUMP

3030-CY-105
3030-CY-106
3030-CY-107
3030-CY-108
DENSIFYING
CYCLONES

ROUGHER SEPARATORS
WASH WATER
1 | P120-3030-5001

CLEANER MAG SEPARATOR
3042-DB-001
3 | P120-3042-5001

3030-HP-118
RO2 MAG DESIFIER
UNDERFLOW HOPPER 2

3030-PU-118B
RO2 MAG
DENSIFIER U/F
HOPPER 2 PUMP

3030-PU-118A
RO2 MAG
DENSIFIER U/F
HOPPER 2 PUMP

3030-CY-101
3030-CY-102
3030-CY-103
3030-CY-104
DENSIFYING
CYCLONES

ROUGHER SEPARATORS
WASH WATER
1 | P120-3030-5001

REGRIND DENSIFYING
CYCLONE 3041-CY-101
2 | P120-3041-5001

CLEANER MAG SEPARATOR
3042-DB-101
3 | P120-3042-5001

3030-HP-117
RO1 MAG DENISIFIER
UNDERFLOW HOPPER 1

3030-PU-117B
RO1 MAG
DENSIFIER U/F
HOPPER 1 PUMP

3030-PU-117A
RO1 MAG
DENSIFIER U/F
HOPPER 1 PUMP

REGRIND DENSIFING
CYCLONE 3041-CY-101
2 | P120-3041-5001

NOTES:

1. THE CIRCUIT SHOWN APPLIES TO STAGE 1 FOR A 2.5 Mtpa CONCENTRATE PRODUCTION TRAIN.
2. FOR STAGE 2 - 15 Mtpa, SIX CIRCUITS WILL BE REQUIRED.

NOT FOR CONSTRUCTION

REFERENCE DRAWINGS

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	BY	SIGN	DATE
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CHECKED			
DESIGNED	GL		08.03.2012
DESIGN CHECK			
DISCIPLINE APPR.			
ENGINEERING MAN.			
PROJECT MAN.			

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CLIENT: MARAMPA IRON ORE LIMITED

PROJECT: MARAMPA IRON ORE PROJECT

TITLE: 15 Mtpa SCOPING STUDY - AREA 3030
ROUGHER PRODUCT SCREENING
PROCESS FLOW DIAGRAM

SCALE: NTS | A1 | DRAWING No: M6037-P120-3030-5004 | REV: E

M6037
6/08/2012 3:44:05 PM - K:\Projects\M6037\3001 General\PFD\M6037-P120-3030-5004.dgn -

RAW WATER
- P120-3080-5002

SCAVENGER MAGS
3030-PU-110
7 P120-3030-5003

SCAVENGER MAGS
3030-PU-109
3 P120-3030-5003

3030-DB-102
SC-103
FEED BOX

3030-SC-104
SCAV MAG
SCREEN
0.18mm

3030-SC-103
SCAV MAG
SCREEN
0.18mm

3030-CH-108
SC-104
OVERSIZE CHUTE

3030-CH-107
SC-104
UNDERSIZE
UNDERPAN

3030-CH-105
SC-103
UNDERSIZE
UNDERPAN

3030-CH-106
SC-103
OVERSIZE CHUTE

3030-PU-120B
SCAV MAG SCREEN
O/S HOPPER 2 PUMP

3030-PU-120A
SCAV MAG SCREEN
O/S HOPPER 2 PUMP

3030-HP-120
SCAV MAG SCREEN
OVERSIZE HOPPER 2

3030-HP-119
SCAV MAG SCREEN
OVERSIZE HOPPER 1

3030-PU-119B
SCAV MAG SCREEN
O/S HOPPER 1 PUMP

3030-PU-119A
SCAV MAG SCREEN
O/S HOPPER 1 PUMP

3030-CY-111
3030-CY-112
DENSIFYING
CYCLONES

3030-HP-124
SCAV MAG DENSIFIER
UNDERFLOW HOPPER 2

3030-PU-124B
SCAV MAG DENSIFIER
HOPPER 2 PUMP

3030-PU-124A
SCAV MAG DENSIFIER
HOPPER 2 PUMP

RO MAG SEPARATORS
3 P120-3030-5002

3030-CY-109
3030-CY-110
DENSIFYING
CYCLONES

WASH WATER
SCAV MAG SEPARATORS
1 P120-3030-5003

SCAVENGER REGRIND
CYCLONE 3041-CY-102
2 P120-3041-5001

SCAVENGER REGRIND
CYCLONE 3041-CY-102
2 P120-3041-5001

RO MAG SEPARATORS
3 P120-3030-5002

3030-PU-114B
SCAV MAG SCREEN
U/S HOPPER 2 PUMP

3030-PU-114A
SCAV MAG SCREEN
U/S HOPPER 2 PUMP

3030-HP-114
SCAVENGER MAG SCREEN
UNDERSIZE HOPPER 2

3030-HP-113
SCAVENGER MAG SCREEN
UNDERSIZE HOPPER 1

3030-PU-113B
SCAV MAG SCREEN
U/S HOPPER 1 PUMP

3030-PU-113A
SCAV MAG SCREEN
U/S HOPPER 1 PUMP

3030-HP-123
SCAV MAG DENSIFIER
UNDERFLOW HOPPER 1

3030-PU-123B
SCAV MAG DENSIFIER
HOPPER 1 PUMP

3030-PU-123A
SCAV MAG DENSIFIER
HOPPER 1 PUMP

NOTES:

1. THE CIRCUIT SHOWN APPLIES TO STAGE 1 FOR A 2.5 Mtpa CONCENTRATE PRODUCTION TRAIN.
2. FOR STAGE 2 - 15 Mtpa, SIX CIRCUITS WILL BE REQUIRED.

NOT FOR CONSTRUCTION

REFERENCE DRAWINGS

DRAWING No	DRAWING TITLE

REVISIONS

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B	08.08.11	BASIS OF ESTIMATE	JCM	MRW	
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	BY	SIGN	DATE
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CHECKED			
DESIGNED	GL		08.03.2012
DESIGN CHECK			
DISCIPLINE APPR.			
ENGINEERING MAN.			
PROJECT MAN.			

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CLIENT MARAMPA IRON ORE LIMITED

PROJECT MARAMPA IRON ORE PROJECT

TITLE 15 Mtpa SCOPING STUDY - AREA 3030
SCAVENGER PRODUCT SCREENING
PROCESS FLOW DIAGRAM

SCALE NTS | A1 | DRAWING No M6037-P120-3030-5005 | REV E

RAW WATER
1 | P120-3080-5002

RO MAG SCREEN O/S
3030-PU-115A/B
2 | P120-3030-5004

RECLEANER TAILS
3042-PU-105
2 | P120-3042-5002

RECLEANER TAILS
3042-PU-106
5 | P120-3042-5002

SCAV MAG SCREEN O/S
3030-PU-119A/B
2 | P120-3030-5005

3041-HO-101
BALL HOIST

3041-XE-101
BALL CHARGE
KIBBLE

3041-ML-101
REGRIND MILL

3041-LU-101
LUBRICATION
UNIT

15mm
APERTURE

SCATS
BUNKER

3041-CY-101
REGRIND
DENSIFYING CYCLONE
CLUSTER

3041-HO-102
BALL HOIST

3041-XE-102
BALL CHARGE
KIBBLE

3041-CY-102
SCAVENGER
REGRIND CYCLONE
CLUSTER

3041-ML-102
SCAVENGER
REGRIND MILL

15mm
APERTURE

SCATS
BUNKER

3041-LU-102
LUBRICATION
UNIT

3041-SS-191
AREA 3041
EYE BATH

3041-PU-191
CONCENTRATE
REGRIND AREA
SUMP PUMP

3041-HP-103
SCAVENGER
REGRIND MILL HOPPER

3041-PU-103A
SCAVENGER
REGRIND MILL HOPPER

3041-PU-103B
SCAVENGER
REGRIND MILL HOPPER

3041-DB-101
SC-101
FEED BOX

3041-SC-101
REGRIND SCREEN
(#250µm)

2.50mm

3041-CH-101
REGRIND SCREEN
DISCHARGE
CHUTE

3041-CH-102
REGRIND SCREEN
U/S UNDERPAN

3041-HP-101
REGRIND SCREEN
O/S HOPPER

3041-PU-101A
REGRIND SCREEN
O/S HOPPER PUMP 1

3041-PU-101B
REGRIND SCREEN
O/S HOPPER PUMP 1

3041-HP-102
REGRIND SCREEN
U/S HOPPER 1

3041-PU-102A
REGRIND SCREEN
U/S HOPPER PUMP 1

3041-PU-102B
REGRIND SCREEN
U/S HOPPER PUMP 1

3041-SC-102
REGRIND SCREEN
(#250µm)

2.50mm

3041-CH-103
REGRIND SCREEN
U/S UNDERPAN

3041-CH-102
REGRIND SCREEN
DISCHARGE
CHUTE

3041-HP-105
REGRIND SCREEN
O/S HOPPER 2

3041-PU-105A
REGRIND SCREEN
O/S HOPPER PUMP 2

3041-PU-105B
REGRIND SCREEN
O/S HOPPER PUMP 2

3041-HP-104
REGRIND SCREEN
U/S HOPPER 2

3041-PU-104A
REGRIND SCREEN
U/S HOPPER PUMP 2

3041-PU-104B
REGRIND SCREEN
U/S HOPPER PUMP 2

3041-SA-101
CONS REGRIND
SAMPLER

3041-SA-102
CONS REGRIND
SAMPLER

RO MAGS SCREEN O/S
3030-HP-115
1 | P120-3030-5004

CLEANER DISTRIBUTION BOX
3042-DB-101
2 | P120-3042-5001

CONS REGRIND
3042-AO-101
4 | P120-3042-5003

RO MAGS SCREEN O/S
3030-HP-115
1 | P120-3030-5004

CLEANER DISTRIBUTION BOX
3042-DB-101
2 | P120-3042-5001

CONS REGRIND
3042-AO-101
4 | P120-3042-5003

RO MAG SEPARATORS
3 | P120-3030-5001

NOTES:

1. THE CIRCUIT SHOWN APPLIES TO A SINGLE, 2.5 Mtpa CONCENTRATE PRODUCTION TRAIN.
2. FOR 15 Mtpa OPTION, SIX OFF TRAINS WILL BE REQUIRED.

NOT FOR CONSTRUCTION

REFERENCE DRAWINGS

DRAWING No	DRAWING TITLE

REVISIONS

No	DATE	DESCRIPTION	BY	CKD	ENG
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DESIGNED	GL		08.03.2012
DESIGN CHECK			
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ENGINEERING MAN.			
PROJECT MAN.			

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CLIENT: MARAMPA IRON ORE LIMITED

PROJECT: MARAMPA IRON ORE PROJECT

TITLE: 15 Mtpa SCOPING STUDY - AREA 3041
CONCENTRATE REGRIND
PROCESS FLOW DIAGRAM

SCALE: NTS | A1 | DRAWING No: M6037-P120-3041-5001 | REV: E

WASH WATER 3050-PU-106A/B
1 P120-3050-5001

MAGS FEED 3030-PU-117
3 P120-3030 -5004

3042-PU-110
2 P120-3042-5003

MAGS FEED 3041-PU-102
2 P120-3041 -5001

WASH WATER
1 P120-3042-5002

NOTES:
1. THE CIRCUIT SHOWN APPLIES TO STAGE 1 FOR A 2.5 Mtpa CONCENTRATE PRODUCTION TRAIN.
2. FOR STAGE 2 - 15 Mtpa, SIX CIRCUITS WILL BE REQUIRED.

3042-DB-101 CLEANER DISTRIBUTION BOX

3042-DB-102 MS-101/102 DISTRIBUTION BOX

3042-DB-104 MS-105/106 DISTRIBUTION BOX

3042-DB-103 MS-103/104 DISTRIBUTION BOX

3042-DB-105 MS-107/108 DISTRIBUTION BOX

3042-MS-101 CLEANER MAGNETIC SEPARATOR 1

3042-MS-102 CLEANER MAGNETIC SEPARATOR 2

3042-MS-103 CLEANER MAGNETIC SEPARATOR 3

3042-MS-104 CLEANER MAGNETIC SEPARATOR 4

3042-MS-105 CLEANER MAGNETIC SEPARATOR 5

3042-MS-106 CLEANER MAGNETIC SEPARATOR 6

3042-MS-107 CLEANER MAGNETIC SEPARATOR 7

3042-MS-108 CLEANER MAGNETIC SEPARATOR 8

3042-SS-191 AREA 3042 EYE BATH

3042-SA-101 CLEANER TAILS SAMPLER 1

3042-PU-101A CLEANER TAILS PUMP 1

3042-PU-101B CLEANER TAILS PUMP 1 (STAND-BY)

3042-HP-101 CLEANER TAILS HOPPER 1

3030-PU-191 CLEANER AREA SUMP PUMP

3042-SA-103 CLEANER CONS SAMPLER 1

3042-PU-103A CLEANER CONS PUMP 1

3042-PU-103B CLEANER CONS PUMP 1 (STAND-BY)

3042-HP-103 CLEANER CONS HOPPER 1

3042-SA-102 CLEANER TAILS SAMPLER 2

3042-PU-102A CLEANER TAILS PUMP 2

3042-PU-102B CLEANER TAILS PUMP 2 (STAND-BY)

3042-HP-102 CLEANER TAILS HOPPER 2

LOCAL SAMPLE

3042-SA-104 CLEANER CONS SAMPLER 2

3042-PU-104A CLEANER CONS PUMP 2

3042-PU-104B CLEANER CONS PUMP 2 (STAND-BY)

3042-HP-104 CLEANER CONS HOPPER 2

LOCAL SAMPLE

SCREEN 3020-SC-101
2 P120-3020-5001

CONS 3042-AO-101
3 P120-3042-5003

CONS 3042-DB-106
4 P120-3042-5002

CONS 3042-AO-101
5 P120-3042-5003

SCREEN 3020-SC-101
6 P120-3020-5001

CONS 3042-DB-106
8 P120-3042-5002

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DESIGNED	GL		08.03.2012
DESIGN CHECK			
DISCIPLINE APPR.			
ENGINEERING MAN.			
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CLIENT MARAMPA IRON ORE LIMITED

PROJECT MARAMPA IRON ORE PROJECT

TITLE 15 Mtpa SCOPING STUDY - AREA 3042
CLEANER MAGNETIC SEPARATION
PROCESS FLOW DIAGRAM

SCALE NTS | A1 | DRAWING No M6037-P120-3042-5001 | REV D

WASH WATER
1 | P120-3042-5001

MAGS FEED 3042-PU-103
4 | P120-3042 -5001

MAGS FEED 3042-PU-104
8 | P120-3042 -5001

NOTES:

1. THE CIRCUIT SHOWN APPLIES TO STAGE 1 FOR A 2.5 Mtpa CONCENTRATE PRODUCTION TRAIN.
2. FOR STAGE 2 - 15 Mtpa, SIX CIRCUITS WILL BE REQUIRED.

3042-DB-106 CLEANER DISTRIBUTION BOX

3042-DB-107 MS-109/110 DISTRIBUTION BOX

3042-DB-109 MS-113/114 DISTRIBUTION BOX

3042-DB-108 MS-111/112 DISTRIBUTION BOX

3042-DB-110 MS-115/16 DISTRIBUTION BOX

3042-MS-109 RECLEANER MAGNETIC SEPARATOR 1

3042-MS-110 RECLEANER MAGNETIC SEPARATOR 2

3042-MS-111 RECLEANER MAGNETIC SEPARATOR 3

3042-MS-112 RECLEANER MAGNETIC SEPARATOR 4

3042-MS-113 RECLEANER MAGNETIC SEPARATOR 5

3042-MS-114 RECLEANER MAGNETIC SEPARATOR 6

3042-MS-115 RECLEANER MAGNETIC SEPARATOR 7

3042-MS-116 RECLEANER MAGNETIC SEPARATOR 8

REGRIND SCREEN 3041-SC-101
2 | P120-3041-5001

CONS 3050-DB-101
3 | P120-3050-5001

CONS 3042-AO-101
4 | P120-3042-5003

TAILS 3041-SC-101
5 | P120-3041-5001

CONS 3050-DB-101
6 | P120-3050-5001

3042-SS-192 AREA 3042 EYE BATH

3042-PU-105A RECLEANER TAILS PUMP 1

3042-PU-105B RECLEANER TAILS PUMP 1 (STAND-BY)

3042-HP-105 RECLEANER TAILS HOPPER 1

3042-SA-105 RECLEANER CONS SAMPLER 1

3042-PU-107A RECLEANER CONS PUMP 1

3042-PU-107B RECLEANER CONS PUMP 1 (STAND-BY)

3042-HP-107 RECLEANER CONS HOPPER 1

3042-PU-106A RECLEANER TAILS PUMP 2

3042-PU-106B RECLEANER TAILS PUMP 2 (STAND-BY)

3042-HP-106 RECLEANER TAILS HOPPER 2

3042-SA-106 RECLEANER CONS SAMPLER 2

LOCAL SAMPLE

3042-PU-108A RECLEANER CONS PUMP 2

3042-PU-108B RECLEANER CONS PUMP 2 (STAND-BY)

3042-HP-108 RECLEANER CONS HOPPER 2

3030-PU-192 RECLEANER AREA SUMP PUMP

NOT FOR CONSTRUCTION

REFERENCE DRAWINGS

DRAWING No	DRAWING TITLE

REVISIONS

No	DATE	DESCRIPTION	BY	CKD	ENG
D	08.03.12	ISSUED FOR CLIENT REVIEW	MIM	PB	GL
C	26.08.11	BASIS OF ESTIMATE UPDATED	JCM	PB	
B	08.08.11	BASIS OF ESTIMATE	JCM	MRW	
A	30.06.11	ISSUED FOR DESIGN REVIEW	JCM		

	BY	SIGN	DATE
DRAWN	MIM		08.03.2012
CHECKED			
DESIGNED	GL		08.03.2012
DESIGN CHECK			
DISCIPLINE APPR.			
ENGINEERING MAN.			
PROJECT MAN.			

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BATEMAN ENGINEERING PTY LTD
(ABN 67 009 001 558)

A MEMBER OF THE BATEMAN ENGINEERING NV GROUP

CLIENT: MARAMPA IRON ORE LIMITED

PROJECT: MARAMPA IRON ORE PROJECT

TITLE: 15 Mtpa SCOPING STUDY - AREA 3042 RECLEANER MAGNETIC SEPARATION PROCESS FLOW DIAGRAM

SCALE: NTS | A1 | DRAWING No: M6037-P120-3042-5002 | REV: D

NOTES:

1. THE CIRCUIT SHOWN APPLIES TO STAGE 1 FOR A 2.5 Mtpa CONCENTRATE PRODUCTION TRAIN.
2. FOR STAGE 2 - 15 Mtpa, SIX CIRCUITS WILL BE REQUIRED.

