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CANYON SPRINGS INVESTMENTS 82 (PTY) LTD

PROPOSED CANYON SPRINGS COAL MINE

ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME

VOLUME 1 OF 4: FINAL ENVIRONMENTAL IMPACT ASSESSMENT

JUNE 2014

Prepared for:



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DMR REF. NO. MP 30/5/1/1/2/10021 MR | MDEDET REF. NO. 17/2/3N-162

REVISION TABLE

REV	DATE	AUTHOR	INTERNAL REVIEW	EXTERNAL REVIEW
1	04/06/2013	Zoë Gebhardt and Elize Botha	Jonathan van de Wouw	Chris Viljoen and Mike Nell
2	21/06/2013	Zoë Gebhardt and Elize Botha	Jonathan van de Wouw	-
3	02/05/2014	Zoë Gebhardt and Elize Botha	Jonathan van de Wouw	Chris Viljoen and Mike Nell

EXECUTIVE SUMMARY

This executive summary provides an overview of the proposed project, including the location and a brief project description, followed by a summary of the public consultation conducted. An overview of the Environmental Impact Assessment process is provided together with the key findings and impacts identified during the Environmental Impact Assessment. The mitigation, management and monitoring measures recommended to reduce the overall impact of the project included in the Environmental Management Programme are also presented.

INTRODUCTION

Canyon Springs Investments 82 (Pty) Ltd is a subsidiary of HolGoun Mining and its parent company, HolGoun Investment Holdings (Pty) Ltd. Canyon Springs Investments 82 (Pty) Ltd has submitted an application for a Mining Right to the Department of Mineral Resources which has been accepted by the Department for **coal** but also including all precious and base-metals, uranium, molybdenite, copper, limestone and rare earths. It is the intention of Canyon Springs Investments 82 (Pty) Ltd to establish a coal-mining operation on the farm Roodekoppies 167 JR.

Canyon Springs Investments 82 (Pty) Ltd is required to undertake an Environmental Impact Assessment and submit an Environmental Management Programme to the Mpumalanga Department of Economic Development Environment and Tourism in accordance with the National Environmental Management Act (No. 107 of 1998). Certain activities at the proposed Canyon Springs Coal Mine are listed in terms of the Environmental Impact Assessment Regulations of 2010 (GNR544, 545 and 546) and therefore require that Environmental Authorisation is granted by Mpumalanga Department of Economic Development Environment and Tourism before the commencement thereof.

PRE-OPERATION ENVIRONMENT

Climate

The Canyon Springs Coal Mine area's climate is typical of that for the greater Mpumalanga Province, which has a sub-tropical climate. The predominant wind direction is between north-easterly and easterly. Average hourly wind speed is 3.16 m/s. The region normally receives about 481 mm of rain per year, with most rainfall occurring during summer. The monthly distribution of average daily maximum temperatures shows that the average midday temperatures range from 19.9°C in June to 28.8°C in January.

Topography

The topography of the specific target area is characterised by a flat surface with an average elevation of 800 meters above sea level.

Geology

The regional geology consists of various groups within the Karoo Supergroup as well as dolerite intrusions, occurring as both dykes and sills. The Canyon Springs Coal Mine project falls within the Springbok Flats Coalfield within the Karoo Basin and is underlain by the Eccia Formation consisting of shales, shaley sandstone, grit, sandstone and conglomerate with coal in places near the base and the top.

Terrestrial Biodiversity

The study site is situated within the Springbokvlakte Thornveld which is characterised as open to dense thorn savannah dominated by *Acacia* species or shrubby grassland with a low shrub layer. The Springbokvlakte Thornveld is nationally classified as a “vulnerable” ecosystem, and the proposed project area contains Protected Areas, Irreplaceable Conservation Biodiversity Area, and Optimal Conservation Biodiversity Area, as classified as a by the Mpumalanga Biodiversity Spatial Plan (2013).

Flora:

Four vegetation communities are found within the study area; valley bottom floodplain, open shrubland, rocky outcrops and cultivated / transformed areas. Four species of conservation concern were identified and four species of provincially protected plants were recorded.

Fauna:

Thirty-one species of the potential 404 bird species found in the area are of conservation concern, two of which are also endemic to southern Africa. Four mammal species of conservation concern, out of the 110 potentially occurring mammals in the area, were identified as having a high probability of occurring in the area. Although no amphibian species were identified during the field survey, 23 amphibian species have previously been noted to occur within the project area. The presence of the Giant Bullfrog (*Pyxicephalus adspersus*) was confirmed in the area. This species has a provincial listing of Vulnerable and a national listing of Near Threatened. Another 39 reptile species have previously been noted to occur in the project area. Six species of conservation concern were given a high probability of occurring in the area due to the presence of suitable habitat.

Aquatic Ecology

Diversity of aquatic macroinvertebrates associated with the proposed project area is likely to be limited. A total of 22 indigenous fish species can potentially occur within the quaternary catchment associated with the study area as well as the adjacent quaternary catchment.

Wetlands

Two wetland types are associated with the Ghotwane River and its tributary, the “No-Name” Stream, within the proposed Canyon Springs project area, a channelled valley bottom wetland and a floodplain wetland. Altogether, delineated wetlands occupy approximately 546 ha. Wetland areas were found to be highly disturbed as a result of grazing and subsistence farming occurring both within and adjacent to the wetlands, with a resultant decrease in biodiversity relative to what is expected under natural conditions. Hydrological functioning, however, appears to remain relatively unchanged.

Soils

The soils encountered on-site can be broadly categorised into two major groupings, with three dominant soil forms that characterise the area of concern. The soils mapped range from shallow sub-outcrop and outcrop of hard plinthite and parent materials to moderately deep sandy loams and sandy clay loams, all of which are associated with either a calcrete or ferricrete/laterite “C” horizon or a hard rock base associated with the parent host rock.

Surface Water

The main watercourse flowing through quaternary catchment B31E is the Ghotwane River and falls within the greater Olifants River Catchment.

The Ghotwane River flows in a south-easterly direction across the proposed Canyon Springs project area and into the Rhenosterkop Dam. The "No-Name" Stream flows in a southerly direction across the project area. It enters the Ghotwane River via its northern watercourse.

Water samples taken indicated that both streams have relatively high water qualities. However, the iron concentration in both samples exceeded the standard marginally, and both manganese and aluminium concentrations exceeded the standard limits of the South African National Standards 241:2011 standard.

Groundwater

Two aquifers occur in the area. These two aquifers are associated with:

- The upper weathered material, and
- The underlying competent and fractured rock material.

A hydrocensus was undertaken within the general project area to identify and document other groundwater users in the area. A total of 28 boreholes were located in the field. Most of these boreholes belong to the local communities and uses range from crop or garden irrigation to livestock watering and domestic use. The Municipality provides residents in the area with water by a combination of a tanker and dedicated water supply boreholes.

From the Acid Base Accounting test results it was concluded that it is likely that Acid Mine Drainage conditions will form from all the lithologies that occur in the area (especially from the coal seam and footwall material).

Archaeology

Three sites of cultural or heritage significance were identified in the study area:

Site 1:

Site 1 comprises the remains of an old farmstead consisting of building ruins, an old dam and other structures. The site is regarded as having a low cultural significance with little to no heritage value.

Site 2:

Site 2 is an area where Middle and Late Stone Age tools as well as Iron Age pottery were identified. These findings therefore do not really constitute a site, but rather a feature and are therefore regarded as having a low cultural significance.

Site 3:

Site 3 is an area where Middle and Late Stone Age tools were found. These artefacts therefore do not constitute a site, but rather a feature and are regarded as having a low cultural significance.

Palaeontology

To date, no fossils have been recorded in the area of the proposed project area. It is therefore assumed that no fossils of significance will be found within the project area during the Life of Mine.

Air Quality

Based on satellite imagery and a site description of the proposed project area, the following surrounding sources of air pollution have been identified in the area: agriculture; domestic fuel burning; and veldt fires.

Potential sensitive receptors to air quality impacts in the vicinity of the project area would include the inhabitants of the following surrounding villages;

RECEPTOR	DISTANCE(KM)	DIRECTION FROM SITE
Moletsi	~ 2 km	WSW
Sehoko	~1 km	SW
Loding	~ 2 km	SSW
Dihekeng	~ 300 m	N
Ramatsho	~ 500 m	N
Ga-Matimpule	~ 2 km	ENE

Traffic

There are three main roads bordering and transecting the project area. The National, Provincial, and Local Municipal/District roads in the immediate vicinity of the site are the R516, the D626 and the R573. The R516 is a paved Provincial road to the north of the proposed coal mine traversing east-west between Settlers and Bela-Bela with a single lane in each direction and which carries low volumes of traffic during peak hours. The D626 is a paved/gravel District road to the south of the proposed coal mine traversing east-west with a single lane in each direction and which carries low traffic volumes during peak hours. The R573 is a paved Provincial road to the south of the proposed coal mine traversing east-west between Marble Hall and Pretoria via Moloto with a single lane in each direction and carries low volumes of traffic during peak hours.

Noise

The areas surrounding the proposed Canyon Springs Coal Mine project area are dominated by villages, open veld and grazing lands with no loud noise producing developments in the vicinity. The project area is characterised by a typically rural noise climate associated. These ambient noise levels do not typically exceed 45 dBA between 06h00 and 22h00 and 35 dBA at night.

Socio-Economic

The project area is located within the Dr. JS Moroka Local Municipality which includes the towns of Siyabuswa and Loding and has 32 wards and 55 villages. The Dr. JS Moroka Local Municipality is characterised by limited economic activity and relatively large population concentrations. Unemployment in the area is also relatively high. The Dr. JS Moroka Local Municipality provides residents in the area with water by a combination of a tanker and dedicated water supply boreholes.

MOTIVATION FOR THE PROJECT

The employment opportunities to be afforded at the proposed Canyon Springs Coal Mine will contribute towards maintaining and improving long-term employment in the Dr. JS Moroka Municipality. The planned workforce at Canyon Springs Coal Mine is approximately 224 permanent employees, 55 % of the Canyon Springs Coal Mine workforce will be sourced from the Local Municipality. The provision of employment at Canyon Springs will positively influence the region through the multiplier effect and contribute to Mpumalanga's Gross Geographic Product. The export of coal from the proposed mine will also boost the local economy in terms of tax revenue, mining royalties and foreign investment.

PROJECT DESCRIPTION

Project Name: Proposed Canyon Springs Coal Mine

Report Title: Volume 1 Final EIA

Project Number: 090270

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The proposed Canyon Springs Coal Mine will comprise of opencast coal mining. The construction phase of the mine consists of excavation of the box-cuts for access to the opencast pits and the construction of the surface infrastructure on-site. The mineable coal resources identified have been targeted for opencast pit development. During construction and operation, strips of land will be cleared of vegetation, and topsoil and overburden will be sequentially stripped and separately stockpiled. The strips will be mined by truck-and-shovel rollover mining with blast development. Initially, three or four strips will be exposed to allow room for mining purposes. Thereafter, overburden material extracted from the strips being mined will be progressively placed into the excavation remaining from the previously mined strips. Run of Mine will be transported to the plant site and fed to a ground hopper onto an apron feeder that will discharge the coal through a jaw crusher to a stockpile. Stockpiled coal will be washed in a Coal Handling and Preparation Plant. Any slurry produced at the Coal Handling and Preparation Plant will be put through a filter press to further recover additional water and produce belt filter cake, which will then be trucked to the temporary discard dump together with the coarse discard for disposal. The intention is that discard will be re-introduced into the opencast excavation during continuous rehabilitation.

Primary access to the site will be gained via the existing series of district roads traversing the project area including D2740 and D1944. Internal haul roads will be unpaved and will branch off the primary access roads to access the opencast pit and beneficiation area.

The mine water balance has identified that the total water demand (for process and potable water) at the mine equates to an average of 1 740 m³ water per day. Recovering water on-site has proved to fall short of the water requirement of the proposed Canyon Springs Coal Mine. The existing Waste Water Treatment Plant at Siyabuswa will be upgraded for the purposes of providing the necessary process and potable water required for the mine. Water to be pumped to the Coal Handling and Preparation Plant will undergo an initial filtration process at Siyabuswa. Water will then be pumped to the mine via a 40.7 km buried 225 mm HPDE pipeline, where it will discharge into a twin reservoir system in the Coal Handling and Preparation Plant area. While the water that leaves the Siyabuswa Waste Water Treatment Plant will be acceptable for Mine plant process water, it will not yet be fit for human consumption. It has been calculated that a total of 50m³ of potable water will be required per day, 45m³ used as service water, and an additional 1700m³/annum or 5m³ per day for the local community to compensate for any water lost through groundwater boreholes due to dewatering activities at the proposed mine. A two-stage reverse osmosis Waste Water Treatment Plant at the mine will serve to treat the Treated Sewage Effluent from Siyabuswa to a suitable quality for use on-site.

A stormwater diversion trench will be constructed down gradient (to the south) of the plant area and will be responsible for channelling all dirty water flow to the Stormwater Control Dam. A clean water diversion berm will be constructed along the northern section of the plant to channel clean run-off away from the Coal Handling and Preparation Plant area. A Pollution Control Dam will be constructed to receive groundwater inflow from the opencast pits during mine operation and to act as the process water storage dam. A pump system will allow this water in the Pollution Control Dam to be used as mine process water.

Diversion berms will be constructed around the strip mining pits and utilised to ensure that minimal surface water run-off comes into contact with mining activities. Catchment paddocks, consisting of a perimeter wall and cross paddock walls, will be constructed around the discard dump and shale stockpile.

All dirty water run-off from the dump / stockpile will be contained within the catchment paddocks and allowed to evaporate.

Bulk power supply will be by Eskom. The estimated maximum demand including a 10% design factor for future growth is 5 MVA.

Following the project lifespan of 20 years, all surface infrastructure will be dismantled and the remaining denuded areas and surface stockpiles will be rehabilitated.

PUBLIC CONSULTATION

A public participation process, designed to engage all potential Interested and Affected Parties was undertaken to ascertain the concerns or issues regarding the proposed Canyon Springs Coal Mine. The Public Consultation conducted during the scoping phase included: the publication of a media notice in English the Sowetan newspaper; the distribution of a Background Information Document to authorities and Interested and Affected Parties; the erection of site notices (in English, Setswana and IsiNdebele) at public locations within the surrounding communities (copies of the draft Scoping Report were also made available at these locations for public comment); a site-visit and authorities meeting; a public open day was held in the Loding Community Hall where presentations in English, Setswana and IsiNdebele were made, while Background Information Documents were distributed and any comments and issues were noted in the minute meetings and via the comment and response forms made available. The key issues raised pertained to the following:

The key issues raised pertained to the following:

- Provision of employment and training opportunities;
- The Social and Labour Plan Local Economic Development initiatives;
- Availability of bursaries for local community members;
- The loss of agricultural and grazing land;
- Compensation for the prospecting done earlier in the year;
- The close proximity of communities to mining area;
- Reduction in local air quality and additional noise as a result of the proposed mining project;
- Issues around health and safety with respect to blasting and vibrations;
- Changes to groundwater quantity and quality; and
- Changes to surface water quantity and quality.

These issues were noted and where possible have been address in the Environmental Management Programme as follows;

- Employment: the Interested and Affected Parties database will be submitted to the client and when the procurement process begins local people will be prioritised for employment opportunities.
- Social and Labour Plan Local Economic Development initiatives: Local Economic Development plans in the Social and Labour Plan have been updated and are now focussed on improving the local clinic and building local computer centres within the surrounding communities. The Social and Labour Plan includes a bursaries plan, which will be implemented once mining commences.
- Loss of land: this has been escalated to the National Department of Land Affairs and the Department of Co-operative Governance and Traditional Affairs who have indicated that people

utilising land proposed for development need to be compensated. They have further indicated land ownerships claims will be addressed in terms of the Distribution and Transfer of Certain State Land Act, No. 119 of 1993 which requires that the Department appoints a Land Titles Adjustment Commission to resolve the issue.

- Prospecting compensation: The Tribal Authority was paid for the prospecting undertaken within the local community and this need to be resolved amongst the community.
- Close proximity of communities: specialists have proposed suitable buffer zones and monitoring plans to ensure communities are not negatively impacted by the mine.
- Blasting and Air Quality: A blasting specialist has designed measures to minimise the impact of blasting and vibration on the community. Air quality and noise monitoring will be undertaken to ensure air and noise pollution is kept within safe limits.
- Groundwater quantity and quality: Management measures to be undertaken throughout life of mine to ensure groundwater quality and quantity are not negatively impacted in the long term have been proposed.
- Surface water quantity and quality: a stream crossing will be constructed to ensure the water resource does not come into contact with the resource and therefore ensure surface water quality and quantity are not negatively impacted in the long term.

The Public Consultation conducted during the assessment phase included: focussed public feedback meetings were held in Moletsi and Sehoko, at the Moletsi Community Meeting Area and the Sehoko Multi Purpose Centre, respectively. Background Information Documents were distributed and any further comments received were also included in the updated comments and responses report, and addressed in the final documentation. Due to the issue of land-ownership and compensation for land, public feedback meetings were not conducted at Loding and Dihekeng as originally planned. Instead, a meeting was held with the Loding and Dihekeng Traditional Authorities of both the towns of Loding and Dihekeng. It was conducted at the Traditional Authorities' offices. Meetings with various authorities were held throughout the assessment phase and issues, such as the inclusions of a wetland rehabilitation report in the EIA, as well as mining activities occurring in sensitive areas such as the Springbokvlakte Thornveld, were addressed.

ENVIRONMENTAL IMPACT ASSESSMENT

The potential impacts of the proposed development on the receiving biophysical and socio-economic environment during construction, operation and decommissioning / closure were assessed during the Environmental Impact Assessment. The significance of potential impacts were rated using a standardised impact rating methodology.

Specialist service providers within their respective fields were commissioned to undertake studies to investigate the baseline conditions of the receiving environment as well as to assess the potential impacts the activities and aspects of the proposed development may elicit thereon, as well as any measures by which the potential significance thereof can be mitigated (if at all). The following specialist studies were conducted:

SPECIALIST STUDIES	
STUDY	COMPANY/INDIVIDUAL
Groundwater and Hydrogeology	Future Flow Groundwater Project Managers
Surface Water	African Environmental Development
Terrestrial, Wetlands and Aquatic	Strategic Environmental Focus Consultants
Soils, Land Use and Land Capability	Earth Science Solutions
Archaeology	Archaetnos Culture & Cultural Resource Consultants
Air Quality	Gondwana Environmental Solutions
Traffic	Goba
Noise	Jongens Keets Associates
Blasting and Vibrations	Blast Analysis Africa

Key Findings of Environmental Impact Assessment

All the impacts identified, for each phase of the mine, were considered significant. These significant impacts and the recommended mitigation measures for each are indicated in the table below.

Construction Phase

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
Terrestrial Ecology			
<ul style="list-style-type: none">▪ Destruction of floral and faunal habitat and vegetation, and stripping of topsoil, due to the clearance of surface areas for construction of the pit, roads and infrastructure e.g. discard dump, pollution control dam, sewage treatment plants and the Treated Sewerage Effluent pipeline	High 75	<ul style="list-style-type: none">▪ The biodiversity management plan, soil management plan and hydrocarbon management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to biodiversity and soil resources which may affect terrestrial ecology.	High 75
<ul style="list-style-type: none">▪ Exposure to erosion due to the removal of vegetation	Medium 40		Low 21
<ul style="list-style-type: none">▪ Increase in dust due to construction activities	Medium 48		Low 27
<ul style="list-style-type: none">▪ Potential increase in invasive vegetation due to the removal of natural vegetation	Medium 48		Low 27
<ul style="list-style-type: none">▪ Faunal interactions with structures and personnel, noise, vibration and light disturbance, i.e. increase in noise levels due to vehicles	Medium 56		Medium 36
Aquatic Ecology			
<ul style="list-style-type: none">▪ Sedimentation of watercourse due to the clearing of natural vegetation which leads to soil erosion▪ Altered runoff regime of water body affects aquatic fauna	Medium 50	<ul style="list-style-type: none">▪ The design of the Pollution Control Dam and Stormwater Control Dam, as discussed in the Environmental Management Programme (Volume 2), will ensure no overflow or seepage of water can occur; and▪ The soil management plan and the aquatic ecology management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to minimise the potential for erosion and sedimentation of runoff.	Low 24

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
Wetlands			
▪ Sedimentation of watercourse due to heavy machines clearing vegetation for construction of the opencast pit and surface infrastructure	Low 24	▪ The wetland management plan, soil management plan, surface water management plan and biodiversity management plan (discussed in the Environmental Management Programme (Volume 2)), must be implemented to mitigate potential impacts to surface water, biodiversity and soil resources which may affect wetlands.	Low 16
▪ Increased erosion and increased run-off received by water courses due to the removal of natural vegetation	Medium 48		Low 14
▪ Introduction and spread of invasive vegetation due to the disturbance / destruction of indigenous vegetation making ecosystem vulnerable to invasions	High 60		Low 24
▪ A stream crossing / culvert to be constructed across the No-Name stream in order to access pit 1, which will be through a wetland, wetland buffer and within the 100 year floodline	Medium 32		Low 24
Soil Quality			
▪ Compaction of soils and loss of land capability due to the movement of heavy vehicles destroying the structure of the soils	High 65	▪ The soil management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to soil resources which may affect land capability.	Low 27
▪ Lost of resource (soil sterilisation) due to the destruction of the soil profile ▪ Loss of resource due to covering or removal of soil ▪ Contamination of soils due to spillage and dirty water	High 70		Medium 36

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
<ul style="list-style-type: none">▪ Compaction of soils and loss of land capability due to the movement of heavy vehicles	Medium 52		Low 27
Groundwater			
<ul style="list-style-type: none">▪ Impact on groundwater volumes due to the dewatering of the opencast pit	Medium 32	<ul style="list-style-type: none">▪ Reports of decreased water levels will be investigated through comparison with the results noted during the hydrocensus – in instances where dewatering has indeed affected borehole groundwater levels, the mine will be responsible with providing the affected user with an equivalent volume of water of a similar or better quality;	Low 28
<ul style="list-style-type: none">▪ Groundwater contamination due to potential hydrocarbon spills	Low 14	<ul style="list-style-type: none">▪ The hydrocarbon management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to avoid and manage the negative impacts of hydrocarbon spills on groundwater resources; and▪ The groundwater management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to groundwater resources which may affect groundwater quality and quantity.	Low 7
Surface Water			
<ul style="list-style-type: none">▪ Greater erosion potential causing siltation resulting in increased turbidity and suspended solids in local rivers and streams▪ Contamination of water due to hydrocarbons spills	Low 8	<ul style="list-style-type: none">▪ Section 21c and 21i water uses, as per the National Water Act, must be authorised prior to the commencement of any mining activities; and▪ The surface water management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to surface water resources which may affect surface water quality.	Low 8
<ul style="list-style-type: none">▪ A stream crossing / culvert to be constructed across the No-Name stream in order to access pit 1. The crossing will be through a wetland and within the 100 year floodline	Medium 32		Low 24
Cultural / Heritage			

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
<ul style="list-style-type: none">▪ Loss of remains of old farmyard at Site 1 due to site clearance for construction	Low 28	<ul style="list-style-type: none">▪ The heritage and palaeontological management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to avoid and mitigate potential impacts to heritage and palaeontological resources.	-
<ul style="list-style-type: none">▪ Loss of Middle and Late Stone Age tools and Iron Age Pottery at Site 2 due to site clearance for construction			
<ul style="list-style-type: none">▪ Loss of Middle as well as Late Stone Age tools at Site 3 due to site clearance for construction			
Air Quality			
<ul style="list-style-type: none">▪ Emissions and particulate matter from machinery / vehicles which results in a local reduction in air quality▪ Wind erosion from exposed areas	High 60	<ul style="list-style-type: none">▪ Wind-breaks and wind speed reduction through sheltering should be introduced and control measures to reduce the potential for fugitive dust emissions in opencast coal mines have to be adopted. The extent of exposed areas must be reduced through careful planning and progressive vegetation; and▪ The air quality management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to air quality which may affect surrounding communities.	Medium 40
<ul style="list-style-type: none">▪ Increased dust fallout due to materials relocation and transport▪ Emissions and particulate matter from machinery / vehicles resulting in a local reduction in air quality▪ Wind erosion from topsoil and overburden stockpiles	High 60		Medium 48
Traffic			

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
<ul style="list-style-type: none"> ▪ Additional traffic due to heavy vehicles transporting construction materials ▪ Damage to local roads due to presence of heavy vehicles ▪ Impacts associated with road safety 	Medium 30	<ul style="list-style-type: none"> ▪ There are residential areas along the identified coal truck routes in the vicinity of the mine. Some long term treatment of unpaved roads may be required to minimise dust generated by haul trucks, however, this will be addressed in ongoing consultation with the Dr. JS Moroka Local Municipality; and ▪ The traffic management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to road traffic which may affect surrounding communities. 	Low 24
Noise			
<ul style="list-style-type: none"> ▪ Increase in noise levels due to use of heavy machinery in pit excavation, overburden removal and surface infrastructure construction 	High 70	<ul style="list-style-type: none"> ▪ The design of all major plans for the mine must incorporate the necessary acoustic design aspects to ensure that the overall noise level generated from the infrastructure, pits and operations does not exceed a maximum equivalent continuous day / night rating level (70 dBA); ▪ The design process is to be done in such a way as to minimise the transmission of noise from the inside of the buildings to the outside, and the insulation of particularly noisy plant and equipment; 	Medium 48

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
<ul style="list-style-type: none"> Increase in noise levels due to use of vehicles to transport construction personnel and materials 	Low 24	<ul style="list-style-type: none"> The design should also to take into account the maximum allowable equivalent continuous day and night rating levels of the land use type of potentially impacted sites outside the mine boundary; Ideally, plant and equipment sound power level should be such that the sound pressure level should not exceed 85 dBA; The noise footprint of each discrete element should be established by measurement in accordance with the relevant standards. The character of the noise should be checked to ascertain whether there is any nuisance factor associated with the operations; In general, construction activities should meet the noise standard requirements of the Occupational Health and Safety Act (No. 85 of 1993); Once the final route of the external coal haul is determined and finalised, the noise impact assessment conducted should be updated to take cognisance thereof; Any updates to the noise impact assessment as contemplated above should also take cognisance of the final layout of infrastructure at the proposed mine in order to improve confidence in the noise contours as calculated and the any management measures revised as necessary; and The noise management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to noise levels which may affect surrounding communities. 	Low 24
Blasting and Vibrations			
<ul style="list-style-type: none"> Ground vibrations due to pit excavation and the removal of overburden 	High 80	<ul style="list-style-type: none"> Measures should be taken to minimise the amount of air-blast produced by a blast to less than 130 dB in the region of the livestock; 	Medium 56
<ul style="list-style-type: none"> Air-blasting due to pit excavation and the removal of overburden 	High 80	<ul style="list-style-type: none"> In view of the close proximity of the villages of Dihekeng, it is recommended that permanent seismic and acoustic monitoring stations be established on the boundaries of these villages closest to the mine; Blast vibrations and deterioration of buildings should be carefully monitored (see blasting and vibrations monitoring discussed in the Environmental Management 	Medium 48

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
<ul style="list-style-type: none">Dust and smoke due to pit excavation and the removal of overburden	Medium 70	<p>Programme (Volume 2)); and</p> <ul style="list-style-type: none">The blasting management plan and air quality management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to surrounding communities and structures and mine personnel as a result of blasting activities.	Medium 40
<ul style="list-style-type: none">Fly-rock due to pit excavation and the removal of overburden	High 80		Medium 48
Socio-economic			
<ul style="list-style-type: none">Loss of land; surface and groundwater pollution; loss of sense of place; damage to property through blasting; increased noise disturbance and decreased air quality due to the various mining activities	High 60	<ul style="list-style-type: none">Procedures and commitments outlined in the Social and Labour Plan must be adhered to;Issues related to land ownership should be addressed between the affected parties, Co-operative Governance Traditional Affairs and the National Department of Land Affairs. Should this matter not be resolved before mining is to commence, the Applicant, together with Co-operative Governance Traditional Affairs and the National Department of Land Affairs must agree to an interim solution with the affected parties to allow access to the land with a compensation protocol implemented as required. Mitigation measures relating to the loss of land for grazing, agriculture and natural resources which should be further investigated include:Potentially securing alternative grazing land for use by the communities. This can be achieved by utilising separate portions of land within the mining area, and which are not being mined at a specific point in time, being fenced off and retained as pastures until mining progresses towards that portion, at which time a separate grazing area should be fenced off, which could include a rehabilitated opencast strip returned to grazing potential;	Medium 39
<ul style="list-style-type: none">Increased job opportunities due to commencement of mining activities	Medium 39	<ul style="list-style-type: none">Should this not prove possible, a rate per hectare for the loss of grazing land will have to be agreed upon with the relevant stakeholders who will then have to be adequately compensated for the loss of grazing land over the time affected. This could take the form of a rental agreement with the relevant persons; andAll trees and vegetation cleared during mine infrastructure construction should be made available for use by members of the community.	High 60 [Positive]
Visual			

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
<ul style="list-style-type: none"> Alteration of natural landscape due to Clearance of land / site for opencast pit excavation and surface infrastructure and services 	High 60	<ul style="list-style-type: none"> The visual impact management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate the potential impact of the proposed Canyon Springs Coal Mine on the visual / aesthetic environment. 	Medium 44

Operational Phase

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
Terrestrial Ecology			
▪ Destruction of floral and faunal habitat and stripping of topsoil leading to loss of biodiversity and increase in alien invasive species	Medium 56	▪ The biodiversity management plan, soil management plan and hydrocarbon management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to biodiversity and soil resources which may affect terrestrial ecology.	Medium 36
▪ Increase in dust due to operational activities	Medium 56		Medium 33
▪ Potential increase in invasive vegetation due to the removal of natural vegetation	Medium 56		Medium 33
▪ Faunal interactions with structures and personnel, noise, vibration and light disturbance	Medium 56		Medium 33
▪ Contamination by stored chemicals and hazardous materials that threaten faunal and floral species	Medium 56		Medium 36
Aquatic Ecology			

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
<ul style="list-style-type: none">Increased salinity and water pollution due to runoff from contaminated areas including the overburden and temporary discard dump, Stormwater Control Dam / Pollution Control Dam, sewage treatment plants and the Treated Sewage Effluent pipeline	High 60	<ul style="list-style-type: none">Ensure that all Best Management Guidelines as published by the Department of Water Affairs are employed and strictly adhered to during all phases of the mining process; andThe soil management plan and the aquatic ecology management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to minimise the potential for erosion and sedimentation of runoff.	Medium 39
<ul style="list-style-type: none">Sedimentation of the watercourse due to erosion cause by the removal of vegetation	Medium 33		Low 18
Wetlands			
<ul style="list-style-type: none">Contamination of watercourse and soils; and the persistence of flora and fauna affected due to hazardous materials used in mining operations	High 70	<ul style="list-style-type: none">No activities, outside of the existing Water Use Licence, may be undertaken within wetland areas or within 500 m of wetlands. Should additional activities be required within wetland areas, an additional Water Use Licence must be applied for through the Department Water Affairs;The wetland management plan, soil management plan, surface water management plan and biodiversity management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to surface water, biodiversity and soil resources which may affect wetlands.	Medium 36
Soil Quality			
<ul style="list-style-type: none">Loss of resource due to collapse of unconsolidated workings during roll over mining	High 80	<ul style="list-style-type: none">The soil management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to soil resources which may affect land capability.	Medium 70
<ul style="list-style-type: none">Loss of resource due to ponding of surface water on collapsed areas and due to cracking of poorly consolidated rehabilitation.	High 80		Medium 70

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
<ul style="list-style-type: none">▪ Compaction of soils resulting on reduction in soil potential and destruction of the soil horizon and soft overburden	Medium 44		Low 24
<ul style="list-style-type: none">▪ Sterilisation of seed pool and discard dump footprint due to the destruction of the soil profile	High 65		Medium 33
<ul style="list-style-type: none">▪ Sterilisation of haulage ways and access routes due to the destruction of the soil profile	Medium 44		Low 22
<ul style="list-style-type: none">▪ Contamination due to uncontrolled dirty water runoff	High 70		Medium 44
<ul style="list-style-type: none">▪ Contamination due to spillage of product and hydrocarbons	High 70		Medium 48
<ul style="list-style-type: none">▪ Contamination due to uncontrolled dumping outside of dump footprint	Medium 56		22
Groundwater			
<ul style="list-style-type: none">▪ Impact on groundwater volumes due to dewatering of the opencast pit	High 80	<ul style="list-style-type: none">▪ The numerical groundwater model must be updated with the information obtained during ongoing monitoring to continually improve the long-term strategy in terms of groundwater management. Cognisance of new technologies that may become available must be taken account of; and▪ The hydrocarbon management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to avoid and manage the negative impacts of hydrocarbon spills on groundwater resources; and▪ The groundwater management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to groundwater resources which may affect groundwater quality and	High 80
<ul style="list-style-type: none">▪ Groundwater quality is negatively impacted due to contamination from the discard dump	Low 18		Low 7
<ul style="list-style-type: none">▪ Groundwater is polluted due to hydrocarbon spills	Medium 52		Medium 33

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
		quantity.	
Surface Water			
▪ Contaminated surface runoff from storage and infrastructure areas may pollute watercourses	Medium 36	▪ The surface water management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to surface water resources which may affect surface water quality.	Low 4
▪ Interception of surface run-off to the Ghotwane and Elands Rivers by the opencast pit	Low 7		Low 7
Cultural / Heritage			
▪ Loss of remains of old farmyard at Site 1 due to site clearance for operational activities	Low 28	▪ The heritage and palaeontological management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to avoid and mitigate potential impacts to heritage and palaeontological resources.	-
▪ Loss of Middle and Late Stone Age tools and Iron Age Pottery at Site 2 due to site clearance for operational activities			
▪ Loss of Middle as well as Late Stone Age tools at Site 3 due to site clearance for operational activities			
Air Quality			

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
<ul style="list-style-type: none">▪ Increased dust fallout due to disturbance and blasting of land cover in mining of the opencast pit▪ Emissions and particulate matter from machinery / vehicles which results in a local reduction in air quality▪ Blasting and vibration leading to an increase in dust fallout	High 70	<ul style="list-style-type: none">▪ As the main road running through the property is tarred, a very large potential emission source has been reduced at the proposed Canyon Springs Coal Mine; and▪ The air quality management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to air quality which may affect surrounding communities.	Medium 40
<ul style="list-style-type: none">▪ Increased dust fallout due to coal relocation and transport▪ Wind erosion from topsoil and overburden stockpiles	High 70		Medium 48
Traffic			
<ul style="list-style-type: none">▪ Additional traffic due to heavy vehicles transporting product on-site and off-site▪ Damage to local roads due to an increase in heavy vehicles on the roads▪ Impacts associated with road safety (mortalities)	Medium 40	<ul style="list-style-type: none">▪ It may be appropriate for the mine to negotiate a contribution to the upgrading of the D1944 road (Ramotsho Road) and D626 after the mine has been established. Upgrading the road ought to ensure that the road section will have the ability to carry increase in traffic; and▪ The traffic management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to road traffic which may affect surrounding communities.	Medium 32
Noise			

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
▪ Increase in noise levels due to the mining activities at the opencast pit	High 70	▪ The noise management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to noise levels which may affect surrounding communities; and ▪ In general, operations should meet the noise standard requirements of the Occupational Health and Safety Act (Act No 85 of 1993).	Medium 48
▪ The removal and transport of overburden to waste rock dumps	High 70		Medium 48
▪ Machinery and equipment at the Coal Handling and Processing Plant	Medium 48		Medium 30
▪ The use of vehicles to transport coal product	Low 24		Low 16
Blasting / Vibrations			
▪ Ground vibrations due to blasting activities occurring at the opencast pit	High 80	▪ The blasting management plan and air quality management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to surrounding communities and structures and mine personnel as a result of blasting activities.	Medium 56
▪ Air-blasting due to blasting activities occurring at the opencast pit	High 80		Medium 48
▪ Dust and fumes due to blasting activities occurring at the opencast pit	Medium 70		Medium 40
▪ Fly-rock due to blasting activities occurring at the opencast pit	High 80		Medium 48

Decommissioning / Closure Phase

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
Terrestrial Ecology			
<ul style="list-style-type: none"> Deterioration of natural vegetation and faunal habitat and the subsequent loss of ecological function due to unsuccessful rehabilitation 	High 60	<ul style="list-style-type: none"> The biodiversity management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to biodiversity and soil resources which may affect terrestrial ecology; During the decommissioning phase, projects that increase biodiversity within the rehabilitated areas should be implemented by suitably qualified ecologists or organisations such as the Endangered Wildlife Trust or South African National Biodiversity Institute; and At the closure of the mine, the closure measure defined in the Environmental Management Programme (Volume 2) must be implemented. 	Medium 36
Wetlands			
<ul style="list-style-type: none"> Erosion which leads to alien species invasion due to unsuccessful rehabilitation of disturbed areas 	High 70	<ul style="list-style-type: none"> There is the opportunity to use a diffused and steady flow regime to enhance wetland functionality and use the flows to enhance surface roughness and vegetation structure. This will have biodiversity and flow regulation benefits to the system; If grazing regimes, burning frequencies and cultivation are substantially reduced accompanied by the above rehabilitation measures (especially plugging of drains and erosion gullies) a slight improvement in wetland health could be expected; and The wetland management plan, soil management plan and biodiversity management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to surface water, biodiversity and soil resources which may affect wetlands. 	Medium 36
Soil Quality			
<ul style="list-style-type: none"> Reduction in soil capability; increased erosion potential; disturbance of soil horizons; and soil compaction due to heavy vehicle movement 	Medium 52	<ul style="list-style-type: none"> The biodiversity management plan, soil management plan and hydrocarbon management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to soil resources which may affect land capability. 	Medium 33

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
<ul style="list-style-type: none"> Contamination of soil and reduced soil quality due to hydrocarbon or chemical spillages 	Medium 55		Low 22
<ul style="list-style-type: none"> Unprotected areas of ground yet to be re-vegetated experiencing erosion and loss of soil resource 	Medium 52		Low 22
<ul style="list-style-type: none"> Loss of resource through contamination and the incorrect order of soil replacement during backfilling of soils into the opencast pits 	High 65		Medium 33
<ul style="list-style-type: none"> Loss of resource due to incorrect or inadequate fertilisation of replaced soils and vegetation. 	Medium 44		Medium 33
<ul style="list-style-type: none"> Loss of vegetation cover due to animal and human impacts (over grazing and movement over rehabilitated lands). 	Medium 44		Low 22
<ul style="list-style-type: none"> Contamination /salinisation of soils during the dismantling of infrastructure, and the inclusion of infrastructural debris and waste (carbonaceous coal) above the due to regional water level 	Medium 44		Low 22

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
<ul style="list-style-type: none">Contamination of soils due to the spillage of waste from dams	High 65		Low 22
Groundwater			
<ul style="list-style-type: none">Recovery of groundwater levels due to mine dewatering being stopped	High 80	<ul style="list-style-type: none">The groundwater monitoring programme implemented during the Life of Mine must be ongoing during the rehabilitation phase;Any external users whose boreholes have been affected in terms of volume (lower water levels or drying out of boreholes) or quality must be provided with an equivalent volume of water of a similar- or better quality than that noted pre-mining;The numerical groundwater model must be updated with the information obtained during ongoing monitoring to continually improve the long-term strategy in terms of groundwater management. Cognisance of new technologies that may become available must be taken account of; andThe groundwater management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to groundwater resources which may affect groundwater quality and quantity.	High 80 [Positive]
<ul style="list-style-type: none">Impacts on groundwater quality due to contaminant migration from hydrocarbon spillages	Medium 44		Low 21
<ul style="list-style-type: none">Impacts on groundwater quality due to contaminant migration from seepage of backfilled material	Low 18		Low 6
Surface Water			
<ul style="list-style-type: none">Infiltration of polluted surface water into surface water bodies due to dirty water system removed before pollution sources have been removed	Medium 30	<ul style="list-style-type: none">The surface water management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to surface water resources which may affect surface water quality.	Low 21
Air Quality			
<ul style="list-style-type: none">Emissions and particulate matter from machinery / vehicles which results in a local reduction in air qualityWind erosion from exposed areas	Medium 32	<ul style="list-style-type: none">The air quality management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to air quality which may affect surrounding communities.	Low 21
Traffic			

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
<ul style="list-style-type: none"> Road safety impacts; damage to local roads; and additional traffic due to the use of heavy vehicles during decommissioning activities 	Medium 40	<ul style="list-style-type: none"> The traffic management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to road traffic which may affect surrounding communities. 	Low 32
Noise			
<ul style="list-style-type: none"> Increase in ambient noise levels due to the Use of heavy machinery in pit rehabilitation and to remove surface infrastructure 	Medium 55	<ul style="list-style-type: none"> In general, decommissioning activities should meet the noise standard requirements of the Occupational Health and Safety Act (Act No 85 of 1993); and The noise management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to noise levels which may affect surrounding communities. 	Medium 36
Socio-economic			
<ul style="list-style-type: none"> Loss of mining jobs due to retrenchments and downscaling 	High 85	<ul style="list-style-type: none"> It is important to ensure that the rehabilitation measures proposed in this EMP are incorporated into a formal closure and rehabilitation plan for the proposed Canyon Springs Coal Mine once operational. This plan should be updated on an ongoing basis so as to ensure that it remains relevant. At closure, this plan should be implemented to ensure that land affected by mining activities are returned as near as possible to the original state or an end land use agreed upon wherever possible. This will ensure that the land may be used for agricultural practices and provide grazing land for livestock; 	High 60
<ul style="list-style-type: none"> Land returned to agricultural land Cessation of nuisance impacts such as noise and blasting. 	Medium 39	<ul style="list-style-type: none"> The various commitments made in the Social and Labour Plan as regard skills development should be implemented during operation to ensure that as many employees as possible are provided with permanent skills to aid them in their future search for employment; Procedures outlined in the Social and Labour Plan for the downscaling and retrenchment process must be adhered to. 	High 60 [Positive]

Post - Closure Phase

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
Wetlands and Aquatic Ecology			
<ul style="list-style-type: none">▪ Negative effect on aquatic biota due to contaminant migration▪ Increased volumes of water entering the catchment due to water decanting from rehabilitated mine workings	Medium 52	<ul style="list-style-type: none">▪ The conceptual closure design (discussed in the Environmental Management Programme (Volume 2)) will accommodate for future decant and also be a self-contained passive system requiring no further input after closure. Should this system be successfully implemented, decant of Acid Mine Drainage is not foreseen to have a negative impact on wetland systems;▪ There is the opportunity to use a diffused and steady flow regime to enhance wetland functionality and use the flows to enhance surface roughness and vegetation structure which could in turn have biodiversity and flow regulation benefits to the system;▪ Rehabilitation programmes should be advised by biodiversity management plans to increase species diversity in rehabilitated areas;▪ Water should be treated to a degree representative of the natural water quality found within the catchment;▪ The wetland management plan, aquatic ecology management plan and biodiversity management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to surface water and biodiversity which may affect wetlands and aquatic ecology.	Low 30
<ul style="list-style-type: none">▪ Recovery of groundwater levels and the decreased water quality due to mine dewatering deceasing	High 70		Medium 36
<ul style="list-style-type: none">▪ Wetland degradation and alien invasive species encroaching due to unsuccessful rehabilitation of wetlands	High 80		Medium 60
Groundwater			
<ul style="list-style-type: none">▪ Recovery of groundwater levels due to mine dewatering activities ceasing	High 80	<ul style="list-style-type: none">▪ The groundwater management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to groundwater resources which may affect groundwater quality and quantity; and▪ The relevant closure measures (discussed in the Environmental Management Programme (Volume 2)) must be implemented.	-
<ul style="list-style-type: none">▪ Impacts on groundwater quality due to contaminant migration	Low 18		Low 6
<ul style="list-style-type: none">▪ Potential generation of acid mine drainage and pollution of surface water resources due to decant from the rehabilitated mining area	Medium 52		Medium 33
Surface Water			

IMPACT	PRE-MITIGATION SIGNIFICANCE RATING AND VALUE	MITIGATION MEASURES	POST MITIGATION SIGNIFICANCE RATING AND VALUE
<ul style="list-style-type: none"> ▪ Acid Mine Drainage due to water decanting from rehabilitated mine workings ▪ Remaining infrastructure on-site may pollute surface water resources 	Medium 33	<ul style="list-style-type: none"> ▪ The surface water management plan and groundwater management plan (discussed in the Environmental Management Programme (Volume 2)) must be implemented to mitigate potential impacts to surface water resources which may affect surface water quality. 	Low 18

Impact Statement

Prime Resources (Pty) Ltd, the Environmental Assessment Practitioner, is of the opinion that the proposed development should go ahead, provided the following conditions are met:

- Implementation of all management measures as indicated in the Environmental Management Programme, in order to ensure that the post-significance impact ratings are maintained; and
- Strict adherence to the Social and Labour Plan in terms of skills development and the management of downscaling and retrenchment.

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DRAFT ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED CANYON SPRINGS COAL MINE

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LIST OF ACRONYMS

AADT	Annual Average Daily Traffic
ABA	Acid Base Accounting
AMD	Acid Mine Drainage
APPA	Atmospheric Pollution Prevention Act
BID	Background information document
CBA	Critical Biodiversity Area
CE	Critically Endangered
CEC	Cation Exchange Capability
CHPP	Coal Handling and Preparation Plant
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
COGTA	Department of Co-operative Governance and Traditional Affairs
CRR	Comments and Responses Report
DAFF	Department of Agriculture Forestry and Fisheries
DEA	Department of Environmental Affairs
DLA	Department of Land Affairs
DMR	Department of Mineral Resources
DRDLR	Department of Rural Development and Land Reform
DRJSMLM	Dr. JS Moroka Local Municipality
DWA	Department of Water Affairs
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMP	Environmental Management Programme
EN	Endangered
ESA	Ecosystem Support Area
GGP	Gross Geographic Product
HGM	Hydro-Geomorphic Units
HPA	Highveld Air Quality Priority Area
HDSA	Historically Disadvantaged South Africans
IAPs	Interested and Affected Parties
IEM	Integrated Environmental Management
IUCN	International Union for Conservation of Nature
IWULA	Integrated Water Use License Application
LED	Local Economic Development
LNAPL	Light Non-Aqueous Phase Liquids
LOM	Life of Mine
LOS	Level of Service
MAR	Mean Annual Rainfall
MBCP	Mpumalanga Biodiversity Conservation Plan
MDEDET	Mpumalanga Department of Economic Development, Environment and Tourism
MEC	Member of Executive Council
MPRDA	Mineral and Petroleum Resources Development Act No. 28 of 2002

MRA	Mining Right Application
MBSP	Mpumalanga Biodiversity Sector Plan
MTPA	Mpumalanga Tourism and Parks Agency
NEMA	National Environmental Management Act No. 102 of 1998
NEMAQA	National Environmental Management Air Quality No. 39 of 2004
NEMBA	National Environmental Management Biodiversity Act No. 10 of 2004
NEMWA	National Environmental Management Waste Act No. 59 of 2008
NHRA	National Heritage Resources Act
NPAES	National Protected Area Expansion Strategy
NWA	National Water Act
PCD	Pollution Control Dam
PES	Present Ecological State
PPV	Peak Particle Velocity
QDS	Quarter Degree Squares
ROM	Run of Mine
R/O	Reverse Osmosis
SAFAP	Southern African Frog Atlas Project
SAHRA	South African Heritage Resources Agency
SANAS	South African National Accreditation System
SANS	South African National Standards
SARCA	Southern African Reptile Conservation Assessment
SCD	Stormwater Control Dam
SLP	Social and Labour Plan
SPL	Sound Pressure Level
STP	Sewage Treatment Plant
TOPS	Threatened or Protected Species
TSE	Treated Sewage Effluent
TSS	Total Suspended Solids
VU	Vulnerable
WULA	Water Use License Application
WWTP	Wastewater Treatment Plant

APPLICANT'S UNDERTAKING

I,, duly and properly authorised by Canyon Springs Investments 82 (Pty) Ltd, hereby declare that the information provided in this Integrated Environmental Impact Assessment (EIA) and Environmental Management Programme (EMP), prepared for Mining Right Application (MRA) (Ref: MP 30/5/1/1/2/10021 MR), in accordance with the National Environmental Management Act (NEMA) (Act 107 of 1998) and the Minerals and Petroleum Resources Development Act (MPRDA) (Act 28 of 2002), is true, complete, and correct. I understand that this undertaking is legally binding and that failure to give effect hereto will render the applicant liable for prosecution in terms of Section 98 (b) and 99 (1)(g) of the MPRDA.

Signed on this day of20... at (Place)

.....

Michael Nell

Chief Operating Officer

HolGoun Mining (Pty) Ltd

1. INTRODUCTION AND BACKGROUND

1.1. Applicant

Name of Applicant:	Canyon Springs Investments 82 (Pty) Ltd
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Commodity:	Coal

HolGoun Investment Holdings (Pty) Ltd. is a family owned, South African investment holding company, established in 2003. The company's activities and investments straddle a range of sectors including Mining and Exploration, Engineering, Property, Healthcare, Lifestyle & Leisure, Finance and Risk Management.

Canyon Springs Investments 82 (Pty) Ltd "Canyon Springs (Pty) Ltd" is a subsidiary of HolGoun Mining and its parent company, HolGoun Investment Holdings (Pty) Ltd. Canyon Springs (Pty) Ltd has submitted an application for a Mining Right to the Department of Mineral Resources (DMR) which was accepted by the DMR on 19 March 2012 for **coal** but also including all precious and base-metals, uranium, molybdenite, copper, limestone and rare earths. It is the intention of Canyon Springs (Pty) Ltd to establish an opencast coal-mining operation on the farm Roodekoppies 167 JR. This application is currently being considered by the DMR.

1.2. Details of the Environmental Assessment Practitioner

Name of Environmental Assessment Practitioner	Prime Resources (Pty) Ltd
Physical Address:	70 - 7 th Avenue, Parktown North, Johannesburg
Postal Address:	PO Box 2316, Parklands, 2121
Telephone Number:	011 447 4888
Fax Number:	011 447 0355
Email:	prime@resources.co.za

As required in terms of Section 17 of Government Notice Regulations (GNR) 543, the EIA Regulations of 2010, the applicant has appointed Prime Resources (Pty) Ltd to conduct the research associated with Volumes 1 – 3 of this EIA / EMP. Prime Resources (Pty) Ltd is an environmental consulting specialist firm providing environmental and related services and which was established in 2003. Prime Resources (Pty) Ltd was founded by Peter Theron, the Managing

Director of the firm, who has over 26 years' experience in the field of environmental science and engineering. Jonathan van de Wouw, the Project Manager and Senior Scientist for the Canyon Springs Coal Mine project, has five years' experience in the field of environmental science. Below are short *Curricula Vitae* of the project team.

Peter Theron *BSc Civil Engineering, GDE (Hons.) Environmental Engineering*

Peter Theron is a Principal Environmental Consultant with 26 years' experience and Director of Prime Resources (Pty) Ltd. Peter began his professional career as a specialist geotechnical engineer, discard dump designer and later became involved in the technical aspects of mining and the environment. Implementation of environmental assessments, sustainable development, environmental project management, environmental due diligence and compliance auditing, geotechnical design, discard and waste management, mine closure and environmental costing are Peter's main areas of specialisation.

Jonathan van de Wouw *BSc (Hons)*

Jonathan is a senior environmental scientist with considerable experience managing projects in the mining sector, including the undertaking of EIAs and the preparation of EMPs, financial liability assessments associated with mine closure and rehabilitation, mine waste and water management planning, including the development of Integrated Water Use License Applications, environmental auditing, environmental due diligence. He also has a detailed knowledge of environmental law and precedents, both locally and internationally. Jonathan also has experience in integrated waste management planning solutions and mining right applications.

Zoë Gebhardt *MSc Hydrology and Business Management*

Zoe is an environmental scientist with experience in water use and waste licence applications, undertaking of EIAs and the preparation of EMPs, financial closure costing and public consultation engagement within the mining industry. She also has experience in environmental compliance auditing and environmental method statements within the public and private sectors. Zoe has a significant knowledge of surface and groundwater processes as well as GIS and mapping skills.

Elize Botha *MSc Water Resource Management*

Elize is an environmental scientist with experience working on projects in the mining sector, including EIAs, EMPs, and water and waste use license applications. Elize also has experience in environmental compliance auditing.

1.3. Project Overview and Location

The proposed Canyon Springs Coal Mine is situated in the Bushveld region of the Mpumalanga Province, South Africa. The proposed mining operation will take place on the farm Roodekoppies 167 IR in the Siyabuswa district within the Dr. JS Moroka Local Municipality (DRJSMLM) (Figure 1 and Figure 2).

All proposed mining activities and infrastructure will be restricted to the farm Roodekoppies 167 IR. The area is situated roughly 60 km south-east of the town of Bela-Bela and just north-west of the Rhenosterkop dam (Figure 3).

