GREATER SOUTPANSBERG MOPANE PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME

DMR References: LP 30/5/1/2/2/10029 MR
LP 30/5/1/2/2/10030 MR
LP 30/5/1/2/2/10031 MR
LP 30/5/1/2/2/10032 MR
LP 30/5/1/2/2/10033 MR
LP 30/5/1/2/2/10034 MR
LP 30/5/1/2/2/10035 MR
LP 30/5/1/2/2/10036 MR

NOVEMBER 2013

GREATER SOUTPANSBERG MOPANE PROJECT

SECTION 2

ENVIRONMENTAL MANAGEMENT PROGRAMME

REGULATION 51

PROJECT DETAILS

Name of Project	**Greater Soutpansberg - Mopane Project**
DMR Reference Numbers	LP 30/5/1/2/2/10029 MR
	LP 30/5/1/2/2/10030 MR
	LP 30/5/1/2/2/10031 MR
	LP 30/5/1/2/2/10032 MR
	LP 30/5/1/2/2/10033 MR
	LP 30/5/1/2/2/10034 MR
	LP 30/5/1/2/2/10035 MR
	LP 30/5/1/2/2/10036 MR
Name of Applicant	
LP 30/5/1/2/2/10029 MR	Regulus Investment Holdings (Pty) Ltd
LP 30/5/1/2/2/10030 MR	Kwezi Mining Exploration (Pty) Ltd
LP 30/5/1/2/2/10031 MR	Kwezi Mining Exploration (Pty) Ltd
LP 30/5/1/2/2/10032 MR	Chapudi Coal (Pty) Ltd
LP 30/5/1/2/2/10033 MR	Coal of Africa Limited
LP 30/5/1/2/2/10034 MR	Coal of Africa Limited
LP 30/5/1/2/2/10035 MR	Kwezi Mining Exploration (Pty) Ltd
LP 30/5/1/2/2/10036 MR	Kwezi Mining Exploration (Pty) Ltd
Responsible person	Baldwin Khosa
Designation	Regulatory Affairs Manager
Physical address	The Campus, Gabba Building (2nd floor)
	57 Sloane Street, Bryanston
Postal Address	PO Box 69517, Bryanston, 2021
Telephone	011 575 4363
Facsimile	086 562 1335
E-mail	*Baldwin.khosa@coalofafrica.com*

Environmental Consultant	Jacana Environmentals cc
Responsible person	Marietjie Eksteen
Physical address	7 Landdros Mare Street, Polokwane
Postal Address	PO Box 31675, Superbia, 0759
Telephone	(015) 291 4015
Facsimile	(015) 291 5035
E-mail	marietjie@jacanacc.co.za

Public Participation Consultant	Naledi Development Restructured (Pty) Ltd
Responsible person	Lizinda Dickson
Physical address	143 Zambezi Avenue, Sinoville
Postal Address	PO Box 13509, Sinoville, 0129
Telephone	(012) 543 9093
Facsimile	(012) 543 9619
E-mail	lizinda@naledidev.co.za

Impact specialist consultants

Soils, land use and capability	Gudani Consulting - EcoSoil Consortium
Surface and Groundwater	WSM Leshika Consulting (Pty) Ltd
Biodiversity	Phaki Phakanani Environmental Consultants
Aquatic systems	Scientific Aquatic Services
Noise	Gudani Consulting
Air Quality	Royal Haskoning DHV
Heritage Resources	Mbofho Consulting and Projects
Socio-Economic	Naledi Development Restructured (Pty) Ltd
Macro-Economic	Mosaka Economic Consultants cc

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Objective 2:

To establish a post-mining land use that will sustain post mining land use as per the closure plan.

Objective 3:

To ensure a sustainable, functional ecosystem post-mining.

Objective 4:

To identify and implement a sustainable post-closure decant management system to prevent the contamination of sensitive water resources.

1.1.2 Objectives for Livelihood Retention

Objective 5:

To empower local communities through Local Economic Development (LED) Initiatives, i.e. identify and establish livelihood retention projects that can create off-mine livelihoods during and post-mining.

Objective 6:

To equip employees with portable skills that can be utilised in other sectors post-mining.

1.2 MANAGEMENT OF ENVIRONMENTAL IMPACTS

1.2.1 Business and Corporate Policies related to the Environment

1.2.1.1 Vision

The full scale project plan for the Greater Soutpansberg Project is based on SHE (Safety, Health and Environment) economical and sustainable production of coking coal, with Zero Harm to people and proactive, early identification and mitigation of potential environmental impact, with an appreciation of the sensitivities around enhancing the livelihood of people in the area.

1.2.1.2 Values

Our value system is based on three fundamental tenets of Compliance, Caring and Competence represented by three pillars of foundational strength and stability, namely:

- Compliance – People always comply with prescribed Legislation, Policies, Procedures, Standards and Rules.
- To instill a work ethic that supports the need for meticulous structure and attention to organised societal needs and demands.
- Caring – People actively demonstrate prescribed leadership, behaviour and duty of care to safeguard themselves and each other at all times.
- To enhance the quality of life of individuals, groups and communities based on truth, honesty and respect for self and others.
- Competence – People apply initiative, skills and knowledge to perform at prescribed levels of competence within the bounds of their abilities and to stimulate the development of people to achieve personal growth and work satisfaction.
- To give recognition to the innate desire of individuals for self-growth and to perform at optimum levels of performance within one's physical, mental and emotional capabilities.

1.2.1.3 Commitment

In support our values of Caring, Compliance and Competence, the Greater Soutpansberg Project commits to a SHE Policy, which addresses:

- Implementing and maintaining a comprehensive SHE management system to drive persistent duty of care and continuous improvement in endeavors to improve the quality of life of communities associated with the Project.

- Integrating a risk-based system with production activities to address the identification and assessment of hazards and risks that may cause harm to persons and the environment, coupled with responsible management to mitigate potential exposures.

- Upholding ethical and recognised good business practices to comply with applicable legislation, sound corporate governance principles and other applicable recognised national and international requirements.

- Respecting fundamental human rights for a safe and healthy environment in which to work and live and the right to self-esteem, personal growth and respect.

- Involving people at all levels of the Project to gain ownership of the process and to upskill performance through relevant training, awareness and communication strategies.

- Regularly reviewing SHE management system performance against applicable recognised national and international best-practice and prescribed criteria to address areas for improvement.

Greater Soutpansberg Project Vision & Values

Our Value System

Caring	Compliance	Competence
People actively demonstrate prescribed leadership, behaviour, and duty of care to safeguard themselves and others	People always comply with prescribed legislation, policies, procedures, standards and rules	People apply skills and knowledge to perform at a prescribed level of competence

CARING	COMPLIANCE	COMPETENCE
↳ Courageous leadership. ↳ SHE committee meetings; progress meetings; start of shift meetings. ↳ Provision of awareness & communications strategies. ↳ Meetings with external & interested parties. ↳ Provision of suitable approved personal protective equipment & facilities. ↳ Emergency preparedness. ↳ Disciplinary procedures. ↳ Provision of employee occupational health & welfare facilities & counselling. ↳ Medical surveillance programmes. ↳ Community development & outreach programmes. ↳ Walk-the-talk.	↳ Legal appointments. ↳ Application of applicable SHE related legislation, codes of practice & industry accepted standards & norms. ↳ Application of company specific standards, rules & instructions. ↳ Application of codes of practices. ↳ Provision of comprehensive operational controls to manage potential exposure to hazards & risks. ↳ Workplace & hazardous equipment inspections. ↳ Task observations to monitor safe work practices. ↳ Internal & external SHE management system audits. ↳ SHE management system reviews.	↳ Induction training & assessment. ↳ Visitors' induction. ↳ Skills training & assessment. ↳ SHE specific training & assessment. ↳ Legal training. ↳ On-the-job coaching. ↳ Mentorships where necessary. ↳ Work performance observations & assessment.

1.2.2 Water and Waste Management Objectives

1.2.2.1 Surface water

1.2.2.1.1 Mine water requirements

Management of mine water should aim to:

- Minimise the water demand and wastage of water.
- Re-use process water where possible.

The objective of the Mopane Project is to re-use and recycle the dirty water generated on the mine in the processing plant, in the mining operation and for dust suppression.

1.2.2.1.2 Water quality

The objective with regard to water quality is to have the surface water qualities remain largely unaffected by the activities on site. Surface water quality should meet as a minimum drinking water standards or the DWA Water Quality Threshold (WQT) guideline until catchment-specific water quality objectives are developed for the Sand River Catchment.

Water quality objectives will be reached by monitoring monthly water quality data for surface water with associated interventions as and when required.

1.2.2.1.3 Storm water

Management of storm water on the mine aims to achieve the following objectives:

- Prevent storm water from coming into contact with material that could contaminate the water, thereby maximising clean water runoff.
- Route clean water runoff to a watercourse.
- Keep water of differing quality (i.e. clean and contaminated water) separate and manage these separately.
- Collect and contain contaminated runoff in appropriate facilities.
- Address potential water contamination at the source.
- Avoid the discharge of contaminated water and therefore aim to ensure that surface water qualities remain largely unaffected by the activities on site.
- Re-use contaminated water where possible.
- Treat contaminated water before discharge or release into the receiving water resource to acceptable standards.
- Prevent erosion of land and watercourses.
- Implement and maintain water management measures that are effective during different hydrological cycles and that will be viable in the long-term.

1.2.2.1.4 Catchment yield and hydrology

During the mine's life there will be a negative impact on the catchment yield and hydrology. The objective is to minimise the impact as measured against the predicted impacts given in the EMP documentation, by managing the impact in the following ways:

- Minimise the loss of yield during the operational phase by:
    - Minimising the footprint of dirty areas as far as is practical.
    - Ensuring clean water from areas upslope of dirty areas is diverted around the dirty areas.
    - Continuous rehabilitation of opencast areas, according to a defined schedule to avoid rehabilitation backlogs.
- Design of rehabilitated areas to ensure that they are free-draining as far as practically possible both during operations and post closure.
- Ensure that there is minimal impact on catchment yield and hydrology post closure.

1.2.2.2 Groundwater

Although it is inevitable that groundwater levels will be affected by mining, the mining schedule will be optimised during the Feasibility Phase in order to minimise the impacts associated with the Mopane and other Greater Soutpansberg Projects. To address issues on groundwater level lowering, the mining plan proposes to:

- The mining schedule will be optimised during the Feasibility Phase in order to minimise the impacts associated with the Mopane and other Greater Soutpansberg Projects. The groundwater flow model will be utilized during this exercise to obtain the most feasible option from a groundwater impact perspective.
- Embark on property specific investigations to determine the baseline of water use, yield and quality on all farms that are shown to be impacted over the LOM. This will enable the property owner and MbeuYashu to monitor against these baselines. These external boreholes will be included in the groundwater monitoring programme and monitored on a six-monthly basis.
- If an impact is detected, further investigation will be done to determine the origin of the impact. If the impact is proved to have been caused by the Mopane Project, MbeuYashu will enter into discussions with surrounding landowners impacted regarding:
    - Compensation
    - Alternative water supply
    - Acquisition of land

To minimise acid generation and manage leachate the mining plan proposes to:

- Deposit mine wastes in the open pit, controlling the migration of high sulphate leachate.
- The horizons that are potentially acid generating, the coal middlings and carbonaceous mudstones will be placed at the bottom of the pit, where it will be submerged below the water table, preventing oxidation.
- Stockpiling of carbonaceous material will be designed with a competent liner with a leachate collection system.
- Stockpiles will be capped, compacted and vegetated as soon as possible to minimise infiltration.
- Open pit areas will be rehabilitated and vegetated as soon as possible to reduce the oxidation and the potential generation of acid-mine drainage.
- Leachate formed in open pits will be pumped to the processing facility for re-use.
- Monitoring boreholes will be installed in appropriately selected sites prior to commencement of mining to detect changes in water quality and water levels with time.
- Ongoing review of groundwater / geochemical models to verify the predictions.

1.2.2.3 Waste

Mopane Project aims to manage the generation of waste according to the following waste management hierarchy:

- Prevent the generation of waste, as far as is practical.
- Minimise the amount of waste generated.
- Re-use and recycle waste as much as possible.
- If waste cannot be re-used or recycled, dispose of waste at licensed facilities.

1.2.2.4 Protection and reinstatement of a healthy ecosystem

The objective in terms of the ecosystem is to return the local ecosystem to as close to pre-mining levels as is practically possible. This will be measured through two primary mechanisms, namely:

- Water quality monitoring to assess the suitability of the water to support aquatic life.
- Implementation of a biodiversity monitoring programme for early detection of potential impacts. This is described in more detail in Section 4 of this report.

1.2.3 Land Use Management Objectives

1.2.3.1 Rehabilitation concurrent to mining operations

- Rehabilitation will be undertaken concurrent to mining operations. The mining plan/schedule will be optimised during the Feasibility Phase to ensure optimal placement of excavated material to facilitate concurrent rehabilitation with a free-draining profile as far as practically possible.
- Revegetation will be done as soon as possible to limit dust and erosion.
- The mining plan/schedule will be updated on a continuous basis to ensure best practice.
- The mine rehabilitation and reclamation plan (refer to Section 2.2) will be implemented and updated as mining progresses and/or changes.
- Rehabilitation monitoring (internal) and auditing (internal and external as required) will be implemented to ensure conformance to this objective and the rehabilitation and reclamation plan.

1.2.3.2 Effective management of topsoil

- The available topsoil will be stripped prior to mining and placed directly (as far as practicably possible) on levelled spoils.
- The compaction of topsoil during stripping and/or placement operations by heavy machinery will be limited and by maintaining vehicle speed to reduce the duration of applied pressure.
- Where possible, topsoil operations will be performed during the drier periods when moisture content is lower.
- Ensure the placement of sufficient topsoil to achieve the final end land use objective post-mining, in this case Rangeland (grazing and browsing class with a high biodiversity component).

1.2.3.3 Effective, long-term sustainable revegetation practices

- The reclamation plan (refer to Section 2.2) will be implemented and updated on a regular basis.
- The regional nursery established by the Makhado Colliery will be supported by the Greater Soutpansberg Projects to ensure sufficient plant material for reclamation.
- Grassing will be undertaken on a seasonal basis, to ensure germination of the grass species.

- All available topsoil areas will be seeded prior to the start of the rainy season to ensure maximum drainage from these areas of clean water back into the catchment system without excessive suspended solids.

- Soil analysis will be performed prior to seeding and the soil fertility rectified (if necessary) to facilitate vigorous growth.

- Organic fertilisers will be used as far as possible.

1.2.3.4 Maintenance of rehabilitated areas

- Annual vegetation audits (internal and external as required) will be undertaken to determine the soil fertility, vegetation coverage and self-sufficiency of the revegetated areas. The necessary actions will be implemented to correct any non-conformances of deficiencies identified during the audit. Once the desired nutritional status and vegetation coverage has been achieved, the audits will be conducted in intervals of 3-4 years.

- The revegetated areas will be monitored for declared weeds and invasive plants. This will be controlled and managed as per the normal procedure.

- Grazing of revegetated areas will be avoided for the first 3-5 years, after which controlled (rotational) grazing would be considered.

- Veld fires will be controlled in the revegetated areas and a rotational burning programme will be developed for the area in consultation with experts in this field.

1.2.3.5 Maintain remaining natural environment

- In areas included in the proposed mining plan, the natural vegetation will be retained as long as possible before topsoiling commences in order to limit dust and erosion.

- In areas not impacted by the mining activities, the natural vegetation will be maintained by implementing the following:

    - burning programmes;

    - rotational grazing programmes;

    - alien vegetation eradication programme; and

    - restricting vehicle movement to existing roads.

- Illegal access will be limited to prevent illegal hunting and snaring of fauna in the area.

- An environmental awareness campaign will be implemented, both internally and externally (local communities).

1.2.3.6 Value indigenous vegetation and endangered fauna

- A flora rescue operation will be initiated prior to the commencement of the proposed mining activity. Specific focus will be placed on the protected species.
- Annual flora rescue operations will be undertaken during the growing season in the areas planned to be mined and/or disturbed within the next year.
- A rescue and relocation programme for fauna species will be developed and implemented with the assistance of specialists in this field.
- Illegal access will be limited to prevent illegal hunting and snaring of fauna in the area.
- An environmental awareness campaign will be launched, both internally and externally (local communities) as described in Section 6 of this report.

1.2.3.7 Limit impact on wetland systems

- Implementation of watercourse alterations that is stable in the long term, in that they mimic the naturally stable characteristics of flow within the current catchment.
- Engineering of stream and wetland crossings to ensure that they comply with DWA requirements in terms of limiting channeling of flow, and increasing velocity. Any proposed design mitigation and methods will be evaluated by an appropriate wetland as well as a storm water specialist.
- Biodiversity offset programmes should include wetland offsets where appropriate.

1.2.3.8 Stability Impact Management

Mopane Project is aiming at developing rehabilitation and pollution control measures that will be sustainable post-closure.

Key issues and objectives relate to:

- All rehabilitated spoils placed within the opencast section will be made free-draining as far as practically possible. Grassing will be undertaken on a seasonal basis, to ensure germination of the grass species. This will to ensure maximum drainage from these areas of clean water back into the catchment system without excessive erosion or suspended solids.
- Preventing and managing erosion of rehabilitated surfaces, such as post mining landforms. The transition to natural systems considered sustainable in the long term taking account of possible exposure to fire and drought is important.
- Ensuring stability of remaining (if required) residue deposits.
- Ensuring that where activities have affected streams, these areas are not prone to erosion or deterioration in the future. In particular, the stability of the river diversions is a key issue.

1.2.4 Legal Compliance

To ensure compliance with the commitments reflected in this EMP, MbeuYashu will perform annual audits as part of the Sustainable Development (SD) reporting schedule to ensure conformance to environmental objectives and strategies and the implementation thereof. Annual external EMP performance assessments will be conducted to determine conformance with this EMP, including effectiveness and appropriateness of the EMP. In addition, annual revision of the closure cost assessment for immediate (pre-mature) closure will be undertaken as part of the EMP performance assessment.

To ensure ongoing compliance to the applicable environmental legislation of the country, the enviro-legal register for the Greater Soutpansberg Project will be updated on an ongoing basis. Bi-annual (every 2 years) external enviro-legal compliance audits will be conducted, taking into account all relevant environmental legislation, including relevant regulations promulgated in terms of the MPRDA, the NEMA, the NWA, the NEMWA and the MHSA.

1.2.5 Socio-Economic Conditions

1.2.5.1 Limit the impact to surrounding communities

- A noise monitoring programme will be implemented when operations commence at the Mopane Project. Monthly noise measurements would be conducted at noise sensitive areas and mine management should be advised of any significant increase in the residual (baseline) sound level as operations move closer to these communities. In cases where unacceptable levels are encountered, the necessary mitigation measures will be instituted.

- The impact and risks associated with light spillage will be limited by installing light fixtures that provide precisely directed illumination.

- Berms will be placed along sensitive viewing areas to screen off unpleasant views on to the planned open pit mining activities. The screening berms will be rehabilitated with indigenous vegetation to increase its aesthetic appeal and screening effect.

- In the case of depletion of water resources due to mining activities, alternative supplies and/or compensation of water to replace existing usage will be negotiated with affected groundwater users based on a structured compensation protocol.

- Dust suppression will be implemented at all operations that could cause increased dust levels, including access and haul roads, stockpile areas, process plant areas, opencast mining activities and rehabilitation and revegetation activities.

- General good housekeeping will be maintained in all areas prone for dust release. Regular inspection and maintenance routines will be implemented in these areas to address spillages on ground level and along conveyors, thereby preventing the re-suspension of settled dust.

- Implement an air quality monitoring system and maintain dust fall-out and particular matter within the guideline range stipulated by law. When these limits are exceeded, a detailed action plan will be compiled.

- Maintain natural vegetation cover as long as possible to limit dust pollution. Rehabilitate opencast areas as soon as possible after mining and re-establish grass cover on topsoiled areas to limit dust pollution and erosion.

- In the unlikely event that coal is hauled to off-site locations, the use of tarpaulins will be enforced. A procedure will be developed to ensure timeous reporting and cleaning of any spillages on the road surface by the contractors. This will be monitored on a regular basis to ensure compliance.

- Implementation of a Blasting Procedure and blasting monitoring programme.

- When blasting commences closer than 500m to any public road, road closure will be initiated during blasting times to prevent the risk of dust, fumes and fly rock injuries to motorists.

- All buildings and structures containing people that are closer than 500m to any blasting shall be evacuated during blasting times.

1.2.5.2 Community upliftment programmes

1.2.5.2.1 Human Resource Development Programmes

MbeuYashu is committed to work with industry stakeholders in creating an enabling environment for the empowerment of HDSAs by providing a comprehensive skills development plan that addresses the HDSA mining skills deficits within the industry. The following aspects are included in this commitment:

- Interfacing with statutory bodies such as the Mining Qualifications Authority (MQA), through the standing consultative arrangements, in the formulation of comprehensive skills development strategies;
- Interfacing with the education authorities and providing scholarships to promote mining-related educational advancement, especially in the fields of mathematics and science at school level;
- Ensuring the provision of scholarships and that the number of registered learnerships in the mining industry will rise from the current level;
- Undertaking to provide skills training opportunities, through the MQA, to employees during their employment to improve their earning capacity after mine closure;
- Providing access to training courses in mining entrepreneurial skills through the MQA and in collaboration with academic institutions, Department of Minerals Resources associated institutions, NGOs, and the Gender Commission;
- Offering every employee the opportunity of becoming functionally literate and numerate;

- Implementing career paths to provide opportunities to employees to progress in their chosen careers; and
- Developing systems through which empowerment groups can be mentored as a means of capacity-building.

1.2.5.2.2 Local Economic Development Programme

The Mopane Project LED programme will focus on the local area from which the operation will draw its labour and especially on communities where there will be a high concentration of resident employees.

Projects will be evaluated by Department of Mineral Resources on criteria such as viability, sustainability, accrued benefits, institutional arrangements and job creation and approved before implementation. Local Economic Development will focus on contributing to the following aspects:

- Informal Sector Support
- Labour Intensive Road Construction
- Adopt-a-school Programme
- Water Conservation and Water Demand Management Strategy with the District Municipality
- Mining School of Excellence

1.2.5.2.3 Procurement

Procurement at the Mopane Project will fall into two categories:

- Capital expenditure
- Working cost expenditure

The objective of the procurement programme will be to promote and enhance the constructive participation of HDSA vendors in the mine's upstream value chain, and to ensure that HDSA suppliers have access to the project's supply chain.

A Procurement Procedure and Local Vendor database will ensure the involvement of Local Suppliers where possible.

1.2.6 Historical and Cultural Aspects

- In the event that the burial sites cannot be avoided, the burial sites will be relocated prior to mining, in accordance with the requirements of the National Heritage Resources Act, 1999 (Act 25 of 1999).
- Phase 1B / Phase 2 investigations will be implemented in accordance with the Heritage Impact Assessment.

- National Heritage and Cultural issues will be included in the environmental awareness programme.

- Regular monitoring of heritage resources of importance.

- Ongoing monitoring during construction and/or mining will be done by a qualified heritage specialist for early detection of unidentified (sub-surface) sites or graves.

1.2.7 Operational Objectives to facilitate Closure

Apart from the short-term objectives and strategies that will require implementation and monitoring over the full life of mine, the following objectives have been set in order to address post-closure issues early on during the operational phase:

1.2.7.1 Verify and manage mine water balance and post-closure decant

- Ongoing sampling and monitoring of parameters important to the final water quality and water volumes.

- Dedicated monitoring programme and modelling to quantify and verify the post-closure water balance and decant water quality. The model will be revised at least every 5 years.

- Ongoing evaluation and reassessment of alternative options for the final water use and required associated water quality, together with the technologies required to achieve the required quality.

- The final land use will also be used to evaluate the post-closure water management.

- Active involvement in the regional integrated water management plan developed in conjunction with the DWA.

1.2.7.2 Develop final land use plan

- Define, in consultation with all IAPs, the final (post-closure) land use for the mining area, including mining areas, surface and water management infrastructure, mine residue facilities, etc.

- Develop a final land use plan and implementation programme as part of the closure plan, taking into account important issues such as ongoing operational and maintenance requirements and long-term responsibilities and ownership.

- Set final closure objectives and standards to ensure conformance to the final land use plan and the requirements of the IAPs and relevant environmental legislation.

- Develop a detailed closure plan for the Mopane Project five years prior to closure and obtain approval from the relevant authorities.

2 IMPLEMENTATION PROGRAMME

2.1 MITIGATORY MEASURES (TECHNICAL AND MANAGEMENT OPTIONS)

Table 1 and Table 2 lists the potential environmental and socio-economic impacts for the Mopane Project, respectively, together with the proposed mitigation measures to prevent and/or minimise such impacts.

The following issues were rated as high risk impacts and the mitigation measures therefore are detailed in the subsequent sections.

- Environmental / Biodiversity Impacts
    - Section 2.2 – Mine Rehabilitation and Reclamation Plan
    - Section 2.3 – Surface Water Management Plan
    - Section 2.4 – Groundwater Management
    - Section 2.5 – Hazardous Substances Management
    - Section 2.6 – Waste Management Procedure
    - Section 2.7 – Energy Management Plan
- Socio-Economic Impacts
    - Section 2.8 – Heritage Management Action Plan
    - Section 2.9 – Community Safety and Traffic Management Procedure
    - Section 2.10 – Influx Management Plan
    - Section 2.11 – Crime and Anti-Poaching Management Plan

Table 1: List of all potential environmental impacts for the Mopane Project with proposed mitigation measures

Activity	Environmental Aspect	Potential Impact	Mitigation Measures
All activities	**Biodiversity / Land Use & Capability**	Surface disturbance of approximately 3,500 hectares for the purpose of mining and infrastructure development over the LOM will lead to impacts on the soil, land use and land capability, natural vegetation and fauna	• Development and implementation of a detailed Mine Rehabilitation and Reclamation Plan during the Feasibility Phase. • Concurrent rehabilitation and levelling of opencast pits in line with the Mine Rehabilitation and Reclamation Plan. • Monitoring, auditing and regular review (if required) of the Mine Rehabilitation and Reclamation Plan. • Rehabilitation of infrastructure and other disturbed areas post-mining. • Implementation of Flora Rescue and Relocation Plan prior to any surface disturbances. • Develop species rescue, relocation and re-introduction plan (fauna) with the assistance of specialists in this field. • Develop and implement Biodiversity Action Plan, including avifaunal plan. • Fencing of designated mining and infrastructure areas. • Implementation of biodiversity monitoring. • Close collaboration with the Vhembe Biosphere Reserve in respect of final end land use and sustainable mining.
		Increased poaching in region as a result of influx	• Establishment of an anti-poaching unit in conjunction with adjacent landowners and communities. • Implement an Environmental Awareness Programme within the surrounding communities.
All activities	**Waste management**	Poor waste management could lead to environmental impacts	• Implementation and regular review of Waste Management Procedure. • Appoint an approved, registered waste contractor to manage the waste generation and safe disposal thereof. • No waste will be disposed of or buried on site, or in any other location that is not a licensed waste disposal site.
		Poor sewage management could impact on water resources	• Sewage effluent will be treated to General Standards and pumped to the Infrastructure Area storage dams for re-use in the process. No effluent will be discharged to the environment.

Activity	Environmental Aspect	Potential Impact	Mitigation Measures
All activities	**Bulk water**	Impact on water stressed catchment - fully allocated	• The bulk water source will be determined during the Feasibility Phase, followed by a detail EIA for the selected option. • Design closed system to ensure optimal recycling of water and minimise water requirements for the mine. • Installation of filter presses to increase water recovery in the process plant.