RECLEANER 1 CONS 3042-SA-105
4 P120-3042-5002

CLEANER 1 TAILS 3042-SA-101
3 P120-3042-5001

CLEANER 1 CONS 3042-SA-103
5 P120-3042-5001

CONS REGRIND 3041-SA-101
4 P120-3041-5001

SCAVENGER 1 TAILS 3030-SA-109
2 P120-3030-5003

SCAVENGER 1 CONS 3030-SA-107
4 P120-3030-5003

ROUGHER 2 CONS 3030-SA-103
4 P120-3030-5002

ROUGHER 1 CONS 3030-SA-101
6 P120-3030-5001

GRINDING 3020-SA-101
2 P120-3020-5001

3042-AO-101
MULTI-STREAM ANALYSER
SAMPLING DEVICE
TRAIN 1

PRIMARY GRINDING SCREEN PRODUCT	MAG SEP ROUGHER 1 CONCENTRATE	MAG SEP ROUGHER 2 CONCENTRATE	MAG SEP SCAVENGER CONCENTRATE	MAG SEP SCAVENGER TAILS	CONCENTRATE REGRIND	MAG SEP CLEANER CONCENTRATE	MAG SEP CLEANER TAILS	MAG SEP RECLEANER CONCENTRATE

9	8	7	6	5	4	3	2	1

3042-AO -201
MULTI-STREAM ANALYSER
SAMPLING DEVICE
TRAIN 2

BALL MILL SCREEN
3020-SC-101
1 P120-3020-5001

CLEANER DISTRIBUTION BOX
3042-DB-101
2 P120-3042-5001

3042-HP-109
MSA
SURGE
HOPPER

3042-PU-109A
OSA RETURN
PUMP

3042-PU-109B
OSA RETURN
PUMP
(STAND-BY)

3042-HP-111
MSA
SURGE
HOPPER

3042-PU-110A
OSA RETURN
PUMP

3042-PU-110B
OSA RETURN
PUMP
(STAND-BY)

NOT FOR CONSTRUCTION

REFERENCE DRAWINGS

DRAWING No	DRAWING TITLE

REVISIONS

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A	30.06.11	ISSUED FOR DESIGN REVIEW	JCM		

	BY	SIGN	DATE
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DESIGNED	GL		08.03.2012
DESIGN CHECK			
DISCIPLINE APPR.			
ENGINEERING MAN.			
PROJECT MAN.			

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CLIENT MARAMPA IRON ORE LIMITED
PROJECT MARAMPA IRON ORE PROJECT
TITLE 15 Mtpa SCOPING STUDY - AREA 3042
MULTI-STREAM ANALYSER - TRAIN 1
PROCESS FLOW DIAGRAM

SCALE NTS | A1 | DRAWING No M6037-P120-3042-5003 | REV D

NOTES:
1. THIS FLOWSHEET APPLIES TO 5 Mtpa CONCENTRATE THICKENING AND 2.5Mtpa CONCENTRATE FILTRATION.

WATER
-
3070-PU-101
2 P120-3070-5001
3050-PU-105
1 P120-3050-5002
MAG SEP CONS 3042-PU-107
3 P120-3042-5002
MAG SEP CONS 3042-PU-108
6 P120-3042-5002
- TRAIN 2

3050-MX-101
FLOCCULANT
MIXER

3050-DB-101
TH-101
FEED BOX

3050-PK-101
MAG CONCENTRATE
THICKENER
VENDOR PACKAGE

3050-PU-191
MAG CONCENTRATE
THICKENER AREA
SUMP PUMP

3050-TH-101
MAG CONCENTRATE
THICKENER

3050-PU-108A
TH-101
U/F PUMP 1

3050-PU-108B
TH-101
U/F PUMP 2

3050-TK-106
TH-101
OVERFLOW TANK

3050-PU-106A
TK-106
TRANSFER PUMP 1

3050-PU-106B
TK-106
TRANSFER PUMP 2

CLEANER & RECLEANER
WASH WATER
1 P120-3042-5001

3050-CN-101
MAG CON FILTER
CRANE

3050-SS-192
AREA 3050
EYE BATH

3050-AG-101
TK-101
AGITATOR 1

3050-TK-101
MAG CONCENTRATE
FILTER FEED TANK 1

3050-PU-101A
FL-101 FEED
PUMP 1

3050-PU-101B
FL-101 FEED
PUMP 2

(8 BAR)

3050-FL-101
MAG CONCENTRATE
FILTER 1

3050-TK-105
2 P120-3050-5002

3050-CV-101
3 P120-3050-5002

- WATER

3050-PU-107A
MAG CONS
GLAND WATER
PUMP 1

GLAND WATER
SUPPLY
TO PUMPS

3050-TK-107
MAG CONCENTRATE
GLAND WATER
TANK

3050-PU-107B
MAG CONS
GLAND WATER
PUMP 2

3050-AG-102
TK-102
AGITATOR 2

3050-TK-102
MAG CONCENTRATE
FILTER FEED TANK 2

3050-PU-102A
FL-102 FEED
PUMP 1

3050-PU-102B
FL-102 FEED
PUMP 2

3050-FL-102
MAG CONCENTRATE
FILTER 2

3050-TK-105
4 P120-3050-5002

3050-CV-102
5 P120-3050-5002

3050-SS-191
AREA 3050
EYE BATH

3050-PK-102A
MAG CONCENTRATE
FILTER PUMPS
VENDOR PACKAGE

- WATER

3050-PU-109A
MAG CONS FILTER
PRESSING WATER
PUMP 1

(16 BAR)

3050-TK-109
MAG CONCENTRATE
FILTER PRESSING
WATER TANK

3050-PU-109B
MAG CONS FILTER
PRESSING WATER
PUMP 2

3050-PK-102A
MAG CONCENTRATE
FILTERS
VENDOR PACKAGE

3050-PK103
6 P120-3050-5003

3050-PK203
-

NOT FOR CONSTRUCTION

REFERENCE DRAWINGS

DRAWING No	DRAWING TITLE

REVISIONS

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A	30.06.11	ISSUED FOR DESIGN REVIEW	JCM		

	BY	SIGN	DATE
DRAWN	MIM		08.03.2012
CHECKED			
DESIGNED	GL		08.03.2012
DESIGN CHECK			
DISCIPLINE APPR.			
ENGINEERING MAN.			
PROJECT MAN.			

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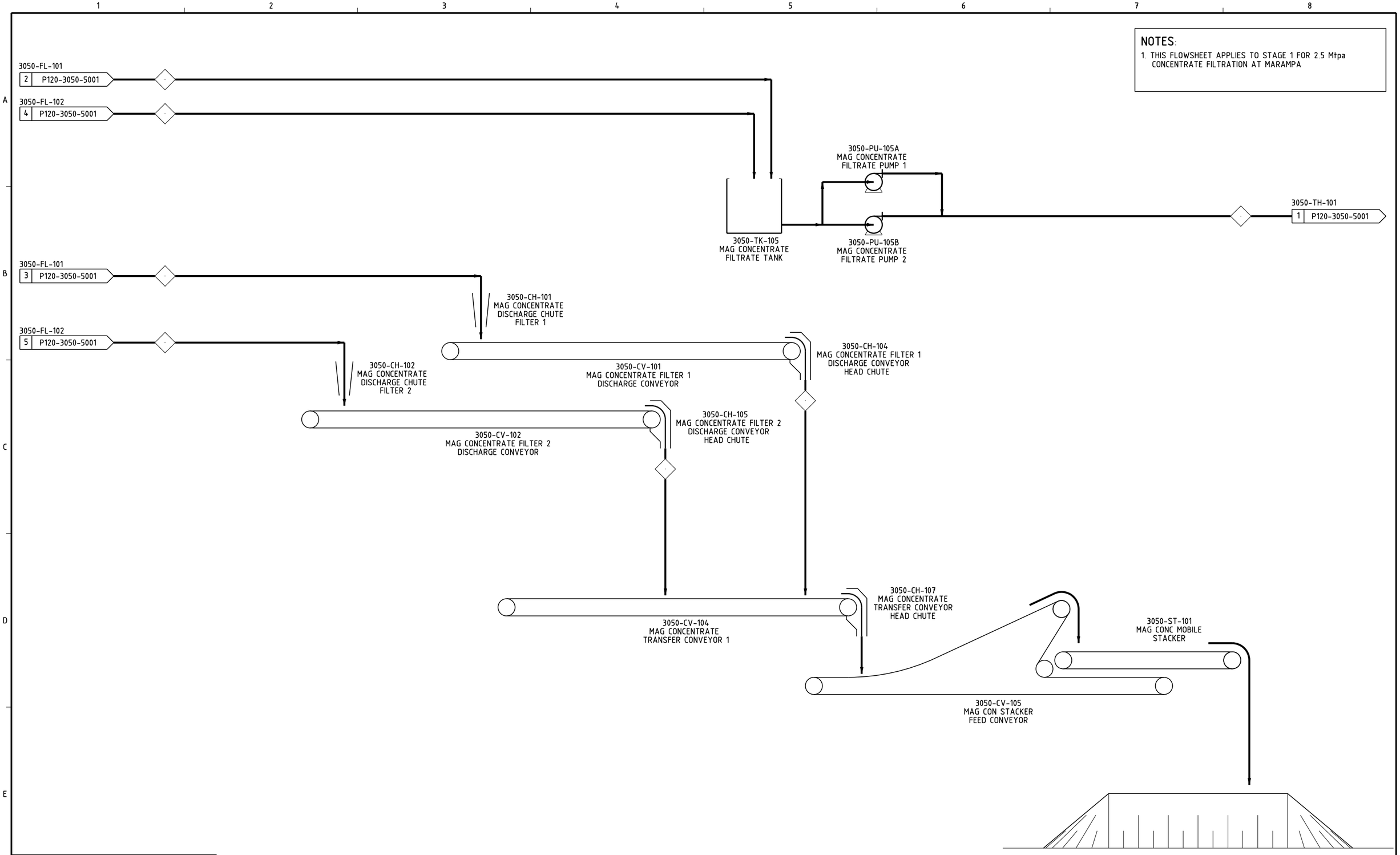
CLIENT MARAMPA IRON ORE LIMITED
PROJECT MARAMPA IRON ORE PROJECT
TITLE 15 Mtpa SCOPING STUDY - AREA 3050 - STAGE 1 CONCENTRATE THICKENING AND FILTRATION RAIL OPTION PROCESS FLOW DIAGRAM
SCALE NTS
A1
DRAWING No M6037-P120-3050-5001
REV D



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REFERENCE DRAWINGS

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	BY	SIGN	DATE
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DESIGNED	GL		08.03.2012
DESIGN CHECK			
DISCIPLINE APPR.			
ENGINEERING MAN.			
PROJECT MAN.			

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CLIENT MARAMPA IRON ORE LIMITED

PROJECT MARAMPA IRON ORE PROJECT

TITLE 15 Mtpa SCOPING STUDY - AREA 3050
CONCENTRATE THICKENING & FILTRATION
PROCESS FLOW DIAGRAM

SCALE		DRAWING No	REV
NTS	A1	M6037-P120-3050-5002	D

WATER
- -

FLOCCULANT 3070-PU-102
2 P120-3070-5001

3050-PU-105
1 P120-3050-5002

MAG SEP CONS 3042-PU-107
3 P120-3042-5002

MAG SEP CONS 3042-PU-108
6 P120-3042-5002

3050-MX-201
FLOCCULANT
MIXER

3050-DB-201
TH-201
FEED BOX

3050-PK-201
MAG CONCENTRATE
THICKENER
VENDOR PACKAGE

3050-TH-201
MAG CONCENTRATE
THICKENER

3050-TK-206
TH-201
OVERFLOW TANK

3050-PU-206A
TK-206
TRANSFER PUMP 1

3050-PU-206B
TK-206
TRANSFER PUMP 2

CLEANER & RECLEANER
WASH WATER
1 P120-3042-5001

- P120-3050-5001

3050-PU-208A
TH-201
U/F PUMP

3050-PU-208B
TH-201
U/F PUMP

3050-PK-103
CONCENTRATE HOLDING TANKS
& 1st STAGE PIPELINE PUMPS
VENDOR PACKAGE

2 P120-4092-5001

3050-PU-291
MAG CONCENTRATE
THICKENER AREA
SUMP PUMP

3050-SS-192
AREA 3050
EYE BATH

NOTES:

1. THIS FLOWSHEET REPRESENTS THE ADDITIONAL EQUIPMENT REQUIRED FOR STAGE 2 PLANT UPGRADE AND WOULD BE DUPLICATED FOR CONSTRUCTION.

NOT FOR CONSTRUCTION

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DESIGNED	GL		08.03.2012
DESIGN CHECK			
DISCIPLINE APPR.			
ENGINEERING MAN.			
PROJECT MAN.			

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CLIENT MARAMPA IRON ORE LIMITED

PROJECT MARAMPA IRON ORE PROJECT

TITLE 15 Mtpa SCOPING STUDY - AREA 3050 - STAGE 2
CONCENTRATE THICKENING AND FILTRATION
PIPE LINE OPTION PROCESS FLOW DIAGRAM

SCALE NTS | A1 | DRAWING No M6037-P120-3050-5003 | REV D

WATER
- | -

FLOCCULANT 3070-PU-101
1 | P120-3070-5001

3030-PU-111
1 | P120-3030-5003

3030-PU-112
5 | P120-3030-5003

- | TRAIN 2

3070-PU-191
3 | P120-3070-5001

3070-PU-192
4 | P120-3070-5001

3053-MX-101
FLOCCULANT
MIXER

3053-DB-101
TH-001
FEED BOX

3053-PK-101
TAILINGS
THICKENER
VENDOR PACKAGE

3053-TH-101
TAILINGS
THICKENER

PROCESS WATER TANK
3080-TK-103
1 | P120-3080-5001

3053-SS-191
AREA 353
EYE BATH

3053-PU-101A
TAILINGS THICKENER
U/F PUMP 1

3053-PU-101B
TAILINGS THICKENER
U/F PUMP 1

3053-HP-101
PUMP HOPPER

3053-PU-102A
TAILINGS THICKENER
U/F PUMP 2

3053-PU-102B
TAILINGS THICKENER
U/F PUMP 2

3053-PU-103A
TAILINGS THICKENER
U/F PUMP 3

3053-PU-103B
TAILINGS THICKENER
U/F PUMP 3

3053-PU-104A
TAILINGS THICKENER
U/F PUMP 4

3053-PU-104B
TAILINGS THICKENER
U/F PUMP 4

3053-PU-105A
TAILINGS THICKENER
U/F PUMP 5

3053-PU-105B
TAILINGS THICKENER
U/F PUMP 5

3053-DB-201
3 | -

3053-DB-301
4 | -

3053-PU-107
TAILINGS DECANT
PUMP 1

3053-PU-108
TAILINGS DECANT
PUMP 2

TAILINGS STORAGE
FACILITY

3053-PU-191
TAILINGS THICKENER
AREA
SUMP PUMP

3053-SS-192
AREA 353
EYE BATH

NOTES:
1. THIS FLOWSHEET APPLIES TO STAGE 1, FOR 5 Mtpa CONCENTRATE PRODUCTION.
2. FOR STAGE 2 - 15 Mtpa, THREE CIRCUITS ARE REQUIRED.

NOT FOR CONSTRUCTION

REFERENCE DRAWINGS

DRAWING No	DRAWING TITLE

REVISIONS

No	DATE	DESCRIPTION	BY	CKD	ENG
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A	30.06.11	ISSUED FOR DESIGN REVIEW	JCM		

	BY	SIGN	DATE
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CHECKED			
DESIGNED	GL		08.03.2012
DESIGN CHECK			
DISCIPLINE APPR.			
ENGINEERING MAN.			
PROJECT MAN.			

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A MEMBER OF THE BATEMAN ENGINEERING NV GROUP

CLIENT: MARAMPA IRON ORE LIMITED
PROJECT: MARAMPA IRON ORE PROJECT
TITLE: 15 Mtpa SCOPING STUDY - AREA 3053 TAILINGS THICKENING PROCESS FLOW DIAGRAM
SCALE: NTS | A1 | DRAWING No: M6037-P120-3053-5001 | REV: D

NOTES:
1. THIS FLOWSHEET APPLIES TO STAGE 1, FOR 5 Mtpa CONCENTRATE PRODUCTION.
2. FOR STAGE 2 - 15 Mtpa, THREE CIRCUITS ARE REQUIRED.

POTABLE WATER
- P120-3080-5001

3070-SS-191
SAFETY SHOWER
AND EYEWASH 1

3070-SS-192
SAFETY SHOWER
AND EYEWASH 2

3070-CN-101
BULKA BAG
CRANE

3070-PK-101
FLOCCULANT MIXING SYSTEM
VENDOR PACKAGE

3070-TK-101
FLOCCULANT STORAGE
TANK

3070-PU-101B
TAILINGS THICKENER
FLOC DOSING PUMP

3070-PU-101A
TAILINGS THICKENER
FLOC DOSING PUMP

3070-PU-102A
CONCENTRATE THICKENER
FLOC DOSING PUMP

3070-PU-102B
CONCENTRATE THICKENER
FLOC DOSING PUMP

FLOCCULANT 3053-MX-101
1 P120-3053-5001

FLOCCULANT 3050-MX-101
2 P120-3050-5001

3053-HP-101
3 P120-3053-5001

3053-HP-101
4 P120-3053-5001

3070-PU-191
REAGENT AREA
SUMP PUMP 1

3070-PU-192
REAGENT AREA
SUMP PUMP 1

NOT FOR CONSTRUCTION

REFERENCE DRAWINGS

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CHECKED			
DESIGNED	GL		08.03.2012
DESIGN CHECK			
DISCIPLINE APPR.			
ENGINEERING MAN.			
PROJECT MAN.			