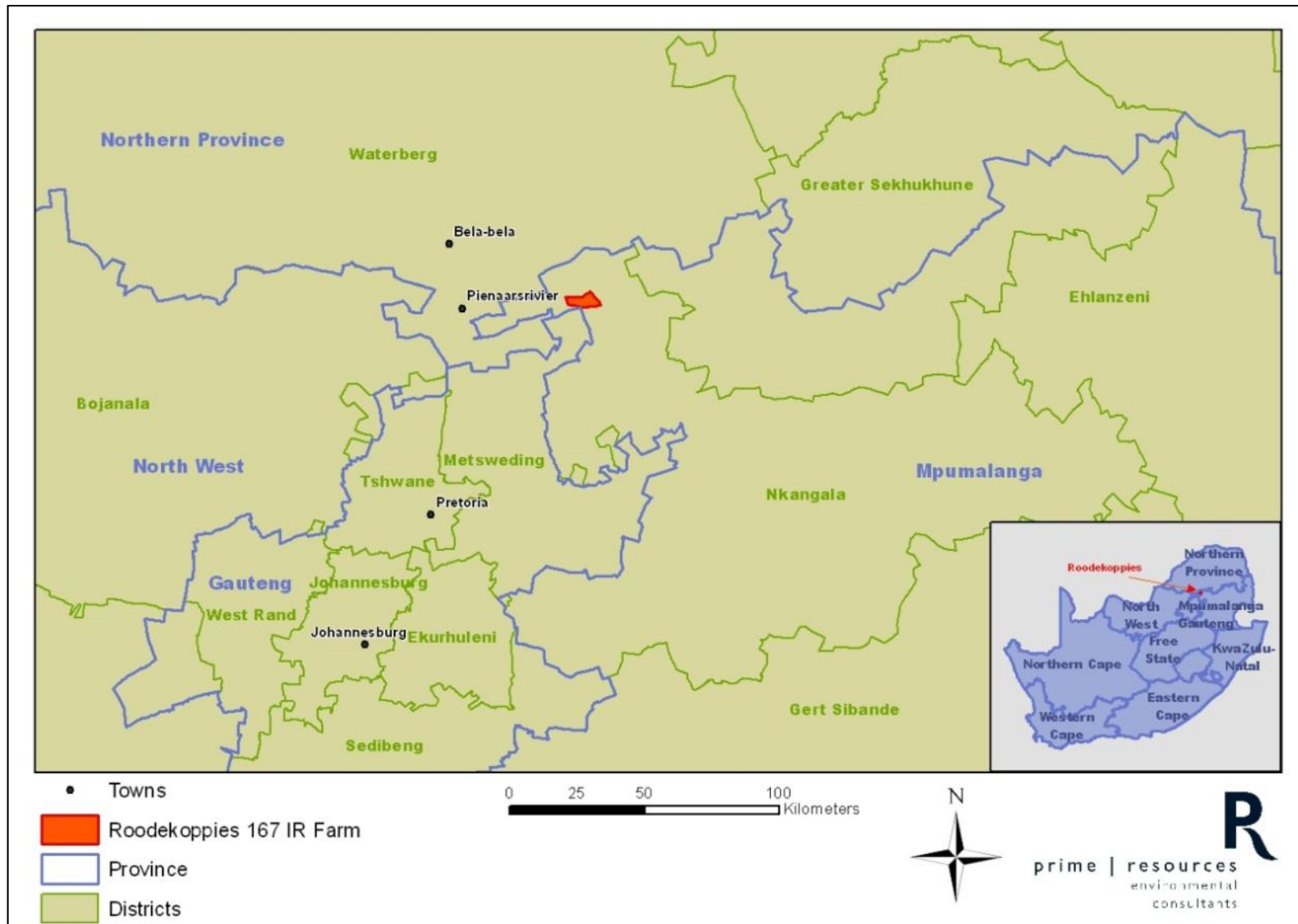


Figure 1: Location of Nkangala District Municipality and Roodekoppies Farm

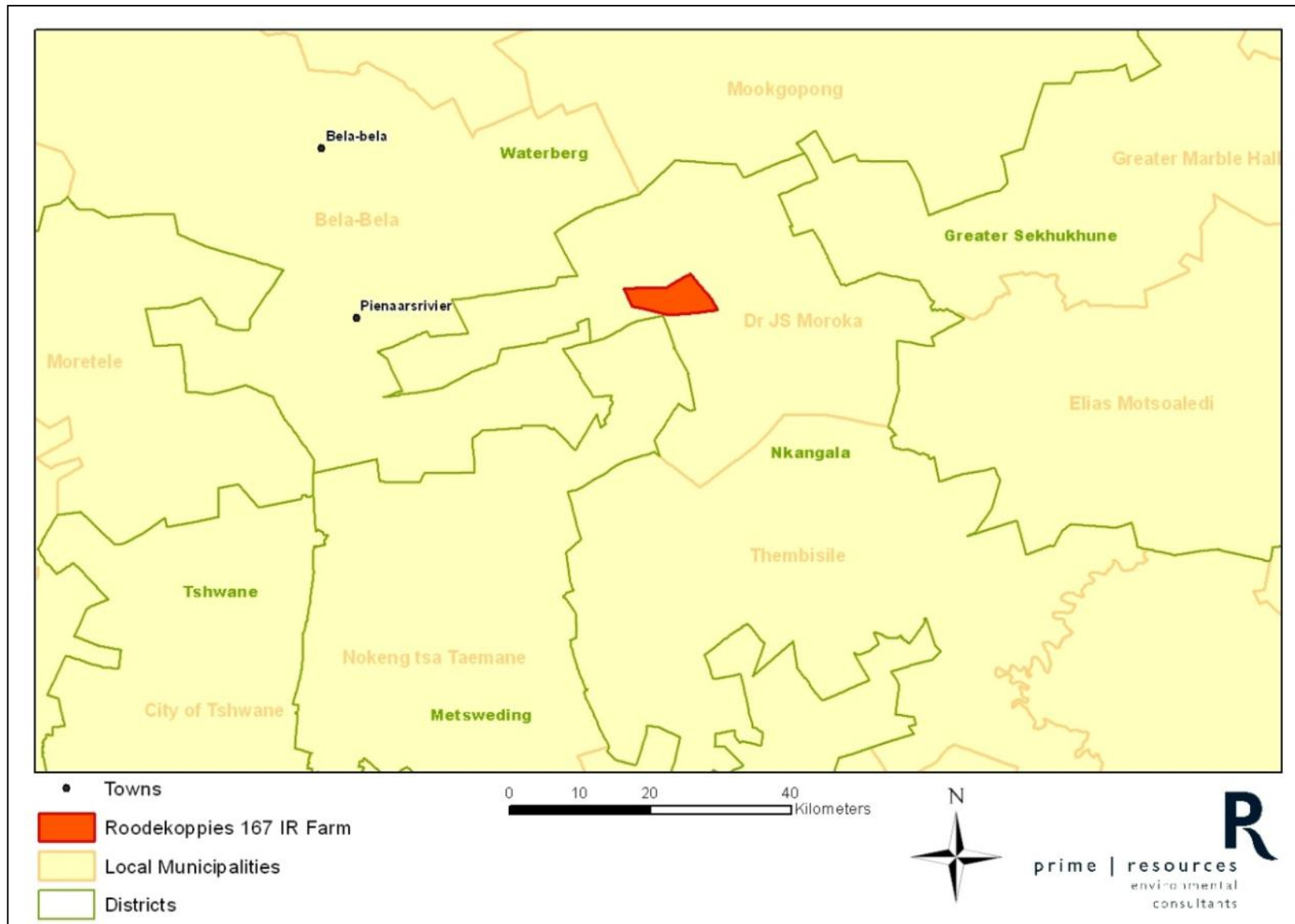


Figure 2: Location of Roodekoppies in Dr JS Moroka Local Municipality

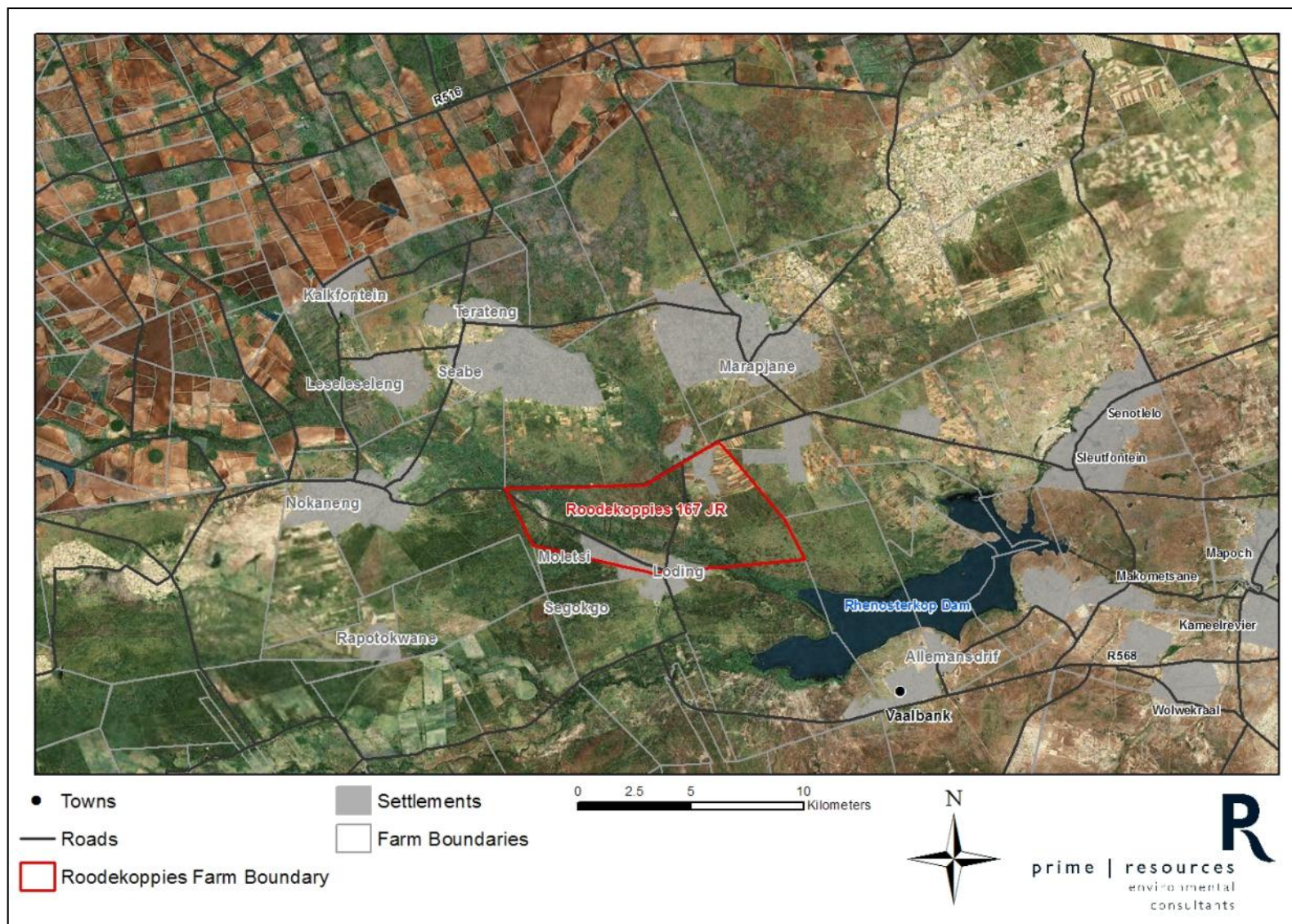


Figure 3: Locality plan of proposed Canyon Springs Project Area

1.4. Methodology

The environmental process to be followed has been based on the requirements as stipulated in the NEMA and Part 3 of the EIA Regulations (GN543 of 2010) for applications subject to Scoping and Environmental Impact Reporting. It should be noted that portions of the process were aligned where possible to meet the requirements of Section 39 of the MPRDA as part of the MRA.

A desktop study was conducted in order to gather as much baseline information regarding the proposed project area as possible. Following the data review conducted, site visits to the proposed project area were conducted by the project team in order to gauge the status quo of the project area in terms of the following:

- Current environmental status of the project area compared to that described in the desktop resources;
- The vulnerability of the area to negative environmental impacts with a particular focus on the activities associated with the proposed development;
- The location of the site with respect to the general land use in the area;
- Accessibility to the area by utilising existing primary and secondary roads;
- The presence of sensitive ecosystems;
- The presence of archaeological artefacts and historical sites; and
- Size of the area taking into consideration the type and nature of infrastructure requirements.

Where inadequate baseline information was available or further information deemed necessary, specialist service providers were appointed to conduct in-depth baseline studies of the project area (which included groundwater, surface water, heritage, wetlands and terrestrial ecology).

The development proposal and project description was then prepared with input from the Applicant and Turgis Mining Consultants (Pty) Ltd (now Royal Haskoning DHV), who were appointed to prepare a Bankable Feasibility Study for the proposed Canyon Springs Coal Mine which took cognisance of limits imposed in terms of sensitive environments and existing laws and statutory requirements.

The baseline information, project description, applicable legislation and potential impacts were utilised in the scoping phase public consultation process to inform surrounding landowners, nearby communities, the Authorities and any other Interested and Affected Parties (IAPs) of the proposed development and to gather issues, comments and concerns. Along with the baseline information, the issues identified through the public consultation process were used to inform the appointment of further specialist studies to conduct assessments of the significance of potential impacts and propose management measures and monitoring plans. The specialist studies were used to address the issues raised during scoping phase public consultation, the results of which have been included in this EMP and will be presented to IAPs in a follow up public consultation meeting.

2. LEGISLATION

2.1. Legal Requirements

South Africa's Constitution guarantees all citizens the right to an environment that is not harmful to their health and / or wellbeing; and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation. The Constitutional obligations of the State to protect the environment with respect to new development can only be met through the implementation, enforcement and monitoring of effective legislation.

In order to protect the environment and ensure that the proposed development is undertaken in an environmentally responsible manner, the following pertinent laws apply and guide this assessment. They are as follows:

2.1.1. The Mineral and Petroleum Resource Development Act (No. 28 of 2002)

The MPRDA is the key legislation in governing mining activities within South Africa. It details the requirements and processes which need to be followed and adhered to by mining companies. The DMR is the delegated authority that deals with all mining related applications.

The MPRDA by definition:

- Recognises that minerals and petroleum are non-renewable natural resources; acknowledging that South Africa's mineral and petroleum resources belong to the nation and that the State is the custodian thereof;
- Affirms the State's obligation to protect the environment for the benefit of present and future generations, to ensure ecologically sustainable development of mineral and petroleum resources and to promote economic and social development;
- Recognises the need to promote local and rural development and the social upliftment of communities affected by mining; and
- Reaffirms the State's commitment to reform to bring about equitable access to South Africa's mineral and petroleum resources.

As previously mentioned, a MRA for the proposed Canyon Springs Coal Mine was accepted by the DMR on 19 March 2012. The conditions of the acceptance included, *inter alia*:

- The submission of a Scoping Report on- or before 19 April 2012 which complies with Regulation 49 of GNR527, 2004 and the Guideline published by the Department on the matter;
- Consultation with IAPs in terms of the DMR's guideline on the matter, on- or before 19 September 2012; and
- The submission of an EIA / EMP in terms of Section 29 and 39(5), when read in conjunction with Regulations 50 and 51 of GNR527, 2004; and in terms of the Departmental Guideline, on- or before 19 September 2012.

The above timeframes were adhered to, with the result that, on 19 September 2012, an EIA / EMP for the proposed Canyon Springs Coal Mine was submitted to the DMR. The DMR subsequently requested clarification on a number of matters and that further information be provided in support of the EIA / EMP. As such, a revised EIA / EMP was submitted to the DMR on 18 of March 2013.

The above, together with the Social and Labour Plan (SLP) and Mining Works Programme were considered by the DMR and a mining right was granted on the 31st May 2013 (See Appendix 18).

2.1.2. The National Environmental Management Act (No. 107 of 1998) and the Environmental Impact Assessment Regulations (GNR543 of 2010)

This Act is enabling legislation intended to provide a framework for integrating environmental management into all developmental activities to promote co-operative environmental governance with regard to decision making by state organs on matters affecting the environment.

The principles of NEMA are laid out in Section 2:

- To avoid and minimise disturbance to ecosystems or loss of biological diversity and to rectify damage where possible;
- To avoid, minimise and remediate pollution and degradation;
- Avoid and minimise the creation of waste and to promote recycling and re-use where possible;
- Negative environmental impacts must be anticipated and prevented where possible, and where that is not possible, impacts must be minimised and remedied; and
- The social and economic impacts must also be considered together with environmental impacts of activities when making decisions.

These principles underpin the principle of Integrated Environmental Management (IEM). A vital component of the IEM principle is accountability to the various parties that may be interested in or affected by a proposed development. Public participation in the formulation of development proposals is a requirement of the IEM procedure, in terms of the identification of truly significant environmental impacts by IAPs.

The IEM procedure is designed to ensure that the environmental consequences of development proposals are understood and adequately considered during the conceptual design process, allowing negative aspects to be resolved or mitigated and positive aspects to be enhanced. It is thus a code of practice for ensuring that environmental considerations are fully integrated into all stages of development, by providing a procedural and regulatory mechanism for EIAs. These regulatory mechanisms are supplied in the form of the EIA Regulations and the subsequent listings which provide a toolkit for the assessment of impacts based on the scope of the project.

Section 28 of NEMA further stipulates that every person who causes-, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment. This section has been amended by the

National Environmental Laws Amendment Act, No. 14 of 2009, which stipulates (in item 12), that the aforementioned duty of care to remediate applies to any significant pollution or degradation which:

- Occurred before the commencement of the Act;
- Arises or is likely to arise at a different time from the actual activity that caused the contamination; or
- Arises through an act or activity of a person that results in a change to pre-existing contamination.

The EIA Regulations of GNR543, June 2010 (and corrected in December 2010), serve to regulate the procedure and criteria for submitting, processing and considering decisions for applications for environmental authorisation in order to avoid the commencement of activities which may have a detrimental impact on the environment. These Regulations provide details on the process to be followed for the consultation of stakeholders and IAPs, the identification of the competent authority and the various timeframes and application requirements for environmental authorisation. A further three Regulations, GNR544, 545, 546, provide lists of activities for which environmental authorisation, either in the form of a Basic Assessment or EIA and EMP, is required before the activity can commence.

The following activities in Table 1 listed in terms of the above are relevant to the proposed Canyon Springs Coal Mine:

Table 1: Listed activities at the proposed Canyon Springs Coal Mine in terms of the EIA regulations of 2010

LISTING NOTICE	ACTIVITY NUMBER	LISTED ACTIVITY	DESCRIPTION
GNR544	12	The construction of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50000 m ³ or more, unless such storage falls within the ambit of activity 19 of Notice 545 of 2010.	The combined capacity of potable-waste and service water facilities on-site will be greater than 50 000 m ³
GNR544	22	The construction of a road, outside urban areas, (i) with a reserve wider than 13,5 meters or, (ii) where no reserve exists where the road is wider than 8 m	The construction of access and haul roads associated with the site.
GNR545	5	The construction of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent and which is not identified in Notice No. 544 of 2010 or included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.	Activities on-site for which a Water Use License in terms of Section 21G of the National Water Act are required. Incl. stockpiling of coal and overburden, waste and water management facilities such as the temporary discard facility, the sewage and wastewater treatment plants and the return water- and pollution control dam
GNR545	15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 ha or more; except where such physical alteration takes place for: <ul style="list-style-type: none"> i. linear development activities; or ii. agriculture or afforestation where activity 16 in this Schedule will apply. 	The alteration of the current landscape for the development of the opencast pit and terraces for surface infrastructure will be greater than 20 ha
GNR545	22	Any activity which requires a mining right or renewal thereof as contemplated in sections 22 and 24 respectively of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	A mining right for the proposed Canyon Springs Coal Mine was granted as described in Section 2.1.1 above. It should be noted, however, that this activity has not yet been enacted.
GNR546	4	The construction of a road wider than 4 metres with a reserve less than 13.5 metres. ii. Outside urban areas, in: bb) National Protected Area Expansion Strategy Focus areas; gg) Areas within 10 kilometres	The construction of access and haul roads associated with the site which is situated closer than 5 km of the Mkhombo Nature Reserve and the National Protected Area Expansion

LISTING NOTICE	ACTIVITY NUMBER	LISTED ACTIVITY	DESCRIPTION
		from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of National Environmental Management: Protected Areas Act or from the core areas of a biosphere reserve.	Strategy Focus thereof.
GNR546	13	The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation in (b) National Protected Area Expansion Strategy Focus areas; c) ii Outside urban areas in Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve.	The land to be cleared for the proposed development is situated within 5 km of the Mkhombo Nature Reserve and the National Protected Area Expansion Strategy (NPAES) thereof. The land to be cleared is also situated in the Springbokvlakte Thornveld which is listed as a vulnerable ecosystem by the National Environmental Management Biodiversity Act No 10. of 2004.
GNR546	14	The clearance of an area of 5 ha or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation in a) i). All areas outside urban areas.	

Although the activities listed above in terms of GNR544 require that a Basic Assessment process be followed in terms of Part 2 of GNR543, Section 20(2)(c) of GNR543 stipulates that a Scoping, EIA and EMP process in terms of Part 3 of GNR543 must be followed if the application pertains to two or more activities as part of the same development and any of the activities is listed in terms of GNR545, as is the case (refer to Table 1).

An application for Environmental Authorisation for the aforementioned activities was accepted by the Competent Authority, i.e. the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET) on 6 June 2012 and has been allocated the reference number 17/2/3/E-154.

A Public Consultation Process in terms of Chapter 6 was undertaken to inform a Scoping Report prepared in terms of Section 28 of GN543. This Scoping Report and Plan of Study for EIA was accepted by MDEDET on 23 October 2012.

This EIA has thus been prepared to meet the requirements of GNR543, Section 31, as indicated below in Table 2:

Table 2: Requirements of GNR543 of the EIA Regulations

GNR543 SECTION 31	CONTENTS	CHAPTER
EIA		
2	An EIA report must contain all information that is necessary for the competent authority to consider the application and to reach a decision contemplated in regulation 35 and must include -	
2(a)	Details of (i) the EAP who compiled the report and (ii) the expertise of the Environmental Assessment Practitioner to carry out an EIA;	1.2
2(b)	A detailed description of the proposed activity;	4
2(c)	A description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is (i) a linear activity, a description of the route of the activity; or (ii) an ocean-based activity, the coordinates where the activity is to be undertaken	1.3
2(d)	A description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;	3 and 8
2(e)	Details of the public participation process conducted in terms of sub-regulation (1). Including (i) steps undertaken in accordance with the plan of study; (ii) a list of persons, organisations and organs of state that were registered as interested and affected parties; (iii) a summary of comments received from. and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments; and (iv) copies of any representations and comments received from registered interested and affected parties;	7
2(f)	A description of the need and desirability of the proposed activity;	6
2(g)	A description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity;	5
2(h)	An indication of the methodology used in determining the significance of potential environmental impacts;	8.2
2(i)	A description and comparative assessment of all alternatives identified during the EIA process;	5
2(j)	A summary of the findings and recommendations of any specialist report or report on a specialised process;	8
2(k)	A description of all environmental issues that were identified during the EIA process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures;	8
2(l)	An assessment of each identified potentially significant impact. Including (i) cumulative impacts; (ii) the nature of the impact; (iii) the extent and duration of the impact; (iv) the probability of the impact occurring; (v) the degree to which the impact can be reversed; (vi) the degree to which the impact may	8

GNR543 SECTION 31	CONTENTS	CHAPTER
	cause irreplaceable loss of resources; and (vii) the degree to which the impact can be mitigated;	
2(m)	A description of any assumptions, uncertainties and gaps in knowledge	9
2(n)	A reasoned opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	10
2(o)	An environmental impact statement which contains (i) a summary of the key findings of the EIA; and (ii) a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives;	10
2(p)	A draft EMP containing the aspects contemplated in regulation 33;	See Volume 2
2(q)	Copies of any specialist reports and reports on specialised processes complying with regulation 32;	Appendices
2(r)	Any specific information that may be required by the competent authority; and	None
2(s)	Any other matters required in terms of sections 24(4)(a) and (b) of the Act.	None

2.1.3. National Environmental Management: Air Quality Act (No. 39 of 2004)

The National Environmental Management Air Quality Act (NEMAQA) has placed the responsibility for air quality management on local authorities that will be tasked with baseline characterisation, management and operation of ambient monitoring networks, licensing of listed activities, and emissions reduction strategies. The main objective of the act is to ensure the protection of the environment and human health through reasonable measures of air pollution control within the sustainable (economic, social and ecological) development framework.

NEMAQA commenced on 11 September 2005 with the exclusion of the sections pertaining to the listing of activities and the issuing of atmospheric emissions licences. Listed Activities and associated Minimum Emission Standards were published in the Government Gazette on 31 March 2010 (No. 33064) as Section 21 of the Air Quality Act. The Atmospheric Pollution Prevention Act (APPA) of 1965 was repealed on the 1st of April 2010 bringing NEMAQA into full force.

The Act makes provision for the minister or Member of the Executive Council (MEC) to prescribe 'measures for the control of dust in specified places or areas, either in general or by *specified machinery or in specified instances*'. This can take the form of guidelines or standards. Guidelines provide a basis for protecting public health from adverse effects of air pollution and for eliminating, or reducing to a minimum, those contaminants of air that are known or likely to be hazardous to human health and wellbeing (World Health Organisation, 2000). Once the guidelines are adopted as standards, they become legally enforceable. These guidelines / standards prescribe the allowable ambient concentrations of pollutants which are not to be exceeded during a specified time period in a defined area. If the air quality guidelines/standards are exceeded, the ambient air quality is poor and the potential for health effects is greatest.

The National Ambient Air Quality Standards for the criteria pollutants were published in December 2009 (GNR1210, 2009). The values of the National Ambient Air Quality Standards, as well as reference methods and compliance dates for PM₁₀ (particulate matter with an aerodynamic diameter of less than 10 µm) are presented in Table 3.

Table 3: National Standards for Ambient Air Quality for PM₁₀ (GNR1210, 2009)

AVERAGING PERIOD	CONCENTRATION (µG/M ³)	FREQUENCY OF EXCEEDANCE	COMPLIANCE DATE
24 hour	120	4	Immediate
	75	4	1 Jan 2015
1 year	50	0	Immediate
	40	0	1 Jan 2015

The South African guidelines for Total Suspended Particulates (as measured by a high volume sampler) stipulate a 24 hour average of 300 µg/m³ and an annual average of 100 µg/m³.

The Draft National Dust Control Regulations were published in May 2011 (GNR309, 2011). They include the following prohibitions:

“No person may conduct any activity in such a way as to give rise to dust in such quantities and concentrations that –

1. The dust, or dust fall, has a detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage, or has contributed to the degradation of ambient air quality beyond the premises where it originates; or
2. The dust remains visible in the ambient air beyond the premises where it originates; or
3. The dust fall at the boundary or beyond the boundary of the premises where it originates exceeds –
 - a) 600 mg/m²/day averaged over 30 days in residential and light commercial areas, measured using reference method ASTM D1739; or
 - b) 1200 mg/m²/day averaged over 30 days in areas other than residential and light commercial areas, measured using reference method ASTM D1739.” (GNR 309, 2011)

The predicted air quality variables, in accordance with the National Standards listed above, for the Canyon Springs Coal Mine are further discussed in Sections 8.3.8 and 8.4.8 and suggested mitigation measures are proposed.

2.1.4. The National Heritage Resources Act (No. 25 of 1999)

The National Heritage Resources Act (NHRA) serves to protect and manage the South African heritage and cultural resources. These resources include places, buildings, structures and equipment of cultural significance, historical settlements and townscapes, archaeological and paleontological sites, graves and burial grounds. The Act protects any heritage resources from damage by developments by stipulating in Section 38 that any person intending on undertaking any form of development must, at the earliest stage of initiation, notify the South African Heritage Resources Association (SAHRA):

- A. the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- B. the construction of a bridge or similar structure exceeding 50 m in length;
- C. any development or other activity which will change the character of a site—
 - i. exceeding 5 000 m² in extent; or
 - ii. involving three or more existing erven or subdivisions thereof; or
 - iii. involving three or more erven or divisions thereof which have been consolidated within the past five years; or
 - iv. the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
- D. the re-zoning of a site exceeding 10 000 m² in extent; or
- E. any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority.

Of the developments listed above, items A and C (i) are invoked for the proposed Canyon Springs Coal Mine. Section 38(8) of the Act states that if heritage considerations are taken into account as part of an application process undertaken in terms of NEMA and the EIA process, there is no need to undertake a separate application in terms of the NHRA. As such, two studies were undertaken, a baseline assessment to establish a broad framework of the potential heritage of the proposed area for development, followed-up by a Phase 1 Heritage Impact Assessment to identify sites, assess their significance, make comments on the impact of the development and provide recommendations for mitigation or conservation. This Phase 1 report was submitted to SAHRA for review who, in turn, responded on the 4th December 2012, and requested that a Palaeontological Impact Assessment (PIA) be conducted or alternatively a specialist letter motivating exemption from completing a PIA. A Palaeontological Desktop Study was completed along with a letter motivating exemption from completing a PIA, which the department accepted on the 6th September 2013 (Appendix 16).

2.1.5. The National Water Act (No. 36 of 1998)

The National Water Act (NWA) regulates all matters relating to inland water resources. It thus operates as a management instrument with the lead authority being the Department of Water Affairs (DWA). This Act provides mechanisms for the prevention of the pollution of water resources to support the management of water as a renewable resource. Section 21 of the Act lists water uses for which authorisation is required from the DWA, while Section 39 identifies several water uses where the need for a license is dispensed with. The use of water for which a license is not required is also described.

Regulation 704 of 1999 provides regulations for the use of water for mining and related activities and is aimed to further protect water resources. These regulations describe how mining activities should be managed to protect water resources. The Act thus plays a crucial role in the mining process as many mining-related activities use water as listed in Section 21, thereby requiring approval from DWA. GN704 thus aims to protect water resources by:

Restrictions in terms of locality

- No mine residue, dam or associated structures may be placed within the 1:100 year flood-line or within a horizontal distance of 100 metres from any watercourse or borehole (aside from monitoring boreholes)
- No mining activities (opencast or related) can be undertaken within the 1:50 year flood-line or within a horizontal distance of 100 metres from any watercourse. This includes sewage facilities, pollution control dams, fuel storage facilities etc.
- No mine residue with pollution potential should be placed in the workings of any mine excavation

Restrictions on use of material

- Mine residue material or any related substance with contamination potential may be utilised for any construction on-site

Capacity of water systems

- Measures should be designed and implemented to separate polluted and unpolluted water. The size of dirty water catchments should be minimised
- All polluted water arising on-site must be retained in dirty water management facilities
- Dirty water management systems must be designed and constructed to accommodate a 50-year flood event and retain 0.8 m freeboard

Protection of water resources

- Polluted water arising on-site must not be allowed to contaminate any water resources
- All clean and dirty water systems and all mine residue deposits must be situated to prevent contamination of water resources
- Minimise ingress to mine workings from groundwater / surface water
- Recycle mine-water as far as possible
- Maintain water management systems to ensure efficiency thereof
- Engineer residue deposits, stockpiles and dams to so that the content thereon- / in will not cause any failure of the facility

A Water Use Licence Application (WULA) has been submitted for the proposed Canyon Springs Coal Mine for the following water uses identified in terms of Section 21 in Table 4:

Table 4: Water uses applied for at the proposed Canyon Springs Coal Mine

APPLICABLE SECTION OF NWA	DESCRIPTION OF WATER USE	APPLIES TO
Section 21(a)	Taking of water from a water resource	<ul style="list-style-type: none"> ▪ Groundwater removed during dewatering of the proposed opencast pits for the safety of men and materials during mining as per Section 21J (below) will be recycled on-site for use as part of the water balance to minimise the volume of make-up water required. ▪ Treated Sewage Effluent (TSE) from the Siyabuswa Wastewater Treatment Plant (WWTP) is to be utilised as bulk water supply for make-up water to the proposed Mine. This

APPLICABLE SECTION OF NWA	DESCRIPTION OF WATER USE	APPLIES TO
		TSE is currently discharged to the Elands River and thus forms part of the reserve for the catchment. Removal of a portion of this water for use at Canyon Springs can thus be considered as "Taking water from a water resource"
Section 21(c)	Impeding the flow of water in a watercourse	<ul style="list-style-type: none"> ▪ The proposed site for development is characterised by a number of watercourses (including rivers, streams and wetlands). Certain infrastructure associated with the development will be situated closer than 500m from certain wetland areas identified, however, the buffer zone prescribed by the wetland specialist will be observed (refer to Volume 2 EMP). ▪ A stream crossing / culvert will need to be constructed across the No-Name stream and associated wetland in order to access the resources at Pit 1.
Section 21(i)	Altering the characteristics of a watercourse	
Section 21(g)	The disposal / handling of waste or water containing waste that may potentially impact on a water resource	<ul style="list-style-type: none"> ▪ A number of facilities on-site entail the handling, storage and disposal of waste or water containing waste which has the potential to impact on the associated water resources. These include: <ul style="list-style-type: none"> ○ Pollution Control Dam (PCD) ○ Stormwater Control Dam (SCD) ○ Temporary Discard Dump ○ Sewage Treatment Plant ○ Wastewater Treatment Plant ○ Dust suppression on roads using water from the PCD ○ Shale Stockpile ▪ Further to the above, and in terms of GN704, the Applicant intends on backfilling discard material from coal beneficiation into the opencast excavations as part of rollover mining with the intention of having no residue facility on surface post-closure. Four evaporation pans will be created, one over each of the backfilled pits in order to manage the potential impact of Acid Mine Drainage (AMD). These conceptual designs are further discussed in Volume 2 (EIA).
Section 21(j)	Dewatering of mine workings for the safety of men, materials and to ensure the efficiency of mining	<ul style="list-style-type: none"> ▪ Dewatering of the opencast workings.

A complete Integrated Water Use Licence Application (IWULA) was submitted to the DWA in May 2013. This submission was acknowledged by DWA on the 7th June 2013 and additional copies were requested. These additional copies were submitted to the DWA on the 19th July 2013.

A letter was received from the DWA dated the 19th December 2013 requesting additional information. A meeting was conducted with Mr Dumisane Hlongwane on the 7th of March 2014, where the above information was provided to the DWA and included into the existing IWULA.

A follow up letter was received from the DWA on the 7th March 2014 requesting 2 additional copies of the IWULA and a wetland rehabilitation plan. These were submitted to the DWA on the 8th April 2014. The required wetland rehabilitation plan is discussed in Volume 2 (EMP)

2.1.6. The National Environmental Management: Waste Act (No. 59 of 2008)

The National Environmental Management: Waste Act (NEMWA) No. 59 of 2008 serves to reform the laws regulating waste management in order to protect public and environmental health by providing measures for the prevention of pollution and ecological degradation and to provide defining requirements for the licensing and control of waste management activities.

This Act succeeds Section 20 of the Environmental Conservation Act, no. 73 of 1989 and provides measures for waste management covering the various aspects of activities which generate waste. The schedule to the Act provides categories of activities for which require a waste management license while also identifying the relevant environmental authorisations which are further required for said activities. The Act is regulated by the Competent Authority, being the Department of Environmental Affairs (DEA) (for hazardous-waste related and Category B Activities) or the local branch thereof (in this case the MDEDET) for general and Category A Activities.

The applicable activities at the proposed Canyon Springs Coal Mine regulated in terms of NEMWA pertain to the temporary handling and transfer facilities for general (domestic) and industrial hazardous waste storage (used fuels, hydrocarbons and lubricants associated with heavy equipment and machinery) at the mine, although the capacities of these facilities will remain below the minimum threshold for licensing (i.e. 100 m³ and 35 m³ respectively). Should these thresholds prove prohibitive, the Applicant will design facilities with greater capacity and submit an application in terms of NEMWA to the DEA.

Further to the above, the proposed Canyon Springs Coal Mine has received approval-in-principal from the DWA to utilise TSE from the DWA owned and Dr JS Moroka Local Municipality- operated Siyabuswa WWTP as a bulk-water supply to the proposed mine and to be included in the WULA. The requirement for the further licensing of this activity (i.e. whether authorisation in terms of both the NWA and NEMWA as per Table 5 below would be required) is to be further established.

Table 5: Listed activities of the National Environmental Management Waste Act triggered by the Canyon Springs Coal Mine

LISTING NOTICE	ACTIVITY NUMBER	LISTED ACTIVITY	DESCRIPTION
GNR718	Category B, Item 7	The treatment of effluent, wastewater or sewage with an annual throughput capacity of 15 000 cubic meters or more.	The Applicant has agreed to effect certain upgrades at the Siyabuswa WWTP in order to filter the TSE before pumping it to site. Once on-site, the Treated Sewage Effluent will be treated to the necessary standard for use in beneficiation activities at the wastewater treatment plant on-
	Category B,	The construction of facilities	

LISTING NOTICE	ACTIVITY NUMBER	LISTED ACTIVITY	DESCRIPTION
	Item 11	for activities listed in Category B of this Schedule.	site.
GNR718	Category A, Item 11	The treatment of effluent, wastewater or sewage with an annual throughput capacity of more than 2000 cubic meters but less than 15 000 m ³ .	A sewage treatment plant will be constructed near the office block and plant at the proposed Canyon Springs Coal Mine to cater for the staff facilities on site.

2.1.7. The National Environmental Management: Biodiversity Act (No. 10 of 2004)

The National Environmental Management: Biodiversity Act (NEMBA), 2004 (Act No. 10 of 2004) has introduced a suite of new legal tools for biodiversity conservation outside protected areas, including listed threatened or protected ecosystems, listed threatened or protected species, bioregional plans, biodiversity management plans for ecosystems or species, and biodiversity management agreements.

NEMBA allows the Minister or a MEC to list these threatened or protected ecosystems. The current list consists of national threatened ecosystems identified based on national criteria. NEMBA further provides for listing of threatened or protected ecosystems in one of the following categories:

- critically endangered (CE) ecosystems, being ecosystems that have undergone severe degradation of ecological structure, function or composition as a result of human intervention and are subject to an extremely high risk of irreversible transformation;
- endangered (EN) ecosystems, being ecosystems that have undergone degradation of ecological structure, function or composition as a result of human intervention, although they are not CE ecosystems;
- vulnerable (VU) ecosystems, being ecosystems that have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention, although they are not CE ecosystems or EN ecosystems; and
- protected ecosystems, being ecosystems that are of high conservation value or of high national or provincial importance, although they are not listed as CE, EN or VU.

The purpose of listing threatened ecosystems is primarily to reduce the rate of ecosystem and species extinction. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems. The criteria and thresholds for nationally threatened ecosystems are summarised in Table 6.

Table 6: Criteria used to characterise nationally threatened ecosystems

CRITERION	CE	EN	VU
A1: Irreversible loss of natural habitat	Remaining natural habitat = biodiversity target	Remaining natural habitat= (biodiversity target + 15 %)	Remaining natural habitat= 60 % of original area of ecosystem

CRITERION	CE	EN	VU
A2: Ecosystem degradation and loss of integrity	60 % of ecosystem significantly degraded	40 % of ecosystem significantly degraded	20 % of ecosystem significantly degraded
B: Rate of loss of natural habitat			
C: Limited extent and imminent threat		Ecosystem extent= 3 000 ha and imminent threat	Ecosystem extent= 3 000 ha and imminent threat
D1: Threatened plant species associations	80 threatened Red Data List Plant Species	60 threatened Red Data List Plant Species	40 threatened Red Data List Plant Species
D2: Threatened animal species associations			
E: Fragmentation			
F: Priority areas for meeting explicit biodiversity targets as defined in systematic biodiversity plan	Very high irreplaceability and high threat	Very high irreplaceability and medium threat	Very high irreplaceability and low threat

Threatened Species

Chapter 4, Part 2 of NEMBA provides for listing of species as threatened or protected species. If a species is listed as threatened, it must be further classified as CR, EN or VU. The Act defines these classes as follows:

- CE: any indigenous species facing an extremely high risk of extinction in the wild in the immediate future.
- EN: any indigenous species facing a high risk of extinction in the wild in the near future, although it is not a CE species.
- VU: any indigenous species facing an extremely high risk of extinction in the wild in the medium-term future; although it is not a CE species or an EN species.
- Protected: any species which is of such high conservation value or national importance that it requires national protection. Species listed in this category will include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Certain activities are regulated on these listed species, via permits obtained under NEMBA Regulations. Restricted activities include the keeping, moving, damaging/harming, having in possession, importing and exporting, and selling of species.

The Canyon Springs Mining Area largely lies within an ecosystem classified as 'least concern' which is not EN, protected or VU and the presence of any such species identified in terms of the Act are further discussed in Section 3.5 below.

An ecological specialist study (Appendix 1A) have identified that the study area is situated in Springbokvlakte Thornveld which is considered an EN vegetation unit. Flora and fauna recorded in

the study area included provincially as well as nationally protected species and a permit is required to remove, cut or destroy these species (Section 3.5.1). This impact may be mitigated through the use of a Plant Rescue & Relocation Plan.

2.1.8. The National Forest Act, 1998 (No. 84 of 1998)

The National Forest Act, 1998 (No. 84 of 1998) enforces the protection of a number of indigenous trees. The removal, thinning or relocation of protected trees will require a permit from the Department of Agriculture, Forestry and Fisheries (DAFF). One protected tree species was identified within the proposed project area, thus prior authorisation from the DAFF will be required should the proposed development necessitate the removal of these species. Refer to section 3.5.1 for detailed findings of the ecological assessment.

2.1.9. Mine Health and Safety Act (No. 29 of 1996)

The Mine Health and Safety Act and the Regulations (GNR992, 1970 and GNR93, 1997) provide for protection of the health and safety of employees and other persons at mines and, for that purpose to promote a culture of health and safety; to provide for the enforcement of health and safety measures; to provide for appropriate systems of employee, employer and State participation in health and safety matters; to establish representative tripartite institutions to review legislation, promote health and enhance properly targeted research; to provide for effective monitoring systems and inspections, investigations and inquiries to improve health and safety; to promote training and human resources development; to regulate employers' and employees' duties to identify hazards and eliminate, control and minimise the risk to health and safety; to entrench the right to refuse to work in dangerous conditions; and to give effect to the public international law obligations of the Republic relating to mining health and safety. The Applicant will ensure that operations on site are in line with the requirements of the Act and Regulations by compiling and implementing health and safety policies which are in line with the Act and Regulations thereof.

2.1.10. Hazardous Substances Act (No. 15 of 1973)

This Act aims to control substances that may cause injury, ill-health, or death through their toxic, corrosive, irritant, strongly sensitising or flammable nature, or by the generation of pressure. The Act provides for the division of such substances or products into groups in relation to the degree of danger as well as the prohibition and control of the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of such substances and products. Hazardous materials such hydrocarbons will be stored and handled on site. The Applicant will ensure that any hazardous materials on site are handled and stored in a manner in line with the Act and Regulations thereof.

3. DESCRIPTION OF THE PRE-OPERATION ENVIRONMENT

3.1. Introduction

This chapter describes the baseline conditions of the environment likely to be affected by the proposed development, both from desktop research and the available specialist studies conducted. This section will also highlight any sensitive environments identified.

3.2. Climate

The Canyon Springs Project area climate is typical of that for the greater Mpumalanga Province, which is sub-tropical.

3.2.1. Local Wind Field

The predominant wind direction (as predicted by the MM5 regional scale model) is between north-easterly and easterly for about 48% of the time (Figure 4). Average hourly wind speed is about 3.16 m/s. Maximum hourly winds (between 5 and 8 m/s) tend to blow from the predominant north-easterly to easterly directions and occasionally from the west-south-west.

Minimal seasonal variation in wind direction is expected. Hourly wind speeds pick up during spring and summer and calm down during autumn and winter. Lowest wind speeds and maximum calm conditions are expected from April to July. The dominant wind direction of north-easterly to easterly does not change with season, although, winds from the east-north-east tend to dominate in the warmer months, while proportionally, winds tend to veer (move in a clockwise direction) to an easterly and even east-south-easterly direction in the colder months.

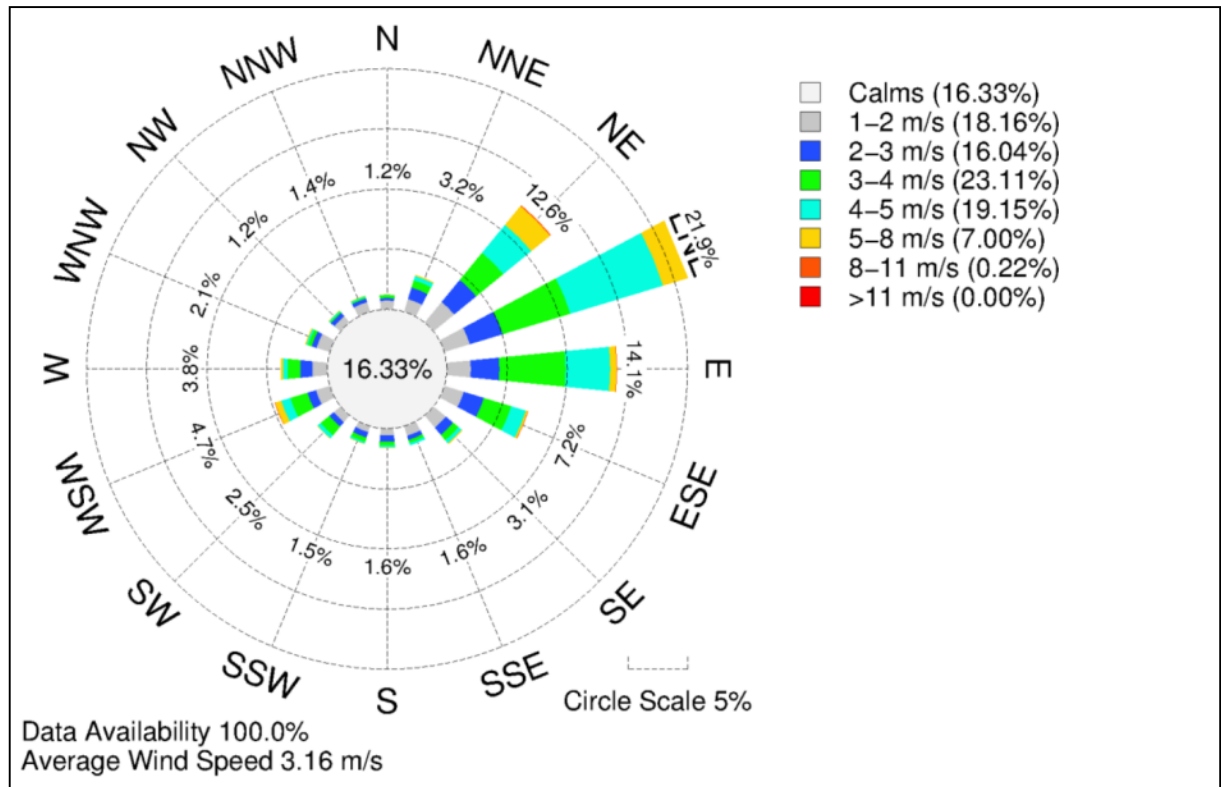


Figure 4: A wind rose of average hourly winds as predicted by the MM5 regional scale model for the proposed project site

3.2.2. Temperature

The monthly distribution of average daily maximum temperatures (Figure 5) shows that the average midday temperatures for Bela-Bela range from 19.9°C in June to 28.8°C in January. The region is the coldest during July when the mercury drops to 2.7°C on average during the night. Consult the chart below (lower right) for an indication of the monthly variation of average minimum daily temperatures (SA Explorer, 2011).

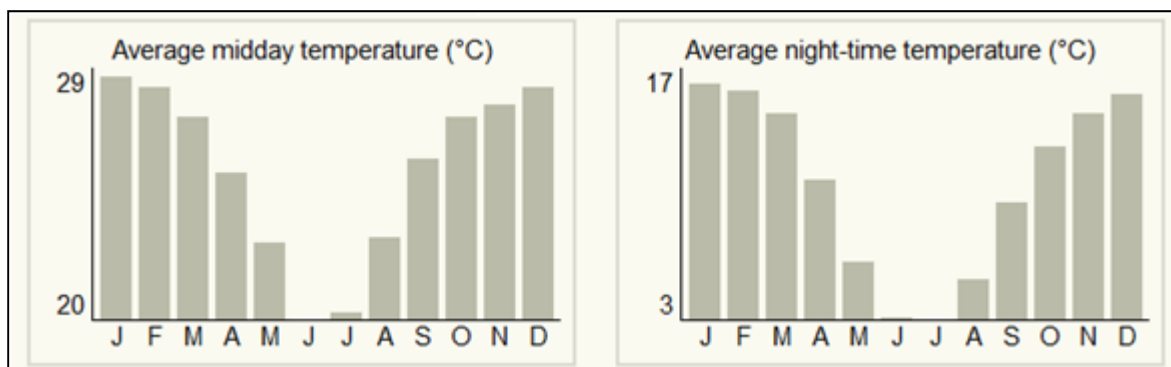


Figure 5: Average annual temperatures for Bela-Bela

3.2.3. Rainfall

According to the Surface Water Report by African Environmental Development, the average annual rainfall (Figure 6) and evaporation (Figure 7) in the proposed project area (Rhenosterkop Dam)

vary significantly from year to year and also over significant periods of time (several years). In general, when the rainfall increases, the evaporation decreases and vice versa and over the period 1985 – 2012 the rainfall has gradually increased and the evaporation decreased. The average rainfall over time in the area is 520 mm per annum and the average S-Pan evaporation over time is 2109 mm per annum.

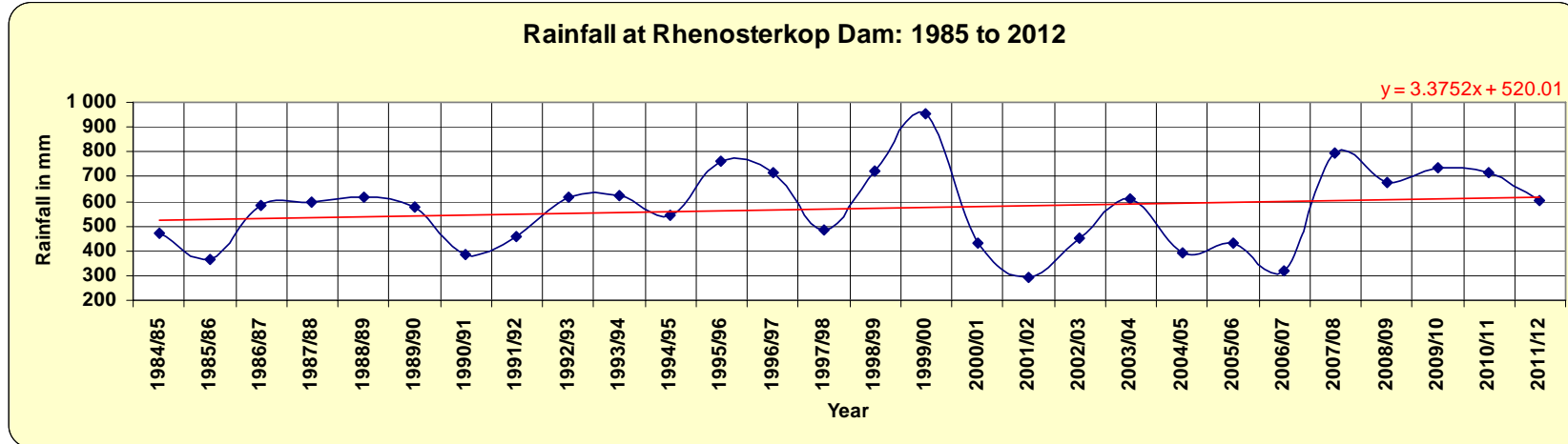


Figure 6: The rainfall recorded at the Rhenosterkop Dam by DWA show an increasing trend (red line) over the period 1985 – 2012

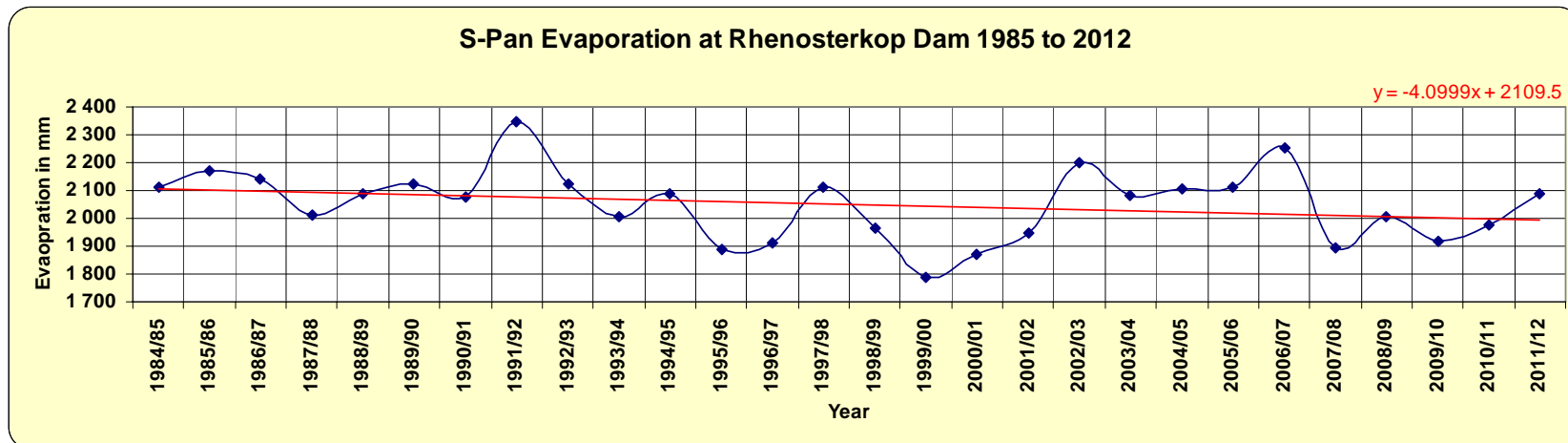


Figure 7: The evaporation recorded at the Rhenosterkop Dam by DWA show a decreasing trend (red line) over the period 1985 – 2012

3.3. Topography

The Canyon Springs Coal Mine project area is situated within the Bushveld region of the Mpumalanga Province. The topography of the specific target area is characterised by a flat surface with an average elevation of 800 meters above sea level (Figure 8). There are no pronounced geomorphological features except for a hill to the north of the project area.