All activities	**Bulk electricity**	Further impact on over-allocated electricity reticulation system	• Energy efficient designs such as:
			  ○ High efficiency motors in plant and workshops
			  ○ Power Factor Correction
			  ○ Use VSDs
			  ○ Use solar power where possible
			  ○ Install solar geysers at change houses\Optimal building design to make use of ambient light
			• Energy Policy must govern energy efficient designs such as: power factor correction; lighting designs; cooking and heating - avoid electricity use gas; process efficiency; high efficiency motors; low loss transformers; green building designs; use of solar and heat pumps for water heating.
			• Implement Energy Management Plan.
			• Monitor and record energy usage on site. Ongoing improvement in energy consumption should form part of the mine's KPIs.

All activities	**Heritage resources**	Destruction of heritage & cultural resources as a result of mining and associated infrastructure (including linear activities)	• A detail Heritage Management Action Plan will be developed during the Feasibility Phase once the mining and infrastructure has been finalised. • Implementation of Heritage Management Action Plan dealing with the Phase 1B&2 assessment as well as grave relocation. • National Heritage and Cultural issues will be included in the environmental awareness programme. • Regular monitoring of off-site heritage resources of importance.
All activities	**Sense of place**	Impact on conservation value of the region	• Identify and implement biodiversity offset programmes in conjunction with the IAPs and authorities, including the Vhembe Biosphere Reserve. • Implementation of environmental monitoring programme. • Develop environmental awareness & educational programmes. • Environmental auditing and reporting.
Opencast mining	**Soils / Land Use & Capability**	Potential hard setting of soils post-reclamation	• Soil analyses and amelioration during reclamation.
		Subsidence of rehabilitated areas	• Free-draining profile (as far as practically possible) for rehabilitated areas and ongoing monitoring.

Activity	Environmental Aspect	Potential Impact	Mitigation Measures
Opencast mining	**Surface water**	Impact on non-perennial streams cutting through mining areas leading to decrease in runoff	• Optimisation of the storm water management plan and positioning of mining pits during the Feasibility Phase. • Diversion of non-perennial streams around opencast areas to minimise decrease in surface runoff. • Rehabilitation concurrent to mining – limit dirty footprint.
		Impact on wetland areas and aquatic ecosystems associated with non-perennial streams	• Aquatic monitoring. • Create small impoundments at head of stream diversions to limit erosion. This could potentially become artificial wetlands over time. • Identify and implement biodiversity offset programmes (including wetland offsets) in conjunction with the IAPs and authorities, including the Vhembe Biosphere Reserve.
		Impact on 1:100 year flood-line of the Sand River	• Revise mining footprint during Feasibility Phase to avoid 1:100 flood-lines of the Sand River, plus a 100m buffer zone.
		Increased sedimentation into Sand River due to uncontrolled surface run-off	• Design and install appropriate outlet structures to retard flow velocity. • Construction of energy dissipating structures along steep slopes. • Side slopes of earth berms / canals to be designed to 1:3 and protected & vegetated to prevent erosion.
		Potential impact on in-stream habitat and riverine vegetation as a result of decrease in runoff	• Implementation of monitoring programme for early detection of impacts (plant moisture stress monitoring). • Diversion of clean storm water runoff around opencast areas to minimise impact of flow within the Sand River.
		Impact of long-term decant on water quality	• Investigate appropriate management measures over the LOM.
Opencast mining	**Groundwater**	Dewatering of aquifer as a result of mining	• The mining schedules will be revised during the Feasibility Phase in line with the recommendation of the specialist EIAs. Once this has been completed, the groundwater impact model will be revised to determine the impact of the revised mining design. • Implementation of baseline monitoring programme on farms that are potentially impacted once the mining and infrastructure feasibility studies have been completed. • Provide alternative water sources where appropriate. • Compensation mechanisms need to be developed and agreed with impacted landowners to compensate those who are impacted upon.

Activity	Environmental Aspect	Potential Impact	Mitigation Measures
		Impact on surrounding vegetation as a result of dewatering and subsequent recovery	• Implementation of monitoring programme for early detection of impacts (plant moisture stress monitoring). • Diversion of clean storm water runoff around opencast areas to minimise impact of flow within the Sand River.
		Decrease in regional water quality due to seepage from rehabilitated pits	• Potential acid generating horizons will be placed at bottom of pit and submerged below the water table, thereby preventing oxidation. • Rehabilitation will be concurrent with mining, minimising the potential for oxidation of sulphide bearing rocks and controlling the migration of high sulphate leachate. • Exposed residue material will be minimised by direct placement of overburden and topsoil. • Vegetation will be re-established as soon as possible after topsoiling to minimise infiltration of water through residue material. • Implementation of baseline monitoring programme to detect any seepage. • Compensation mechanism to compensate landowners who are impacted upon.
		Migration of pollution plume after full recovery of groundwater levels (prior to decant)	• Investigate appropriate management measures over the LOM. • Groundwater and geochemical models must be updated on a regular basis (every 5 years) to verify potential for decant.
Opencast mining	**Air Quality**	Dust impact caused by vehicle movement	• Application of dust suppression measures (surface surfactants) such as Dustex. • Reduce vehicle speed on unpaved roads to limit dust creation.
		Dust impact caused by blasting activities	• Develop Blasting Procedure to minimise impacts.
		Dust impact caused by materials handling	• Reduction of drop height to reduce the dispersion of materials being transferred, and increase in moisture content (water sprays). • Creation of wind breaks in close proximity to storage piles to reduce the potential erosive forces of the wind.
		Methane emissions leading to air quality impacts	• Ongoing methane monitoring if required.

Activity	Environmental Aspect	Potential Impact	Mitigation Measures
Opencast mining	**Noise**	Elevated noise levels caused by mining operation, dewatering (pumping) and blasting activities	• Noise attenuation berms (topsoil) on footprint of opencast areas. • Noise suppression devices on heavy vehicles and all noisy plant. • Alternative reverse hooting systems will be implemented to reduce the noise levels. • Low noise generator sets will be used in pit. • Develop air blast control measures. • Blasting limited on regular times, restricted to 08:00-18:00. • All plant, equipment and vehicles to be kept in good repair. • Employees / contractors working in areas where the 8-hour ambient noise levels exceed 85dBA shall wear ear protection equipment.
Opencast mining	**Visual / Aesthetics**	The mining will have a negative on the aesthetics / sense of place	• Berms on footprint of opencast areas to be protected and vegetated to reduce the visual impact. • Avoid the unnecessary removal of vegetation during the operational phase. • Rehabilitation and revegetation will be performed concurrent to mining. • Introduce trees to the landscape at strategic locations (sensitive receptors) to break full exposure of the mine. Further analyses and stakeholder engagement will be required for this commitment.
Opencast mining	**Socio-economic**	Impact on the communities and sensitive receptors as a result of blasting	• Develop and implement Blasting Procedure as well as an Evacuation Procedure.
Processing plant / infrastructure areas (including RLT & siding)	**Soils / Land Use & Capability**	Soil impacts as a result of poor hydrocarbon management and spillages	• Develop and implement hydrocarbon management procedure. • Reclamation of soils in the event of accidental spillages.
		Surface disturbance caused by infrastructure	• Dismantling of infrastructure. • Final rehabilitation of disturbed areas. • Rehabilitation of dams and storm water drainage.
Processing plant / infrastructure areas (including RLT & siding)	**Surface water**	Water quantity impact due to decreased surface runoff	• Optimisation of the storm water management plan and positioning of infrastructure during the Feasibility Phase. • Separation of clean and dirty water systems (stream diversions) to minimise impact on runoff.
		Water quality impact on Sand River	• Directing and containment of dirty water runoff in dirty water dams and providing silt traps. • Recycling (reuse) of dirty water in process. • The dirty water dam will be designed for the 1:50 year flood-event and HDPE lined to prevent discharges / seepage into the surface water resources.

Activity	Environmental Aspect	Potential Impact	Mitigation Measures
		Water quality impacts as a result of poor hydrocarbon management and spillages	• Develop and implement hydrocarbon management procedure. • Bulk facilities to be concrete lined and bunded to capacity of 110%.
Processing plant / infrastructure areas (including RLT & siding)	**Groundwater**	Water quality impacts due to infiltration of dirty water from the plant and infrastructure areas	• Dirty water dams to be plastic lined to prevent groundwater contamination. • Carbonaceous plant stockpile areas to be appropriately lined with dedicated dirty water drainage from the stockpile to prevent groundwater contamination. • Dirty water canals in the Infrastructure Area to be concrete lined to prevent groundwater contamination.
Processing plant / infrastructure areas (including RLT & siding)	**Air quality**	Air quality impacts associated with processing activities and movement of vehicles	• Reduction of drop height to reduce the dispersion of materials being transferred, and increase in moisture content (water sprays). • Plant and access roads to be surfaced or treated with dust palliatives such as Dustex.
		Dust impact caused by crushing and screening operations	• Introduce dust suppression systems, either in the form of water sprays or cladding in order to reduce the potential emissions. • Reduce vehicle speed on unpaved roads to limit dust creation.
Processing plant / infrastructure areas (including RLT & siding)	**Noise**	Elevated noise levels caused by crushing and processing activities	• Rubber vulcanised belt – less noisy / vibration. • Cladding of crushing and screening plants and noisy equipment – encapsulation in buildings, acoustic covers, screens or sheds. • Noise suppression devices on heavy vehicles / crushing equipment. • Low noise generator sets will be used in plant. • Employees / contractors working in areas where the 8-hour ambient noise levels exceed 85dBA shall wear ear protection equipment.
Processing plant / infrastructure areas (including RLT & siding)	**Visual / aesthetics**	Processing plant will have a visual impact as a result of high buildings	• Avoid the use of highly reflective material in construction. • Metal surfaces should be painted in natural soft colours (Aloe Green) that would blend in with the environment.

Activity	Environmental Aspect	Potential Impact	Mitigation Measures
Processing plant / infrastructure areas (including RLT & siding)	**Lighting**	Sky glow effect will have an impact on the sense of place at night	• Use specifically designed lighting equipment that minimises the upward spread of light near to and above the horizontal. Care should be taken when selecting luminaries to ensure that appropriate units are chosen and that their location will reduce spill light and glare to a minimum. • Keep glare to a minimum by ensuring that the main beam angle of all lights directed towards any potential observer is not more than 70°. Higher mounting heights allow lower main beam angles, which can assist in reducing glare. In areas with low ambient lighting levels, glare can be very obtrusive and extra care should be taken when positioning and aiming lighting equipment. • Covering of high lighting masts to reduce the glow. • Suppress dust forming to minimise the effect of sky glow during night.
		Impact on invertebrates	• Long-wavelength light sources should be used, e.g. low-pressure sodium vapour lights.
On-site conveyance of ROM and product	**Air Quality**	On-site conveyance will increase the ambient air quality	• Application of dust suppression (Dustex) on internal haul roads. • Surfacing of access road and main haul roads. • Water sprays at stockpiles and transfer points. • Water misters will be installed at strategic points at the transfer points along the conveyor in order to abate dust emission. • Vehicle speed on unpaved roads limited to prevent dust creation. • Conveyor design to include 'dogsheeting' on top and along the prevailing wind direction sides to minimise dust generation. • Use of appropriate plant operation and material handling techniques, good maintenance and housekeeping. Therefore the implement measures to minimise the generation and dispersion of dust and surface disturbances. • Employ latest technology to reduce vehicle exhaust gas emissions.
On-site conveyance of ROM and product	**Surface water**	Stream crossings (road and conveyor) could potentially impact on the stream flow and lead to stream flow reductions downstream	• Design crossings for 1:20 year flood to minimise effect of damming of water upstream. No permanent retention of water in river at crossings.

Activity	Environmental Aspect	Potential Impact	Mitigation Measures
		Spillages along conveyors/roads could impact on water quality	• Regular inspections will be implemented for early detection of spillages. Cleaning up of any spillages that may have occurred. • All conveyors to be fully enclosed for zero spillage over all stream crossings. • Conveyors covered to deflect rain water away from conveyor belt. • Installation of primary and secondary scrapers ensures that there is continuous contact between the scrapers and the belt which will prevent spillages on the return belt.
On-site conveyance of ROM and product	**Noise**	Elevated noise levels caused by trucking and conveying activities	• Rubber vulcanised belt – less noisy / vibration. • Maintenance of vehicles. • All equipment selection to fall in line with permissible noise dBA. • During the selection of the main components and equipment of the proposed undertaking as a whole, installation of alternative low-noise generating makes and models will be considered. • Noise suppression devices on heavy vehicles / conveying equipment.
On-site conveyance of ROM and product	**Soils / Land Use & Capability**	Surface disturbance caused by infrastructure	• Dismantling of infrastructure. • Final rehabilitation of disturbed areas and storm water drainage.
Mine residue stockpiles	**Groundwater**	Impact of carbonaceous stockpiles on groundwater resources	• Carbonaceous stockpiles to be appropriately lined with a sub-surface drainage system. • Stockpiles to be compacted, properly capped and revegetated to reduce recharge. • Stockpiles slopes to be designed such to increase runoff whilst preventing erosion. • Carbonaceous stockpiles to be disposed in-pit as far as possible at closure to minimise final footprint of surface carbonaceous stockpiles.
Mine residue stockpiles	**Surface water**	Impact on non-perennial streams cutting through mining areas leading to decrease in runoff	• Optimisation of the storm water management plan and re-positioning of stockpiles during the Feasibility Phase. • Diversion of non-perennial streams around stockpile areas to minimise decrease in surface runoff.
		Increased sedimentation in Sand River due to uncontrolled surface run-off and erosion	• Side slopes of stockpiles to be protected and vegetated to prevent erosion. • Construction of energy dissipating structures along steep slopes.
		Water quality impacts as a result of dirty water runoff / seepage from carbonaceous stockpiles	• Dirty water / seepage to be collected in lined facility and recycled to dirty water dams for use in process.

Activity	Environmental Aspect	Potential Impact	Mitigation Measures
Mine residue stockpiles	**Visual / Aesthetics**	Large stockpiles will impact on the landscape	• In-pit disposal as far as possible. • Stockpiles to be protected and vegetated to reduce visual impact. • Landscaping of stockpiles to minimise impact – avoid straight lines and design contoured stockpiles that represent the natural lines of the existing topography.
Mine residue stockpiles	**Air quality**	Increase dust emissions as a result of stockpiles	• Compaction by heavy vehicles used for stockpile operations. • Stockpiles to be vegetated to reduce dust emissions.
Mine residue stockpiles	**Noise**	Noise from stockpile construction leading to the main contributing factors to the noise at the sensitive receptors, especially at night-time	• Noise suppression devices on heavy vehicles / crushing equipment. • Alternative reverse hooting systems will be implemented to reduce the noise levels.
Off-site conveyance of ROM - conveyor between Voorburg & Jutland	**Safety**	Road / conveyor crossings could lead to safety risks to road users	• Appropriate crossings (under or over-passes) will be designed to eliminate the safety risks. • The conveyor route will be fenced off to prevent people and animals from going onto or across the conveyor.
Off-site conveyance of ROM - conveyor between Voorburg & Jutland	**Surface water**	Stream crossings where culverts may concentrate flow, leading to enhanced flow velocities and associated erosion problems	• Design crossings for 1:20 year flood to minimise effect of damming of water upstream. No permanent retention of water in river at crossings. • Construct the necessary erosion control measures at these crossings to reduce the impact.
Off-site conveyance of ROM - conveyor between Voorburg & Jutland	**Surface water**	Potential for water quality impacts due to dirty runoff and spillages along the conveyor	• Regular inspections will be implemented for early detection of spillages. Cleaning up of any spillages that may have occurred. • All conveyors to be fully enclosed for zero spillage over all stream crossings. • Conveyors covered to deflect rain water away from conveyor belt. • Installation of primary and secondary scrapers ensures that there is continuous contact between the scrapers and the belt which will prevent spillages on the return belt.
Off-site conveyance of ROM - conveyor between Voorburg & Jutland	**Noise**	Increase of ambient noise levels along the conveyor route	• Cladding of conveyor drives and other noisy equipment – encapsulation in buildings, acoustic covers, screens or sheds. • Rubber vulcanised belt – less noisy / vibration. • Noise suppression devices on conveying equipment.
Off-site conveyance of ROM - conveyor between Voorburg & Jutland	**Air quality**	Increase of dust emissions along the conveyor route	• Dust fallout monitoring points will be established along the conveyor route to detect an increase in emissions. • Regular inspections will be done along the conveyor route to detect and clean any spillages from the conveyor.

Activity	Environmental Aspect	Potential Impact	Mitigation Measures
Off-site conveyance of ROM - conveyor between Voorburg & Jutland	**Biodiversity**	Land units will be divided into smaller units which may not be ecologically viable	• Re-route conveyor to align with existing disturbed corridors, i.e. roads, railway line. This will be finalised during the Feasibility Phase. • Animal crossings (underpasses) will be created along the conveyor for animals and domestic livestock, if the route cannot feasibly be re-routed.
		Potential impact on protected flora species identified along the route	• The conveyor route will be diverted to prevent impact to specific protected species, e.g. baobabs, impala lilies. • Where possible, the species that cannot be avoided will be rescued and relocated as per the Rescue & Relocation Plan.
		Creation of additional corridors which could lead to increased poaching	• Establishment of an anti-poaching unit in conjunction with adjacent landowners and communities. • Fencing (game fence) of the conveyor for safety and access control.
		Killing of animals crossing the conveyor	• The conveyor will be fenced off to prevent animals from going onto the conveyor system.

Off-site conveyance of product by truck (in emergencies)	**Safety**	Road transport of product will impact on the traffic along the route, safety risk to road users	• Implementation of Community Safety and Traffic Management Procedure, including:
			  ○ Upgrading of road intersections.
			  ○ Other traffic calming measures identified during the LOM.
			  ○ Maintaining vehicle speeds.
			  ○ Covering of vehicles when in motion, both for loaded and unloaded vehicles.
			  ○ Switching on head lights of trucks.
			• Due notification to the surrounding landowners and communities in the event of emergency trucking.
			• Implement a Traffic Awareness Programme within the surrounding communities.

Off-site conveyance of product by truck (in emergencies)	**Biodiversity**	Killing of animals and avifauna on the roads, especially nocturnal animals/birds	• Maintaining vehicle speeds. • Trucking during daylight hours only. • Implement an Environmental Awareness Programme for trucking contractor.
Off-site conveyance of product by truck (in emergencies)	**Surface water**	Potential for water quality impacts due to spillages and dirty runoff into the streams	• Regular inspections will be done along the route to detect and clean any spillages from the trucks. • Emergency procedure to be developed and implemented in the event of any spillage / accident along the route. • Covering of vehicles when in motion, both for loaded and unloaded vehicles.

Activity	Environmental Aspect	Potential Impact	Mitigation Measures
Off-site conveyance of product by truck (in emergencies)	**Air quality**	Material and product loss from trucks	• Gravel roads to be surfaced or treated with dust palliatives such as Dustex. • Covering of vehicles when in motion, both for loaded and unloaded vehicles. • Regular inspections will be done along the route to detect and clean any spillages from the trucks.
Off-site conveyance of product by truck (in emergencies)	**Noise**	Increase of ambient noise levels along the route	• Noise suppression devices on transport trucks. • Trucking during daylight hours only.

Table 2: List of all potential socio-economic impacts for the Mopane Project with proposed mitigation measures

Social Aspect	Potential Impact	Proposed Mitigation measures
Demographic and Population Impacts	Influx of work seekers into the area	• Optimise the use of local labour as far as possible. Establishing early on skills development programmes in the local area will support to possibility of finding skilled people locally. • Development and Implementation of an Influx and Land use Management Plan. • Develop a code of conduct with which contractors and their employees must comply. The code should deal with the interaction with local communities and substance abuse among other things. • Develop a Stakeholder Engagement Plan (SEP) which clarifies the principles of engagement with community and other stakeholders, sets in place appropriate liaison forums (a community forum is recommended), and describes the grievance management procedure to be adopted by the Mopane Project. Establishment of a local labour recruitment committee to monitor recruitment procedures and results. • Communicate through media the recruitment procedures and priorities to discourage work seekers from outside the area.
Demographic and Population Impacts	Influx of construction labour with pressure on services and social structures	• Facilitate the provision of housing and associated infrastructure. • Establishment of a construction accommodation camp to house those employees that cannot be sourced from the local community due to a lack of skills. • Optimise the use of local labour as far as possible. Establishing early on skills development programmes in the local area will support to possibility of finding skilled people locally. • Development and Implementation of an Influx and Land use Management Plan. • Develop a code of conduct with which contractors and their employees must comply. The code should deal with the interaction with local communities and substance abuse among other things. • Develop a Stakeholder Engagement Plan (SEP) which clarifies the principles of engagement with community and other stakeholders, sets in place appropriate liaison forums (a community forum is recommended), and describes the grievance management procedure to be adopted by the Mopane Project. • Establishment of a local labour recruitment committee to monitor recruitment procedures and results. • Develop and communicate a clear and concise employment and recruitment policy to prevent opportunistic job seekers from settling in the area. • Implementation of a programme of STD and HIV/AIDS screening, counselling and (where possible) treatment.

Social Aspect	Potential Impact	Proposed Mitigation measures
Demographic and Population Impacts	Influx of operational workforce with pressure on services and social structures	• Contribution towards the provision of housing, infrastructure and services for operational staff. • The establishment of partnerships with other private sector stakeholders, government authorities and civil society organisations to integrate planning around the provision of services and infrastructure, and to ensure that Mine inputs in this context compliment initiatives led by other players, especially the local and district municipality. • Development and Implementation of an Influx and Land use Management Plan. • Optimise the use of local labour as far as possible. Establishing early on skills development programmes in the local area will support to possibility of finding skilled people locally. • Induction of contractors and workforce with regard to their code of conduct in the local communities. • Develop and communicate a clear and concise employment and recruitment policy to prevent opportunistic job seekers from settling in the area. • Implementation of a programme of STD and HIV/AIDS screening, counselling and (where possible) treatment. • Continuous assessment and monitoring of infrastructure and services capacity in focal points (assessment every 5 years). • Determine scale of assistance required at focal points and enter into an agreement with the municipality. • Establish a development, infrastructure and service monitoring forum with the municipality to continuously assess and monitor capacity, determine assistance required and oversee implementation.

Social Aspect	Potential Impact	Proposed Mitigation measures
Demographic and Population Impacts	Influx of people and the development of spontaneous settlements near project facilities, in the Mopane Town and surrounding areas	• Develop a Community Development Plan which addresses issues relating to provision of housing for the workforce through on-going communication and engagement between the mine and local authorities for implementation of this plan. • Develop and adoption of an Influx Management Plan in consultation with the local government that outlines proactive management measures to discourage and manage influx, outlines and refines relevant stakeholders and their roles and responsibilities and the way in which each role-player intends to manage influx and spontaneous settlements. • Support the compilation of a development master plan, in cooperation with relevant local and regional authorities for the Musina and Makhado areas, whereby new development areas for workers' and new arrivals' accommodation will be catered for and duly planned • Support local government capacity for integrated development planning. • Develop and communicate a clear and concise employment and recruitment policy to prevent opportunistic job seekers from settling in the area. • Continuous assessment and monitoring of infrastructure and services capacity in focal points (assessment every 5 years). • Determine scale of assistance required at focal points and enter into an agreement with the municipality. • Establish a development, infrastructure and service monitoring forum with the municipality to continuously assess and monitor capacity, determine assistance required and oversee implementation.
Demographic and Population Impacts	Conflicts arising at the end of construction due to the termination of job opportunities for contractors	• Investigate the possibility of transferring labour from one operation to another – depending on the phasing of the projects. • Develop the MbeuYashu grievance procedure to capture and address grievances arising due to retrenchments and downscaling. • Ensure compliance with all applicable Labour Regulations of South Africa. • Consider compliance with Best Practice , i.e. IFC's Performance Standard 2 "Labour and Working Conditions". • Monitoring of all contractors and sub-contractors for compliance with the above standards, with contractually-established financial sanctions for observed non-compliances. • Communicate the termination conditions to the communication structure established. • Communicate the termination conditions to all employees – including contractors and sub-contractors.

Social Aspect	Potential Impact	Proposed Mitigation measures
Health and Social Wellbeing	Increased chances of the spread of communicable diseases such as HIV/AIDS and STDs linked to influx of predominantly male job-seekers and workers	• Develop a comprehensive HIV/AIDS and STD program to employees through employee wellness programmes which should include prevention, voluntary counselling for HIV testing, as well as anti-retroviral treatment for employees. • Develop a Community Health Action Plan which focuses on HIV/AIDS, tuberculosis. • Repeated awareness campaigns that is focused beyond employees, and includes contractors and the communities near project facilities.
Health and Social Wellbeing	Safety and Risk Exposure through an increase in crime	• Increased security on mine premises. • Construction and permanent workers are identified and marked with clear identifiable clothing. • Code of Conduct to form part of induction of new workers with a clear statement and procedure regarding access, conduct and identification. All construction workers should wear clothing marked (and reflective vests) with the logo of the construction firm/contractor or sub-contractor as well as identification cards that cannot be easily forged, so that they can be easily recognized as being legitimate. • Workers to be screened including criminal background checks. • Properly constructed and secured fences can control access to construction sites. Implementing strict access control of the project site and specifically the contractors accommodation camp. • Workers should be urged to recognize and report suspicious activity and signs of burglary and be informed of crime prevention measures that they themselves can take. • Employment of local people on the mine to improve the poverty levels in the host and neighbouring communities. • MbeuYashu to liaise with existing community policing forums and project security to properly secure the project area and surrounding area. • Investigate the implementation of an anti-poaching unit in collaboration with local stakeholders, policing forums and police.

Social Aspect	Potential Impact	Proposed Mitigation measures
Health and Social Wellbeing	Safety and Risk Exposure due to an increase in poaching on neighbouring game farming properties	• Establishment of an anti-poaching unit available to adjacent landowners, and establishing a security forum in collaboration with these land owners. Landowners are to be actively involved in the selection of the contracting company employed to conduct anti-poaching in the area. • Increased security measures (fencing, access control and monitoring) on mine premises. • Properly constructed and secured fences can control access to construction sites. • Implementing strict access control of the project site and the contractors workforce camp. • Construction workers accommodated on mine are identified and marked with clear identifiable clothing. • Code of Conduct to form part of induction of new workers with a clear statement and procedure regarding access, conduct and identification. All construction workers should wear clothing marked (and reflective vests) with the logo of the construction firm/contractor or sub-contractor as well as identification cards that cannot be easily forged, so that they can be easily recognized as being legitimate. • Workers to be screened including criminal background checks. • Employment of local people on the mine to improve the poverty levels in the local communities.
Quality of Living Environment	Change in "sense of place"	• Regular and effective engagement with stakeholders through the SEP. • An effective grievance management procedure managed within the framework of the SEP. Grievance mechanisms must be in place throughout the life of the mine, including for a determined period post-closure, to address any impact for affected communities. • Implementation of traffic management measures. • Implementation of mitigation measures for noise. • Implementation of visual barriers. • Colour schemes must complement the local environment. • Minimising disturbance to vegetated areas outside the critical development areas where possible. • Revegetation/rehabilitation of disturbed sites in parallel with development. • Successful mitigation interventions can reduce the intensity of the impact to at least moderate and ultimately moderate-low levels. If grievances are addressed adequately, and communication and engagement is effective affected communities may be able to adjust more easily to the changes.
Quality of Living Environment	Disruption of Social Networks and decrease in Social Capital	• Employment of local people already part of the community. • Code of conduct to form part of induction for all new workers. • Grievance Procedure within the local communities.