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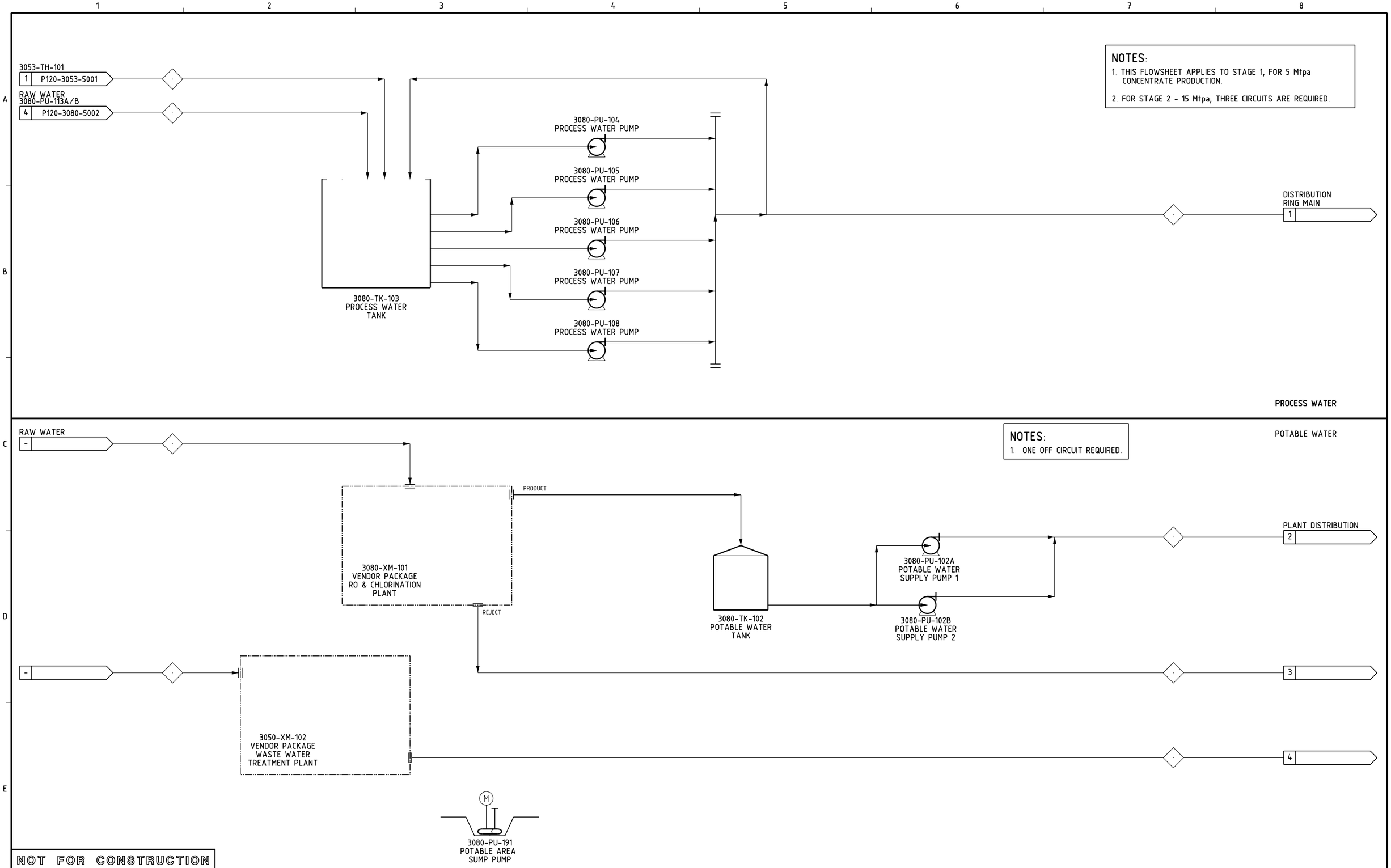
CLIENT: MARAMPA IRON ORE LIMITED
PROJECT: MARAMPA IRON ORE PROJECT
TITLE: 15 Mtpa SCOPING STUDY - AREA 3070
REAGENTS
PROCESS FLOW DIAGRAM
SCALE: NTS
A1
DRAWING No: M6037-P120-3070-5001
REV: D



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DRAWN	MIM		08.03.2012
CHECKED			
DESIGNED	GL		05.03.2012
DESIGN CHECK			
DISCIPLINE APPR.			
ENGINEERING MAN.			
PROJECT MAN.			
	BY	SIGN	DATE

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(ABN 67 009 001 558)

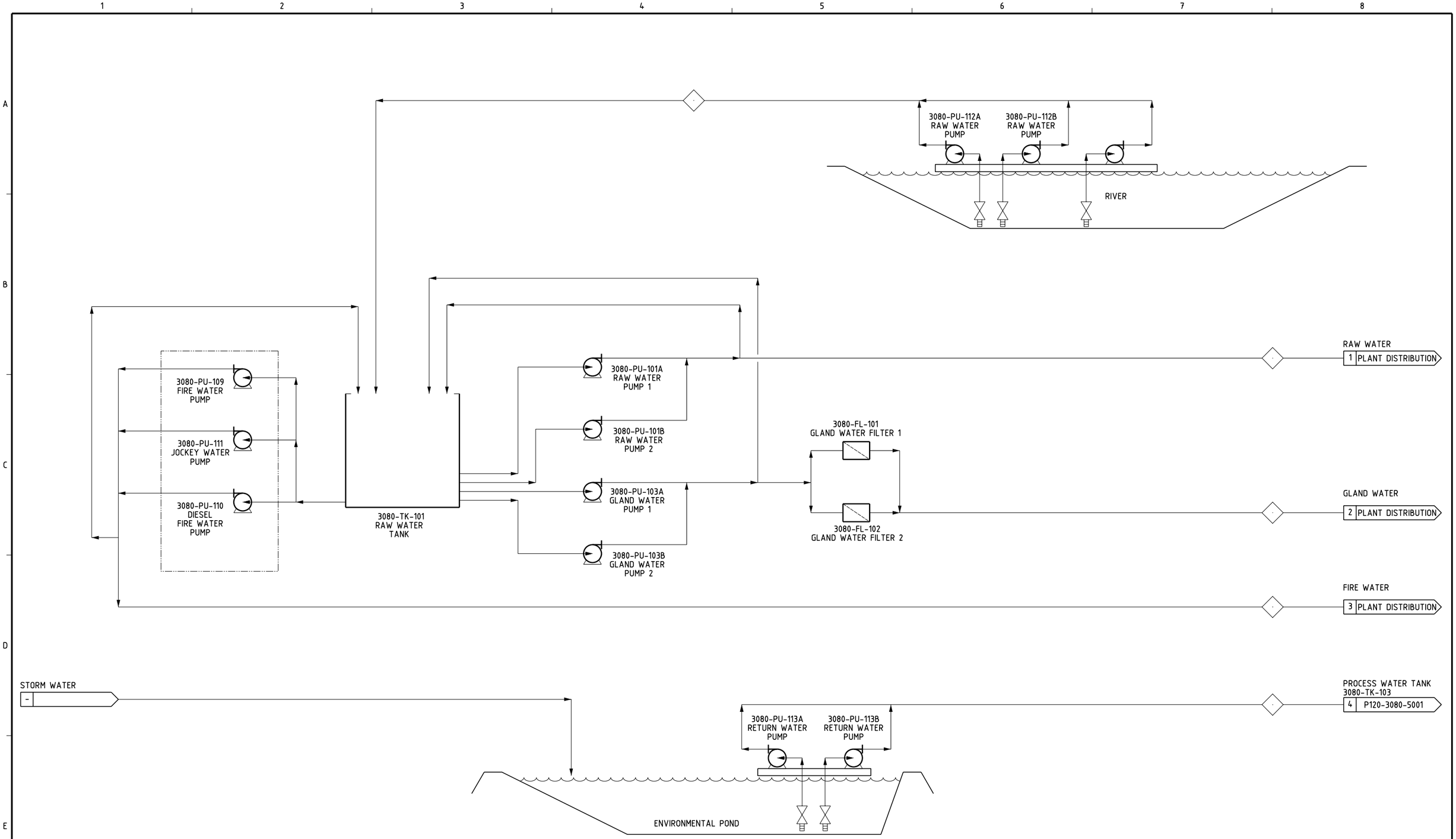
A MEMBER OF THE BATEMAN ENGINEERING NV GROUP

CLIENT: MARAMPA IRON ORE LIMITED

PROJECT: MARAMPA IRON ORE PROJECT

TITLE: 15 Mtpa SCOPING STUDY - AREA 3080
SERVICES - PROCESS AND POTABLE WATER
PROCESS FLOW DIAGRAM

SCALE		DRAWING No	REV
NTS	A1	M6037-P120-3080-5001	D



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REFERENCE DRAWINGS

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REVISIONS

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	BY	SIGN	DATE
DRAWN	MIM		08.03.2012
CHECKED			
DESIGNED	GL		08.03.2012
DESIGN CHECK			
DISCIPLINE APPR.			
ENGINEERING MAN.			
PROJECT MAN.			

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(ABN 67 009 001 558)

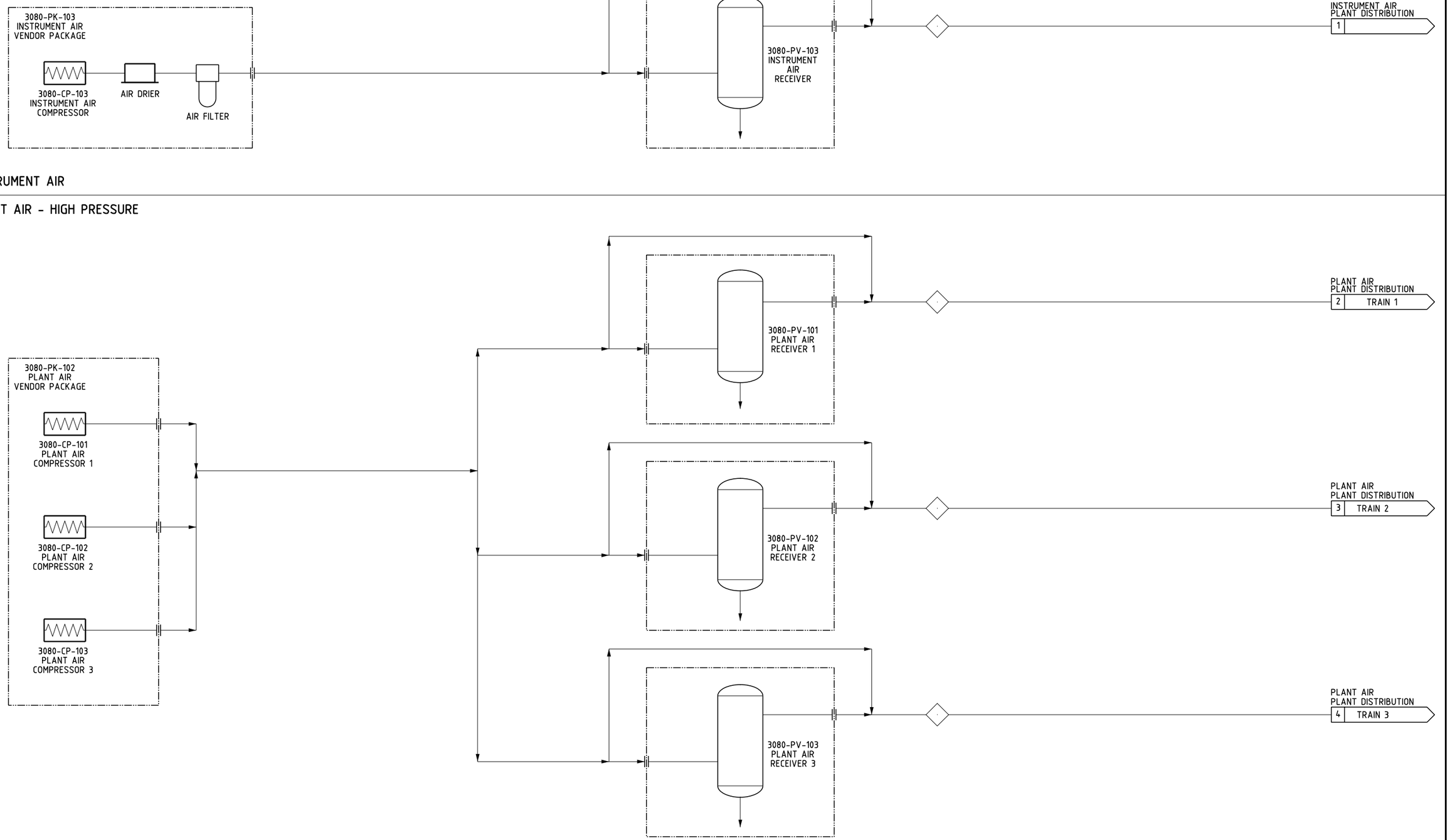
A MEMBER OF THE BATEMAN ENGINEERING NV GROUP

CLIENT: MARAMPA IRON ORE LIMITED

PROJECT: MARAMPA IRON ORE PROJECT

TITLE: 15 Mtpa SCOPING STUDY - AREA 3080
SERVICES - RAW, GLAND AND FIRE WATER
PROCESS FLOW DIAGRAM

SCALE: NTS | A1 | DRAWING No: M6037-P120-3080-5002 | REV: D



NOT FOR CONSTRUCTION

REFERENCE DRAWINGS

DRAWING No	DRAWING TITLE

REVISIONS

No	DATE	DESCRIPTION	BY	CKD	ENG
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B	08.08.11	BASIS OF ESTIMATE	JCM	MRW	
A	30.06.11	ISSUED FOR DESIGN REVIEW	JCM		

	BY	SIGN	DATE
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DESIGNED	GL		08.03.2012
DESIGN CHECK			
DISCIPLINE APPR.			
ENGINEERING MAN.			
PROJECT MAN.			

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A MEMBER OF THE BATEMAN ENGINEERING NV GROUP

CLIENT: MARAMPA IRON ORE LIMITED

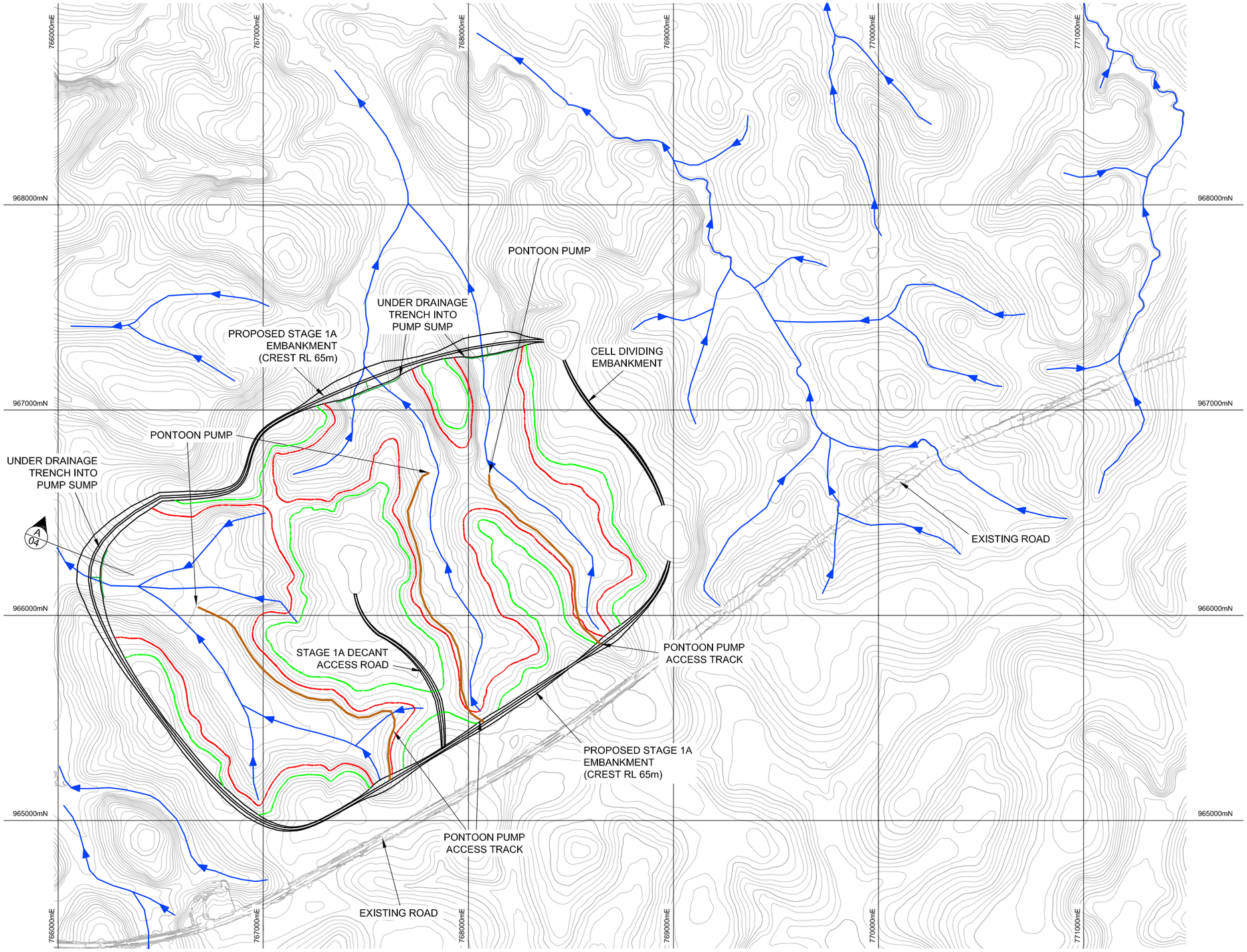
PROJECT: MARAMPA IRON ORE PROJECT

TITLE: 15 Mtpa SCOPING STUDY - AREA 3080
SERVICES - PLANT AND INSTRUMENT AIR
PROCESS FLOW DIAGRAM

SCALE		DRAWING No	REV
NTS	A1	M6037-P120-3080-5003	E

M6037
6/08/2012 3:55:49 PM - K:\Projects\M6037\3001 General\PFD\M6037-P120-3080-5003.dgn -

APPENDIX E3: TAILINGS STORAGE FACILITY DRAWINGS



LEGEND

- APPROXIMATE YEAR 2 TAILINGS EXTEND - 55mRL
- APPROXIMATE YEAR 3 TAILINGS EXTEND - 58mRL
- DRAINAGE LINES
- TOPOGRAPHY (1m)
- TOPOGRAPHY (5m)

TAILINGS STORAGE FACILITY - STAGE 1A
PLAN
SCALE 1:10 000

notes:

1. SURVEY DATA PROVIDED BY CAPE LAMBERT IRON APRIL 2011.
2. TAILINGS STORAGE CAPACITY REQUIRED 21,4Mm³, ACTUAL STORAGE CAPACITY 24,1Mm³ (2 YEARS).
3. FREEBOARD 5m, DENSITY 1,5t/m³.
4. EMBANKMENT VOLUME 2,009,825m³.

rev no	revision note	date	approved
A	ISSUED FOR CLIENT REVIEW	08/08/11	CH

Drawn:	FvdL
Approved:	CH
Date:	08/08/11
Scale:	1:10 000
Original size:	A1

coffey mining
SPECIALISTS FROM BOARDROOM TO MINE FACE

Client:	CAPE LAMBERT IRON
Project:	MARAMPA IRON ORE PROJECT MARAMPA MINE
Title:	TAILINGS STORAGE FACILITY STAGE 1A PLAN
Project no:	MWP00866AA
Dwg no:	MWP00866AA-02A
Rev:	A