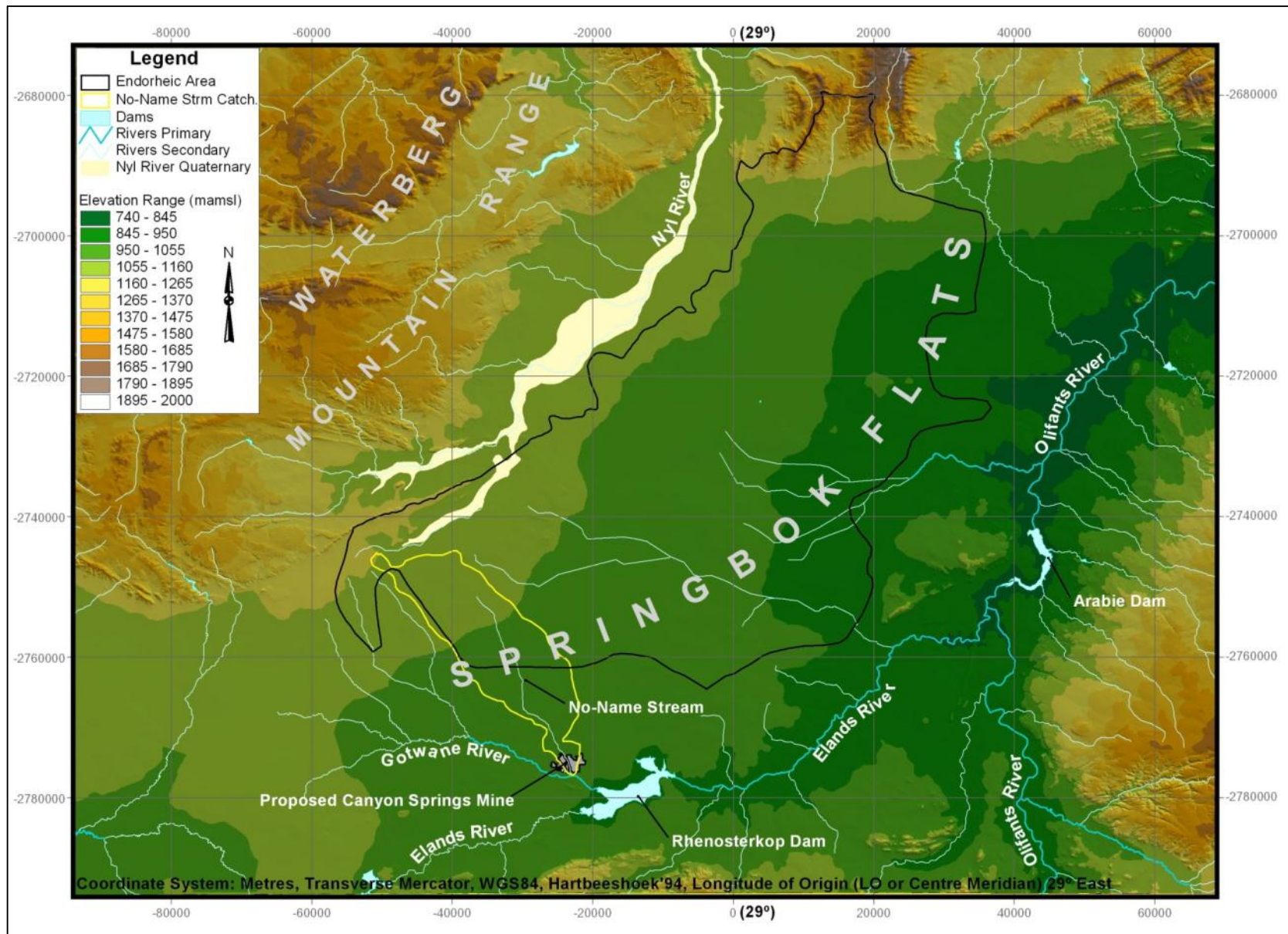


Figure 8: Topographical map of the Springbok Flats region

3.4. Geology

3.4.1. Regional geology

The regional geology consists of various groups within the Karoo Supergroup as well as dolerite intrusions, occurring as both dykes and sills. The Canyon Springs Coal Mine project falls within the Springbok Flats Coalfield (Figure 9) within the Karoo Basin. Primarily due to the nature and depth of the coal zone in the Springbok Flats Coalfield, conventional underground mining is currently not an option. About 15% (1 210 Mt) of the coal occurs within the opencastable range (0–75 m) in small resource blocks around the edges of the basin.

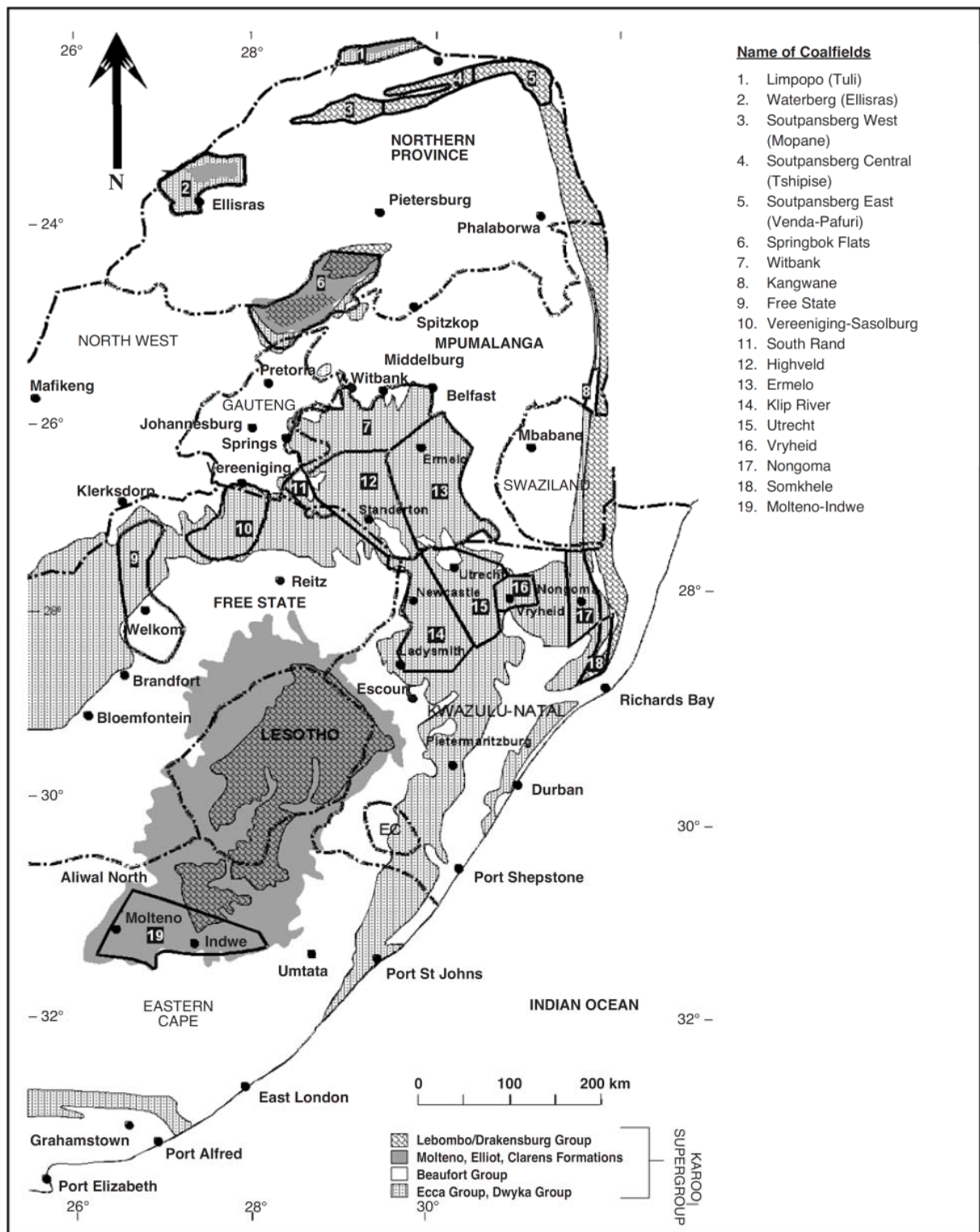


Figure 9: Coalfields of South Africa (Jeffrey, L.S. 2005)

3.4.2. Local Geology

The Canyon Springs Coal Mine is underlain by the Ecca Formation consisting of shales, shaley sandstone, grit, sandstone and conglomerate with coal in places near the base and the top (Figure 10).

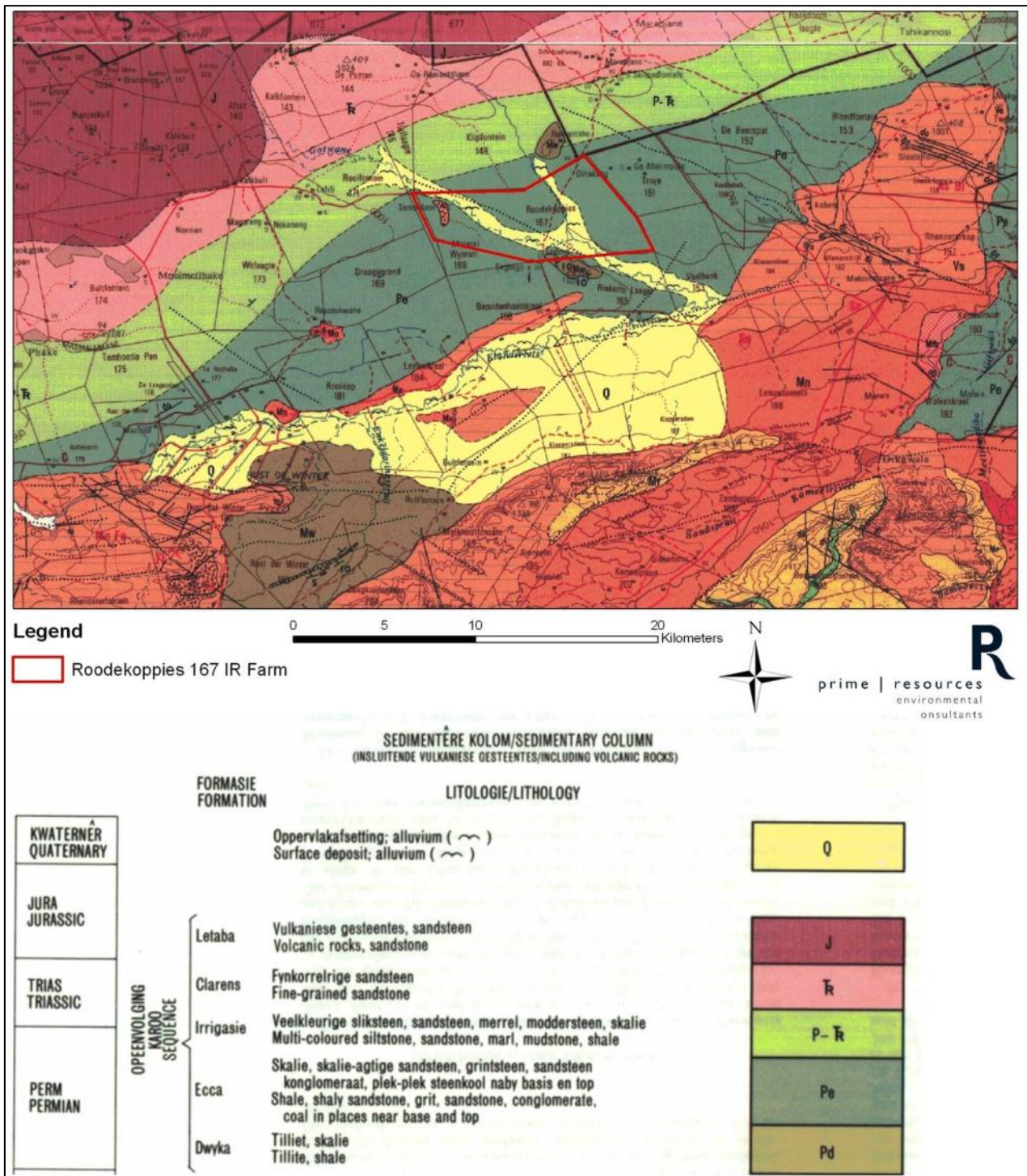


Figure 10: The Geology Underlying the Canyon Springs Project Area

3.5. Terrestrial Biodiversity

Ecological studies were conducted by Strategic Environmental Focus in November 2011 and February 2012 to assess the fauna, flora and wetland systems within the proposed Canyon Springs project area. A follow up study was completed in April 2013 (these studies are included as Appendix 1A and 1B respectively).

3.5.1. Flora

3.5.1.1. Regional Vegetation

The proposed Canyon Springs Coal Mine area lies within the Springbokvlakte Thornveld ecosystem, which is classified as VU in terms of NEMBA. According to the Mpumalanga Biodiversity Sector Plan (MBSP, released in 2013), this ecosystem has been further divided into Protected Areas, Critical Biodiversity Areas (CBA) Irreplaceable, CBA Optimal, Ecosystem Support Area (ESA) Landscape Corridor, ESA Local Corridor, ESA Species Specific, Other Natural Areas, Moderately Modified and Heavily Modified (Figure 11).

The Springbokvlakte Thornveld is characterised as open to dense thorn savannah dominated by *Acacia* species or shrubby grassland with a low shrub layer. Approximately 1% of the vegetation unit is statutorily conserved in the Mkombo Nature Reserve. At least 50% of this vegetation unit has been transformed by cultivation and urban sprawl.

The natural areas within the study site comprise mixed savannah with areas of open and closed woodland, a few watercourses including rivers, a floodplain and a small dam with associated riparian vegetation, as well as a rocky outcrop in the north. Disturbed and transformed areas included rural settlements and cultivated fields.

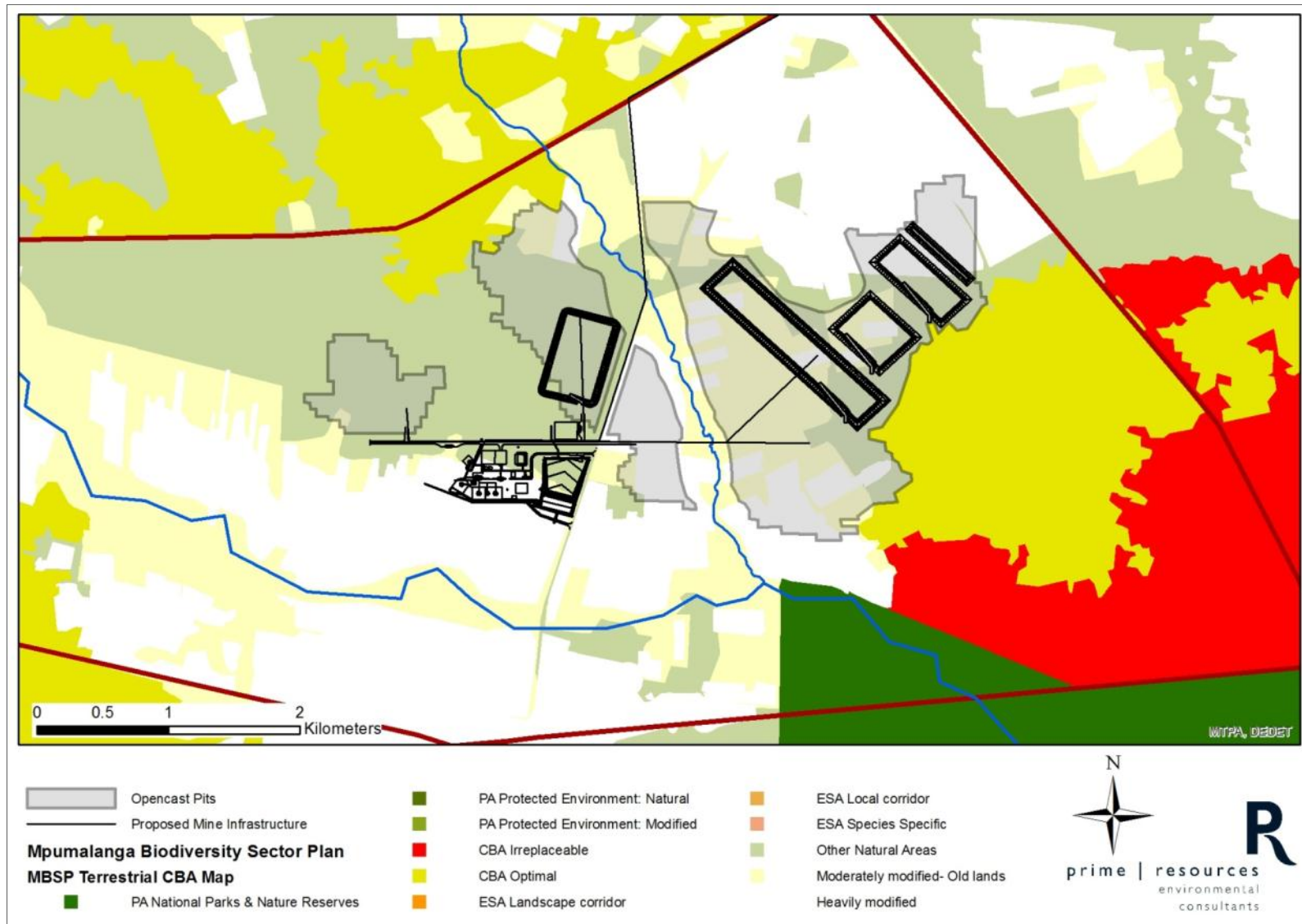


Figure 11: Mpumalanga Biodiversity Sector Plan in relation to the proposed project area

Four vegetation communities were found within the study area (Figure 12) and are discussed as follows:

Valley Bottom Floodplain

The valley bottom floodplain is associated with low laying areas and drainage lines. The *Acacia* thornveld is dominated by species such as *Acacia karoo*, *Acacia mellifera* subsp. *detinens*, *Acacia tenuispina* and *Acacia tortillis* subsp. *heteracantha*, while *Ziziphus mucronata*, *Boscia foetida* subsp. *rehmannia*, *Peltophorum africana* and *Tachonanthus camphoratus* were frequently found in the area. The grass layer is severely over-grazed leading to the formation of *Gymnosporia glaucophylla* thickets.

Open Shrubland

The vegetation community in the south eastern section of the Roodekoppies farm also consists of *Acacia* thornveld, but is less severely overgrazed resulting in a well-developed grass and shrub layer. *Boscia foetida* subsp. *rehmannii* is common throughout this vegetation community and large areas are infested by *Cereus jamacaru* (Queen of the night). The grass layer consists of *Themeda triandra*, *Schiachyrium sanguineum*, *Aristida congesta*, *Heteropogon contortus* and *Aristida diffusa*. This vegetation community is located within the portion of the study area which is earmarked for protection by the NPAES and is classified as "Highly Significant" by the Mpumalanga Biodiversity Conservation Plan (MBCP, 2007) (Figure 11).

Rocky Outcrops

The rocky outcrops and surrounding areas in the northern portion of the study area support unique species which have not been observed in the *Acacia* thornveld or open shrubveld. On the lower slopes of the rocky outcrops, vegetation is dominated by *Terminalia sericea*, *Mundulea sericea*, *Dodonaea angustifolia*, *Combretum hereroense* and *C. zeyheri*. Large infestations by *Agave americana* var. *americana* (American Agave) was observed in the disturbed areas around the base of the rocky outcrops. The rocky area supports unique species such as *Vitex pooara* (Waterberg Pooaraberry), *Burkea africana*, *Bridelia mollis*, *Combretum molle*, *Lannea discolor*, *Ochna pulcra*, *Searsia (Rhus) zeyheri*, *Strychnos cocculoides* and *Strychnos pungens* all of which are limited to the upper part of the rocky outcrops. The provincially protected *Orbea lutea* and *Gladiolus pretoriensis* are found on top of the rocky outcrops.

Cultivated/Transformed Areas

Cultivated or transformed areas are present throughout the study area and include human settlements and areas transformed through agricultural activities e.g. the cultivation of maize. A high number of alien plant species such as *Agave americana* var. *americana* (American Agave), *Agave sisalana* (Sisal), *Opuntia ficus-indica* (Sweet prickly pear), *Cereus jamacaru* (Queen of the night) and *Melia azedarach* (Seringa) are present in the areas around human settlements. Although low species diversity was recorded for these areas, large individuals of the protected tree, *Acacia erioloba* (Camel Thorn) are present in the cultivated fields.

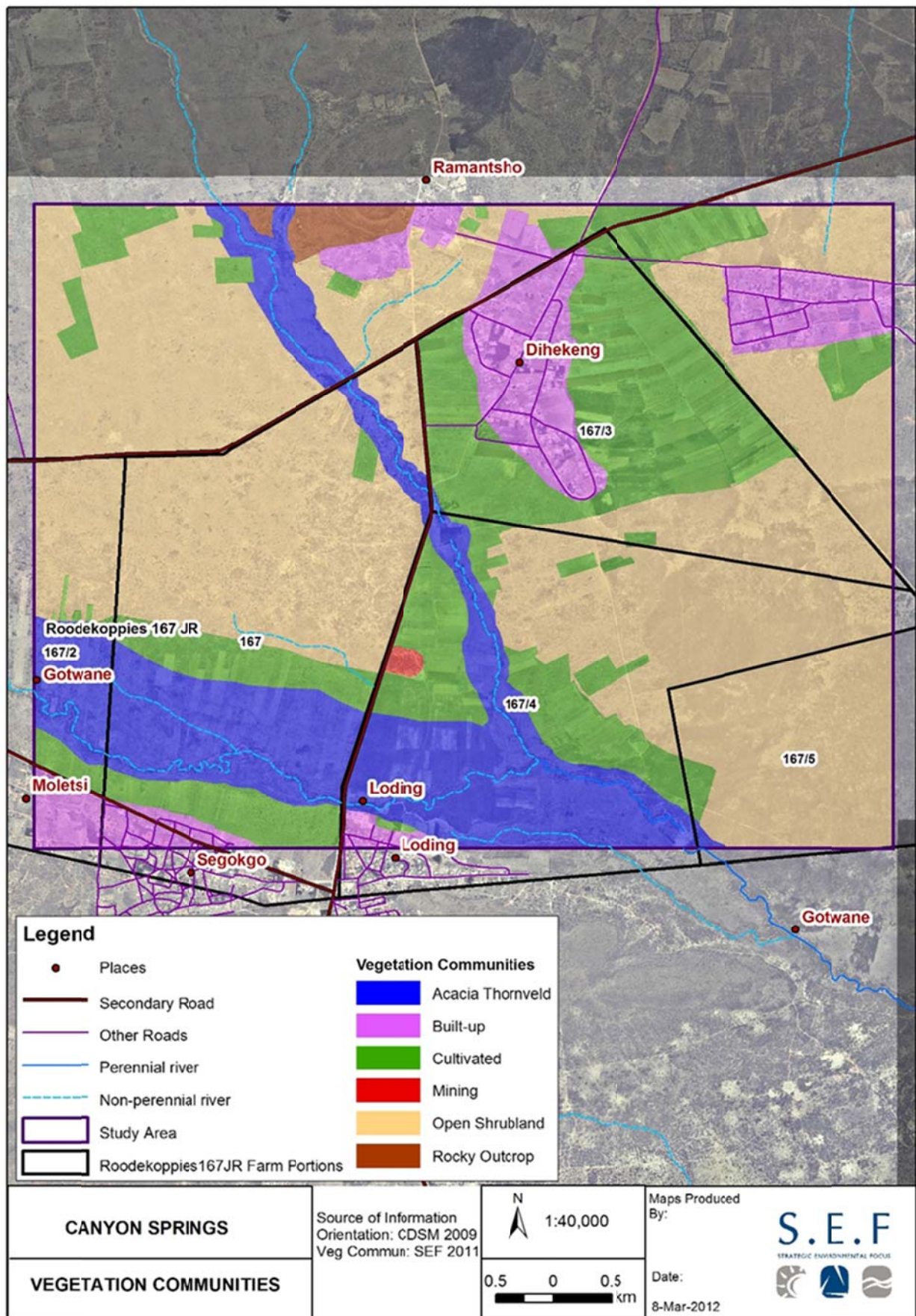


Figure 12: Vegetation communities in the project area

3.5.1.2. Plants of Conservation Concern (Threatened Plant Species)

Plants of conservation concern (previously termed Red Data Plants) are those plants that are important for South Africa's conservation decision making processes and include all plants that are Threatened (CE, EN, and VU), Extinct in the Wild, Data Deficient, Near Threatened, Critically Rare, Rare and Declining. Some of these plants are nationally protected by the NEMBA. Table 7 lists the species potentially associated within the Roodekoppies farm area that are considered of conservation concern:

Table 7: Species of conservation concern that could occur on the site

SCIENTIFIC NAME	CONSERVATION STATUS	TYPICAL HABITAT	OCCURRENCE ON SITE
<i>Stenostelma umbelluliferum</i>	Near Threatened	Deep black turf in open woodland mainly in the vicinity of drainage lines. Has been recorded in Pretoria North and adjacent areas in the North West Province.	Likely to occur along drainage lines
<i>Acacia erioloba</i>	Declining	Savanna, semi-desert and desert areas, deep sandy soils and along drainage lines in very arid areas, sometimes in rocky outcrops. Widespread in the drier areas of the northern provinces of South Africa.	Confirmed in three locations (refer to Figure 17)
<i>Crinum macowanii</i>	Declining	Mountain grassveld and stony slopes in hard dry shale, gravelly soil or sandy flats	Recorded within the Quarter Degree Square of Roodekoppies farm. Likely to occur along drainage lines in areas with limited clay on the study site
<i>Lydenburgia cassinoides</i>	Near Threatened	Exposed norite bedrock and dolomite. Roossenekal to Strydpoort Mountains.	Has been recorded within the Quarter Degree Square of the site (POSA, 2011). Possible occurrence in the vicinity of the koppie on the northern boundary of the Roodekoppies farm, however, unlikely to occur on most of the site.

3.5.1.3. Provincially Protected Plants

A number of plants that were identified within the study areas are not threatened, but are protected by Schedule 11 of the Mpumalanga Nature Conservation Act, 1998 (Act No. 10 of 1998).

The plants are listed in Table 8 and may not be removed, picked, pruned or destroyed without permission or a permit from the Mpumalanga Tourism and Parks Agency (MTPA) (Figure 13).

Table 8: Provincially protected plants recorded in the Roodekoppies farm

SPECIES	PROTECTION	OCCURRENCE WITHIN ROODEKOPPEIS FARM
<i>Aloe greatheadii</i>	All Aloes naturally occurring in Mpumalanga	Widespread in study area
<i>Gladiolus pretoriensis</i>	Genus	Rocky outcrops
<i>Orbea cf lutea</i>	Whole genus	Rocky outcrops
<i>Adenia digitata</i>	Whole genus	Acacia thornveld

In addition to the occurrence of the above species, *Adenia digitata* (Wild Granadilla) has also been confirmed to occur within the study site.

3.5.1.4. Nationally protected trees

The National Forest Act, 1998 (Act No. 84 of 1998) enforces the protection of a number of indigenous trees. The removal, thinning or relocation of protected trees will require a permit from the DAFF.

The study site provides suitable habitat for the protected tree *Boscia albitrunca* (Witgat / Shepard's Tree). Although the tree was not identified during the surveys, it could potentially occur within the area. A close relative, which is not a protected tree, *Boscia foetida subsp. rehmanniana* (Stink Witgat / Stink Shepard's Tree) was observed to occur throughout most of the study site. *Acacia erioloba* (Camel Thorn) (Figure 13) was recorded at three localities within the study area as shown in Figure 17.

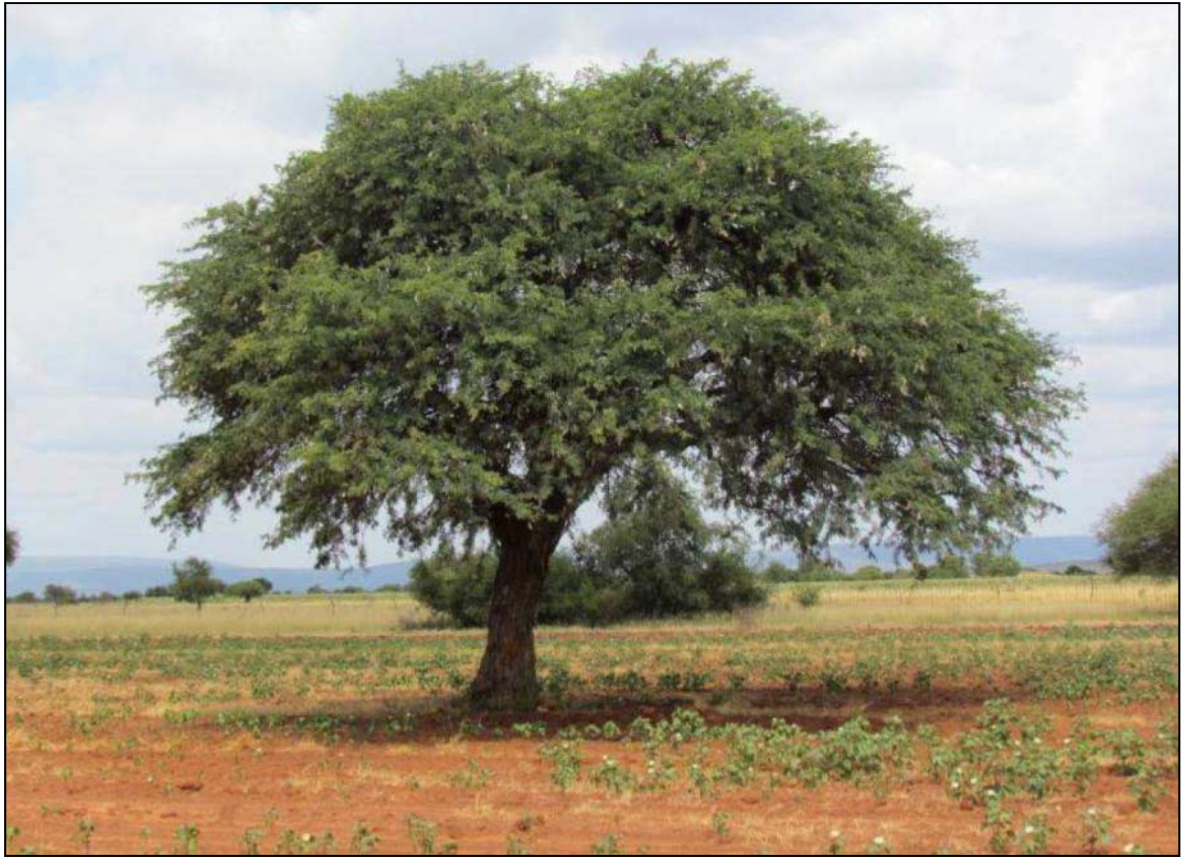


Figure 13: Acacia erioloba in cultivated fields within the project area

3.5.1.5. Alien invasive species

Declared weeds and invaders have the tendency to dominate or replace the herbaceous layer of natural ecosystems, thereby transforming the structure, composition and function of natural ecosystems. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species. It is therefore important that all these transformers be eradicated and controlled by means of an eradication and monitoring programme.

The amended Regulations (Regulation 15) of the Conservation of Agricultural Resources Act (No. 43 of 1983) identifies three categories of problem plants:

- Category 1 plants may not occur on any land other than a biological control reserve and must be controlled or eradicated. Therefore, no person shall establish, plant, maintain, propagate or sell / import any Category 1 plant species;
- Category 2 plants are plants with commercial application and may only be cultivated in demarcated areas (such as biological control reserves) otherwise they must be controlled; and
- Category 3 plants are ornamentally used plants and may no longer be planted, except those species already in existence at the time of the commencement of the regulations (30 March 2001), unless they occur within 30 m of a 1:50 year flood line and must be prevented from spreading.

Thirteen alien invasive species were recorded during the field survey (Table 9).

Table 9: Alien invasive plant species recorded in the project area

SCIENTIFIC NAME	COMMON NAME	LOCALITY IN ROODEKOPPIES	CATEGORY
<i>Agave americana</i> var <i>americana</i>	American Agave	Widespread, especially around human settlements	Special effect weed (Competitor and visual impact)
<i>Agave sisala</i>	Sisal	Around human settlements	2
<i>Bidens bipinnata</i>	Black-jack	Widespread in disturbed areas	Weed
<i>Catharanthus roseus</i>	Periwinkle	Widespread around human settlements	Weed
<i>Cereus jamacaru</i>	Queen of the night	Widespread throughout study area	1
<i>Conyza bonariensis</i>	Flax-leave Fleabane	Widespread in disturbed areas	Weed
<i>Datura stramonium</i>	Thorn Apple	Drainage lines and disturbed areas	1
<i>Melia azedarach</i>	Seringa	Widespread	3
<i>Opuntia ficus-indica</i>	Sweet Prickly Pear	Widespread	1
<i>Ricinus communis</i>	Castor Oil Plant	Drainage lines and river courses	2
<i>Sesbania punicea</i>	Red Sesbania	Drainage lines and river courses	1
<i>Verbena bonariensis</i>	Red Top	Widespread	Weed
<i>Zinnia peruviana</i>		Widespread	Weed

Opuntia ficus-indica (Sweet Prickly Pear) and *Cereus jamacaru* (Queen of the night) were widespread throughout the study area (Figure 14). Two Agave species, *Agave americana* var *americana* (American Agave) and *Agave sisala* (Sisal) were recorded from areas around human settlements (Figure 15).



Figure 14: *Opuntia ficus-indica* (Sweet Prickly Pear) (left) and *Cereus jamacaru* (Queen of the night) (right) recorded throughout the study area



Figure 15: Two Agave species namely *Agave americana var americana* (American Agave) and *Agave sisala* (Sisal) were recorded from areas adjacent to human settlements

For full lists of floral species confirmed and potentially occurring on-site, refer to the scoping phase terrestrial ecology report (Appendix 1A).

3.5.1.6. Protected areas

Protected Areas are defined as areas of land that are formally protected by law and managed mainly for biodiversity conservation. The greater Roodekoppies area includes a portion of the Mkombo Nature Reserve (Figure 16).

The south-eastern corner of the Roodekoppies farm is situated within an area earmarked for protection by the NPAES (Figure 16). The NPAES aims to expand existing protected areas for ecological sustainability and increased resilience to climate change. Although not currently protected, these areas should be considered as being of high development constraint for infrastructure proposed to be located within or in close proximity to these areas.

The proposed Canyon Springs Coal Mine will not involve any mining or related / incidental activities within the Mkhombo Nature Reserve or the NPAES thereof (Figure 17).

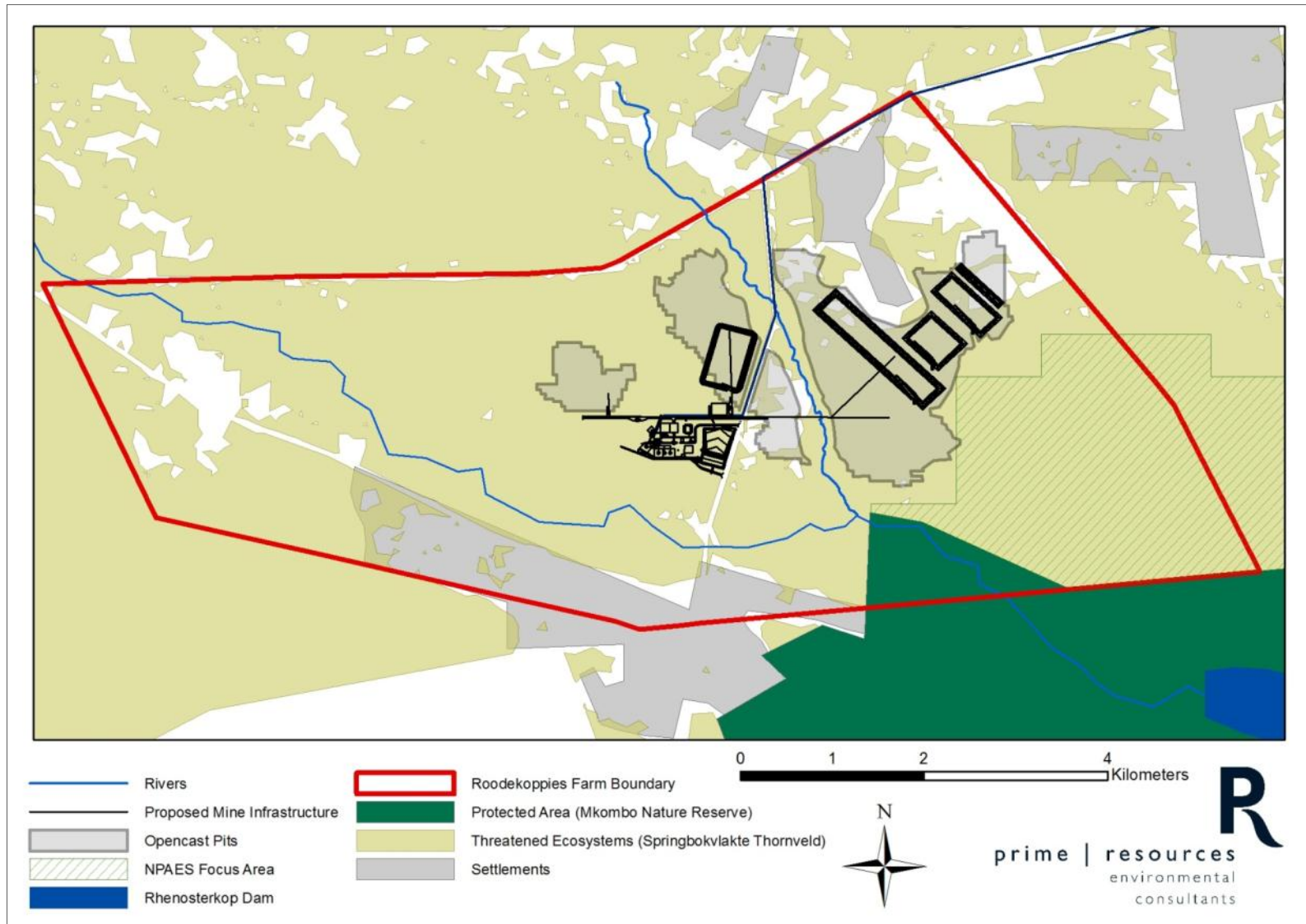


Figure 16: Protected areas and NPAES focus areas within the Canyon Springs project area

3.5.1.7. Sensitive Areas

Ecological sensitivity is dependent upon an area's ecological function. Ecological function describes the 'completeness' of the structure and function of the vegetation communities in an area. It also refers to the degree of ecological connectivity between the identified vegetation communities and other systems within the landscape. Therefore, systems with a high degree of landscape connectivity among each other are perceived to be more sensitive.

Ecological sensitivity is also dependant on the conservation importance of the area. This is determined by the necessity to conserve areas based on factors such as the importance of the site on a National and / or Provincial scale and on the ecological state of the area (degraded or pristine). This is determined by the presence of a high diversity, rare or endemic species and areas that are protected by legislation.

The following sensitive areas were highlighted in the ecological survey (Figure 17):

- Areas of high sensitivity - Ghotwane River with a 100 m protective buffer zone, the Mkombo Nature reserve / area earmarked by the NPAES, the rocky outcrops in the northern section of the study area, and the vulnerable Springbokvlakte Thornveld ecosystem;
- Areas of medium sensitivity - Woodland areas where no cultivation has taken place and in which protected trees species (*Acacia erioloba*) were recorded. This area also provided suitable habitat for species of conservation concern as well as provincially protected species; and
- Areas of medium to low sensitivity - Historically cultivated areas and settlements.

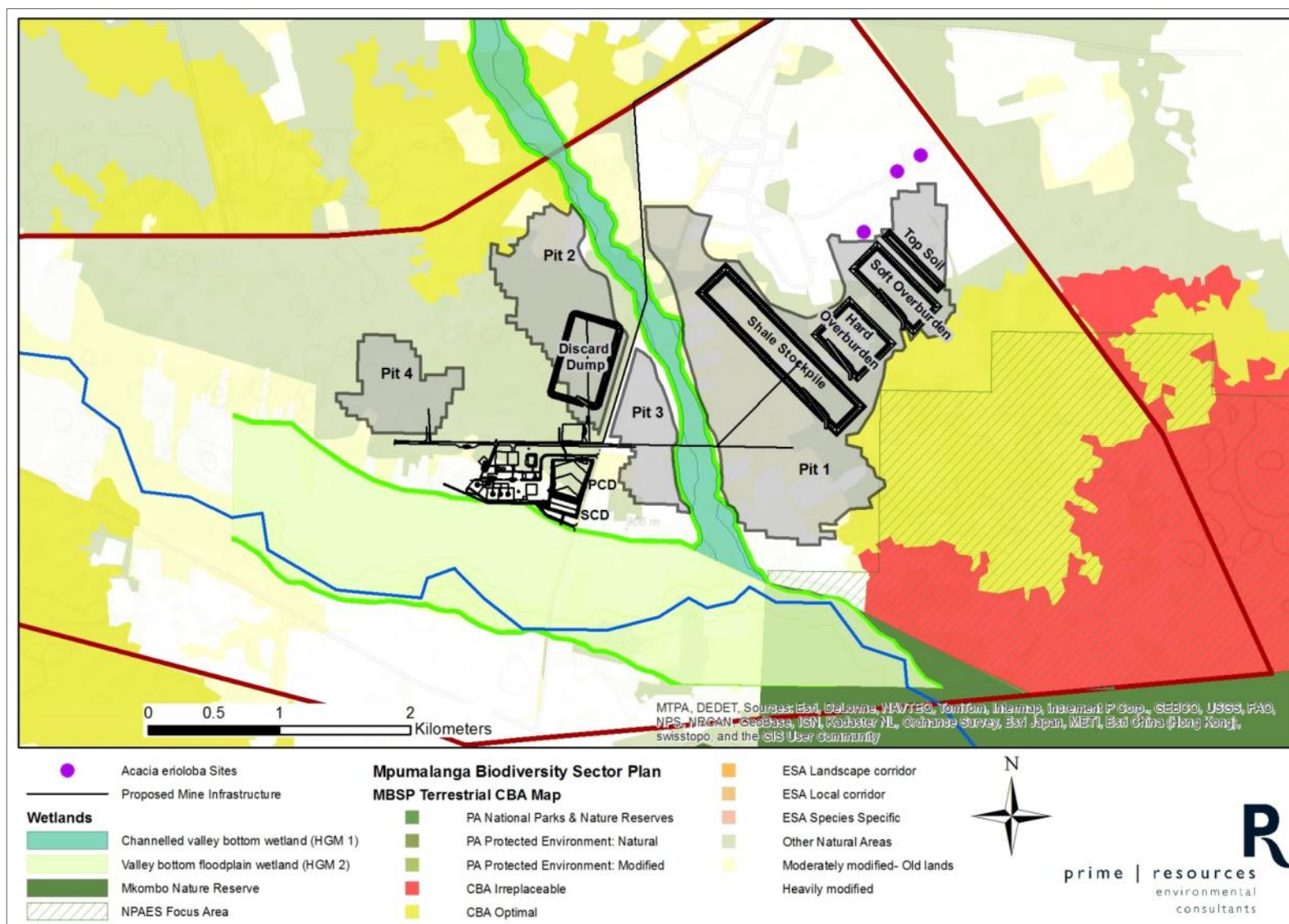


Figure 17: Ecological sensitivity map

3.5.2. Fauna

The savannah biome, into which the project area falls, supports a higher biodiversity in terms of fauna than any other ecoregion. Savannah vegetation provides a wide variety of faunal habitats due to the combined diversity of grassland and woodland features and has the capacity to support both browsing and grazing fauna. Browsing and grazing pressure also influences tree-grass dominance in a mixed savannah. For full lists of faunal species confirmed and potentially occurring on site, refer to the appendices of the Appendix 1A.

3.5.2.1. Birds

The greater project area supports a high avifaunal diversity with approximately 404 bird species potentially occurring within Quarter Degree Squares (QDS) 2528BA and 2528BB combined. Of this total, approximately 305 species (75.5%) are associated with savannah woodland, farmland and rocky areas. A total of 66 bird species were confirmed to occur within the study area, most of which were associated with savannah woodland.

A high level of endemism also exists in the area with 51 of the total bird species potentially occurring in QDS 2528BA and 2528BB combined being endemic to southern Africa. A total of 11 endemic bird species were observed in the study area including Swainson's Spurfowl (*Pternistis swainsonii*), Southern Yellow-billed Hornbill (*Tockus leucomelas*), Southern White-crowned Shrike (*Eurocephalus anguitimens*), White-throated Robin-Chat (*Cossypha humeralis*), Ant-eating Chat (*Myrmecocichla formicivora*), Burchell's Starling (*Lamprotornis australis*), Pied Starling (*Lamprotornis bicolor*), Ashy Tit (*Parus cinerascens*), Southern Pied Babbler (*Turdoides bicolor*), Chestnut-vented Tit-Babbler (*Sylvia subcaerulea*) and Cape Sparrow (*Passer melanurus*).

Thirty-one species of the total potential 404 species are of conservation concern, two of which are also endemic to southern Africa. Two species, the Red-billed Oxpecker (*Buphagus erythrorhynchus*), which has a provincial (MTPA) and National listing (NEMBA) of Near Threatened, and the European Roller (*Coracias garrulus*), which has a global listing (International Union for Conservation of Nature {IUCN}) of Near Threatened, were observed in the study area. A further eight species were given a high probability of occurring on site, though not observed within the survey period. Such species include the Vulnerable Lappetfaced Vulture (*Torgos tracheliotus*), White-backed Vulture (*Gyps africanus*), Martial Eagle (*Polemaetus bellicosus*), Tawny Eagle (*Aquila rapax*) and Lesser Kestrel (*Falco naumanni*) and the Near Threatened Secretarybird (*Sagittarius serpentarius*), Lanner Falcon (*Falco biarmicus*), and Red-footed Falcon (*Falco vespertinus*).

3.5.2.2. Mammals

Approximately 110 mammal species can potentially occur within QDS 2528BA and 2528BB combined. A total of nine mammal species were identified in the area during the field survey and confirmed by sight, field evidence such as spoor, droppings and burrows, or by a local community representative. A further 35 species have a high probability of occurring in the study area due to the availability of suitable habitat, while none of the observed species were of conservation concern, four species of conservation concern were identified as having a high probability of

occurring in the area, including the Near Threatened Southern African Hedgehog (*Atelerix frontalis*), Lesser Woolly Bat (*Kerivoula lanosa*), Honey Badger (*Mellivora capensis*) and African Wild Cat (*Felis silvestris*).

3.5.2.3. Herpetofauna

Although no amphibian species were identified during the field survey, 23 amphibian species have previously been noted to occur within QDS 2528BA and 2528BB according to the Southern African Frog Atlas Project (SAFAP). The presence of the Giant Bullfrog (*Pyxicephalus adspersus*) was, however, confirmed in the area. This species has a provincial listing of Vulnerable (MTPA) and is listed as Near Threatened (and is thus protected in terms of NEMBA), while the IUCN lists it as Least Concern but declining. According to Chapter 4 of NEMBA which pertains to Threatened or Protected Species (TOPS), a permit will be required if any habitat is destroyed where this species has been confirmed to occur. Twelve other amphibian species (none of conservation concern) were given a high probability of occurring in the study area due to the presence of suitable habitat.

According to the Southern African Reptile Conservation Assessment (SARCA), 39 reptile species have previously been noted to occur in QDS 2528BA and 2528BB combined. While no species were observed during field surveys, six species of conservation concern were given a high probability of occurring in the area due to the presence of suitable habitat. These include the endemic Shield Cobra (*Aspidelaps scutatus*), listed as Vulnerable by the MTPA, and the endemic Black-spotted Dwarf Gecko (*Lygodactylus nigropunctatus*) (listed as Least Concern). Four species with a high probability of occurring in the area are listed in the CITES Appendix II and include the Southern African Python (*Python natalensis*), Common Flap-neck Chameleon (*Chamaeleo dilepis*), Lobatse Hinged Tortoise (*Kinixys lobatsiana*) and Rock Monitor (*Varanus albigularis*).

3.6. Aquatic Biodiversity

The present study area is located within the Southern Temperate Highveld freshwater ecoregion, which is delimited by the South African interior plateaux sub-region of the Highveld aquatic ecoregion, of which the main habitat type (in terms of watercourse) is Savannah-Dry Forest Rivers. Aquatic biotas within this bioregion have mixed tropical and temperate affinities, sharing species between the Limpopo and Zambezi systems. The Southern Temperate Highveld freshwater ecoregion is considered to be bio-regionally outstanding and its conservation status EN. The ecoregion is defined by the temperate upland rivers and seasonal pans.

An aquatic baseline and impact study was completed by Strategic Environmental Focus in April 2013 (Appendix 2). A field survey was undertaken by Strategic Environmental Focus on the 7th of March 2013, where 5 sites located along both the Ghotwane and "No-Name" tributary were sampled. Within the project area, the available aquatic habitat associated with the Ghotwane River and the unnamed tributary both lack diversity of biotopes. Marginal vegetation and stones biotope are the only significant biotopes present that are able to support any number of diverse taxa and different groups of aquatic biota. The utilisation of marginal vegetation by aquatic biota

is, however, only likely to occur during the wet season when marginal vegetation is inundated following seasonal rainfall.

During the drier periods of the year, the aquatic habitat will comprise of isolated pools that are dominated by sandy or muddy substrate, and will progressively dry to a point where no surface water is available. The field survey confirmed the non-perennial nature of the system; the “No-Name” tributary was found to be completely dry, whilst the Ghotwane River was also largely dry with the exception of some isolated pools.

There is evidence of significant erosion in certain areas, which is due to increased catchment runoff caused by uncontrolled grazing from livestock and a lack of attenuation within the catchment, as well as the presence of bridges and culverts which channelise the flows during the wet season.

3.6.1. Aquatic Macroinvertebrates

Given the remote location of the study area and the lack of historical data from other assessments (e.g. Rivers Database), very little information was available in order to adequately assess the aquatic macroinvertebrates within the watercourses associated with the study area. Based on the nature of the aquatic habitats likely to be present within the study area, the diversity of aquatic macroinvertebrates associated with the proposed Canyon Springs Coal Mine is still likely to be limited.

Many of the more sensitive aquatic macroinvertebrates taxa commonly found in perennial systems will be absent in these systems due to the lack of sustained riffles and/or rapids and the persistent lack of flowing water. However, after a six week period of inundation, the watercourses would represent a system reflective of the catchment conditions, with many of the more tolerant species occurring, particularly taxa that favour marginal vegetation as well as gravel, sand and mud and slower flowing systems. The Ghotwane River catchment immediately upstream of Rhenosterkop Dam was determined to be a Phase 2 National Freshwater Ecosystem Priority Area (NFEPA), indicating that the main river within the catchment is regarded as a moderately modified river, i.e. Present Ecological Status (PES) Category C, as ecosystem targets are not able to be met for similar rivers in a natural state. Given the condition of the catchment associated with the study area, it is likely that the PES according to the aquatic macroinvertebrate assemblage would represent a Category D or lower.

3.6.2. Ichthyofauna

In general, a total of 14 species were expected to have a low to medium probability of occurrence within the study area, while eight species were expected to have a high probability of occurrence within the study area. In addition, several exotic fish species may be present during times of high flow, the most notable of which would be *Micropterus salmoides* (Largemouth Bass) which is known to occur within the Rhenosterkop Dam. Given the proximity of the Rhenosterkop Dam to the present study area, it is likely that many fish species use the dam as a refuge during the drier periods, migrating up into inflowing watercourses during periods of high flow. However, given the non-perennial nature of the Gotwane River associated with the study area, the diversity of fish species present during times of high flow is likely to be limited, particularly in relation to the

adjacent perennial Elands River which is likely to support a higher diversity of species throughout the year.

3.6.3. Species of Conservation Importance

It was noted that a number of species that were considered endemic to the southern African region were likely to be associated with the study area (see Table 3 of Appendix 2). Only one species of a conservation concern had a high probability of occurrence within the study area, namely *Oreochromis mossambicus* (Mozambique Tilapia; listed as Near Threatened). This species is widely dispersed beyond this range to inland regions and to the south west and west coastal rivers including the lower Orange and rivers of Namibia where it occurs in all but fast-flowing waters, and thriving in standing waters. This species has until recently not been considered of conservation importance in the southern Africa region. However, *Oreochromis niloticus* (Nile Tilapia) is invading its natural range in the Zambezi and Limpopo river systems, with hybridisation occurring in the Limpopo system, and pure strains of *O. mossambicus* are likely to become extirpated in those systems through competition and hybridisation.

3.7. Wetlands

A wetland baseline study and wetland impact assessment study were completed by Strategic Environmental Focus in March 2012 and April 2013 respectively (see Appendix 3A and 3B). Wetlands within the project area were identified and delineated according to the methodology required by the DWA (2005), whereby wetlands are classified according to the soil types, hydrological processes, presence of wetland vegetation and terrain units. Thereafter, these characteristics were used to classify wetlands into Hydro-Geomorphic Units (HGM). A HGM unit is a single "reach", segment or unit of a particular wetland type as classified by the characteristics listed above.

Two wetland types comprising two separate HGM units are associated the Ghotwane River and its tributaries within the proposed Canyon Springs Coal Mine Area. They are classified as a channelled valley bottom wetland (HGM 1) and a valley bottom floodplain (HGM 2) (Figure 18). Wetlands within the study area serve to improve habitat within and potentially downstream of the study area through the provision of various ecosystem services. Many of these functional benefits therefore contribute directly or indirectly to increased biodiversity within the study area as well as downstream of the study area through provision and maintenance of appropriate habitat and associated ecological processes. Altogether, the delineated wetlands occupy approximately 546 ha of the field study area.

From a hydrological functioning perspective, HGM 2 is characterised by large flood attenuation characteristics including several floodplain features and relatively flat slope. The dominance of vertic soils within the wetlands allows for large cracks on the surface to develop as a result of its inherent shrinking and swelling properties. Water infiltration during rainfall events are therefore initially very high and rapid, thereafter infiltration drop dramatically as the soil swells, surface seals and flooding takes place across the floodplain. HGM 1 also exhibits some flood attenuation value and allows for the settlement of sedimentation during big flood events, although its hydrologic

functionality is not nearly as important as HGM 2's due to its relative smaller size and slightly steeper slope.

A Wet-Health assessment of the study area was conducted and PES scores were assigned for the HGM units. The Wet-Health study results indicated that the wetlands within the study area have been largely modified as a result of current and historic anthropogenic activities. Additionally, an Ecological Importance and Sensitivity (EIS) assessment was undertaken to rank water resources in terms of:

- Provision of goods and service or valuable ecosystem functions which benefit people;
- Biodiversity support and ecological value; and
- Reliance of subsistence users (especially basic human needs).