Social Aspect	Potential Impact	Proposed Mitigation measures
Quality of Living Environment	Perceptions of and Feelings in relation to the project	• Establish on-going Consultative Forums with concerned groups to air concerns, find possible mitigation measures for their perceived impacts, solutions to co-existence and monitor implementation and effectiveness of mitigation measures. • Continuous communication with all stakeholders providing information on anticipated impacts and planned mitigation measures.
Family and Community Impacts	Impacts on landowner and labourers	• Development of a land acquisition or lease policy defining the negotiation process to minimize the feelings of uncertainty. • Financial compensation of affected property owners/tenants, employees and their families in terms of the relevant legislation. • Displacement of workers and their dependents requires an equitable policy, principles, financial guidelines and clarification of operational approaches. • Land acquisition, lease and compensation agreements reached with affected landowners that include arrangements and measures for labour tenants.
Family and Community Impacts	Change processes and impacts related to daily movement patterns	• The project description defines that no hauling will take place along existing farm roads or regional / national roads. It is planned that the run-of-mine (ROM) coal will be transported for short distances by truck, on the in-pit haul roads to the crushing and screening facilities. The crushed and screened ROM product will be transported to the coal beneficiation plant at the Infrastructure Hub via conveyor. It is further planned that the product will be loaded directly onto trains at the Rail Load-out Terminal situated at the Infrastructure Hub which links up with the existing Musina-Makhado railway line.
Family and Community Impacts	Conversion of land use	• Acquisition and/or leasing of directly impacted land. • Fair compensation negotiated and agreed with land owners that will lose agricultural land. • Continuous consultation with landowners discussing co-existence and feasibility. • Educate landowners in terms of their rights and responsibilities prior to the construction phase. • Assist landowners in identifying ways to adapt their land uses, to the benefit of both the landowner and MbeuYashu. • Implement a consultation programme with regional stakeholders in the development of a closure plan and rehabilitation programme. • Determine the regional needs and characteristics to ensure post mining use of land enhances the regional characteristics.

Social Aspect	Potential Impact	Proposed Mitigation measures
Institutional/Legal/Political/ Equity Impacts	Challenge to local government capacity	• Intensive engagement between MbeuYashu and the municipality well in advance of construction. In this context the responsibilities of local government should be well understood, and potential problems defined and addressed as early as possible. • Establishment of a limited and time-bound municipal support function. MbeuYashu should contribute funding and appropriate technical resources. The participation of other major mines and industries in the area should be promoted by both MbeuYashu and the local municipality.
Institutional/Legal/Political/ Equity Impacts	Participation and Consultation in process	• Either provide transport or reimbursement to the Historical Disadvantaged Communities. • During the Operational phase, the structures established for participation should have a proper constitution that addresses reimbursement of costs. • Arrangement of meetings in proximity to the mine or in affected communities to minimize the distance of directly affected parties to travel. • Cluster meetings together on the same day or over 2 days to minimize disruption of personal schedules.
Institutional/Legal/Political/ Equity Impacts	Impact equity	• Tax and Profit benefits must be ploughed back into the Local Municipal areas and immediate communities. • Employment should be prioritized to local communities. • Local beneficiation programmes to be investigated and implemented.
Socio-economic Wellbeing	Increase in South African GDP and Trade Balance	• Procure goods and services from South African suppliers as far as possible. • Procure ancillary services for goods procured abroad, such as installation, customisation and maintenance, from South African companies as far as possible.
Socio-economic Wellbeing	Increase in provincial and local GDP	• Procure goods and services from local or provincial suppliers as far as possible. • Procure ancillary services for goods purchased from outside of the Limpopo Province, such as installation, customisation and maintenance, from local or provincial companies as far as possible.
Socio-economic Wellbeing	Increase in government revenue	• None

Social Aspect	Potential Impact	Proposed Mitigation measures
Socio-economic Wellbeing	Increase in employment, income and skills development	• Aim to use local workers as far as possible and formalise this policy in contracts. • Consider implementing labour-intensive rather than capital-intensive work methods wherever possible. • Procure resources from local sources wherever possible. • Establish a database of local people with information on qualifications and skills, utilize this database to develop skills plans and recruit local people. • Implement early on skills development programmes in the areas where most job opportunities will be created, i.e. operators and drivers. • Include training for general life skills such as financial management and health. • Implement portable skills development programmes. • Design and implement economic development programmes that will assist people being retrenched in sustaining their livelihoods. • Establish a future forum with representation from the workforce to discuss potential difficulties and solutions. • Implementation of programmes to minimize and mitigate the impact of downscaling and retrenchment
Socio-economic Wellbeing	Impact on existing businesses in surrounding areas	• Devise a compensation plan for direct impacts of mining on adjacent farms, such as loss or pollution of land. • Screen mining activities from the adjacent farms and the main access road to minimize the impact on the general sense of place and tourists. • Identification of employees that may lose their employment and enrol in skills programme.
Socio-economic Wellbeing	Change in property values	• Attempt to minimize impacts through implementation of mitigation strategies focusing on aspects that may affect tourism characteristics including traffic, noise, and visual aspects such as screening mining activities from the adjacent farms and the main access road to minimize the impact on the general sense of place. • Establish a baseline of property values by conducting baseline valuations on representative properties and providing such to landowners, thereafter conducting monitoring valuations in periods of 5 years or as may be agreed with landowners. • Establish a communication channel with direct adjacent land owners to address impacts and grievances. • Adopting principles of good corporate citizenship focused on conservation of natural resources such as water, biodiversity, etc. Inclusion of these principles and actions into information disseminated in the local area ("how mining can be done differently").
Socio-economic Wellbeing	Decrease of visitors, tourists and hunting parties	• Attempt to minimize impacts through implementation of mitigation strategies focusing on aspects that may affect tourism characteristics including traffic, noise, and visual aspects such as screening mining activities from the adjacent farms and the main access

Social Aspect	Potential Impact	Proposed Mitigation measures
		road to minimize the impact on the general sense of place. • Collaborate with local stakeholders in terms of regional planning to ensure certain areas are protected for tourism and hunting activities. • Adopting principles of good corporate citizenship focused on conservation of natural resources such as water, biodiversity, etc. Inclusion of these principles and actions into information disseminated in the local area ("how mining can be done differently").
Socio-economic Wellbeing	Equity Participation of the Local Communities	• Ensure communities are fully involved and properly represented in the structures. • Ensure capacity is built at an early stage for communities to understand how equity and dividends work. • Place protective measures in place that will shield the communities from any business risk or liabilities.
Socio-economic Wellbeing	Participation of local business in procurement opportunities	• Ensure communities are fully involved and understand the local procurement policy and procedure. • Ensure capacity is built at an early stage through enterprise development to enable local business to participate in opportunities. • Identify local only opportunities that is reserved for local business.
Socio-economic Wellbeing	Decline in South African GDP and Trade Balance at Decommissioning	• None
Socio-economic Wellbeing	Decline in provincial and local GDP at decommissioning	• Actively promote the development of different economic sectors from an early stage, e.g. through incentivising other industries to locate in the area, providing adequate infrastructure and promoting an increase and diversity of skills in the local population. • Actively engage with a range of stakeholders throughout the life-of-mine to discuss potential consequences of mine closure and possible mitigation. • Incorporate measures to retrain workers in the Social and Labour Plan.
Socio-economic Wellbeing	Decline in government revenue at Decommissioning	• None
Socio-economic Wellbeing	Decline in employment, income and skills development at decommissioning	• Aim to use local workers as far as possible and formalise this policy in contracts. • Consider implementing labour-intensive rather than capital-intensive work methods wherever possible. • Purchase resources from local sources wherever possible. • Institute training programmes for local workers to raise skills levels. • Include training for general life skills such as financial management and health.

Social Aspect	Potential Impact	Proposed Mitigation measures
Vulnerable Group Impacts	Gendered Division of labour	• Women must have equal employment opportunities. • Training and skills development for women. • Salaries of women must be equal to that of men. • Establish opportunities that are suitable for women employment. • Implement measures to enable working environment for women. • Establishing gender-sensitive policy positions, such as for cultural heritage, employment and business development. • Mainstreaming gender into project planning, particularly for community development. • Using gender-sensitive indicators, such as employment data disaggregated by gender. • Consultation with national women's organizations.
Vulnerable Group Impacts	Potential Infringements on Historically Disadvantaged People's Human Rights	• Focusing local benefits on those communities previously disadvantaged to ensure upliftment. • Enter into agreements with local communities to address post closure land use and sustainability. • Optimization of local employment to minimize impacts of external or migrant workers on the local communities.

2.2 MINE REHABILITATION AND RECLAMATION PLAN

The successful rehabilitation of mined areas (soil, land capability and potential land use perspective) is determined by a number of critically important factors, as follows:

- Mine residue management: stockpiles and in-pit disposal;
- Sequence of horizons;
- Slope, grade and erodibility: must not exceed critical erosion slopes;
- Land capability: suitable 'topsoiling' materials and 'topsoiling' depth;
- Soil properties: compaction, organic carbon, fertility, soluble pollutants, acid mine drainage and dust (particularly coal dust);
- Reclamation (re-vegetation); and
- Climate.

These factors interact and have a large bearing on the ease with which roots colonise the soil. In areas where plants thrive, there will consequently be a higher level of vegetative basal cover, and lower levels of run-off and soil erosion. Any one of the aforementioned factors (either singly or in combination) may jeopardize the successful rehabilitation of the impacted area.

2.2.1 Rehabilitation objectives

The following objectives have been set for the successful rehabilitation of the disturbed areas associated with the Mopane Project:

- **Demolition**: To demolish the surface structures where alternative use is not possible (agreed with community) and rehabilitate the areas where required.

- **Rehabilitation**: To rehabilitate the opencast pits, remaining surface stockpiles and other disturbed areas to a post-mining grazing capability class.

To achieve the objectives, the following actions will be implemented when mining cease:

2.2.1.1 Demolition

- All buildings and steel structures will be demolished in a safe and environmentally responsible manner.
- Material will be recycled as far as possible and MbeuYashu will make use of contractors specialising in this field to dismantle the surface infrastructure and recycle the building material as far as possible.
- Inert building rubble that cannot be recycled will be used to seal the incline and ventilation shafts.
- Other non-recyclable building material will be disposed of at a registered landfill site as per the Waste Management Procedure (Section 2.6).

- All contaminated and carbonaceous material within the Infrastructure Area will be removed and disposed off at an appropriate registered landfill site.

2.2.1.2 Rehabilitation

- All disturbed areas will be ripped to a minimum depth of 1m.
- Levelling, sloping and landscaping of the disturbed areas according to the mine rehabilitation plan.
- Topsoiling and re-vegetation of levelled areas.

2.2.2 Rehabilitation Plan

As far as practically possible, all areas will be designed to be free-draining as far as practically possible and all clean surface runoff to be discharged into the natural environment. Final destination scheduling will be developed during the Feasibility Phase. This schedule will indicate the removal of materials from all pits (mainly box-cut excavations), and utilize this material to ensure an overall compliance of the rehabilitation objectives.

2.2.2.1 Development of stockpiles

Carbonaceous stockpiles will comprise the following:

- A prepared lay down area;
- A compacted subsoil starter wall;
- Clean water diversion berms on the upstream side;
- Dirty water/leachate interception drains and filters downstream side;
- Dirty storm water and leachate collection dams;
- The main body of the stockpile.

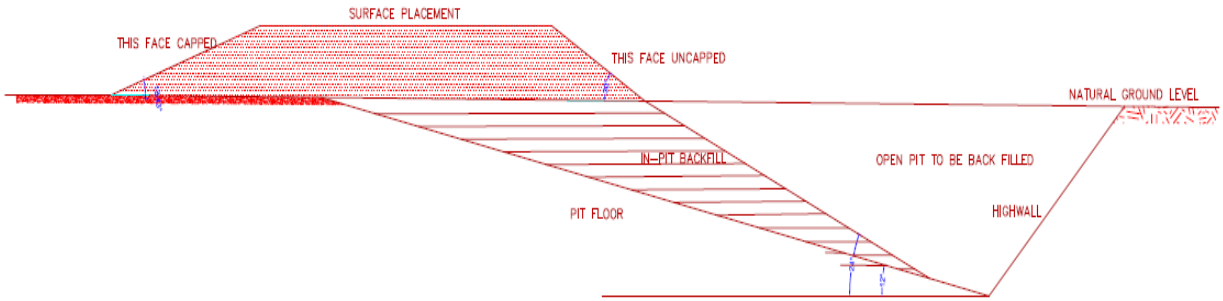
The placing of carbonaceous material will be carried out as follows:

- Remove and stockpile topsoil and subsoil;
- Place an appropriate liner beneath the stockpiles where required with interceptor drains to intercept any seepage. Where not required (a natural liner suffices) a sub-soil drainage system will be the only requirement;
- Construct perimeter start walls;
- Raise the main body of the coarse residue by making use of a lower "bench" to maintain stability.

2.2.2.2 In-pit residue placement

The in-pit backfilling procedure will entail the isolation of the discards in purpose made cells which will then be isolated with inert mining residue.

In-pit residue placement will be done according to the same principles as the surface placement. The carbonaceous spoil will be mixed, placed in layers and compacted. A 30 degree (angle of repose) slope is assumed for the pit face and 50 to 100m is required space for the mining operations and cannot be backfilled. A maximum thickness of 10m can be placed after which an isolating layer non-reactive residue must be placed and compacted to seal the reactive material. This spoil will thus be placed in cells of this configuration and separated by overburden walls and floors. At least two cells will be needed at any time, one for stockpiling and one being covered. Compaction of the stockpiled material is achieved by the stockpiling vehicles and spreading machines moving across the backfill during placement. Refer to figure below for a typical section through the partially backfilled pit.



Compartmental placement must adhere to the following principles:

- Filling material into pre-built compartments to isolate reactive material with a higher risk within slopes, and to control combustion within one compartment;
- Building compartments with a fixed width to maintain a constant stacking rate, determined by the risk model as the safe rate, and to maintain a constant ratio between different types of waste materials;
- Sealing of the compartments to isolate reactive material between levels and compartments to handle combustion within one compartment, in case of combustion;
- Isolating reactive waste from the pit's high-walls using layers of benches 10m with 1m isolating material to prevent transfer of combustion into the high-walls.

From an environmental impact perspective, it is imperative that the discard/carbonaceous material be placed at the bottom of the pit for the following reasons:

- Submergence of the carbonaceous material should reduce the possibility of the occurrence of spontaneous combustion; and

- The reduction of the possibility of Acid Mine Drainage (AMD) generation, since the oxidation of the pyrites in the rock requires the presence of both water and oxygen.

2.2.2.3 Topsoil management

Any soil that might possibly be contaminated during the construction or mining operations should be stripped and stockpiled in advance of any activities. The Red and Yellow Apedal soil groups are suitable as growing medium; effort should therefore be made to strip the topsoil separate from the underlying material for later use. Average soil depths range from 30-90cm and are generally shallower than 70cm. If soil stripping is necessary, it is recommended to strip only 40-60cm of the soil.

Stockpiles should be placed where possibly on the areas covered by stony or rocky soils (Mispah, Glenrosa and Coega). The stockpiles should not exceed a maximum height of 6m and it is recommended that the side slopes and surface areas be vegetated in order to prevent water and wind erosion and to keep the soils biologically active. All stockpiles should also be protected by a bund wall to prevent erosion of stockpiled material and deflect water runoff, and energy dissipating structures along steep slopes.

Stockpiles can be used as a barrier to screen operational activities. If stockpiles are used as screens, the same preventative measures described above should be implemented to prevent loss or contamination of soil. If used to screen operations, the surface of the stockpile should not be used as roadway as this will result in excessive soil compaction.

Factors that need to be managed during and post-rehabilitation are:

2.2.2.3.1 Compaction

Problems caused by compaction include the following:

- Drainage impedance – An increase in bulk density reduces the total porosity (reduced pore spaces and pore size), thus reducing the saturated flow of moisture through the soil. Halving the pore size would reduce the flow by a factor of 16.

- Root impedance – Since large pores also function in the aeration of the soil, compacted soils (reduced pore size) have a limited oxygen supply. Soil strength also increases with compaction. Thus roots will not elongate if large pores are absent (limited oxygen) or if soil strength is high (prevents active displacement of soil by root pressure). As a general guideline (varies from soil to soil), roots will fail to penetrate materials compacted to bulk densities greater than about 1500 kg/ m³ for clayey (>35 % clay), and about 1700 kg/m³ for sandy (<15 % clay) soils (Chamber of Mines Guidelines, 1981).

Factors affecting compaction:

- Fine sand and silt – Soils with high proportions of fine and silt are most susceptible to compaction and the formation of high bulk densities. If the soils in the survey area are handled (stripping and 'topsoiling') in the dry state, then they are likely to be moderately

susceptible to compaction. However, if they are handled in the moist or wet states, then they are likely to be highly susceptible to compaction.

- Moisture content – In order to avoid (stripping and 'topsoiling' operations) or alternatively to achieve (compacted layer underlying/overlying a redundant pollution control dam if present) compaction (i.e. high bulk density), machinery should ideally operate at or near to the optimum moisture content required to achieve the desired compaction, which varies from soil to soil for the two extremes. Thus in order to limit compaction (stripping and 'topsoiling' operations), machinery should ideally operate at a moisture content of below approximately 8-10%.

- Pressure and duration of pressure – Tracked vehicles are more desirable for the stripping and 'topsoiling' operations, since tracked vehicles have a lower point loading and slip than wheeled vehicles. Vehicle speed should be maintained in order to reduce the duration of the applied pressure, thereby minimizing compaction.

Alleviating compaction:

- Compaction in affected areas may be alleviated to a certain extent by rotovating / ripping the soils in the dry state (only).

2.2.2.3.2 Hard-setting

Hard-setting of a cultivated soil involves slumping, a process of compaction that occurs without the application of an external load. Hard-setting involves the collapse of the aggregate structure during and after wetting, and a hardening without re-structuring during drying.

A hard-setting horizon is thought to resemble the fragipan of other soil classification systems which is defined as follows: 'A loamy or (uncommonly) sandy subsurface horizon, very low in organic matter, with a high bulk density relative to the horizons above it, and slowly permeable to water. It is seemingly cemented when dry and, when moist, peds tend to rupture suddenly under pressure. Dry fragments slake or fracture when placed in water'.

Hard-setting is common in soils prone to dispersion. At high levels of exchangeable sodium, certain clay minerals, when saturated with sodium, swell markedly. With the swelling and dispersion of a sodic soil, pore spaces become blocked and infiltration rates and permeability are greatly reduced. Soils with E-horizons (none in survey area) and bleached (occasional in survey area) orthic A-horizons show a greater tendency than most soils for clay dispersion and poor structural stability. Hard-setting in the dry state and surface crusting or sealing after heavy rain are two common physical problems encountered on such soils, the severity of which depends also however, on other textural features such as a high proportion of silt and fine sand.

Soils prone to hard-setting are very sensitive to the electrolyte concentration of the soil solution. The potential for dispersion is enhanced where irrigation periodically supplements rainfall, or *vice versa*. The potential for dispersion is further enhanced when sensitive soils are cultivated under wet conditions, and a low EC of the soil water. A soil need not have a high ESP for dispersion to occur. Soils with an SAR of less than three are found to disperse when a mechanical stress is applied. The

effect of SAR on hard-setting is manifested mostly in the upper part of the soil profile. Because of the soil buffering capacity, the SAR-induced changes in soil ESP occur gradually with time. The risk of SAR-induced hard-setting is therefore related to the long-term mean SAR value during the irrigation season (preferably weighted by the irrigation volume). It is not significantly affected by short time variations in SAR.

Thus, poor quality (i.e. strongly structured / therefore hard-very hard dry consistence / with a high pH of ≥8.4; or neocutanic, alluvium, and carbonate [shallow phase] broad soil groups) 'topsoils' are not recommended as a surface placement (although utilized further down in the rehabilitated profile), while unsuitable (vertic, hydromorphic and duplex broad soil groups) 'topsoil' types are not recommended for rehabilitation purposes at all.

Therefore, only high to moderate quality 'topsoiling' material must be replaced on the immediate surface during rehabilitation operations, thereby providing an acceptable medium for the growth of vegetative cover.

2.2.2.3.3 Organic carbon

Organic matter (indicated by the amount of organic carbon) is of vital importance in soil. It improves the structural condition of both coarse- and fine-textured soils and improves the water holding capacity, especially of sandy soils. It therefore greatly reduces the erodibility of soil. Organic matter supplies greater than 99% of total soil nitrogen (N) and 33-67 % of total soil phosphorus (P). Humus, the active fraction of soil organic matter has a very high CEC (between 150 and 300 cmol(+) kg^{-1}) and can absorb up to about 6 times its own weight in water. The C:N (carbon:nitrogen) ratio of humus is often about 10:1 to 12:1.

Given the above:

- The A-horizon soil material should ideally be replaced at the surface, the B-horizon material only contributing to the required 'topsoiling' depth. Thus the A-horizon (approximately top 0.3m) and B-horizon material should ideally be stripped, stockpiled and re-distributed separately from each other. However, given the machinery/method which the mine plans to utilize for 'topsoil' handling, the separation of the A- and B-horizons is generally not practically possible. However, measures must be implemented in order to keep this mixing to a minimum.

- Composting/mulching: it would be advantageous if the vegetation removed during the construction and operational phases were not disposed of, but rather chipped and composted, this organic material being mixed into the top 0.3m of the rehabilitated 'topsoiled' areas. Alternatively compost may be imported and mixed into the 'topsoil'. The implementation of effective composting/mulching may go a long way to reducing the necessity of replacing the A-horizon 'topsoil' at the surface.

2.2.2.3.4 Fertility

Soil analysis (top 15cm) in order to provide corrective fertilization regimes is an ongoing procedure and is required periodically in order to facilitate vigorous plant growth for high levels of production.

This procedure should initially be carried out immediately after the construction of 'topsoil'/'topsoiled' berms and 'topsoil' stockpiles, as well as after rehabilitation ('topsoiling'), the soil fertility status being corrected before re-vegetation. Thereafter the soils should be sampled on an annual basis until the required phosphorus (adequate levels for the Mispah soil form, but seriously deficient to deficient for all other soils in the area), potassium (deficient in sand and loamy-sand textured soils in the area, but more than adequate for all other soils), and magnesium (more than adequate for all soils in the area) levels have been built up. The pH must also be addressed. The pH of the analysed samples (all horizons) varies from 6.09 (slightly acid) to 9.12 (very strongly alkaline). The former pH (6.1-6.5: slightly acid - ideal) is for the Mispah form (shallow broad soil group) which overlies quartzite tallus/scree or sandstone and dominates in the survey area. The former pH will also apply to the non-analysed Hutton (red apedal broad soil group), Oakleaf/Tukulu/Inhoek (neocutanic broad soil group), and Clovelly/Avalon (yellow-brown apedal broad soil group) forms. The pH of the aforementioned soil forms may also frequently be 6.6-7.3 (neutral), or occasionally 7.4-7.8 (mildly alkaline). However, the pH of the remaining (majority) soil forms (and thus broad soil groups) in the survey area is problematic due to being too high (7.9-8.4: moderately alkaline; or 8.5-9.0: strongly alkaline). Once the desired nutritional status of post-mining grazing and wilderness capability class areas has been achieved, intervals of three to four years can be allowed between sampling.

2.2.2.3.5 Sedimentation

The sedimentation of rivers and streams in the vicinity of the opencast and infrastructure areas will be reduced by the construction of the surrounding run-off interception berms. Furthermore, the 'topsoiling' and re-vegetation of berms and the 'topsoil' stockpiles will also be beneficial to the slowing and trapping of sediment. However, the river, stream, donga and gully beds which exist in the area are already sedimented (natural process), predominantly with coarse sand and gravel, these dry beds only flowing (flash floods) for short periods after heavy rainfall events.

2.2.3 Reclamation Plan

Successful restoration of the vegetation is key to sustainable future end land use for mining area. A detailed Reclamation Plan was developed for Makhado Colliery (ANNEX-16) and includes the following aspects:

- End-use objectives and targets
- Detail implementation plan
- Establishment of a nursery
- Monitoring procedure
- Training and skills development

This plan will be rolled out at the Mopane Project and the regional nursery established by the Makhado Colliery will be supported by the Greater Soutpansberg Projects.

2.2.3.1 End-use objectives

Reclamation is defined as re-instating the agricultural potential of land through the re-vegetation of ameliorated soil and management thereof, to establish a post mining land use. The post mining land use (end land use objective) proposed for the Mopane Project is Rangeland grazing and browsing with low production potential, medium erosion risk and high biodiversity:

CLASS	PRODUCTION POTENTIAL	EROSION RISK	BIODIVERSITY (Expected)
Permanent pasture (Productive Grazing)	med-high	med	low
Rangeland (Grazing / browsing)	low	med	high
Sensitive rangeland (Minimum grazing/browsing)	Low-none	high	high

2.2.3.2 Rescue and relocation strategy

2.2.3.2.1 Pre-mining surveys

A comprehensive plant survey should be done to identify the composition, distribution and ratio of species in the area earmarked for de-vegetation. The objective with the pre-mining surveys / vegetation material collection is to ensure that appropriate techniques are used to remove existing trees and shrubs in an organised and orderly manner.

Therefore, any vegetated area needs to be thoroughly surveyed before being mined or disturbed to identify the existing plants and locate all the protected plants tabled below, as well as succulents and other transplantable plants.

2.2.3.2.2 Relocation of flora species

Protected plants must be removed / transplanted before any mining and/or construction activities start. Permits to remove and / or destroy protected transplantable and non-transplantable plants will be obtained from the Limpopo Department of Economic Development, Environment and Tourism (LEDET) and the Department of Agriculture, Forestry and Fisheries (DAFF).

Scientific name	Common name	Status	Act
Adansonia digitata *Balanites maughamii* *Boscia albitrunca* *Combretum imberbe* *Elaeodendron transvaalensis* *Philenoptera violacea* *Sclerocarya birrea* subsp *caffra*	Baobab Torchwood Shepherd's tree Leadwood Bushveld Saffron Apple-leaf Marula	Protected trees	National Forest Act, 1998 (Act 84 of 1998): GN No 897 of 8 September 2006
Harpagophyton procumbens	Devil's Claw	Protected species	TOPS Regulations: GN No R152 of February 2007
Adansonia digitata *Adenium multiflorum* *Spirostachys Africana*	Baobab Impala Lily Tamboti	Schedule 12: Protected Plants	Limpopo Environmental Management Act, 2003

Stapelia spp. (All species)	Stapelia species		
Aloe spp	Aloe species	Appendix II	CITES
Euphorbia guerichiana	Paper-bark Woody Euphorbia	Appendix III	

The smaller succulents in the area demarcated for denudation must be transplanted and as many as possible of the *Adansonia digitata* (Baobab) and *Sesamothamnus lugardi* (Transvaal sesame bush) plants, depending on their size and the availability of suitable transplanting equipment. There are also many transplantable *Commiphora* species (Corkwood); however, it will be difficult logistically and excessively expensive for any organisation to replant all the trees. The proposal therefore is that MbeuYashu transplant as many of the small Corkwood trees as possible and sell some of the mature trees to nurseries that specialise in transplanting big trees.

Trees and shrubs that can be rescued/salvaged are fairly easy to transplant, although with the necessary pre-treatments. Trees and other plants that are transplanted during July to August while in a dormant stage and before the growing season starts have the best chance of survival. Trees that will be transplanted are *Adansonia digitata (*Baobab), different species of *Commiphora (*Corkwood), *Sesamothamnus lugardi (*Transvaal Sesame bush) and the *Kirkia acuminata* (White Seringa). Other plants are the *Adenium multiflorum (*Impala Lily) and *Adenia.*

Transplantable trees should be handled in a way that causes the least damage to ensure their survival. While special machines are available to transplant mature trees their suitability to operate in the stony soil of Mopane must be confirmed. Excavators, front-end loaders and trucks equipped with cranes can also be used.

2.2.3.2.3 Seed collecting

Seed from as many of these species as possible will be collected for the re-vegetation programme. Seed collecting will take place throughout the year when the seeds of the different plants are ripe. Ripe seed collected from different populations in the same area (not more than 20% from the same plant) will increase germination percentage and longevity. In the case of Mopane where the plants are going to be removed, however, the 20% restriction will be ignored.

Seed are collected from trees selected for health, vigour and appearance. Before the seeds can be stored, the necessary cleaning and drying need to be done to prevent fungal and bacterial growth.

The Reclamation Plan includes training manuals for the taking of herbarium species and for seed collection and storage.

2.2.3.2.4 Removal and storage of remaining vegetation

Once the identified species have been relocated, the remainder of the area will be debushed. The area to be de-bushed will be demarcated very clearly before any organisation or person is allowed entry and meticulously supervised to restrict contractors to the demarcated area. The area that is cleared must always be the minimum necessary for the safe operation of the mine.