REF:
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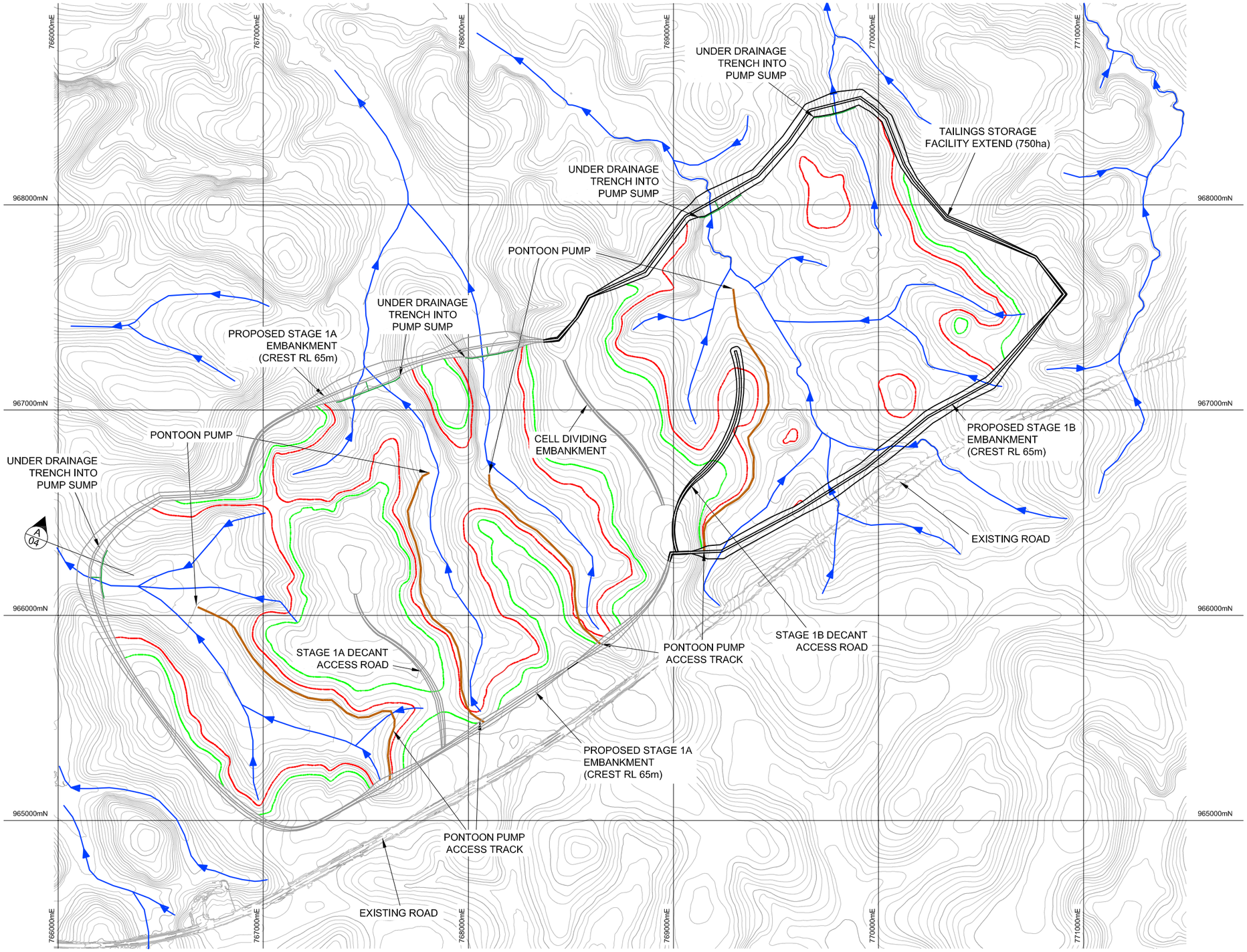

LEGEND

- APPROXIMATE YEAR 2 TAILINGS EXTEND - 55mRL
- APPROXIMATE YEAR 3 TAILINGS EXTEND - 58mRL
- DRAINAGE LINES
- TOPOGRAPHY (1m)
- TOPOGRAPHY (5m)

TAILINGS STORAGE FACILITY - STAGE 1 PLAN

SCALE 1:10 000

notes:

1. SURVEY DATA PROVIDED BY CAPE LAMBERT IRON APRIL 2011.
2. TAILINGS STORAGE CAPACITY REQUIRED 42,7Mm³, ACTUAL STORAGE CAPACITY 44,7Mm³ (4 YEARS).
3. FREEBOARD 5m, DENSITY 1,5t/m³.
4. EMBANKMENT VOLUME 4,118,800m³.

rev no	revision note	date	approved
E	TAILINGS STORAGE FACILITY STAGE 1A / STAGE 1B SPLIT	08/08/2011	CH
D	TAILINGS STORAGE FACILITY ENLARGED	08/06/2011	CH
C	ADJUSTED NOTES TEXT	03/05/11	CH
B	UPDATED DESIGN	19/04/11	CH
A	ISSUED FOR CLIENT REVIEW	11/04/11	CH

Drawn: FvdL
Approved: CH
Date: 03/05/11
Scale: 1:10 000
Original size: A1

coffey mining
SPECIALISTS FROM BOARDROOM TO MINE FACE

Client: CAPE LAMBERT IRON
Project: MARAMPA IRON ORE PROJECT MARAMPA MINE
Title: TAILINGS STORAGE FACILITY STAGE 1 PLAN
Project no: MWP00866AA
Dwg no: MWP00866AA-02
Rev: E

REF:
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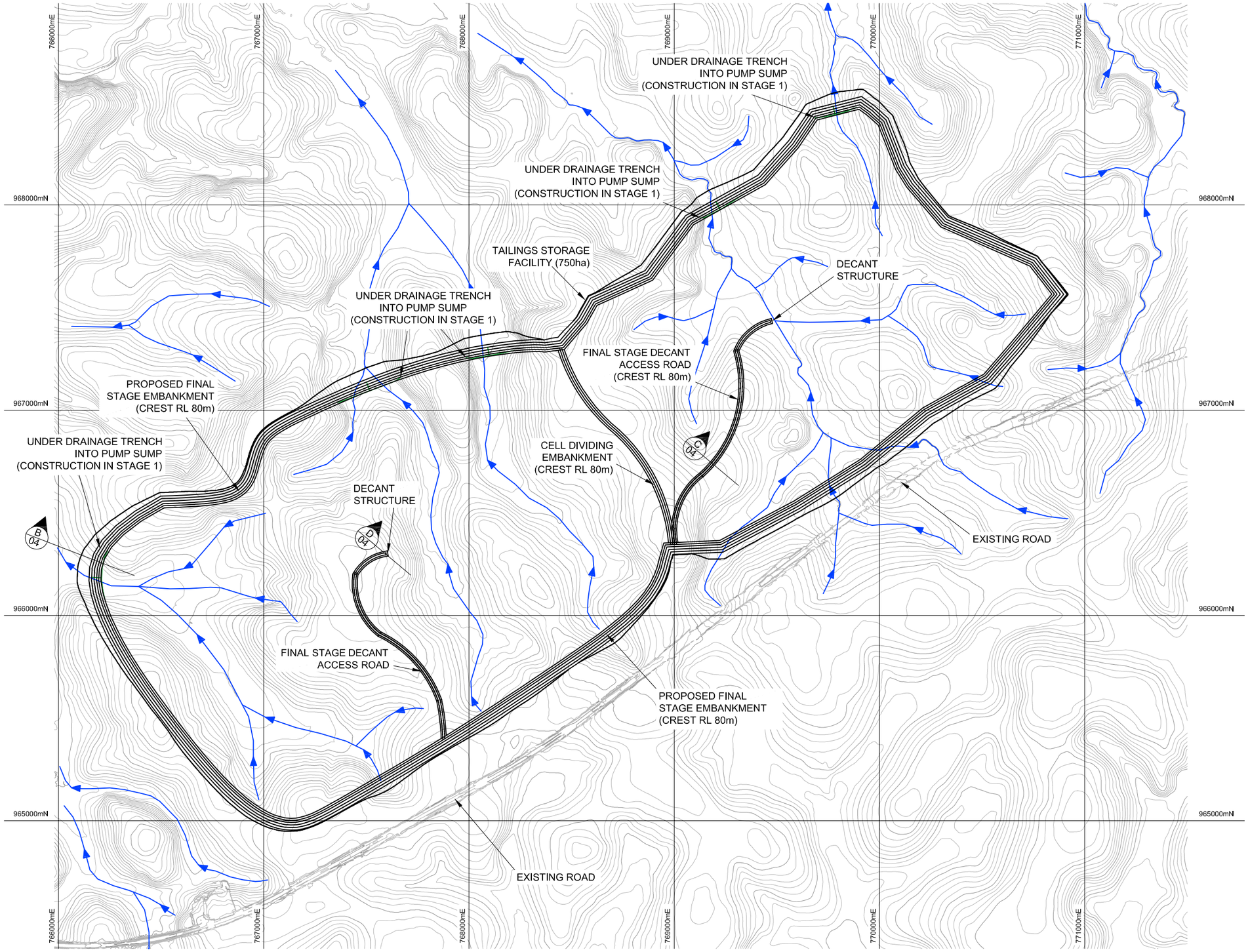

LEGEND

- DRAINAGE LINES
- TOPOGRAPHY (1m)
- TOPOGRAPHY (5m)

TAILINGS STORAGE FACILITY - FINAL STAGE PLAN
SCALE 1:10 000

notes:

1. SURVEY DATA PROVIDED BY CAPE LAMBERT IRON APRIL 2011.
2. TAILINGS STORAGE CAPACITY REQUIRED 128Mm³, ACTUAL STORAGE CAPACITY 144,9Mm³ (10 YEARS).
3. FREEBOARD 5m, DENSITY 1,5t/m³.
4. EMBANKMENT VOLUME 11,240,900m³.

rev no	revision note	date	approved
D	TAILINGS STORAGE FACILITY ENLARGED	08/06/2011	CH
C	ADJUSTED NOTES TEXT	03/05/11	CH
B	UPDATED DESIGN	19/04/11	CH
A	ISSUED FOR CLIENT REVIEW	11/04/11	CH

Drawn:	FvdL
Approved:	CH
Date:	03/05/11
Scale:	1:10 000
Original size:	A1

coffey mining
SPECIALISTS FROM BOARDROOM TO MINE FACE

Client: CAPE LAMBERT IRON
Project: MARAMPA IRON ORE PROJECT
MARAMPA MINE
Title: TAILINGS STORAGE FACILITY FINAL STAGE PLAN
Project no: MWP00866AA
Dwg no: MWP00866AA-03
Rev: D

REF:
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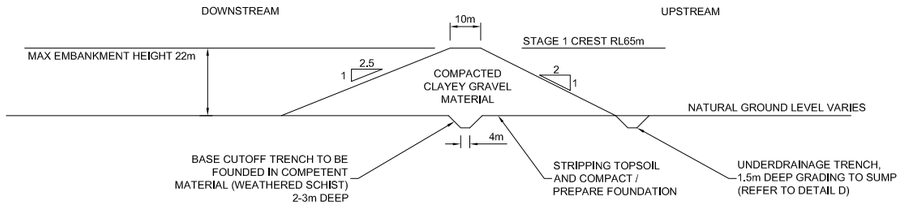

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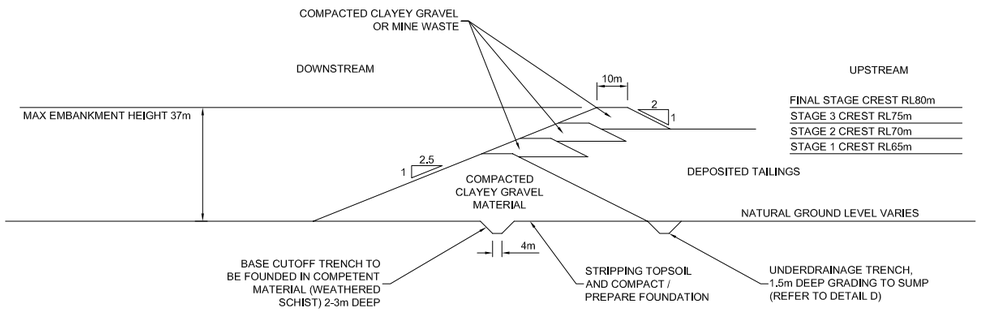
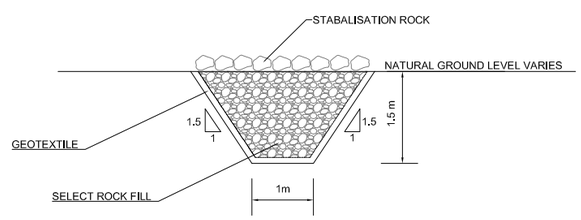


B 03 FINAL EMBANKMENT
TYPICAL SECTION
SCALE: N.T.S

C 03 DECANT ACCESS ROAD
TYPICAL SECTION
SCALE: N.T.S



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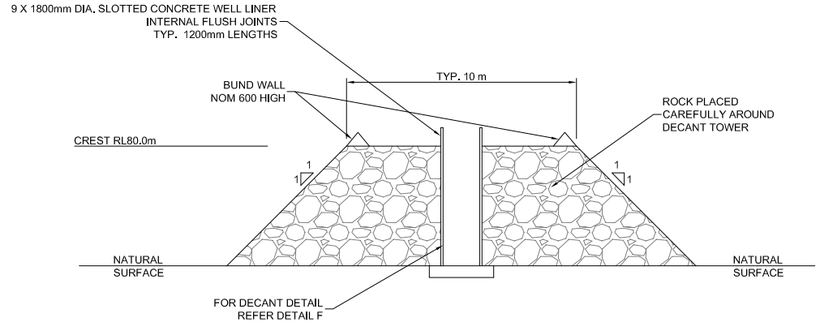

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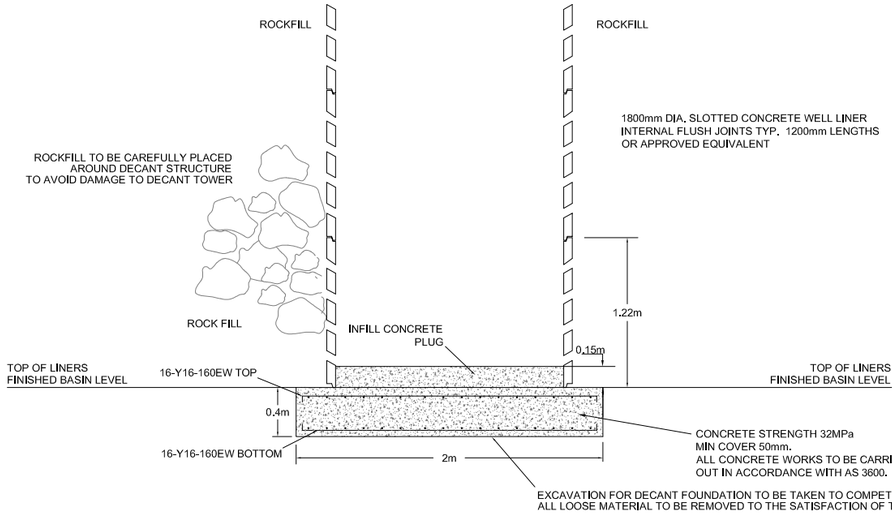

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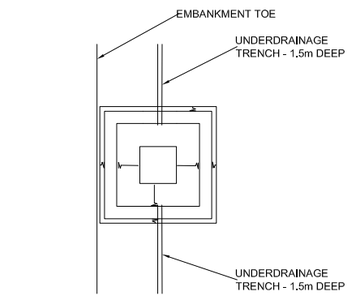

G - UNDERDRAINAGE SUMP
LAYOUT PLAN
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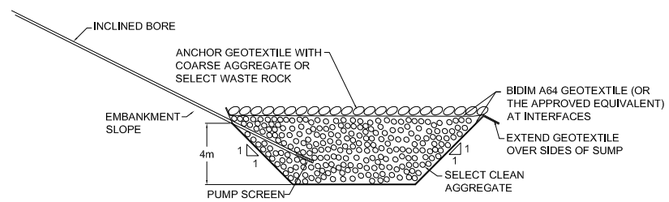

H - UNDERDRAINAGE SUMP
TYPICAL SECTION
SCALE: N.T.S

notes:

REFERENCE DRAWINGS:
1. MWP00866AA-02
2. MWP00886AA-03

rev no	revision note	date	approved
A	ISSUED FOR CLIENT REVIEW	17/06/11	CH

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Approved:	CH
Date:	17/06/11
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Original size:	A1

coffey mining
SPECIALISTS FROM BOARDROOM TO MINE FACE

Client:	CAPE LAMBERT IRON
Project:	MARAMPA IRON ORE PROJECT MARAMPA MINE
Title:	TYPICAL SECTIONS AND DETAILS
Project no:	MWP00866AA
Dwg no:	MWP00866AA-04
Rev:	A

REF:
DWG: F:\MINE\Projects\Cape Lambert Iron Ore Ltd\MINE\WPER00886AA_Marampa FS\DWG\MWP00886AA - 04 Rev A.dwg

APPENDIX F

F ENVIRONMENTAL MANAGEMENT PROGRAMME

Appendix F: Preliminary Environmental Management Programme

The tables below list the management measures identified in the ESIA. The first table presents the commitments arising from the biophysical impact assessment process and relate directly to the identified impacts in Chapter 7 of the ESIA. The second table presents the commitments arising from the social impact assessment (Chapter 8), and the third table presents those arising from the community health, safety and security impact assessment (Chapter 9). The fourth table is a table of general commitments, which are not specific to any individual impact but represent good industry practice.

These programmes have been developed as outlined in Section 11.1.4. The column headings are explained below.

- **Impact reference** – this specifies the impacts the proposed management measure influences (Tables 1 to 3 only).
- **Objective** - statement of the objective of the management action/s, which generally addresses the impact/s.
- **Reference number** - a unique reference for the management measure.
- **Type** – an abbreviation indicating the type of the management measure (IH = inherent design or management described in Chapter 4, MM = mitigation measure, EM = enhancement measure, GP = good practice measure).
- **Management measure** - a description of the measure or action, which will be clear, concise and specific enough to enable execution of the action. Where relevant, the appropriate targets, indicators, trigger points and/or threshold levels will be incorporated into the management measure. If a set of management actions is required to meet the objective, the ESMP will be simplified by making a commitment to develop an appropriate supporting document in which the detail will be provided. Where the management measure cross references to another measure under a different impact it is shown in italics.
- **Project phase** – an abbreviation indicating the project phase/s when the management measure is applicable (DD= Detailed design, C = Construction, O = Operation, D = Decommissioning, PC = Post Closure).
- **Timing** – the time when the management action should be implemented and/or completed, and if relevant, how frequently it should be undertaken.
- **Achievement criteria** – an indication of how achievement of the management measure will be assessed, which will be used to develop the monitoring, inspection or audit programmes.