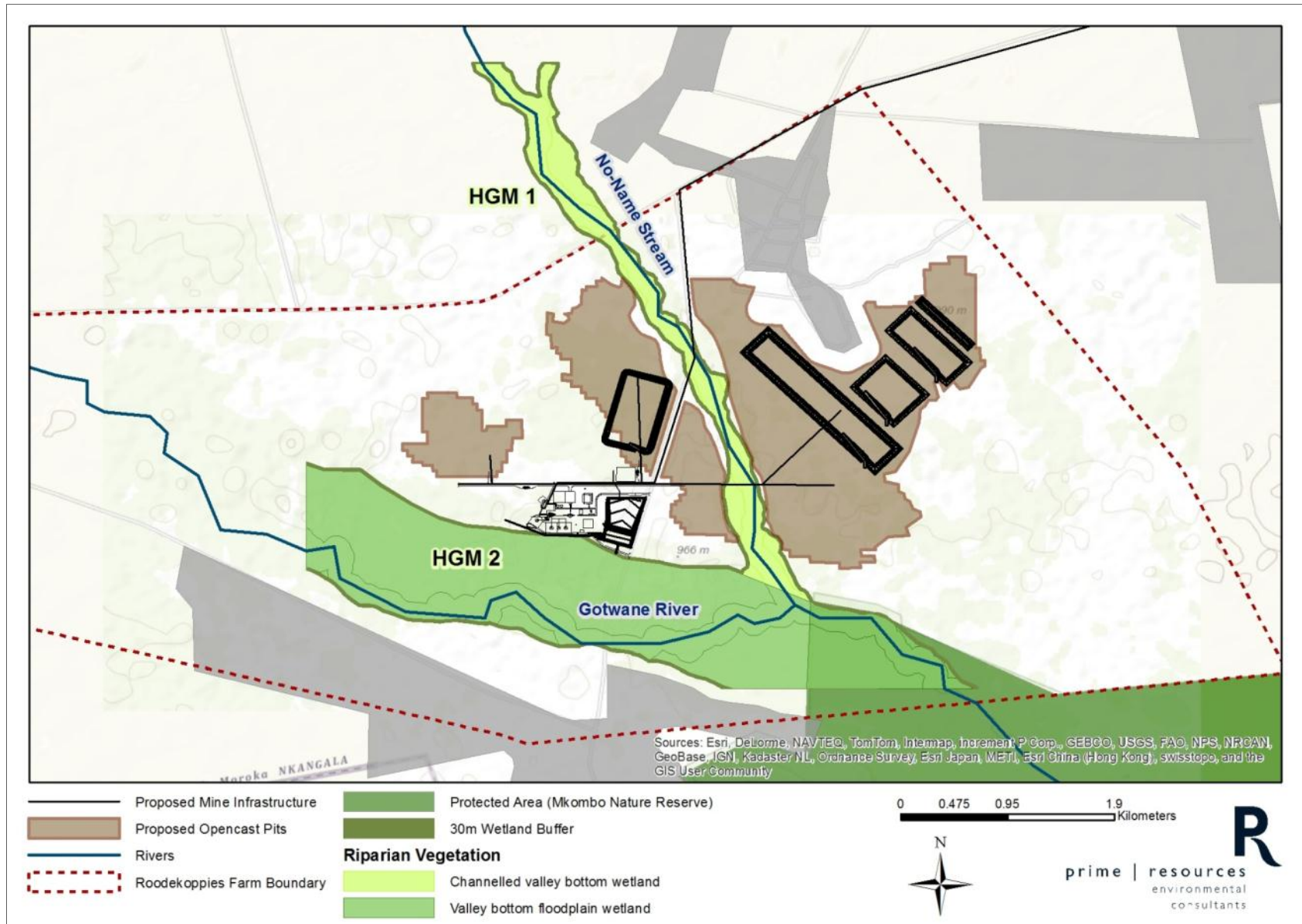


Figure 18: Wetland delineation for the study area

3.7.1. Wetland Present Ecological State assessment using Wet-Health

WET-Health is a tool designed to assess the health or integrity of a wetland. Wetland health is defined as a measure of the deviation of wetland structure and function from the wetland's natural reference condition. This technique attempts to assess hydrological, geomorphological and vegetation health in three separate modules:

- Hydrology: defined as the distribution and movement of water through a wetland and its soils;
- Geomorphology: defined as the distribution and retention patterns of sediment within the wetland; and
- Vegetation: defined as the vegetation structural and compositional state.

Each of these modules follows a broadly similar approach and is used to evaluate the extent to which anthropogenic changes have impacted upon wetland functioning or condition. Impact scores obtained reflect the degree of change from natural reference conditions. Resultant health scores fall into one of six health categories (A-F) on a gradient from "Unmodified" (Category A) to "Critically Modified" (Category F) as depicted in Table 10.

Both the wetlands' PES was found to be a category D, which indicates that they have been largely modified and a large loss of natural habitats and basic ecosystem functions has occurred. Hydrological functioning, however, appears to not have been affected.

Table 10: PES Category Ratings

Rating of Present Ecological State Category (PES Category)
CATEGORY A Score: 0-0.9; Unmodified, or approximates natural condition.
CATEGORY B Score: 1-1.9; Largely natural with few modifications, but with some loss of natural habitats.
CATEGORY C Score: 2 – 3.9; Moderately modified, but with some loss of natural habitats.
CATEGORY D Score: 4 – 5.9; Largely modified. A large loss of natural habitats and basic ecosystem functions has occurred.
OUTSIDE GENERAL ACCEPTABLE RANGE
CATEGORY E Score: 6 -7.9; Seriously modified. The losses of natural habitats and basic ecosystem functions are extensive.
CATEGORY F Score: 8 - 10; Critically modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat.

The WET-Health of HGM 1 due to pre-existing impacts indicated that the unit was largely modified. Scores obtained for the hydrology module for HGM1 indicated that water inputs (derived from its

catchment) and water retention and distribution patterns within the wetland unit itself have been altered. The most severe impacts on a catchment scale included large scale commercial farming of annual crops including use of pivot irrigation systems, several rural towns, earthen dams and lowered basal cover as a result of various rural land uses such as heavy grazing regimes. The hydrology and geomorphology of the wetland itself have been modified through rural cultivation practices and heavy grazing regimes. The above mentioned land-uses reduced surface roughness through lowered basal cover, resulting in an increase in run-off which in turn also decreased sinuosity in the main channel through creation of channels in a few localities. Impeding features within the valley bottom wetland include a tar road with limited culverts as well as a large earthen dam. A number of small erosion features such as erosion gullies exist in a few localities.

The overall Wet-Health scores indicated that HGM 2 has also been largely modified. Impacts associated with the wetland as well as its catchment are similar to HGM 1, although on a larger scale. Rural agriculture has also taken place within the wetland itself which had a significant impact on the wetland as a result of poor cultivation practices (e.g. ploughing perpendicular to contour). The grazing regime within the wetland and the immediate catchment was illustrated through the presence bush encroachers as well as the low basal cover which had a significant impact on surface roughness. The reduced surface roughness in the wetland and within the catchment would have resulted in an increase in flood peak magnitude and reducing sub-surface water inputs to the wetland.

3.7.2. Wetland Ecological Importance and Sensitivity

The moderate EIS score for HGM 1 and HGM 2 of between 1.7 and 2.2 out of 4, respectively, was assigned and can be attributed to the possible presence of Giant Bullfrog (*Pyxicephalus adspersus*) which is listed provincially as Vulnerable and nationally as Near Threatened, the likely presence of the near threatened plant *Stenostelma umbelluliferum*, as well as the Springbokvlakte Thornveld which is considered an EN vegetation unit (see Section 3.5). See Table 6 in Appendix 3B for the EIS scores for the two wetlands. The moderate to low EIS assigned to the wetlands can primarily be attributed to the loss of functionality as a result of land use issues as well as the temporary nature of most wetlands within the study area.

The dominance of both the wetlands current condition, combined with further anthropogenic disturbances, diminish the wetlands' ability to contribute to hydrological regulating, quality enhancement benefits and biodiversity features. Various direct human benefits are associated with both wetland units, the most significant and extensive being livestock grazing and cultivation of various annual crops within the nutrient rich soils.

3.8. Land Cover and Land Use

A comparative land use assessment was prepared in September 2012 (Appendix 4).

3.8.1. Regional Land-Use

Mpumalanga is dominated by vast open areas of natural vegetation. Urbanisation is still relatively low, with only 1.25% of the region being classed as urban land. Most of the transformed land has been converted to cultivation (26%), with commercial plantations which comprise 8% of the total land area of Mpumalanga (Mpumalanga SoER, 2003).

The vast majority of land in the DRJSMLM is either tribal or communal land with only a small portion being Government-owned. Cultivated areas (permanent- and temporary- dry and irrigated land) cover less than 15% of the municipality (IDP, 2010-2011). Urban areas cover 14% of the municipality. The Mkhombo and Mdala are the only reserves in the municipality. Land capability within the DRJSMLM has a high agricultural potential, owing to stable soil and geological conditions (IDP, 2010-2011).

3.8.2. Local Land-Use

The eastern side of the farm Roodekoppies (to the east of the tar road that bisects the project area) has been used for grazing (Figure 19; Figure 20). In addition, Acacia trees are regularly removed from the project area to increase the amount of grass cover available for grazing. Approximately 50% of the study area was historically cultivated (SEF, 2011). The cultivated areas are situated largely around the Ghotwane River that flows through the site. The western portion of the project area is fenced in and covered with fairly dense, natural vegetation (Figure 20; Figure 21). The residential areas of Loding and Moletsi fall within the south of project area, with Dihekeng in the north-east. These residential areas are associated with areas of degraded land and Dihekeng is surrounded by cultivated land (Figure 19).

The portions of state-owned land within the project area are largely held in trust by the local tribal authorities. Community members living within the surrounding residential areas have been allocated portions of this land, on which they are able to graze their cattle and engage in subsistence farming. In order to lease the land from the state for mining purposes these tribal authorities will need to be consulted and the local farmers compensated for loss of grazing/farm land (see Section 7.2.8).

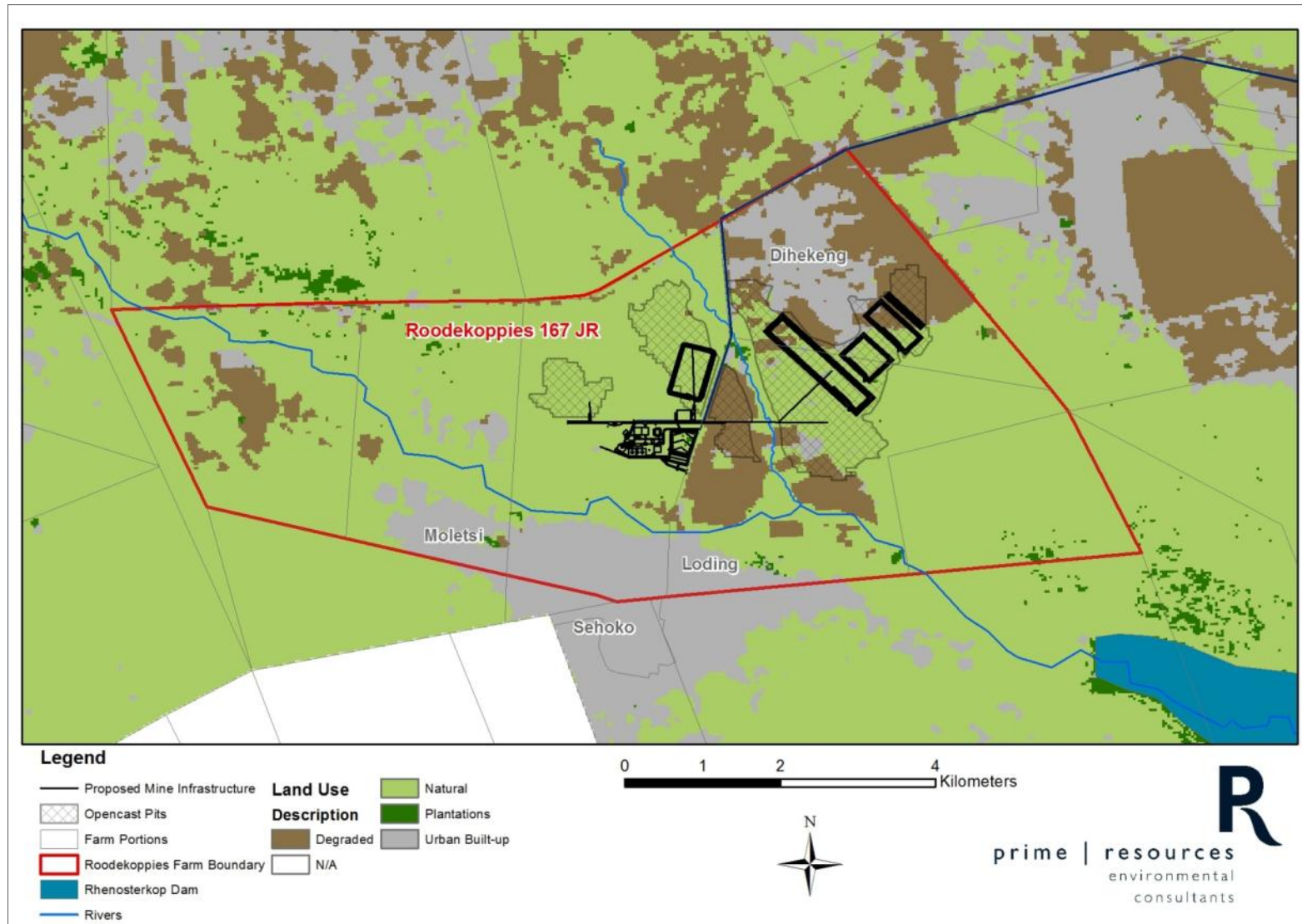


Figure 19: Land Use Types within the Proposed Canyon Springs Project Area



Figure 20: Area used for grazing on the eastern section of Roodekoppies farm

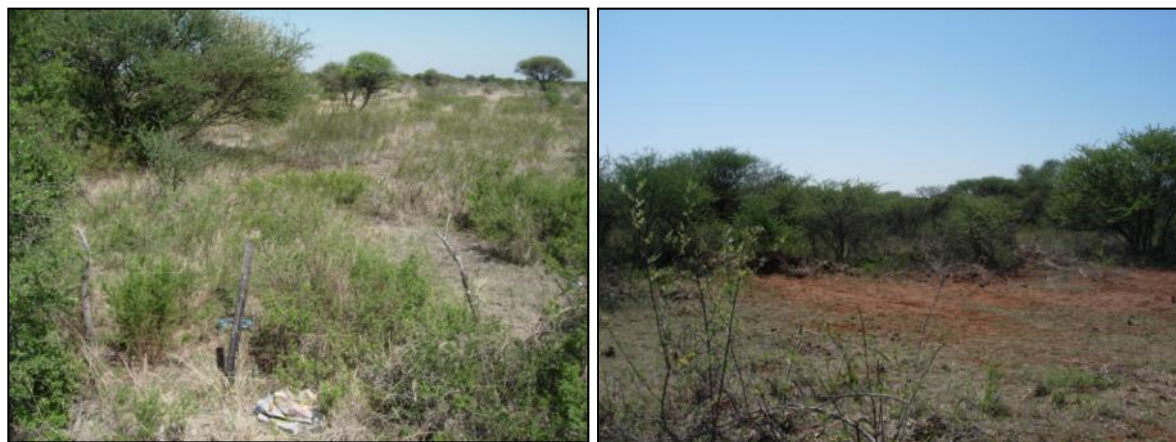


Figure 21: Western section of Roodekoppies, characterised by natural vegetation

3.9. Soil Quality and Land Capability

A soil quality and land capability study, impact assessment and management plan was completed by Earth Science Solutions (Pty) Ltd in September 2012 (see Appendix 5).

3.9.1. Soil Characterisation

The soils encountered on-site can be broadly categorised into two major groupings, with three dominant soil forms characterising the site. The soils mapped (Figure 22) range from shallow sub-outcrop and outcrop of hard plinthite and parent materials, e.g. sediments and intrusive dolerite, to moderately deep sandy loams and sandy clay loams, all of which are associated with either a calcrete or ferricrete/laterite "C" horizon at differing depths or a hard rock base associated with the parent host rock. The saprolitic (chemically weathered) horizons are generally quite thin.

The deeper and sandier loam soils of the project area are considered High Potential materials and are distinguished by the better than average depth of relatively free draining soil to a greater depth (> 600 mm). This group is recognisable by the subtleness of the mottling (water within the profile for less than 30% of the season), is noted at greater depths within the profile (> 500 mm) and the land capability is rated as moderate intensity grazing and/or arable depending on their

production potential. The ability for water to permeate through these profiles is significantly better. The more sandy texture of this soil group renders them more easily worked and as a result are of a lower sensitivity (Deep >500mm) (Figure 22).

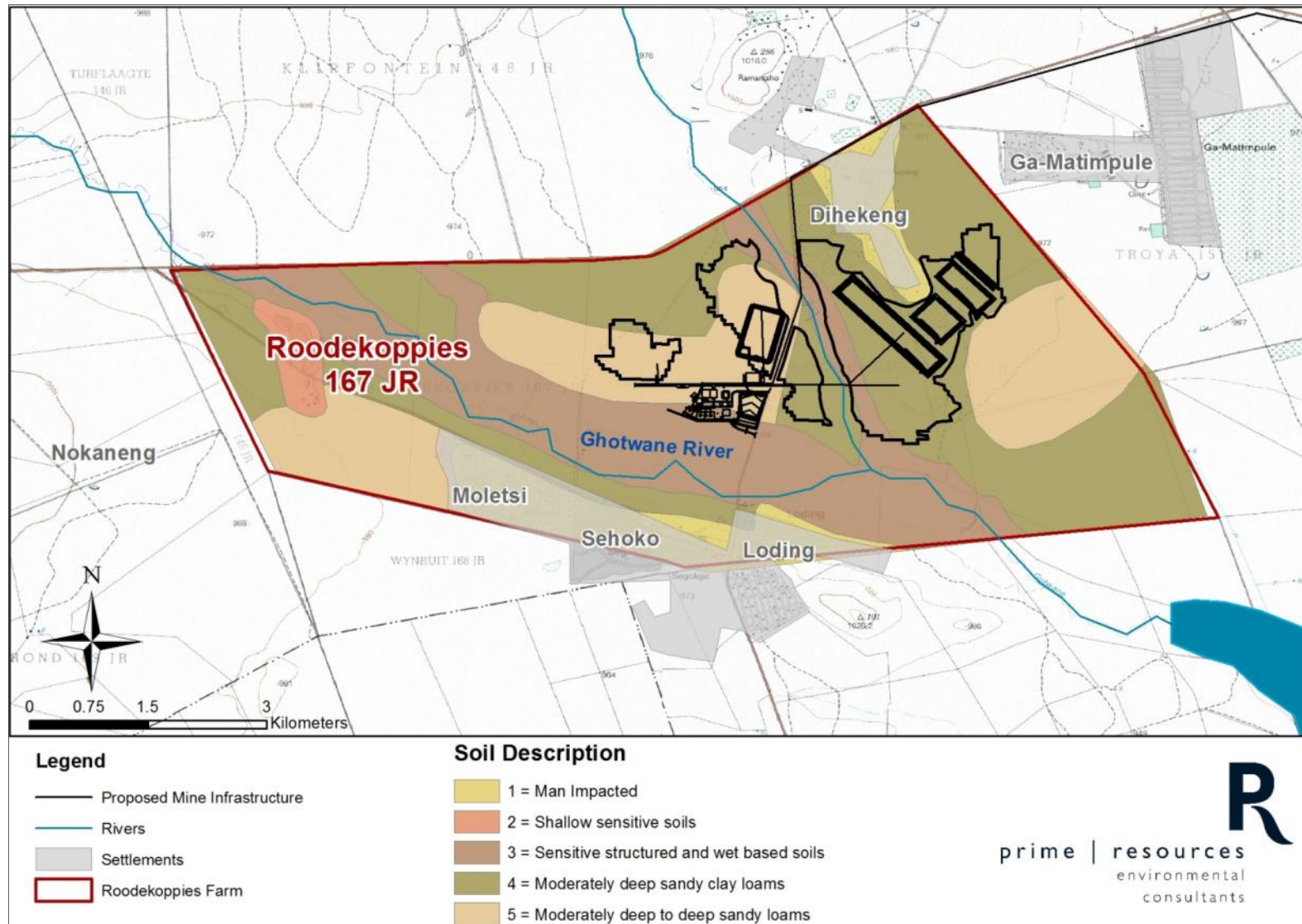


Figure 22: Soil map of the Canyon Springs area

In contrast, the shallower and more structured materials are considered to be more sensitive and will require greater management if disturbed. This group of shallower and more sensitive soils (< 500 mm) are associated almost exclusively with the sub outcropping of the parent materials, the Karoo Sediments, at the surface. Although they constitute a relatively small percentage of the overall area of study they have a relatively large and important function in the sustainability of the overall biodiversity of the area.

The generally flat to slightly undulating topography has had little to no impact on the pedogenesis of the soils, albeit that the retention of soil water within the vadose zone due to lack of preferred horizontal flow has resulted in the creation of the pronounced calcrete/ferricrete layer. The degree to which the plinthite layer has been cemented (friability of the calcrete and / or ferricrete) will determine the effectiveness of the layer as a barrier to infiltration, while the depth of overlying soil will dictate how easily or difficult it is for the soil water to be accessed by the fauna and flora, and in the extreme case weather water is held at surface as a pan. It results in the development of areas of wet based soils. The friability of the ferricrete will also have an effect on the amount of clay mineralisation that the soil contains within this horizon, and will in turn influence the water holding characteristics of the soil and the degree of structure. The occurrence of extensive calcrete and/or ferricrete horizons within the soil profile classify as "relic" land forms for the most part, albeit that significant area of more recent laterite development were mapped. These layers occasionally outcrop at surface as hardpan ferricrete and are the basis for many of the pan structures found within the sedimentary profile and landscape of the coalfields in this region.

The third group of soils comprise those that are associated with the hard pan ferricrete/calcrete and perched soil water. These soils are characterised by relatively higher clay contents (often of a swelling nature), poor intake rates, poor drainage, generally poor liberation of soil water and a restricted depth – often due to the inhibiting barrier within the top 700 mm of the soil profile. These soils are generally associated with a wet base. These soils will be more difficult to work in the wet state, store and re-instate at closure.

3.9.2. Soil Chemical Characteristics

Laboratory analysis of the various soil groupings identified returned a variety of materials that range from very well sorted sandy loams with lower than average nutrient stores and moderate clay percentages (< 20% - B2/1) to soils with a moderately stratified to weak blocky structure, sandy loam to clay loam texture and varying degrees of utilisable nutrients.

The pH ranges from acid at 5.3 to neutral and slightly alkaline at 7.5, a base status ranging from a Eutrophic soil (slight leaching status) to a Mesotrophic soil (moderate leaching status). Nutrient levels reflect generally high levels of calcium and sodium, but there are deficiencies in the levels of magnesium, potassium, phosphorous, copper, aluminium and zinc, with low stores of organic carbon matter. The more structured (moderate blocky) and associated sandy and silty clay loams are inherently low in potassium reserves, and returned lower levels of zinc and phosphorous.

Soil Fertility

The soils mapped returned at best moderate levels of some of the essential nutrients required for plant growth with sufficient stores of calcium and magnesium. However, levels of Na, Zn, P, and K are generally lower than the optimum required. The majority of the study area is rated as low intensity grazing land. A significantly large area of the soils mapped have a lower than acceptable level of plant nutrition. These poor conditions for growth were further compounded by the low organic carbon (< 1.0%), however there are no indications of any toxic elements that are likely to limit natural plant growth in the soils mapped within the study area.

Nutrient Storage and Cation Exchange Capacity

The soils mapped are generally low in organic carbon. This factor coupled with the moderate to high clay contents for the majority of the soils mapped will adversely affect the erosion indices for the soils. The inherently low organic carbon content is detrimental to the exchange mechanisms, as it is these elements which naturally provide exchange sites that serve as nutrient stores. The moderate clay contents will temper this situation somewhat with at best a moderate to low retention and supply of nutrients for plant growth.

Soils rich in humus will have a Cation Exchange Capability (CEC) of 300 milligram equivalents (me)/100g, while a soil low in organic matter and clay may have a CEC of 1-5 me/100 g. Generally, the CEC values for the soils mapped in the area are moderate.

Soil Erosion and Compaction

The majority of the soils mapped can be classified on the erodibility index as being moderate to highly erodible in terms of their organic carbon content and clays to some degree. The vulnerability of the "B" horizon to erosion once the topsoil and / or vegetation is removed must not be underestimated when working with or on these soils. These horizons (B2 / 1) are vulnerable and are rated as medium to high when exposed.

3.9.3. Soil Physical Characteristics

The majority of the soils mapped exhibit apedal to strong blocky structure, moderate to high clay content and a dystrophic leaching status. The texture comprises sandy to silty sands for the most part, with much finer silty loams and clay loams associated with the colluvial derived materials associated with the lower slope positions. A feature that is moderately common across the site where the soils are associated with the sedimentary host rocks (albeit that it often occurs below the 1.5 m auger depth on the deeper soils) is the presence of a hard calcrete or hard pan ferricrete (plinthite) layer within the soil profile.

The semi-arid climate combined with the geochemistry of the host rock geology are conducive to the formation of evaporites, with both calcrete and ferruginous layers or zones within the vadose zone. The accumulation of concentrations of calcium iron and manganese rich fluids in solution will result in the precipitation of the salts and metals due to high evaporation. This process results in the development of a restrictive or inhibiting layer/zone within the profile over time. The generally low rainfall of 500 mm / year or less, and the high evaporation that averages 1 350 mm / year are the driving mechanisms behind the calcrete and hard pan ferricrete mapped.

The degree of hardness of the evaporite is gradational, with soft plinthic horizons (very friable and easily dug with a spade or shovel), through hard plinthite soil (varying in particle size from sand to gravel – but no cementation) to nodular and hard pan ferricrete or hard plinthic (cementation of iron and manganese into nodules) that are not possible to free dig or break with a shovel.

The variation in the consistency of the evaporite layer, its thickness and extent of influence across/under the site are all important to the concept of a restrictive horizon or barrier layer that is formed at the base of the soil profile and/or close to the soil surface. Where this horizon develops to a nodular form or harder (Nodular, Honeycomb and Hard Pan) the movement of water within the soil profile is restricted from vertical movement and is forced to move laterally or perch within the profile. It is this accumulation of soil water and the precipitation of the metals from the metal and salt rich water that adds progressively to the ferricrete layer over time.

3.9.4. Land Capability

The area to be disturbed by the open cast mining and surface infrastructure development comprises a range of land capability classes, with significant areas of friable and good grazing potential class soil, smaller but highly sensitive sites that returned wet based soils, and a significant area of highly structured and sensitive materials that occur within the planned development footprint. These colluvial derived soils are at best considered to have a low intensity grazing land potential or wilderness status. The majority of the study area classifies as low intensity grazing land or wilderness status. There are little to no high potential grazing land soils associated with this area. The various land uses are listed below:

Arable Land

Although some soil depths are reflective of an arable status (> 750 mm), the growth potential (nutrient status and soil water capabilities) and ability of soils in the study site to return a cropping yield equal to or better than the national average is lacking. This is due mainly to the poor rainfall. These variables reflect the natural conditions, and do not include any man induced additives such as fertilisers or water.

Grazing Land

The classification of grazing land is generally confined to the shallower and transitional zones that are well drained. These soils are generally darker in colour, and are not always free draining to a depth of 750 mm but are capable of sustaining palatable plant species on a sustainable basis, especially since only the subsoil's (at a depth of > 500 mm) are periodically wetted.

Wilderness / Conservation Land

The shallow rocky areas and soils with a structure stronger than "strong blocky" e.g. vertic are characteristically poorly rooted and support at best very low intensity grazing, or more realistically are of a Wilderness character and rating.

Wetland (Areas with wetland status soils)

A significant but relatively small proportion of the study area classifies as having wet based soils (see Section 3.7). However it is important to note that a significantly large area of the open pit

and infrastructure development being planned encroaches on soils with a wet base. These zones (wetlands) are dominated by hydromorphic soils (wet-based) that often show signs of structure, and have vegetation that is associated with seasonal wetting or permanent wetting of the soil profile. The wetland soils are generally characterised by dark grey to black organic carbon in the topsoil horizons and are often high in transported clays and show variegated signs of mottling on greyed backgrounds (pale grey colours) in the subsoil's. Wetland soils occur within the zone of soil water influence.

3.10. Groundwater

A baseline groundwater study was completed by Rison Groundwater Consulting in November 2011 (Appendix 6A) and groundwater impact assessment was completed by Future Flow in May 2013 (Appendix 6B).

The site falls within quaternary catchment B31E which has a surface area of approximately 1530 km². The Karoo rock types associated with the proposed site for development can be divided into two distinct aquifers, namely a shallow weathered material aquifer and a deeper fractured rock aquifer.

3.10.1. Aquifer description

Two aquifers occur in the area. These two aquifers are associated with a) the upper, shallow weathered material, and b) the underlying, deeper, competent and fractured rock material.

3.10.1.1. Shallow Weathered Aquifer

The aquifer is associated with the weathered material situated between surface and the more competent material below. The upper weathered material aquifer has an average depth of around 4.4 m and is recharged by rainfall, estimated to be approximately 3% of the Mean Annual Rainfall (MAR). The numerous shale layers in the weathered formations restrict the downward infiltration of rainwater into the aquifer and recharging groundwater is thus confined to preferential flow-paths formed at the interface between the weathered material and the more competent underlying material.

The borehole yields in this aquifer are generally low. Reports for the area in general show that borehole yields are typically low, yielding from 0.5-2 litres per second (l/s) except for areas underlain by Basalt, where yields can range from 2-5 l/s. Sediment yields of groundwater are less than 0.5 l/s and in the dolerite dykes are 0.5-2 l/s. The groundwater quality in undisturbed areas is good due to the dynamic recharge from rainfall. This aquifer is, however, more likely to be affected by contaminant sources situated on surface, such as ore stockpiles, waste rock dumps and discard dump facilities.

3.10.1.2. Deeper fractured aquifer

Groundwater flow in the deeper Eccra Group rocks underlying the shallow, weathered material is restricted, except along preferential flow-paths formed by secondary fracturing. Groundwater flow in the deeper, fractured material aquifer is thus associated with dolerite dykes, sills and faults in the area.

Although occasional, high-yielding boreholes may be intersected, boreholes in this aquifer generally yield in the region of 1 l/s. The coal seams themselves often show the highest hydraulic conductivity. The groundwater quality in the fractured aquifer is generally of a poorer quality than the weathered aquifer due to the concentration of salts and slower rate of recharge.

Aquifer transmissivity ranges between 0.2 m²/day and 30 m²/day. The general regional aquifer is classified using the Parsons Classification System as a minor aquifer, but is considered to be of high importance to the local landowners who rely on the groundwater supply.

3.10.2. **Hydrocensus and Groundwater Use**

A hydrocensus by Future Flow was undertaken and a total of 28 boreholes were located in the field (Figure 23). The DRJSMLM provides residents in the area with water by a combination of a tanker and dedicated water supply boreholes. Information made available by the DRJSMLM indicates a total of 3 boreholes present in the Loding Village, which is located just south of the proposed mining area. Only one of these three boreholes is currently being used. Groundwater is mostly used for domestic and gardening use. Only four boreholes are used for livestock watering (CSH-06, CSH-08, CSH-20 and CSH-22).

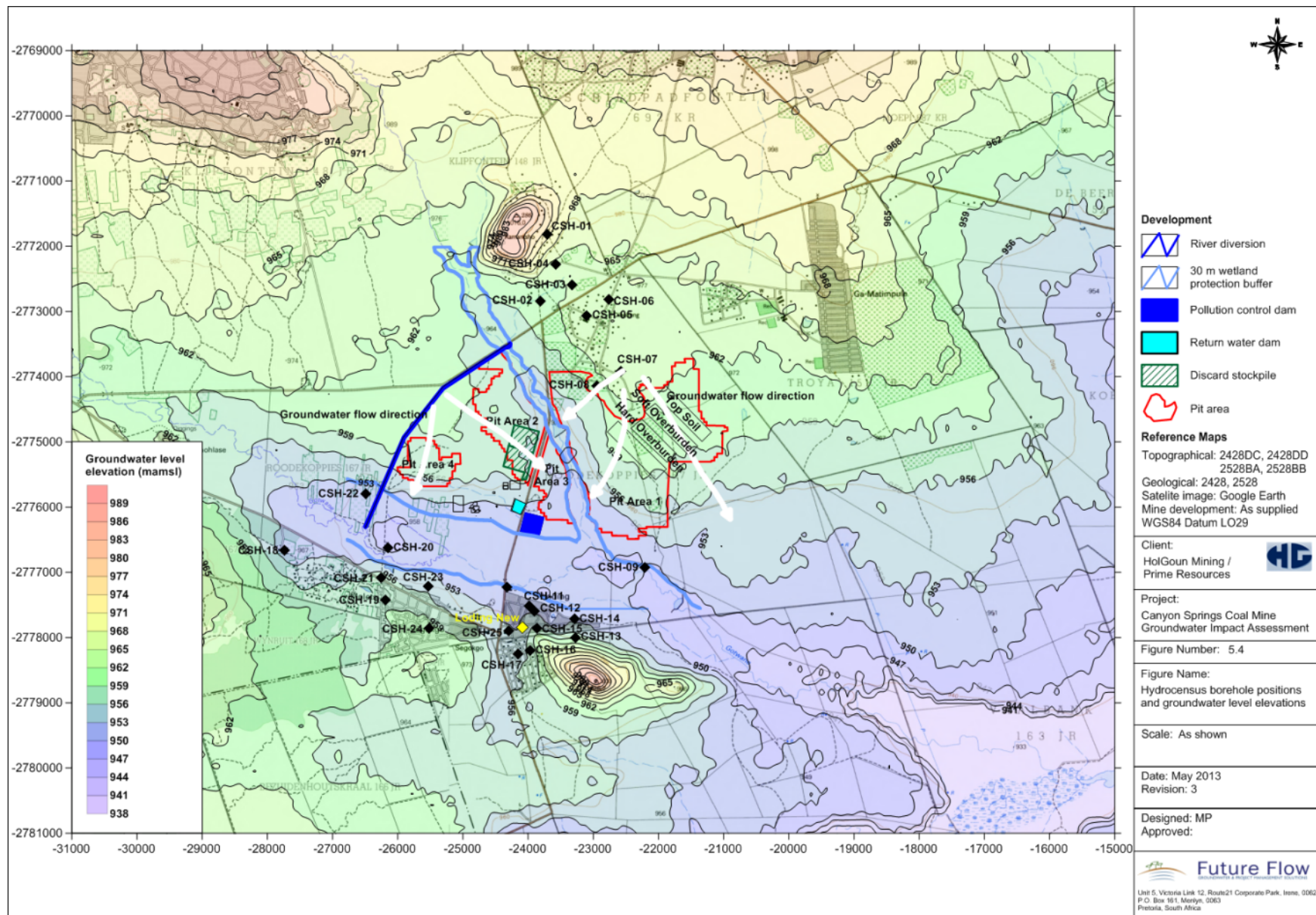


Figure 23 Locality of the hydrocensus boreholes identified

3.10.3. Groundwater Flow Direction

Plotting groundwater level elevation versus topographical elevation for this area yields a 78% correlation. Since the project area occurs within a topographic low, groundwater flow will be towards the site from most directions. From this it can be concluded that the groundwater levels generally mimic topography, albeit at a slightly shallower gradient. The groundwater flow directions are from the northeast, north, northwest, west, southwest and south. Groundwater flow in the study area occurs along a topographical gradient of approximately 0.35% (Figure 23).

Portions of the mining area are located within a gentle depression and most groundwater flows towards the site, although flow also moves away from the site towards the south-east. The groundwater flow gradient in the vicinity of the pit areas ranges around 0.35%.

3.10.4. Groundwater quality and quantity

Flows in the upper aquifer vary seasonally while flows in the fractured rock aquifer for general host geology are 0.004-0.03 m / day and 0.1-0.5 m / day in fracture zones. From the Piper diagram (Figure 24), it was found that the predominant water type is sodium-calcium / chloride-bicarbonate, which is typical of ancient water that is described as brackish. The expected water type in such a pristine environment would be Ca-Mg-HCO₃ which is typical of recharging water. It is thus likely that there is a confining layer preventing recharge to the aquifer and therefore increasing residence time. Increased residence time allows salts to become concentrated in the groundwater.

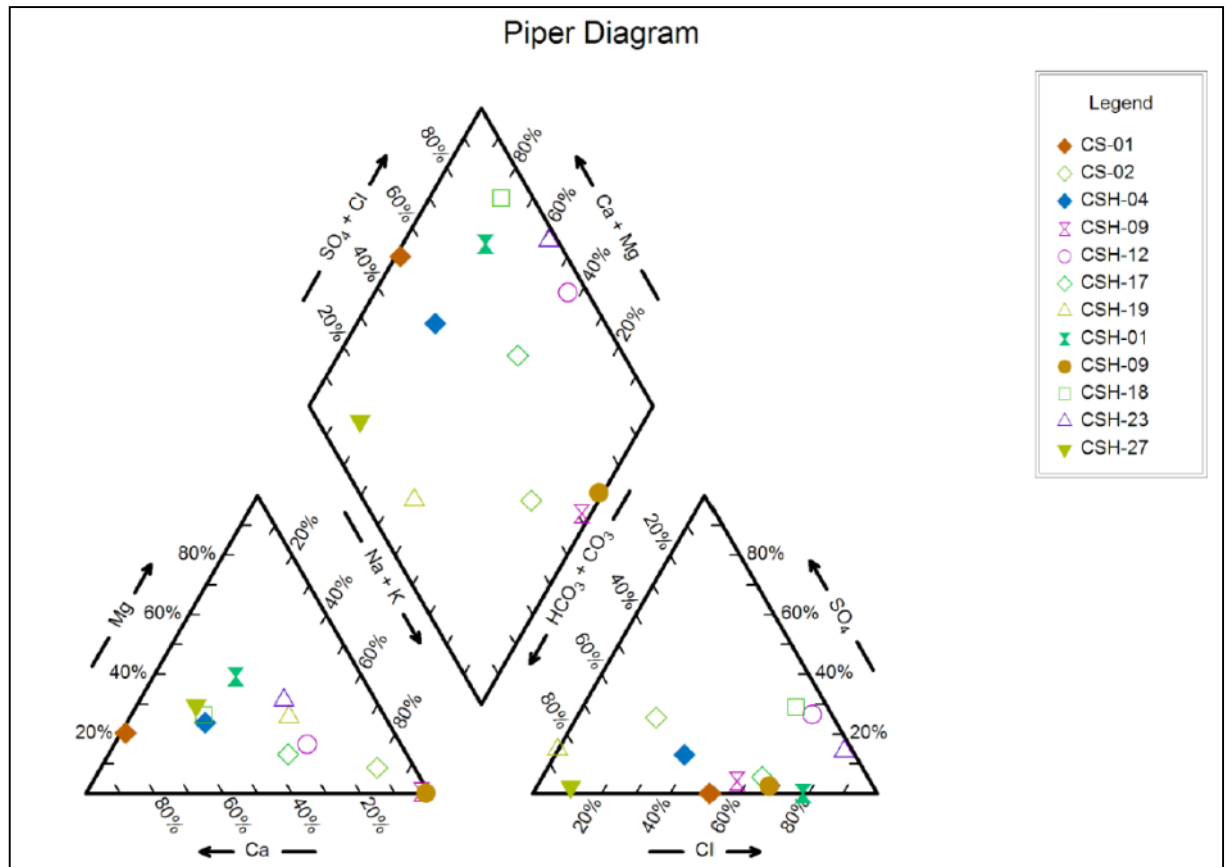


Figure 24: Piper diagram showing hydrochemical classification

3.10.5. Acid Mine Drainage Potential

Acid Base Accounting (ABA) and associated leach testing was undertaken on three representative samples of material from the mining area (coal seams, footwall and high-wall). AMD is the product formed by oxidation of relatively common iron-sulphur minerals such as pyrite (FeS_2) and pyrrhotite (FeS), and any other products generated as a consequence of these oxidation reactions. Acidity produced due to the oxidation of iron-sulphur minerals may not produce AMD if the material also contains minerals which can produce sufficient alkalinity to neutralise the acidity produced due to the oxidation of iron-sulphur minerals.

ABA is a geochemical procedure for determining both acid potential, and neutralising potential of geological materials. At the same time, total sulphur and paste pH are also generally obtained.

Overall, the calcrete and mudstone in the litho-stratigraphy has no net acid generation potential but a significant potential to neutralise acid generated from carbonaceous rocks to some degree. The weathered sandstone and topsoil has no potential to either generate or to neutralise acid-mine drainage because of the large degree of weathering. Carbonaceous units include the carbonaceous mudstone roof, coal and the sandstone/shale floor. These units will probably be net acid generating and must either be removed from the open cast or backfilled in areas where 1) it will be excluded from oxygen (saturated with water) and 2) be in contact with carbonate rich material (like the calcrete).

Carbonaceous material will generate a medium to high salt load. Before acidification SO_4 will leach close to gypsum saturation at approximately 1 800 – 2 500 mg/L. If carbonaceous material could be excluded from oxygen no acidification will occur and the mine will probably only generate a low salt load of < 1 000 mg/L SO_4 .

3.11. Surface Water

A surface water and hydrological impact assessment was completed by African Environmental Development in December 2012 (Appendix 7).

The project area falls within the greater Olifants River Catchment. The Ghotwane River flows in a south-easterly direction across the proposed Canyon Springs Coal Mine project area and into the Rhenosterkop Dam. A tributary of the Ghotwane flows in a southerly direction across the project area. This tributary is non-perennial and appears to rarely hold water and if so only after major rainfall events (Figure 25).

3.11.1. Description of the Catchment

The proposed Canyon Springs Coal Mine locates on the southern part of the Springbok Flats coalfield, i.e. on the sedimentary rocks of the Eccia Group, Karoo Supergroup. The primary watercourse in this region is the Olifants River, which flows from its origin on the continental watershed in Mpumalanga towards its confluence with the Limpopo River immediately downstream from the Massingir Dam in Mozambique. The proposed Canyon Springs Coal Mine locates in quaternary catchment B31E, within the Olifants River Water Management Area. The Ghotwane River flows in a south-easterly direction across the proposed Canyon Springs Coal Mine and into the Rhenosterkop Dam. A tributary of the Ghotwane flows in a southerly direction across the project area. See Figure 25 for an indication of the watercourses associated with the proposed development.

3.11.2. Ghotwane River

The main watercourse flowing through catchment B31E is the Ghotwane River. Due to the endorheic nature of most of the Springbok Flats, within which this quaternary catchment locates, the Ghotwane River is a non-perennial river for its entire length up to its confluence with the Elands River (within the Rhenosterkop Dam), in spite of its relatively large catchment of 1 383 km^2 .

The Ghotwane River has several tributaries, all of which are non-perennial streams. One such streams is associated with the project area, as the coal resource targeted extends below this watercourse and mining will inevitably occur in close proximity to the stream on both sides of the stream's banks. This tributary does not have a name, thus it has been named the "No-Name" Stream for the purposes of this project. This stream flows roughly from northwest to southeast to its confluence with the Ghotwane River.

The Ghotwane River flows into the Elands River in Quaternary Catchment B31F. This confluence occurs within the Rhenosterkop Dam, the receiving body of water, downstream from the proposed mine. After passing through the Rhenosterkop Dam, the Elands River continues to meander towards its confluence with the Olifants River near Marble Hall, some 70.7 km downstream from the Rhenosterkop Dam wall, right at the tail end of the Arabie Dam in the Olifants River.

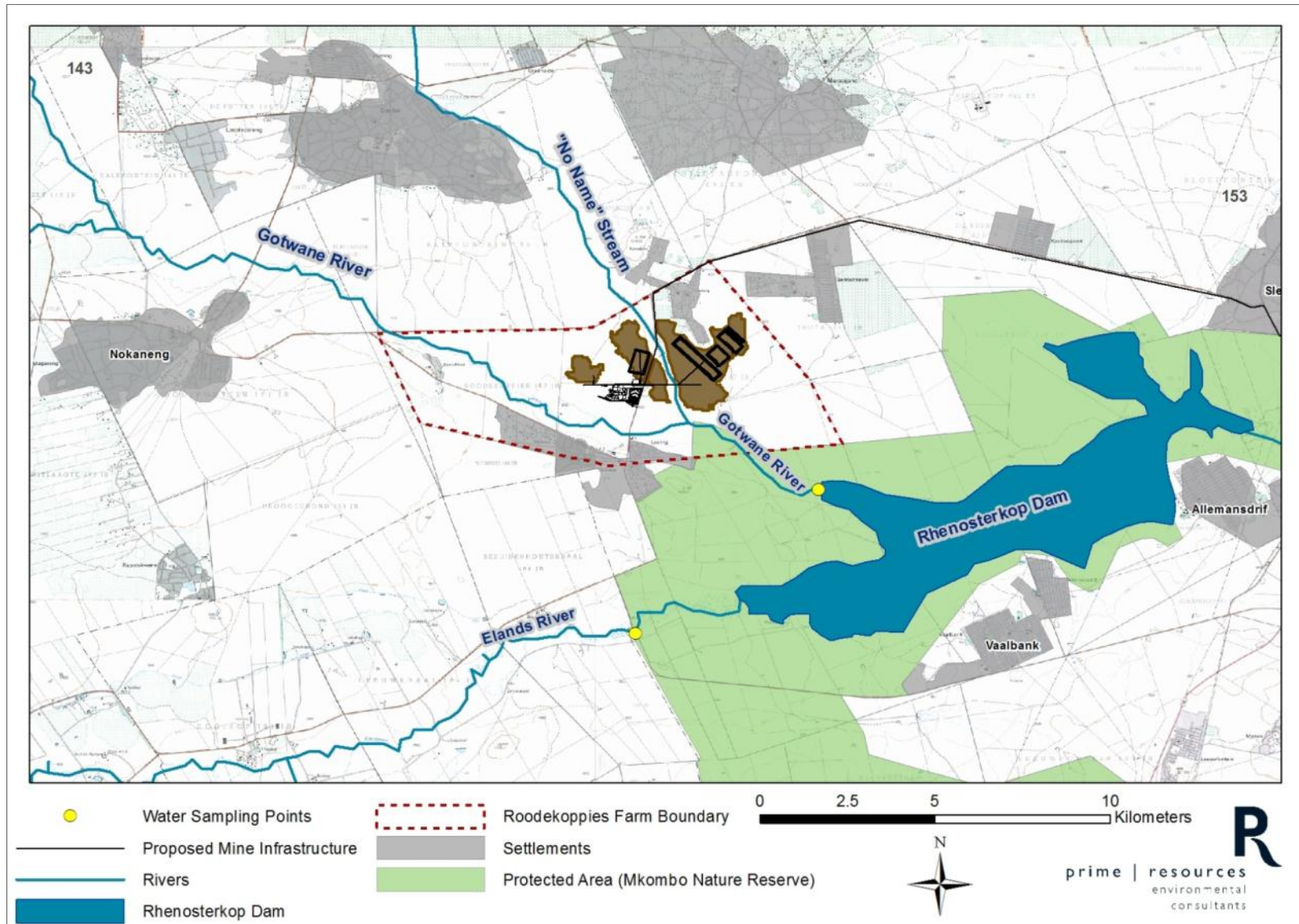


Figure 25: Surface water resources associated with the proposed Canyon Springs Coal Mine

Due to the very flat nature of the general area surrounding the proposed mine, the Ghotwane River splits into two separate watercourses (a northern and southern leg) just south of the proposed mine. These two legs of the Ghotwane River confluence some distance downstream from the proposed mine. The "No-Name" Stream enters the Ghotwane River via its northern leg.

3.11.2.2. Limpopo River

The Limpopo River rises in central Southern Africa at the confluence of the Marico and Crocodile Rivers, and flows eastwards to the Indian Ocean. It is around 1 750 km long, with a drainage basin 415 000 km². Its mean annual discharge is 170 m³/s at its mouth near the town of Xai Xai in Mozambique. After the Zambezi River, the Limpopo River is the second largest river in Africa that drains to the Indian Ocean.

The Limpopo River flows eastwards in a great arc across the African continent, first meandering north, then northeast, then turning east and finally southeast. It serves as an international border for about 640 km, separating South Africa to the southeast from Botswana to the northwest and Zimbabwe to the north. There are several rapids as the river falls off Southern Africa's inland escarpment. Its main tributary is the Olifants River, contributing around 1 233 million m³ of water per year. Other major tributaries include the Shashe River, Mzingwane River, Crocodile River, Mwenezi River and Luvuvhu River.

The waters of the upper Limpopo River are sluggish and silty. Rainfall is seasonal and unreliable. In dry years, the upper parts of the river only flow for approximately 40 days/year or less. The upper part of the drainage basin is arid, in the Kalahari Desert, but becomes less arid as the river progresses further downstream.

3.11.2.3. Olifants River

The Olifants River rises on the farm Nooitgedacht 237 IS along the African Continental Watershed some 15 km to the west of the town of Breyten. However, while the water in the Olifants River flows into the Indian Ocean via the Limpopo River, water flowing in the Vaal River flows via the Orange River into the Atlantic Ocean.

The Olifants River and some of its tributaries, notably the Klein Olifants River (originating near Hendrina, flowing into the Olifants River downstream of the Middelburg Dam), the Elands River, Wilge River and Bronkhorstspuit, rise along the continental watershed in the Highveld grasslands. Thirty-one large dams in the Olifants River's catchment include the Witbank Dam (New Doringpoort Dam), Renosterkop Dam, Rust de Winter Dam, Blyderivierspoort Dam, Loskop Dam, Middelburg Dam, Ohrigstad Dam, Arabie Dam and the Phalaborwa Barrage in South Africa and the Massingir Dam in Mozambique. Figure 26 shows the proposed Canyon Springs Coal Mine in relation to the Olifants River within the Olifants River catchment, as well as the flow of the Olifants River into Mozambique.

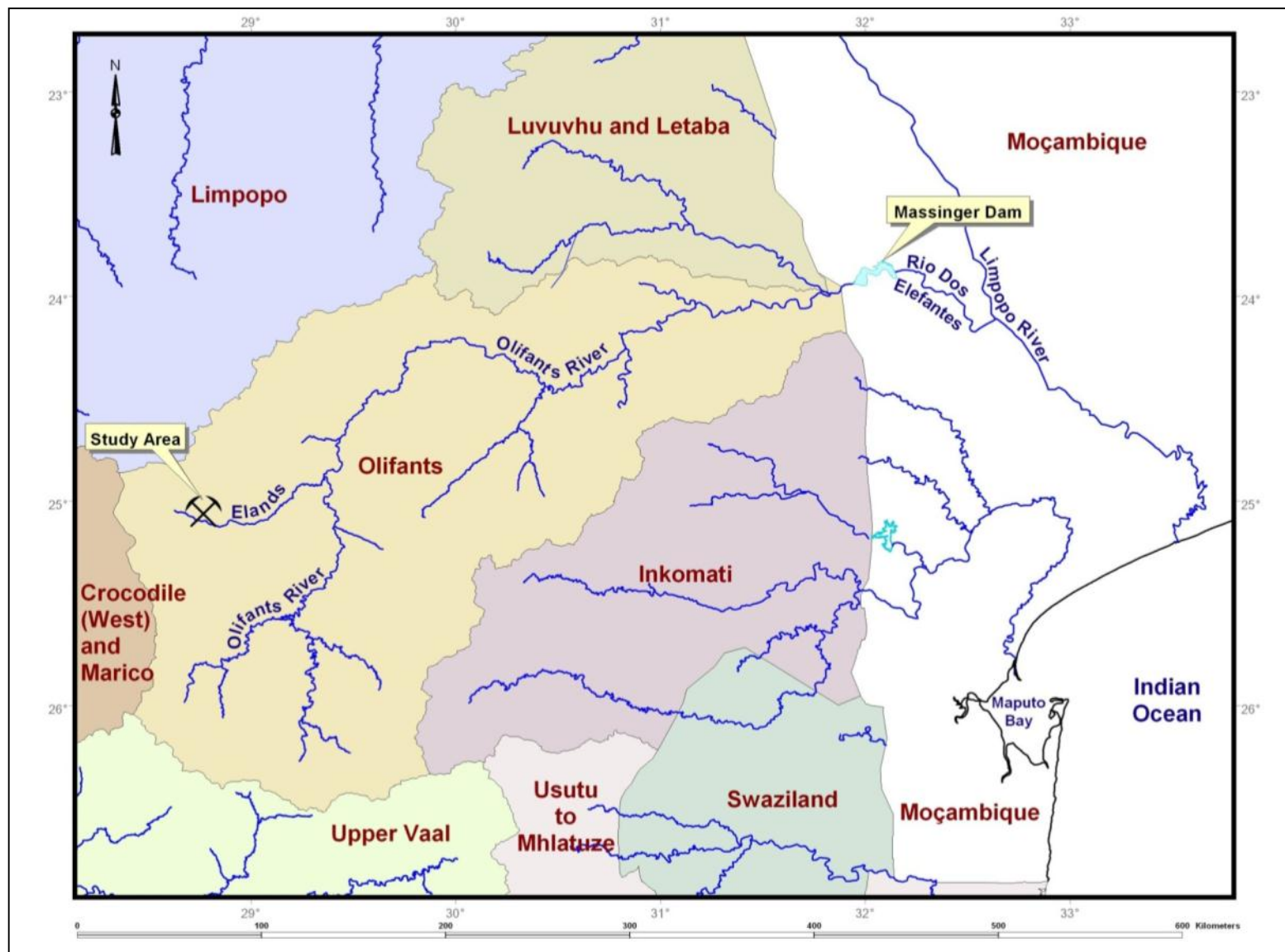


Figure 26: The Canyon Springs Coal Mine in relation to the Water Management Agencies of the rivers flowing eastwards to the Indian Ocean

3.11.3. Surface Water Flow Patterns

Surface flow will drain directly towards the Ghotwane River from all surface infrastructure areas, either directly or via the "No-Name" Stream. The total area catchment area to be occupied by the proposed development is approximately 563 Ha, which equates to a volume of approximately 43 914 m³ surface run-off in terms of the MAR to the Ghotwane and Elands Rivers annually (about 120 m³/day).

Figure 27 is a visual representation of the direction of the flow of surface water at the Canyon Springs Coal Mine.