The dense vegetation at Mopane will produce a large volume of biomass that has to be removed and stockpiled before mining commences. It is difficult to store and distribute such a large mass of

vegetation for re-vegetation. However, a large percentage of the removed plant material should be stored and used to protect newly established plants, prevent soil erosion and serve as seed catchers and / or will be chipped for compost, mulching and stabilising berms in the mine.

Chipped material will be stored in a dedicated composting area and the excess stored in heaps on pre-determined areas.

People in surrounding communities may want to use some of the excess material for building purpose or as firewood. It may even offer entrepreneurs the opportunity to start a small business.

2.2.3.3 Re-vegetation strategy

The primary objective of re-vegetation is reducing soil loss to a minimum and at least one of the species used should provide rapid and dense ground cover during the establishment season to prevent surface erosion.

Species well-adapted to local climatic conditions, as well as the post-establishment method, should be used and perennial species forms the basis of any re-vegetation programme. Locally-adapted species have a larger biomass and prolific root system and are planted specifically to ensure sufficient biomass for organic material or high-production grazing for animals - it is important that this aspect is well managed.

Local experience about the establishment and maintenance of the species selected is of utmost important.

2.2.3.3.1 Re-vegetation plan

The trees and shrubs required for re-vegetation will be grown from seed collected from the specific mining area before de-vegetation. All plants must be hardened off in the open area of the regional nursery before planting.

Grass seed required for re-vegetation are collected from the specific area and supplemented by available commercial seed mixes of species occurring in the area. The commercial seed will ensure a higher germination percentage and rapid stabilisation of the soil, while a proper grass cover will reduce surface erosion. Recently removed topsoil normally contains viable grass, tree and shrub seeds and micro-organisms such as essential arbuscular mycorrhizal fungi that contribute to the successful establishment of local plant species; therefore, topsoil must preferably placed directly on levelled areas and not stockpiled.

The best time for planting and seeding is after the first rains in early summer when climatic conditions, temperature and rainfall are most likely to ensure success. Planted trees and shrubs should be watered at regular intervals to prevent dehydration. Thick layers of mulch will be placed around newly planted trees to slow down soil evaporation, making more moisture available to the newly planted trees and germinating seeds from the seed bank in the soil.

The reclaimed areas will be fenced off to prevent free roaming game and livestock to graze and browse the newly established vegetation until it is fully established. A layer of stones will be packed

around the tree to keep warthogs at bay which also serves as mulch. The stored woody material will be scattered on the re-vegetation areas as seed catchers of small plants and trees and to protect young plants. The scattered material will also serve as a habitat for insects, rodents, reptiles and birds and prevents soil erosion. The branches and especially thorn tree branches will serve to protect the newly planted trees against browsing animals like impala, eland and kudu.

The stockpile areas will be seeded with grasses using a Hydro mulching technique, with the correct ratio of local grass species, to ensure that a cover of grass stabilises the slopes and prevents soil loss through erosion. Grass species that do not required significant management in terms of cutting, etc. will be selected since the slopes are inaccessible and difficult to maintain.

The Mopane area is dry and hot and it is not possible to establish trees without irrigation. The ideal time of the year to establish container-grown trees remains to be determined, but whether the planting takes place in summer or winter, the plants will have to be irrigated for a number of months before they will be able to survive on their own. Mulching will lengthen the intervals of irrigation. In the absence of rain, water trees planted in summer or winter twice a week for two months after planting, thereafter once a week for another month and then only be watered once every two weeks. The responsible employee(s) must keep a close eye on the trees and adjust the watering according to weather conditions and rainfall. Trees that lose their leaves in autumn must only be watered once a month to prevent the roots from rotting.

2.2.3.3.2 Maintenance plan

The maintenance plan must address challenges experienced for both the soil and vegetation resource to achieve sustainable reclamation and improved agricultural potential and final land-use, which is important for mine closure planning. This includes:

- Soil
    - Fertilizer applications
- Vegetation
    - Burning – well-established grazing and unutilized moribund grass material
    - Weed control – herbicide applications
    - Alien invasive species control
    - Plant protection
- Reclaimed land use management
    - Fodder production – correct timing of cutting and baling
    - Animal grazing - correct stocking rates according to pre-determined carrying capacity established through appropriate surveys during the monitoring phase

2.2.3.3.3 Removal of alien / invasive species

One of the key objectives in the re-vegetation and maintenance of mined land is the eradication and control of alien invasive species and special care should be taken to prevent the establishment and spread of such species.

The Mopane area is generally free of unwanted species and likely to remain so due to the low rainfall. However, a survey of all the exotic plants in the neighbouring villages is important to point out the dangers of unwanted plants.

2.2.3.3.4 Monitoring plan

The use of remote sensing satellite imagery and aerial photography will establish the overall condition of large rehabilitated areas and will be justified by on-site ground truth visual observations and specific measured parameters. This approach will address frequent monitoring and justification of sustainable reclamation success over time, which will support mine closure pre-requisites.

Growth will be monitored by measuring the stem diameter above ground level as well as the height when the trees are planted. Trees will be numbered and indicated on a map to monitor mortality annually, so as to adjust the revegetation strategy if necessary.

The percentage regrowth of herbaceous plants and grass will be monitored annually by surveying and a species count will be done simultaneously. Vegetation will be monitored annually towards the end of the late summer, when the identification of species is easier, for a representative idea of the ecological status and agricultural potential of the vegetation.

The following parameters can be used to establish the condition of the vegetation with other landscape function parameters: Basal cover; Biomass production; and Botanical composition

Soil monitoring should be done annually in alignment with land uses and the final agreed end-use objectives and should include:

- Chemical properties - fertility status
- Physical properties - soil bulk densities and strength (compaction)
- Biological properties - soil health (microbial count / diversity)

2.2.4 Utilisation of Natural Resources

The dense vegetation within the proposed mining and infrastructure areas will produce a large volume of biomass that has to be removed and stockpiled before mining commences.

A large percentage of the removed plant material will be stored and used to protect newly established plants, prevent soil erosion and serve as seed catchers in line with the Reclamation Plan.

A further portion will be chipped for compost, mulching and stabilising berms in the mine. This organic material will be mixed into the top 0.3m of the rehabilitated 'topsoiled' areas.

Excess wood will be stockpiled and distributed to the local communities, for building purpose or as firewood, as required. It may even offer entrepreneurs the opportunity to start a small business.

2.3 SURFACE WATER MANAGEMENT PLAN

Water management on the mine involves all the actions required to ensure that the available water use is maximised and imported water required are minimised by:

- Re-use of internal water
- Management of clean storm water run-off
- Management of dirty storm water run-off

In general, the storm water control measures intend to secure the dirty areas (i.e. haul roads, dirty stockpile areas, open pit area and process plant area) and to divert clean upslope water past the mine. In terms of the proposed new development, a conceptual layout of the required system has been done, based on the requirements in the Best Practice Guideline G1: Storm Water Management, DWA, August 2006, using the available mining layouts as at September 2013.

Note that the conceptual layouts do not take the timeline into account as it only shows the structures and systems required towards the end of the mining period. Over the life of a pit, intermediate systems may be installed to shorten flow paths. It have been assumed that no drainage structures may cross over rehabilitated zones and therefore allowed for long diversion structures around the continuous pits. Furthermore, only the major systems required to contain dirty water and divert clean water around sensitive areas are included. In the operational phase, more nominal sized conduits and ponds may be required which are not indicated in the conceptual, small-scale layout.

The non-carbonaceous dumps all require paddocks (or a form of silt trap) at the toe to prevent the transport of sediment to streams and rivers. If feasible, the tops of the dumps should be dished and/or provided with a low berm on the edge to retain rainwater which should evaporate quickly in the hot, dry summers. In this climate where there may not always be enough water in dry spells to establish and/or maintain vegetation on the sides of the dumps, erosion down the slopes will occur and should be controlled. This can be achieved by providing relatively flat side slopes and back-slope terraces at carefully selected intervals.

The carbonaceous stockpiles should all be provided with impermeable liners and dirty water collector drains to discharge into the dirty water system leading to holding ponds.

The locality of the carbonaceous, non-carbonaceous and topsoil stockpiles are generally not positioned to be hydraulically favorable, meaning that the current placement of the stockpiles would create numerous additional ponds, berms and canals. Therefore it is proposed that the footprints of the stockpiles be reshaped hydraulically so that the extent of the footprints acts as drainage basins that allow dirty storm water runoff to converge to a single point at a lower elevation within the footprints and at the same time diverting clean storm water runoff around the footprints back to its natural flow paths.

A brief description of the conceptual storm water systems envisaged is given in the following sections. It includes the current layout, as well as a proposed revised layout to optimize the storm water management for each of the open pits and the Infrastructure Hub.

This will be finalized during the Feasibility Phase once the mining design and schedule have been optimized.

2.3.1 Voorburg Section

Figure 2 shows the extent of the mining activities at the Voorburg Section.

2.3.1.1 West Pit (P1)

Figure 3 shows the current layout of the proposed mining infrastructure at the West Pit (P1).

2.3.1.1.1 Current layout

Two small, non-perennial drainage lines, streams V1 and V2, traverse Pit 1. The southern boundary of the pit is located higher up the slopes than the northern boundary. The proposed clean water cut-off berm around the pit will suffice to divert flow around the pit, except where the pit impedes on the natural flow path of stream V1. This will create the need for a clean water pond to be constructed as the topography would not allow for the stream to be diverted around the pit.

The pit also impedes on the stream V2L, which will cause the stream to be deemed redundant. However, by diverting the stream around the pit via a clean water canal into stream V2R the stream is retained.

On the eastern side of the pit the proposed non-carbonaceous stockpile NC3 will impede on streams V2L and V2R, which will also cause for the abolishment of the entire stream V2. The stockpile should rather be relocated to save the streams.

On the western end of the pit the proposed non-carbonaceous stockpile NC2 will also impede on the natural flow path of stream V1 and we suggest that it be relocated to allow the upper reaches of stream V1 to fully utilize the remaining catchment area to collect clean water.

The topsoil stockpile west of Pit 1 as well as the topsoil stockpile north-west of Pit 2 currently does not impact any major drainage line nearby. However both of them are shaped and positioned in such a way that they would permit the construction of more than one pollution control pond. Therefore it is proposed that both of them be hydraulically shaped and positioned to minimize the need for excessive mitigation measures.

2.3.1.1.2 Proposed revised layout

Except for the footprint of the pit, all carbonaceous, non-carbonaceous and topsoil stockpiles will have to be relocated and the footprints of the stockpiles will also have to be reshaped hydrologically to minimize the number of detention ponds needed, to aid in the collection of dirty water runoff and also to have a minimal impact on the existing streams.

Figure 4 shows the proposed relocated and reshaped stockpiles as well as the two diversion canals along with the 1:100 year flood-lines of the Sand River and stream V2R.

2.3.1.2 Central Pit (P2)

Figure 5 shows the current layout of the proposed mining infrastructure at the Central Pit (P2).

2.3.1.2.1 Current layout

Two non-perennial streams, V2 and V3, occur within the pit area. Stream V2 will be obliterated by the pit and therefore needs to be diverted via a clean water canal along the proposed haul road. The locality of the carbonaceous stockpile C1 will also impede on the natural drainage lines of stream V2R and therefore needs to be relocated to allow the streams to traverse through the site area.

Both of the tributaries of stream V3L will become redundant due to the proposed pit activities and no alternative is proposed.

The topsoil stockpile TS3 as well as the carbonaceous stockpile C3 does not pose any impact on streams and therefore is only recommended to be hydrologically reshaped for better drainage characteristics.

2.3.1.2.2 Proposed revised layout

Except for the footprint of the pit, all carbonaceous, non-carbonaceous and topsoil stockpiles will have to be relocated and the footprints of the stockpiles will also have to be reshaped hydrologically to minimize the number of detention ponds needed, to aid in the collection of dirty water runoff and also to have a minimal impact on the existing streams.

It is proposed that stream V2L be diverted, via a clean water canal CW1, along the north-eastern boundary of Pit 1 to discharge into stream V2R.

It is also proposed that stream V2R be diverted, via a clean water canal CW2, along the proposed haul road, south-west of Pit 2, up to the nearest point where the stream can be released back to its natural flow path.

Figure 6 shows the proposed relocated and reshaped stockpiles, proposed clean water diversion canals as well as the 1:100 year flood-lines of the Sand River and streams V2R and V3R.

2.3.1.3 East Pit (P3)

Figure 7 shows the current layout of the proposed mining infrastructure at the East Pit (P3).

2.3.1.3.1 Current layout

Stream V3R will not be affected by any mining activity apart from the proposed haul road for the Voorburg Section.

Three non-perennial streams, V4, V5 and V6, exist within the pit area. Stream V4 will be destroyed by the proposed pit excavation, as well as the placement of the non-carbonaceous stockpile NC4. Clean water runoff therefore needs to be diverted via a canal into the stream V3R.

Stream V_5 will be totally abolished by the pit area and the placement of non-carbonaceous stockpile NC_4 and no alternative is proposed as the topography of the area and the locality of the pit will not allow for the stream to be diverted.

Stream V6L will be impeded by the proposed pit activities and no diversion of the stream is possible due to the locality of the pit and the topography of the area. However a clean water dam just upstream from the pit area is proposed. This will require that the non-carbonaceous stockpile NC_4 be reshaped to prevent disturbance of V6L.

With the disappearance of stream V6L, the topsoil stockpiles TS_4 & TS_5 will not have a major impact on the streams and therefore it is only recommended that these be reshaped to obtain better drainage patterns.

2.3.1.3.2 Proposed revised layout

Except for the footprint of the pit, it is proposed that all carbonaceous, non-carbonaceous and topsoil stockpiles be relocated. In addition, the footprints of the stockpiles should be reshaped to minimize the number of detention ponds needed, to aid in the collection of dirty water runoff and also to have a minimal impact on the existing streams.

Figure 8 shows the proposed relocated and reshaped stockpiles as well as the 1:100 year flood-line of the stream V_3R.

2.3.1.4 Sand River flood-line

Parts of the pit footprints protrude the calculated 1:100 year flood-line for the Sand River. The protrusion typically occurs where smaller tributaries or streams discharges into the Sand River. The requirements of Government Notice 704 (GN704) state that mining activities may not be located within the 1:100 year flood-line or within a horizontal distance of 100 meters from any watercourse or estuary, whichever is the greatest.

Figure 1 shows the 1:100 year flood-line as well as the 100 meter buffer zone for the Sand River within which it is proposed that no mining activity will take place. The calculated flood-line is wider than the 100m buffer zone and it therefore controls the extent of mining activities. However, the aquatic assessment recommended a 100m buffer from the edge of the riparian zone (wetlands), in this instance the Sand River flood-line, which implies that no mining activities should take place within 100m from the edge of the 1:100 year flood-line. It is therefore propose that the footprints of the pits be reduced to adhere to the recommendations of the aquatic assessment.

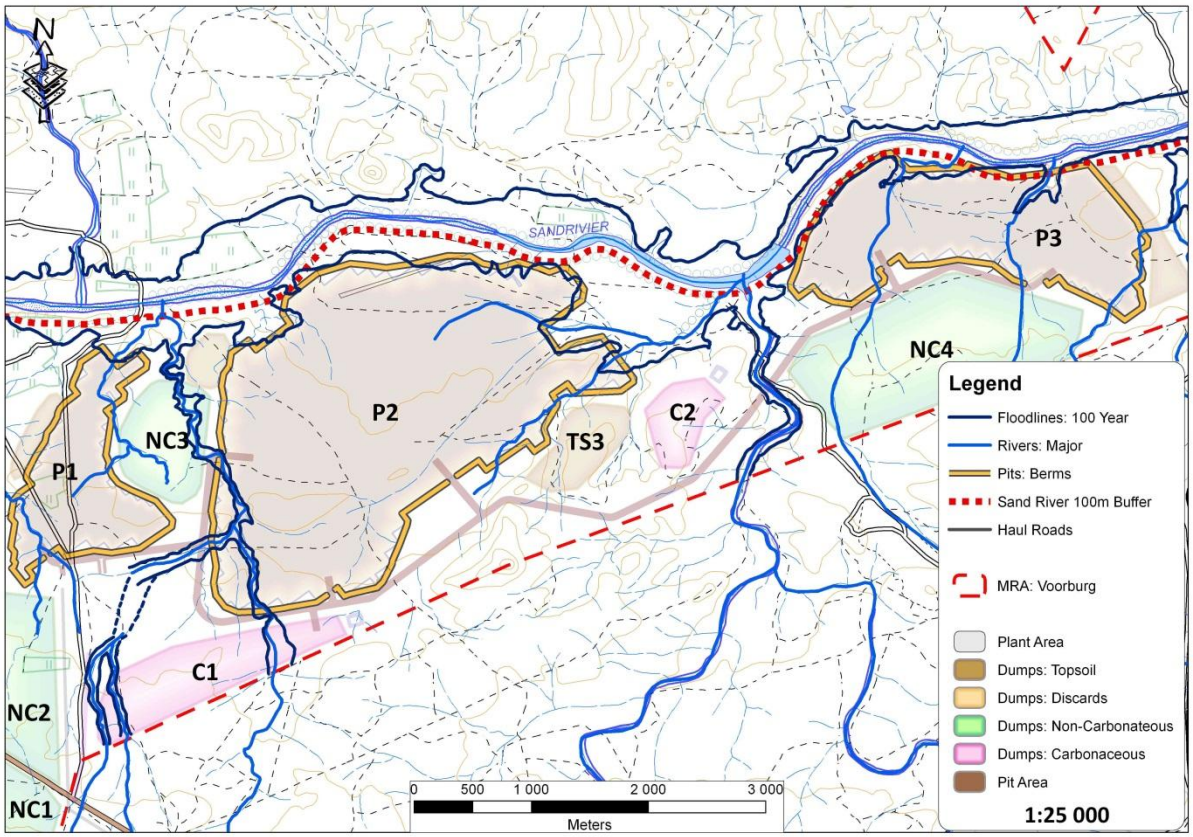


Figure 1: Sand River 1:100 year flood-line and 100m buffer

2.3.2 Jutland Section

Figure 9 shows the extent of the Jutland Section.

2.3.2.1 West Pit (P4)

Figure 10 shows the current layout of the proposed mining infrastructure at the West Pit (P4).

2.3.2.1.1 Current layout

Streams J1, J2, J3 and J4 will become redundant due to the mining activities. Therefore it is proposed that the non-carbonaceous stockpile NC5 and NC6 as well as the carbonaceous stockpile C3 be relocated and hydrologically reshaped to either allow these streams to accumulate clean storm water in suitable ponds or to divert the storm water via a clean water canal north-westwards into stream J7.

2.3.2.1.2 Proposed revised layout

Except for the footprint of the pit, all carbonaceous, non-carbonaceous and topsoil stockpiles will have to be relocated and the footprints of the stockpiles will also have to be reshaped hydrologically to minimize the number of detention ponds needed, to aid in the collection of dirty water runoff and also to have a minimal impact on the existing streams.

It is proposed that streams J1, J2 and J4 be diverted into aclean water canal flowing north-eastwards to stream J7.

Figure 11 shows the proposed relocated and reshaped stockpiles as well as the proposed clean water canal.

2.3.2.2 East Pit (P5), Plant Area (PA), Discards (D) and Railway Loop

Figure 12 shows the current layout of the proposed mining infrastructure at the East Pit (P5).

2.3.2.2.1 Current layout

Three streams, J5, J6 and J7 were identified that will be impacted on by the current mining activities.

Stream J5 will be affected by the proposed pit activities and proposed plant area. It is proposed that the stream be diverted around the pit area as well as the plant area to join stream J7. This will however increase the flood inundation area within the proposed railway loop area.

The topsoil stockpile TS10 will not impede on the natural flow path of stream J5, however it is recommended that the stockpile be hydrologically shaped to aid in dirty water runoff collection.

Stream J6 emanates within the footprint of the discards stockpile D1 and is also impeded by the topsoil stockpile TS9 and the proposed plant area PA. It is suggested that the stream be deemed as redundant.

Stream J5 should be diverted and a dirty water dam be constructed at the lowest point along the proposed haul road which would accumulate dirty water runoff from the discard stockpile D1 as well as the topsoil stockpile TS9. Therefore it is also required to relocate the topsoil stockpile TS9 and haul road access to discard stockpile D1.

Due to the abovementioned proposed mitigation measures, the remainder of stream J6 will be become redundant and no further alternatives for the proposed plant area were envisaged.

2.3.2.2.2 Proposed revised layout

Figure 13 shows the proposed relocated and reshaped stockpiles as well as the 1:100 year flood-line of stream J7, the plant area and proposed clean water canal.

The footprints of the pit and the discard stockpile D1 do not require any relocation; however, all topsoil stockpiles will have to be relocated. The footprints of the stockpiles should be reshaped to minimize the number of detention ponds needed, to improve the collection of dirty water runoff and also to have a minimal impact on the existing streams.

The haul road giving access to discard stockpile D1 also needs to be relocated as high as possible to allow topsoil stockpile TS9 to be relocated to a more hydrologically convenient position in order to drain towards the same dirty water dam as is proposed for discard stockpile D1.