Table F1: Management programme to address identified biophysical impacts

Impact Ref.	Objective	Ref no.	Type	Management measure	Proj. Phase	Timing	Achievement criteria
LT1	Minimise limits on land use by local communities due to land modification	1	IH	Rehabilitate the land and make it available for use by communities post-closure	O, D, PC	Progressive rehabilitation ongoing Land handed to communities after decommissioning	Closure and Rehabilitation Plan developed in consultation with communities; rehabilitated site signed off by environmental officer and if necessary regulatory authorities
				Refer to mitigation measures listed for impact RL1			
		2	GP	Develop a Construction Management Plan that includes requirements to: • Minimise the footprint disturbed during construction, operation and decommissioning of the Project. • Minimise the duration of the disturbance by starting rehabilitation as soon as possible and progressively rehabilitating disturbed areas that are no longer being used for the Project, and making them available for communities to use.	DD, C	Develop the plan prior to construction commencing; implement it during construction	Plan in place with evidence of implementation. Compliance with the plan included in the contract documentation of contractors appointed
		3	GP	Prohibit unnecessary off road driving, and use planned and designated access routes and lay-down areas only.	C, O, D	Ongoing	No visual evidence of Project related use of non-designated access routes or lay-down areas.
		4	GP	Review and update the Closure and Rehabilitation Plan periodically to address current site conditions; community expectations; and the results of ongoing routine monitoring.	O, D	At least every three years	Plan in place with record of review outcomes
LT2	Minimise disruption to community access routes			*Refer to measures under RL2*			
LT3	Minimise visual intrusion associated with mine activities and infrastructure	5	IH	Develop a waste landfill site to handle non-mining waste generated by the Project.	C, O	Open prior to commencement of construction and close on decommissioning	Waste management plan implemented; no visible Project-related waste or waste-related complaints.
		6	MM	At closure, remove mine infrastructure that does not have a continued use.	D	As soon as infrastructure is no longer needed	Records of consultation with communities and government; inventory of infrastructure left on site, listing its post-closure use
		7	MM	Revegetate and landscape the site on closure, to reflect the surrounding topography and vegetation as much as possible.	O, D	Phased rehabilitation as operation tails off and certain areas are no longer in use.	Visual inspection; Rehabilitation measures signed off by Environmental Officer in accordance with assessment criteria stipulated in the final closure plan

Impact Ref.	Objective	Ref no.	Type	Management measure	Proj. Phase	Timing	Achievement criteria
		8	MM	Consider the use of screening tools such as dense vegetation where practical and appropriate to the surroundings.	DD	Prior to finalisation of design	Signed off by appropriately qualified engineer; visual inspection; no community complaints
		9	MM	Clear vegetation in phases so that only those areas required for immediate development are cleared.	C	Clear sections shortly prior to construction in that area	Schedule for clearing of areas corresponding to construction schedule
		10	MM	Develop and implement a waste management plan that includes provision for waste resulting from secondary developments and domestic waste linked to the Project.	DD, C, O, D	Develop plan prior to construction; implement it from construction to decommissioning	Completed Waste Management Plan; no visible waste on mine site and surrounding areas
		11	GP	Paint buildings and structures or use materials with colours that reflect and complement the natural colour and textures of the surrounding landscape.	DD	Finalisation of building design	Visual inspection
		12	GP	In accordance with a closure plan, the slopes of the WRF and any other visually intrusive stockpiles will be reduced during closure to be more consistent with the surrounding natural topography.	D	When decommissioning the site	Rehabilitation measures signed off by Environmental Officer in accordance with assessment criteria stipulated in the final closure plan
		13	GP	Use directional lighting in areas operating at night, if communities are affected by lighting.	C, O	Ongoing	Signed off by appropriately qualified engineer; Visual inspection; no community complaints
			GP	*Refer to dust control measures under Impact AQ1.*			
LT4	Minimise decrease in land capacity through loss of topsoil.	14	MM	Avoid disturbance of slopes or sensitive areas such as drainage areas, where possible.	C, D	Ongoing, especially during site clearing	Visual inspection; signed off by Environmental Officer
		15	MM	Implement erosion control measures where steep slopes or large unvegetated areas are created, or where sensitive areas such as river banks are disturbed.	C, D	Vegetation clearing and earth movement	Visual inspection; ; signed off by Environmental Officer
		16	MM	Inspect disturbed, rehabilitated, and sensitive areas such as river banks affected by project infrastructure for visual signs of erosion and/or deposition affecting either the Project's or community's use of the land. If problems are identified, initiate remedial action.	C, O, D	Regular inspections, at least on a 3-monthly basis	Visual inspection and maintenance of photographic records. No community complaints
		17	MM	Clear and stockpile topsoil separately from subsoil / fill material, for use during rehabilitation.	C	Clearing of vegetation and earthmoving for construction or rehabilitation	Soil Management Plan in place; visual inspection; signed off by Environmental Officer
		18	MM	Implement rehabilitation and establishment of vegetation cover as soon as possible.	C, O, D	As soon as an area is no longer in use	Progressive rehabilitation strategy; signed off by Environmental Officer

Impact Ref.	Objective	Ref no.	Type	Management measure	Proj. Phase	Timing	Achievement criteria
		19	GP	Maintain topsoil stockpiles to prevent their erosion or contamination with subsoil or other materials.	C, O	Ongoing	Soil Management Plan in place; visual inspection; signed off by Environmental Officer
		20	GP	Ensure stockpiled topsoil is used within two years and is not excessively compacted to preserve a viable seed bank.	C, O, D	Ongoing, as and when topsoil is cleared	Soil Management Plan in place; visual inspection; signed off by Environmental Officer
		21	GP	Avoid driving over or otherwise compacting or disturbing topsoil.	C, O, D	Ongoing	Visual inspection
		22	GP	Design roads, pipeline routes and landscape features to minimise disruption of natural drainage patterns.	DD	Prior to construction	Map showing detailed design relative to drainage lines; signed off by Environmental Officer and engineer
LT5	Minimise effects of wind-blown dust on soil chemistry and land capability	23	IH	Maintain a pond on the TSF	O	Ongoing	Visual inspection; signed off by Environmental Officer
		24	MM	Implement dust control measures, such as wetting down and maintaining a pond at the tailings storage areas.	O	Ongoing, especially in dry windy conditions	Plan in place with evidence of implementation; no complaints about dust
		25	MM	On closure, put in place measures (such as revegetation) to ensure continued erosion control of the tailings material.	D, PC	Progressive rehabilitation as parts of the TSF are no longer in active use	Closure and Rehabilitation Plan in place; dust monitoring results; signed off by Environmental Officer
		26	GP	Using data collected during the monitoring programme, develop a Soils Management Plan to evaluate the effects of blowing tailings dust on soils and determine whether further management measures may be required to mitigate impacts from windblown tailings. The plan should determine: • expected incremental increases in metals and effects of dilution; • extent and effects of remobilisation; • potential eco-toxicological effects; and • removal standards if needed.	O	During early part of operations	Plan in place with evidence of implementation
WR1	Minimise effects of pit dewatering on local communities	27	IH	Relocate villages directly impacted by mining.	DD, C	Prior to construction of pits	RAP developed and resettlement implemented in accordance with RAP; RAP close out audit
		28	MM	Provide affected villages with adequate water supply (including for irrigation of crops).	C, O, D, PC	If monitoring shows villages impacted then ongoing until ground water supply has recovered	Monitoring of village water availability; no complaints in this regard
		29	MM	Consider installation of new wells / maintenance or repairs to existing village wells.	C	Prior to pit dewatering	Records of community consultation and evidence of well installed or repaired if required

Impact Ref.	Objective	Ref no.	Type	Management measure	Proj. Phase	Timing	Achievement criteria
		30	MM	If necessary, make alternative wetland areas available for rice cultivation.	DD, C	If monitoring shows existing cultivated wetlands impacted, as and when necessary	Monitoring changes to extent of cultivated wetland areas
WR2	Minimise effects of surface water abstraction	31	IH	Re-use of water from tailings and other process waters to minimise abstracted amount	O	Ongoing	Evidenced by water balance
		32	GP	Minimise the abstracted volume, as far as practicable.	O	Ongoing	Water conservation methods included in Water Management Plan; signed off by Environmental Officer
		33	GP	Monitor either river stage or flow for the life of the mine to detect any negative impacts to river flow.	O	Ongoing as specified in monitoring programme	Records of monitoring results, and investigation of any negative impacts observed
WR3	Minimise effects on instream ecology resulting from stream diversion	34	IH	Scheduling of stream diversions only when required for pit infrastructure, and reinstatement of natural stream drainage lines post-closure where practicable.	C, O, D	As required during pit excavation	Water Management Plan indicating scheduling; signed off by Environmental Officer
				See measure 27 regarding relocation of affected villages.			
				Implement erosion control measures listed in LT4			
		35	MM	Design surface water diversion channels to mimic the natural instream habitat as closely as possible, and rehabilitate using indigenous vegetation. ☐	DD, C	Construction of infrastructure	Construction signed off by appropriately qualified engineer
		36	MM	Include key instream habitat features, such as deeper pools, to maintain fish populations during the dry season in stream diversion channels.	DD, C	During construction	Construction signed off by Environment Officer
				See measure 22 on routing of roads etc to avoid drainage lines			
		37	GP	Use semi-permeable materials where possible in preference to impermeable materials for surfaces such as roads and paving.	DD, C	Detailed design and construction	Design signed off by appropriately qualified engineer
		38	GP	Monthly average flow for each river should be measured for at least a year, and used to determine impacts during non-peak river flow.	DD, C	As specified in monitoring programme, with preliminary evaluation after one year	Monitoring data; evaluation report
WR4	Minimise flood risk to local communities arising from surface water diversions			*Implement erosion / sedimentation control measures listed in Impacts LT4 and WR7 in and around diversion channels.*			
		39	GP	Include flood risk in the Emergency Response and Preparedness Plan (ER&PP) and raise awareness with potential affected communities of the risks and what to do in the event of a flood.	C, O	Ongoing	Evidence of awareness campaigns in local communities; inclusion in ER&PP
		40	GP	Update the preliminary Water Management Plan.	DD	Prior to construction	Updated plan in place

Impact Ref.	Objective	Ref no.	Type	Management measure	Proj. Phase	Timing	Achievement criteria
WR5	Minimise deterioration of groundwater quality as a result of seepage from mine wastes	41	IH	Fit the TSF with an under-drainage system to collect any seepage and return it to the processing area	DD, C	Design and construction of TSF	Construction signed off by appropriately qualified engineer
		42	IH	Groundwater quality and quantities around the TSF will be monitored frequently	O, D, C	As outlined in monitoring programme	Boreholes in place; monitoring data
		43	IH	Have the design and operation of the TSF inspected by a qualified geotechnical engineer at least once per year.	O	At least once a year	Inspection reports
		44	GP	Undertake further geochemical characterisation of expected waste rock and tailings material to confirm preliminary findings.	DD	Prior to construction	Characterisation data available; revised designs if necessary
WR6	Minimise discharge to surface water	45	IH	Minimise release of storm water from the site by designing and constructing storm water settlement ponds in accordance with Project design criteria.	DD, C	Design and construction of ponds	Construction signed off by qualified engineer
		46	IH	Place bunding around the perimeter of the pit to prevent natural surface drainage entering the pit.	DD, C	Prior to construction	Construction signed off by qualified engineer
		47	IH	Design the TSF such that upslope catchment areas will be small	DD	Prior to construction	Design signed off by qualified engineer
		48	IH	Treat sewage effluent from the construction camp, accommodation camp and office/admin area at the beneficiation plant using containerised sewage treatment plants	C, O	Ongoing	Sewage treatment facilities in place; maintenance records; monitoring data
		49	IH	Construct drainage channels around the waste dump areas and through the waste dump slopes, to direct the surface water flow to the settlement ponds.	C	Construction	Construction signed off by appropriately qualified engineer
		50	IH	Dispose of oils and other hazardous materials in accordance with the Waste Management Plan.	C, O	Ongoing	Records of waste disposal
		51	IH	Store hazardous materials in a suitably bunded area with an impermeable surface, with the size of containment being at least 110% of the contents of the largest tank within the facility, or provide facilities to direct excess volume to an alternative spill containment facility.	C, O	Ongoing	Construction signed off by qualified engineer; visual inspections during operation
		52	IH	Design, construct and operate the TSF to remain stable with no uncontrolled discharges.	DD, C, O	Ongoing	Visual inspections; No pollution incidents reported
		53	IH	Store mine site fuel in above ground steel tanks in a bunded facility at the beneficiation plant. The tanks will be designed to international standards.	DD, C, O	Design, construction and operation of storage tanks	Construction signed off by qualified engineer; visual inspections during operation
				Plan and implement a comprehensive erosion control programme, including erosion and dust control measures listed in Impacts LT4 and AQ1.			
		54	MM	Use sedimentation control techniques such as installation of straw bales buffers in drainage lines downstream of potential sources of increased sediment load.	DD, C, O, D	Prior to clearing of vegetation and ongoing	Visual inspection; monitoring data of watercourses
		55	MM	Implement a Water Management Plan for the site.	O, D	Ongoing	Plan produced and implemented; no stormwater management issues reported

Impact Ref.	Objective	Ref no.	Type	Management measure	Proj. Phase	Timing	Achievement criteria
		56	MM	Implement a comprehensive Rehabilitation and Closure Plan, which includes rehabilitation of the backfilled pits, WRD and TSF to prevent post-closure discharge, and revegetation to ensure continued erosion control.	D, PC	Initiated during decommissioning and ongoing until complete	Signed off by environmental officer; site rehabilitated and returned to communities for use
		57	MM	Where practicable, separate clean and "dirty" (i.e. with elevated levels of contaminants) stormwater and handle to two categories differently.	C, O	During construction	Visual inspection; monitoring data of watercourses
		58	MM	Ensure clean water is piped to the outlet point and not allowed to flow freely where it may cause erosion.	C, O	Ongoing	Visual inspection of release points
		59	GP	Avoid construction activities in the Bankasoka River catchment area (northern portion of the TSF area), which is ecologically sensitive	DD, C	Design and during construction of TSF	Signed off by environmental officer
		60	GP	Implement a water quality monitoring programme (continuing post-closure) to detect changes to surface water quality and take the required remediatory actions.	O, D, PC	As per monitoring programme	Monitoring programme; monitoring data
		61	GP	Implement a surface water biomonitoring programme (as per the specialist recommendations) to monitor effects on aquatic ecosystems.	O	As per monitoring programme	Monitoring programme; monitoring data
		62	GP	Implement a Spill Management Plan, which includes preventive measures such as secondary containment of pipelines crossing water courses and bunding of hazardous liquids stored on site.	C, O, D	Ongoing	Plan in place; no spill incidents reported
EB1	Minimise loss of habitat and individuals due to site clearing	63	MM	Where possible adjust positioning of project infrastructure during planning to avoid gallery forest and wetland habitats.	DD	Prior to construction	Evidence of exploring other options when forest or wetland areas are to be impacted
		64	MM	Clear vegetation in phases working progressively in one direction so that fauna have an opportunity to move to adjacent areas.	C	During clearing of vegetation	Evidenced by schedule for vegetation clearing
				Stockpile topsoil as per the recommendations listed in Impact LT4, for use during rehabilitation.			
EB2	Minimise spread of invasive species resulting from soil disturbance	65	MM	Implement an alien plant control management programme, including training of personnel to implement the programme.	C, O, D	Ongoing	Completed alien plant control management programme and evidence of training and implementation.
		66	MM	Implement rehabilitation as soon as possible, and monitor rehabilitated areas for growth of invasive species.	C, O, D	Ongoing	Evidence of progressive rehabilitation; no invasive alien plants in rehabilitated areas
				Implement good practice measures listed in Impact LT1 to minimise the disturbed area.			
				Implement erosion control measures as listed in Impact LT4.			
		67	MM	Remove invasive alien plants before they bear seed and dispose of removed plants appropriately.	C, O, D	Ongoing	No evidence of alien invasive plants in development footprint

Impact Ref.	Objective	Ref no.	Type	Management measure	Proj. Phase	Timing	Achievement criteria
EB3	Minimise disturbance and displacement of wildlife due to Project activities	68	GP	Develop and implement a Wildlife and Habitat Management Plan that: • protects gallery and swamp forest areas from disturbance (see Figure 5.12); • provides awareness training to staff and contractors on: prevention of injury of animals; identification of likely species found on site (and those of conservation concern); identifications of animal hazards (such as venomous snakes); and what to do if dangerous animals are encountered; • requires personnel to report kills of species of conservation concern to the mine's Environment Management team, who may investigate the incident; • encourages personnel to report sightings of wildlife of conservation importance to the mine's Environment Management team; and • allows for the monitoring and, if necessary, eradication of any invasive species occurring on site or in surrounding disturbed areas.	C, O, D	Develop during construction with at least annual review	Plan in place with evidence of implementation and review
EB4	Avoid creating an attractive nuisance, resulting in impacts on indigenous ecosystems	69	MM	Develop and implement a waste management plan that accommodates all waste types produced on site, particularly food waste.	C, O, D	Plan developed prior to construction and implemented through to closure	Completed waste management plan and evidence of implementation; no unmanaged waste on site
		70	MM	Manage the landfill site in accordance with good practice standards, including access control and fencing.	O	Ongoing	Reflected in waste management plan; no complaints or issues relating to the landfill
		71	MM	Monitor the incidence of drowning in water storage facilities and implement preventive measures if required.	O	Ongoing	Records of monitoring and preventive measures if required
		72	MM	If required, a pest control programme should be implemented, and should include monitoring of accidental death of non-pest species. Should the use of rodent control measures be required, the use of natural predators eg raptors should be considered, and pesticides that bio-accumulate should be avoided.	C, O, D	Ongoing	Monitoring programme for accidental deaths of non-pest species if required; documented pest control programme in place

Table F2: Management programme to address identified social impacts

Impact Ref.	Objective	Ref no.	Type	Management measure	Proj. Phase	Timing	Achievement criteria
ED1	Maximise employment benefits to local communities	1	IH	Focus recruitment of semi-skilled and unskilled labour to residents of local communities.	C, O	During recruitment	Local content targets met
		2	EM	Develop a local employment strategy giving preference to local candidates, provided they meet the required eligibility criteria.	DD	Prior to recruitment	Completed Recruitment Plan
		3	EM	Develop a fair and transparent local recruitment plan	DD	Prior to recruitment	Definition of local; Recruitment Plan; records of engagement with local community
		4	EM	Require contractors (by means of their contract) to give preference to local employees, provided they meet the required eligibility criteria.	C, O, D	At tender stage and ongoing	Records of tender evaluation showing consideration of local content; Contracts showing relevant clauses
		5	EM	Organise training for workers on management of household incomes.	O	Ongoing	Training material and registers
		6	EM	Develop a programme for gradual 'indigenisation' of the workforce. This includes a general and technical skills training programme.	O	Prior to recruitment	Evidence of implementation of the programme and records of "indigenisation" success.
		7	EM	Develop and implement a construction and operational phase stakeholder engagement plan (SEP). As part of this SEP document disclose the recruitment process to manage community expectations (also related to Impact SO2).	DD, C, O	Prior to construction and ongoing through to closure	Completed SEP; records of disclosure of recruitment process to community
		8	GP	Give preference to people directly affected by land acquisition to reduce the magnitude of impacts described in Section 8.2.	C, O	During recruitment of employees and suppliers	Evidence in tender and contract documentation; local employment targets met
		9	GP	Develop a programme of training prior to project start up to maximise potential for local employment.	DD, C	Prior to construction and operation	Training programme; evidence of training implemented
ED2	Maximise the potential for employee training and skills development in the local community	10	EM	Prepare and implement a training and skills development plan for ongoing skills development of the Project workforce including contractors' personnel.	DD, C, O	Ongoing	Completed plan; Records of training / skills development
		11	EM	Support a 'vocational training programme' to assist local people to qualify for semi-skilled positions.	C, O	Ongoing	Records of training programme; monitoring of success in achieving qualifications and positions
		12	EM	Encourage workers to introduce the learned skills and practices in their homes	C, O	Ongoing	Include practical examples in training material.
		13	GP	Continue technical and financial support to educational institutions and students.	O, D	Ongoing	Records of support provided.