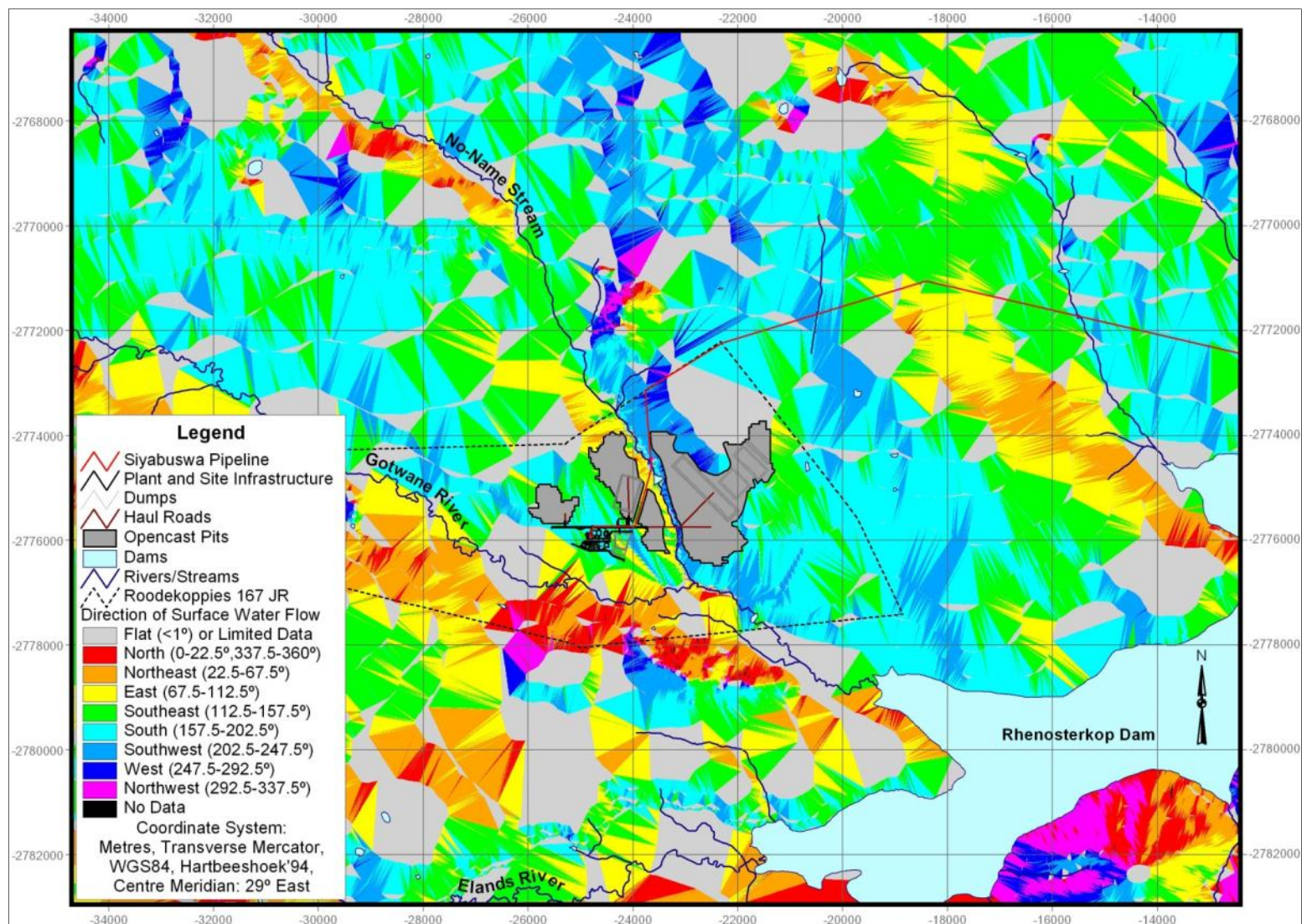


Figure 27: The direction of surface water flow across the proposed mining area of Canyon Springs Coal Mine

3.11.4. Hydrology

3.8.3.1 Projected Peak Flow Quantities

The elevation containing the maximum discharge, at each cross section along the “No-Name” Stream, was plotted on either side the streams centre-lines and transferred, in plan, to the drawing, to demarcate the 100-year flood lines for this stream section. The dam wall and the inadequately sized culverts which exist under the tarred road will have a damming effect on floodwaters during a 100-year storm, elevating the flood lines by a significant amount in the area upstream from these two obstructions.

The “No-Name” Stream, a tributary of the Ghotwane River, has a catchment up to the study area of 338.6 km², of which 220.0 km² is classified as an endorheic area. An endorheic area is an area that has an inflow but no visible outflow on the surface, i.e. it is a dead end catchment. Water entering it never leaves it in a visible form. All water falling onto or flowing into such a basin is lost as either evaporation or as groundwater recharge.

To incorporate the reduced run-off produced by an endorheic catchment, a reduction factor of 78% was applied on the total catchment surface area as well as on the rainfall. The two reductions were calculated separately and for each method of applying this reduction, a discharge was calculated:

- When the surface area was reduced (and the rainfall left the same), a maximum discharge of 272.9 m³/s was produced by a 3-hour storm; and
- When the rainfall was reduced (and the surface area was left the same), a maximum discharge of 251.2 m³/s was produced by a four hour storm.

An average of the values i.e. 262.05 m³/s was derived using the two reduction methods.

3.11.4.2. Floodlines

While certain limits based on the 50 year floodlines are indicated in GN704, for the purposes of this investigation, only the 100-year flood was determined and will be used for both 50- and 100-year flood purposes. This merely means that the 50-year flood lines will have an additional built-in safety margin.

Figure 28 shows the 100-year flood lines of the “No-Name” Stream within the study area and the target resource. Mining activities closer than the 100-year flood line and the management thereof will be further investigated in Sections 8.3.6, 8.4.6 and 8.5.5.

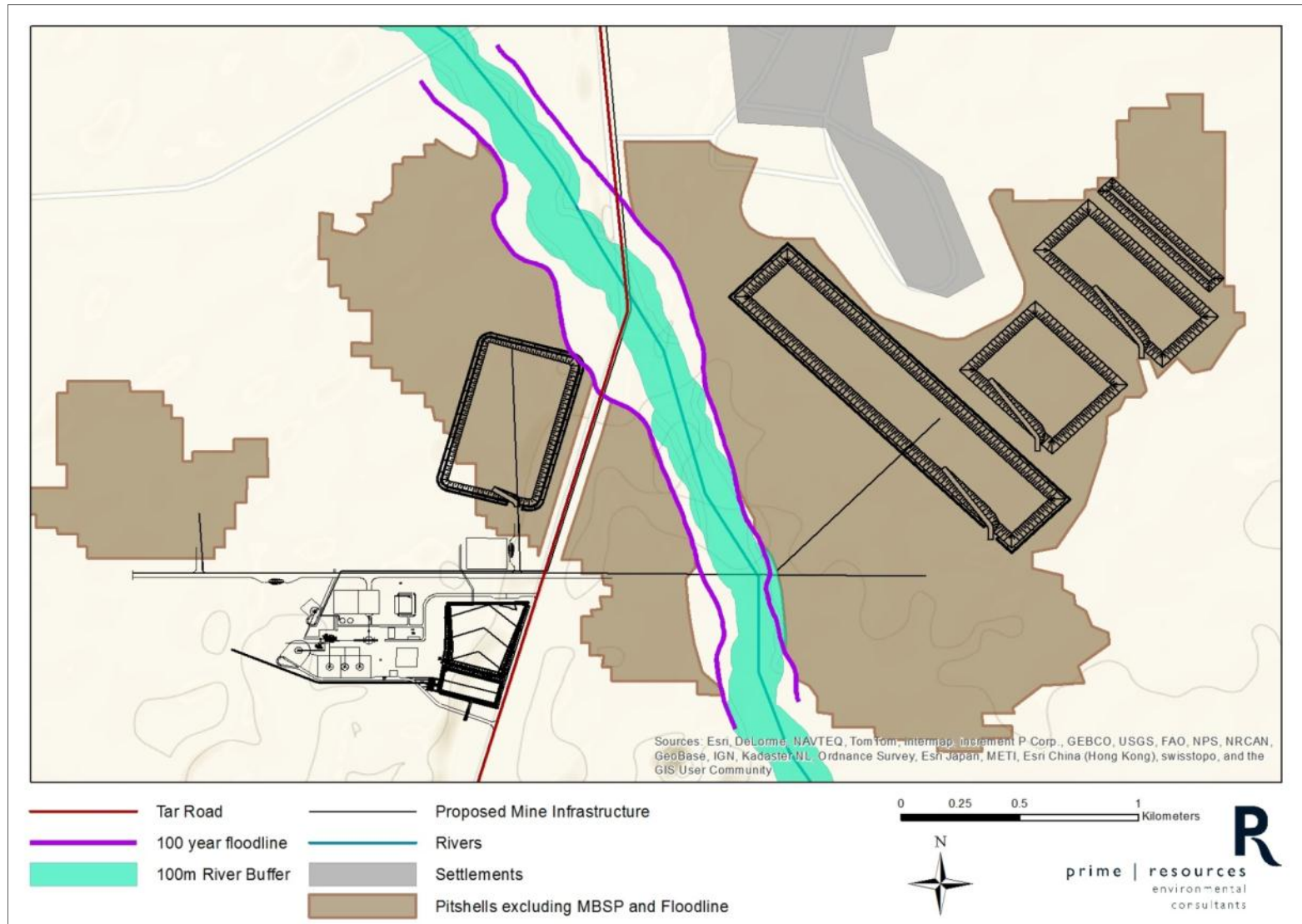


Figure 28: The 100-year flood lines (purple lines) and the 100-m buffer (green lines) along the “No-Name” Stream

3.11.5. Surface Water Quality

To assess the surface water quality at the Canyon Springs Coal Mine, two water samples were collected, one from the Elands River upstream from the Rhenosterkop Dam, where the tarred road between the villages of Loding (at the proposed mine) and Vaalbank, south of the Rhenosterkop Dam, passes over this river. A second sample was collected from a stagnant pool in the Ghotwane River shortly before it flows into the Rhenosterkop Dam.

The samples were analysed at a South African National Accreditation System (SANAS) accredited laboratory and compared to the South African National Standards (SANS) drinking water standard, 241 of 2011, which separates water into three classes of suitability for human consumption. These classes are described as follows (Table 11):

Table 11: SANS 241 Water Quality Classes

SANS 241: 2011 Upper Limits and Ranges				
Not classified	Class 0	Class I	Class II	Exceeding Class II
	(Ideal)	(Acceptable – exceeds only aesthetic or non-health concentration)	(Max. Allowable)	(Not allowed – Exceeds health concentration)

The results of the analyses of samples are illustrated in Table 12.

As can be seen from Table 12, apart from the three metals (iron, manganese and aluminium), the water of both samples complied with the SANS 241:2011. This indicates that both streams have relatively good water qualities. The iron concentration in both samples exceeded the standard marginally. Although it still complied with the health standard limit, it exceeded the aesthetic standard limit, indicating that the water from both streams would have a distinctive iron taste. Both manganese and aluminium exceeded the standard limits of the SANS 241:2011 standard. In both cases, we believe that this is likely to be attributable to the relatively low pH (although both samples still represented alkaline conditions) but particularly as a result of the products produced by the natural decomposition of organic material during the winter months (periods of low flow in the rivers when the samples were obtained). This often results in localised lowering of pH and the subsequent dissolution of some of the metals. As the pH afterwards does not get high enough to effect precipitation of these metals, they remain in solution. The presence of these metals in these concentrations is attributable to natural environmental conditions, i.e. factors beyond the control of the management of the future mine. At the same time, sulphate, the most commonly used and most reliable indicator of coal mining pollution was very low (9 and 12 mg/l for the Elands and Ghotwane Rivers, respectively). This will be the norm against which the performance of the proposed mine will be gauged in future.

Table 12: The chemical analyses results of the surface water samples collected from the surface streams at the proposed Canyon Springs Coal Mine

Sample ID → Determinant ↓	Units ↓	Elands River	Gotwane River	SANS 241:2011	
Macro and Physical Determinants				Standard Limits	Risk
pH	@25°C	7.8	7.4	≥5.0 - ≤9.7	Operational
Conductivity	mS/m @25°C	24.0	73.0	≤170	Aesthetic
Total Hardness	mg/l CaCO ₃	46.0	176.0		
Chloride	mg/l	57.0	127.0	≤300	Aesthetic
Sulphate	mg/l	<50	<50	250 and 500	Acute Health: ≤500 Aesthetic: ≤250
Nitrate	mg/l N	<0.5	0.7	≤11	Acute Health
Calcium	mg/l	6.8	39.0	<150 (SANS 241:2006 Class I)	
Magnesium	mg/l	2.8	16.0	<70 (SANS 241:2006 Class I)	
Sodium	mg/l	25.0	64.0	≤200	Aesthetic
Potassium	mg/l	5.7	6.4	<50 (SANS 241:2006 Class I)	
Manganese	mg/l	6.8	15.0	0.1 and 0.5	Chronic Health: ≤0.5 Aesthetic: ≤0.1
Iron	mg/l	0.89	0.97	0.3 and 2.0	Chronic Health: ≤2.0 Aesthetic: ≤0.3
Total Alkalinity	mg/l CaCO ₃	21.0	177.0		
Micro Determinants					
Aluminium	µg/l	1211.70	1109.70	≤300	Operational
Antimony	µg/l	0.60	0.10	≤20	Chronic Health
Arsenic	µg/l	0.50	2.70	≤10	Chronic Health
Barium	µg/l	53.90	116.90		
Beryllium	µg/l	0.09	0.05		
Bismuth	µg/l	0.02	0.01		
Cadmium	µg/l	0.04	0.02	≤3	Chronic Health
Chromium	µg/l	1.50	5.60	≤50	Chronic Health
Cobalt	µg/l	0.29	0.85	≤500	Chronic Health
Copper	µg/l	7.47	4.80	≤2 000	Chronic Health
Lanthanum	µg/l	0.96	0.29		
Lead	µg/l	1.10	0.69	≤10	Chronic Health
Lithium	µg/l	1.90	1.98		
Mercury	µg/l	0.20	0.19	≤6	Chronic Health
Molybdenum	µg/l	0.45	1.30		
Nickel	µg/l	2.00	7.90	≤70	Chronic Health
Platinum	µg/l	<0.01	<0.01		
Selenium	µg/l	2.38	2.50	≤10	Chronic Health
Tellurium	µg/l	0.05	0.03		
Thallium	µg/l	0.07	0.06		
Tin	µg/l	0.46	0.50		
Titanium	µg/l	27.00	59.00		
Vanadium	µg/l	1.50	6.60	≤200	Chronic Health
Zinc	µg/l	4.56	2.20	≤5 000	Aesthetic
Uranium	µg/l	0.60	3.80	≤15	Chronic Health

The major cation and anion equivalents for the samples analysed were plotted on a Piper Diagram in order to provide a fingerprint of the water resources at the proposed Canyon Springs Coal Mine. This method involves plotting the cations and anions on adjacent tri-linear fields, with these points then being extrapolated to a central diamond field, where the chemical character of water, in relation to its environment, can be observed and changes in the quality interpreted.

The cation triangle on the left (below) shows that the Ghotwane River exhibits slightly cationic properties, which is even more pronounced with the Elands River. The anion triangle on the right shows that the Elands River exhibits distinct chloride characteristics and the Ghotwane River leaning towards chloride characteristics although bicarbonate characteristics still play a role in the river's composition.

The Piper Diagram in Figure 29 shows that the Ghotwane River has an almost ideal water quality, with the Elands River water migrating slightly towards the area generally associated with urbanisation (indicated by the tendency to plot towards the area dominated by sodium and chloride, i.e. the right of the central diamond field of the Piper Diagram). The Ghotwane River illustrates good mixing and dissolution of the water, and the water indicates no dominant type of ion, e.g. Mg, Na, SO_4 etc, present. Although the Elands River does not drain any of the large metropolitan areas, it does have several smaller rural villages in its catchment and this is the likely cause for the Piper Diagram to show this slight tendency towards the sodium chloride zone. It must also be kept in mind that during periods of low flow (end of winter), there is a significant amount of concentration of salts in sluggishly flowing streams, due to evaporation. The Elands River indicates sign of sewage pollution and has higher Ca, Mg, Cl, Na etc. concentrations than the Ghotwane River.

However, as the Piper Diagram uses equivalents and not concentrations, it must be assumed that if there is a measure of concentration, all the determinants used in the Piper Diagram would have been subjected to the same amount of concentration and subsequently, the points would still plot in the same areas.

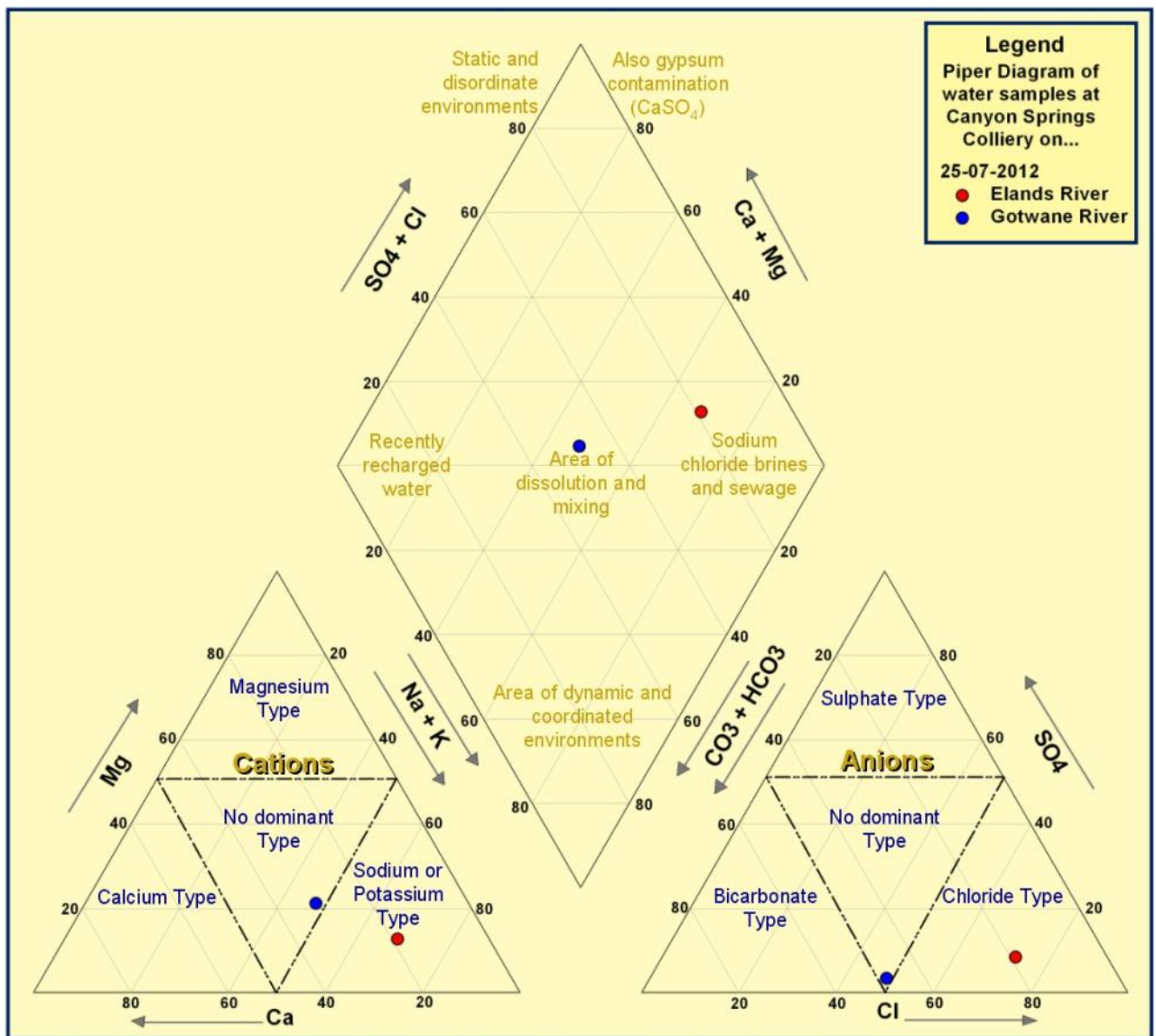


Figure 29: Piper Diagram of the water samples collected at the proposed Canyon Springs Mine

3.12. Cultural and Heritage Resources

A cultural and heritage resources baseline study was conducted by Archaeos Culture & Cultural Resource Consultants in November 2011 (Appendix 8A) with a follow-up Phase 1 Cultural and Heritage Assessment in August 2012 (Appendix 8B). The following three sites of cultural significance were identified within the study area (Figure 30).

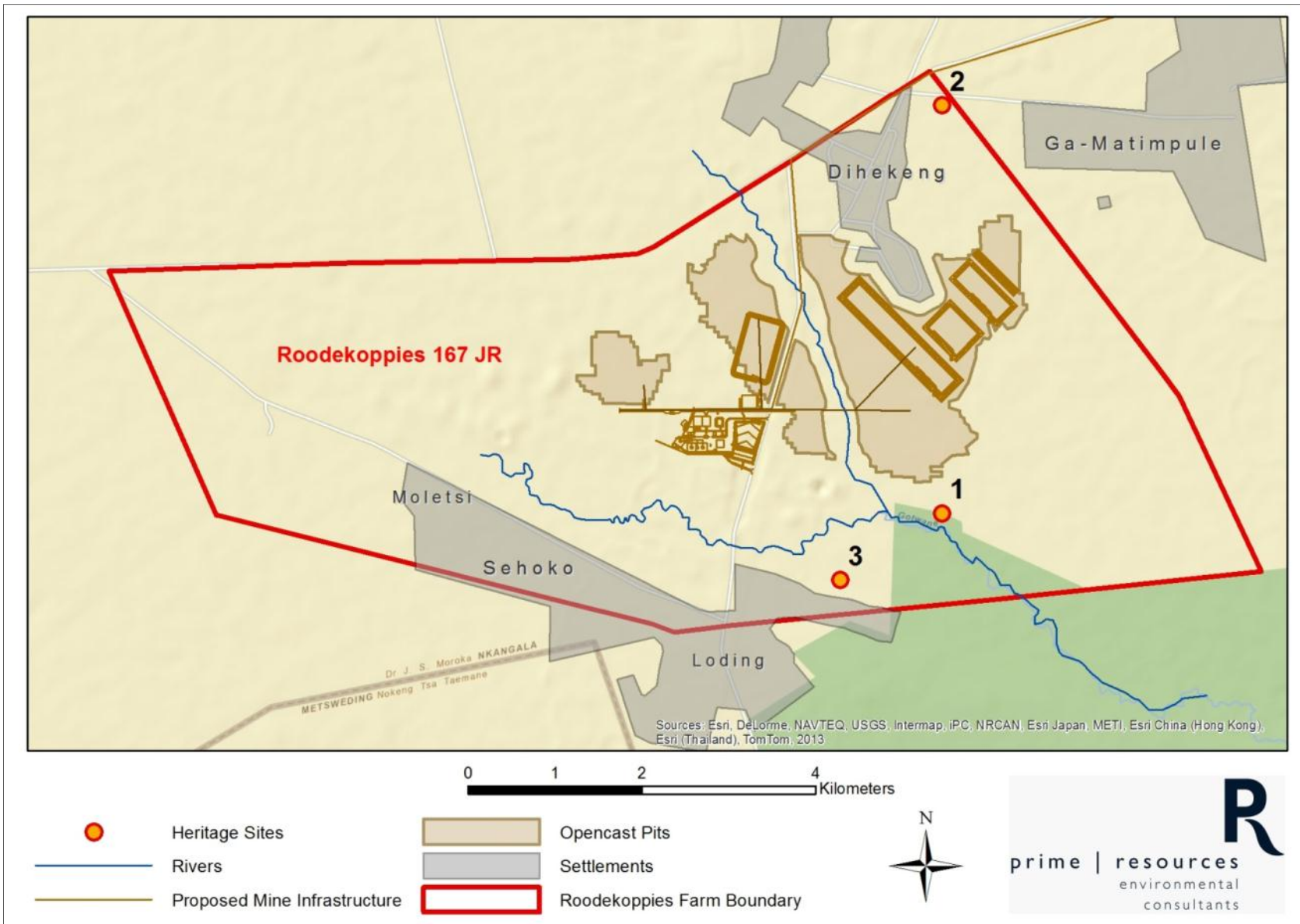


Figure 30: Location of the identified cultural/heritage sites within the Canyon Springs Coal Mine Project Area

3.12.1. Site 1

Site 1 comprises the remains of an old farmstead consisting of building ruins, an old dam and other related structures (Figure 31). These structures may be slightly older than 60 years but are not unique. The site is regarded as having a low cultural significance with little to no heritage value.



Figure 31: Ruins and Site 1

3.12.2. Site 2

Site 2 is an area where Middle and Late Stone Age tools as well as Iron Age pottery were identified (Figure 32 and Figure 33). One of the potshards found was decorated and seems to be related to the Rooiberg facies of the Late Iron Age, however this is not conclusive as only one piece of pottery was identified. These materials are likely to have been washed into the area from further north. These findings therefore constitute a feature rather than a site and are therefore regarded as being of low cultural significance.



Figure 32: Middle and Late Stone Age tools at Site 2



Figure 33: Iron Age pottery at Site 2

3.12.3. Site 3

Site 3 is an area where Middle and Late Stone Age tools were found (Figure 34). The site is situated within the floodplain of the Ghotwane River and thus these artefacts were washed down the river from further upstream. These artefacts therefore do not constitute a site, but rather a feature and are regarded as having a low cultural significance.



Figure 34: Late Stone Age tool from Site 3

It needs to be considered at all times that the environmental factors may have had an influence on the identification of sites and further sites may thus be uncovered during the course of the development. No graves, apart from those in formal cemeteries in the town of Loding, were identified. The Community Liaison Officer, Mr. Rodney Maodi, indicated that he does not know of any other graves within the project area.

3.13. Palaeontology

A desktop Palaeontological Impact Assessment (PIA) was conducted by Professor Marion Bamford of the Evolutionary Studies Institute of the University of the Witwatersrand in August 2013 (Appendix 8). The study found that geologically, the proposed project area is within the Early Permian Eccra Group of the Karoo Supergroup (approximately 270 to 260 million years old) with abundant coal deposits. To date, fossils have not been recorded from the area of the proposed Canyon Springs Mine and the report indicated that it is unlikely that fossils of importance will be found at the proposed project site (Appendix 16).

3.14. Air Quality

An air quality impact assessment was completed by Gondwana Environmental Solutions in September 2012 (Appendix 9). This study found that many sources of air pollution exist in Mpumalanga, ranging from veld fires and wind erosion of exposed areas to industrial processes, agriculture, mining activities, power generation, paper and pulp processing, vehicle use and domestic burning of fossil fuels. Different pollutants are associated with each of the above activities, ranging from volatile organic compounds and heavy metals to dust and odours.

The proposed Canyon Springs Coal Mine falls within the declared National Highveld Priority Area (HPA) for Air Quality. As such the ambient levels of particulate matter are high, and often exceed the national standards.

The diurnal and seasonal wind roses for the proposed project area are presented in Figure 35. Based on the prevailing meteorological conditions for the area, dust and particulate matter are transported predominantly in a north-easterly to easterly direction across the proposed project area. The prevalence of moderate to fast winds, between 14 km/h and 29 km/h (depending on the month) has the potential to transport dust and particulate matter several kilometres.

The diurnal variation in hourly winds shows much the same pattern as the seasonal variation. Winds from a north-easterly direction dominate during the warmer hours of the day, with the wind direction veering to a dominantly easterly direction into the coldest hours of the night.

During the day strong convective mixing brings higher momentum air to the ground, where drag at the surface acts as a momentum sink. The mixing process is vigorous enough to maintain substantial wind speeds at the anemometer height of 10 m. This mixing process also impacts the mixing height. Mixing heights below 400 m above ground level are common during the night, but start to rise during the day as heating increases and reach a median of almost 3 km above ground level during the late afternoon. As the sun sets the convective boundary layer breaks up and the stable, nocturnal boundary layer forms around 200 m above ground level. The remainder of the convective boundary layer will form the residual layer that will be re-entrained into the convective boundary layer during the next day.

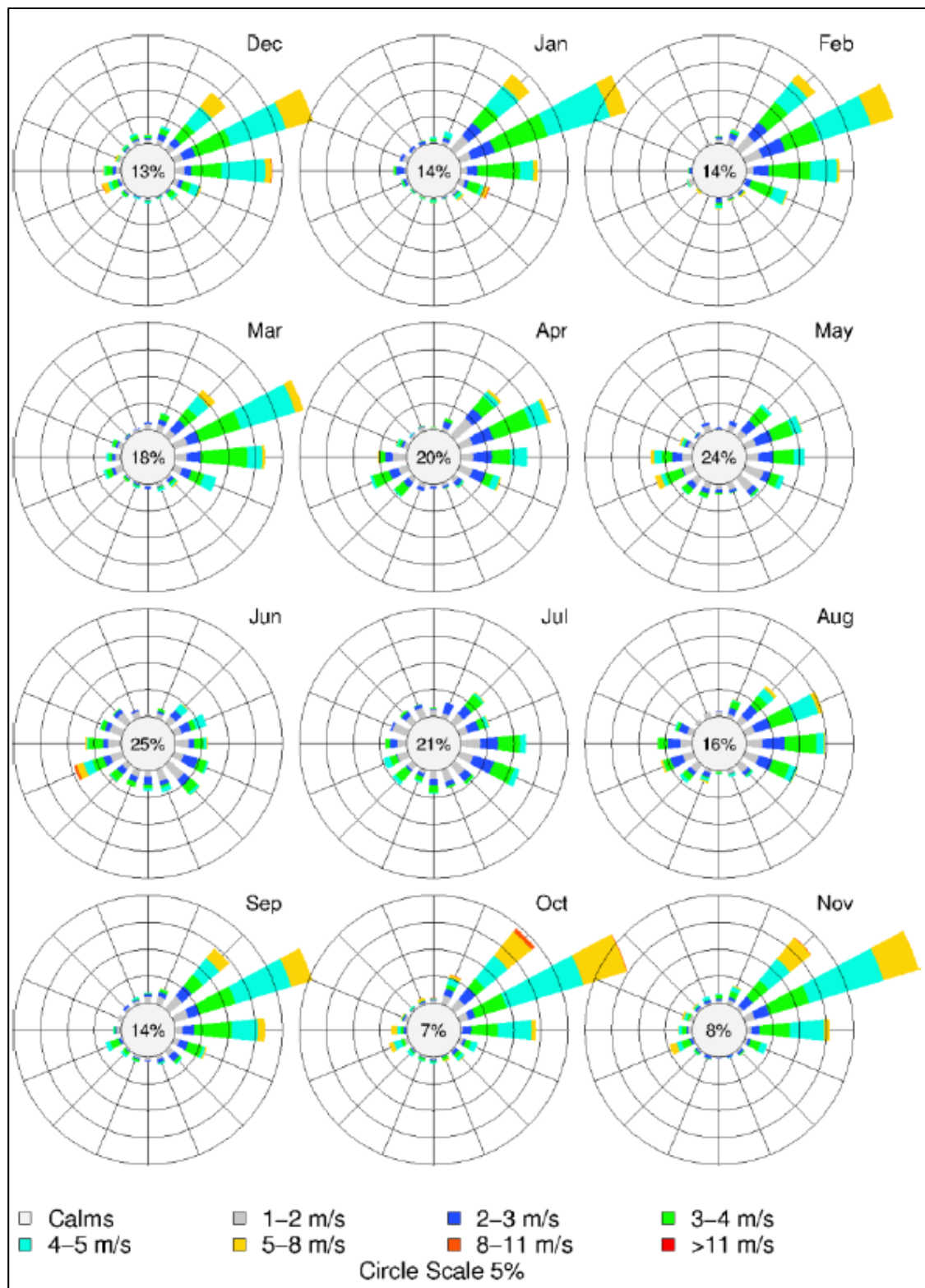


Figure 35: Monthly wind roses of hourly data as predicted by the MM5 regional model for the proposed project site

3.14.1. Sensitive Receptors

A sensitive receptor for the purposes of the current investigation is defined as a person or place associated with the receiving area where involuntary exposure to pollutants could take place. Receptors surrounding the proposed site were identified from satellite images of the area. Potential sensitive receptors to air quality impacts in the vicinity of the project area thus include the inhabitants of the surrounding villages. Table 13 illustrates the locations of the various settlements in relation to the proposed mining site.

Table 13: Identified receptors surrounding the proposed site

RECEPTOR	DISTANCE (KM)	DIRECTION FROM SITE
Moletsi	~ 2 km	WSW
Sehoko	~1 km	SW
Loding	~ 2km	SSW
Dihekeng	~ 300 m	N
Ramatsho	~ 500 m	N
Ga-Matimpule	~ 2 km	ENE

3.15. Traffic

A study was conducted by Goba Consulting Engineers in August 2012 (Appendix 10). The National, Provincial, and Local Municipal/District roads in the immediate vicinity of the proposed Canyon Springs Coal Mine are the R516, the D626 and the R573.

- The R516 is a paved Provincial road to the north of the proposed coal mine traversing east-west between Settlers and Bela-Bela with a single lane in each direction and which carries low volumes of traffic during peak hours. The interchange of the N1/R516 is approximately 52 km from the proposed location of the Mine. The road is in a poor condition;
- The D626 is a paved/gravel District road to the south of the proposed coal mine traversing east-west with a single lane in each direction and which carries low traffic volumes during peak hours. The interchange of N1/D626 is approximately 54 km from the proposed mine location. The condition of the road is poor; and
- The R573 is a paved Provincial road to the south of the proposed coal mine traversing east-west between Marble Hall and Pretoria via Moloto with a single lane in each direction and carries low volumes of traffic during peak hours. The condition of this road is poor.

There are two roads bordering and transecting the project area (Figure 36). The proposed Canyon Springs Coal Mine will occupy both sides of the existing D1944 road. The other road of note is the gravel road (D2740) between R576/R516 and D626. The D2740 traverses east-west between the proposed mine location and the R101 to the east.

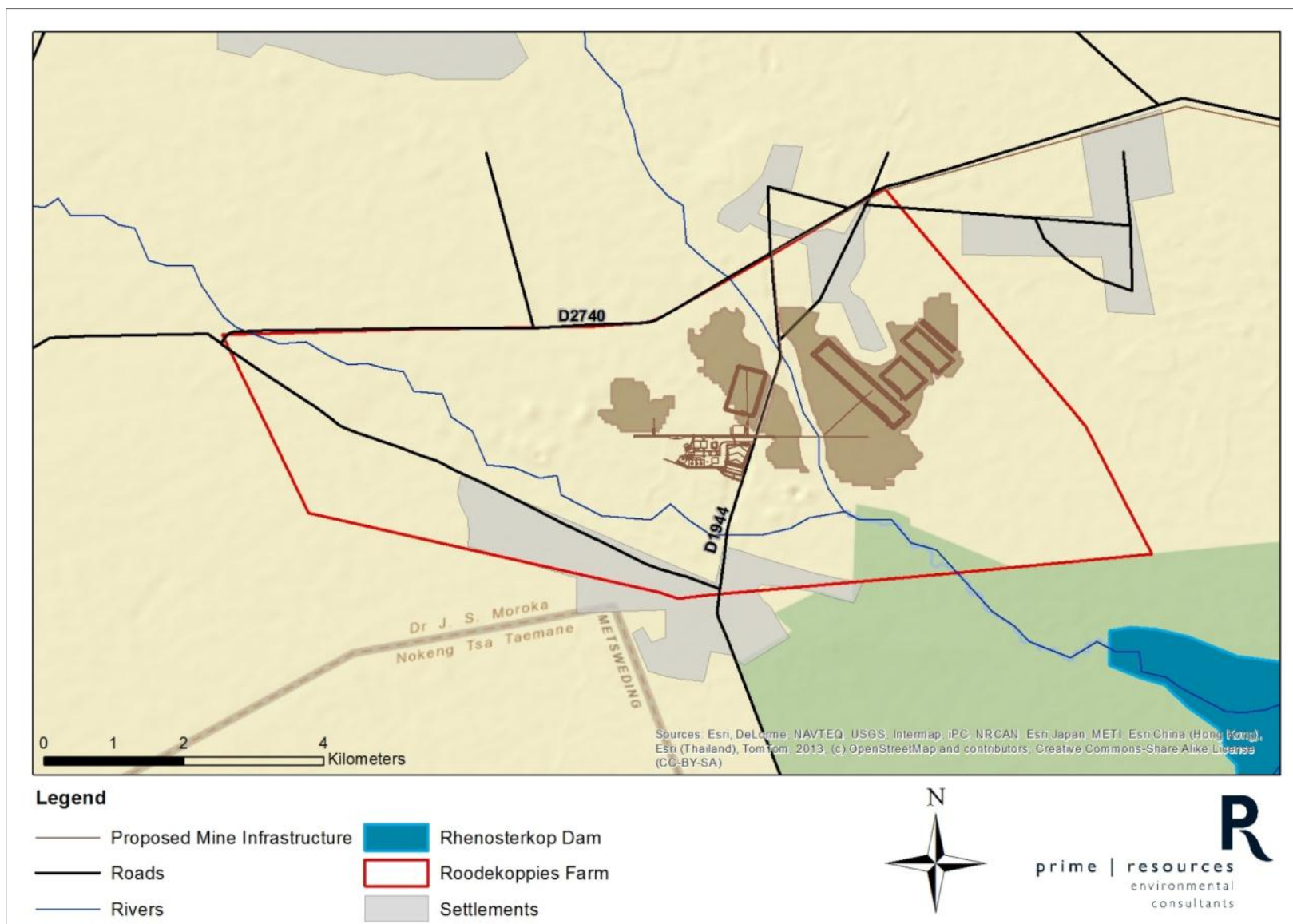


Figure 36: The road network associated with the Canyon Springs project area

A 12-hour traffic count conducted as part of the baseline study in August 2012, indicated the following in terms of traffic volumes:

- Volumes, through the various intersections that were measured, in the order of 280, 900 and 60 vehicles respectively.
- The morning and afternoon peak hours were found to be between 07:00 to 08:00 and 16:15 to 17:15, respectively.
- There is maximum peak hour traffic of 31, 102 and 8 vehicles at intersection 1, 2 and 3, respectively.
- All intersections are operating at a Level of Service (LOS) A classification, in both the morning and the afternoon peak hour. LOS A consists of a delay of less than 5 seconds per vehicle at an intersection. This constitutes free flow at the intersection which allows for good progression, few stops and short cycle lengths.

3.16. Noise

A noise impact assessment was conducted by Jongens Keet Associates in August 2012 (Appendix 11). The areas surrounding the proposed Canyon Springs Coal Mine project area are dominated by villages, open veld, grazing lands, and land used for agricultural purposes. No loud noise producing developments occur in the immediate vicinity. The project area is mainly characterised by agricultural land which has a typically rural noise climate associated with it. These ambient noise levels ideally should not exceed 45 decibels (dBA) between 06h00 and 22h00 and 35 dBA at night (22h00 to 06h00).

In general the residual noise levels in the villages surrounding the development site are typically representative of a rural character but are tending towards a suburban character, namely where the average daytime noise levels do not exceed 50 dBA and the night-time levels do not exceed 40 dBA.

The only noise generated would be that from traffic along the D1944 road that bisects the study area and from traffic within the surrounding villages. Residences in some areas are negatively impacted from traffic noise, particularly at night.

Atmospheric temperature inversions have a significant effect on the noise propagation character of the area. These inversions tend to increase noise levels at some distance from a source. One of the main meteorological aspects that will affect the propagation of the noise is the wind. Meteorological data used for modelling purposes was obtained from Gondwana Environmental Solutions. From the Pretoria wind rose it is noted that the wind blows almost equally from all directions, with a slight predominance from the south. Calm periods for this region are of the order of 9.6% of the time period.

3.16.1. Sensitive Noise Receptors

Potential sensitive receptors to noise impacts in the vicinity of the project area would be the inhabitants of the surrounding villages of Moletsi, Sehoko, Loding and Dihekeng. The various farmhouses and farm labourer residences to the south of the proposed mining area, the schools

and crèches and the hospitals and clinics may be defined as noise sensitive land uses in the study area. Figure 38 shows the settlements surrounding the proposed project area.

3.17. Socio-Economic

3.17.1. Municipal Socio-Economic context

The proposed Canyon Springs Coal Mine project area is situated in the Mpumalanga province within the Nkangala District Municipality, which is approximately 16 892 km² in size, and consists of six local municipalities. The project area is located within the DRJSMLM which includes the towns of Siyabuswa and Loding and has 32 wards, 55 villages and covers an area of 1 416 km² (IDP, 2011).

The DRJSMLM is located in the north-western corner of the Mpumalanga Province where it borders with the Gauteng Province to the south-west and the Limpopo Province to the north. It forms part of a larger economic sub-region greatly influenced by economic activities within neighbouring areas.

The population of the municipality is estimated to be approximately 246 969 with 56 875 households and an estimated population growth of 1.06% (IDP 2011/2012, 2007 Community Survey).

About 30% of males and 36% females over 20 years had no schooling in 2001. This was reduced to 19% for males and 26% for females by 2007, which indicate favourable improvements in educational attainment over a period of 6 years. The percentage with some secondary education increased to 34% for males and 33% for females from 2001 to 2007; those with grade 12 increased to 17% for males and declined slightly to 16% for females. The percentage with higher levels of education do not change much; it remains at about 5% for both males and females (IDP, 2012/2013).

The DRJSMLM is characterised by limited economic activity and relatively large population concentrations. Unemployment in the area is also relatively high. Percentage employment increased in the municipality between 2001 and 2007. About 25% of males and 13% females were employed in 2007 (IDP, 2012/2013). The government services sector dominates the economy of the local Municipality which, in general, experiences slow and limited growth. The deep rural location of most towns and villages contribute to the dire economic situation. The government, transport, mining and trade sectors, however, enjoy steady growth. These sectors employ roughly 37% of the labour force. The majority of employment offered is either part time or contract positions. This has a negative effect on job security, financial planning and investment in the area. With the majority of businesses, the owner is the only employee. Remuneration in the formal sector ranges from R5 to R40 per day, depending on the performance of the business on the specific day. There is considerable friction between the formal and informal business owners due to the limited consumer buying power (IDP, 2009/2010). 67% of the households in the DRJSMLM are expected to earn income below R800.00 per month (IDP, 2012/2013).

Although urbanisation figures are unavailable, it is expected that more people will be concentrated around towns like Siyabuswa and Marapyane, where access to municipal services, housing and development projects, as well as employment opportunities are available. Smaller towns like Loding do not have sufficient sewerage/sanitation systems, running water and other municipal services. Out of 57 811 households in the DRJSMJLM, 12047 households have backlogs in terms of sanitation (IDP, 2012/2013).

It is estimated that less than 9% (5086) of households still require basic levels of service for water and less than 10% (8700) households experience intermittent water supply. The DRJSMLM provides residents in the area with water by a combination of a tanker and dedicated water supply boreholes. There is generally a lack of planned and maintenance of the water services infrastructure in the municipality, instead maintenance is carried out on a reactive basis (IDP, 2012/2013). Groundwater is mostly used for domestic and gardening use. Only four boreholes are used for livestock watering.

3.17.2. Land Ownership

A title-deed search for the Farm Roodekoppies 167 JR, Portions 2, 3, 4 and Remaining Extent, as relate to the proposed Canyon Springs Coal Mine, revealed that the land is State Owned, under the control of the Department of Rural Development and Land Reform (DRDLA) (see Appendix 13.6) and held in trust for the Tribal Authorities as follows:

- The Remaining Extent and Portion 2 of the farm Roodekoppies 167 JR are held in trust for the Bakgatla-Ba-Mocha Tribe (Figure 37); and
- Portions 3 and 4 for the farm Roodekoppies 167 JR are held in trust for the Amandebele Tribe (Figure 37).

According to the communities residing in the DRJSMLM, namely the residents of Loding, Moletsi, Sehoko and Dihekeng, however, historic land ownership agreements were in place whereby ancestors of the community members purchased the land through signatories acting on their behalf and that allowed for community members living in the four towns to be allocated portions of land within the central area on Roodekoppies 167 JR for subsistence farming and cattle grazing.

The above matter has been escalated to the National Department of Land Affairs (DLA) and the Department of Co-operative Governance and Traditional Affairs (COGTA) who have indicated that: People utilising land which is to be utilised for development need to be compensated in terms of the Interim Protection of Informal Land Rights Act, No. 31 of 1996. They have further indicated that issues pertaining to land ownerships claims will be addressed in terms of the Distribution and Transfer of Certain State Land Act, No. 119 of 1993 which requires that the Department appoints a Land Titles Adjustment Commission to resolve the issue. Until this matter is resolved, the Applicant must engage the affected communities and come to a resolution which will define the way-forward.

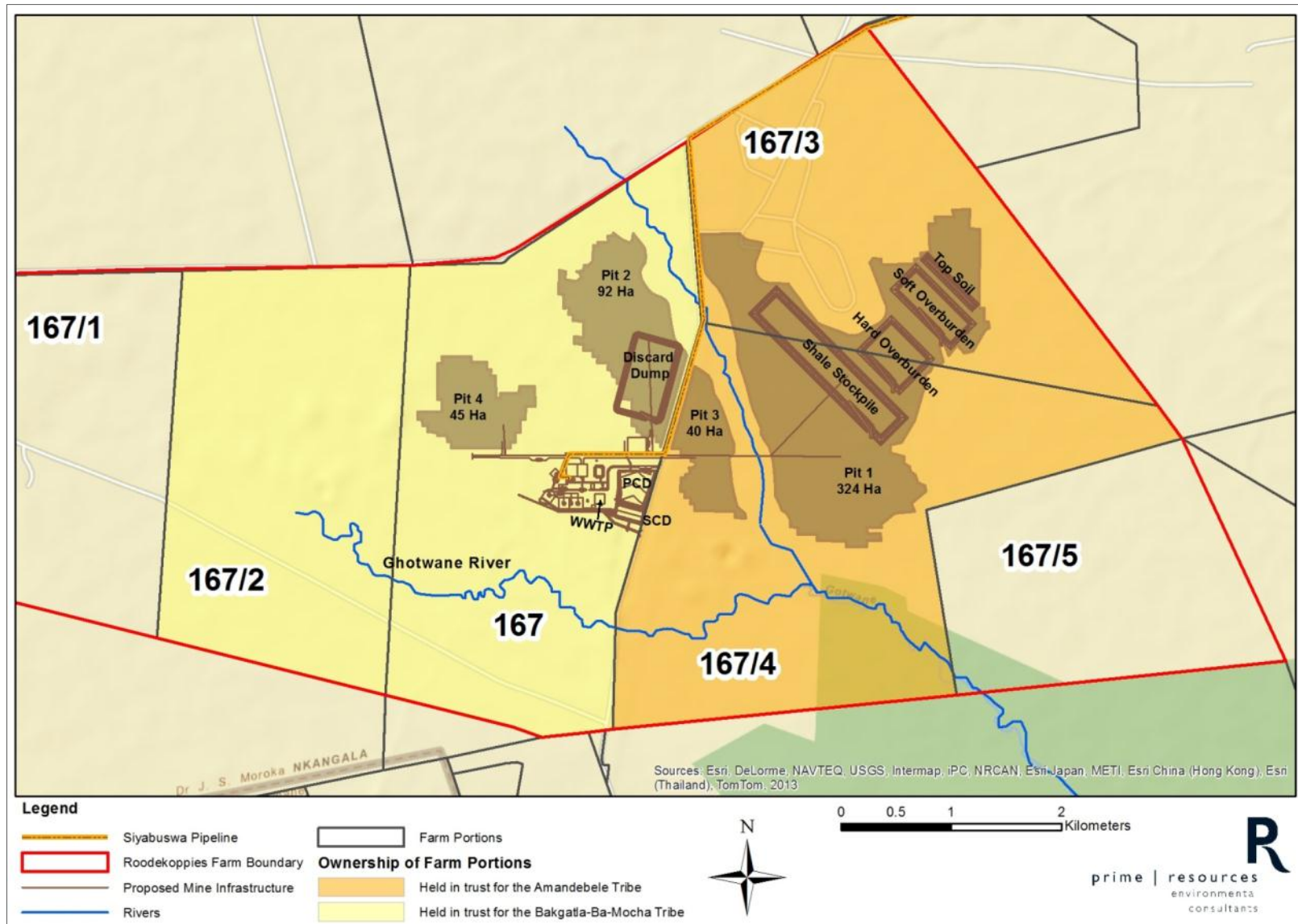


Figure 37: Mine layout across various portions of the Roodekoppies farm held in trust for the Bakgatla Ba-Mocha and Amandebele Tribes

3.17.3. Sensitive Environments

Figure 38 is a sensitivity map which combines all the ecologically and environmentally sensitive environments mentioned in the sections above. The sensitive environments indicated on the map below, consist of:

- Nationally protected tree species (*Acacia erioloba*);
- Heritage sites;
- Wetlands;
- Ghotwane River and the No-Name Stream;
- Protected areas (NPAES and Mkombo Nature Reserve);
- Surrounding Communities; and
- MBSP area;

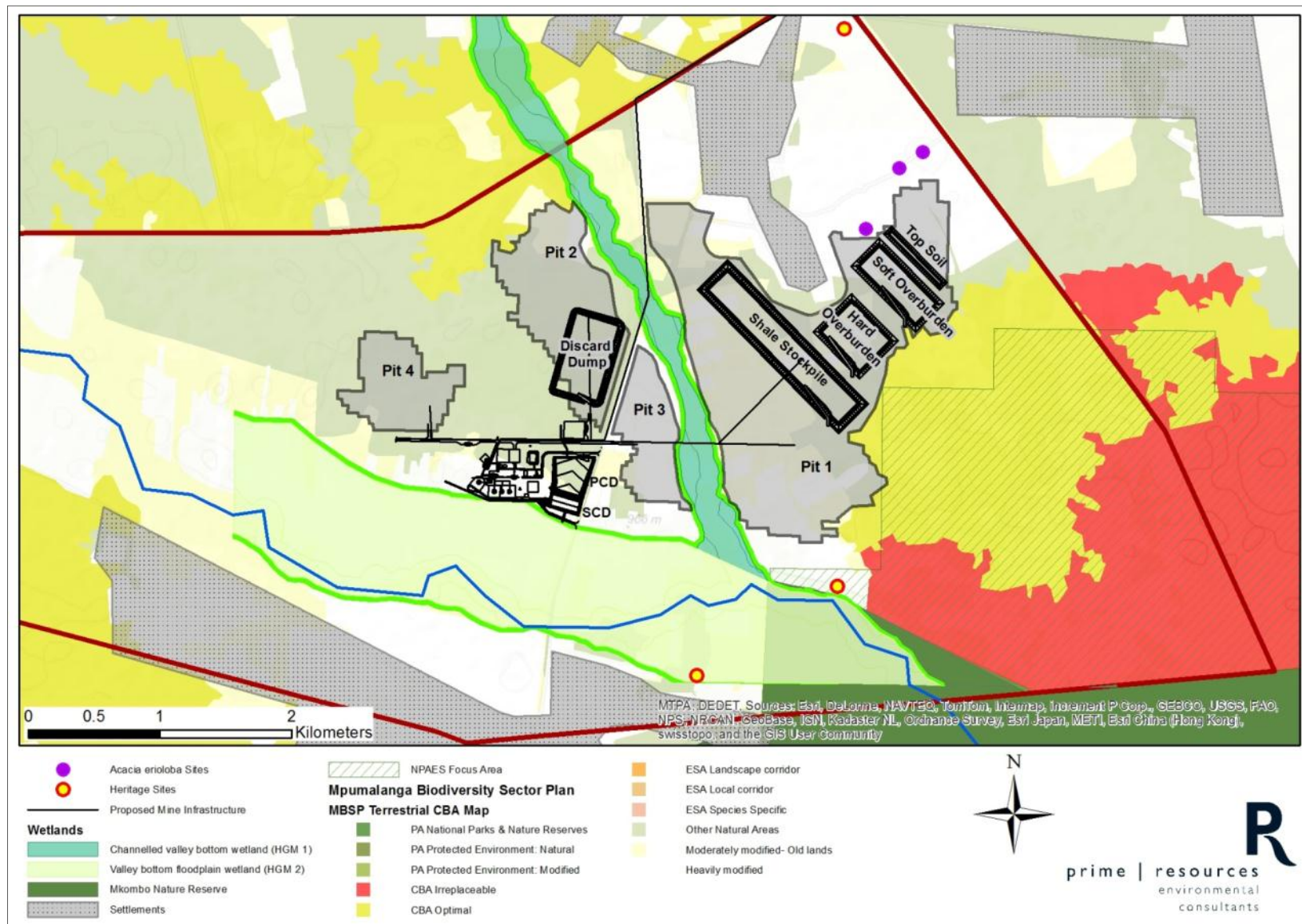


Figure 38: Sensitive environments at the proposed Canyon Springs Coal Mine

4. PROJECT DESCRIPTION

This chapter provides a description of the processes and infrastructure anticipated for the proposed development at the proposed Canyon Springs Coal Mine. Based on the data currently available, the estimated resource of 81M tons of coal is to be mined over a 20-year life of mine (LOM) through typical opencast coal mining at a rate of 3 000 000 ROM tons of coal per annum. Refer to Appendix 17 for the general arrangement for the proposed development.