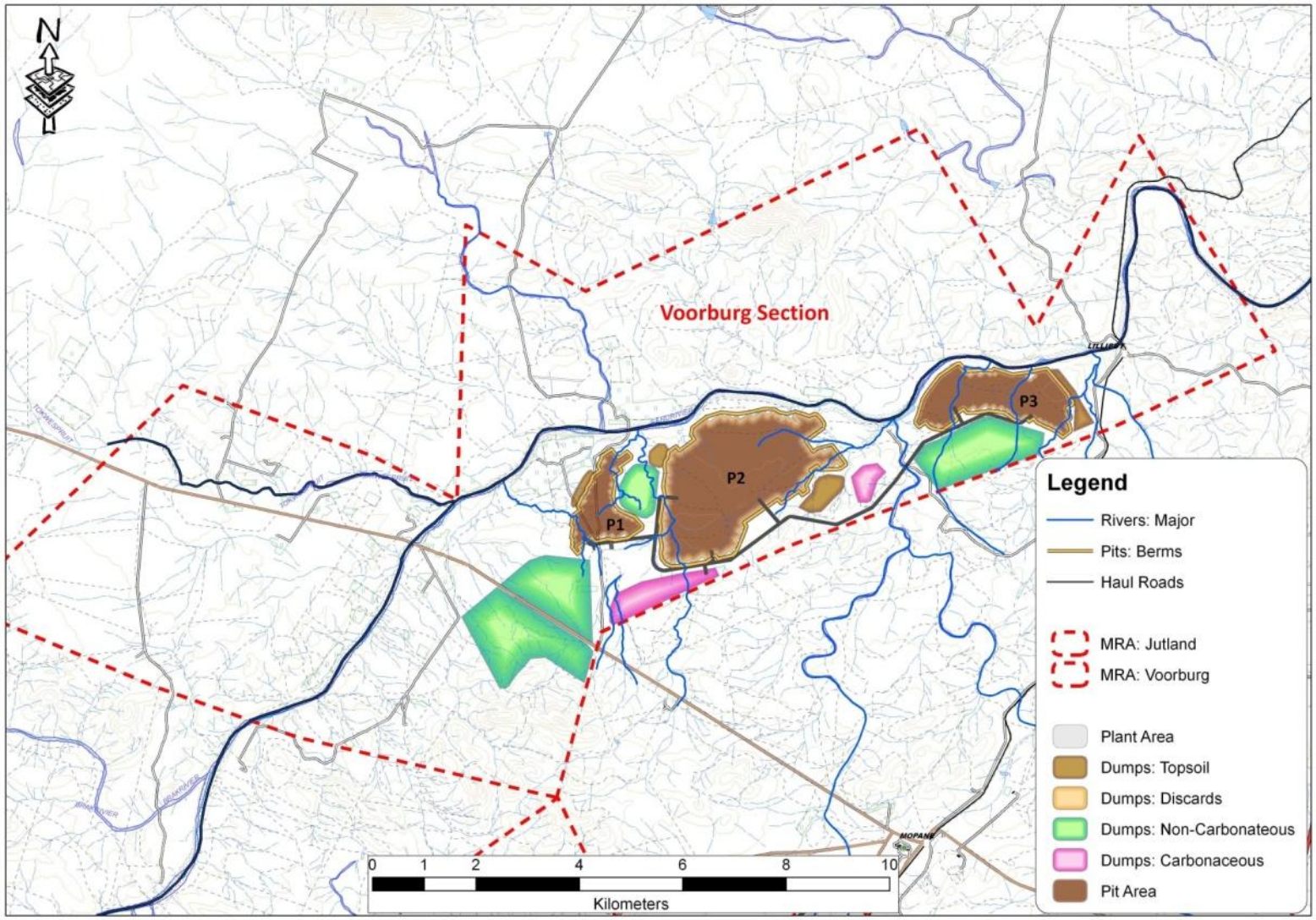


Figure 2: Mining layout plan – Voorburg Section

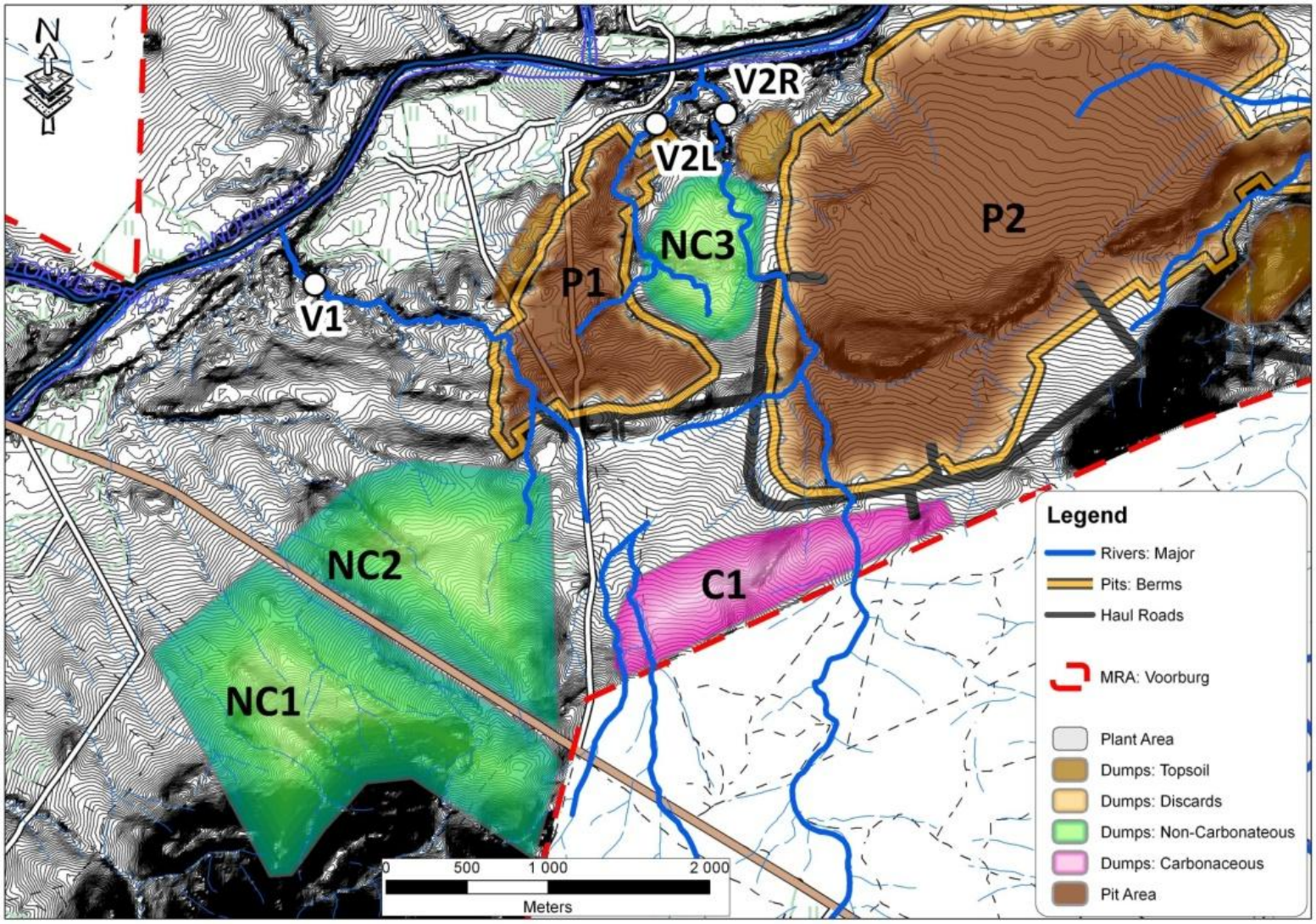


Figure 3: West Pit – Mining layout plan

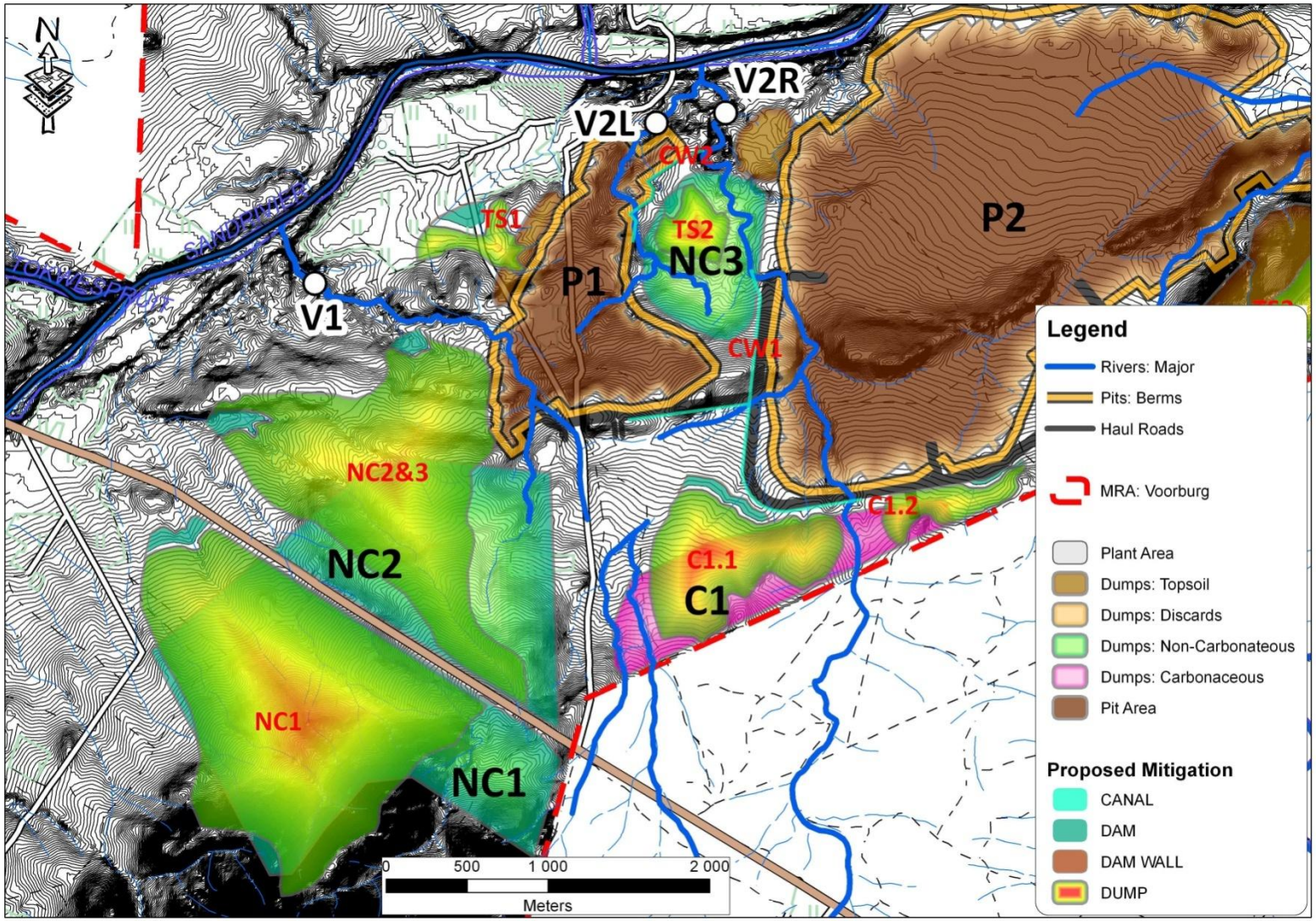


Figure 4: West Pit - Proposed revised mining layout plan

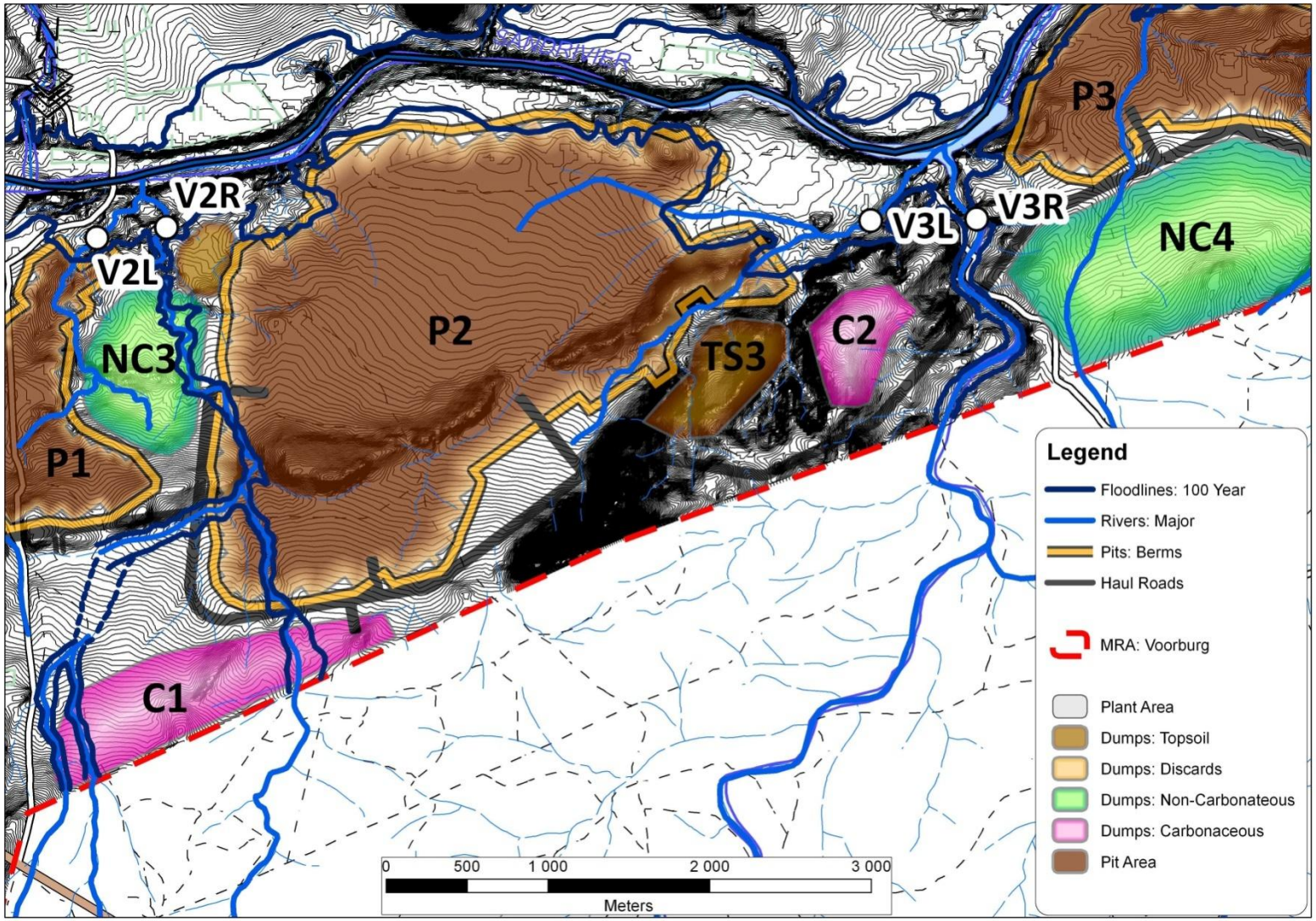


Figure 5: Central Pit - Mining layout plan

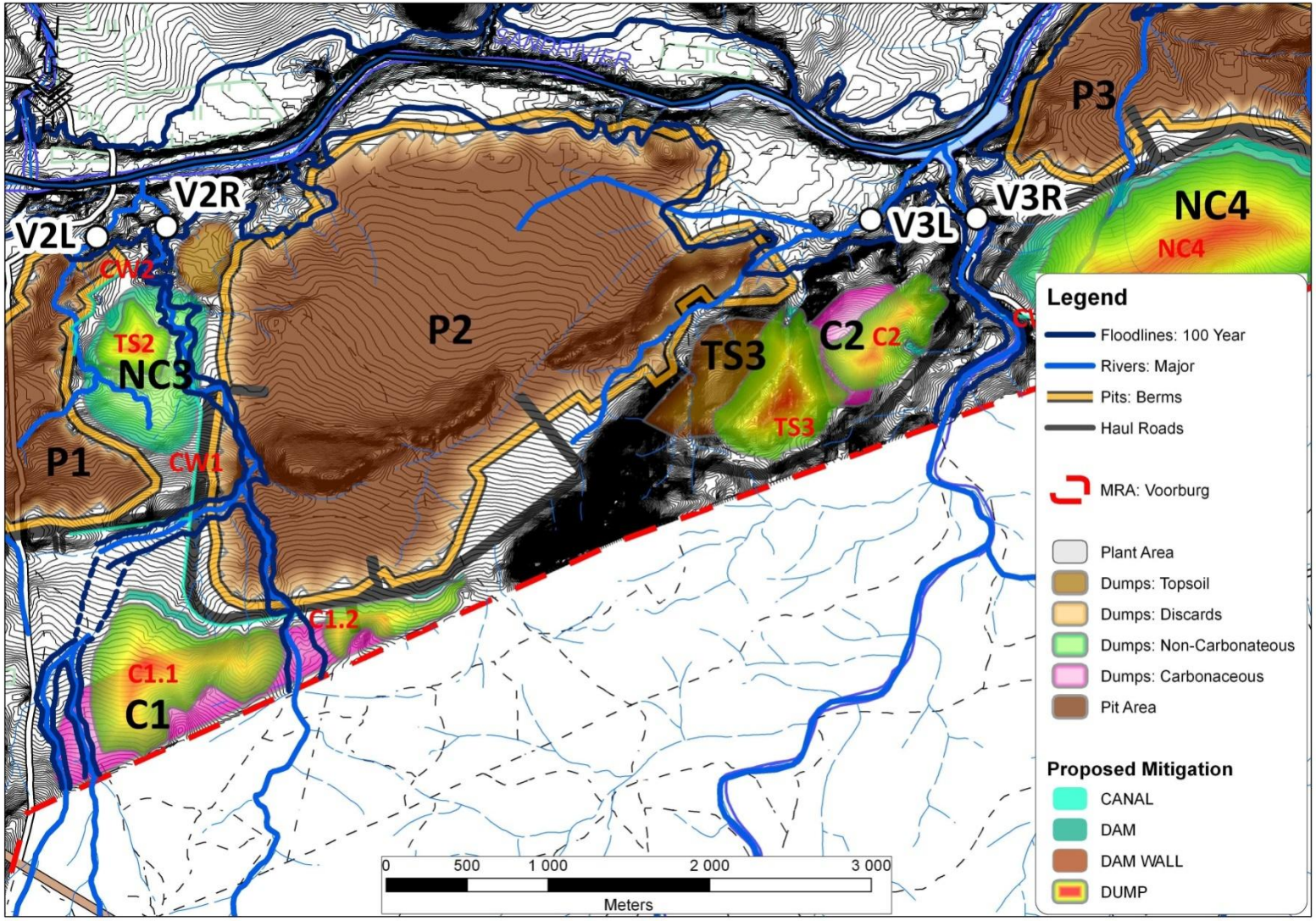


Figure 6: Central Pit - Proposed revised mining layout plan

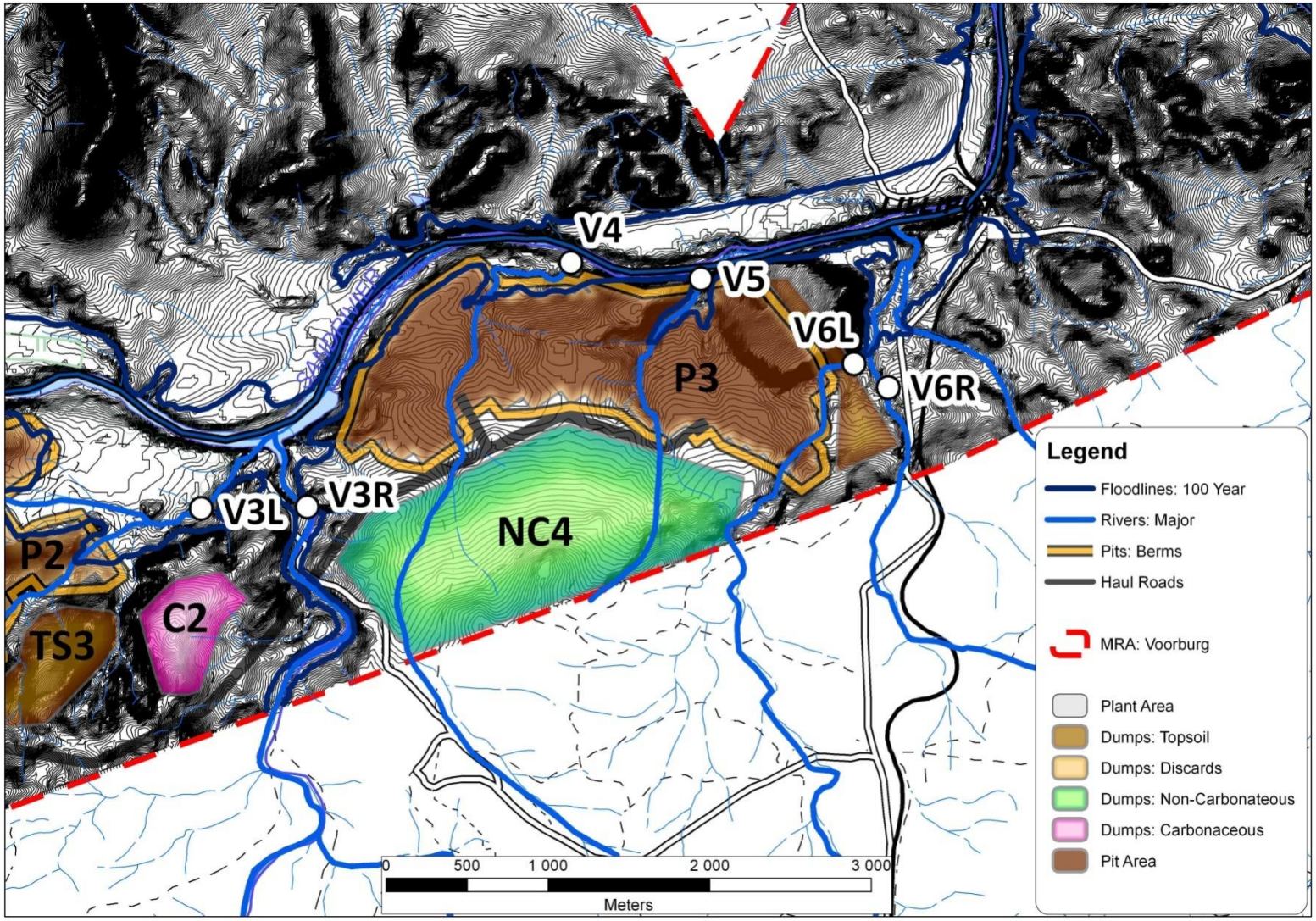


Figure 7: East Pit - Mining layout plan

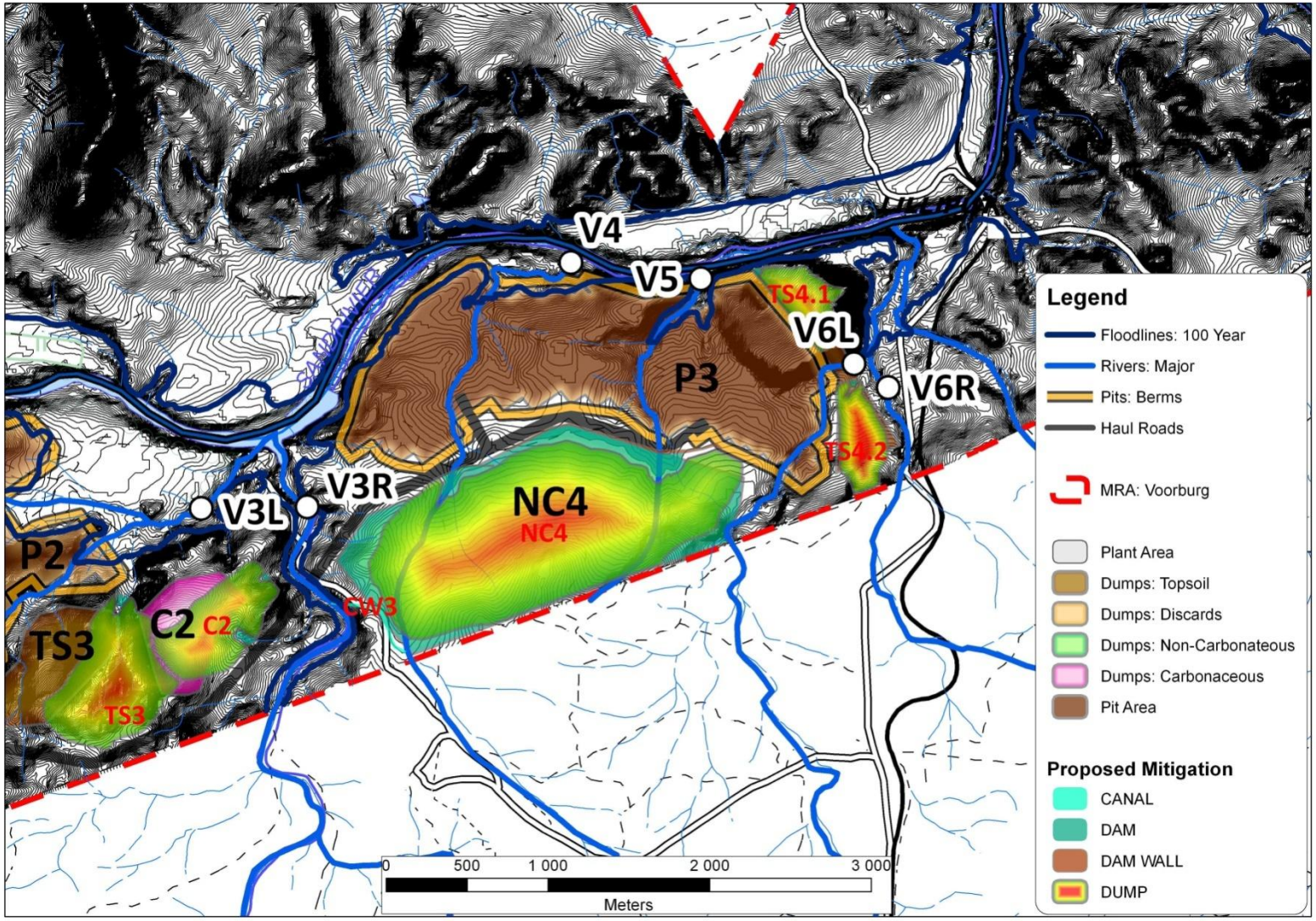


Figure 8: East Pit - Proposed revised mining layout plan

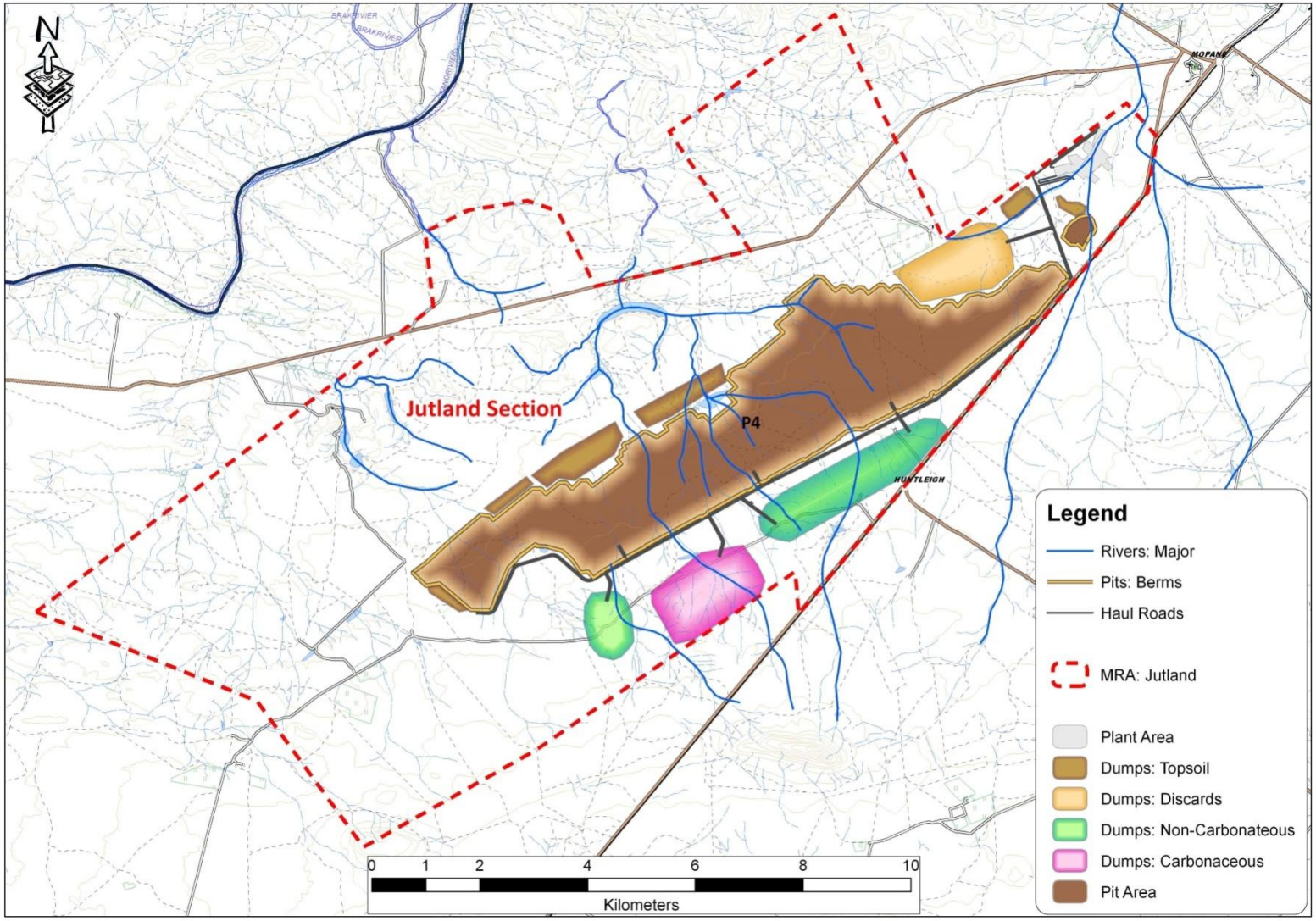


Figure 9: Mining layout plan - Jutland Section

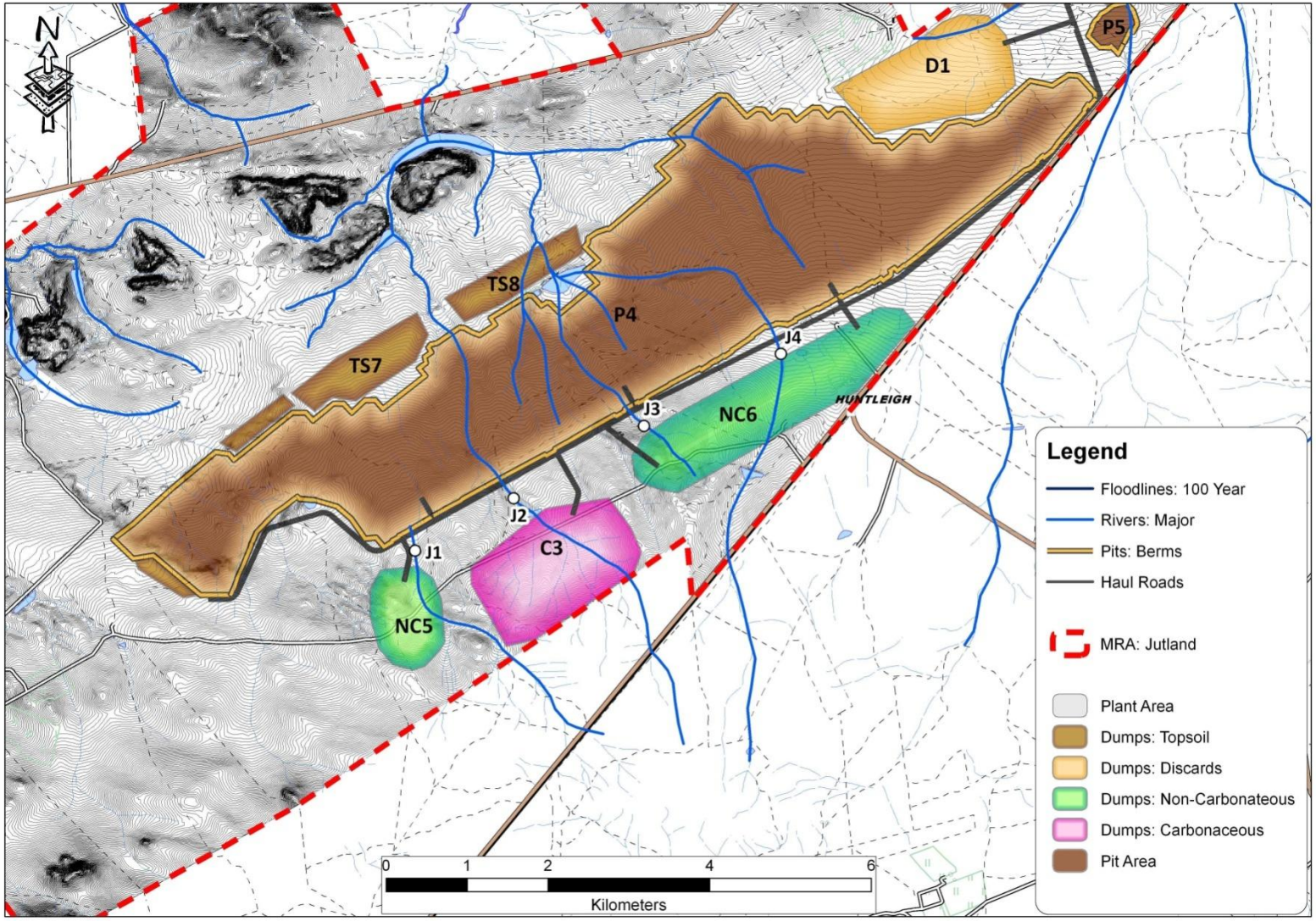


Figure 10: West Pit - Mining layout plan

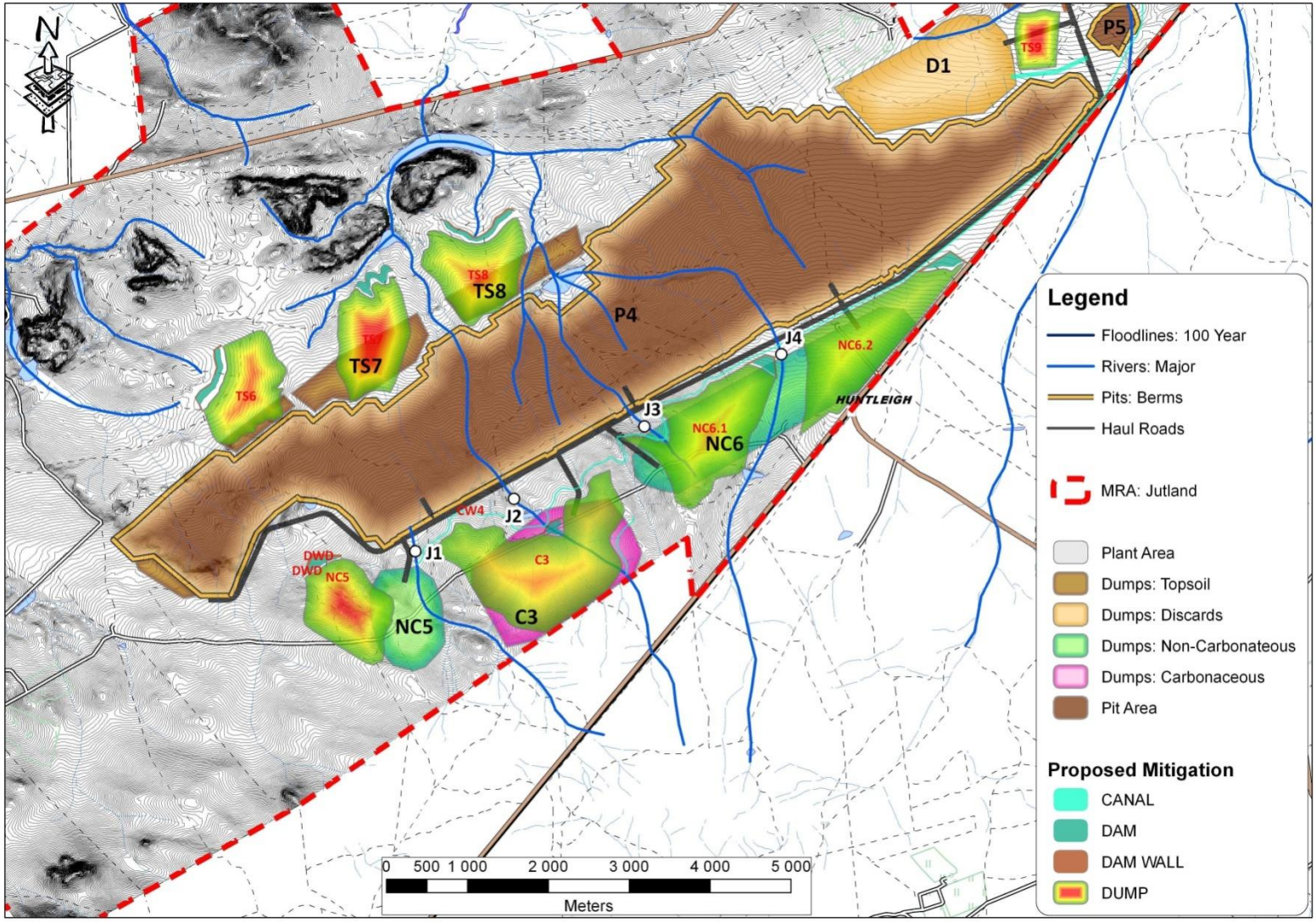


Figure 11: West Pit - Proposed revised mining layout plan

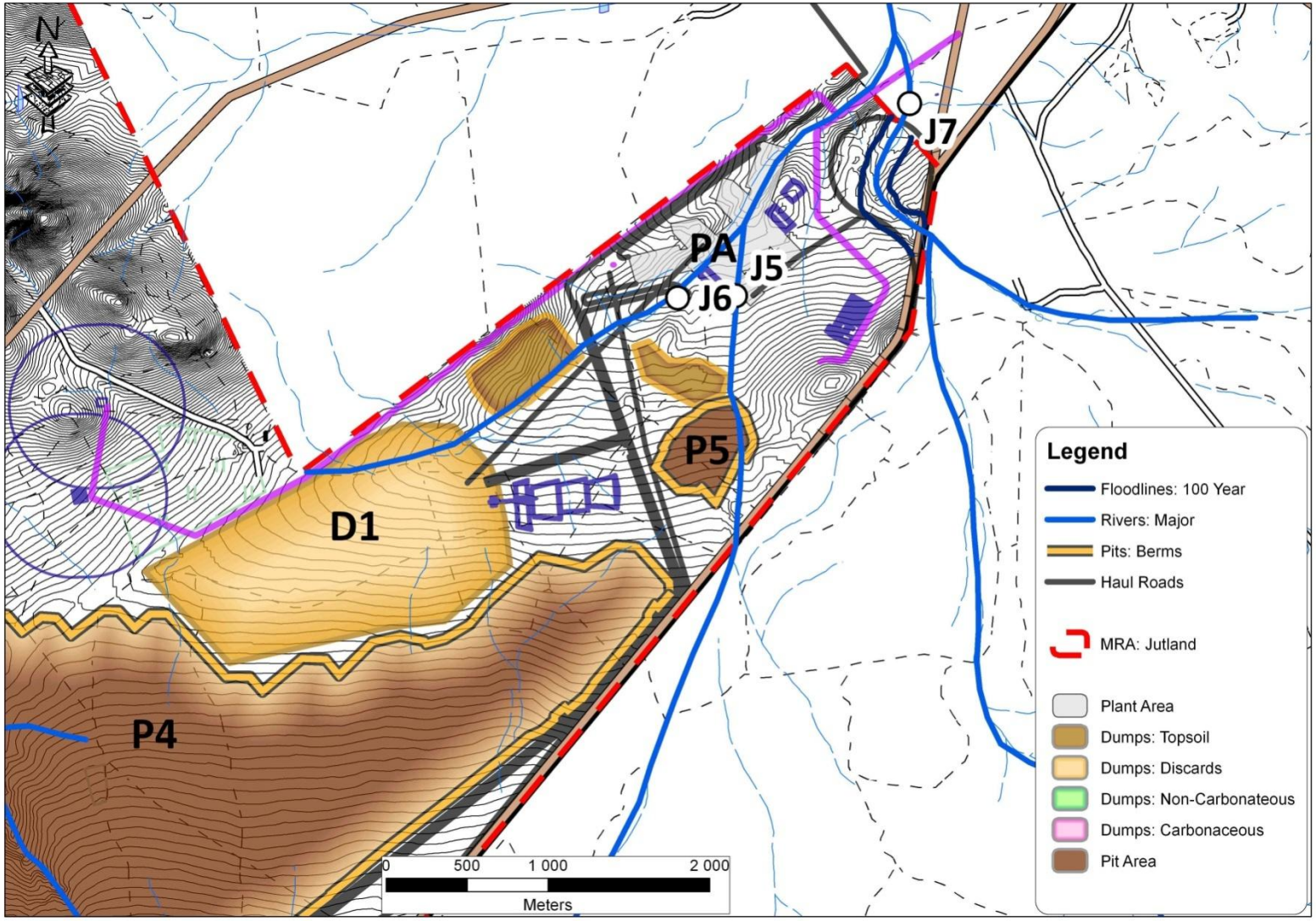


Figure 12: East Pit and Infrastructure Hub - Mining layout plan

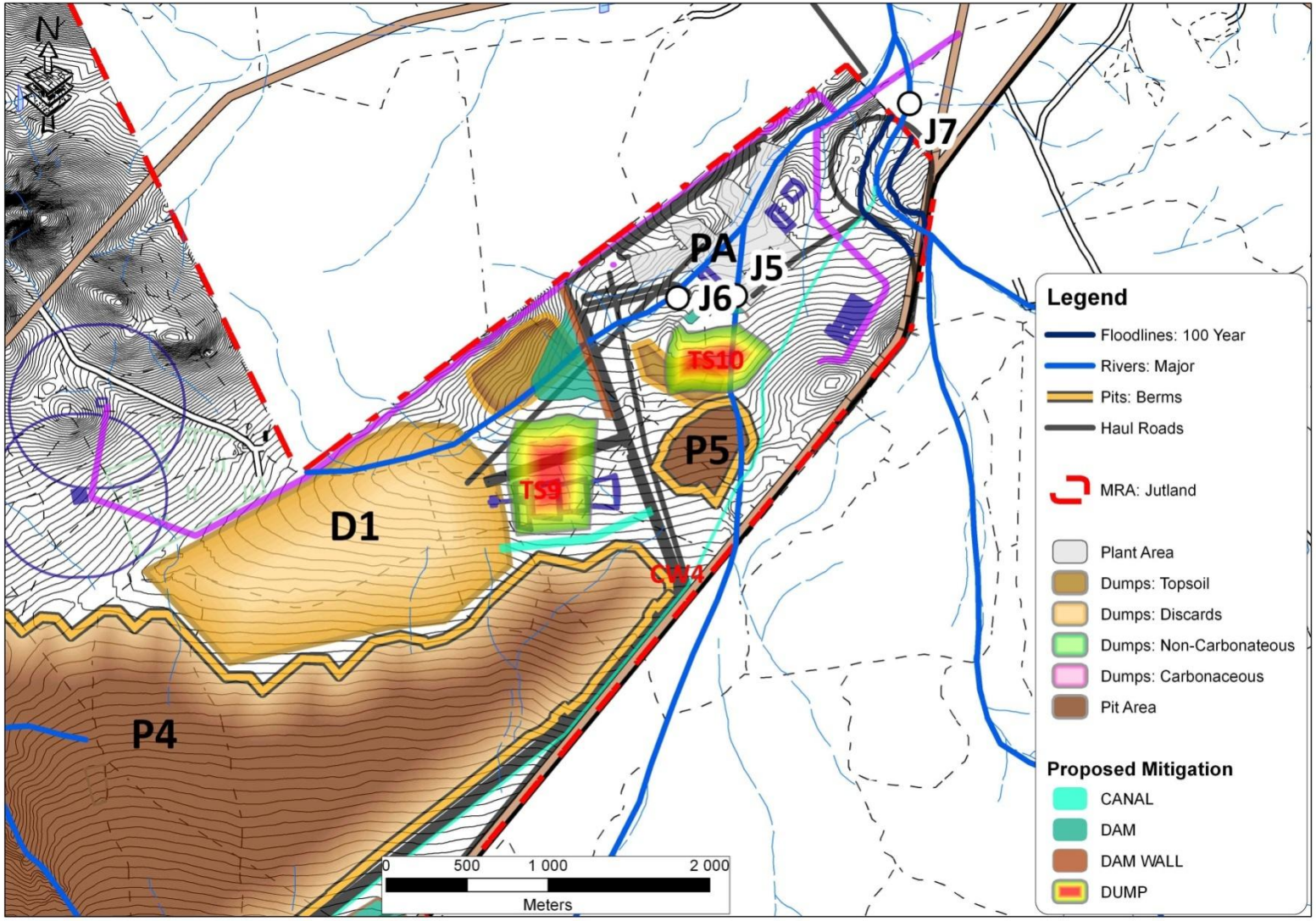


Figure 13: East Pit and Infrastructure Hub - Proposed revised mining layout plan

2.4 GROUNDWATER MANAGEMENT

2.4.1 Impact on Groundwater Levels

To address issues on groundwater level lowering, the mining plan proposes to:

- The mining schedule will be optimised during the Feasibility Phase in order to minimise the impacts associated with the Mopane and other Greater Soutpansberg Projects. The groundwater flow model will be utilized during this exercise to obtain the most feasible option from a groundwater impact perspective.

- Embark on property specific investigations to determine the baseline of water use, yield and quality on all farms that are shown to be impacted over the LOM. This will enable the property owner and MbeuYashu to monitor against these baselines. These external boreholes will be included in the groundwater monitoring programme and monitored on a six-monthly basis.

- If an impact is detected, further investigation will be done to determine the origin of the impact. If the impact is proved to have been caused by the Mopane Project, MbeuYashu will enter into discussions with surrounding landowners impacted regarding:
    - Compensation
    - Alternative water supply
    - Acquisition of land

2.4.2 Impact on Groundwater Quality

To minimise acid generation and manage leachate the mining plan proposes to:

- Deposit mine wastes in the open pit, controlling the migration of high sulphate leachate.

- The horizons that are potentially acid generating will be placed at the bottom of the pit, where it will be submerged below the water table, preventing oxidation.

- Stockpiling of carbonaceous material will be designed with a competent liner with a leachate collection system.

- Stockpiles will be capped, compacted and vegetated as soon as possible to minimise infiltration.

- Open pit areas will be rehabilitated and vegetated as soon as possible to reduce the oxidation and the potential generation of acid-mine drainage.

- Leachate formed in open pits will be pumped to the processing facility for re-use.

- Monitoring boreholes will be installed in appropriately selected sites prior to commencement of mining to detect changes in water quality and water levels with time.

- Ongoing review of groundwater / geochemical models to verify the predictions.

2.4.3 Management of Post-Closure Decant

The groundwater and geochemical models will be updated once the mining schedule has been finalised during the Feasibility Phase to verify potential for decant.

The decant needs to be intercepted and treated to acceptable levels prior to discharge into the natural environment. Appropriate management options need to be investigated during the operational phase of the mine in conjunction with the relevant authorities and IAPs. Given the duration between mine closure and the potential time of decant (50 yrs+), emphasis should be placed on passive treatment options such as artificial wetlands.

2.5 HAZARDOUS SUBSTANCES MANAGEMENT

Hazardous chemical substances used will be stored in secured secondary containers. The relevant Material Safety Data Sheets (MSDS) will be available on Site. Procedures detailed in the MSDS will be followed in the event of an emergency situation. For potentially hazardous substances that are to be stored on site, the responsible person will provide a Method Statement detailing the substances/materials to be used, together with the storage, handling and disposal procedures of the materials.

2.5.1 Hydrocarbons

Hydrocarbons (petrol, diesel, oils/lubricants) will be managed in the following manner:

- Fuel and lubricants will be delivered and stored in the bulk storage facility situated in the Infrastructure Area (bulk lubricant terrace).

- The storage area will be designed and constructed in accordance with the SANS requirements, and will be concrete lined and sufficiently bunded to prevent spillages.

- As a result of the hydrocarbon activities, the dirty in the Infrastructure Area water will be captured by means of collection sumps and oil traps before releasing the water to lined channels to drain down to the dirty water storage dams.

- All oil and other petroleum products (bulk storage area and other storage areas) must be stored in a bunded area with a containment capacity of the product being stored plus 10%.

- Used lubricants will be containerised in drums and will be collected from the various workshops and lubrication vehicles. This will then be pumped into collection tanks situated on the bulk lubricant terrace for collection by a specialist waste management contractor (OILKOL).

- Decanting facilities must be available for decanting purposes at all times. Decanting facilities must be bunded appropriately to prevent spillages. Decanting must be done in such a way that no spillages occur whilst filling or emptying any containers.

- All portable diesel bowsers shall be used, filled, pumped, emptied, decanted and transported in such a way to prevent spillages of any kind.

- The maintenance of any petroleum liquid (e.g. oil, petrol and diesel) and grease supply pipes must be done in such a manner as to prevent any spillages to the environment.

- All machines, equipment and tanks (including mobile compressors and diesel bowsers) that have got the potential to leak oil shall be inspected and kept in good condition at all times. Leaking equipment will be repaired immediately or removed from the Site.

- The handling of drip trays and management of volume of oil levels in drip trays will be such that they will not overflow into the environment. If any spillages of oil did occur, it shall be cleaned immediately after the spillage occurred – refer to Section 3.2 for the *Spill Management Procedure*.

- The relevant Material Safety Data Sheets (MSDS) will be available on Site. Procedures detailed in the MSDS will be followed in the event of an emergency situation.

- The Contractor shall ensure that proper spillage kits is implemented and maintained for cleaning of any spills. Any leaks or spillages will be cleaned up as soon as possible and reported to the Site Manager immediately. Also refer to Section 3.2 for the *Spill Management Procedure*.

- Oil contaminated rags and other cleaning material used for cleaning of spillages shall be disposed into allocated hazardous waste bin and removed by a certified waste removal company.

- Under no circumstances will the selling of empty drums for other uses be allowed.

2.5.2 Explosives

Explosives will be handled as follows:

- Emulsion will be delivered to site by road tanker and stored in appropriately sized silos situated within the Infrastructure Area.

- Detonators and cartridge explosives will be stored in the Explosives Magazine.

- The Explosives Magazine, as well as the destruction area will comply with all legislative requirements.

- The final position will be determined after finalisation of the mining schedule during the Feasibility Phase.

2.5.3 Sewage Effluent

Sewage effluent will be managed as follow:

- An appropriate sewage treatment plant will be designed and constructed for the Mopane Project. The final treatment system will be selected during the Feasibility Phase and the necessary authorization applied for.
- As a minimum, treatment will adhere to the General Standards and chemical dosing will be applied for final effluent disinfection (chlorine contact basin).
- Treated effluent will be re-used in the processing plant.
- No sewage disposal will be allowed on site.

2.6 WASTE MANAGEMENT PROCEDURE

The following waste types will be generated during the course of the project:

- Domestic waste
- Hazardous waste
- Fluorescent tubes
- Glass
- Plastics
- Chemicals
- Medical waste
- Scrap metal
- Used oil/diesel/greases
- Building rubble (construction & demolition activities)
- Used tyres
- Old explosives

The different waste streams will be segregated and disposed of in appropriate designated receptacles. An approved, registered waste contractor will be appointed by the mine to manage the waste generation and safe disposal thereof. No landfill site will be established on the Mopane Project site. The waste removed will be either treated through the composting station, recycled through the Waste Transfer Station (WTS) and the remainder will be disposed through landfill at appropriate registered landfill sites.

No waste will be disposed of or buried on site, or in any other location that is not a licensed waste disposal site.

2.6.1 Waste Separation

All containers will be clearly marked as to what type of waste will go in them. Each waste type container must be in a specified colour. The types of waste that is generated as well as their container type are:

- Domestic or General waste – Green bins with waste identification labels. General waste will be separated at source into glass, cans, plastics, paper and litter (food waste).
- Hazardous Waste – Red wheelie bins, Black & Red skip bins.
- Scrap Metal – Light Blue drums, Blue skip bins.
- Fluorescent tubes, CFLs and MBLs – Black & Blue Box, Black & Blue drums.
- Used diesel/oil/greases – 1000L or larger tank (supplied and serviced by OILKOL).

2.6.2 Equipment

Different containers will be used for different types of waste. 240L wheelie bins, $6m^3$ skip bins, 210L drums, 1000L tanks and 8 foot steel boxes will be used to contain the various types of waste, and will be placed at designated collection points.

All general waste bins as well as hazardous waste bins will be fitted with lids to secure the contents from wind, rain and from contaminating the environment, and wild animals.

The containers that will be used for collection, sorting, storing and handling for non-hazardous waste and hazardous as follows:-

2.6.2.1 Non-Hazardous Waste