Impact Ref.	Objective	Ref no.	Type	Management measure	Proj. Phase	Timing	Achievement criteria
ED3	Encourage government investment in areas local to the Project to maximise their benefit	14	GP	Disclose information on Project's payment to government to the local communities and other interested stakeholders as part of the SEP.	C, O	Ongoing	Records of disclosure to local communities
		15	GP	Liaise with government to promote the use of revenue from the Project in the Project's area of influence for local development.	DD, C, O, D	Ongoing	Records of consultation with government
ED4	Maximise opportunities for local suppliers and contractors	16	EM	Identify the types of goods and services required and those that can be sourced from within Sierra Leone.	DD, C, O	Regular updates throughout Project	Regularly updated database of local suppliers and service providers
		17	EM	Develop a procurement programme to maximise the use of local suppliers.	DD	Prior to procurement	Documented procurement programme with targets for use of local suppliers
		18	GP	Develop a supplier and contractor database, along with a process to review, monitor and strengthen capabilities of local suppliers and contractors.	DD, C, O	Ongoing	Functional database with regular updates; records of performance review and monitoring
RL1	Minimise impoverishment of local communities through loss of land and resources	19	IH	Provide relocated households and communities with housing and social infrastructure to equal if not better that lost, as per the RAP.	DD	During relocation	Records of housing and other infrastructure lost and that provided; records of consultation with relocated communities
		20	MM	Prepare a Resettlement Action Plan (RAP) in agreement with affected population, the Paramount Chief and key government and non-government stakeholders as per the RF (Appendix D). The plan should provide details of: • affected people; • entitlements (cash or preferably in the form of replacement land for long term sustainability of livelihoods); • cash compensation for loss of any standing crops, plantations and trees; • assistance for redevelopment of farms and plantations on new land; • provision of improved replacement residential and community structures as per the preference of local communities.	DD	Prior to relocation or land acquisition	Completed RAP; records of consultations with local communities and other stakeholders
		21	MM	Build alternative access routes in consultation with users of affected routes (*see also Impact LT2*).	C	During construction, prior to disruption of access	Records of consultation with local communities; map showing affected routes and alternatives created
		22	MM	Undertake a community development programme for people facing loss of livelihood opportunities.	DD	Prior to resettlement and land acquisition	Completed plan; evidence of implementation
		23	MM	Iteratively consult with affected people to identify and resolve their issues in a timely manner.	DD, C, O, D	Ongoing	Grievance Mechanism in place; records of consultation with affected communities

Impact Ref.	Objective	Ref no.	Type	Management measure	Proj. Phase	Timing	Achievement criteria
		24	MM	Implement a grievance mechanism for identification of resettlement related issues and address them in a timely manner.	C, O, D	Ongoing	Grievance Mechanism with record of any complaints and how they were addressed
		25	MM	Undertake post resettlement monitoring of affected parties to timeously detect issues and take action if necessary.	C, O	Ongoing	Records of post-resettlement monitoring and actions taken if required
		26	GP	Preferentially employ eligible members from directly affected families.	C, O, D	During recruitment	Records of directly affected families, showing employment status
RL2	Minimise vulnerability of communities			*Implement measures under Impact RL1.*			
		27	IH	Facilities and roads will be unfenced except for the beneficiation plant and accommodation camp, allowing a degree of access by communities.	O	Ongoing	Design and construction signed off by appropriately qualified engineer
		28	IH	Allow use of haul roads and other mine roads by communities, if safety permits	O	Ongoing	Visual inspection and records of accidents reported along haul roads
		29	MM	Provide safe crossing points across or around mine infrastructure where existing tracks are affected.	DD, C	After discussion with communities regarding access routes and prior to construction	No community complaints or road safety incidents
		30	MM	Liaise with the affected communities to determine alternate routes around mine area that cannot be crossed.	DD, C	Prior to construction and stage 2 expansion	Record of meetings with agreed route alignments on map
		31	MM	Maintain the selected bypass roads in the vicinity of the mine operations for the duration of the life of the operation.	C, O, D	Ongoing	No community complaints or road safety incidents
		32	MM	At closure, liaise with communities to determine if previous routes should be restored.	O, D	Prior to decommissioning, when developing final closure plan	Records of meetings with communities; maps showing routes to be restored

Impact Ref.	Objective	Ref no.	Type	Management measure	Proj. Phase	Timing	Achievement criteria
SO1	Maintain standard of living of local communities affected by in-migration			*Encourage local recruitment and procurement as per measures for Impact ED1 and ED4.*			
		33	MM	Encourage local communities to use the grievance procedure (measure 24)for resolving their concerns.	C, O, D	Ongoing	Records of consultation with local communities on use of the Grievance Procedure
		34	GP	Facilitate joint planning with other industries, local government, Paramount Chief and other stakeholders to minimise speculative migration.	DD, C, O	Ongoing	Plan in place with records of implementation including records of communication/ information sharing. Monitoring of speculative migration
SO2	Prevent Project-related increase in social ills / problems	35	MM	Undertake awareness and educational campaigns (directly or through existing institutions) for prevention of social ills.	DD, C, O	Ongoing	Records of campaigns and monitoring of success
		36	MM	Provide employees and visitors to the site with cultural awareness training.	C, O	On arriving at site	Training material; records of training attendance
		37	MM	Provide assistance to the local health department (and NGOs) to strengthen programmes for control of communicable diseases.	DD, C, O	Ongoing	Needs assessment to determine priority areas; records of assistance provided
				Implement the management measures given under Impact SO1.			
SO3	Minimise social discord due to perceptions of unfair distribution of Project benefits	38	MM	Maintain transparency in the recruitment process.	DD, C, O, D	Ongoing	Evidenced by Recruitment Policy; Records of disclosure to local communities
		39	MM	Maintain regular communication with local communities and other stakeholders to minimise tensions.	DD, C, O, D	As per SEP	Records of communication
		40	MM	Maintain and monitor the grievance mechanism for timely resolution of community grievances.	DD, C, O, D	Ongoing	Functional grievance mechanism with records of grievances raised and resolved
				Implement measures under Impacts SO1, ED1 and ED4 to minimise population influx.			
AC1	Minimise loss of community access to cultural resources			*Implement measures in Impact RL1 regarding protection of natural resources.*			
		41	MM	Record mythological stories associated with specific sacred sites as part of their relocation.	DD, C	Ongoing	Records of stories recorded made available to communities

Impact Ref.	Objective	Ref no.	Type	Management measure	Proj. Phase	Timing	Achievement criteria
DC1	Minimise economic decline following closure	42	MM	Conduct an independent social impact assessment prior to closure.	O	Prior to closure	Social impact assessment including recommendations for mitigation of impacts
		43	MM	Develop a social closure plan including the following: • design and implement a retrenchment policy and strategy in consultation with workers and other stakeholders; and • plan for post-project sustainability of community development activities.	O	Prior to closure, after conducting an independent social impact assessment	Completed Social Closure Plan, based on findings of social impact assessment
		44	MM	Allocate funds (in advance) for implementation of the social closure plan.	O	Prior to closure, after development of social closure plan	Approved budget allocation for implementation of social closure plan
		45	MM	Re-train workers for increasing their chances for re-employment elsewhere after Project closure.	O, D	Prior to closure, as production tails off	Records of training
		46	MM	Conduct stakeholder consultations on closure issues as part of the ongoing stakeholder engagement process.	O, D	Ongoing	Records of consultations
		47	GP	Promote and support building the capacity of local suppliers to diversify their customer base and move beyond the Project area.	O, D	Prior to closure	Programme offering business development advice to suppliers affected by mine closure

Table F2: Management programme to address identified health, safety and security impacts

Impact Ref.	Objective	Ref no.	Type	Management measure	Proj. Phase	Timing	Achievement criteria
AQ1	Minimise the generation of dust from the construction and operation of the mine	1	IH	Maintain a pond on the TSF to minimise dust	O	Ongoing	Visual inspection of pond levels; no dust from the TSF
		2	IH	Relocate villages close to mine infrastructure (where ambient dust levels are predicted to be above guideline levels) (*refer also to RL1 in Table F1*)	DD	Prior to construction	Villages identified relocated in accordance with RAP; Post RAP audit
		3	IH	Use water sprays to control dust.	C, O, D	Ongoing	Visual inspection of dust levels; monitoring data complies with standards
			MM	*Refer to the erosion control measures listed under Impact LT4.*			
		4	MM	Maintain or reduce vehicle speeds on unpaved roads to 40 km/hr, especially on roads passing near villages.	C, O	Ongoing	Visual inspection; random speed checks
		5	MM	Implement dust suppression measures in sensitive areas, such as wetting, use of chemical dust suppressant and / or paving on roads with high vehicular activity (for example, haul roads).	C, O, D	Ongoing, especially during dry season	Visual inspection; monitoring data complies with standards
		6	MM	Control dust emissions on ore stockpiles through use of water spraying and/ or wind breaks.	O	Ongoing, especially during dry season	Visual inspection; monitoring data complies with standards
		7	MM	Use dust suppression measures such as rock cladding or grassing, on the side walls of the TSF and other exposed built up areas.	C, O	Once TSF has been built and during any subsequent alterations	Visual inspection; monitoring data complies with standards
		8	MM	Minimise the dry beach area of the TSF and wet the TSF surface if monitoring results indicate dust generation from this source.	O	Ongoing	Visual inspection; monitoring data complies with standards
		9	MM	Minimize lengths of access roads and eliminate unnecessary traffic.	DD, C, O, D	During detailed design and ongoing	Maps showing road alignments; visual inspection
		10	GP	Investigate and respond to any air quality complaints picked up by the Grievance Mechanism.	C, O, D	Ongoing	Records of complaints and how they are addressed.
		11	GP	Provide site workers with appropriate Personal Protective Equipment (PPE), and implement standard international occupational health and safety procedures.	C, O, D	Ongoing	Reflect in Health and Safety Policy and all necessary PPE provided and used
		12	GP	Limit vehicle idling and keep vehicles well maintained.	C, O	Ongoing	Vehicle maintenance log
NV1	Minimise disturbance of local communities due to blasting	13	IH	Conduct blasting in accordance with international good practice standards, by trained personnel	C, O	Ongoing	Blasting procedures in place
		14	IH	Relocate villages close to mine pits (where air overpressure and vibration levels are predicted to be above guideline levels)(*see also RL1 in Table F2*)	DD	Prior to construction	Villages identified relocated
		15	GP	Re-assess impacts once detail regarding blasting regime is available.	DD	Prior to blasting	Evidence of re-assessment
		16	GP	Monitor initial blasting to ensure compliance with specified air overpressure and vibration criteria.	C	On commencement of blasting regime	Records of monitoring and compliance with criteria

Impact Ref.	Objective	Ref no.	Type	Management measure	Proj. Phase	Timing	Achievement criteria
		17	GP	Schedule blasting outside of hours when people are most disturbed by noise (such as at night).	C, O	Ongoing	Blasting schedule; no complaints in this regard
		18	GP	Inform local communities of blasting timetable in advance and provide adequate notice of when blasts are required outside of the planned schedule.	C, O	Prior to blasting	Records of informing communities
		19	GP	Maintain records of each blast (including location of blast holes, design, measured overpressure and vibration)	C, O	For each blast	Records kept
NV2	Minimise increase in background noise levels due to the Project	20	IH	Provide hearing protection for operators to comply with health and safety guidelines.	C, O, D	Ongoing	Protective equipment available and staff know how to use
		21	IH	Relocate villages close to mine infrastructure (where ambient noise levels are predicted to be above guideline levels) (*see also RL1 in Table F2*)	DD	Prior to construction	Villages identified relocated
		22	GP	Maintain vehicles and equipment in accordance with manufacturer's instructions to minimise noise.	C, O, D	Ongoing	Maintenance / servicing log; no faulty equipment
		23	GP	Avoid unnecessary revving of engines and switch off equipment when it is not required.	C, O, D	Ongoing	No community complaints
		24	GP	Start up vehicles and plant sequentially rather than simultaneously.	O	Ongoing	No community complaints
		25	GP	Fit vehicles with broadband reversing alarms.	C, O, D	Prior to bringing vehicle on site	Auditory inspection
		26	GP	Undertake standardised noise measurements on major items of equipment upon delivery to provide a noise reference against which regular checks can be compared.	C, O	When equipment arrives at site and at regular intervals thereafter	Log of measurements
		27	GP	When plant equipment is due for replacement, the replacement equipment should have a sound power level equal to or less than the plant that it is replacing.	C, O	During sourcing of replacement equipment	Records of sound power level of old and replacement equipment
		28	GP	Plan for operating times of noisy activities to be outside of hours when people are most disturbed by increased noise levels (such as at night).	C, O, D	Ongoing	Schedule for noise generating activities; no noise complaints
		29	GP	Promptly investigate and respond to any noise complaints picked up by the Grievance Mechanism.	C, O, D	Ongoing	Records of complaints and how they are addressed
		30	GP	Routine noise monitoring should be carried out at the surrounding receptors	C, O	On an annual basis	Records of monitoring
		31	GP	Keep haul routes well maintained and avoid steep gradients.	C, O	When constructing haul roads; ongoing maintenance	Design of haul roads; road maintenance schedule
		32	GP	Minimize the drop height for materials.	C, O, D	Ongoing	Visual inspection

Impact Ref.	Objective	Ref no.	Type	Management measure	Proj. Phase	Timing	Achievement criteria
TS1	Minimise project-related safety risks to other road users	33	IH	Underpasses will be constructed where the haul roads cross the Makeni highway to avoid intersecting with the highway	DD, C	Design and construction of haul roads	Design drawings; visual inspection
		34	MM	Appropriately sign-post the site entrance and access to the Makeni highway.	C, O	Signs erected during construction and maintained through to closure	Visual inspection
		35	MM	Design site roads to a standard suitable for mine and construction traffic, and maintain the roads to this standard.	DD, C, O	Design of roads; ongoing maintenance	Signed off by suitably qualified engineer.
		36	MM	Assess the condition of local roads and their capacity to accommodate the mine-specific traffic and if necessary upgrade the roads prior to mine construction	DD	Detailed design of roads	Assessed by suitably qualified engineer.
		37	MM	In conjunction with the Government of Sierra Leone, devise and implement a road maintenance programme for roads affected by the Project.	DD, C, O	Consultation prior to construction; ongoing implementation	Records of consultation in this regard and documented road maintenance programme and schedule
		38	GP	Design and implement sheeting and correct positioning and securing of loads on vehicles in line with international health and safety procedures.	C, O, D	Ongoing	Signed off by qualified Health and Safety officer
		39	GP	Control delivery of oversize loads to site during times of minimal highway traffic as far as possible, and minimise travel outside daylight hours.	C, O, D	Ongoing	Schedule for deliveries of oversize loads
		40	GP	Minimise travel by heavy vehicles during heavy rains.	C, O, D	Ongoing	Records of travel times
TS2	Minimise safety risks to local communities using mine site roads			*Refer to measure 8 (LT2) in Table F1*			
		41	MM	Enforce speed limits and safe diving practice.	C, O, D	Ongoing	Training and disciplinary procedures; random speed checks
		42	MM	Educate local communities on traffic safety.	C, O, D	Ongoing	Records of community awareness programme on traffic safety
				Refer to measure 6 above (Table F3) on dust suppression			
		43	MM	Consider providing and maintaining access paths alongside roads for key access areas.	DD, C, O	Design of roads; ongoing maintenance	Maps showing road and access path layouts; maintenance schedule
SR1	Minimise risk of human rights abuses due to conflict with communities	44	MM	Provide training to MIOL security staff and local police on the Voluntary Principles on Security and Human Rights.	DD, C, O	On recruiting security staff and prior to relocation of villages	Records of training provided; no community complaints in this regard
		45	MM	Maintain the grievance procedure, and encourage and facilitate stakeholders to use the mechanism to express concerns.	C, O, D	Ongoing	Grievance procedure in place; records of informing stakeholders on use of the procedure

Impact Ref.	Objective	Ref no.	Type	Management measure	Proj. Phase	Timing	Achievement criteria
SR2	Minimise risk of exposure to communicable diseases	46	IH	Establish a clinic for mine employees to address health concerns	C	Prior to commencement of operation	Clinic operational; records kept of visits and diagnoses
		49	MM	Develop and implement management policies for HIV/AIDS, tuberculosis and other potential communicable diseases focusing on prevention, control, diagnosis and treatment in coordination with NGOs and local government.	DD	Prior to recruitment of staff for construction or operation	HIV/AIDS Management policy in place
		50	MM	Provide health awareness programmes and counselling services to employees.	O	Ongoing	Documented health awareness programme; counselling service operational
		51	MM	Promote use and availability of condoms at the workers camp.	C, O	Ongoing	Condoms available; records of awareness of use of condoms
		52	MM	Undertake routine health screening of employees to detect and treat diseases early.	C, O	On recruitment and annual screening thereafter	Records of health screening and treatment provided if necessary
OH1	Minimise risk of injury from blasting	53	IH	Conduct blasting using standard mining industry practices and procedures. This includes the development and implementation of standard operating procedures, blasting rules and a safety management plan that: • Delineates the danger zone associated with each blast of at least 400m and clear workers from this zone before, during and after each blast; and • Provides an audible warning at least three minutes before a blast is fired.	C, O	Procedure in place prior to blasting and implemented prior to each blast	Blasting procedure and safety management plan; signed off by qualified Health and Safety officer
OH2	Minimise risk of community exposure to toxic or hazardous substances			*Refer to mitigation measures listed under Impact EB4 for management of the landfill site*			
		54	GP	Design hazardous material containment structures taking into consideration natural hazards and the implications of these on structural integrity of the containment facilities.	DD	Design of hazardous liquid storage areas	Signed off by appropriately qualified engineer
		55	GP	Size containment areas to contain 110% of the contents of the largest tank within the facility or provide facilities to direct excess volume to an alternative spill containment facility.	DD	Design of hazardous liquid storage areas	Signed off by appropriately qualified engineer
		56	GP	Pave (with an impermeable surface such as concrete) mine site fuel delivery and dispensing pump areas and design these areas to drain into the adjacent storage tank containment areas.	DD	Design of fuel storage areas	Signed off by appropriately qualified engineer
		57	GP	Prohibit construction of hazardous material facilities (including temporary and permanent refuelling areas) within drainage lines or the 1 on 100 year flood lines of watercourses.	DD	Design of such facilities	Signed off by appropriately qualified engineer
		58	GP	Treat (for example with an oil separator), evaporate or dispose of as a hazardous material any polluted water collected in hazardous material containment facilities.	C, O, D	Ongoing	Records of appropriate treatment and disposal of polluted water