4.1. Mining Method

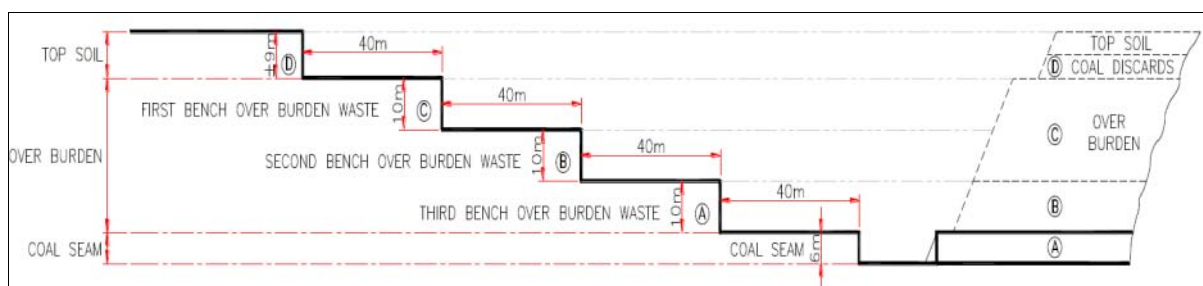
The mineable coal resources identified have been targeted for opencast pit development in areas where the strip ratio shouldn't exceed 5:1. As such, for opencast pit areas were delineated as mining targets with the relevant pit sizes being as follows:

- Pit 1: 324 Ha
- Pit 2: 92 Ha
- Pit 3: 40 Ha
- Pit 4: 45 Ha

The location of the proposed opencast pits is indicated on the layout plan in Appendix 17. Each of the four opencast pits was divided into mineable blocks via strips across the relevant benches. Strips will be constructed on the crest and toe of every bench (a bench height of 10m is indicated) and will be approximately 50 m in width and 200 m in length. The first strips in Pit 1 will target shallower coal where the total depth to coal floor does not exceed 25m. Initially, three or four strips will be exposed to allow room for mining purposes. The strips will be mined by truck-and-shovel rollover mining with blast development:

- Initially, strips will be cleared of vegetation, and topsoil will be removed and stockpiled.
- Thereafter, soft overburden (comprising calcrete and shale material) will be removed by means of an excavator until competent rock is encountered and separately stockpiled.
- Hard rock overburden (mostly shale material) will be removed following blasting and temporarily stockpiled.
- Finally, the coal seam will be blasted and removed to the beneficiation plant.

The position of the temporary stockpile areas is over future mining areas so to minimise the overall footprint and to promote the correct sequencing of concurrent rehabilitation. A typical layout of the above is indicated below (RHDHV, 2013):



Once the box-cuts have been established and strip-mining is in a steady state, the requirement for stockpiling will be eliminated as rehabilitation will be concurrent (i.e. material removed from the strip being mined will be placed back into the excavation remaining from the previous strip).

4.2. Processing Plant

Run of mine (ROM) will be transported to the plant site via truck along the purpose built haul road and fed to a ground hopper onto an apron feeder that will discharge the coal through a jaw crusher. Crushed coal will be stockpiled, approximately 15 000 tons storage capacity (half a day's production) and stockpiled coal will then be washed in a Coal Handling and Preparation Plant (CHPP).

In the CHPP initially stockpiled coal will be wet screened and the resulting fractions fed into dense medium cyclones and spirals which serve to wash the coal and produce the different quality products (depending on the target market i.e. import or export). The process further involves a thickening circuit which produces thickened slurry and recovered water. Slurry will then be put through a filter press to further recover additional water and produce belt filter cake (approximately 8 % by volume at 15 % moisture content), which will then be trucked to the temporary discard dump (see Appendix 17 for design drawing) together with the coarse discard for disposal.

The temporary discard dump will be surrounded by catchment paddocks to collect and evaporate dirty run-off. The size of the catchment paddocks will allow more than sufficient capacity to contain a 1:100 year flood event. The temporary discard dump is planned to only operate during the early stages of the LOM. After approximately two years, when the strip mining operations are fully operational, the discard will be placed in the bottom of the worked out pits.

4.3. Additional Infrastructure

The mine infrastructure will comprise of typically a change-house, workshops, mine store and salvage yard (for hazardous industrial materials, hydrocarbon materials, biodegradable materials, domestic waste and materials for repair and re-use in the plant), security, weighbridges and administration offices.

4.3.1. Roads

Primary light vehicle access to the site will be gained via the existing series of district roads traversing the project area including D2740 and D1944. An additional 1.7km of internal roads will be constructed of compacted gravel and will cater for mine vehicles; these roads will be 10m wide. The main coal haul road linking Pit 1 and 3 crosses the D1944 district road. A traffic circle will be constructed at the intersection of the two such that haul trucks can have right of way and vehicles on D1944 will be controlled by Yield signs in both directions. This haul road will be 15m wide and of a more competent design to cater for heavier vehicles than general internal mine roads. Final

product haulage trucks will enter the site via the D1944 and then utilise the same section of the haul road 900m long and 15m wide.

4.3.2. Culvert

A stream crossing / culvert will need to be constructed across the No-Name stream in order for pit 1 to be accessed, this crossing will be approximately 3m high at the deepest point, 20m wide and 300m long. Embankments for the 15m roadway will be constructed on either side of the No-Name stream. Culvert pipes will be sized to allow for the flow within the No-Name stream to be unimpeded. This culvert crossing is typical in design and size to the exiting crossing for the D1944 provisional road immediately to the north.

4.3.3. Hydrocarbons

Fuel storage facilities will comprise two bulk fuel depots installed by a selected fuel supplier, one close to the ROM stockpile, and next to the mining contractor's laydown area, while the second will be situated next to the weighbridges. Each one will be approximately 226 m² and adequate to house 1 x 23 m³ fuel tank required to keep the haul and mining fleets fuelled for about 7 days.

4.3.4. Sewage Treatment and Disposal

A packaged Sewage Treatment Plant (STP) sized for approximately 350 people will be constructed within the dirty water catchment. It will treat sewage to a final effluent quality acceptable to the DWA. Treated sewage effluent will report to the PCD.

4.4. Water Management

The mine water balance has identified that the total water demand (for process and potable water) at the mine equates to an average of 1 740 m³ water per day.

Recovering water on-site has proved to fall short of the water requirement of the proposed Canyon Springs Coal Mine, as the nearby tributary of the Ghotwane River flowing through a portion of the site is non-perennial and no other nearby sources of water for the mine (service water or potable) exist. The DWA has also indicated that the nearby Rhenosterkop dam is fully allocated. Calculations carried out on the water balance indicate that an additional water supply will be needed to make up the required 1 740 m³/day for approximately the first 8 to 9 years of mining operations, as precipitation cannot be relied upon year round.

4.4.1. Siyabuswa Wastewater Treatment Plant

The existing WWTP at Siyabuswa will be upgraded for the purposes of providing the necessary process and potable water required for the mine. A letter in this regard has been received from the Municipality addressed to Canyon Springs (Appendix 18). The pumping rate from the Siyabuswa WWTP to the mine has been calculated at 22 l/s and assumes a 90 % availability in order to deliver the required 1 740 m³/day. Water to be pumped to the CHPP will undergo an

initial filtration process at Siyabuswa. A sand filtration system will be installed to remove particulate matter, while ultra-violet germicidal irradiation will kill all microorganisms in the system. Water will then be pumped to the mine via a 40.7 km buried 225 mm HPDE pipeline (Figure 39), where it will discharge into a twin reservoir system in the CHPP area.

4.4.2. Wastewater Treatment at the Mine

While the water that leaves the Siyabuswa WWTP will be acceptable for Mine plant process water, it will not yet be fit for human consumption. It has been calculated that a total of 50m³ of potable water will be required per day, 45m³ used as service water, and an additional 1700m³/annum or 5m³ per day for the local community to compensate for any water lost through groundwater boreholes due to dewatering activities at the proposed mine.

A two-stage Reverse Osmosis (R/O) WWTP at the mine will serve to treat the TSE from Siyabuswa to a suitable quality for use on-site. The first stage involves the use of an ultra-fine filter which will remove approximately 7 % (by volume) of remaining particulate matter as sludge. The second stage R/O will utilise a semi-permeable membrane to remove the remaining salts, which will constitute approximately 3 % (by volume). Overall, the R/O process has a 90 % recovery rate, whereby 55.6 m³ of TSE from Siyabuswa will be required to make up a daily total of 50 m³ of potable water (5.6 m³ will be removed as sludge and brine).

4.4.3. Clean and Dirty Water Separation

The CHPP, including the workshop, laydown and coal handling areas are centrally situated at the proposed Canyon Springs Coal Mine and will be considered dirty water catchment areas. A stormwater diversion trench will be constructed down gradient (to the south) of the plant area and will be responsible for channelling all dirty water flow to the SCD. A clean water diversion berm will be constructed along the northern section of the plant to channel clean run-off away from the CHPP area. Prior to entering the SCD, the diversion trench will enter a twin silt trap. The purpose of the double silt trap is to allow water to be channelled through one silt trap while leaving the second open for cleaning. A downstream spillway with energy dissipater will be constructed in the event of emergency overtopping for a greater than 1 in 50 year event, without compromising the safety of the dam wall.

Further to the above, a PCD will be constructed to receive groundwater inflow from the opencast pits during mine operation and to act as the process water storage dam. The PCD has been designed with sufficient capacity to handle all inflow water (both groundwater and precipitation) from all operational opencast pits during the maximum operating capacity of the mine. A pump system will allow this water in the PCD to be used as mine process water. The design philosophy adopted to size the PCD assumes that the CHPP takes water from this dam in priority to pumping water from Siyabuswa WWTP. i.e. if water is available in the PCD, the CHPP uses water from the PCD. The PCD will be located up gradient and adjacent to the SCD. A pump system will be in place to allow excess water to be pumped from the SCD to the PCD when necessary.

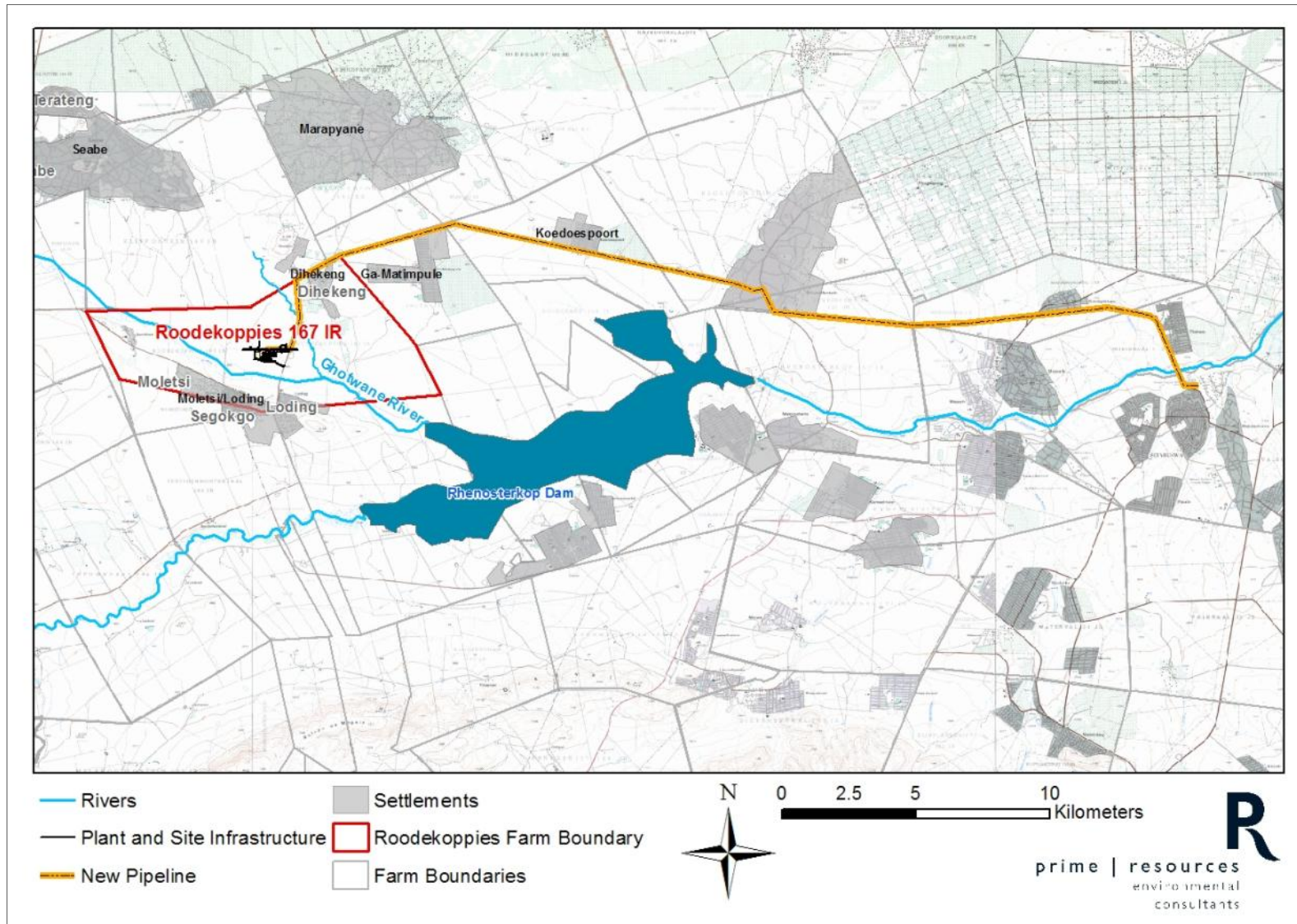


Figure 39: Proposed pipeline from the Siyabuswa Waste Water Treatment Plant to the proposed Canyon Springs Coal Mine

Diversion berms will be constructed around the strip mining pits and utilised to ensure that minimal surface water run-off comes into contact with mining activities.

Water management aspects associated with the temporary discard dump will be in place to contain any dirty run-off water only. A catchment paddock will be constructed around the toe of the discard dump, consisting of a perimeter wall and cross paddock walls. All dirty water run-off from the dump will be contained within the catchment paddocks and allowed to evaporate. The size of the catchment paddocks will allow more than sufficient capacity to contain a 1:100 year flood event.

Because the shale stockpile is composed of potentially carbonaceous material, the water management aspects associated with the design will be similar to those of the temporary discard dump. Catchment paddocks will be constructed around the stockpile to catch any dirty water run-off.

4.5. Bulk Services

Bulk power supply will be by Eskom. The estimated maximum demand including a 10% design factor for future growth is 5 MVA. Eskom will provide a new 37 km 22 kV overhead power line from the Rust-de-Winter substation, which will be stepped-down and reticulated internally. No Eskom substation will be provided on-site, the Eskom line will terminate in a pole mounted auto-recloser and a metering enclosure which will for the point of supply. The plant load is estimated at 4 MVA and other loads at 500 kVA. The supply will be at 22 kV. Eskom was unable to provide a feasibility quote for the supply, a high level cost estimate from Eskom was however provided. In the light of the simplicity of the power supply is it not expected that the cost will change outside of the accuracy of this study.

5. PROJECT ALTERNATIVES

5.1. Introduction

The objective of this section is to describe land use and development alternatives identified for the proposed Canyon Springs Coal Mine.

5.2. Mine Residue (Discard) Handling

Two alternatives were identified in terms of discard management, in that discard can either remain on surface and become a feature of the landscape post-closure (with due rehabilitation) or alternatively be backfilled to the opencast pit as part of continuous rehabilitation.

5.2.1. Rehabilitating discard on surface

Discard will remain on surface where measures will be implemented to ensure that as little damage as possible is done to the surrounding environment. Revegetation of the surface of the discard dump is encouraged, and measures such as the placement of an impermeable clay liner under the dump, and drains and trenches surrounding the discard dump, will ensure that dirty water is channelled away from the clean water catchment.

5.2.2. Backfilling of discard

Material will be replaced in such a way as to ensure that the layers of the material is backfilled the same order that it originally was found in. Discard material will be placed in the pits first to cap the pits and to ensure that the risk of AMD generation is reduced. The discard material is followed by the carbonaceous shale, hard overburden, soft overburden and then lastly with the topsoil. Vegetation is encouraged to grow on top of the backfilled material to ensure soil erosion does not occur.

5.3. Coal Transport Route

Various options were investigated regarding the transport of the coal product from the Canyon Springs Coal Mine to market. These include the D626 road and the local road found 14 km north of Pienaarspoort Station.

5.3.1. D626 transport route

- There are no residential areas along the route except for Loding which is the vicinity of the proposed mine.
- The route is 54 km long between the mine and the N1/D626 interchange;
- The road is paved for 32 km starting from the N1/D626 interchange and gravel for the remaining 22 km to the mine;

- D626 connects to both the N1 and the R101 near the Pienaars River Station. Thus trucks can either take the N1 or the R101 to get to Pretoria; and
- During the operational phase of the mine there will be an additional 360 trucks on the D1944 per day. The Annual Average Daily Traffic (AADT) on the northern approach of intersection 2 at the town of Loding will increase irrespective of which of the two route alternatives is chosen. If the D262 transport route alternative is chosen the AADT on the southern approach of intersection 2 will increase. The amount of traffic that will be the intersection will carry during an average 14 hour day period is illustrated in Figure 40.

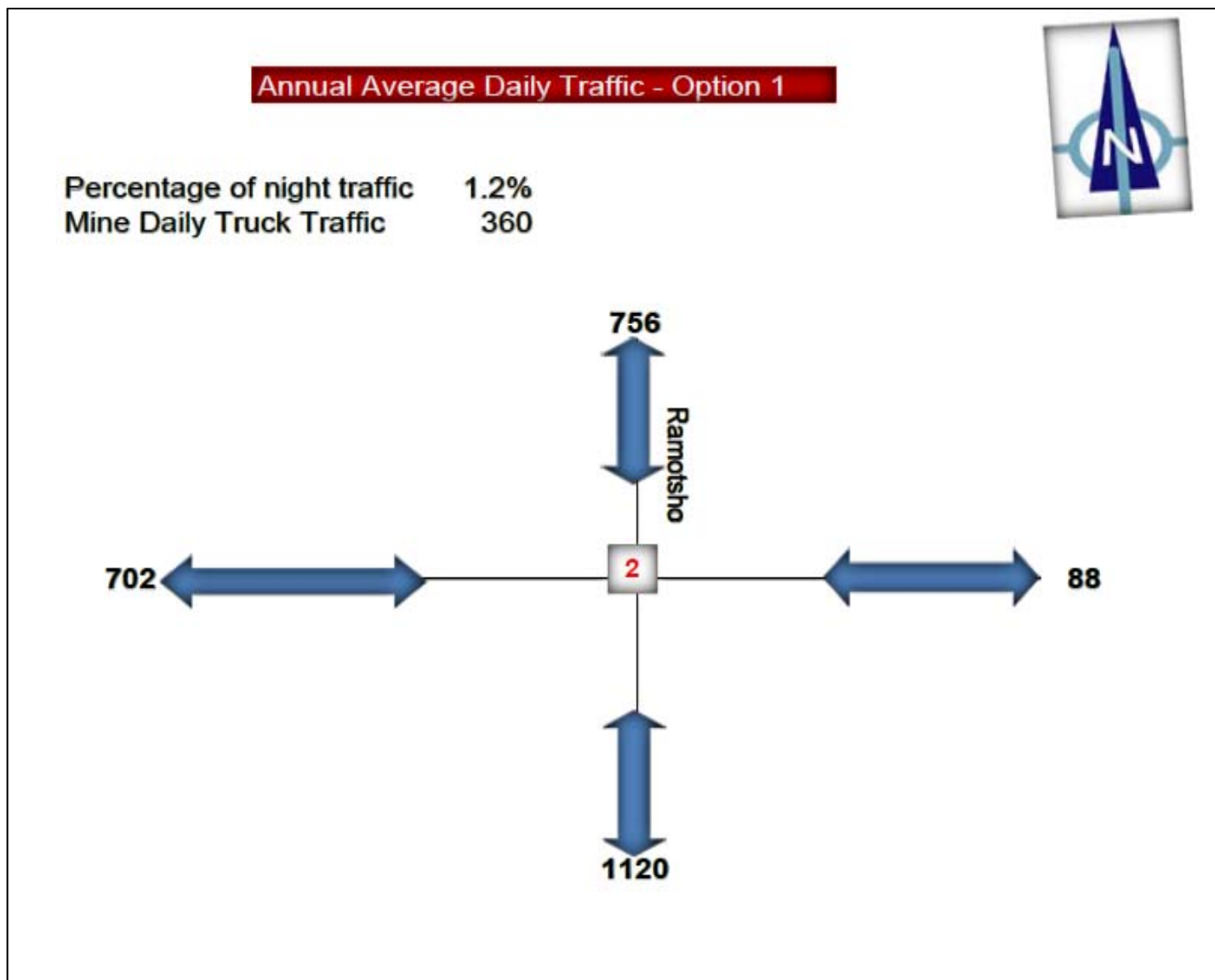


Figure 40: Traffic carried by the Loding intersection as per the D262 route alternative

5.3.2. Alternative Route (Local Road at 14 km north of Pienaarspoort Station)

- There are several residential areas along the route including Loding, Moletsi, Lefifi, Nokaneng, Magareng, Mmantlole and Petsaneng;
- The route is approximately 50 km long between the mine and the N1/D626 Interchange;
- The road is paved for 20 km starting from the proposed Mine up to the residential area of Mmatlole, the rest of the road is gravel (from Mmatlole to R101);
- The road passes over the N1 and connects to the R101 at 1 km west of the N1; and
- The AADT on the northern approach of intersection 2 will increase irrespective of the coal transport route chosen. If the Alternative Route is chosen the AADT on the western approach of intersection 2 will increase. Figure 41 illustrates the number of vehicles that will be utilising the intersection per 14 hour day should the Alternative route be chosen.

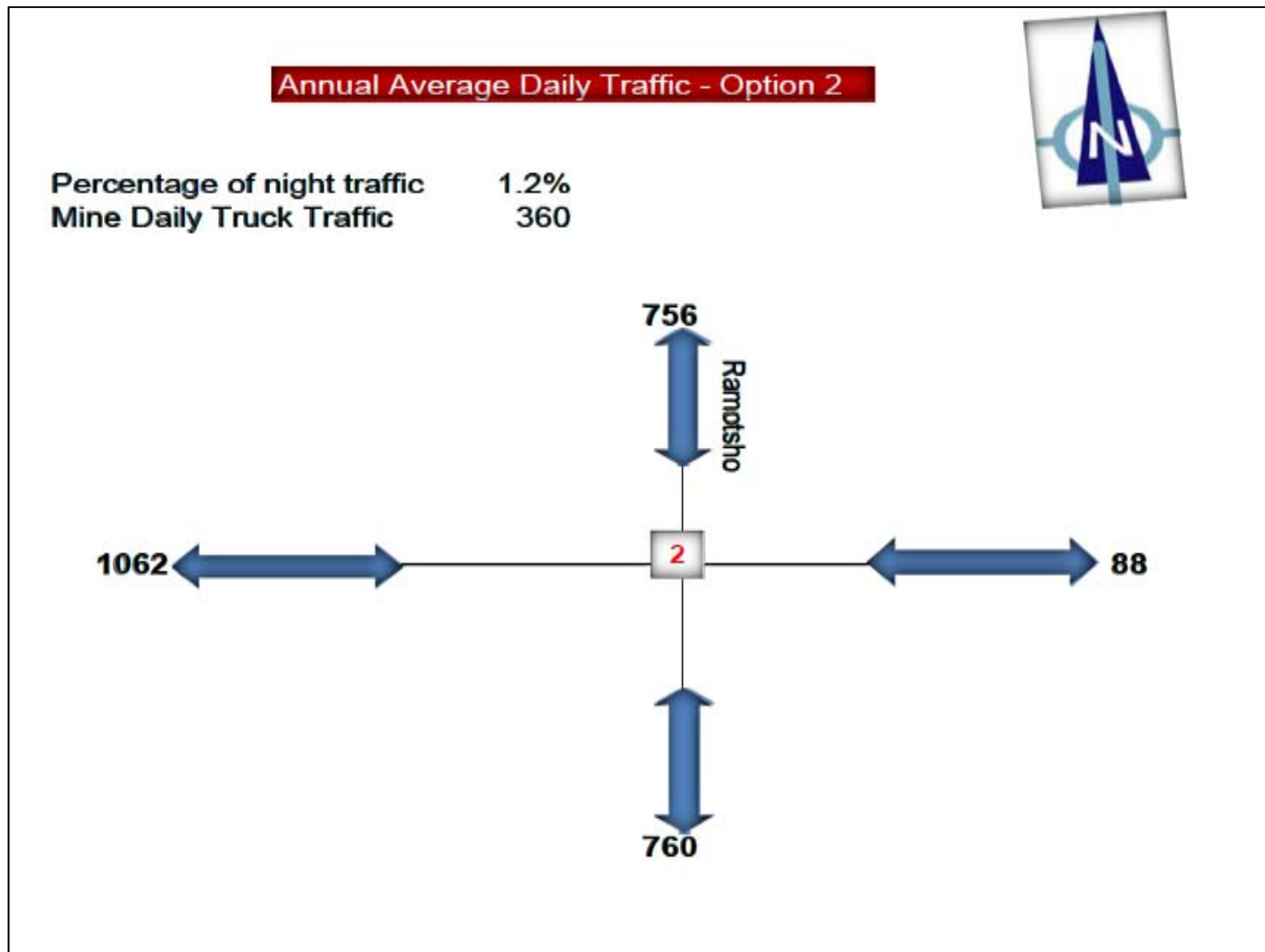


Figure 41: Traffic carried by the Loding intersection as per the Alternative route

5.4. Proximity to the Floodline of the “No-Name” Stream

As per Government Notice GN704, specifically dealing with the location of mines relative to flood lines, promulgated in terms of the NWA, legislates that no dam, reservoir or any surface infrastructure may be placed within the 100-year flood line of a river or a stream or within a horizontal distance of 100 m (whichever is the greatest). Certain mineable coal reserves at the proposed Canyon Springs Coal Mine are situated within the 100-year floodlines- and beneath the “No-Name” stream. The following alternative options were considered for the mining of the coal resources associated with the “No-Name” stream:

5.4.1. Option 1: Diverting The “No-Name” Stream Around The Mining Area

The first option investigated entailed the diversion of the “No-Name” Stream around the northwest of the mine and back into the Ghotwane River approximately 4.3 km upstream from the present confluence of these two watercourses (Figure 42). This option would liberate a significant amount of additional, mineable coal resources which are presently sequestered below the existing “No-Name” Stream and which would not otherwise be mineable as per the restrictions imposed by GN704.

The disadvantages entailed with such a stream diversion include the removal of the existing, small dam, used for livestock watering. Furthermore, such a diversion will result in the destruction of 0.6 ha of 17.55 ha of the channelled valley bottom wetland (as delineated by Strategic Environmental Focus in 2012) and will further exert impacts on the associated aquatic flora and fauna, permanently removing those habitats. This will have a potentially negative impact on downstream aquatic biodiversity and the Rhenosterkop Dam. A stream diversion will result in an increase in water temperature as well as velocity of the stream which could negatively impact the aquatic biodiversity. It is unlikely that the stream and wetland can be restored to their original condition, once they are destroyed. In addition to this, the construction of a river diversion is wholly dependent on permission granted by the DWA and may include additional conditions.

This option was previously considered to be the preferred alternative, however, correspondence with the MTPA as discussed further in Section 7.3.2 has resulted in the downgrade of the preference to pursue this alternative.

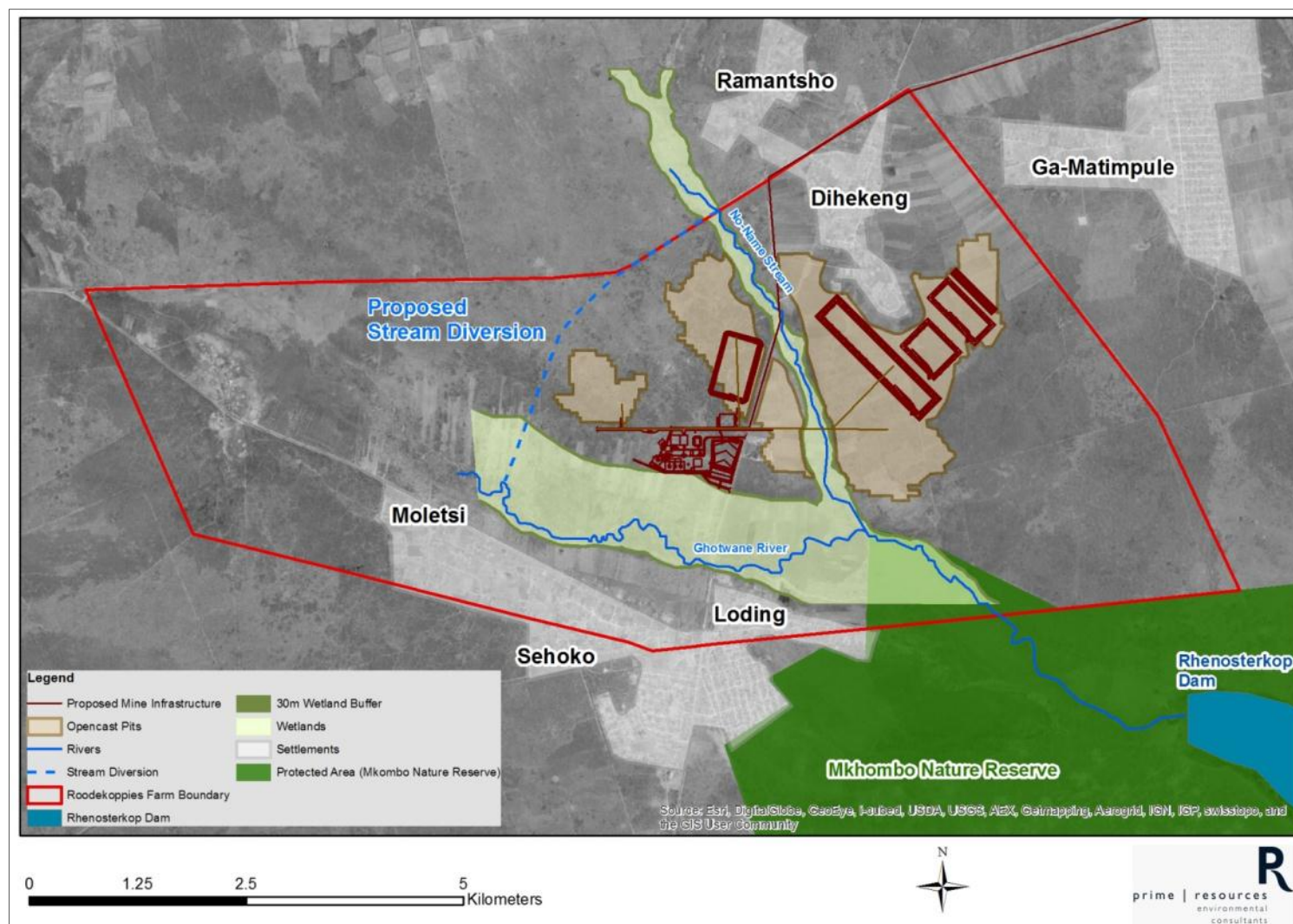


Figure 42: Proposed stream diversion (Option 2) in relation to the Canyon Springs Coal Mine infrastructure

5.4.2. Option 2: Mining activities to remain outside the floodlines

Care will be taken to ensure that mining activities will occur outside the 30 m buffer of the wetlands, or the 100-year floodlines of the No-Name Stream (Figure 28), whichever proves to be the greatest. Berms will be constructed on either side of the No-Name Stream to ensure that dirty and clean water will be kept separate within the dirty water catchment. The construction of berms on either side of the stream and wetland will protect the stream, wetland and associated aquatic flora and fauna, however care should be taken to properly construct the berms to avoid sedimentation of the watercourse. The stream will still be available for watering of livestock by the local farming community during the wet season when the stream holds water.

A disadvantage of this option is that coal reserves directly under the riverbed and wetland, the berms, and under the boundary area on the outside of the berms will not be mined, and therefore no economic gain from these resources can be obtained.

5.5. Assessment of Alternatives

A high-level assessment of the alternatives considered was undertaken utilising the significance criteria described in Section 8.2 below. The considerations were given to the overall potential for impacts in terms of (1) financial impact to the Applicant, (2) potential impacts to the environment and (3) potential social impacts. The significance arrived at for each was then totalled to ascertain the overall significance value, the lesser option for which was selected as the preferred alternative (indicated by underlining). The no project alternative is also weighed against the situation of the development proceeding.

ALTERNATIVE CONSIDERED	SIGNIFICANCE			
	FINANCIAL	ENVIRONMENTAL	SOCIAL	TOTAL
DISCARD LOCATIONS				
Discard left on surface	64	60	64	188
Discard backfilled into pit	52	60	52	<u>164</u>
COAL TRANSPORT ROUTE				
D626 transport route	26	20	36	<u>82</u>
Alternative Route (Local Road)	39	20	56	115
PROXIMITY TO THE FLOODLINE				
Construction of river diversion, no berms	26	56	39	121
Mining outside of the 100-year floodlines	40	38	32	<u>110</u>
PROJECT				
Project Proceeds	30	44	55	<u>129</u>
No-Project Alternative	64	6	72	142

From the above it is ascertained that the preferable options for the development are:

- To backfill the discard into the opencast pit rather than to leave it on surface, which exerts a greater financial and social impact;
- The recommended route to join either the R101 or the N1 is D626 as it goes through only one residential area (Loding) and connects to both the R101 and the N1. It is recommended that the construction traffic also take this route;
- Although the stream diversion was previously the preferred alternative with regards to coal resources the environmental impact is considered too great to make this alternative feasible. For management measures pertaining to impacts of mining on the surrounding wetlands and surface water, please refer to the wetlands / stream management plans in the EMP. The best alternative in this regards is thus Option 2, mining outside of the wetlands and floodlines, as this will have the least impact on the environment as well as the social environment; and
- Considering the project as a whole, the development proceeding is preferable to the no-project alternative. While the project proceeding exerts a greater impact on the environment, it provides greater benefits in terms of social and financial benefits.

5.6. No Project Alternative

Should the proposed Canyon Springs Coal Mine development not occur, the coal resources identified will remain *in situ* and thus cannot be extracted for any economic gain. In such an

event, the landowners and legal occupants will continue to utilise the area for grazing and cultivation. There will thus be no added socio-economic benefits over the long-term if the proposed mine was not to proceed, however, potential environmental impacts which may result from the proposed mining operation will be avoided.

6. MOTIVATION FOR THE PROPOSED PROJECT

Mining is an important sector in Mpumalanga, providing jobs and contributing to over one fifth of Mpumalanga's Gross Geographic Product (GGP) (Mpumalanga State of the Environment Report, 2003).

The following section describes the need and desirability of the proposed Canyon Springs Coal Mine development (see Appendix 14 for the full SLP).

6.1. Introduction

The concept of need and desirability relates to the type of development being proposed, for which "need" refers to time and "desirability" to place. The key issues to be considered in determining need and desirability are:

- The scale of the proposed development;
- The numbers of people affected by the proposed development;
- Present users of the property proposed for the development;
- The impact on the existing character of the development footprint; and
- Potential impacts to:
 - Protected or conserved areas;
 - Traffic implications;
 - Past site history (if possible);
 - Future development proposals;
 - Non-agricultural uses in the area; and
 - New / existing buildings.

6.2. Need

The employment opportunities to be afforded at the proposed Canyon Springs Coal Mine will contribute towards maintaining and improving long-term employment in the DRJSMLM. The provision of employment at the Canyon Springs Coal Mine will positively influence the region through the multiplier effect and contribute to Mpumalanga's GGP. The export of coal from the proposed mine will also boost the local economy in terms of tax revenue, mining royalties and foreign investment.

The employment of staff members will contribute towards maintaining employment levels in the DRJSMLM. The provision of employment at the Canyon Springs Coal Mine will positively influence the region through the multiplier effect. According to the IDP of 2010/2011, 314 people were employed by the mining industry in the DRJSMLM in 1996, however according to the 2001, this figure had dropped to only 64. The proposed Canyon Springs Coal Mine project would aid in increasing this employment figure again.

The implementation of the proposed project will allow for the initiatives for social upliftment, as well as the transfer of skills from people employed at the Mine to people in the surrounding

community. These initiatives are set out in the Local Economic Development (LED) Plan, and the Human Resources Development section, of the SLP to be put in place. The initiatives include:

- LED Plan
 - The upgrading of the clinic

The mine has committed to upgrading the local clinic. As set out in the SLP, the construction of the clinic will provide 60 short-term employment opportunities. It is anticipated that the existing staff will continue to provide healthcare services at the upgraded clinic. The upgrade of the clinic will also mean better and more readily available health care for the local communities; and
 - Technology Training Centres

The mine proposes to establish a technology training centre in Sehoko with satellite centres in the three surrounding areas. These centres will be supplied with computers and associated equipment, training software, a server and network system and will be maintained by Canyon Springs for the duration of the project. After Year 3, the Satellite Centres will be established within the adjacent communities within the DRJSMLM.
- Human Resource Development Programmes
 - A skills development plan will be established to identify the type of training required at the Canyon Springs Coal Mine and the number of people requiring training.
 - An Adult Basic Education and Training programme will be established to improve employee's numeracy and literacy levels.
 - Portable skills offered at the Canyon Springs Coal Mine should enable employees to take up opportunities post closure of the mine, or to arm them with the skills to establish small businesses and potentially to be self-employed.
 - Core Business and Artisan Training programmes will be implemented to provide local learners with an opportunity to earn an income while acquiring technical skills that would improve their skills level as employment opportunities within the mining sector.
 - A Career Progression Plan for all employees will be developed in order to ensure that a talent management system is implemented and monitored as well as to ensure that employees are aware of the career paths that would be available to them.
 - A Mentorship Plan aimed at facilitating developmental needs and specifically the transference of skills, knowledge and competence to Historically Disadvantaged South Africans (HDSAs) in particular, will be established.

The Canyon Springs Investments 82 (Pty) Ltd Bursary Scheme will be utilised to assist potential students to achieve qualifications in mining related disciplines, thereby contributing to the general upliftment of skills and qualification levels in the mining sector. On successful completion of their academic studies at tertiary institutions, the Bursars then join the

Canyon Springs Coal Mine as potential employees with the designation “Graduates in Training”.

6.3. Desirability

The scale of the proposed development

The proposed Canyon Springs Mine is approximately 563 hectares in extent and is to be situated in close proximity to the surrounding communities. The nearest points of the proposed mine to each of the surrounding communities is indicated below (Table 14):

Table 14: Community distances from the proposed Canyon Springs Coal Mine

COMMUNITY	APPROXIMATE DISTANCE FROM THE PROPOSED MINE
Loding	~ 2 km
Ramantsho	~ 500 m
Ga-Matimpule	~ 2 km
Moletsi	~ 2 km
Dihekeng	~ 300 m

The development thus has the potential to exert an influence on the surrounding communities and the receiving environment as per the content of this EIA and described further in Section 8 below.

The numbers of the population implicated in the proposed development

The mining industry is responsible for creating employment opportunities and contributing to over one fifth of Mpumalanga's GGP (Mpumalanga SoER, 2003). The planned workforce at Canyon Springs Mine is approximately 224 permanent employees, 55 % of the Canyon Springs Coal Mine workforce will be sourced from the DRJSMLM. Canyon Springs Investments 82 (Pty) Ltd will provide a housing allowance, which equates to 4% of the individuals cost to company. A housing allowance or living out allowance will also be provided to employees who have identified housing available for rental in the area surrounding the mine. The provision of employment and housing will have a positive impact municipal area as it will not only be the employees that benefit but also their families and the municipal area.

Present users of the property

People living in the communities utilise the central area of the Roodekoppies Farm for subsistence agriculture and cattle grazing. The title deed relevant to the surface area associated with the proposed Canyon Springs Coal Mine identifies that the land is currently held in trust by Department of Rural Development and Land Reform (DRDLR), which is the relevant local branch of the DLA, for the relevant Traditional Authorities. Section 7.2.8 discusses in more detail the landownership of the Roodekoppies Farm.

The impact on the existing character of the development footprint

- The proposed development will result in the loss of the land available for subsistence agriculture. The Applicant has undertaken an exercise to identify the number of subsistence farming plots that will be impacted by the proposed mine plan.
- The proposed mine will likely result in the loss of access to grazing land as well as the removal of grazing vegetation on the eastern side of the farm Roodekoppies is used for grazing.
- The western portion of the project area is fenced in and covered with fairly dense, natural vegetation whereas the cultivated areas on the project area are situated largely around the Ghotwane River that flows through the site.
- All the residential areas in the project area are associated with areas of degraded land and the settlement of Dihekeng is surrounded by cultivated land.

From the above, it can be ascertained that the proposed development could potentially impact the character of the existing footprint. The potential impacts to this end are discussed further in Section 8.3.12.

Impact on a protected or conserved area

The land associated with the proposed development is mostly utilised for grazing, and cultivation (which consists of 50% of the study area) surrounded by residential settlements. The cultivated areas are situated largely around the Ghotwane River that flows through the site. The western portion of the project area is fenced in and covered with fairly dense, natural vegetation. The residential areas of Loding, Sehoko and Moletsi are situated to the south of the proposed area for development, with Dihekeng in the north-east. These residential areas are associated with areas of degraded land, while Dihekeng is surrounded by cultivated land. The greater mining right area boundary crosses the Mkhombo Nature Reserve, which is a protected area; however, as stated in Section 3.5.1.6 no mining activities or infrastructure will be developed or undertaken within the Mkhombo or the NPAES. A meeting held with the MTPA regarding the impacts of the proposed mine on the Reserve are discussed in Section 7.2.5.

Traffic implications

The traffic on the roads such as the R516, the D626 and the R573 surrounding the project area will increase minimally during the construction and operational phases of the Mine. See Section 8.3.9 and Section 8.4.9 for more information in this regard.

Past site history if possible

The Canyon Springs Coal Mine is located within the Nkangala District Municipality, in the Mpumalanga Province on the Roodekoppies farm which is zoned as "agricultural and rural / undeveloped land". The surrounding areas are mostly characterised by subsistence agriculture and livestock grazing. Heritage resources were identified at three sites within the proposed project area. Refer to Section 3.12 for a detailed description of the heritage resources identified in the area. However, all of the sites are of low cultural significance.

Future proposals

There are currently no known future proposals for the area other than the proposed Canyon Springs Coal Mine.

Non-agricultural uses in the area

The only other land use in the area excluding agriculture is housing, as the residential areas of Loding, Moletsi and Sehoko are situated to the south of project area, with Dihekeng in the north-east.

New/existing buildings

Existing buildings in the area include the residential dwellings within the residential settlements discussed above. No new or existing buildings currently being utilised have been identified within the proposed area for development.

The disadvantages of the proposed development pertain to the potential impacts identified and discussed further in Section 8 below.

7. PUBLIC PARTICIPATION PROCESS

7.1. Introduction

This Chapter details the Public Participation process that has been followed to date. The Chapter provides reference to the Comments and Responses Report (CRR) (Appendix 16), which details all concerns raised and the responses provided to these concerns. The CRR details all issues raised by authorities and IAPs and has been categorised as comments received from authorities and IAPS. The IAPs comments have been sub-categorised as socio-economic, public consultation process, prospecting, land use, water supply, blasting and vibrations, traffic, air quality and noise issues.

7.2. Scoping Phase Public Participation Process

The scoping phase consultation process was designed to provide the authorities and any IAPs with information about the proposed project, and allow them to comment, raise any concerns, request additional information, and to be registered on the database of IAPs for the proposed project. The public consultation process included media notices in a local newspaper, a Background Information Document (BID) sent to authorities and IAPs, the erection of site notices, and an open day held at the Loding Community Hall. The Scoping Report was made available online on the Prime Resources website and was placed within the community at a general dealer in Dihekeng and in Sehoko, a trading store in Loding and a shop in Moletsi for a cumulative total of 61 days during the commenting period. All comments that were raised during the commenting period were then included in the CRR (Appendix 16) and addressed in the EIA.

7.2.1. Interested and Affected Parties

An IAP Database was compiled for the Public Consultation Process which aimed to identify the landowner, legal occupant/s of the land, adjacent landowners, surrounding occupants and any other IAP potentially influenced by the project. The residents of the towns of Loding, Sehoko, Moletsi, and Dihekeng have been targeted in this regard. These IAPs were identified through existing tribal structures as well as by registration of any potential IAP who was made aware of the project by the means described below. The names of all IAPs are contained in the database in Appendix 18.

The following Government authorities were identified as relevant to the proposed development and were engaged per the means described below:

- DMR;
- MDEDET;
- DWA;
- DRDLR;
- MTPA;
- SAHRA;

- Nkangala District Municipality;
- DRJSMLM.

7.2.2. Background Information Document

The BID prepared briefly served to describe the background to the project, the project proposal in brief, the environmental process followed, potential impacts identified and included contact details of the EAP should any queries arise (Appendix 18). The BID was distributed via community structures and was made available to all IAPs who attended open-day meetings (discussed in Section 7.2.5).

7.2.3. Site Notice

Site notices were prepared in English, isiNdebele and Setswana, and posted up for display within and around the areas of the proposed development and within the affected communities. The display areas were selected to be easily visible to the public in areas of high pedestrian traffic throughput, and included the Itsoseng General Dealer, Mabena General Dealer and Loding General Dealer, the access gate along the D1944 and a shop in Moletsi. This gave an opportunity for IAPs in the area to peruse the notice and be made aware of what the proposed development entailed. The site notice invited stakeholders to attend the public meetings described in Section 7.2.5 below. The site notices provided contact details that allowed all IAPs the opportunity to raise queries and concerns and find out further information. Details of the environmental process were also indicated thereon and IAPs were notified of the availability of documentation for comment. Deadlines for the submission of comments were also included on the site notices.

7.2.4. Media Notice

A media notice (advertisement) was published which provided a brief description of the proposed project, the environmental process followed, details of applicable legislation as well as contact details of the Environmental Assessment Practitioner, where further information could be obtained, the availability of documentation for comment, commenting periods and an invitation to attend the public meeting. This notice was published in English in the daily newspaper publication, The Sowetan on the 7th of June 2012 (Appendix 18). The Sowetan newspaper was identified by the local residents as the most read in the area as no local newspaper is published.

7.2.5. Meetings and Correspondence

DWA

A pre-application WULA consultation meeting was conducted on the 17th of July 2012, with Ms Adivhaho Rambuda of the B31 catchment at the Olifants Catchment Office in Bronkhorstspuit. Minutes of this meeting are contained in Appendix 18.

A complete IWULA was submitted to the DWA in May 2013. This submission was acknowledged by DWA on the 7th June 2013 and an additional 3 hard copies and one soft copy were requested (Appendix 18). These additional copies were submitted to the DWA on the 19th July 2013.

Mr Johann van Aswegen, the Regional Director of Mpumalanga Water Resource Management, was consulted regarding the utilisation of TSE from the Siyabuswa WWTP as the bulk-water supply to the proposed Mine. A letter, dated 5th March 2012, was sent to Mr van Aswegen explaining the proposal to pump treated wastewater from the WWTP to the mine (Appendix 18). Mr van Aswegen responded on the 17th May 2012, explaining that utilisation of the outfall water from the Siyabuswa WWTP was a possibility and that normal WULA procedures should be followed in this regards (see Appendix 18 to view this documentation).

DRJSMLM

A meeting with members of the Local Government of the DRJSMLM was held at the DRJSMLM Offices on the 12th of September 2012. A presentation was made to the DRJSMLM regarding the environmental and social issues associated with the proposed project. The DRJSMLM raised concerns with the SLP and land-ownership (see Appendix 18 for documentation). These concerns were recorded and have been added to the CRR (Appendix 16).

A meeting with the Water Resources Manager (Mr. Bapedi) at the DRJSMLM was held on the 20th of October 2012 regarding the utilisation of the TSE for the proposed Canyon Springs Coal Mine.

At the meeting he indicated there are tap systems to individual homes or a communal tap from the weir / treatment plant, with the reservoir situated on the koppie. He further indicated that there are 46 good yielding boreholes in the area, a borehole map was provided which indicated that the municipal supply boreholes are marked. The boreholes supplement the weir supply.

A letter from the DRJSMLM dated 20 May 2013 was received indicating permission to pursue the use of the Siyabuswa WWTP as bulk-water supply.

MTPA

A meeting held between the Applicant and the MTPA on 14 March 2013 regarding the proposed development of the Canyon Springs Coal Mine in proximity to the Mkombo Nature Reserve and the NPAES thereto.

Open-day

A public open-day was held on 27 June 2012 at the Loding Community Hall of which IAPs were notified through the channels described above. The meeting venue was situated in close proximity to the proposed project area for all IAPs to attend. The meeting entailed a translated presentation to all present about the proposed development, the potential impacts being investigated, the environmental process and how issues could be raised. A poster presentation with all details presented was also displayed (Appendix 18).

7.2.6. Commenting periods

The commenting period commenced upon publication of the media notice and erection of the site notices. An initial 40-days was allowed for comments on the draft scoping report, which was then

revised to reflect all comments received and then made available to all registered IAPs for a further 21-days before submission to the Competent Authorities.

7.2.7. Integrated Issues Trail

An Integrated Issues Trail was maintained and updated regularly throughout the Public Consultation Process with any comments, queries or concerns raised by any IAP or Authority and which utilised to inform the EIA and focus the management / mitigation measures proposed in the EMP. This Integrated Issues Trail was incorporated into the CRR (contained as Appendix 16). The main issues raised were regarding the proposed LED plans in the SLP, employment and training for local residents, the availability of bursaries for local community members and issues around health and safety with respect to blasting and vibrations, reduction in local air quality and additional noise as a result of the proposed mining project (for the full Integrated Issue Trail contained in the CRR, see Appendix 16). Community members also raised concerns around who had been compensated for the prospecting done earlier in the year and issues concerning land-ownership and loss of farming and grazing land as a result of the mine.

These concerns were all noted and where possible addressed. The LED plans in the SLP have been updated and are now focussed on improving the local clinic and building local computer centres within the surrounding communities, which have been accepted by the DRJSMLM. The IAP database will be submitted to the client and when the procurement process begins local people will be prioritised for employment opportunities. The SLP includes a bursaries plan, which will be implemented once mining commences. A blasting specialist has designed measures to minimise the impact of blasting and vibration on the community. Air quality and noise monitoring will be undertaken to ensure air and noise pollution is kept within safe limits. The Tribal Authority was paid for the prospecting undertaken within the local community and this need to be resolved amongst the community.

7.2.8. Land Affairs

The local surrounding communities raised concerns over the issue of land ownership and compensation for land to be utilised for the proposed development.

The communities have indicated that historic land ownership agreements were in place with their forefathers that allowed for community members living in the towns to be allocated portions of land within the central area on Roodekoppies 167 JR for subsistence farming and cattle grazing. This is not in line with the findings of the DRDLR who confirmed that the properties involved in the Canyon Springs Project are State-owned land and are under the control of the DRDLR (see Appendix 18). In addition to this, the Directorate at the DRDLR has been unable to determine whether the descendants of the individuals whose names appear in schedules attached to the title deeds in question form part of the relevant tribes/communities.

The properties under the management and control of the DRDLR are in the area of jurisdiction of various Tribal Authorities, or in some cases held in trust for those communities. The land held in trust is for the following tribes (see Figure 37).

- The Remaining Extent and Portion 2 of the farm Roodekoppies 167 JR are held in trust for the Bakgatla-Ba-Mocha Tribe; and
- Portions 3 and 4 for the farm Roodekoppies 167 JR are held in trust for the Amandebele Tribe.

The above matter has been escalated to the National DLA and the Department of COGTA. A meeting with COGTA was held on 5 May 2013 at the KwaMhlanga Municipal Offices. COGTA have indicated that people utilising land which is ear-marked for development need to be compensated in terms of the Interim Protection of Informal Land Rights Act, No. 31 of 1996. They have further indicated that issues pertaining to land ownerships claims will be addressed in terms of the Distribution and Transfer of Certain State Land Act, No. 119 of 1993 which requires that the Department appoints a Land Titles Adjustment Commission to resolve the issue. Until this matter is resolved, the Applicant must engage the affected communities and come to a Landholders' Resolution which will define the way-forward. The Applicant has been consulting with the communities and a survey of the area is being undertaken to identify land users and land use to determine the compensation requirements. Once this has been completed a process to enter into a long term lease agreement with the Department for surface rights can be undertaken.

7.3. Assessment Phase Public Participation Process for the Proposed Canyon Springs Coal Mine

The assessment phase consultation process was designed to provide the State Departments and registered IAPs with feedback on issues raised during Scoping and also to provide further information about the progress of the proposed project. The process further allowed all registered IAPs and State Departments to comment, raise any concerns, request additional information about the proposed project. All comments that were raised during the commenting period have been included in the Integrated Issues Trail, contained as part of the CRR (Section 7.2.7).

7.3.1. Background Information Document

An English feedback BID was prepared which summarised the environmental findings of the EIA and EMP and which provided Prime Resources' contact details for IAPs to provide any additional comments and feedback during the 40-day commenting period. These BIDs were distributed to all IAPs attending the feedback meetings (See Appendix 18).

7.3.2. Authority Meetings

DWA

A letter was received from the DWA dated the 5th December 2013 (Appendix 18) requesting the following additional information to the submitted IWULA:

1. Master layout plan which indicates proposed activities;
2. Section 21 (c) and (i) supplementary questionnaire;
3. Design report and design drawings signed by a professional engineer;

4. Wetland rehabilitation plan;
5. Rehabilitation plan for watercourses to be affected.

A meeting was conducted with Mr Dumisane Hlongwane on the 7th of March 2014, where the above information was provided to the DWA and included into the existing IWULA. A follow up letter was received from the DWA on the 7th March 2014 requesting 2 additional copies of the IWULA and a wetland rehabilitation plan (Appendix 18). These were submitted to the DWA on the 8th April 2014.

MTPA

As discussed in Section 3.5.1.7, comment was received from the MTPA on the 29th August 2013 (Appendix 18) with regard to the draft EIA and EMP, which requested that the following seven concerns be addressed:

1. Revised mine plan to incorporate changes made due to the comments made below;
2. The present ecological state of the wetland;
3. If the wetland are degraded as stated in the report, a rehabilitation plan must be included (All wetlands must be conserved and rehabilitated if necessary; their destruction for development purposes will not be supported);
4. The delineation procedure that has been applied must be described;
5. Conservation worthy / valuable biota identified in the wetland or surrounding areas;
6. Sensitivity map showing the outer edge of the temporary wetland and the buffer in relation to the New proposed mine plan; and
7. Impact assessment of the proposed development on the hydrological regime of the rivers or streams and the change thereof, including the effect of that change on the upstream habitat of fish populations and the overall integrity of the system.

A site-visit was conducted with specialist representatives of the MTPA together with the Applicant on the 31st of October 2013, in order to discuss the proposed changes to the EIA / EMP and ensure that the measures taken were sufficient to deal with the concerns raised by the MTPA. A follow-up letter was received from the MTPA on the 27th of November 2013 (see Appendix 18) after this site visit to confirm that the changes to the EIA / EMP were sufficient in dealing with the concerns raised by the MTPA. The minutes of this meeting are contained as Appendix 18.