- Green wheelie bins with waste identification labels – General or domestic waste. This includes but not limited to food waste, glass, plastics, boxes, paper, cans, toothpaste tubes, cigarette butts, etc.
- Refuse bags will be used at points which already have fixed bins and don't require wheelie bins. These may only be used for general waste.
- Blue skip bin – Non-hazardous waste. This is for building rubble, concrete and cements bags.
- Light Blue drum – Scrap metal.

2.6.2.2 Hazardous Waste

- Red wheelie bin – Hazardous waste. This includes but not limited to oil contaminated rags and gloves, paint containers, thinners, etc.
- Black & Red skip bin – Hazardous waste. This is hazardous waste such as filters that cannot fit into the red wheelie bin.

- Black & Blue drum – CFLs and MBLs.
- Black & Blue box – Fluorescent tubes.
- 1000L or larger Black Oil tank – Used oil. All contractor may dispose of their oil into the used oil tank situated at designated sites.
- Medical waste will be the responsibility of the doctors making use of the facilities.

2.6.3 Waste Collection Points

Collection points will be identified and logged via GPS coordinates at the mine. The designated areas will be clearly marked and fenced. The containers will be placed on a cement slab, and if hazardous will have a bund wall. Spill kits (chemical and oil spill kits) will be placed and clearly marked at hazardous waste collection areas.

The waste containers will be emptied as and when required. General waste bins will be collected daily for all eating areas on the mines as well as the kitchen collection point. All points will be monitored on a daily basis and collected accordingly, while hazardous waste will be collected as required. All full containers will be replaced with clean, empty containers, on collection.

Every collection will be signed off by the responsible person per site. All collections will be recorded by the waste contractor everyday and signed off.

All areas will be inspected by the waste contractor and a monthly report will be submitted to the Environmental Management Department.

2.6.4 Sorting and Disposal of Waste

All non-hazardous waste will be transported to the WTS for short term storage. Organic waste, "greens and browns" will be treated in the composting station. All recyclables will be sorted into the various types (plastic, paper, boxes, cans and bottles) at the WTS, placed in bulk bags and sent out to be recycled. The non-recyclable and untreatable general waste will be placed into the general waste skip bins at the WTS, collected and disposed of at a suitable registered landfill site. Currently the only registered landfill site close to the mining site is the Thulamela landfill site in Thohoyandou.

No hazardous waste will be taken to the WTS. All hazardous waste will be transported directly to the Holfontein H:H waste disposal site in Springs, Johannesburg for treatment and disposal in an environmentally sound manner. Fluorescent tubes will be crushed using a bulb eater into 210L drums and disposed as hazardous waste.

Scrap metal bins will be taken directly to the identified local recycler. Construction rubble will be taken to the Thulamela landfill site in Thohoyandou.

The used oil tanks will be serviced and emptied by OILKOL.

All waste taken offsite for recycling will be recorded and a waste manifest will be completed. Similarly, all waste taken offsite for disposal at either Holfontein or a general landfill site will be

recorded and a waste manifest will be completed. A waste manifest disposal certificate will be issued by OILKOL upon collection of the used oil, reflecting the volume collected.

Copies of all waste manifests will be submitted to the Environmental Department on a weekly basis.

2.6.5 Transport of Waste

Non-hazardous and hazardous waste will be transported using compliant and certified vehicles and drivers in accordance with the National Road Traffic Act of 1996 and the Transport of Dangerous Substance by Road - Chapter 8 of the National Road Traffic Act.

Safe and responsible waste transportation (to the WTS or disposal sites) will be ensured at all times. Drivers must secure the containers and make sure that no waste is exposed. Nets will be used at all times.

The waste contractor will transport non-hazardous waste in collection containers to the WTS for short term storage before it is transported to the recycling station. For waste disposed at a landfill site, the contractor will secure and produce disposal manifest accordingly.

Hazardous waste will be transported directly from the collection site to the hazardous disposal facility with all the disposal manifests being secured by the contractor.

2.6.6 Collection and Transportation of Hazardous Waste

Collection vehicles must be compatible with the type of containers utilised, e.g. skip truck for the collection and transportation of waste contained in a skip bin.

Vehicles must be specialised and certified to carry hazardous waste, and have proper and relevant hazchem signage. Waste containers must be clearly labeled.

Vehicles must always be roadworthy and in good condition, and drivers must be fit to drive.

Personnel collecting waste must be trained to handle and transport the type of waste, as well as regarding the emergency procedures.

Transportation of hazardous waste must conform to the following legislation:

- The National Road Traffic Act (Act 93 of 1996) incorporating the SANS codes.
- The Hazardous Substance Act (Act 15 of 1973)
- The Occupational Health and Safety Act (Act 85 of 1993)

Waste must be handled as per specific SOPs and appropriate fire fighting equipment and spill kits must be available at the collection site as well as on the vehicle transporting the waste.

2.6.7 Emergency Plan

In the event of an incident or accident during the transportation of hazardous waste, the following must be done:

- When a spill occurs, isolate the area to prevent people from entering the spill area and spreading the contamination. This is done with warning signs and barrier tape, or other similar actions. Seal off the area until assistance arrives.
- Women who might be pregnant, or people with a history of kidney damage, should be kept away from the spill area until the clean-up is finished.
- The driver must notify his supervisor who will in turn contact clean-up services for a large spill.

For a small to medium spill (from 30ml up to 20-40L), the following types of spill kits may be used depending on the type of waste spilled – follow the clean-up procedures in the spill kit.

Product Description	Inventory List
240L Oil Spill Kit Wheelie Bin Complete (1 Unit)	1 x 240 Litre Wheelie bin
	1 x Bag of Abzorbit Hydrocarbon Absorbent – absorbs 170 liters of hydrocarbon
	2 x 2m booms (to contain or re-route spillage)
	10 x Oil Absorbent Mat Pads
	1 x Spark Proof Broom
	1 x Spark Proof Shovel
	5 x Recovery Bags and Ties
	1 x Pair of PVC Gloves
	1 x Dust Masks
	1 x Safety Glasses
	1 x Spill Training Manual
240lt Chemical spill kit bin complete (1 unit)	1 x 240lt blue wheelie bin
	1 x 25lt bucket minrosorb
	1 x 25lt bucket organogel
	2 x 2m chemical boom
	10 x chemical mat pads
	1 x Dust masks
	1 x Safety goggles
	1 x Nitrile glove
	1 x Broom
	1 x Spark proof shovel
	5 x Recovery bags and cable ties

For a large spill call: 0800 147 112 – Enviroserv National Oil and Chemical Spill Response (24 hours)

2.7 ENERGY MANAGEMENT PLAN

Power and energy management, on an on-going basis, is not only good business practice but is also a national imperative, given the difficulties facing the electricity-supply industry in South Africa. A number of power and energy reduction initiatives have already been introduced to reduce power demand and energy consumption. These have been categorised as follows:

- Design inclusions and initiatives in the project;
- Initiatives for further evaluation at implementation phase;
- On-site energy management;
- On-going continuous improvement (CI) processes;
- Renewable energy.

Whilst the implementation of energy and power-saving measures are appropriate at design and implementation phase, it is also a requirement, particularly against the background of power shortages in South Africa in the short term, to institute a continuous improvement process – at least for the first 5 years of operation. The following is envisaged:

2.7.1 Energy Policy

MbeuYashu will develop an energy policy with particular focus on reducing and optimising power and energy usage in general at Mopane. The policy will comprise:

- Mission statement
- Vision statement
- Energy-management objectives which are realistic and measurable. It could also include a 'stretch' component
- Set policy review periods

2.7.2 Energy Management Plan

As a follow on from the energy policy, it is envisaged that an energy management plan will be developed to set out the strategy for continually improving energy saving and optimisation measures. Such a plan will address all of the items above, in terms of on-going performance, and would also set out to identify research and implement any other energy reduction technologies and measures.

An energy management plan would require the following steps:

- Set up the energy management team and coordinators;
- Develop an energy policy;
- Perform extensive education;
- Compile a load list from an audit;
- Perform a 'balanced-energy scorecard' on all possible energy-management solutions;
- Set current benchmarks and identify future opportunities;
- Implement energy management projects;
- Conduct an annual survey;
- Update policy and plans.

Part of the energy management team's responsibilities would be pro-active monitoring and auditing of the energy management plan and implementation of corrective action, as and when required, on a regular and on-going basis.

2.7.3 Reduction opportunities

The mitigation of carbon footprints through the development of alternative projects, such as solar or wind energy or reforestation, represents ways of reducing a carbon footprint and is often known as carbon offsetting.

While governmental action is an integral part of stopping the nation's effect on global warming, every person and company is responsible for reducing its carbon footprint. It can be achieved through:

- Reducing electrical energy consumption;
- Reduce water consumption;
- Optimisation of transport to reduce fuel consumption;
- Purchase products and goods that are CO^2 and carbon lean.

At Mopane a large quantity of shrubs or trees will be removed during the operation of the mine through bush clearing activities. MbeuYashu's strategy will be to minimise the amount of vegetation to be removed during its operations, whilst at the same time transplanting trees or re-establishing vegetation in disturbed areas as soon as reasonably possible to limit the effects of deforestation.