Impact Ref.	Objective	Ref no.	Type	Management measure	Proj. Phase	Timing	Achievement criteria
		59	GP	Require vehicle maintenance to be undertaken in the designated workshops where appropriate pollution control measures are provided to prevent leaks or spills of fuel or lubricants reaching the environment.	C, O, D	Ongoing	Designated workshop for vehicle maintenance; visual inspection of pollution control measures and signed off by environmental officer
		60	GP	Develop and implement a spill prevention and control system as part of the Emergency Preparedness and Response Plan for the mine site	C, O, D	Develop plan prior to construction, and implement on an ongoing basis	Spill prevention system; appropriate management of spills
OH3	Minimise risk of fire or explosions	61	IH	Make fire extinguishers available at storage areas for flammable substances, and install a fire water system servicing the beneficiation plant and accommodation areas.	C, O	Installed prior to operation and in use through operation	Signed off by qualified Health and Safety officer
		62	IH	Follow standard international good practice with regard to storage and handling of combustible materials.	C, O	Ongoing	Signed off by qualified Health and Safety officer
		63	IH	Adhere to occupational health and safety guidelines with regard to safe working conditions and the use of PPE.	C, O, D	Ongoing	PPE provided and used when required; signed off by qualified Health and Safety officer
OH4	Minimise risk of TSF failure	64	IH	Design TSF to be appropriate for the seismicity of the area and in accordance with international good practice	DD	Design of TSF	Signed off by appropriately qualified engineer

Table F4: General management controls representing good practice

Objective	Ref no.	Management measure	Proj. Phase	Timing	Achievement criteria
Spill prevention and management	1	Provide spill prevention and response training to staff , contractors and visitors, including: • an explanation of good house-keeping practices; • identification and use of equipment and engineering controls designed to prevent spills; • description of proper spill response procedures; and • indication of possible health, safety and environmental risks potentially occurring as a result of a spill.	C, O, DC	On arrival at Project sites	Training/induction logs
	2	In association with the incident reporting requirements (Section 11.3.2), record and report information on spills including: • location of spill; • material type (hazard potential) and quantity released; • quantity of material recovered; • media affected (soils, water, air); • actions taken to contain, recover and remove material released; • methods and location of disposal of recovered material or affected media (refer to waste management plan); • cause of the spill; and • how future spills could be avoided.	C, O, DC	When spills occur	Records of spills showing lessons learnt
Hazardous material management	3	Develop and implement a Hazardous Material Management Plan including procedures for transport, handling and storage of hazardous substances to minimise risk of accidental exposure. Hazardous materials include explosives, fuel, lubricants, laboratory chemicals, hazardous waste etc. The plan will: • include clear instructions on what to do should exposure occur; • prohibit construction of hazardous material facilities including temporary and permanent refuelling areas within drainages or the expected flood zones of ephemeral watercourses; • require that any polluted water collected in hazardous material containment facilities is treated, evaporated or dispose d of as a hazardous material; • require vehicle maintenance be performed in designated workshops where appropriate pollution control measures are provided.	C, O, DC	When transporting, handling or storing hazardous materials	Plan in place, with evidence of implementation
	4	Design mine waste, concentrate and hazardous material containment facilities with consideration of natural hazards.	DD	During detailed design	Record of design considerations

Objective	Ref no.	Management measure	Proj. Phase	Timing	Achievement criteria
Prevent Project waste causing harm to local communities or ecological systems	13	Prepare construction and operation waste management plans and implement these consistent with Sierra Leone regulations and international standards to the extent practicable. Include in the waste management plans the following: • a commitment to a waste hierarchy comprising a) waste avoidance, source reduction, prevention or minimisation; b) waste recovery for materials that can be re-used; c) waste treatment to avoid potential impacts to human health and the environment or to reduce the waste to a manageable volume; and d) safe and responsible waste disposal; • inventory of wastes identifying the source/s, characteristics and expected volumes; • waste segregation requirements; • location and type of waste collection points, which are conveniently located, have adequate capacity, are frequently serviced and clearly labelled; • storage requirements; • opportunities for source reduction, re-use or recycling; • targets for waste re-use, recycling and incineration; • opportunities to minimise bulk or render waste non-hazardous; • procedures for operating waste storage, treatment and disposal facilities; • labelling requirements for waste disposed of offsite; • method of tracking waste recovered, incinerated or disposed of to the site's landfill; • method of tracking quantity, date, transporter and fate of waste disposed of offsite; • a contingency plan should waste disposal facilities be unavailable for a time; and • training requirements for waste management staff and other employees and contractors.	DD, C, O	Developed during detailed design with at least annual review	Plan in place with evidence of review
	14	Recycle, compost or incinerate non-hazardous waste to the extent practicable.	C, O	Ongoing	Records of waste recycled, composed or incinerated
	15	Preferably return hazardous waste to the associated supplier or transport to other appropriately licensed facilities off-site to the extent practicable and permitted.	C, O, D	Ongoing	Records of waste returned to supplier
	16	Provisionally store hazardous waste not transported off site in appropriate storage facilities on-site until their final disposal is determined. Include a roofed enclosure over a concrete pad with a low concrete wall to provide containment to hold 110% of the volume of stored hazardous liquids. Also include a fenced open area of storage of empty containers. Restrict access to this area to qualified personnel only.	C, O, D	Ongoing	Visual inspection
	17	Provide an open air non-hazardous waste transfer site on a pad with containment.	C	Construction of infrastructure	Built according to design
	18	Provide a 30 m peripheral buffer around the landfill area.	DD, C	Design and construction of waste facility	Built according to design
	19	Establish a tire dump close to the landfill and progressively cap as tires are deposited.	DD, C	Design and construction of waste facility	Built according to design
	20	Establish a bio-remediation area with graded base and perimeter embankment close to the landfill to treat soils contaminated with hydrocarbons. Determine if treated soil can be used as an interim cover at the landfill site.	DD, C	Design and construction of waste facility	Built according to design

Objective	Ref no.	Management measure	Proj. Phase	Timing	Achievement criteria
	21	Establish a solid and liquid waste incinerator at the mine site.	DD, C	Design and construction of waste facility	Built according to design
	22	Dispose of sludge from the sewage treatment facilities to the landfill or use in rehabilitation if appropriate.	C, O	Ongoing	Records of sludge disposed of
	23	Maintain sewage treatment facilities according to manufacturers' specifications and Sierra Leone requirements.	C, O	According to manufacturer's instructions	Maintenance logs
	24	Fit cooking areas with grease traps, and maintain these, to prevent excess oils and fats reporting to the sanitation facilities.	C	Construction of infrastructure	Visual inspection
Prevent or minimise occupational health and safety risks	25	Develop health and safety policy and plan to cover identified health and safety risks likely to occur during construction, start up, operation, closure and rehabilitation phases of the project.	C, O	Developed during detailed design with at least annual review	Policy and plan in place with evidence of review
	26	Systematically and continuously identify, assess and respond to health and safety risks throughout the Project life cycle in accordance with the plan.	C, O, D	Ongoing	Record of risk identification and management
	27	Restrict the noise levels emitted from equipment or provide suitable personal protection devices if this limit cannot be achieved.	C, O	Ongoing	Noise levels known and equipment provided where necessary
	28	Provide fire protection systems to comply with the applicable national and international regulations.	C, O	Ongoing	Systems in place and tested
	29	Facilitate interaction between the health and safety and Environment teams.	C, O	Annual review	Records of meetings between teams
	30	Provide personnel with appropriate personal protection equipment (PPE) if they are obliged to work in areas where occupation health and safety standards are exceeded. Provide staff and visitors with training on how and when to use the PPE.	C, O, DC	Ongoing	PPE available and staff know how to use it
	31	Prevent access to areas with high hazard potential and clearly mark such areas with suitable warning signs showing written and visual representation of the hazard.	C, O, DC, PC	Ongoing	High hazard areas identified on a plan and barriers in place with suitable warning signs

APPENDIX G

G PRELIMINARY ENVIRONMENTAL AND SOCIAL MONITORING PROGRAMMES

Appendix G: Preliminary monitoring programmes

'Project facilities' refer to the different Project related installations. 'Project area' refers to the areas outside Project facilities but where Project personnel are likely to be working.

Table G1: Preliminary environmental monitoring programme

Aspect	Impact reference	Type of monitoring	Units	Frequency	Location/s	Records	Internal reporting
Land disturbance	LT1, LT4, EB1	Extent of footprint area disturbed and/or rehabilitated	m^2	Monthly during construction and then as needed when land disturbed or rehabilitated	Within footprint of all disturbed areas, including along pipelines and roads	Log	Monthly report during construction and rehabilitation Annual report during operation
	LT1, LT4, LT5, WR6, EC1	Visual inspections for signs of erosion or wind deposition	None	Quarterly or on receipt of grievance	Construction sites, rehabilitated areas, road/ pipeline culverts and water release points	Log	Annual report (non-conformances handled as per Section 11.3.2)
	LT2	Visual inspection of road condition	None	Quarterly or on receipt of grievance	Haul roads and any bypass roads developed around project infrastructure	Log	Annual report (non-conformances handled as per Section 11.3.2)
Water	WR1	Volume and rate of water pumped from the pits (pump ratings can be used)	m^3/d and L/s	Daily when pit dewatering occurring	Pit sump pumps	Database	Monthly report of max and min rate and daily volume
	WR1, WR2	Groundwater levels in village wells within drawdown cone	m below ground level (mbgl)	Continuously using transducers or monthly using dip meters	Monitoring boreholes as shown on Figure 1	Database	Quarterly report of levels and long term trends
	WR1, WR2, WR3	Cultivated wetland surface area and type of crop grown	m^2 and type of crop	Start and end of each rainy season	Cultivated wetland areas downstream of mine footprint areas	Database	Annual report
	WR2	Rate and volume of water abstracted from Rokel River	L/s and m^3/d	Continuous during abstraction	Point of abstraction	Database	Monthly report of max and min rate and daily volume
	WR2	Rate and volume of water used and recycled at the mine site	m^3/d and L/s	Continuous	Accommodation camp, beneficiation plant, power plant, TSF, storm water ponds, water spray trucks and any other key water off-take points	Database	Monthly water balance showing daily/monthly volumes
	WR5	Groundwater quality at the mine site and in nearby communities for at least the following parameters[(a)]: pH, Eh, TDS, alkalinity, temperature, dissolved oxygen, nitrate, chloride, fluoride, sulfate, phosphate, Na, K,	ug/L, mg/L or other units as appropriate	Quarterly for full parameter suite, with field pH, EC and temperature collected monthly when water	New holes installed around the TSF, landfill and hazardous materials storage areas; monitoring boreholes shown on Figure	Database	Quarterly report of results and long term trends

Aspect	Impact reference	Type of monitoring	Units	Frequency	Location/s	Records	Internal reporting
		Ca, Mg, Al, Cr, Fe, Mn, B, Cu, Zn, As, Se, Mo, V and U (U at the mine site only)		levels recorded	1 (subject to review during construction)		
	WR4, WR5, EB3, EB4	Surface water quality in water holding facilities for at least the following parameters[(a)]: pH, Eh, TDS, TSS, alkalinity, temperature, dissolved oxygen, nitrate, chloride, fluoride, sulfate, phosphate, Na, K, Ca, Mg, Al, Cr, Fe, Mn, B, Cu, Zn, As, Se, Mo, V and U	ug/L, mg/L or other units as appropriate	Quarterly for full parameter suite, with monthly field pH, EC, DO, turbidity, TSS and temperature	Storm water settlement ponds (following rain events), tailings supernatant pond, pit sumps	Database	Quarterly report of results and long term trends
	WR3	Flow rate and stage measurement for streams in sub-catchments influenced by Project infrastructure	m^3/s and m	Monthly flow rate; daily stage data	Monitoring points shown on Figure 2	Database	Quarterly report of flows
	WR6	Stream water quality for at least the following parameters[(a)]: pH, Eh, TDS, TSS, alkalinity, temperature, dissolved oxygen, nitrate, chloride, fluoride, sulfate, phosphate, Na, K, Ca, Mg, Al, Cr, Fe, Mn, B, Cu, Zn, As, Se, Mo, V and U	ug/L, mg/L or other units as appropriate	Quarterly for full parameter suite, with monthly field pH, EC, DO, turbidity, TSS and temperature	Surface water monitoring points shown on Figure 1 (subject to review during construction)	Database	Quarterly report of results and long term trends
	WR4, WR6	Record upset conditions when storm water settlement ponds are full and discharges occur. Sample the water released for the same parameters as above. If possible, record estimated volume of water released	ug/L, mg/L or other units as appropriate	When upset conditions occur	At the point of release	Log and database	Annual report (non-conformances handled as per Section 11.3.3)
	WR6	Inspection of storage facilities to determine need for sediment removal	None	Quarterly	Water holding facilities	Log	Annual report (non-conformances handled as per Section 11.3.3)
Air and climate	AQ1	Weather conditions on site (wind, rainfall, temperatures)	various	Monthly	Onsite weather station	Database	Quarterly report of results and long term trends
	AQ1	Dust fallout over a monthly period	$\mu g/m^3$	Monthly	Bucket monitoring stations shown on Figure 3subject to review during construction)	Database	Quarterly report of results and long term trends
	AQ1	PM_{10} and $PM_{2.5}$ (24 hour reading)	$\mu g/m^3$	Monthly	At monitoring stations shown on Figure 3 (subject to review during construction)	Database	Quarterly report of results and long term trends
	AQ1	Ambient NO_2 and SO_2 24-hour concentrations (using Radiello Badges)	$\mu g/m^3$	Quarterly	Monitoring stations as shown on Figure 3 (subject to review during construction)	Database	Quarterly report of results and long term trends

Aspect	Impact reference	Type of monitoring	Units	Frequency	Location/s	Records	Internal reporting
	AQ1	Times and duration of upset conditions	Date and time	When upset conditions occur	HFO plant	Log	Annual report (non-conformances handled as per Section 11.3.3)
Noise and vibrations	NV1	Air overpressure (from blasting)	dBL	Initial 3 blasts and on receipt of complaint	Closest villages or at location of complainant	Log	Annual report
		Blasting-related vibrations (measured as Peak Particle Velocity)	Mm/s	Initial 3 blasts and on receipt of complaint	Closest villages or at location of complainant	Log	Annual report
	NV2	Ambient noise levels over 24 hour period (intermittent between weekday and weekend)	dB(A)	Monthly or upon receipt of complaint	As shown on Figure 3 or at location of complainant	Log	Annual report
Ecological	WR3, WR5, WR6	Aquatic biomonitoring programme - diatoms	Category (A-F)	Annually (dry season) during construction and operation	As shown on Figure 4	Database	Annual report
	WR3, WR5, WR6	Aquatic biomonitoring programme - Fish	Number of species	Annually (dry season) during construction and operation	As shown on Figure 4	Database	Annual report
	WR1, WR3, EB1	Spatial extent of wetland areas	m^2	Start and end of rainy seasons	Wetland areas downstream of project areas	Database	Annual report
	EB2	Visual inspections of presence of invasive plant species	None	Quarterly	Disturbed and rehabilitated areas, and adjacent areas	Log	Annual report on findings and remedial measures
	EB3, EB4	Records of wildlife kills by equipment, vehicles, drowning or poisoning	None	On occurrence	Within Project areas	Log	Monthly report on fatalities and remedial measures
	EB3	Records of major wildlife sightings	None	On occurrence	Within or near the Project area	Log	Annual report on observations
	EB4	Records of prevalence of nuisance animal species	None	On occurrence	Within or near the Project area	Log	Annual report on observations
Vehicles and equipment	AQ1, EB3, TS1, TS2	Random speed checks	km/hr	Once every two weeks at different locations and times	Access and haul roads	Log	Annual report (non-conformances handled as per Section 11.3.3)
	NV2	Records of vehicle and equipment maintenance	None	As per manufacturer's instructions	Mine truck shop and equipment workshop	Log	None
	NV2	Baseline noise emissions of new equipment	dB	On commissioning of new equipment	Within 100m of equipment	Log	None
Hazardous materials	General	Records of hazardous materials acquired and used	m^3 or kg of each type of material	On arrival at site and during construction/ operation	Warehouse or storage facility	Log	Quarterly report
	General	Inspections of hazardous substances containment facilities, instrumentation and detection systems.	None	At least monthly for containment facilities with instrumentation as	Hazardous material containment facilities	Log	Annual report (non-conformances handled as per Section 11.3.3)

Aspect	Impact reference	Type of monitoring	Units	Frequency	Location/s	Records	Internal reporting
				per manufacturer's instructions			
Waste	General	Volume of different wastes types disposed of to landfill or removed to hazardous waste site	kg or tonnes	Daily	Waste disposal sites	Log	Quarterly report
	General	Volume of different waste types recycled or reused	kg or tonnes	Daily	Waste disposal sites	Log	Quarterly report
	General	Volume of soil bio-remediated	kg or tonnes	When soil arrives at bio-remediation site	Waste management site at mine	Log	Quarterly report

Table G2: Socio economic monitoring programme

Aspect	Impact reference	Type of monitoring	Units	Frequency	Location/s	Records	Reporting
Economic development	ED1, ED2, RL1, SO1, SO2, SO3,	Source of employees (for MIOL and its contractors) categorised by: • skill level; • whether they are local, provincial, national and/or international; • ethnicity • gender; • from a vulnerable group (for example disabled).	Percentage of employees in each category	Ongoing throughout the life of the project	Project facilities	Employee database for MIOL and for its contractors	Quarterly human resources report
	ED1, SO1, SO2	Unemployment	Percentage	Yearly	Lunsar and affected villages	Government records; Primary survey data	Yearly social performance report
	ED3	Government revenue used in areas affected by the Project	Percentage	Yearly	Port Loko District	Government revenue and budget records	Yearly social performance report
	ED4, SO1, SO2, SO3	Origin of contractors and suppliers (Local, provincial, national and/or international)	Percentage	Quarterly	Project facilities	Contracts register	Quarterly report from contractors/suppliers
Resettlement and loss of land and social and natural resources	RL1, RL2	Provision of improved replacement housing, replacement farmland and access to natural resources	Percentage	Quarterly	Project affected villages	Resettlement monitoring reports	Quarterly community relations report
	RL2, RL3	Access to social infrastructure such as schools, health centre, grain banks, markets for selling and buying, credit facilities, religious centres, water supply and sanitation	Percentage	Yearly	Project affected villages	Resettlement monitoring reports	Quarterly community relations report
	RL1	Restoration of livelihoods to the level of pre-resettlement	Percentage	Yearly	Project affected villages	Resettlement monitoring reports	Quarterly community relations report
	RL1	Food security (post resettlement)	Percentage	Yearly	Project affected villages	Resettlement monitoring reports	Quarterly community relations report
	RL2	Access to social support networks	Percentage	Yearly	Project affected villages	Resettlement monitoring reports	Quarterly community relations report
	RL1, RL2, RL3, SO3	Initiatives for promotion of alternative livelihoods (focus on affected people and vulnerable members)	Number and type of initiatives	Quarterly	Project affected villages	Reports on initiatives; Meeting minutes	Quarterly community relations report
	RL1, RL2, RL3, SO1, SO2, SO3, AC1, DC1	Community grievances or complaints	Number and type of complaints	Monthly	Project affected villages	Grievance register; Community meetings; Letters; Media reports	Monthly community relations report