7.3.3. Public Meetings

Focussed public feedback meetings were held in Moletsi and Sehoko on 16 August 2013, at the Moletsi Community Meeting Area and the Sehoko Multi Purpose Centre. The meetings were held at 10:00 and 12:00, respectively (see Appendix 18). These feedback meetings served to inform IAPs, through a presentation (see Appendix 18), of the findings of the EIA / EMP and how comments, issues and concerns raised during the Scoping Phase environmental process were addressed. Any further comments received were also included in the updated Integrated Issues Trail (contained in the CRR in Appendix 16) and addressed in the final documentation. The details of the open-days (date, time, place etc.) were indicated to all registered IAPs by means of SMS / email.

Due to the issue of land-ownership and compensation for land, public feedback meetings were not conducted at Loding and Dihekeng as originally planned. Instead, a meeting was held with the Loding and Dihekeng Traditional Authorities (including the King, Council and community leaders) of both the towns of Loding and Dihekeng which was conducted on the 24th of August 2013 at the Traditional Authorities' offices (Appendix 18).

7.3.4. Commenting Periods

The draft EIA / EMP was made available to the following State Departments for comment: DMR, MDEDET, DWA, DRDLR, MTPA, SAHRA, the Nkangala District Municipality; and the DRJSMLM. The documents were delivered to the departments on the 15th of July 2013. These authorities then had 40 days to comment on the draft EIA / EMP, with the closing date falling on the 24th of August 2013. This excludes the DWA that has 60 days to comment on the documents, with the closing date then falling on the 13th of September 2013 (Appendix 18). All comments received have been included into the Integrated Issues Trail (contained in the CRR in Appendix 16).

The complete draft EIA / EMP was made available to all registered IAPs for review and comment at the general dealer in Dihekeng and in Sehoko, a trading store in Loding and a shop in Moletsi. The availability of the report was indicated to all registered IAPs by means of SMS / email. Registered IAPs had 30 days (8th of July 2013 to the 19th of August 2013) to comment on this report, after which their comments were included into the integrated issues trail and addressed where possible (Appendix 18).

The final EIA / EMP will be made available for final review and comment for 21-days, and thereafter all comments received together with the final EIA and EMP will be submitted to MDEDET for consideration.

8. DESCRIPTION AND ASSESSMENT OF POTENTIAL IMPACTS

8.1. Introduction

The assessment has been separated by mining phase (construction, operation, decommissioning and post-closure) and then per component e.g. groundwater, wetlands, air quality, etc. for each phase. The assessment in terms of activity area is as per the Mpumalanga DMR Standard directive entitled "Standard directive in terms of Section 39(5) of the MPRDA Regarding the Required Information, Compilation and Format of the EMP".

8.1.1. Specialist Studies

Specialist studies were undertaken to investigate the baseline conditions and also to assess the significance of the potential impacts of the proposed development on the receiving environment while making recommendations for the management of impacts and monitoring protocols. The following specialist studies were conducted:

Air Quality	Gondwana Environmental Solutions
Aquatic Ecology	Strategic Environmental Focus
Archaeology And Heritage	Archaeos Culture and Cultural Resources Consultants
Blasting	Blast Analysis Africa
Ecology and Wetlands	Strategic Environmental Focus
Groundwater And Hydrogeology	Future Flow GPMS
Noise	Jongens Keet Associates
Soil	Earth Science Solutions
Surface Water	African Environmental Development
Traffic	GOBA

The significance of potential impacts was determined using the standardised impact rating methodology (Section 8.2).

8.2. Impact rating methodology

As stipulated in Section 31 of the EIA Regulations GN543 the EIA must include "an indication of the methodology used in determining the significance of potential environmental impacts" as well as "a description of all environmental issues that were identified during the EIA process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures". The significance of both positive and negative potential impacts will be determined through the evaluation of impact consequence and likelihood of occurrence.

The significance of an impact is assessed by rating each variable numerically according to defined criteria as outlined below. The severity, spatial scope, and duration of the impact together comprise the consequence of the impact (when summed obtaining a maximum value of 15). The frequency of the activity and the frequency of the impact together comprise the likelihood of the impact occurring (when summed obtaining a maximum value of 10). The impacts are first rated without any mitigation methods being implemented and then re-rated to reflect the change in significance should the recommended mitigation measures be implemented. In the impact rating tables, the post-mitigation ratings are indicated in parentheses, below the pre-mitigation

The following risk assessment model will be used for determination of the *significance* of impacts.

$$\text{SIGNIFICANCE} = (\text{MAGNITUDE} + \text{DURATION} + \text{SCALE}) \times \text{PROBABILITY}$$

The maximum potential value for significance of an impact is 100 points. Environmental impacts can therefore be rated as high, medium or low significance on the following basis:

- High environmental significance 60 – 100 points
- Medium environmental significance 30 – 59 points
- Low environmental significance 0 – 29 points

MAGNITUDE (M)	DURATION (D)
10 – Very high (or unknown)	5 – Permanent
8 – High	4 – Long-term (ceases at the end of operation)
6 – Moderate	3 – Medium-term (5-15 years)
4 – Low	2 – Short-term (0-5 years)
2 – Minor	1 – Immediate
SCALE(S)	PROBABILITY (P)
5 – International	5 – Definite (or unknown)
4 – National	4 – High probability
3 – Regional	3 – Medium probability
2 – Local	2 – Low probability
1 – Site	1 – Improbable
0 – None	0 – None

8.3. Construction Phase

The construction phase of the proposed Canyon Springs Coal Mine will be undertaken over a period of approximately one year; and will consist of the following:

- The initial construction of the opencast pits will require clearing of vegetation and stripping of topsoil across the opencast pit area;
- Drilling, blasting and overburden removal will occur during the initial pit excavation and all topsoil removed will be stockpiled separately to the overburden material;
- There will be one topsoil dump, a soft and hard overburden dump and one carbonaceous shale stockpile; and
- Land will be cleared for the construction of the PCD, SCD, WWTP and dirty water drainage system including berms and canals to contain contaminated water and divert clean stormwater, as well as for the construction of access and haul roads on site, bulk service infrastructure, the CHPP, STP and administration offices. These facilities will also be constructed / installed during this time.

8.3.1. Terrestrial Ecology

Impact Assessment

- The removal of surface vegetation during construction activities at the development footprint will cause exposed soil conditions where rainfall and strong winds can cause mechanical erosion. Indigenous vegetation communities are unlikely to colonise eroded soils successfully and seeds from proximate alien invasive trees can spread easily into these eroded soils, thereby further endangering the already vulnerable Springbokvlakte Thornveld, on which the proposed mining site lies. In addition, construction vehicles and equipment which may have been used on various other sites could potentially introduce alien invasive plant seeds or indigenous plants not belonging to this vegetation unit to the construction site. The significance of this is expected to be **medium**, but this can be reduced to **low** through the implementation of the proposed mitigation measures;
- According to the MBSP the Springbokvlakte Thornveld ecosystem has been further divided into Protected Areas, CBA Irreplaceable, CBA Optimal, ESA Landscape Corridor, ESA Local Corridor, ESA Species Specific, Other Natural Areas, Moderately Modified and Heavily Modified. CBA Irreplaceable, CBA Optimal as well as Other Natural Areas occur within the MR area. The structure of the mine layout ensures that all Protected Areas, CBA Irreplaceable and CBA Optimal areas will be avoided during the LOM;
- The proposed Canyon Springs Coal Mine will not involve any mining or related / incidental activities within the Mkhombo Nature Reserve or the NPAES thereof;
- Dust caused by construction of infrastructure including roads could impact negatively on ecological processes such as photosynthesis of plants and persistence of pollinators on the site and surrounds. The significance of this is expected to be **medium**, through proposed mitigation this can be reduced to a **low** significance;

- The construction of infrastructure as well as stripping of topsoil for opencast mining operations will destroy faunal and floral habitat potentially leading to increased mortality rates. The significance of this impact is expected to be **high**, and although mitigation measures can be followed the significance of this impact is unlikely to be reduced; and
- The presence of the construction site may result in negative faunal interactions that could be associated with construction personnel including poaching, trapping and hunting of faunal species, as well as possible collisions of fauna with construction vehicles. Furthermore, construction activities will result in high levels of noise, vibrations and the operation of floodlights, should construction continue in the night. This will disturb the fauna utilising the surrounding vegetation, especially nocturnal species, and could result in a localised decrease in biodiversity as faunal species move away from the disturbance into the surrounding areas. Additionally, many plant species are re-seeders and are dependent on pollination by visiting fauna. Noises produced by the construction activities may scare off potential pollinators thus decreasing reproductive success and decreasing population sustainability. These impacts are expected to have a **medium** significance and will be maintained at a **medium** significance by implementing proposed mitigation measures.

Mitigation Measures

- The biodiversity management plan (Section 4.4 of the EMP), soil management plan (Section 4.10 of the EMP) and hydrocarbon management plan (Section 4.9 of the EMP) must be implemented to mitigate potential impacts to biodiversity and soil resources which may affect terrestrial ecology.

8.3.2. Aquatic Ecology

Impact Assessment

- The clearing of natural vegetation and the stripping of topsoil can result in the increased runoff of sediment from the site (inclusive of the pipeline) into watercourses associated with the study area. The transport of eroded soil into surrounding surface water resources can increase the Total Suspended Solids (TSS), which may adversely affect the aquatic fauna in a number of ways. These include the alteration of substrate composition and changing the suitability of the substrate for certain taxa, the increase of invertebrate drift (the rate at which aquatic macroinvertebrates move by floating downstream) due to sediment deposition, or substrate instability, the effect on the respiration due to the deposition of silt on the gills of biota, the effect on the feeding activities (impeding of filter feeding), reduction of the food value of the periphyton and reduction of density of the prey organisms, reduction in the suitability of spawning habitat and the hindering of the development of eggs, larvae and juveniles, modification of migration patterns and the interference with hunting efficiency of fish;
- The movement of construction vehicles and personnel can also result in the onset of erosion and associated sedimentation of streams and rivers. The stockpiling of excavated earth and construction materials can result in increased sedimentation of surface water and wetlands, as a result of erosion of stockpiles; and

- These impacts have a **medium** significance rating which can be reduced to **low** impact if mitigation measures as adhered to.

Mitigation Measures

- The design of the PCD and SCD, as discussed in Design Report (Appendix 15) will ensure no overflow or seepage of water can occur; and
- The soil management plan (Section 4.10 of the EMP) and the aquatic ecology management plan (Section 4.5 of the EMP) must be implemented to mitigate potential impacts to minimise the potential for erosion and sedimentation of runoff.

8.3.3. Wetlands

Impact Assessment

- The clearing of natural vegetation and the stripping of topsoil leads to soils becoming exposed, thus increasing the runoff of sediment into surrounding watercourses during periods of high rainfall. Rainfall and inadequate drainage systems would lead to erosion. Water flowing down trenches and access roads, as well as the movement of construction vehicles and personnel, could cause additional sediment to accumulate within the wetland area. The potential siltation of the wetland system would alter geomorphological functioning, the movement of water through the system (hydrological functioning) as well as having an impact on water quality within the resource. The significance rating for the sedimentation of the wetlands is **low** with and without mitigation;
- The installation of clean and dirty water separation infrastructure could cause concentrated flows from reaching the wetland and initiate erosion processes. The dominance of watercourse by vertic soils with high erosion risk characteristics will be very susceptible to erosion processes. Dispersive soils within the wetlands will be susceptible to erosion processes if flows are concentrated. Once erosion processes such as gullies are initiated, it is very difficult to control due to the shrink / swell characteristics of the clay minerals. If no mitigation measures are implemented the impact significance rating for the increase in erosion and surface runoff received by the wetlands is **medium** but can be reduced to **low** if the mitigation measures are implemented;
- The potential for hydrocarbon spills to contaminate wetlands exists during the construction phase. This may occur when spills happen and the dirty water containment system has not yet been constructed. Hydrocarbons may then potentially come into contact with the soils and water contained within the wetland system;
- The seed of alien invasive species that occurs within the construction area could spread into the disturbed soils and stockpiled soils. In addition, the construction vehicles and equipment can potentially introduce alien invasive plant seeds or indigenous plants not belonging to this vegetation unit to the construction site. Alien vegetation can thus potentially disperse into the watercourse due to the proximity of the valley bottom wetlands situated directly north west of the main construction site. The significance rating is **high** for the introduction and spread of invasive vegetation. However, if the mitigation measures mentioned below are put in place the rating can be reduced to **low**;

- As mentioned in Section 4.3.2 a stream crossing / culvert will need to be constructed across the No-Name stream and associated wetlands in order for pit 1 to be accessed. The construction of the stream crossing may lead to the sedimentation of the watercourse which will affect the aquatic habitat. Clearing of the land to construct the stream crossing will also affect the surrounding flora and wetlands. This stream crossing / culvert is expected to have a **medium** significance rating, which can be reduced to **low** if the proposed decommissioning mitigation measures are implemented and the disturbed wetland area is properly rehabilitated (see Section 4.8 of the EMP);
- During public consultation the MTPA raised concerns regarding the proposed stream diversion of the No-Name stream and the removal of its associated wetlands. It was originally proposed that the stream be diverted around the mine on the western side so as to avoid sedimentation of the stream, however the negative impacts on the stream flow and temperature, and thus fauna and flora within the stream and wetland were considered too great and the MTPA recommended that stream diversion proposal be scrapped and that the wetlands and stream be conserved. The revised mine design has been adjusted to accommodate this to ensure all mining pits remains outside the 30 m wetland buffer and / or the 100-year floodline, which ever is greater.

Mitigation Measures

- The wetland management plan (Section 4.8 of the EMP), soil management plan (Section 4.10 of the EMP), surface water management plan (Section 4.7 of the EMP) and biodiversity management plan (Section 4.4 of the EMP) must be implemented to mitigate potential impacts to surface water, biodiversity and soil resources which may affect wetlands.

8.3.4. Soil Quality

Impact Assessment

- The activities being planned for the Canyon Springs Coal Mine require the total extraction of all coal within the seam, with the associated disturbance of the geological and soil sequence above the coal seam. This will result in the complete destruction of the soil horizon and soft overburden as well as the hard rock formations above the coal and will result in the loss of resource; this has a **high** significance impact;
- The soil resources may become contaminated due to spillage of hydrocarbons. During the construction of infrastructure soil is covered, removed/sterilised or is lost through erosion. All of these impacts on the soil have a significance rating of **high** impact rating that can be reduced to **medium** if the proper mitigation measures are implemented;
- Heavy vehicles utilised during construction activities and which do not utilise existing access roads, or where access roads to an area of the proposed development do not exist, can lead to the compaction of soils and loss of land capability. The impact associated with this activity is considered to be **medium** but can be reduced to **low** if proper mitigation measures are followed; and

- Depending on the type of contamination and the accumulation of phytotoxic concentrations of chemicals in any of the above instances, there is the potential for a reduction in the soils potential to support plant growth, resulting in a change in land capability and potentially land use.

Mitigation Measures

- The soil management plan (Section 4.10 of the EMP) must be implemented to mitigate potential impacts to soil resources which may affect land capability.

8.3.5. Groundwater

Impact Assessment

- Groundwater inflows into the box-cut of Pit area 1 are calculated to be approximately 565 m³/day. This groundwater inflow will be actively pumped from the mining area to allow for the continuation of mining.
- The dewatering of the pit during the construction phase of the opencast mine will likely result in the drawdown of local groundwater levels. The maximum drawdown in groundwater level is expected to be around 32 m, and the zone of influence of the drawdown cone is expected to be approximately 2.5 km from the pit area. Private groundwater use boreholes CSH-05, CSH-06, CSH-07, and CSH-08 fall within the zone of influence of the drawdown cone. The extent of the zone of influence of the groundwater level drawdown can be attributed to the shallow gradient coupled to a high aquifer transmissivity (Figure 43). This has a **medium** significance rating which can be reduced to a **low** rating if the correct mitigation measures are introduced;
- The use of fuels can potentially pollute groundwater in the event the containment measures aren't yet in place. Petroleum hydrocarbons are generally classified as Light Non-Aqueous Phase Liquids (LNAPLs) which means that the density is less than that of water and, therefore, it should be found floating on top of the groundwater table. Because the hydrocarbons float on top of the groundwater contaminant migration is dependent on the groundwater flow directions.

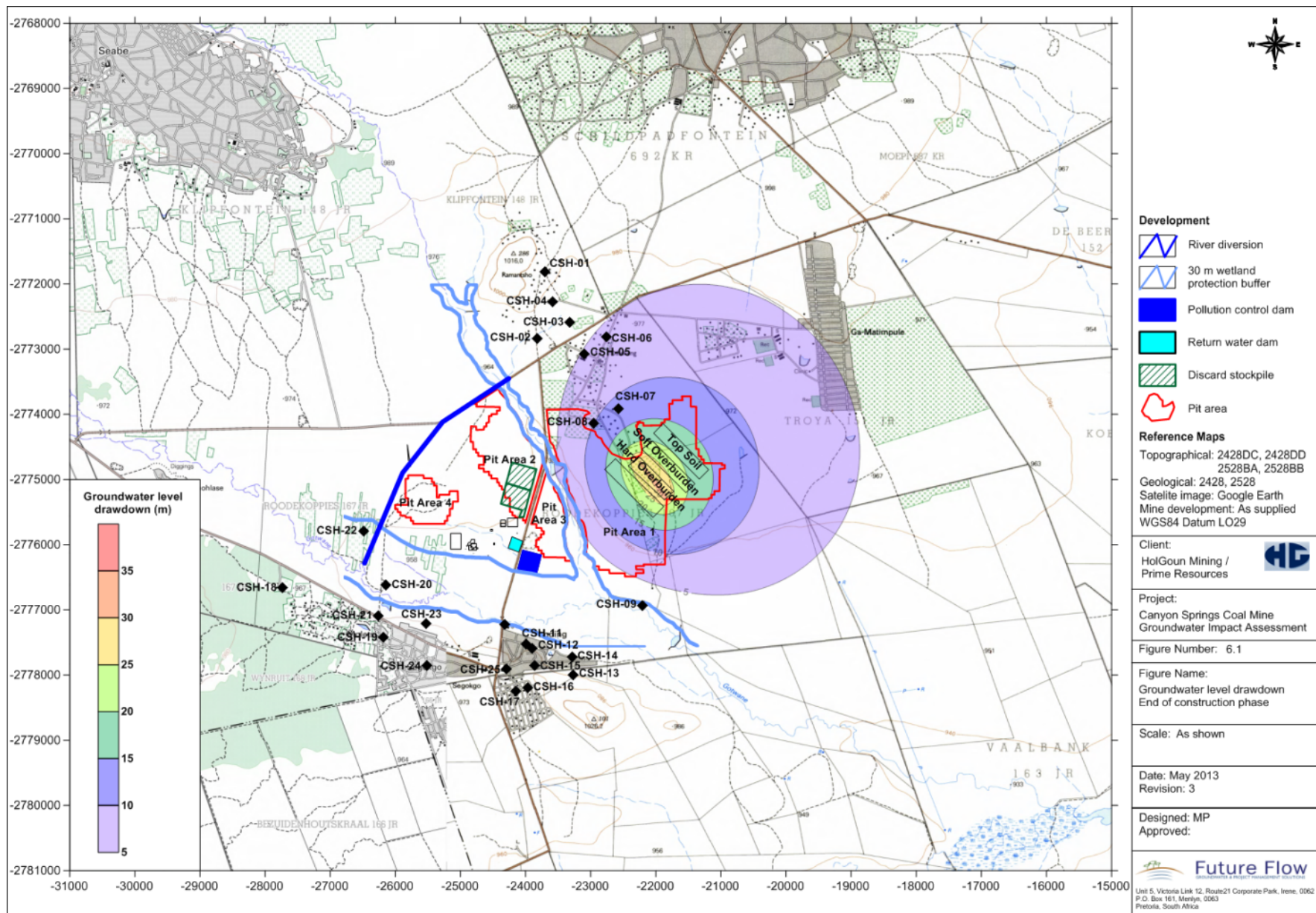


Figure 43: Groundwater level drawdown at the end of the construction phase

- Therefore it can be said that should contamination enter the aquifer material outside the zone of influence of the box-cut dewatering the contamination will migrate down gradient. Contamination that enters the aquifer inside the zone of influence of the box-cut dewatering will migrate towards the opencast area.
- This has a **low** impact rating which can be further reduced through the implementation of the mitigation measures discussed below; and
- Surface construction of the site-office, overburden dumps, temporary discard dump, and access / haul roads is not expected to breach the groundwater level and is therefore not expected to have any impact.

Mitigation Measures

- Reports of decreased water levels will be investigated through comparison with the results noted during the hydrocensus – in instances where dewatering has indeed affected borehole groundwater levels, the mine will be responsible with providing the affected user with an equivalent volume of water of a similar or better quality;
- The hydrocarbon management plan (Section 4.9 of the EMP) must be implemented to avoid and manage the negative impacts of hydrocarbon spills on groundwater resources; and
- The groundwater management plan (Section 4.6 of the EMP) must be implemented to mitigate potential impacts to groundwater resources which may affect groundwater quality and quantity.

8.3.6. Surface Water

Impact Assessment

- The development footprint will be cleared during the construction phase. The berms and canals intended to both contain contaminated water and to divert clean water will not yet have been completely constructed, or will be in the process of being constructed. This may lead to increased surface runoff potentially giving rise to a greater measure of erosion while construction is underway, especially if construction is undertaken during the rainy season. Greater erosion will lead to greater siltation into the surrounding surface water resources. This impact has a **low** significance rating with or without the implementation of mitigation measures; and
- The storage of hydrocarbons on-site during the construction phase may lead to uncontained spills in the event that the construction of the SCD / PCD has not yet been completed. This, however, will only pose a threat during the wet season when the non-perennial No-Name stream is flowing, during the winter season when it is a dry channel, this will not likely pose a contamination risk.
- Streams / Rivers
 - A stream crossing / culvert will need to be constructed across the No-Name stream in order for pit 1 to be accessed (see Section 4.3.2). The construction of the stream crossing may lead to the sedimentation of the watercourse which will affect the

aquatic habitat. Clearing of the land to construct the stream crossing will also affect the surrounding flora and wetlands. Section 21 (c) and (i) water uses have been applied for in order to authorise the construction of this culvert and roadway. The construction of the crossing is expected to have a **medium** significance which will be reduced to a **low** significance with the implementation of mitigation measures described below;

- Embankments for the 15m roadway will be constructed on either side of the No-Name stream, within the wetland, wetland buffer of 30 m and within the 100-year floodline. The total footprint of the loss of wetland is 0.7 Ha.

Mitigation Measures

- Section 21c and 21i water uses, as per the NWA, must be authorised prior to the commencement of any mining activities; and
- The surface water management plan (Section 4.7 of the EMP) must be implemented to mitigate potential impacts to surface water resources which may affect surface water quality.

8.3.7. Cultural and Heritage Resources

Impact Assessment

- The loss of the resources during the process of clearing the land situated within the development footprint of the mine are a potential impact;
- The resources that have been identified at the proposed Canyon Springs Coal Mine are of **low** significance and are not located within the proposed development footprint;
- No other sites of cultural significance were found on site; additionally no graves, apart from those in formal cemeteries which will not be affected by the mining development, were found within the study area; and
- All three sites identified are located outside of the development footprint (see Figure 30) and will therefore not be impacted on.

Mitigation Measures

- The heritage and palaeontological management plan (Section 4.13 of the EMP) must be implemented to avoid and mitigate potential impacts to heritage and palaeontological resources.

8.3.8. Air Quality

Impact Assessment

- During the construction phase, the use of heavy machinery and the disturbance and blasting of land cover in preparation of the opencast pits will result in increased dust fallout, emissions and particulate matter from machinery / vehicles;
- Vehicle-entrained dust emissions from the unpaved haul roads within the proposed Canyon Springs Coal Mine potentially represent one of the most significant sources of fugitive dust.

This includes hauling overburden from the pit to the overburden stockpile during construction of the opencast pits, and maintenance of temporary roads;

- Land that has already been disturbed will be levelled out and wind erosion may occur on topsoil and overburden stockpiles. This leads to an increase in dust and particulate matter present at the site. When considering the emissions and particulate matter from the machinery and/or vehicles on-site, the likely result will be a local reduction in air quality;
- Drilling and blasting operations represent intermittent sources of fugitive dust emissions;
- Each of these operations has its own duration and potential for dust generation. It is anticipated therefore that the extent of dust emissions would vary substantially from day to day depending on the level of activity, the specific operations, and the prevailing meteorological conditions; and
- All of the above impacts will have a conservatively **high** significance impact rating if no mitigation measures are put in the place, however, the impact will be reduced to a **medium** significance rating if mitigation measures are implemented. However, it is anticipated that the emissions from this phase of the project will be lower than during the operational phase.

Mitigation Measures

- Wind-breaks and wind speed reduction through sheltering should be introduced and control measures to reduce the potential for fugitive dust emissions in opencast coal mines have to be adopted. The extent of exposed areas must be reduced through careful planning and progressive vegetation; and
- The air quality management plan (Section 4.2 of the EMP) must be implemented to mitigate potential impacts to air quality which may affect surrounding communities.

8.3.9. Traffic

Impact Assessment

- The total peak hour traffic expected during construction is 63 vehicles (42 cars, 11 buses, 10 trucks). The generated construction traffic is very low and will likely have no effect on the existing road network as the road network currently carries low traffic volumes;
- The impact on pavement loading to the surrounding roads will be insignificant. 53 E80 trucks will travel along the existing road network per day. (An E80 is an 80 kilo Newton equivalent axle load used to determine the strength of road pavement.) The loading impact on the surrounding road network is short term and minor;
- With the construction traffic added the three local intersections operate at LOS B. (LOS B has an average approach delay for signalised intersections of 6.6 to 19.5 seconds. The average approach delay for priority intersections is between 5 and 10 seconds);
- There will also potentially be impacts associated with road safety due to the increase in traffic on the local roads; and
- The impacts associated with the construction activities will be of a **medium** rating and through the implementation of mitigation measures can be reduced to **low**.

Mitigation Measures

- There are residential areas along the identified coal truck routes in the vicinity of the mine. Some long term treatment of unpaved roads may be required to minimise dust generated by haul trucks, however, this will be addressed in ongoing consultation with the DRJSMMLM; and
- The traffic management plan (Section 4.12 of the EMP) must be implemented to mitigate potential impacts to road traffic which may affect surrounding communities.

8.3.10. Noise

Impact Assessment

- Mine construction activities will result in an increase in the ambient noise levels;
- Intermittent loud noises from construction activities are likely to be a nuisance to residents living in the communities situated in close proximity to the construction sites (See Table 15 for noise levels generated by construction equipment; and see Table 14 for distances of affected settlements from the proposed Canyon Springs Coal Mine). The impact of the noise from construction activities on the surrounding communities will be **high** without mitigation and **medium** if the mitigation measures listed below are implemented;

Table 15: Typical noise levels generated by construction equipment

PLANT/EQUIPMENT	TYPICAL OPERATIONAL NOISE LEVEL AT GIVEN OFFSET (DBA)							
	5M	10M	25M	50M	100M	250M	500M	1000M
Air compressor	91	85	77	71	65	57	51	46
Compactor	92	86	78	72	66	58	52	46
Concrete batching plant	84	78	70	64	58	49	42	35
Concrete mixer	95	89	81	75	69	61	55	49
Concrete vibrator	86	80	72	66	60	52	46	40
Mobile Conveyor belt	77	71	63	57	51	43	37	32
Crusher (aggregate)	90	84	76	70	64	56	50	44
Crane (mobile)	93	87	79	73	67	59	53	47
Dozer	95	89	81	75	69	61	55	49
Loader	95	89	81	75	69	61	55	49
Mechanical shovel	98	92	84	78	72	64	58	52
Pile driver	110	104	97	91	85	77	71	65
Pump	86	80	72	66	60	52	46	40
Pneumatic breaker	98	92	84	78	72	64	58	52
Rock drill	108	102	94	88	82	74	68	62
Roller	84	78	70	64	58	50	44	38
Trucks	87	81	73	67	64	60	57	54

- Working on a worst case scenario basis, it is estimated that the ambient noise level from general construction activities could negatively affect noise sensitive sites within a distance

of 1300 m of the construction site. Night-time construction could have a significant impact on noise sensitive sites within a radius of 3000 m of the construction site;

- The use of heavy machinery to shift materials leads to an increase in noise levels. This has a negative impact with a **high** significance rating. This can be reduced to a **medium** rating if mitigation measures proposed below are implemented; and
- The daily construction related traffic, which will include construction personnel as well as mine supervisory staff, will on average be about 100 (two-way) vehicle trips. The impact of construction related traffic on the ambient noise levels will be **low** without mitigation and **low** if the mitigation measures listed below are implemented.

Mitigation Measures

- The design of all major plans for the mine must incorporate the necessary acoustic design aspects to ensure that the overall noise level generated from the infrastructure, pits and operations does not exceed a maximum equivalent continuous day / night rating level, which is a noise level of 70 dBA (within the mine boundary) as specified for industrial districts in SANS 10103;
- The design process is to consider, inter alia, the following aspects: the position and orientation of buildings and plant on the site, the design of the buildings is to be done in such a way as to minimise the transmission of noise from the inside of the buildings to the outside, and the insulation of particularly noisy plant and equipment;
- The design should also take into account the maximum allowable equivalent continuous day and night rating levels of the land use type of potentially impacted sites outside the mine boundary. Where the noise level at the external site is presently at- or exceeds the maximum, the existing level shall not be increased by more than indicated as acceptable in SANS 10103;
- Ideally, plant and equipment should meet the following specification: the sound power level should be such that the sound pressure level (SPL) – i.e. the noise level, measured at 1 m from the surface of the given plant/equipment should not exceed 85 dBA. When ordering plant and machinery, manufacturers should be requested to provide details of the sound power level. Where possible, those with the lowest sound power level should be selected;
- At commissioning of the mine, the noise footprint of each discrete element should be established by measurement in accordance with the relevant standards, namely SANS ISO 8297:1994 and SANS 10103. The character of the noise (qualitative aspect) should also be checked to ascertain whether there is any nuisance factor associated with the operations;
- In general, construction activities should meet the noise standard requirements of the Occupational Health and Safety Act (No. 85 of 1993);
- Once the final route of the external coal haul is determined and finalised, the noise impact assessment conducted should be updated to take cognisance thereof;
- Any updates to the noise impact assessment as contemplated above should also take cognisance of the final layout of infrastructure at the proposed mine in order to improve

confidence in the noise contours as calculated and the any management measures revised as necessary; and

- The noise management plan (Section 4.11 of the EMP) must be implemented to mitigate potential impacts to noise levels which may affect surrounding communities.

8.3.11. Blasting / Vibrations

Impact Assessment

- The points of concern are the closest houses to the planned Opencast Pit 1. The northern perimeter of the Pit 1 lies within 300 m from the nearest dwellings in Dihekeng village;
- A geotechnical investigation of the proposed area for development is overlain with soft strata that can be removed by free digging (which requires no blasting to remove the overburden); however, it has been mentioned that loading and hauling efficiencies can be improved if the overburden is blasted with a low powder factor which will aid in loosening the strata;
- In view of the fact that there are an unknown number of people residing within 300 m of the proposed opencast pits, exceptional measures need to be taken in order to reduce the negative impact of blasting operations. While it may be possible to evacuate people and animals from these areas, houses and other structures will remain within the blast zone and there is thus a high likelihood that these structures could be damaged;
- During construction, two main activities will be occurring, namely: (1) Overburden removal and (2) Pit excavation. These operations will both involve drilling and blasting;
- There are four main impacts that may potentially occur as a result of blasting operations, namely: (1) Ground vibrations, (2) Air blast, (3) Dust and (4) Fly-rock.
 - The ability of ground vibrations to cause damage to buildings is proportional to the Peak Particle Velocity (PPV) of that shock wave and is inversely proportional to the frequency. Thus a ground vibration with a high PPV and low frequency will most likely cause damage to buildings. Buildings can generally withstand ground vibration amplitudes of 12.7 mm / s or more; however, humans and animals are easily disturbed by ground vibrations at low levels. The significance of the negative impact caused by ground vibrations during the construction phase is predicted to be **high**; however, once the recommended mitigation measures and monitoring programmes are implemented the significance of the impact can be decreased to **medium**;
 - Air blast amplitudes up to 134 dB should not result in any adverse impacts. Air blasts greater than 134 dB will cause human irritation and may generate complaints during blasting operations; air blasts of this magnitude will not result in any damage to property but may alert nearby residents to the fact that blasting operations are in progress. The significance of the negative impact caused by air blasts during the construction phase is predicted to be **high**; however, once the recommended mitigation measures and monitoring programmes are implemented, the significance of the impact can be decreased to **medium**;

- Dust fallout due to blasting is discussed in Section 8.3.8. The significance of the negative impact caused by dust generation during the construction phase is predicted to be **medium**; however, once the recommended mitigation measures and monitoring programmes are implemented the significance of the impact will decrease to **medium**; and
- Fly-rock is the greatest hazard in blasting operations as it may result in injuries and / or loss of life. For this reason fly-rock should be given priority in blast design. The significance of the negative impact caused by fly-rock due to blasting during the construction phase is predicted to be **high**; however, once the recommended mitigation measures and monitoring programmes are implemented, the significance of the impact can be decreased to **medium**.

Mitigation Measures

- Measures should be taken to minimise the amount of air-blast produced by a blast to less than 130 dB in the region of the livestock;
- In view of the close proximity of the villages of Dihekeng, it is recommended that permanent seismic and acoustic monitoring stations be established on the boundaries of these villages closest to the mine;
- Blast vibrations and deterioration of buildings should be carefully monitored (see blasting / vibrations monitoring programme in Volume 2 (EMP)); and
- The blasting management plan (Section 4.3 of the EMP) and air quality management plan (Section 4.1 of the EMP) must be implemented to mitigate potential impacts to surrounding communities and structures and mine personnel as a result of blasting activities.

8.3.12. Socio-economic

Impact Assessment

- The development of mine infrastructure will potentially result in impacts to surface water (Section 8.3.5, 8.4.6, 8.5.5 and 8.6.2), increased noise disturbance (Section 8.3.10, 8.4.10, and 8.5.8), decreased air quality (Section 8.3.8 and 8.4.8), damage to property in close proximity to blasting activities (Section 8.3.11 and 8.4.11) and a loss of a sense of place (Section 8.3.12) (should effective management measures not be implemented). The combined effect of these impacts on the socio-economic environment are considered to be **high**, but can be reduced to **medium** if proper mitigation measures are applied; and
- The positive impacts of the proposed development on the socio-economic conditions of the area includes increased job opportunities through possible mine employment; positive spinoffs that the community will receive e.g. construction of a technology training centre and subsequent satellite centres, and updating the existing clinic at Loding. SLP initiatives that will benefit the employees of the Canyon Springs Coal Mine include the following: plans geared to developing and assisting HDSAs e.g. Adult Basic Education and Training (ABET), Bursary Plans and Internships, and housing allowances with the aim of using the houses as guest houses or lodges after decommissioning of the mine. This is considered to

be of **medium** significance that can be increased to **high** if conditions of the SLP regarding labour and procurement are adhered to.

Mitigation Measures

- Procedures and commitments outlined in the SLP must be adhered to;
- Issues related to land ownership should be addressed between the affected parties, COGTA and the National DLA. Should this matter not be resolved before mining is to commence, the Applicant, together with COGTA and the DLA must agree to an interim solution with the affected parties to allow access to the land with a compensation protocol implemented as required. Mitigation measures relating to the loss of land for grazing, agriculture and natural resources which should be further investigated include:
 - Potentially securing alternative grazing land for use by the communities. This can be achieved by utilising separate portions of land within the mining area, and which are not being mined at a specific point in time, being fenced off and retained as pastures until mining progresses towards that portion, at which time a separate grazing area should be fenced off, which could include a rehabilitated opencast strip returned to grazing potential;
 - Should this not prove possible, a rate per hectare for the loss of grazing land will have to be agreed upon with the relevant stakeholders who will then have to be adequately compensated for the loss of grazing land over the time affected. This could take the form of a rental agreement with the relevant persons; and
 - All trees and vegetation cleared during mine infrastructure construction should be made available for use by members of the community.

8.3.13. Visual / Aesthetic

Impact Assessment

- The clearance of land for the surface infrastructure development footprint will alter the existing natural aesthetics of the area. The visual aesthetic currently comprises of natural veld with some scattered subsistence farming with no significant developments in the form of infrastructure within the mining site. Without mitigation, this impact is therefore considered to be **high**. With the implementation of mitigation measures however, this impact can be reduced to **medium**.

Mitigation Measures

- The visual impact management plan (Section 4.14 of the EMP) must be implemented to mitigate the potential impact of the proposed Canyon Springs Coal Mine on the visual / aesthetic environment.

RECEPTOR / RESOURCE	ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT	IMPACT EFFECT	MAGNITUDE (M)	DURATION (D)	SCALE (S)	PROBABILITY (P)	SIGNIFICANCE		MITIGATION AND MANAGEMENT MEASURES	MONITORING
								RATING	VALUE		
Terrestrial Ecology	<ul style="list-style-type: none"> Clearance of surface for construction of the pit, roads and infrastructure e.g. discard dump, pollution control dam, sewage treatment plants and the TSE pipeline Blasting to clear the pit Heavy vehicles utilised in pit for opencast mining and on local mine roads Noise generated by vehicles and humans Increased human interactions on site Clearance of land for 	<ul style="list-style-type: none"> Destruction of floral and faunal habitat & vegetation and stripping of topsoil 	Negative	8 [8]	5 [5]	2 [2]	5 [5]	High [High]	75 [75]	Terrestrial ecology mitigation measures associated with the construction phase in Section 8.3.1.	Implement and maintain terrestrial ecology monitoring programme in Section 5.1 of the EMP.
		<ul style="list-style-type: none"> Exposure to erosion 	Negative	6 [4]	2 [2]	2 [1]	4 [3]	Medium [Low]	40 [21]		
		<ul style="list-style-type: none"> Increase in dust due to construction activities 	Negative	6 [4]	4 [4]	2 [1]	4 [3]	Medium [Low]	48 [27]		
		<ul style="list-style-type: none"> Potential increase in invasive vegetation 	Negative	6 [4]	4 [4]	2 [1]	4 [3]	Medium [Low]	48 [27]		
		<ul style="list-style-type: none"> Faunal interactions with structures and personnel, noise, vibration and light disturbance 	Negative	8 [6]	4 [4]	2 [2]	4 [3]	Medium [Medium]	56 [36]		
Aquatic Ecology	<ul style="list-style-type: none"> Clearing of natural vegetation Movement of construction vehicles 	<ul style="list-style-type: none"> Sedimentation of watercourse Altered runoff regime affects aquatic fauna 	Negative	6 [4]	2 [2]	2 [2]	5 [3]	Medium [Low]	50 [24]	Aquatic Ecology impact mitigation measures associated with the construction phase in Section 8.3.2 .	Aquatic Ecology monitoring is detailed in Section 5.2 of the EMP.
Wetlands	<ul style="list-style-type: none"> Heavy machines clearing vegetation for construction of the opencast pit and surface 	<ul style="list-style-type: none"> Sedimentation of watercourse 	Negative	4 [4]	2 [2]	2 [2]	3 [2]	Low [Low]	24 [16]	Mitigation measures of wetlands associated with the	Implement and maintain the wetlands monitoring

RECEPTOR / RESOURCE	ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT	IMPACT EFFECT	MAGNITUDE (M)	DURATION (D)	SCALE (S)	PROBABILITY (P)	SIGNIFICANCE		MITIGATION AND MANAGEMENT MEASURES	MONITORING
								RATING	VALUE		
	infrastructure. ▪ Water separation infrastructure leads to concentrated flows. ▪ Disturbance / destruction of indigenous vegetation making ecosystem vulnerable to invasions. ▪ Hydrocarbon spills	▪ Increased erosion and increased run-off received by water courses	Negative	6 [4]	4 [2]	2 [1]	4 [2]	Medium [Low]	48 [14]	construction phase in Section 8.3.3 .	programme in Section 5.3 of the EMP.
		▪ Introduction and spread of invasive vegetation	Negative	6 [4]	4 [3]	2 [1]	5 [3]	High [Low]	60 [24]		
	▪ Stream crossing / culvert constructed across the No-Name stream in order to access pit 1	▪ Crossing will be through a wetland, wetland buffer and within the 100 year floodline ▪ Construction may lead to sedimentation of the No-Name Stream and destruction of floral habitat	Negative	4 [2]	3 [3]	1 [1]	4 [4]	Medium [Low]	32 [24]		
Soil Quality	▪ Removal of soil for pit excavation ▪ Heavy vehicles over the opencast pit ▪ Clearance of land for discard dump, PCDs, sewage treatment plants and TSE pipeline ▪ Clearance of land for surface infrastructure	▪ Compaction of soils and loss of land capability	Negative	8 [4]	4 [4]	1 [1]	5 [3]	High [Low]	65 [27]	Soil mitigation measures associated with the construction phase in Section 8.3.4 .	Implement and maintain soil monitoring programme in Section 5.4 of the EMP.
		▪ Lost of resource (soil sterilisation) ▪ Loss of resource due to covering or removal of soil ▪ Contamination of soils due to spillage and dirty water	Negative	8 [6]	4 [4]	2 [2]	5 [3]	High [Medium]	70 [36]		

RECEPTOR / RESOURCE	ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT	IMPACT EFFECT	MAGNITUDE (M)	DURATION (D)	SCALE (S)	PROBABILITY (P)	SIGNIFICANCE		MITIGATION AND MANAGEMENT MEASURES	MONITORING
								RATING	VALUE		
	<ul style="list-style-type: none"> Use of hydrocarbons on site 	<ul style="list-style-type: none"> Compaction of soils and loss of land capability due to the movement of heavy vehicles 	Negative	8 [4]	4 [4]	1 [1]	5 [3]	Medium [Low]	52 [27]		
Groundwater	<ul style="list-style-type: none"> Dewatering of the pit 	<ul style="list-style-type: none"> Impact on groundwater volumes 	Negative	4 [3]	2 [2]	2 [2]	4 [4]	Medium [Low]	32 [28]	Groundwater mitigation measures associated with the construction phase in Section 8.3.5.	Implement and maintain groundwater monitoring programme in Section 5.5 of the EMP.
	<ul style="list-style-type: none"> Hydrocarbons spills 	<ul style="list-style-type: none"> Groundwater contamination 	Negative	2 [2]	3 [3]	2 [2]	2 [1]	Low [Low]	14 [7]		
Surface Water	<ul style="list-style-type: none"> Clearance of land for the construction of infrastructure Excavation of opencast pit Hydrocarbon spills 	<ul style="list-style-type: none"> Greater erosion potential causing siltation resulting in increased turbidity and suspended solids in local rivers and streams Contamination of water due to hydrocarbons spills 	Negative	2 [2]	1 [1]	1 [1]	2 [2]	Low [Low]	8 [8]	Surface water mitigation measures associated with the construction phase are found in Section 8.3.6.	A surface water monitoring programme is to be implemented and maintained as set out in Section 5.6 of the EMP.
	<ul style="list-style-type: none"> Stream crossing / culvert constructed across the No-Name stream in order to access pit 1 	<ul style="list-style-type: none"> Crossing will be through a wetland and within the 100 year floodline Construction may lead to sedimentation of the No-Name Stream 	Negative	4 [2]	3 [3]	1 [1]	4 [4]	Medium [Low]	32 [24]		
Cultural Heritage /	<ul style="list-style-type: none"> Site clearance for construction 	<ul style="list-style-type: none"> Loss of remains of old farmyard at Site 1 	Negative	2	4	1	4	Low	28	Heritage resource mitigation	Implement and maintain

RECEPTOR / RESOURCE	ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT	IMPACT EFFECT	MAGNITUDE (M)	DURATION (D)	SCALE (S)	PROBABILITY (P)	SIGNIFICANCE		MITIGATION AND MANAGEMENT MEASURES	MONITORING
								RATING	VALUE		
		<ul style="list-style-type: none"> Loss of Middle and Late Stone Age tools and Iron Age Pottery at Site 2 								measures associated with the construction phase can be found in Section 8.3.7.	heritage resources (See Volume 2 (EMP) heritage, cultural and palaeontology management measures programme)
		<ul style="list-style-type: none"> Loss of Middle as well as Late Stone Age tools at Site 3 									
Air Quality	<ul style="list-style-type: none"> Use of heavy machinery in preparation of the opencast pit Disturbance and blasting of land cover in preparation of the opencast pit 	<ul style="list-style-type: none"> Increased dust fallout Emissions and particulate matter from machinery / vehicles which results in a local reduction in air quality Wind erosion from exposed areas 	Negative	6 [4]	4 [4]	2 [2]	5 [4]	High [Medium]	60 [40]	Air quality mitigation measures associated with the construction phase in Section 8.3.8.	Implement and maintain air quality monitoring programme in Section 5.7 of the EMP.
	<ul style="list-style-type: none"> Clearance of groundcover for surface infrastructure Use of heavy machinery to transport materials Coal and overburden handling 	<ul style="list-style-type: none"> Increased dust fallout due to materials relocation and transport Emissions and particulate matter from machinery / vehicles resulting in a local reduction in air quality Wind erosion from topsoil and overburden stockpiles Levelling of disturbed land 	Negative	6 [6]	4 [4]	2 [2]	5 [4]	High [Medium]	60 [48]		

RECEPTOR / RESOURCE	ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT	IMPACT EFFECT	MAGNITUDE (M)	DURATION (D)	SCALE (S)	PROBABILITY (P)	SIGNIFICANCE		MITIGATION AND MANAGEMENT MEASURES	MONITORING
								RATING	VALUE		
Traffic	<ul style="list-style-type: none"> Use of heavy vehicles in construction activities The use of vehicles in constant activities for transportation of men and materials 	<ul style="list-style-type: none"> Additional traffic Damage to local roads Impacts associated with road safety 	Negative	2 [2]	2 [2]	2 [2]	5 [4]	Medium [Low]	30 [24]	Traffic mitigation measures associated with the construction phase can be found in Section 8.3.9.	
Noise	<ul style="list-style-type: none"> Use of heavy machinery in pit excavation, overburden removal and surface infrastructure construction Noise generated by blasting and pit excavation 	<ul style="list-style-type: none"> Increase in noise levels 	Negative	8 [6]	4 [4]	2 [2]	5 [4]	High [Medium]	70 [48]	Noise mitigation measures associated with the construction phase in Section 8.3.10.	Implement and maintain noise monitoring programme in Section 5.8 of the EMP.
	<ul style="list-style-type: none"> Use of vehicles to transport construction personnel and materials 		Negative	2 [2]	2 [2]	2 [2]	4 [4]	Low [Low]	24 [24]		
Blasting / Vibrations	<ul style="list-style-type: none"> Overburden removal Pit excavation 	<ul style="list-style-type: none"> Ground vibrations 	Negative	10 [8]	4 [4]	2 [2]	5 [4]	High [Medium]	80 [56]	Blasting mitigation measures associated with the construction phase in Section 8.3.11.	Implement and maintain blasting monitoring programme in Section 5.9 of the EMP.
		<ul style="list-style-type: none"> Air-blasting 	Negative	10 [6]	4 [4]	2 [2]	5 [4]	High [Medium]	80 [48]		
		<ul style="list-style-type: none"> Dust and smoke 	Negative	8 [4]	4 [4]	2 [2]	5 [4]	Medium [Medium]	70 [40]		
		<ul style="list-style-type: none"> Fly-rock 	Negative	10 [10]	4 [4]	2 [2]	5 [3]	High [Medium]	80 [48]		
Socio-economic	<ul style="list-style-type: none"> Opencast pit excavation Development of mine infrastructure 	<ul style="list-style-type: none"> Loss of land Surface and groundwater pollution Loss of sense of place 	Negative	8 [6]	4 [4]	3 [3]	4 [3]	High [Medium]	60 [39]	Details of mitigation measures to reduce negative	The SLP should be adhered to (Appendix 14).

RECEPTOR / RESOURCE	ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT	IMPACT EFFECT	MAGNITUDE (M)	DURATION (D)	SCALE (S)	PROBABILITY (P)	SIGNIFICANCE		MITIGATION AND MANAGEMENT MEASURES	MONITORING
								RATING	VALUE		
		<ul style="list-style-type: none"> Damage to property through blasting (Section 8.3.11) Increased noise disturbance (Section 8.3.10) Decreased air quality (Section 8.3.8) 								impacts and increase potential positive impacts on the socio-economic environment are described in Section 8.3.12.	
	<ul style="list-style-type: none"> Mine Employment 	<ul style="list-style-type: none"> Increased job opportunities 	Positive	6 [8]	4 [4]	3 [3]	3 [4]	Medium [High]	39 [60]		
Visual Aesthetics /	<ul style="list-style-type: none"> Clearance of land / site for opencast pit excavation and surface infrastructure and services 	<ul style="list-style-type: none"> Alteration of natural landscape 	Negative	6 [6]	4 [4]	2 [1]	5 [4]	High [Medium]	60 [44]	Detailed visual mitigation measures associated with the construction phase can be found in Section 8.3.13.	

8.4. Operation Phase

The operational phase at the proposed Canyon Springs Coal Mine will consist of the following:

- Through roll-over mining and progressive rehabilitation opencast mining will consist, in total, of four pits. The pits will be mined progressively throughout the LOM. The operational phase will be approximately 19 years (The construction and decommissioning phases will last for 6 months, decommissioning – 6 months);
- All the storm water that comes into contact with any of the mining or processing operations will be captured and directed to either the SCD or the PCD. The stormwater falling on the CHPP area will be directed to the SCD via a double silt trap for silt removal.
- ROM will be transported to the plant site via truck / haul road and fed to a ground hopper onto an apron feeder that will discharge the coal through a jaw crusher to a stockpile of approximately least 15 000 tons (storage capacity for half a day's production); and
- Discard and slurry produced at the CHPP will discharge to the temporary discard stockpile to be constructed adjacent to the CHPP. The intention is that discard will be re-introduced into the opencast excavation during continuous rehabilitation.

8.4.1. Terrestrial Ecology

Impact Assessment

- Mining activities such as blasting, the clearance of ground and excavations (associated with opencast pit mining) will destroy natural vegetation and faunal habitat and may cause mortality to faunal species. Alien species have a tendency to invade and displace indigenous vegetation in cleared areas, which will lower the plant and animal diversity in the area, further negatively affecting the already vulnerable Springbokvlakte Thornveld. Alien invasive species out-compete and thus displace the natural vegetation and leads to a species poor, transformed landscape. The significance of this impact is expected to be **medium** and if proposed mitigation measures are implemented this can be maintained at a **medium** significance;
- Dust caused by the mining operation could hamper photosynthesis of plants and persistence of pollinators on the site and surrounds. Dust produced during the loading of coal, as well as during the transport of crushed material can be carried into surrounding habitat by strong winds or runoff during rains. This coal in the form of dust may be deposited on plants, thus reducing light availability and plant productivity. Furthermore, coal and hazardous material (such as industrial chemicals) deposition on the ground amongst natural vegetation has the potential to change the soil chemistry and groundwater quality essential to support important species. The significance of this impact is expected to be **medium** and will remain **medium** through the implementation of proposed mitigation measures;
- Mining activities will result in high levels of noise, vibrations and light pollution (during mining following sunset). This will disturb the fauna utilising the surrounding vegetation,

especially nocturnal species, and could result in a localised decrease in biodiversity as faunal species move away from the disturbance into the surrounding areas; and

- The presence of the mine may result in negative faunal interactions that could be associated with mine personnel including poaching, trapping and hunting of faunal species, as well as possible collisions of fauna with mine vehicles. The significance of this impact is likely to be **medium** and will remain **medium** through the implementation of proposed mitigation measures.

Mitigation Measures

- The biodiversity management plan (Section 4.4 of the EMP), soil management plan (Section 4.10 of the EMP) and hydrocarbon management plan (Section 4.9 of the EMP) must be implemented to mitigate potential impacts to biodiversity and soil resources which may affect terrestrial ecology.

8.4.2. Aquatic Ecology

Impact Assessment

- Water salinity
 - Water contained within the SCD and PCD, the runoff from contaminated areas (including the overburden and temporary discard dump, STP), as well as the TSE from Siyabuswa, will likely be characterised by elevated concentrations of contaminants like sulphates, iron, manganese, aluminium etc. Should any seepage or release of this water occur into the receiving catchment, whether as a result of intentional or unintentional releases, overcapacity, permeable dam construction, etc., the result will be a significant loss of aquatic biota and a definite degradation of the PES of the Ghotwane catchment, and may also result in the decrease of the fisheries potential of Rhenosterkop Dam. There is also the increase in potential for fish mortalities within the Rhenosterkop Dam. Increased salinity and water pollution is considered to have a **high** significance if mitigation measures are not implemented. If mitigation measures are correctly implemented however this significance should be reduced to **medium**.
- Siltation of the Watercourse
 - The movement of construction vehicles and personnel can result in the onset of erosion and associated sedimentation of streams and rivers. The stockpiling of excavated earth and construction materials can result in contamination of runoff, as a result of erosion of stockpiles and / or berms. Due to the clearing of the vegetation the watercourse may experience an increase in sedimentation which has a **medium** significance impact which can be reduced to a **low** significance rating if mitigation measures are implemented.

Mitigation Measures

- Ensure that all Best Management Guidelines as published by the DWA are employed and strictly adhered to during all phases of the mining process; and

- The soil management plan (Section 4.10 of the EMP) and the aquatic ecology management plan (Section 4.5 of the EMP) must be implemented to mitigate potential impacts to minimise the potential for erosion and sedimentation of runoff.

8.4.3. Wetlands

Impact Assessment

- Hazardous materials used in the mining process have the potential to contaminate soils, watercourses and groundwater. In addition, coal and coal dust that fall from trucks or spill at loading areas could influence soil and groundwater that could threaten the persistence of fauna and flora species in the area during operation as well as after decommissioning. This potential impact has a **high** significance rating which can be reduced to **medium** if the mitigation measures proposed below are implemented; and
- Clean surface runoff entering the mining infrastructure area could potentially be contaminated by substances such as stormwater runoff with AMD-type characteristics, oils, fuel, greases, etc. in discharged water from the mine workings and contained in the dirty water systems on-site- this can contaminate surface water resources if not adequately contained, and ultimately being transported through the watercourses to the downstream Rhenosterkop Dam. Should any seepage or release of this water occur as a result of intentional or unintentional releases, overcapacity, permeable dam construction, etc., the result will likely have a negative impact on water quality and biodiversity within wetlands.