2.8 HERITAGE MANAGEMENT ACTION PLAN

A detail Heritage Management Action Plan will be developed for the Mopane Project during the Feasibility Phase and will be implemented in a phased approach over the life of mine. The preliminary short-, intermediate- and long-term management actions are described below:

2.8.1 Short-term Actions (Year 1-3) Action Plan

Protection: Protect and demarcate sites that are in close proximity to the planned exploration activities planned during this period. No exploration activities should be undertaken within 50m of identified sites.

Rock Art: Although no signs of rock art were discovered during the initial survey, attention will again be given to rock faces and shelters to ensure that none were missed during the initial survey. If any are found, a rock art specialist (Rock Art Institute) will be commissioned to assess these finds and to mitigate management measures.

Stone Age: A Stone Age specialist must be commissioned to assess the Stone Age bearing gravels.

Grave relocation: Consultation must be initiated for grave sites that may be affected by future mining activities. The possible grave sites that have been identified must be verified as soon as possible. Refer to Grave Relocation Procedure below.

Phase 3: Develop and implement a Phase 3 Site Management Plan to ensure the protection of sites that will not be affected by mining related activities.

Heritage Committee: A heritage committee should be established comprising of stakeholders such as the heritage authority, community representatives, and representatives from Traditional Authorities, ASAPA and other IAPs. This committee should guide the rescue and research aspects of the future archaeological and consultative work.

2.8.2 Intermediate Actions (Voorburg Section)

Protection: Protect and demarcate sites that are not directly threatened by any activity relating to the mining development at the Voorburg Section and Infrastructure Hub.

Phase 1B: Implement Phase 1B assessments (test pits) at sites that may be threatened by the mining and infrastructure developments.

Phase 2: Implement Phase 2 assessments at sites if Phase 1B indicated the need for further work or where the heritage specialist made such recommendation.

2.8.3 Long-term Actions (Jutland Section)

Protection: Protect and demarcate sites that are not directly threatened by any activity relating to the mining development at the Jutland Section.

Phase 1B: Implement Phase 1B assessments (test pits) at sites that may be threatened by the mining development.

Phase 2: Implement Phase 2 assessments at sites if Phase 1B indicated the need for further work or where the heritage specialist made such recommendation.

2.8.4 Grave Relocation Procedure

2.8.4.1 Grave older than 60 years

- Application of a permit from SAHRA's BGG Unit in terms of Section 36 of the National Heritage Resources Act for graves older than 60 years or that of a victim of conflict.
- Known graves: Proof of thorough consultative process:
    - Locate next of kin and obtain letter of consent from next of kin.
    - Obtain a letter of consent or statement of no objection from the local traditional authority if in a rural area.
    - Determine a place for the re-burial of each grave in consultation with next of kin. In addition, also determine the arrangement of reburial, i.e. by the next of kin/community or a funeral undertaker.
    - Submit documentation of the above with the permit application to SAHRA.
    - Inform the SA Police Service (SAPS) of intent to relocate the grave/s and submit a copy of the permit to SAPS.
- Unknown graves: Proof of thorough consultative process:
    - Place advertisement in a local and national newspaper with description and location of graves and full contact detail of consultant and developer. A waiting period of 60 days applies.
    - If no reaction to advertisement follows, then apply for permit from SAHRA after waiting period of 60 days with proof of advertisement and any other consultative process.
    - If in rural area obtain a letter of consent or statement of no objection from local traditional authority and submit with permit application.

- If advertisement leads to a claim from next of kin or from a community who by tradition has an interest, then written consent from relevant party must be obtained.
- Determine a place for the reburial of each grave.
- Submit documentation of the above with the permit application to SAHRA.
- Inform SAPS of intent and process of reburial and submit a copy of the permit to SAPS.

2.8.4.2 Graves less than 60 years old

- In terms of the Human Tissues Act No. 65 of 1983 and the Removal of Graves and Dead Bodies Ordinance No. 7 of 1925.
- Locate the next of kin of the buried persons and obtain consent from the next of kin for the relocation of the graves.
- Determine a place for the reburial of each grave.
- Obtain a letter of consent or statement of no objection from the local traditional authority if in a rural area.
- Submit above documentation to the Department of Health and obtain permission for the relocation of the graves, which process would most probably be regulated by the Vhembe District Municipality.
- Inform the SAPS and provide above-mentioned documentation.
- The graves are to be exhumed by a funeral undertaker under the supervision of an archaeologist. Undertaker would also arrange all the formalities for the reburial.

In all of the above determine the specific requirements with regard to ritual and ceremonial practices from next of kin and/or community for both the exhumation and reburial activity must be determined beforehand and facilitated by the developer.

2.8.5 Grave Visitation Policy

The following principles would form the basis of the visitation policy to remaining graves:

- Graves remaining in the project area should be clearly marked (e.g. fenced, indicated with a tombstone or concrete slab etc.) so that possible damage by heavy vehicles or mining activities are minimised as far as possible.

- In the event where there is gross damage (e.g. destruction of tombstone or concrete slab) to a grave (and it can be proven that the mine is responsible) the mine will be liable for the repair cost of the grave.

- It is the responsibility of the next of kin of the grave to keep the grave and related infrastructure (such as the fencing) in good repair and clearly visible.

- Next of kin is allowed to visit the grave(s) as often as is required.

- Visitation of grave(s) will be subject to written approval by the Mine Manager or his/her delegated authority (e.g. Head of Security).

- The required forms / procedure to authenticate visitation to the grave should be available at the Mine's Security and at the Entrance Gate in case of an emergency.

- A list of remaining graves linked to a surviving next of kin should also be kept by the mine / Security Office at the Entrance Gate. Visitors should indicate to which grave they would like to tend, upon entering the mining area.

- The next of kin must be issued with a permit stating permission to be present in the mining area and giving them permission to visit the grave.

- The mine will do all in their power to secure the safety of the next of kin within the boundaries of the mined area. However, the next of kin enters the area at own risk and cannot keep the mine liable for injuries sustained on site while visiting the remaining graves.

- The next of kin will need to undergo the on-site safety induction at the entrance to the mine

- The exhumations and reburials of affected graves forms part of the implementation process of the Grave Relocation Policy. Should next of kin decide during the Grave Relocation Policy implementation process to leave graves behind, they will have no future claim from MbeuYashu for exhumation and reburial elsewhere, unless future mining activities directly impact on the remaining graves.

- During visits to graves, next of kin will be subject to the security and safety provisions stipulated by MbeuYashu (e.g. allowed traversing routes, number of relatives allowed at once, access points, duration of visits, being accompanied by mine security personnel etc.).

- Next of kin will not be allowed to overnight at the graves.

2.9 COMMUNITY SAFETY AND TRAFFIC MANAGEMENT PROCEDURE

2.9.1 Risk Assessment

The MbeuYashu project team and relevant stakeholders must conduct a comprehensive community safety and traffic risk assessment using the prescribed hazard identification and risk assessment documents.

Amongst others, the community safety and traffic risk assessment must consider as a minimum the following exposures:

- Unauthorised access or illegal penetration of mining authorisation areas through perimeter and boundary fences
- Traffic on public roads leading to and from mining areas and local communities and at entrances/ exits to project sites.
- Vehicle activities in remote off-road areas, particularly during exploration related activities.
- Access controls to mining authorization areas.

Significant risks identified must have suitable mitigation strategies and should be included in a detailed plan that must be developed in conjunction with the affected parties. This plan should be updated on a regular basis.

2.9.2 Communication and Awareness Creation

The significant hazards and risks and mitigation strategies must be communicated to the relevant community leaders at the appropriate forums for further dissemination and communication to local community members.

A Community Liaison officer will be responsible to liaise with local school educators and governing bodies to disseminate relevant community safety and traffic management information to create awareness amongst learners. Amongst others, the following are proposals in which community safety and traffic management can be promoted in local communities:

- **Sensitisation discussions** at community forum meetings and with school authorities
- Development of **Posters** for display in classrooms and discussion by educators depicting the incorrect and correct behaviour when using the roads, for example.

Incorrect behaviour	Correct behaviour
Walking on the wrong side of the road	Walking on right side of the road
Playing in the road	Playing off the road in a safe place
Sitting on the edge of LDV load wells	Sitting properly in the back of LDVs
Drivers speeding on the roads	Drivers adhering to the speed limit
Throwing litter alongside the road	Keeping litter for proper disposal in a bin
Vehicles driving with lights off after sundown	Vehicle lights switched on at sundown
Occupants not wearing seatbelts	Occupants wearing seatbelts
Drinking and driving	Sober and driving
Driving while tired	Driving while alert
Pedestrians wearing dark clothes at night	Pedestrians wearing bright colours at night

In addition to road traffic management, promotion must also include aspects associated with unauthorised entrance to project areas or illegal penetration of boundary fences and the consequences thereof, which may include legal action taken by the project against offenders.

2.9.3 Monitoring and Enforcement

The MbeuYashi project team shall monitor mitigation strategies to check effectiveness of the community safety and traffic management plan. This plan should be updated on a regular basis.

SANRAL and local traffic department authorities must do regular inspections of the condition of road signs and markings and to take immediate action to address deviations.

Local traffic department authorities must carry out regular law enforcement activities on public roads as may be deemed necessary to ensure road traffic infringements do not occur, which may include, but not limited to:

- Vehicle inspections
- Vehicle licence disc checks
- Driver licence checks
- Speed and reckless driving infringements

2.10 INFLUX MANAGEMENT PLAN

A common impact of major mining and infrastructural projects in developing countries is the influx of opportunity seekers. The influx may be motivated by expectations around the project itself, or it might be the result of a more general perception of opportunity in the region. Influx is not negative by definition, but its impacts can be damaging where the migrants are not readily assimilated, placing stress on services, disrupting existing communities, and in some cases living in unhealthy and crowded conditions.

This Influx Management Plan outlines the proposed Mopane Project's contribution to the mitigation of negative impacts associated with uncontrolled influx. The plan recognizes that a single mining company has limited influence to stem or manage the effects of influx, but it is believed that the measures proposed will make a contribution. If done in with a holistic approach the mitigation on the cumulative effects of influx management should be significant.

The Land use and Influx management plan can only be successfully implemented if there is buy-in and partnership with Local Municipalities and Landowners.

The following actions are included in the Influx Management Plan:

- **Management of expectations**. This will be done via regular briefings on labour, recruitment and procurement to the Mopane Project Stakeholder Committees to be established

- **Recruitment and supply chain transparency**. Recruitment / procurement rules and opportunities must be transparent and accessible. Communication in this context should be the

joint responsibility of the Human Resource Manager and the Community Engagement Manager. The Mopane Project Recruitment Office must follow transparent rules and procedures, and must be the point of entry for employment. This will remove the incentive for people to gather 'at the gate' or to squat adjacent to the mine area. Mopane Project must express commitment to:

  - The use of local labour wherever possible and
  - The use a local skills database to source employees
  - Collaborate with Department of Labour and the Local Municipalities to source local skills.

- **Mine area security arrangements**. Mine access roads will have boom gates and access control, and major facilities will be fenced. All security arrangements will be in line with international best practice.

- **Land allocation and usage**. Landowners of open land in the project-impacted area will be informed of the risks of opportunistic influx, and will be provided with tools to address problems if these arise.

The following Implementation Plan is proposed:

Action	How	Target	When	Who
Communicate policy on procurement & recruitment	Special Newsletter Municipal Notice Board Public Places	Local area Municipal area	Upfront & thereafter Yearly	Community Engagement Manager
	Meetings with Stakeholder Committees	Local area	Upfront & thereafter Yearly	Community Engagement Manager
Notice of opportunities	Placement of Community Notice Boards Municipal Notice Board	Local area Municipal area	Monthly	Human Resource & Procurement manager
Briefing on labour and procurement statistics	Section in Newsletter Municipal Notice Board	Local area Municipal area	Quarterly	Human Resource Manager
	Meetings with Stakeholder Committees	Local area	Quarterly	Community Engagement Manager
Recruitment procedure	Compile and workshop of recruitment procedure	Local Municipalities Department of Labour Ward Councillor & Committee Stakeholder Committees	Prior construction in take Prior to operational intake	Human Resource Manager Outsourced
Improve local labour recruitment	Skills development programme a) identification of talent pool b) identification of programmes, scheduling and enrolment	Identified talent pool from local area Stakeholder Committees	Prior construction in take Prior to operational intake	Human Resource Manager Outsourced
Define mine areas and fencing requirements	As per the safety procedure	Mine management	Prior to construction –	Mine management

Action	How	Target	When	Who
			all areas	
Monitor the fence-lines for breakages	All fence lines to be patrolled. Procedure and line of communication to be established for reporting of any fence breaks	Safety and Security on mine	Weekly	Safety and security
Security measures of open land	Notification boards Security access if possible	Local area	Prior to construction	Safety and security
Agreement with Landowners for security monitoring of open land	Agreements reached	Local area Open land owners	Prior to construction	Legal Safety and Security
On-going monitoring of open land for activity	Monitoring schedule Monitoring reports	Local area Open land owners	Upfront & thereafter Monthly At steady state Quarterly	Legal Safety and Security

The following resources from MbeuYashu will be required for the implementation of this strategy:

No	Resource	Frequency
1	Human Resource Manager	Upfront, thereafter Monthly
2	Community Engagement Management	Continuously
3	Social Specialists to conduct reviews	Quarterly for first year, thereafter annually
4	Safety and Security Personnel	Continuously
5	Legal representative	Upfront to compile agreements with landowners to monitor open land

2.11 CRIME AND ANTI-POACHING MANAGEMENT PLAN

A central change processes associated with the construction and development process of a development such as the Mopane Project is the presence of contracting firms and construction workers, usually accommodated in workforce accommodation camps. This may include workers as well as opportunists and burglars/robbers posing as construction workers. The bigger the project, the more opportunity, the more people involved, could result in a crime increase.

A further secondary impact due to the influx of job seekers and creation of access to a previously remote area is the increase in poaching activities in the adjacent areas.

The increase in the safety and security risk in the surrounding area requires a mitigation measure that is implemented in partnership with various stakeholders including:

- Development companies (including MbeuYashu) in the project area
- The Local Municipalities
- The Local Police Services
- The landowners

- Community leaders
- Outsourced specialists

2.11.1 Crime management through Community Policing

Crime management on the mine and adjacent area can only be successful if the current stakeholders operating in this environment collaborates in implementing the mitigation measures. It is therefore recommended that a Community Policing Forum be established to develop and implement the crime management plan. The actions that must form part of the action plan include the following:

- Increased security on mine premises: Properly constructed and secured fences can control access to construction sites. Implementing strict access control of the project site and specifically the contractor's workforce camp.
- Construction and Permanent Mine workers:
    - Identified and marked with clear identifiable clothing
    - Include a code of conduct in project induction of new workers
    - Employees screened
- Awareness creation
    - Employees and landowners to be urged to recognize and report suspicious activity and signs of burglary and be informed of crime prevention measures that they themselves can take.
- Mapping of Target Areas
    - Identify area to be included in the Community Policing area
    - Map routes and access to mine areas and surrounding properties
    - Identify hot spot areas
- Registrations as a Community Policing Forum
    - Partnership with local municipalities and police service
- Community Policing Patrols
    - Schedules and involvement
- Community Policing Reporting and Evaluation of effectiveness

2.11.2 Anti-poaching through Collaboration

Poaching is the illegal taking of wild plants or animals contrary to local and international conservation and wildlife management laws. Violations of hunting laws and regulations are normally punishable by law and, collectively, such violations are known as poaching. Poaching is in effect the illegal "hunting" of fauna and flora. Poaching can generally be divided into three different

classes: Subsistence, Commercial and Syndicated. All poaching levels are as equally critical, as they are often interlinked and intelligence passes through all three levels.

Poaching is already present in the development area, and is further worsened by the lack of police capacity and Provincial Nature Conservation to assist in managing and/or mitigating the situation. A mine development may increase the occurrence and spatial spread of poaching and theft of game/livestock.

Anti-poaching in the adjacent area can only be successful if the current landowners and property managers collaborate in implementing the mitigation measures. The actions that must form part of the implementation plan include the following:

- Finalisation of the Anti-poaching Approach and Policy
- Selection of a contracting company / selected parties to implement the anti-poaching unit and measures. Land owners are to be actively involved in the selection of the contracting company employed to conduct anti-poaching in the area.
- Awareness creation. Creation of awareness amongst local communities regarding the situation to ensure understanding of why anti-poaching is being done
- Registrations of Anti-poaching unit with local police service and Nature Conservation
- Anti-poaching patrols
- Anti-poaching reports and evaluation of effectiveness

The following Implementation Plan is proposed:

Action	How	Target	When	Who
Complete Community Policing Plan and Anti-poaching plan	Participation amongst all stakeholders	Communities Landowners Mine Local Municipalities Local Police Service Outsourced specialists	Upfront	Mine management Community Engagement Manager
Increased security on mine premises	Fencing Access control	Mine premises	Upfront	Safety and Security
Construction and Permanent Mine workers identified	Clearly marked code of conduct Screening of employees	Mine premises	Upfront and continuously	Human Resource Department
Awareness creation	Newsletter Meetings	Employees Communities Landowners	Upfront and continuously	Community Engagement Manager
Mapping of Target Areas – Policing & Anti-poaching	GIS mapping	Communities Landowners Mine	Upfront thereafter yearly	Community Engagement Manager
Registrations as a Community Policing Forum & Anti-poaching unit	Registration with local municipalities and police service	Local Municipalities Local Police Service	Upfront	Community Engagement Manager

Action	How	Target	When	Who
Community Policing Patrols Anti-poaching Patrols	Volunteers Schedule Costs	Communities Landowners Mine	Continuously	Safety and Security
Community Policing & Anti-poaching Reporting and Evaluation of effectiveness	Report Evaluation Meetings	Communities Landowners Mine	Quarterly for first year thereafter yearly	Community Engagement Manager Safety and Security
Anti-poaching contractor / selected parties	Interview, evaluate and appoint in collaboration with stakeholders	Communities Landowners Mine Local Municipalities Local Police Service Outsourced specialists	Upfront thereafter Yearly re-evaluate	Community Engagement Manager Safety and Security

The following resources from MbeuYashu will be required for the implementation of this strategy:

No	Resource	Frequency
1	Human Resource Manager	Upfront, thereafter Quarterly
2	Community Engagement Management	Continuously
3	Safety and Security Personnel	Continuously

2.12 ACTION PLAN FOR IMPLEMENTATION

The action plan to achieve the stated environmental objectives is tabled below, together with key performance areas and indicators.

Table 3: Key performance areas and indicators

Activity	Implementation Phase	Review / Repeat Frequency	Responsibility
Implement Rescue and Relocation Plan (flora)	Prior to mining	Annual rescue operation for areas to be disturbed in the next 12 months	Specialist to be appointed
Develop and implement Biodiversity Action Plan, including avifaunal plan	Within one year of mining	Annual review	Specialist to be appointed
Develop Rehabilitation Plan and Materials Placement Plan in line with the final mining plan	Feasibility Phase	Annual review or if major change in scheduling	Mining Dept
Reporting of rehabilitation plan • Areas disturbed • Areas levelled • Areas topsoiled/capped • Areas vegetated	Construction Phase	Monthly	Environmental Dept
Initiate alien vegetation programme	Construction Phase	Annual review	Environmental Dept
Phases 1B and 2 heritage studies	Prior to Construction Phase	Prior to new areas being disturbed	Specialist to be appointed
Heritage monitoring	Construction phase	Prior to new areas being disturbed	Archaeologist to be appointed

Activity	Implementation Phase	Review / Repeat Frequency	Responsibility
Identify offset programmes	Construction Phase	Annual review	Environmental specialist in conjunction with relevant stakeholders
Revision of groundwater flow & geochemical model	During Feasibility Phase in line with final mining plans	Revise every 5 years	Specialist to be appointed
Develop detail blasting procedure in line with specialist advise	Prior to opencast mining	Ongoing review based on monitoring data	Blasting contractor
Stipulate best practice requirements in tender documentation iro emissions, noise, equipment, transport, etc.	Prior to appointment of contractors	Ongoing review as new technology becomes available	Procurement Dept
Implement environmental awareness programme	Construction Phase	Ongoing review Include in annual induction programme	Environmental Dept Human Resources
Maintenance of clean and dirty water system	Operational Phase	Weekly	Engineering Dept
Dam safety inspections of clean and dirty water dams	Operational Phase	Annually	Specialist to be appointed
Identify and clean-up of any spillages along transport routes (haul roads / rail line / overland conveyor)	Operational Phase	Weekly	Engineering Dept
Identify and report any road maintenance issues	Operational Phase	Ongoing	Engineering Dept RAL
Implement aftercare and maintenance programme for rehabilitated areas	Within 2 years of mining	Ongoing implementation as per specialist recommendations	Environmental Dept
Implement monitoring programme	Prior to mining	Annual review of monitoring programme or if major change in scheduling	Environmental Dept
Review and analyses of monitoring data for: • Surface water • Groundwater • Mine water balance Land use management • Air quality • Environmental noise • Blasting • Natural resources, including riverine forest • Waste management	Commencement of mining	Monthly	Environmental Dept HSEC Committee
Internal review of EMP compliance, conformance to environmental objectives and strategies and their implementation	Commencement of mining	Bi-annually (6-monthly)	Environmental Dept HSEC Committee
EMP performance assessment to determine conformance with the EMP, including effectiveness and appropriateness of EMP	Commencement of mining	Annually	External appointment

Activity	Implementation Phase	Review / Repeat Frequency	Responsibility
Vegetation audit to determine effectiveness of land use management plan and long-term sustainability of vegetated areas	Commencement of rehabilitation	Annually	External appointment
Environmental legal compliance audit	Commencement of mining	Bi-annually (2-yearly)	External appointment
Revision of closure cost assessment	Commencement of mining	Annually	Engineering Dept
Stakeholder Engagement Forum	Commencement of mining	Quarterly	Mine Management
Establish and update Recruitment database	Commencement of construction	Upfront and then Annually updated	Human Resource Manager
Compile and workshop of recruitment procedure	Commencement of construction	Prior construction Prior operations	Human Resource Manager
Define and communicate the Community Safety and Traffic Management Plan	Prior to construction	Prior construction	Community Engagement Manager
Compilation of an existing and future land use plan	Commencement of construction	Annually	Community Engagement Manager
Awareness Newsletters	Commencement of construction	Bi-annually (6-monthly)	Community Engagement Manager
Establish a Grievance and Issue Management Procedure to manage any issues raised by existing land occupants and newcomers	Construction and Operational Phase	Continuously	Community Engagement Manager

3 ENVIRONMENTALLY RELATED EMERGENCIES AND REMEDIATION

3.1 LIST OF POTENTIAL EMERGENCIES AND REMEDIATION

An environmental incident is defined as "*an unexpected sudden occurrence, including a major emission, fire or explosion leading to serious danger to the public or potentially serious pollution of or detriment to the environment, whether immediate or delayed*".

Some environmental emergencies have been identified that could occur during the project, in the event of which immediate remedial action must be undertaken, namely:

- Occurrence of surface fires, including veldt fires
- Compromising of dirty water management structures such as berms
- Hydrocarbon spills or leaks from machinery on the surface
- Incident or accident during the transportation of hazardous waste
- Flooding of opencast workings
- Blasting incidents

3.1.1 Surface Fires

In the event of a fire, the procedure to be followed is provided in Section 18 of the National Veld and Forest Fires Act, 1998 (Act 101 of 1998). The said Act provides for the notification of relevant affected parties, access to land on which a fire is burning for the purpose of extinguishing it, and requires that the fire protection officer of the area be informed, as well as those of surrounding areas to which the fire may spread. An emergency procedure will be developed in conjunction with the landowners and the local fire department to ensure in the event of a surface fire, the requirements of the National Veld and Forest Fires Act will be met.

3.1.2 Compromising of Surface or Groundwater Protection Measures

All compromised berms and other surface or groundwater protection measures will immediately be repaired and stabilised to avoid further contamination of clean areas with dirty water and the impacts associated therewith. Also refer to *Spill Management Procedure* below.

3.1.3 Hydrocarbon Spills or Leaks from Machinery

All areas affected by spills of hydrocarbons will be remedied immediately. Soil rehabilitation by land farming, or other means will be initiated immediately, and the necessary measures will be taken to ensure that pollution of surface water and groundwater does not occur. Also refer to *Spill Management Procedure* below.

3.1.4 Transportation of Hazardous Waste

An emergency plan has been developed for possible incident or accident during the transportation of hazardous waste – refer to Section 2.6.

3.1.5 Flooding of Mine Workings

A detailed Code of Practice for In-Rushes will be compiled for the opencast mine workings as required in terms of the Mine Health and Safety Act.

3.1.6 Blasting Incidents

A detailed Blasting Procedure including an Evacuation Procedure will be developed during the Feasibility Phase in conjunction with relevant community forums and/or representatives.

3.2 SPILL MANAGEMENT

3.2.1 Definitions

- *Minor Risk Incident* - Minor spills are those which can be controlled, contained and cleaned up with the help of the people on site. Minor effects on biological or physical environment. Minor short to medium term damage to small area of limited significance.

- *Major Risk Incident* - Significant spills are those in which human hazard is evident, the spill cannot be contained and /or has led to contamination of a water resource and / or other sensitive location e.g. drain. Moderate short to medium term damage, widespread with some impairment of ecosystem function, possible fire hazard, explosion or danger to health.

- *Emergency* - Means an accidental situation involving the release or imminent release of dangerous goods or other substances that could result in serious adverse effects to the health and/or safety of persons or the environment. An emergency may be the result of human cause or natural occurrences including, but not limited to, process upsets, controlled reaction, fires, explosions, threats, structural failures, floods, storms, etc.

- *Dangerous Goods* - Means goods that include explosives, compressed and liquefied gasses, flammable and combustible materials, as well as radioactive materials.

- *Hazardous Substance* - Includes any toxic, harmful, corrosive, and irritant or asphyxiate substance, or mixture of such substance for which an occupational exposure limit is prescribed, or which could create a hazard to human health or the environment.

- *MSDS* - Means Material Safety Data Sheet of the product or substance.

3.2.2 Spill Management Procedure

Minor Risk Incident

- Assess the situation and determine the hazard and extent of the spill, taking into account the quantity of the spillage and the danger of the substance. Refer to MSDS of the substance spilled to identify hazard.
- Contact the Site Manager, detailing the substance, quantity, severity, location and possible environmental impact.
- Demarcate the area where the substance was spilled.
- Contain the spill with the correct control measures i.e. sand, spill-sorb, bunding, spill-kits, etc. Refer to the MSDS of the substance spilled for correct handling and control of the spill.
- The Site Manager must contact the relevant person(s) to attend to the situation.

Major Risk Incident or Emergency

- Assess the situation and determine the hazard and extent of the spill, taking into account the quantity of the spillage and the danger of the substance. Refer to MSDS of the substance spilled to identify hazard.
- Raise the alarm and evacuate the area.
- Contact the Site Manager, detailing the substance, quality, severity, location and possible environmental impact.
- Demarcate the area where the substance was spilled.
- If possible try to contain the spill with the correct control measures i.e. bunding, etc. Ensure not to endanger anyone or yourself by doing this. Refer to MSDS of the substance spilled for correct handling and control of the spill.
- The Site Manager must contact the relevant person(s) to attend to the situation.

3.2.3 Reporting

The reporting and control of an emergency incident should be dealt with in terms of Section 20 of the NWA and in the event of a Major Spill, the following agencies should be notified immediately:

- Department of Water Affairs: Emergency Toll-free 0800 200 200; Polokwane (015) 290 1200; Louis Trichardt (015) 519 3300; Nzhelele (015) 973 8183
- Makhado Fire Department: Emergency (015) 516 5588
- South African Police Services: (015) 519 4300
- Makhado Local Municipality: Emergency (015) 516 2990; Local (015) 519 3000

4 ENVIRONMENTAL MONITORING AND AUDITING

4.1 MONITORING

A comprehensive monitoring system was developed for the Mopane Project in line with the proposals of the specialists – refer to Table 4. The objective of the environmental monitoring system is to:

- Prevent and/or minimise the environmental impact associated with the proposed mining operation;
- Ensure that the environmental management system at the Mopane Project performs according to specifications;
- Ensure conformance with the environmental objectives;
- Ensure timeous implementation of the environmental strategies and implementation programme;
- Act as a pollution early-warning system;
- Obtain the necessary data required to address knowledge gaps;
- Check compliance with license requirements; and
- Ensure consistent auditing and reporting protocols.