Aspect	Impact reference	Type of monitoring	Units	Frequency	Location/s	Records	Reporting
Social order	SO1, SO2	Population	Population; Rate of growth	Every three to five years	Lunsar and affected villages	Primary sample survey; Government statistics	Yearly social performance report
	SO2, SR2	Prevalence of communicable diseases: • STIs • Tuberculosis and respiratory track infections • Malaria • Diarrhoea	Incidence of diseases	Quarterly	Lunsar and affected villages	Reports from health centres; Employee health screening records	Quarterly social performance report
	SO2, SR2	Prevalence of crime	Percentage increase	Yearly	Project affected villages	Community meetings; Police records; media reports	Quarterly social performance report
	SO2, SR2	Prevalence of commercial sex workers	Percentage increase	Yearly	Project affected villages	Community meetings; Police records; media reports	Yearly social performance report
	SO2, SR2	Prevalence of alcohol and drug abuse	Number of incidences	Yearly	Project affected villages	Community meetings; Police records; media reports	Yearly social performance report
	SO3	Disputes between residents of affected villages and outsiders	Number of incidences	Monthly	Project affected villages	Community meetings records	Monthly community relations report
Archaeology and cultural heritage	AC1	Relocation of sacred bushes and cemeteries to the satisfaction of affected people	Percentage of sacred bushes and cemeteries	Quarterly	Project affected villages	Community meetings records	Quarterly social performance report
Decommis-sioning and closure	DC1	Number of retrenched workers re-employed in other mining projects or alternative occupations	Percentage	Quarterly (during decommissioning phase)	Project affected villages	Placement records	• Employee newsletters; • Yearly human resources report
	DC1	Persons provided with pre-retrenchment training and type of training provided	Number of persons and type of training	Quarterly (prior to and during decommissioning phase)	Project affected villages	Training records	Quarterly human resources report

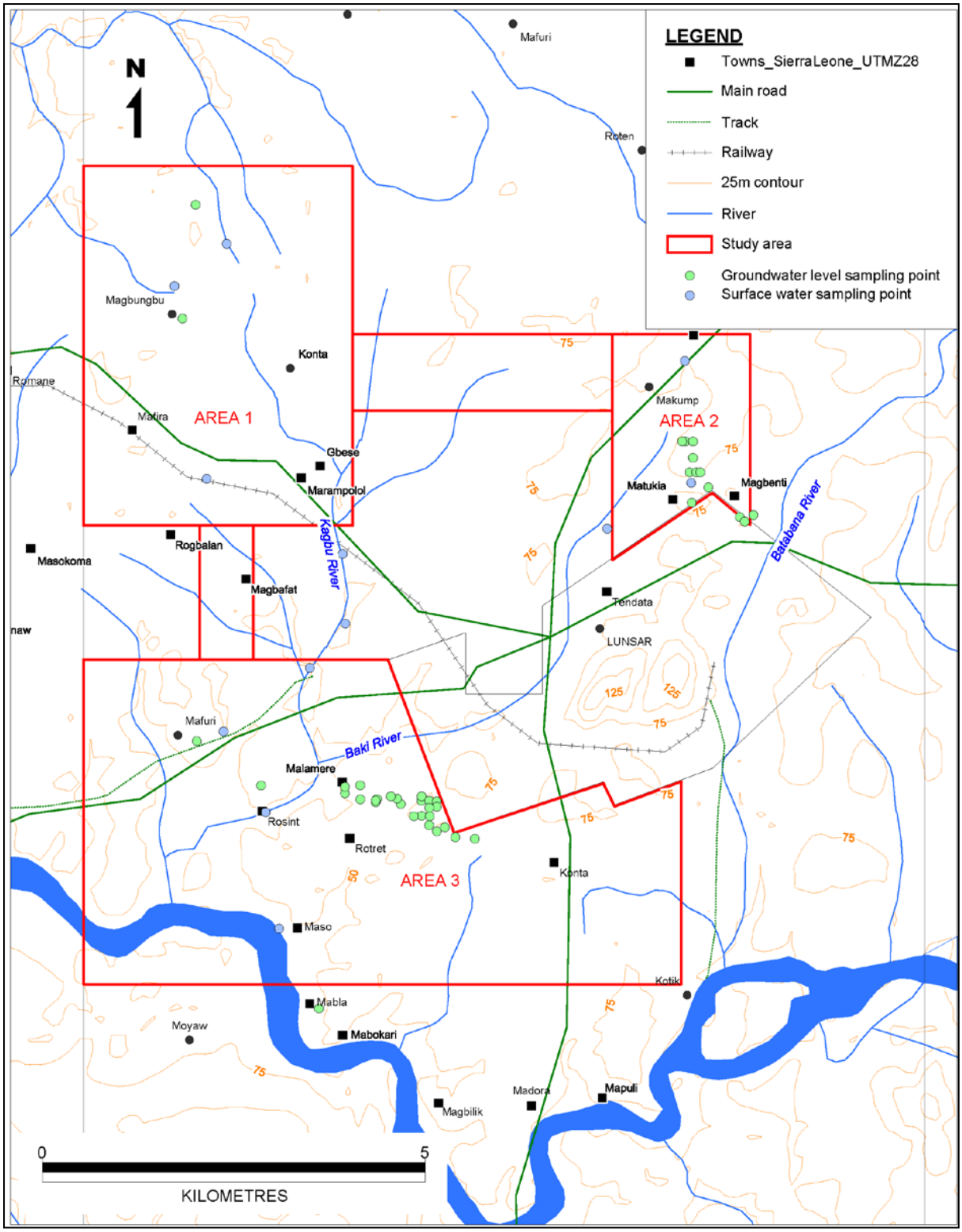

Figure 1: Locations of surface water and groundwater monitoring points

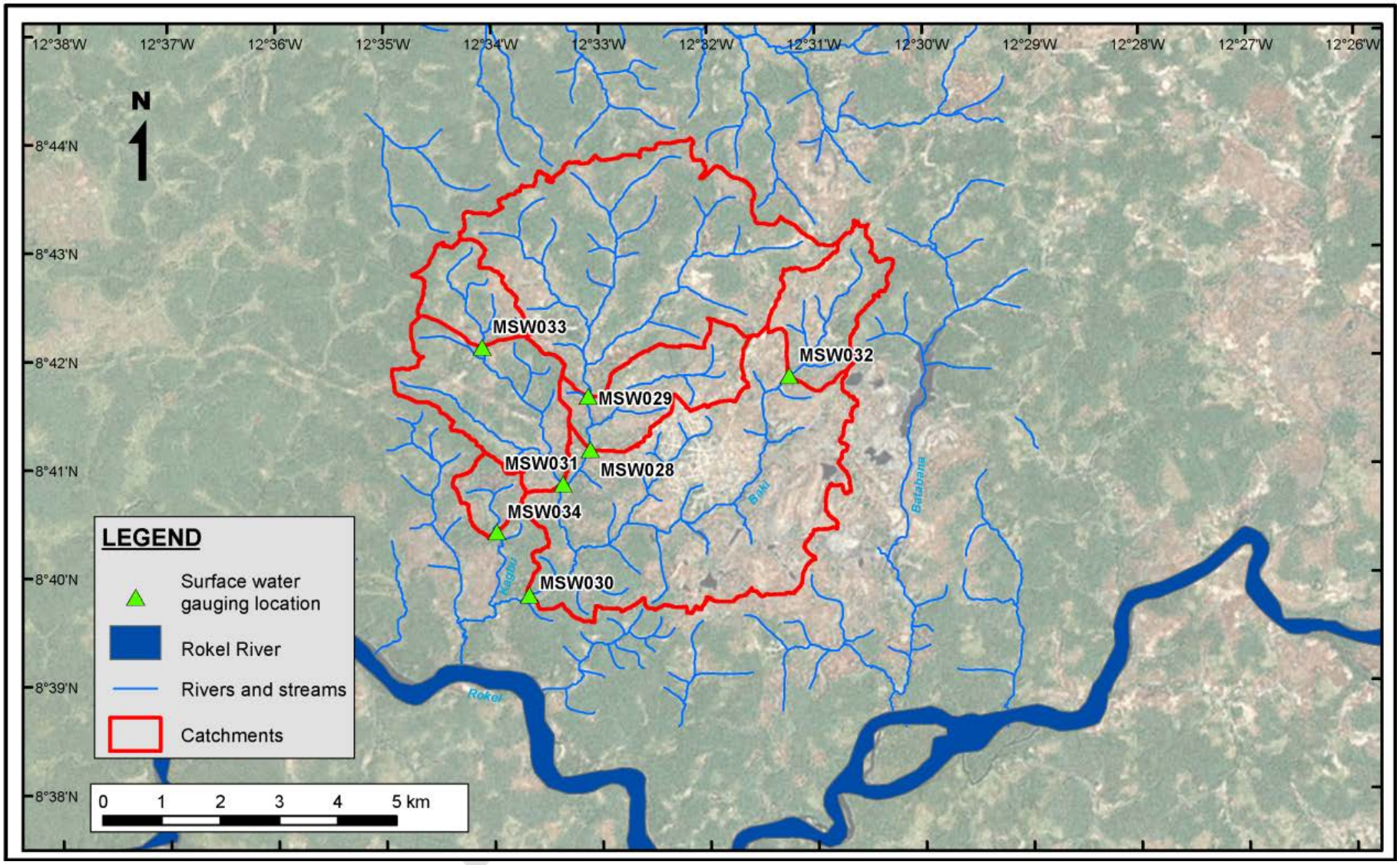

Figure 2: Locations of surface water flow gauging monitoring points

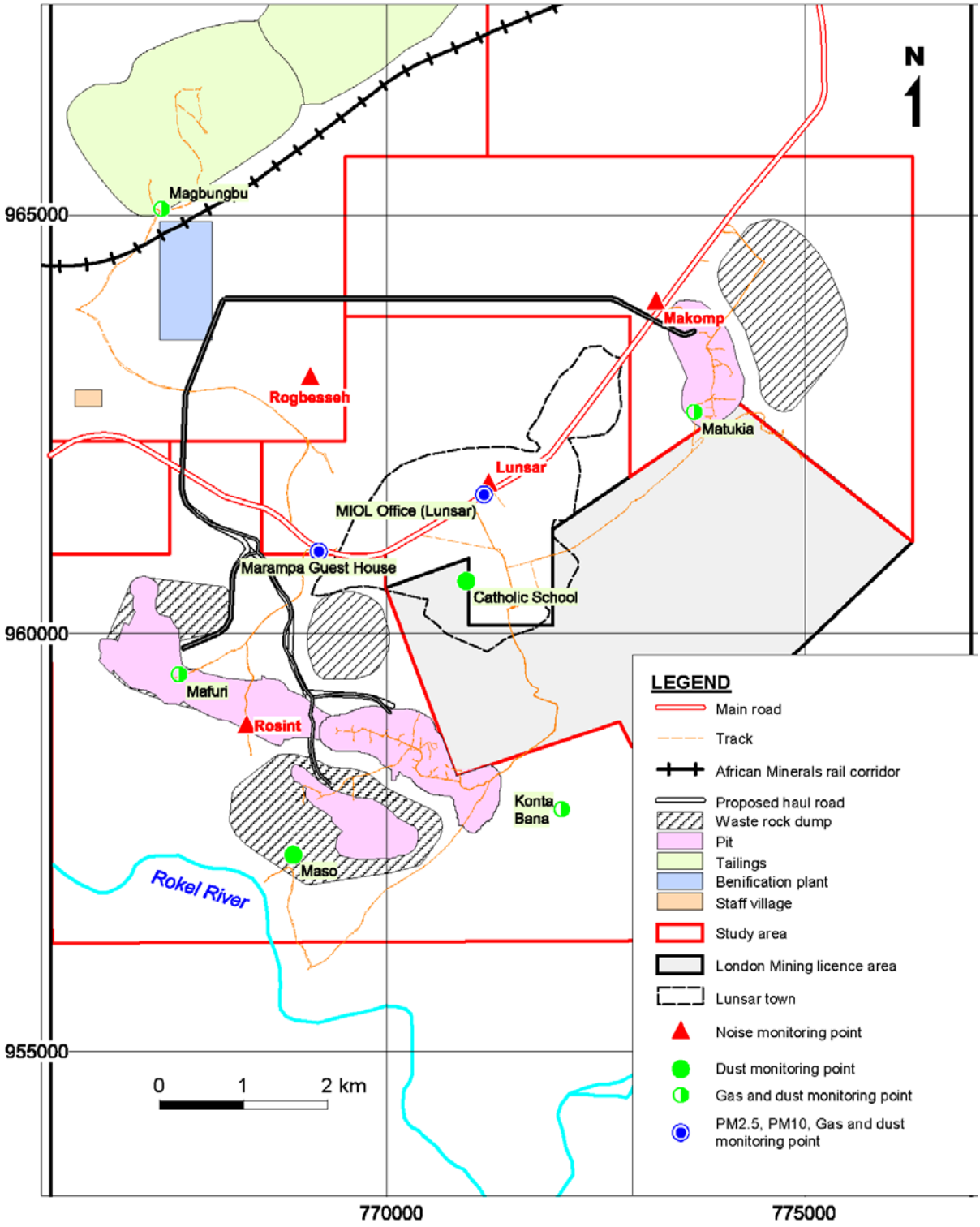

Figure 3: Locations of air quality and noise monitoring points

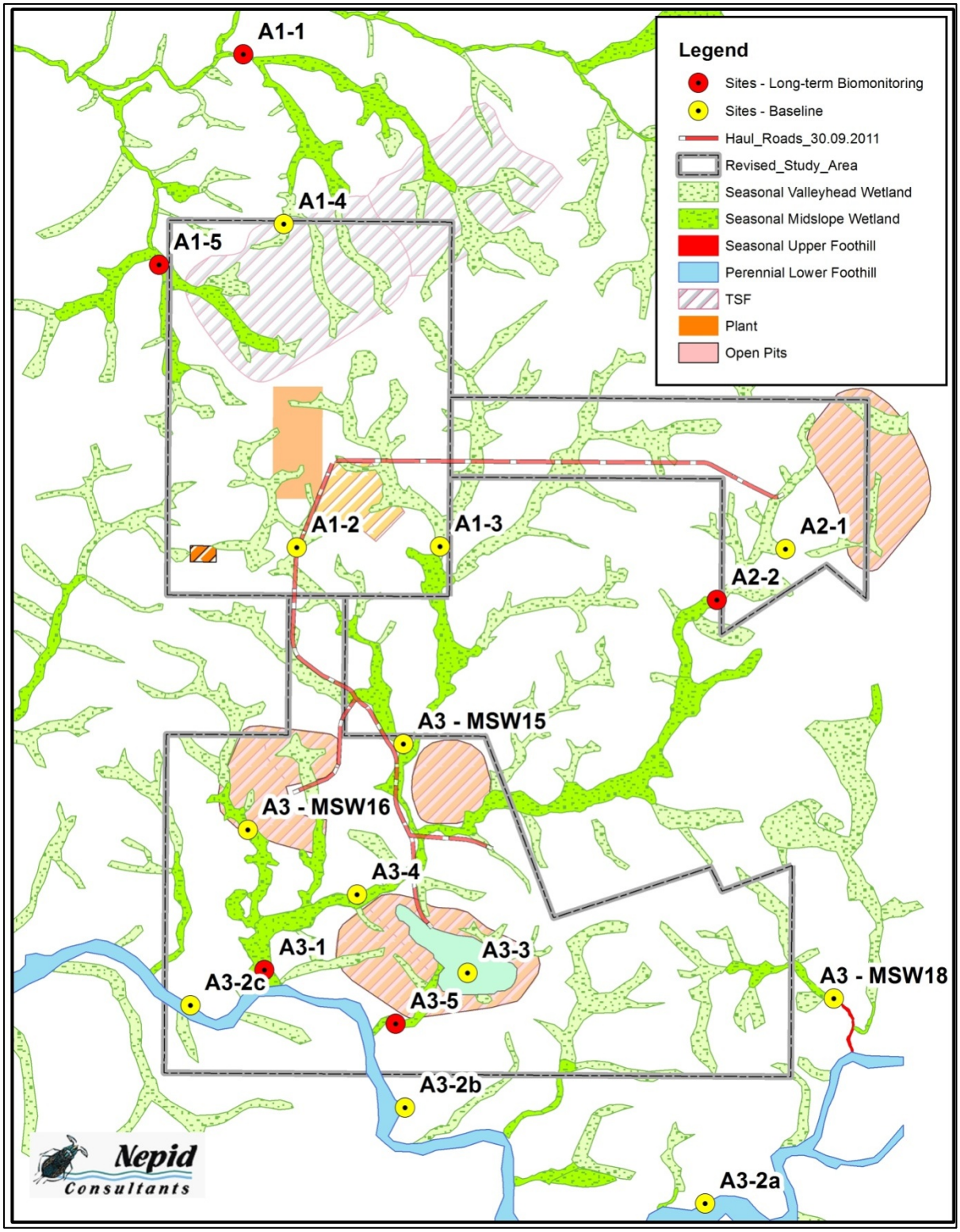

Figure 4: Locations of aquatic biomonitoring sampling sites

APPENDIX H

H MIOL POLICIES

Cape Lambert
Marampa Iron Ore (SL) Limited

Marampa Iron Ore (SL) Ltd - Health, Safety and Environmental (HSE) Policy

MIOL is committed to effective HSE management as a cornerstone of our striving for zero harm, social responsibility, corporate citizenship and sustainability.

To realize this, MIOL undertakes to:-

give priority to protecting the health and safety of our employees, contractors, visitors and host communities;

operate our business with respect and care for the environment to prevent and mitigate adverse impacts;

identify and assess potential hazards of our activities and manage associated risks to the lowest practical level;

work in full compliance with applicable laws and, where absent, with international best practice;

challenge ourselves to continually improve HSE performance with the goal of zero harm;

provide appropriate HSE training and resources to employees, contractors and visitors;

work with host communities to support programmes focused on community health and safety issues;

incorporate biodiversity and natural resources protection in our investment, operations and closure decisions;

review our HSE performance and publically report on it to stakeholders;

communicate this HSE policy to all our stakeholders;

engage in constructive dialogue with employees, contractors, visitors and host communities to share relevant information and responsibility in meeting our commitments.

Steve Kesler

Steve Kesler
Chief Executive Officer

Marampa Iron Ore (SL) Ltd Policy on Sustainable Development and Social Responsibility

MIOL undertakes to contribute to the social and economic development of sustainable communities associated with our operations.

To realize this, MIOL will:-

engage regularly and openly with Government , local authorities, community leaders and people affected by our operations and take their views and concerns into account in our decision making;

uphold and promote human rights within our area of influence respecting the cultural heritage, customs and rights of communities associated with our operations;

work with Government, local authorities, community leaders, NGO's and other interested parties to develop and support projects especially in the areas of education, health, environment and livelihood that have long lasting benefits and improve the quality of life in the communities associated with our operations;

employ and train local people to the maximum within the requirement of meeting operational goals;

make a broader economic contribution through indirect employment by helping local businesses develop capacity to provide our operations with a diverse range of services and products;

work to minimise the adverse impacts of our operations on the communities in which we operate and ensure they participate in lasting social and economic benefits.

Steve Kesler
Chief Executive Officer