A proper data management system will be set up to facilitate trend analyses and preparation of reports. All the monitoring data will be collated and analysed on a bi-annual basis and included in management reports.

It must be noted that the monitoring programme is a dynamic system changing over the different life-cycle phases of the mine. The programme will be reviewed on a bi-annual basis and revised if necessary.

Table 4: Environmental Monitoring Programme for Mopane Project

Aspect	Issue	Purpose	Monitoring points	Frequency	Sampling Method	Variables
Climate	Weather station	To obtain detailed weather records for the LOM	Infrastructure Hub	Continuous	Air quality monitor	Wind speed & direction Temperature & rainfall Humidity and atmospheric pressure
Surface water	Surface water quality	Determine any deterioration in water quality as a result of the mining related activities	Sand River – u/s & d/s of site Major site streams – u/s & d/s of proposed development	Monthly (if flow)	Grab sampling	EC, pH, TDS, SS, Cl, SO_4, NO_3, Na, F, Fe, Al, Mn, Zn, Total Alkalinity, Ca, Mg, K, Total Hardness
				Annually	Grab sampling	Analyses to 95% charge balance, including all metals and hydrocarbons
	Potable water	Determine quality of drinking water	Outflow of potable treatment facility	Weekly	Grab sampling	Turbidity and micro-biological constituents
	Sewage effluent	Determine water quality of sewage effluent	Outflow of sewage works	Weekly	Grab sampling	Turbidity and micro-biological constituents
	Clean water canals	Determine the sediment levels or any other contamination prior to discharge into the Sand River and its tributaries	Downstream points on clean water canals	Monthly	Grab sampling	EC, pH, TDS, SS, Cl, SO_4, NO_3, Na, F, Fe, Al, Mn, Zn, Total Alkalinity, Ca, Mg, K, Total Hardness, hydrocarbons
	Water management infrastructure	Monitoring of condition, identifying areas that require maintenance	Along clean & dirty water canals, clean & dirty water dams	Quarterly After a big rain event	Visual	Evidence of erosion, cracks, subsidence, overgrowth, etc.
	Dirty water systems	Determine the water quality and long-term chemical changes in the dirty water systems	Dirty water dams	Monthly	Grab sampling	EC, pH, TDS, SS, Cl, SO_4, NO_3, Na, F, Fe, Al, Mn, Zn, Total Alkalinity, Ca, Mg, K, Total Hardness
	Haul road crossings	To identify and mitigate any spillages into the clean water system	All haul road crossings over clean water canals	Weekly	Visual inspection	Evidence of spillages
	Aquatic monitoring	To determine the impact on the aquatic ecosystems	6 monthly	6 monthly	Riparian vegetation Habitat integrity Aquatic macro-invertebrates and fish counts	TBD
	Riverine vegetation	To early detect impact on riverine vegetation as a result of dewatering and reduced surface runoff	6 monthly	6 monthly	Plant Moisture Stress monitoring	TBD

Aspect	Issue	Purpose	Monitoring points	Frequency	Sampling Method	Variables
Groundwater	Groundwater quality	To determine any impact on the groundwater quality as a result of mining	Up & down gradient of mining area Along geological structures Alluvium & all other water-bearing zones Neighbouring farms (Hydro-census / baseline boreholes)	Monthly Six-monthly - hydro-census boreholes	High integrity grab sampler (double valve), preferably made from PVC/Teflon	EC, pH, TDS, SS, Cl, SO_4, NO_3, Na, F, Fe, Al, Mn, Zn, Total Alkalinity, Ca, Mg, K, Total Hardness
	Groundwater levels	To determine any impact on the groundwater levels as a result of mining	As above	Monthly	Pump samples	Water level
	Geochemical	To collect sufficient geochemical data to verify and quantify the geochemical models during mining	Solid waste materials (all waste rocks, carbonaceous and non-carbonaceous)	Quarterly	Representative grab samples	ABA and leach tests
			Toe drain leachate of all carbonaceous stockpiles and dirty water dams	Quarterly	Grab sample (liquid only)	Full chemical analyses (incl. heavy metals)
	Surface-groundwater interaction	To quantify the interaction between surface and groundwater to determine possible seepage volumes	Selected boreholes	Biennially	Piezometers	Isotope analyses
Mine water balance	Water levels in dams	To verify water balance and volume of water stored	Clean & dirty water dams	Monthly	Survey	Height (m)
	Dirty water recycled	To determine volume of dirty water abstracted & recycled for processing and dust suppression	Dewatering points in the open pits Underground mine water at the dewatering pumps	Monthly reading	Water meters	Volume (m^3)
	Clean water abstraction	To determine volume of clean water abstracted	Surface water abstraction points Borehole abstraction points Neighbouring farms	Monthly reading	Water meters	Volume (m^3)
	Process flow	To determine accurate process water balance	Inflows & outflows Moisture content of the product & residue	Monthly	Water meters	Volume (m^3)
Land use management	Concurrent rehabilitation	To determine conformance with environmental objectives for concurrent rehabilitation	Mining area	Monthly	Survey	Hectares disturbed Hectares levelled Hectares topsoiled Hectares revegetated
	Rehabilitation plan	To ensure conformance with final rehabilitation plan	Rehabilitated areas	Monthly	Survey	Final level of rehabilitation

Aspect	Issue	Purpose	Monitoring points	Frequency	Sampling Method	Variables
	Soil analysis	To determine any deficiencies in soil fertility prior to seeding	Topsoiled areas	Ongoing (prior to seeding)	Soil samples	As per specialist advise
	Soil erosion	To pro-actively identify soil erosion in order to rectify prior to serious degradation	Rehabilitated areas	Routinely (monthly)	Field survey	-
Biodiversity	Land use coverage / Vegetation health	To determine effectiveness of reclamation plan and long-term sustainability of vegetated areas	Total mining area, including rehabilitated areas	Annually	Field survey Satellite imagery	As per specialist advise
	Species diversity	To determine species diversity (fauna & flora)	Total mining area, including rehabilitated areas	Annually	Field survey	As per specialist advise
	Landscape Function Analysis	To establish ecosystem functionality of rehabilitated areas	Total mining area, including rehabilitated areas	Annually	Field survey	As per specialist advise
	Riparian condition assessment	To determine the impact on the riverine forest as a result of mining	Along Sand River	Annually	TBD	As per specialist advise
	Alien vegetation	To monitor conformance with alien vegetation programme	Total mining area, including rehabilitated areas	Monthly (during eradication programme)	Survey	Area (hectares)
Air quality	Dust outfall	To determine the levels of dust outfall as a result of the mining activities	As per specialist advise	Continuous	Directional dust outfall buckets	Settleable particles ($mg/m^2/day$)
	Particulate Matter	To determine the particular matter levels for PM_{10} and $PM_{2.5}$	Infrastructure Hub	Continuous	Air Quality monitor	$\mu g/m^3$
Environmental noise	Noise levels	To determine the noise levels within the communities and sensitive areas	Infrastructure areas Sensitive receptors within 35dBA noise isopleth	Monthly	To be determined	dBA
Blasting	Air blast and ground vibration	To determine the effectiveness of the blasting procedure	As per specialist report / blasting procedure	Continuous	Vibration stations (seismograph)	Air blast Ground vibration
Waste	Waste generation & management	To determine volume of waste generated & disposed	Site	Weekly	Contractor report	Waste types
Heritage	Heritage/cultural resources	To capture all heritage/cultural resources exposed by mining	Site	As required	Archaeologist site visit	-

4.1.1 Surface Water Monitoring

Surface water sampling will be carried out on a monthly basis. A full spectrum analysis is carried out bi-annually during April and September, while a selection of variables is analysed monthly. The constituents analysed are:

- Selected Variables:
    - EC, TDS, Ca, Mg, Na, K, Al, Fe, Mn, SO_4, Cl, F, NO_3, Total Alkalinity, Total Hardness and pH. At the same time dam levels should also be recorded.
- Full Spectrum:
    - EC, TDS, Ca, Mg, Na, K, Al, Fe, Mn, SO_4, Cl, F, NO_3, NO_2, Sr, NH_4, PO_4, Acidity, Total Alkalinity, Total Hardness and pH.

The samples are analysed by an independent SANS approved laboratory. The surface water quality at the monitoring localities will be evaluated in terms of the SANS 241 Drinking Water Standards and the DWA Water Quality Threshold (WQT) guideline until catchment-specific water quality objectives are developed for the Sand River Catchment.

4.1.2 Groundwater monitoring

Monitoring of groundwater water levels, water quality, inflows and pumping volumes is necessary to determine if the groundwater system is reacting as predicted. The monitoring programme should be audited for compliance to the stated objectives and adapted when and where required. It must be noted that the monitoring programme is a dynamic system changing over the different life cycle phases of the mine. The following groundwater monitoring components have been identified:

- Monitoring Climate: Monitoring rainfall, rainfall intensity and evaporation would be required.
- Water Groundwater Levels: Monitoring of water levels should be done up gradient and down gradient of the mining area, along geological structures. Continuous recorders can be installed on selected boreholes and monthly readings taken at other boreholes.
- Groundwater Quality: water quality in all the aquifers surrounding the mine area should be done on a monthly basis. All macro elements should be determined.
- Inflows: Inflows to the opencast and underground areas should be monitored by means of measuring the volume of water pumped out. Measurements should be done on at least a monthly basis.
- Leachate: Any leachate formed should be monitored for quantity and quality on at least a monthly basis. Sulphates, pH and trace metals need to be included in the quality analysis.
- Abstraction: All abstraction including dewatering, irrigation, plant and domestic use, needs to be measured on a continuous basis and reported on a monthly basis.

It is recommended that these monitoring activities be done in conjunction with the neighbouring farmers in order to obtain a greater regional perspective and ensure transparency.

After 2 years from start of mining, the monitoring information collated should be used to update the groundwater flow and geochemical models. These models should thereafter be updated on at least a 5 yearly basis. Management and mitigation plans should be continuously adapted using the monitoring data.

4.1.3 Biodiversity monitoring

Monitoring will include ground-truthing and physical evaluation, as well as more technological advanced methods such as satellite. A number of aspects need to be monitored on an ongoing basis, namely:

- Land use / coverage, both pre- and post-rehabilitation
- Vegetation health of rehabilitated areas
- Riparian condition assessment to identify any impacts on the riverine vegetation
- Species diversity (fauna & flora), both pre- and post-mining
- Alien vegetation monitoring
- Landscape Function Analysis (LFA) to establish ecosystem functionality

The use of remote sensing satellite imagery and aerial photography will establish the overall condition of large rehabilitated areas and will be justified by on-site ground truth visual observations and specific measured parameters. This approach will address frequent monitoring and justification of sustainable reclamation success over time, which will support mine closure pre-requisites.

Growth will be monitored by measuring the stem diameter above ground level as well as the height when the trees are planted. Trees will be numbered and indicated on a map to monitor mortality annually, so as to adjust the revegetation strategy if necessary.

The percentage regrowth of herbaceous plants and grass will be monitored annually by surveying and a species count will be done simultaneously. Vegetation will be monitored annually towards the end of the late summer, when the identification of species is easier, for a representative idea of the ecological status and agricultural potential of the vegetation.

The following parameters can be used to establish the condition of the vegetation with other landscape function parameters:

- Basal cover
- Biomass production
- Botanical composition

Soil monitoring should be done annually in alignment with land uses and the final agreed end-use objectives and should include:

- Chemical properties - fertility status
- Physical properties - soil bulk densities and strength (compaction)
- Biological properties - soil health (microbial count / diversity)

Monitoring of the above aspects is complex and specialists in the field will be required to perform the monitoring. Specialists will be appointed once mining commences to assist with the development of procedures and data interpretation.

4.1.4 Air quality and noise monitoring

4.1.4.1 Dust fall-out

A comprehensive monitoring network will be implemented once the mining plan has been finalised (Feasibility Phase) to include the areas proposed for the open pits, material storage piles, near the crushing plant and along the overland conveyor route. This monitoring should begin before activities are underway at the site in order to obtain a representative baseline set of results, as prescribed as part of the Equator Principles and Guidelines.

Monthly reporting of these results will be required along with the notification to relevant Government Agencies should Alert Thresholds be reached at any monitoring point, along with the cause and mitigation for the exceedance.

4.1.4.2 Particular matter

Due to South Africa's legislative shift to the inclusion of particulate matter in size fractions below 10µm, a real-time monitoring system will be permanently installed to provide the site with meteorological data, specific for the site, as well as particulate matter data for PM_{10} and $PM_{2.5}$ which will allow the mine to start monitoring for pollutants which will become a legal requirement in years to come. A permanent installation will allow for the monitoring of mitigation measures to ensure that all are implemented successfully. The position of the monitor should be carefully selected to allow for the monitoring of impacts on the nearby Mopane Village and other sensitive receptors.

4.1.4.3 Noise monitoring

Monthly noise monitoring will be undertaken to determine the noise levels within the Mopane Village and at other sensitive receptors. The positions of the noise monitoring points must still be determined.

4.1.5 Blasting Monitoring

Vibration and air blast monitoring at Mopane Village and other sensitive receptors will be needed for all blasts to make sure that the limits are being achieved and to provide an indication of when modifications are needed to the blasting method to correct for increased vibration and air blast levels. The best is to have permanent calibrated vibration stations installed at one or two strategic positions as determined by a blasting specialist that are supported and monitored by the explosives supplier or preferably an independent third party.

The monitoring should occur at the houses / sensitive receptors closest to the blasting activity. The vibration records should be checked every six months by an expert to make sure that no problems are occurring. The vibration records should be filed together with information on:

- Date
- The wind direction
- Cloud cover
- Distance to the blast
- Blast design (charge mass, hole diameter, hole depth, burden, spacing, stemming length and blast timing)
- Technician responsible for the recording

Blast reports should be kept for every blast. These should include:

- Date
- Blast design including design charge per hole/deck and blast timing
- Charging records
- Photograph and analysis of results

4.1.6 Waste monitoring

Domestic and hazardous waste will be removed and taken to an appropriate waste disposal site as per the Waste Management Procedure. Registered contractors will be appointed for the implementation of the Waste Management Procedure.

The contractors will be required to keep record of the volumes of waste removed from the mine site and the volumes dumped at the disposal facility, which is then reported to the mine.

4.2 AUDITING

Internal review:

- EMS working group – The mine will identify appropriate employees, which will include members of the management team, to form an EMS working group which will discuss all relevant environmental issues (including monitoring) on a monthly basis. Action plans will be drafted at each meeting, and followed up during each subsequent meeting.

- Management meetings – The mine will conduct monthly meetings where relevant Health, Safety, Environmental, Community (hereafter referred to as the HSEC) issues are discussed with the General Manager of the mine.

- Review meetings – The mine management team will provide feedback to the Operations Director on a monthly basis and all HSEC issues will be included in these meetings.

- Perform annual internal audit as part of the HSEC reporting schedule to ensure conformance to environmental objectives and strategies and the implementation thereof.

External review:

- EMP performance assessments, as required in terms of the MPRDA will be performed on an annual basis and submitted to the Department of Mineral Resources (DMR) for distribution to other relevant authorities.

4.3 SHE MANAGEMENT SYSTEM

The Greater Soutpansberg Project is in the process of developing a Safety, Health & Environment (SHE) Management System, which comprises of 18 Elements based on sound industry-wide, tried-and-tested methodologies and in addition includes innovation to enhance implementation and compliance through comprehensive simplicity and ease of understanding.

The SHE management system is designed to cater for further developments and advancements in our safety and health endeavours and in time to allow for assessment and bench marking against other national and international SHE management systems.

Where practicable, recognition is given to relevant existing SHE related information and data such as current standards, procedures, safe operating procedures, and the like, and these have been initially drawn into this system and will be adapted where necessary to conform to a unified approach and presentation.

The implementation and management of a unified, successful SHE management system demands volumes of time, effort, finances and resources, but above all, the enthusiastic involvement, participation, motivation and commitment of individuals throughout the process.

The Greater Soutpansberg Project SHE management system incorporates the following 18 Elements, aligned with other recognised systems such as the Occupational Health and Safety Assessment Series, OHSAS 18000 and the International Organization for Standardisation, ISO 14000 standards.

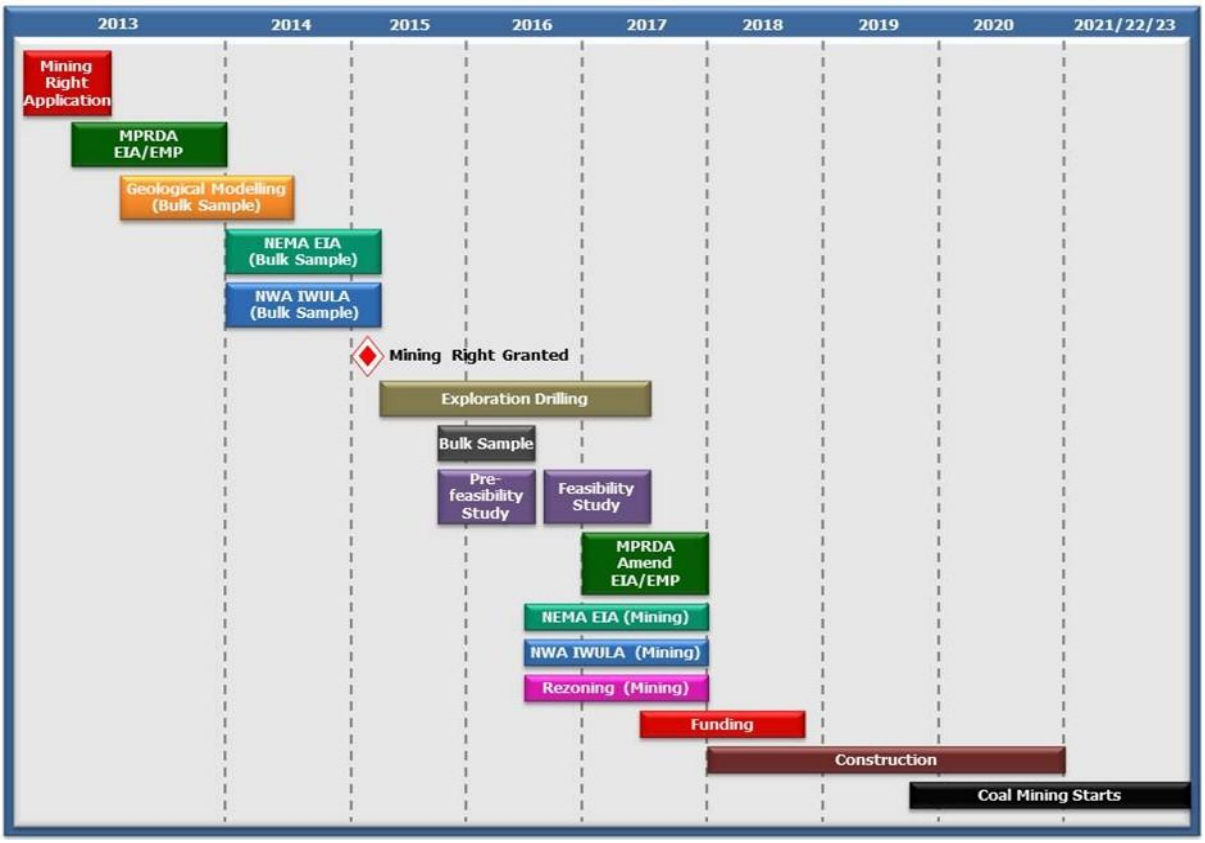
1. Leadership & personal commitment
2. Hazard identification, risk assessment & controls
3. Legal & other requirements
4. Objectives & programmes
5. Resources, roles, responsibility, accountability & authority
6. Competence, training & awareness
7. Communication, participation and consultation
8. Documentation
9. Control of documents
10. Operational controls
11. Emergency preparedness, response & recovery
12. Performance measuring & monitoring
13. Evaluation of compliance
14. Incident reporting, investigation and remedial action
15. Control of records
16. Internal audit
17. Occupational health & wellness
18. System review

5 FINANCIAL PROVISION

5.1 CLOSURE COST CALCULATION

The project schedule as put forward in the Mining Work Programme (MWP) and the Scoping Report over the next 10 years is shown below.

From this it is clear that once the mining licence is granted, no physical mining and construction will take place within the first 2 years. During this time period further exploration (drilling and bulk sampling) will be undertaken. This will provide the necessary information required to optimize the mining schedule of the LOM during the Pre-Feasibility and Feasibility Phases, at which point a revised financial provision calculation will be submitted to the DMR based on the final mining plan.



MbeuYashu has estimated the financial provision to cover all the work conducted up to the point of execution of a bulk sample. The preparatory work that will lead into the exact placement of the bulk sample has been covered and at this point the impact of the bulk sample operations will be evaluated and additional funds will be provided should it be required.

The financial provision is based on the quantities and rates displayed in Table 5.

Table 5: Cost estimate for rehabilitation of exploration boreholes

Activity	Unit	Quantity	Rate	Cost
Drill sites (1)				
Sealing of boreholes with concrete	boreholes	1	R 500.00	R 500.00
Contouring & ripping of levelled areas	m^2	100	R 3.50	R 350.00
Remediation of contaminated soil	m^2	10	R 100.00	R 1 000.00
Seeding	m^2	100	R 1.50	R 150.00
Subtotal per borehole				R 2 000.00

The current planning is to drill 200 holes per annum for the first 2 years of further exploration. The total cost estimate for financial provision for YR1-2 is provided in Table 6.

Table 6: Financial provision (immediate closure) for YR1-2

Year	Amount (ZAR)
YR1	R 400 000
YR2	R 400 000

6 ENVIRONMENTAL AWARENESS PLAN

Environmental awareness communication and reporting forms an integral part of an EMP and includes social awareness programmes. For this reason, a procedure will be developed that will describe the means by which the mine will communicate with its employees and with IAPs on environmental issues. The mine acknowledges the importance of effective internal communication of the Environmental Management System (EMS), as well as external communication of the EMS, and as such will maintain communication channels, both within the company and with the IAPs of the mine.

In general, the objective of this procedure will be to:

- Ensure that employees understand the environmental objectives and goals;
- Ensure that information regarding the environment is communicated effectively and is readily accessible to the relevant parties;
- Improve feedback of operational and environmental performance to management;
- Provide for the establishment of forums to discuss environmental issues, allocate resources and ensure that adequate measures are being taken to address the environmental problems;
- Provide guidelines for communication with outside organisations and IAPs;
- Ensure effective and constructive response with IAPs; and
- Ensure that records of environmental communication and interaction are documented and filed in an easily accessible storage system.

6.1 INTERNAL COMMUNICATION AND AWARENESS CAMPAIGN

Internal communication will be conducted on a regular basis at the Mine as follows:

- Environmental induction – The mine will include environmental awareness in its induction programme for employees and contractors. Included in this will be the environmental requirements stipulated by this EMP, heritage and cultural aspects.
- EMS working group – The mine will identify appropriate employees, which will include members of the management team, to form an EMS working group which will discuss all relevant environmental issues on a monthly basis. Action plans will be drafted at each meeting, and followed up during each subsequent meeting.

- Management meetings – The mine will conduct monthly meetings where relevant Health, Safety, Environmental, Community (hereafter referred to as the HSEC) issues are discussed with the General Manager of the mine.

- Review meetings – The mine management team will provide feedback to the Operations Director on a monthly basis and all HSEC issues will be included in these meetings.

6.2 EXTERNAL COMMUNICATION AND AWARENESS CAMPAIGN

External communication will be conducted as follow:

- Stakeholder Register – The Mine has a comprehensive Stakeholder Register as a result of the EMP process. This register will be maintained by the Mine's Environmental Department and updated on an annual basis.

- Stakeholder Reports – HSEC reports will be prepared annually and distributed to all the major stakeholders. To encourage feedback and facilitate stakeholder participation, each report will contain a feedback sheet, which will allow the stakeholders to change their contact details, if necessary, and to comment on or enquire as to HSEC matters. Any feedback sheets received will be managed according to fixed operating procedures and any actions taken will be recorded for reference purposes.

- Stakeholder Engagement Forums – Annual meetings will be held with major stakeholders to present and discuss HSEC issues. A register of attendees will be completed and minutes taken during the proceedings, which will be distributed to all the major stakeholders for information purposes, whether they attended the meeting or not.

- External Complaints Register – An HSEC external complaints register will be stationed at the office of the Mine's Environmental Manager. If a complaint and/or concern are raised, a formal Incident Investigation will be opened, managed and investigated in accordance with the appropriate EMS operating procedure. A central complaints register will be kept by the Environmental Department and updated and monitored on a monthly basis. Records will be kept of the external complaints, as well as the follow-up investigation and actions taken. Regular contact will be kept with the complainant until the complaint has been suitably addressed.

7 TECHNICAL AND SUPPORTING INFORMATION

ANNEX-1	SOILS, LAND USE & CAPABILITY	Gudani Consulting - EcoSoil Consortium
ANNEX-2	SURFACE WATER	WSM Leshika Consulting (Pty) Ltd
ANNEX-3	GROUNDWATER	WSM Leshika Consulting (Pty) Ltd
ANNEX-4	BIODIVERSITY	Phaki Phakanani Environmental Consultants
ANNEX-5	AQUATIC SYSTEMS	Scientific Aquatic Services
ANNEX-6	NOISE	Gudani Consulting
ANNEX-7	AIR QUALITY	Royal Haskoning DHV
ANNEX-8	HERITAGE RESOURCES	Mbofho Consulting and Projects
ANNEX-9	SOCIO-ECONOMIC	Naledi Development Restructured (Pty) Ltd
ANNEX-10	MACRO-ECONOMIC	Mosaka Economic Consultants cc
ANNEX-11	STAKEHOLDER ENGAGEMENT	Naledi Development Restructured (Pty) Ltd

8 CAPACITY TO MANAGE AND REHABILITATE THE ENVIRONMENT

8.1 FINANCIAL CAPACITY

The estimated annual environmental cost required for monitoring and auditing, specialist involvement and biodiversity off-sets are given below (in real terms):

MONITORING	Amount (Rands)
- Water monitoring	550 000
- Dust monitoring	150 000
- Biodiversity monitoring	450 000
- Heritage monitoring	350 000
SPECIALIST STUDIES	750 000
AUDITING & REPORTING	450 000
BIODIVERSITY OFF-SETS	TBD
TOTAL	**2 700 000**

The cost of rehabilitation is dependent on the aerial extent of the rehabilitation required, and can only be finalised during the Feasibility Phase when the mining schedule will be optimised in line with recommendations made by this EMP. Sufficient funding will be made available in the project cost structure for rehabilitation and environmental aspects.

8.2 RESOURCE CAPACITY

The following resources from MbeuYashu will be required for the implementation of the Environmental and Social Management Plans and associated strategies / policies:

- Human Resources Manager
- Community Engagement Management
- Environmental Officer

In addition, the following specialists will be appointed as required to assist with the development of the plans and programmes, and to perform the necessary monitoring:

- Qualified archaeologist
- Qualified biodiversity specialist
- Qualified groundwater specialist
- Qualified social and stakeholder engagement specialist
- Specialists required to assist with off-set programmes

9 UNDERTAKING

Herewith I, the person whose name and identity number is stated below, confirm that I am the person authorised to act as representative of the applicant in terms of the resolution submitted with the application, and confirm that the above report comprises EIA and EMP compiled in accordance with the guideline from the Department's official website and the directive in terms of Section 29 and 39(5) in that regard.	
FULL NAMES AND SURNAME	BALDWIN KHOSA
IDENTITY NUMBER	780502 5529 087
SIGNATURE	