Mitigation Measures

- No activities, outside of the existing Water Use Licence, may be undertaken within wetland areas or within 500 m of wetlands. Should additional activities be required within wetland areas, an additional Water Use Licence must be applied for through the Department Water Affairs; and
- The wetland management plan (Section 4.8 of the EMP), soil management plan (Section 4.10 of the EMP), surface water management plan (Section 4.7 of the EMP) and biodiversity management plan (Section 4.4 of the EMP) must be implemented to mitigate potential impacts to surface water, biodiversity and soil resources which may affect wetlands.

8.4.4. Soil Quality

Impact Assessment

- There is the potential for the loss of the soil resource due to the collapse of unconsolidated / compacted workings during rollover mining, due to ponding of the surface water on collapsed areas and the cracking of consolidated areas, which was calculated to have a **high** significance;
- Potential impacts arising in terms of surface water contamination e.g. failure to contain contaminated water within the dirty water catchment, runoff from coal stockpiles, as well as the spillage of hydrocarbons can lead to the sterilisation of seed pools and

contamination of soil resources. Soil stockpiles may experience a reduction in soil fertility due to erosion. The above activities will have an impact of **high** significance on the soils but can effectively be reduced to an impact of **medium** significance if mitigation measures are put in place; and

- Heavy vehicles and stockpiling leads to the compaction of soils which in turn results in the reduction of soil potential and the destruction of the soil horizon and soft overburden. Soils are contaminated by the uncontrolled dumping outside of the dump footprint. The use of haulage ways and access routes leads to the sterilisation of the soils found on these ways and routes which has a **medium** impact rating and can be successfully reduced to a **low** impact rating.

Mitigation Measures

- The soil management plan (Section 4.10 of the EMP) must be implemented to mitigate potential impacts to soil resources which may affect land capability.

8.4.5. Groundwater

Impact Assessment

- Groundwater Quality
 - Geochemical analysis indicates that no AMD will occur during the operational phase because of the short residence time of water in the mine, as well as the high neutralisation potential of the rock that will prevent acidification at least over the short term. The discard area is planned to be a lined, temporary facility and will only be operational for a maximum period of the initial 24 months of the LOM after which the material will be placed in the already mined pits as part of continuous rehabilitation. Furthermore, the coal fines discard area is planned in the footprint of the eventual Pit Area 2, which means that any contamination that does enter the underlying aquifers during the initial 24 months of the life of operations will be removed together with the aquifer rock material as part of the opencast mining process. The area will also be totally rehabilitated as part of the mine rehabilitation program. It is thus not expected that any significant sulphate contamination will form in the mining area, or migrate away from the mining area during the life of operations;
 - The impact of mining on groundwater quality during the operational phase is considered to be **low**, this can be further reduced through the implementation of the mitigation measures discussed below;
 - As during the construction phase, there is a risk of hydrocarbon spills from vehicles and the fuel bay area. Should contamination enter the aquifer material outside the zone of influence of the mine dewatering the contamination will migrate down gradient away from the mining area. Contamination that enters the aquifer inside the zone of influence of the mine dewatering will migrate towards the opencast area; and

- The impact of potential hydrocarbon spills on groundwater quality is expected to be **medium**, this impact can be reduced to **low** with the implementation of the mitigation measures suggested below.
- Groundwater Quantity
 - Due to the fact that the topographical elevation of the opencast pit floors will be below the general groundwater level, groundwater will flow will be directed into the active mining areas from the surrounding aquifers during operations. Groundwater flow directions around the active mine area will be directed towards the opencast pit areas due to mine dewatering for the safety of men and materials and the efficient continuation of mining. On account of the above, no contamination will be able to migrate away from the opencast mining area while the mine is operational and being actively dewatered;
 - Dewatering of the mine will likely be associated with a decrease in groundwater level by ways of a dewatering cone within the zone of influence. The maximum drawdown in groundwater level within the zone of influence will likely be around 45 m, while the zone of influence itself may extend up to 4 km from the edge of the proposed mining areas. It should be noted, however, that the zones of influence for each of the dewatering cones developing around the four mining areas depend on several factors including the depth of mining below the regional groundwater level, recharge from rainfall to the aquifers, vertical infiltration of the recharging water, the size of the mining area, the aquifer transmissivity, and aquifer storativity amongst others, while also being affected by concurrent rehabilitation of the opencast areas and the elevated recharge from rainfall that is associated with disturbed and rehabilitated areas. The development of the groundwater level drawdown cone in the fractured rock aquifer over time is illustrated in the following (Figure 44– year 7, Figure 45– year 14, Figure 46– year 20, conclusion of mining);
 - Almost all the boreholes identified during the hydrocensus surveys fall directly in the zone of influence of the cone of dewatering. This means that groundwater levels in each of the boreholes can be expected to reduce over time, thereby possibly impacting on the sustainable yields of the boreholes. Boreholes where the sustainable yields are likely to be at risk due to the mine dewatering include:
 - CSH-02 (medium to high risk). Currently being used for water supply;
 - CSH-07 (medium risk). Currently not being used as the hand pump is broken;
 - CSH-08 (high risk). Currently being used for livestock watering;
 - CSH-10 (medium risk). Used for water supply to the Mbulawa Secondary School. Around 10 000 litres is used every week;
 - CSH-12 (medium risk). Used by Mr Hlaletwa for domestic and gardening purposes. Abstraction is around 14 000 litres per week;
 - CSH-15 (medium risk). The pump is currently broken and it is uncertain how much water is pumped when the pump is operational. It is also not known when last the pump was operational; and
 - CSH-27 (medium risk). The borehole is not currently equipped.

- From Figure 44 to Figure 46 it can be seen that the Ghotwane River falls within the zone of impact of mine dewatering. It is thus likely that the baseflow contribution to the Ghotwane River by groundwater will thus be reduced, thus reducing stream flow volumes – the impact of this is calculated to be around 10%;
- Due to the non-perennial nature of both the “No-Name” stream and the Ghotwane River, it can be said that the majority of the stream flows will occur during the rainy season when flow volumes mostly constitute surface runoff. This fact will thus reduce the potential impact on the stream flow volumes;
- The numerical groundwater flow model shows that the total groundwater inflow volumes into the Canyon Springs Coal Mine opencast pit areas can be expected to range between 360 and 1 720 m³/day. This equates to between 4 and 20 l/s. The total inflow volumes, and therefore dewatering requirements, fluctuate over the LOM depending on a combination of:
 - The number of pit areas operational during a specific year;
 - Depths of each of the active pit areas below the regional groundwater levels. Generally speaking the greater the depth of the pit, the greater the groundwater flow gradient towards the pit, and therefore the greater the groundwater inflows;
 - Pit sizes. The greater the pit size the greater the groundwater inflows; and
 - Relative positioning of the pit area. Pit areas close to each other have overlapping zones of influences of their respective groundwater level drawdown cones, thus the total dewatering requirement for such pit areas is less than if the two pits had to be dewatered independently.
- Inflows into Pit Area 1 range between 565 and 1 720 m³/day over the 20 years life of operations in the pit area. There is a general increasing trend as the mined out pit area expands. During the last two years of the life of operations here there will be a decrease in the excavation volumes down to as little as 150 000 tonnes compared to between 1 and 2 million tonnes in previous years. Therefore, there will be reduction in new, un-dewatered ground being broken, and therefore there will be a reduction in the volume of water released from storage;
- Expected pit inflows at Pit Area 2 range between 110 and 370 m³/day over the 18 years life of operations. The Pit Area falls partially within the zone of dewatering caused by the larger Pit Area 1, and there is thus a reduction in groundwater flows towards Pit Area 2 up until near the end of life of Pit Area 1. Due to reduced mining rates, and ultimately total stoppage of mining in Pit Area 1 at the end of year 20, inflows into Pit Area 2 then increases again;
- Inflows into Pit Area 3 range between 105 m³/day during the initial 7 years of the pit, to less than 10 m³/day during the later years of the life of the pit. This reduction in pit inflows is due to the pit area falling within the developing drawdown cone around the much larger and deeper Pit Area 1;
- Groundwater inflows into the Pit Area 4 range between 210 and 360 m³/day over the 20 years life of operations here;

- Considering the above, the potential impact on groundwater volumes is thus likely to be **high** and although mitigation measures can be implemented this impact is likely to remain **high** during the operational phase.

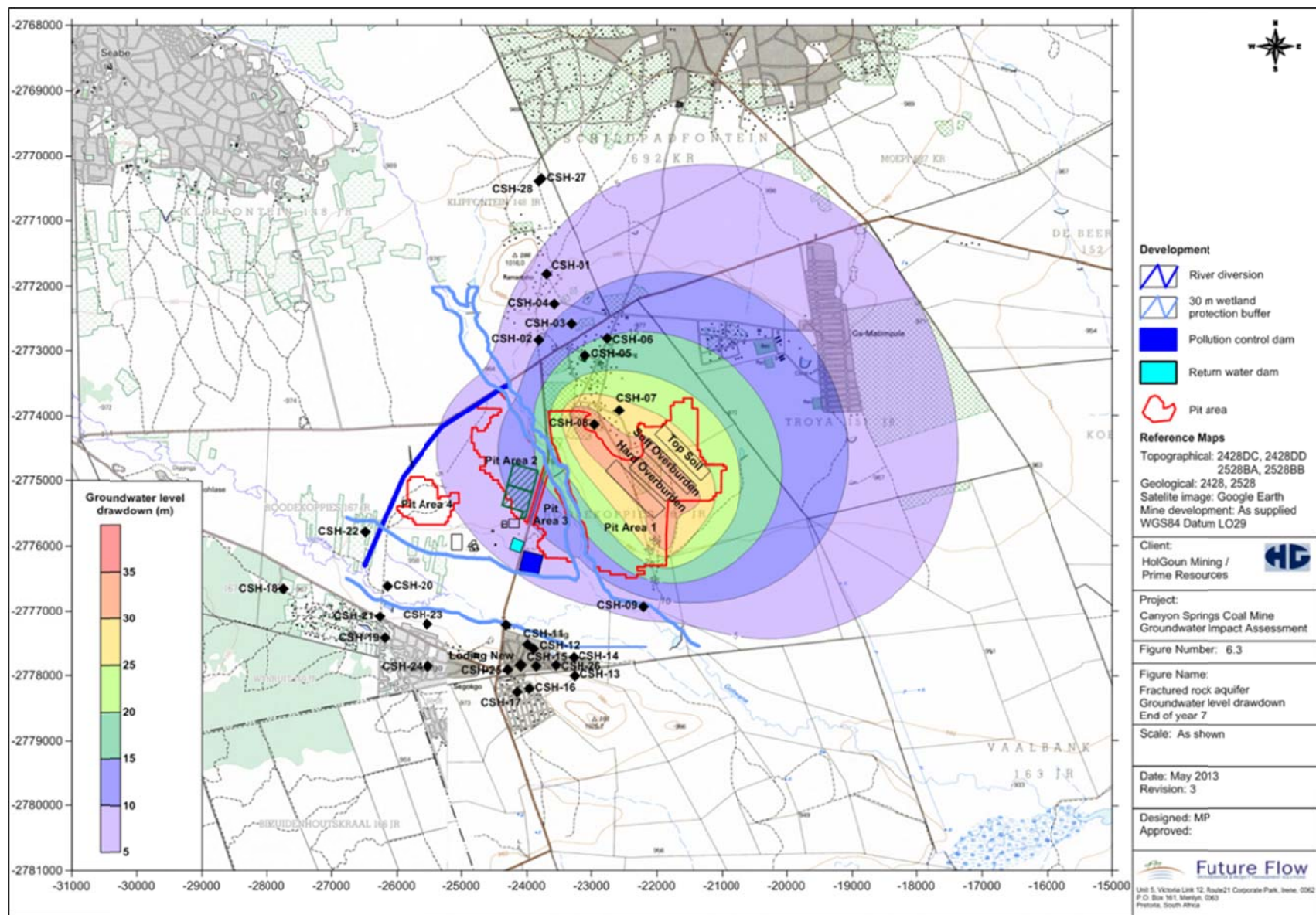


Figure 44: Drawdown of groundwater end of year 7

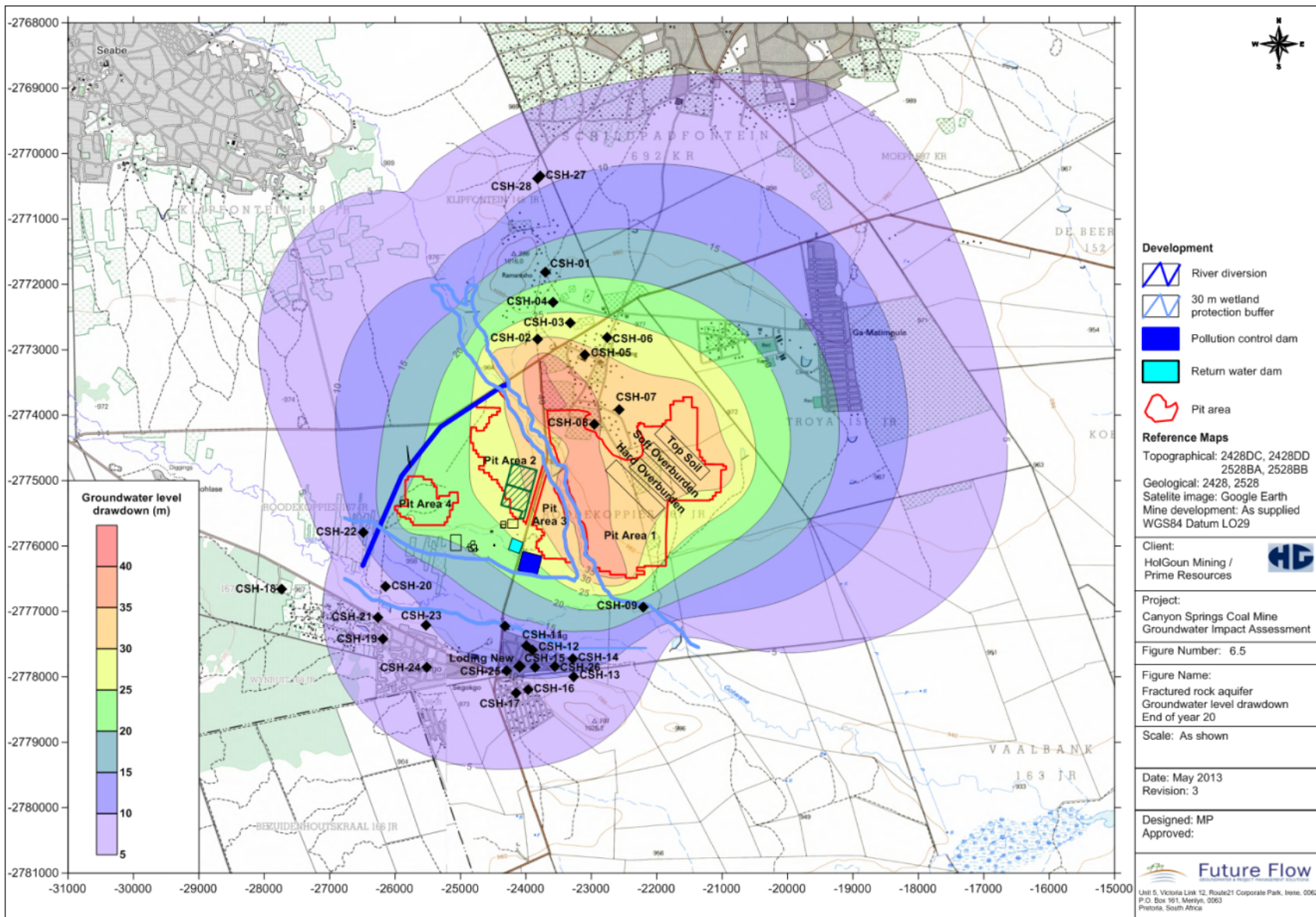


Figure 46: Drawdown of groundwater levels end of year 20

Mitigation Measures

- The numerical groundwater model must be updated with the information obtained during ongoing monitoring to continually improve the long-term strategy in terms of groundwater management. Cognisance of new technologies that may become available must be taken account of; and
- The hydrocarbon management plan (Section 4.9 of the EMP) must be implemented to avoid and manage the negative impacts of hydrocarbon spills on groundwater resources; and
- The groundwater management plan (Section 4.6 of the EMP) must be implemented to mitigate potential impacts to groundwater resources which may affect groundwater quality and quantity.

8.4.6. Surface Water

Impact Assessment

- Water Quantity
 - There is a limited potential impact regarding the interception of water by the opencast pits and surface infrastructure from the catchment of the Ghotwane and Elands Rivers. This impact has a significance rating of **low** with or without the implementation of mitigation measures; and
 - The “No-Name” Stream, as well as the Ghotwane River itself, fall within the zone of impact of the mine dewatering. This will reduce base flow contribution to the stream, thereby reducing stream flow volumes.
- Water Quality
 - Clean surface runoff entering the mining infrastructure area could potentially be contaminated by substances such as AMD, oils, fuel, greases, etc. in discharged water from the mine workings and contained in the dirty water systems on-site- this can contaminate surface water resources if not adequately contained, ultimately culminating in the Rhenosterkop Dam. This has a significance rating of **medium** without mitigation and a **low** significance rating after the implementation of mitigation measures; and
 - Groundwater geochemical analysis (refer to groundwater study Appendix 6B) indicates that no AMD will occur in the operational opencast mining because of the short residence time of water in the mine, as well as the high neutralisation potential of the rock that will prevent acidification at least over the short term. Thus surface water bodies are not at risk of AMD pollution during the operation phase of the mine. The impact of AMD generation will only have to be addressed during the post-closure phase of the mine.

Mitigation Measures

- The surface water management plan (Section 4.7 of the EMP) must be implemented to mitigate potential impacts to surface water resources which may affect surface water quality.

8.4.7. Cultural / Heritage

Impact Assessment

- The loss of the resources during the process of clearing the land situated within the development footprint of the mine are a potential impact;
- The resources that have been identified at the proposed Canyon Springs Coal Mine are of **low** significance and are not located within the proposed development footprint;
- No other sites of cultural significance were found on site; additionally no graves, apart from those in formal cemeteries which will not be affected by the mining development, were found within the study area; and
- All three sites identified are located outside of the development footprint (see Figure 30) and will therefore not be impacted on.

Mitigation Measures

- The heritage and palaeontological management plan (Section 4.13 of the EMP) must be implemented to avoid and mitigate potential impacts to heritage and palaeontological resources.

8.4.8. Air Quality

Impact Assessment

- During the operational phase of the project, the use of heavy machinery to transport materials and the handling of coal and overburden will result in an increase in dust fallout due to the relocation and transport of materials. This will have a **high** impact on the air quality. This impact rating can be lowered to **medium** if mitigation measures are implemented correctly;
- Primary crushing operations represent significant dust-generating sources if uncontrolled. Dust fallout in the vicinity of crushers also gives rise to the potential for the re-entrainment of dust by vehicles or by the wind at a later date;
- Drilling and blasting operations represent intermittent sources of fugitive dust emissions;
- Dust emissions occur due to the erosion of open storage piles and exposed areas;
- Simulations were undertaken to determine concentrations of particulate matter with a particle size of less than 10 microns (μ) in size (PM_{10}) from operations at the proposed Canyon Springs Coal Mine. The modelling was done on a 500 m resolution. The dispersion of pollutants was modelled up to a distance of 20 km from the proposed site. The isopleths are given in Figure 47 and Figure 48. Figure 47 indicates that the PM_{10} over a 24-hour period, and without any mitigation measures, would exceed the national daily standard of $75 \mu g/m^3$ up to a distance of approximately 5 km from the fence line, which incorporates the residential areas of Dihekeng, Moletsi, Loding, Segokgo and Ga-Matimpule as well as

over a small north-western section of the Mkombo Nature Reserve. This is a health risk for the residents of these areas. Figure 48 indicates that the annual average PM₁₀ concentrations, also without any mitigation measures, would exceed the national annual average standard of 40 µg/m³, but only within the property boundary.

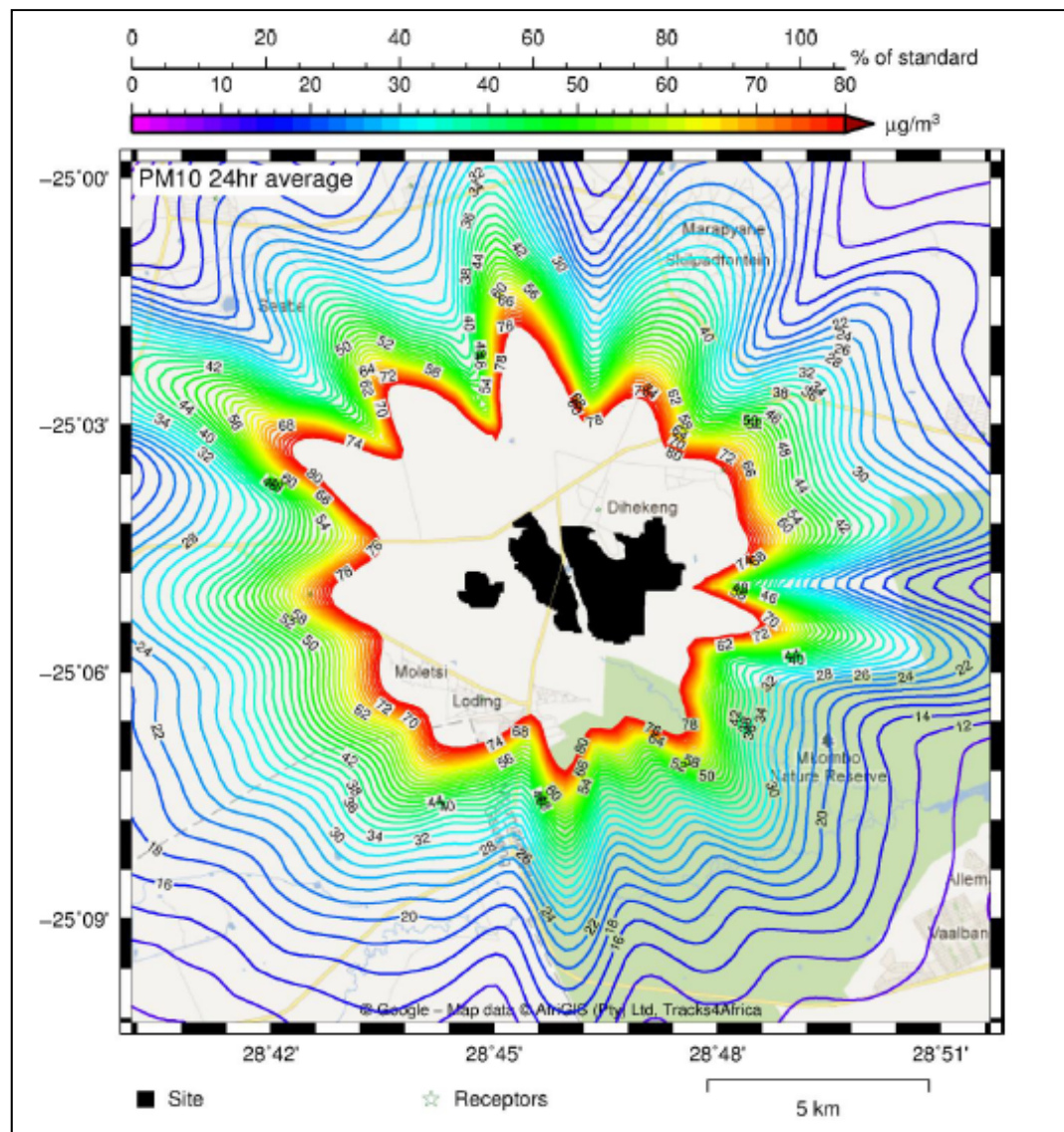


Figure 47: Modelled prediction of daily average PM₁₀ concentrations without mitigation measures

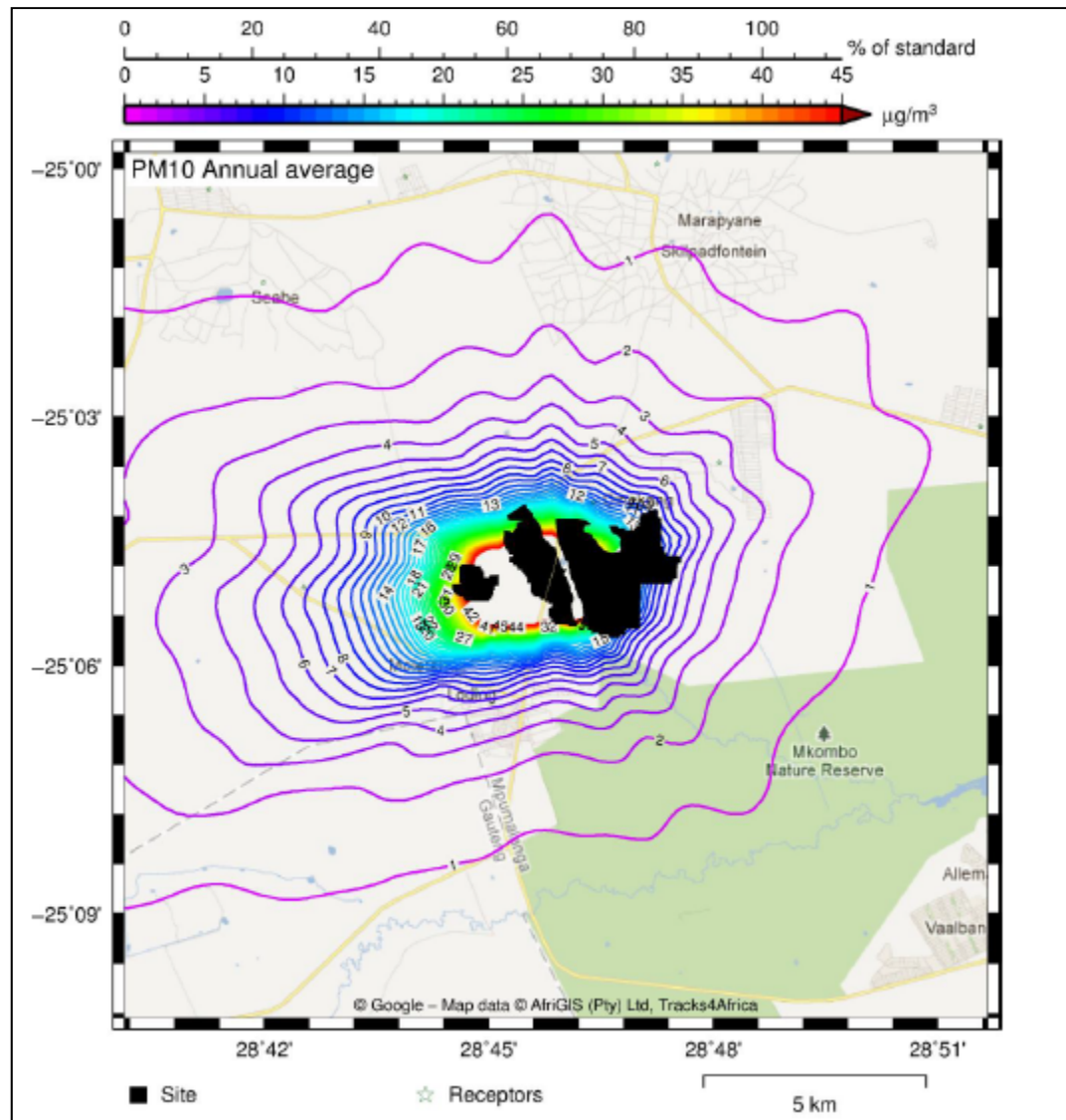


Figure 48: Modelled prediction of annual average PM₁₀ concentrations without mitigation measures

Mitigation Measures

- Because the main road running through the property is tarred, a very large potential emission source has been reduced at the proposed Canyon Springs Coal Mine; and
- The air quality management plan (Section 4.2 of the EMP) must be implemented to mitigate potential impacts to air quality which may affect surrounding communities.

8.4.9. Traffic

Impact Assessment

- The use of vehicles in activities for the transportation of men and materials throughout the operational phase e.g. coal transport off-site, worker transport to- and from site, service and maintenance vehicles and good-delivery will likely result in additional traffic on local roads;
- This increase in traffic volumes may lead to damage to local roads and increased potential for negative impacts associated with road safety e.g. road accidents;
- The anticipated vehicle load during operation was calculated to be approximately 360 coal trucks per day which are fully loaded inbound and empty outbound. This translates to 1908 E80s per day along the existing road network. This will add to the load the road has to carry and may lead to road deterioration;
- All three of the local intersections still operate at LOS B, with the operational phase traffic added. (LOS B has an average approach delay for signalised intersections of 6.6 to 19.5 seconds. The average approach delay for priority intersections is between 5 and 10 seconds.); and
- By implementing the suggested mitigation measures the potential impacts related to traffic can be maintained at a **medium** significance rating;

Mitigation Measures

- It may be appropriate for the mine to negotiate a contribution to the upgrading of the D1944 road (Ramotsho Road) and D626 after the mine has been established. Upgrading the road ought to ensure that the road section will have the ability to carry increase in traffic; and
- The traffic management plan (Section 4.12 of the EMP) must be implemented to mitigate potential impacts to road traffic which may affect surrounding communities.

8.4.10. Noise

Impact Assessment

- Mining activities associated with the opencast pits will involve the use of pneumatic drills (for blast holes) and dewatering pumps, which will be continuous sources of noise. There will be intermittent sources of noise involved with opencast mining activities which include ancillary transport in the pits e.g. vehicles used by the blasting operator, service vehicles, water trucks, supervisory vehicles.

- The removal and transport of overburden, from the opencast pit to the designated overburden dump areas, by loaders, bulldozers and trucks will be a continuous source of noise throughout the operation phase. These sources will increase the ambient noise levels which may be a nuisance to residents living in the surrounding communities. The impact of the noise from opencast mining operations on the surrounding communities will be **high** without mitigation and **medium** if the mitigation measures listed below are implemented;
- Noise will continuously be generated from the CHPP from the crushers, conveyor system, grizzly screens and sizing screens, wash plant screen and chutes, cyclones, hydraulic breakers, haul trucks, compressor house and the pumps. There is a potential for numerous noise sensitive receptors to be impacted on by the noise generated from the CHPP. The impact of the noise generated from the CHPP on the surrounding communities will be **medium** without mitigation and will remain **medium** if the mitigation measures listed below are implemented;
- During the operation phase, coal haul trucks will make use of the roads to transport coal product off-site. It is estimated that the mining operation will require 180 truckloads to export the final product from the mine daily (360 two-way trips). Employees will also utilise these roads to access and leave the mine each day. Total daily traffic volumes from the mine (430 trips per day in total) will be small compared to the number of vehicles on the main roads in the study area and therefore the impact on the ambient noise levels will be **low**;
- The overall combined noise area of influence, before any mitigation measures have been implemented, of all of the individual noise zones are shown on Figure 49. According to SANS 10103, the 35 dBA ambient noise contour demarcates the outer limit of influence. Figure 49 shows these limits with temperature inversion conditions. There will, at times, be noises arising at the mine that can be heard beyond the indicated positions of the respective 35 dBA contours, specifically from single short-term events (such as blasting);
- Figure 50 shows the combined noise contours of the opencast pit mining activities, over the entire mining area for the LOM, before any mitigation measures have been implemented. It indicates the worst situation that could occur at any specific receiver point (but only for a specific period of the mining operation). There is a potential for numerous noise sensitive receptors to be impacted by the mining operation noise from the pits (albeit at different periods of mining). For the potential area of impact in the villages during the daytime period, refer to the 50 dBA contours in Figure 50. For the potential area of impact in the villages during the night-time period refer to the 40 dBA contours in Figure 50;
- The noise footprint of the CHPP, without any mitigation measures applied, is shown in Figure 51. There is a potential for numerous noise sensitive receptors to be impacted in the suburban residential areas. For the potential area of impact during the daytime period, refer to the 50 dBA contours in Figure 51. For the potential area of impact during the night-time period refer to the 40 dBA contours in Figure 51. Intermittent short-term loud noises, such as the trucks dumping coal loads are likely to be heard further afield than the position of the 35 dBA contour.

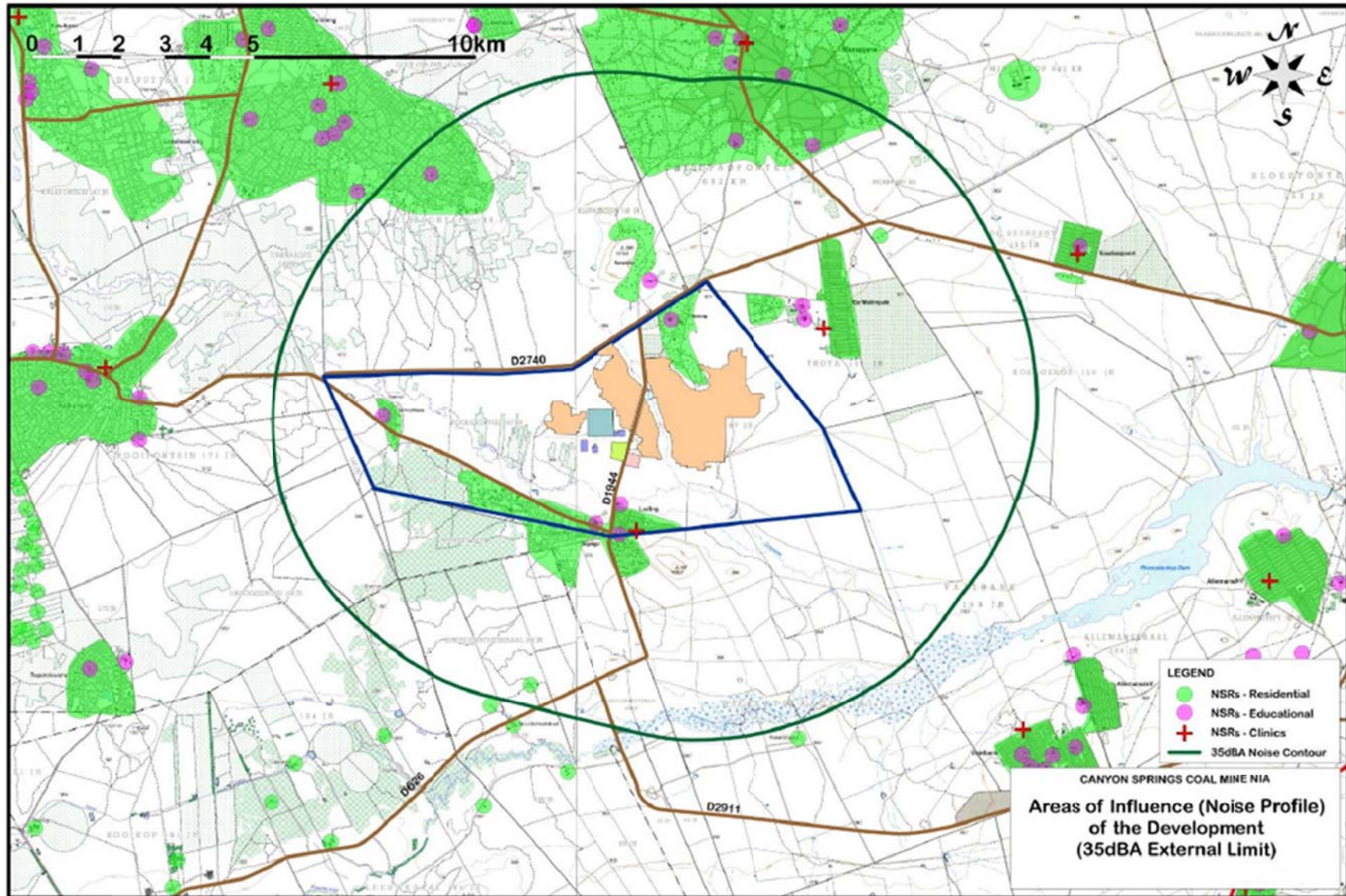


Figure 49: The overall combined noise area of influence of the proposed Canyon Springs Coal Mine

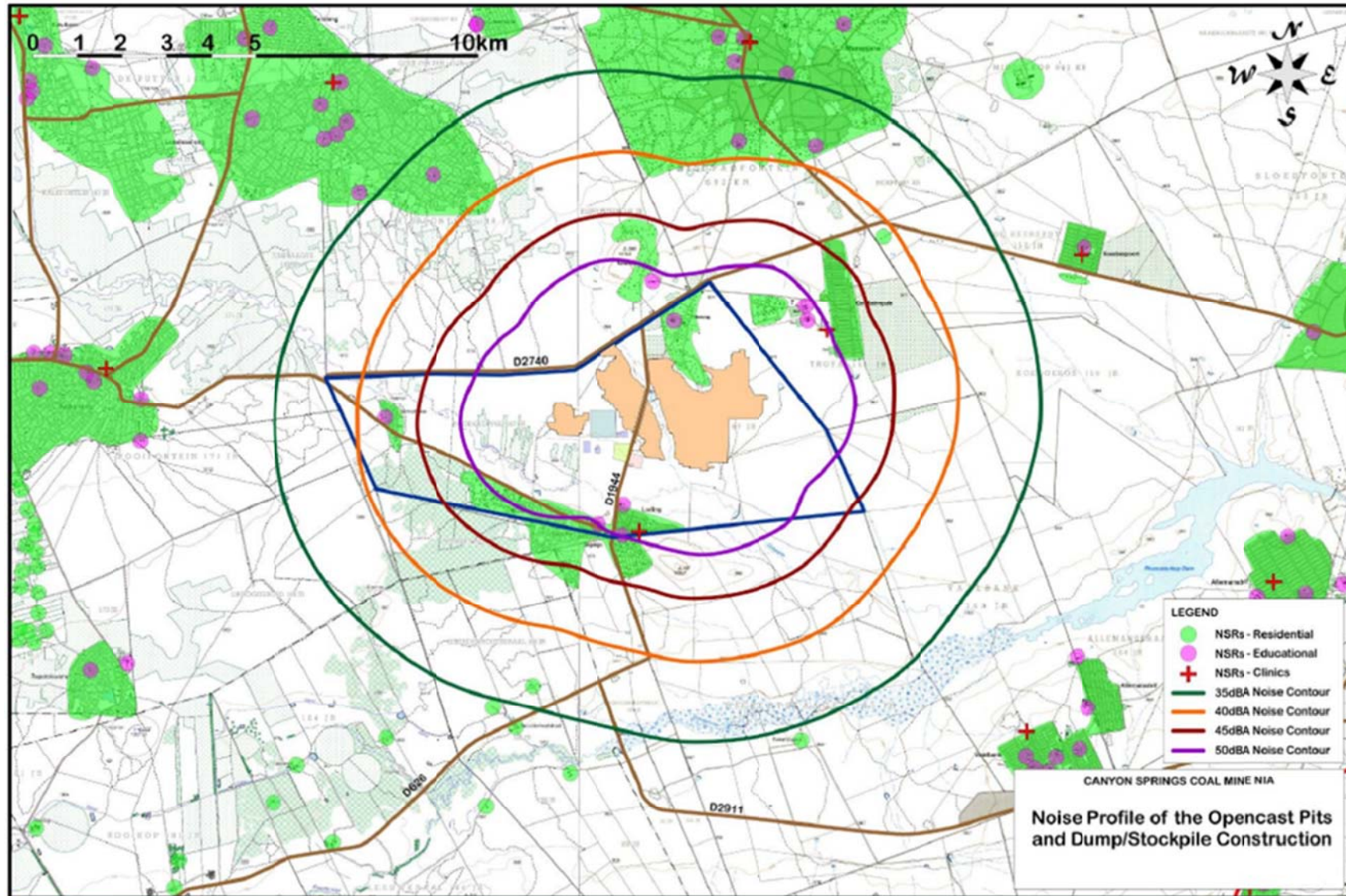


Figure 50: The areas affected by the operation of the pits and the dump/stockpile

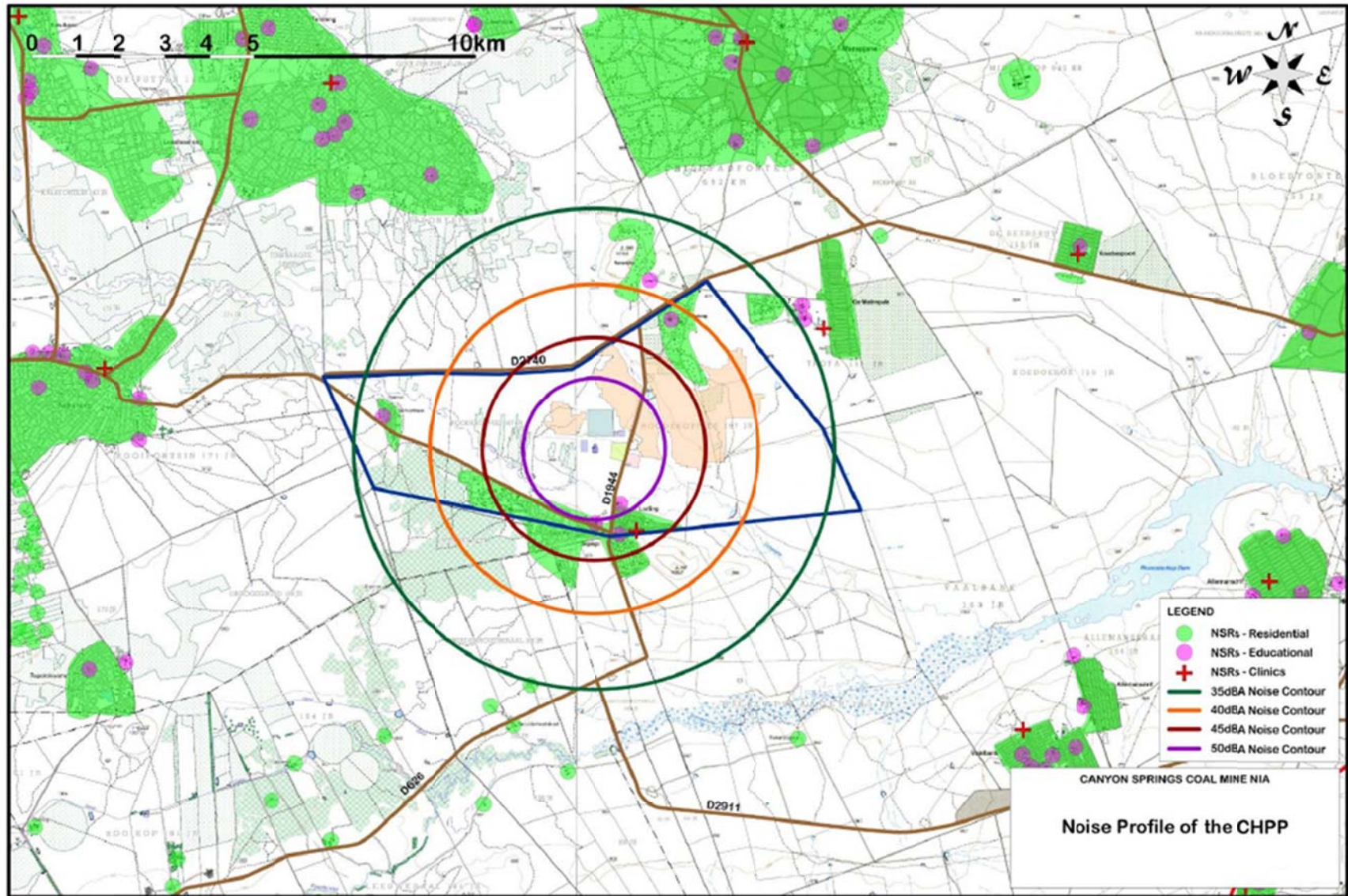


Figure 51: Areas affected by noise generated during the processing of coal

Mitigation Measures

- The noise management plan (Section 4.11 of the EMP) must be implemented to mitigate potential impacts to noise levels which may affect surrounding communities; and
- In general, operations should meet the noise standard requirements of the Occupational Health and Safety Act (No. 85 of 1993).

8.4.11. Blasting / Vibrations

Impact Assessment

- The points of concern are the closest houses to the planned Opencast Pit 1. The northern perimeter of the Pit 1 lies within 300 m from the nearest dwellings in Dihekeng village;
- A geotechnical investigation of the proposed area for development is overlain with soft strata that can be removed by free digging (which requires no blasting to remove the overburden); however, it has been mentioned that loading and hauling efficiencies can be improved if the overburden is blasted with a low powder factor which will aid in loosening the strata;
- In view of the fact that there are an unknown number of people residing within 300 m of the proposed opencast pits, exceptional measures need to be taken in order to reduce the negative impact of blasting operations. While it may be possible to evacuate people and animals from these areas, houses and other structures will remain within the blast zone and there is thus a high likelihood that these structures could be damaged;
- During construction, two main activities will be occurring, namely: (1) Overburden removal and (2) Pit excavation. These operations will both involve drilling and blasting;
- There are four main impacts that may potentially occur as a result of blasting operations, namely: (1) Ground vibrations, (2) Air blast, (3) Dust and (4) Fly-rock.
 - The ability of ground vibrations to cause damage to buildings is proportional to the PPV of that shock wave and is inversely proportional to the frequency. Thus a ground vibration with a high PPV and low frequency will most likely cause damage to buildings. Buildings can generally withstand ground vibration amplitudes of 12.7 mm / s or more; however, humans and animals are easily disturbed by ground vibrations at low levels. The significance of the negative impact caused by ground vibrations during the construction phase is predicted to be **high**; however, once the recommended mitigation measures and monitoring programmes are implemented the significance of the impact can be decreased to **medium**;
 - Air blast amplitudes up to 134 dB should not result in any adverse impacts. Air blasts greater than 134 dB will cause human irritation and may generate complaints during blasting operations; air blasts of this magnitude will not result in any damage to property but may alert nearby residents to the fact that blasting operations are in progress. The significance of the negative impact caused by air blasts during the construction phase is predicted to be **high**; however, once the recommended mitigation measures and monitoring programmes are implemented, the significance of the impact can be decreased to **medium**;

- Dust fallout due to blasting is discussed in Section 8.4.8. The significance of the negative impact caused by dust generation during the construction phase is predicted to be **medium**; however, once the recommended mitigation measures and monitoring programmes are implemented the significance of the impact will decrease to **medium**; and
- Fly-rock is the greatest hazard in blasting operations as it may result in injuries and / or loss of life. For this reason fly-rock should be given priority in blast design. The significance of the negative impact caused by fly-rock due to blasting during the construction phase is predicted to be **high**; however, once the recommended mitigation measures and monitoring programmes are implemented, the significance of the impact can be decreased to **medium**.

Mitigation Measures

- The blasting management plan (Section 4.3 of the EMP) and air quality management plan (Section 4.1 of the EMP) must be implemented to mitigate potential impacts to surrounding communities and structures and mine personnel as a result of blasting activities.

RECEPTOR / RESOURCE	ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT	IMPACT EFFECT	MAGNITUDE (M)	DURATION (D)	SCALE (S)	PROBABILITY (P)	SIGNIFICANCE		MITIGATION AND MANAGEMENT MEASURES	MONITORING
								RATING	VALUE		
Terrestrial Ecology	<ul style="list-style-type: none"> Ground clearing, excavation, trenching and vehicular movement Habitat disturbance due to ground clearing Blasting to clear the pit Clearance of land for discard dump, pollution control dam and sewage treatment plant 	<ul style="list-style-type: none"> Destruction of floral and faunal habitat and stripping of topsoil leading to loss of biodiversity and increase in alien invasive species 	Negative	8 [6]	4 [4]	2 [2]	4 [3]	Medium [Medium]	56 [36]	Terrestrial ecology mitigation measures associated with the operational phase in Section 8.4.1	Implement and maintain terrestrial ecology monitoring programme in Section 5.1 of the EMP
		<ul style="list-style-type: none"> Increase in dust due to operational activities 	Negative	8 [6]	4 [4]	2 [1]	4 [3]	Medium [Medium]	56 [33]		
		<ul style="list-style-type: none"> Potential increase in invasive vegetation 	Negative	8 [6]	4 [4]	2 [1]	4 [3]	Medium [Medium]	56 [33]		
		<ul style="list-style-type: none"> Faunal interactions with structures and personnel, noise, vibration and light disturbance 	Negative	8 [6]	4 [4]	2 [2]	4 [3]	Medium [Medium]	56 [36]		
		<ul style="list-style-type: none"> Contamination by stored chemicals and hazardous materials that threaten faunal and floral species 	Negative	8 [6]	4 [4]	2 [2]	4 [3]	Medium [Medium]	56 [36]		
Aquatic Ecology	<ul style="list-style-type: none"> Clearing of natural vegetation Runoff from contaminated areas including the overburden and temporary discard dump, SCD/PCD, sewage treatment plant and the TSE pipeline Movement of 	<ul style="list-style-type: none"> Increased salinity and water pollution 	Negative	8 [6]	4 [4]	3 [3]	4 [3]	High [Medium]	60 [39]	Aquatic Ecology impact mitigation measures associated with the construction phase in Section 8.4.2.	Aquatic Ecology monitoring is detailed in Section 5.2 of the EMP.
		<ul style="list-style-type: none"> Sedimentation of the watercourse 	Negative	6 [4]	3 [3]	2 [2]	3 [2]	Medium [Low]	33 [18]		

RECEPTOR / RESOURCE	ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT	IMPACT EFFECT	MAGNITUDE (M)	DURATION (D)	SCALE (S)	PROBABILITY (P)	SIGNIFICANCE		MITIGATION AND MANAGEMENT MEASURES	MONITORING
								RATING	VALUE		
	vehicles and personnel										
Wetlands	<ul style="list-style-type: none"> Hazardous materials used in mining processes 	<ul style="list-style-type: none"> Contamination of watercourse and soils Persistence of flora and fauna affected 	Negative	8 [6]	4 [2]	2 [1]	5 [4]	High [Medium]	70 [36]	Wetland mitigation measures associated with the operation phase in Section 8.4.3.	Implement and maintain wetland monitoring programme in Section 5.3 of the EMP.
Soil Quality	<ul style="list-style-type: none"> Removal of soil for pit excavation Clearance of land for discard dump, pollution control dam and sewage treatment plants Heavy vehicles and stockpiling Footprint clearance Use of hydrocarbons on site Management of stockpiles and berms Use of haulage ways and access routes 	<ul style="list-style-type: none"> Loss of resource due to collapse of unconsolidated workings during roll over mining 	Negative	10 [8]	5 [5]	1 [1]	5 [5]	High [Medium]	80 [70]	Soil mitigation measures associated with the operation phase in Section 8.4.4.	Implement and maintain soil monitoring programme in Section 5.4 of the EMP.
		<ul style="list-style-type: none"> Loss of resource due to ponding of surface water on collapsed areas and due to cracking of poorly consolidated rehabilitation. 	Negative	10 [8]	5 [5]	1 [1]	5 [5]	High [Medium]	80 [70]		
		<ul style="list-style-type: none"> Compaction of soils resulting on reduction in soil potential and destruction of the soil horizon and soft overburden 	Negative	6 [4]	4 [3]	1 [1]	4 [3]	Medium [Low]	44 [24]		
		<ul style="list-style-type: none"> Sterilisation of seed pool and discard dump footprint 	Negative	8 [6]	4 [4]	1 [1]	5 [2]	High [Medium]	65 [33]		
		<ul style="list-style-type: none"> Sterilisation of haulage ways and access routes 	Negative	6 [6]	4 [4]	1 [1]	4 [2]	Medium [Low]	44 [22]		

RECEPTOR / RESOURCE	ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT	IMPACT EFFECT	MAGNITUDE (M)	DURATION (D)	SCALE (S)	PROBABILITY (P)	SIGNIFICANCE		MITIGATION AND MANAGEMENT MEASURES	MONITORING
								RATING	VALUE		
		<ul style="list-style-type: none"> Contamination due to uncontrolled dirty water runoff 	Negative	8 [6]	4 [4]	2 [1]	5 [4]	High [Medium]	70 [44]		
		<ul style="list-style-type: none"> Contamination due to spillage of product and hydrocarbons 	Negative	8 [6]	4 [4]	2 [2]	5 [4]	High [Medium]	70 [48]		
		<ul style="list-style-type: none"> Contamination due to uncontrolled dumping outside of dump footprint 	Negative	8 [6]	4 [4]	2 [1]	4 [2]	Medium [Low]	56 [22]		
Groundwater	<ul style="list-style-type: none"> Dewatering of the pit Mining processes Contamination from discard stockpile 	<ul style="list-style-type: none"> Impact on groundwater volumes 	Negative	8 [8]	5 [5]	3 [3]	5 [5]	High [High]	80 [80]	Groundwater mitigation measures associated with the operation phase in Section 8.4.5.	Implement and maintain groundwater monitoring programme in Section 5.5 of the EMP.
		<ul style="list-style-type: none"> Groundwater quality is negatively impacted 	Negative	2 [2]	5 [3]	2 [2]	2 [1]	Low [Low]	18 [7]		
		<ul style="list-style-type: none"> Groundwater is polluted due to hydrocarbon spills 	Negative	6 [4]	5 [5]	2 [2]	4 [3]	Medium [Medium]	52 [33]		
Surface Water	<ul style="list-style-type: none"> Runoff from storage and infrastructure areas Decant or spillages from PCD. 	<ul style="list-style-type: none"> Contaminated surface runoff may pollute watercourses 	Negative	6 [2]	4 [1]	2 [1]	3 [1]	Medium [Low]	36 [4]	Surface water impact mitigation measures associated with the construction phase in Section 8.4.6.	Surface Water monitoring is detailed in Section 5.6 of the EMP.
		<ul style="list-style-type: none"> Interception of surface run-off to the Ghotwane and Elands Rivers 	Negative	2 [2]	3 [3]	1 [1]	1 [1]	Low [Low]	7 [7]		
Cultural / Heritage	<ul style="list-style-type: none"> Site clearance for operational activities 	<ul style="list-style-type: none"> Loss of remains of old farmyard at Site 1 	Negative	2	4	1	4	Low	28	Heritage resource mitigation measures associated with the construction phase	
		<ul style="list-style-type: none"> Loss of Middle and Late Stone Age tools and Iron Age Pottery at Site 2 									

RECEPTOR / RESOURCE	ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT	IMPACT EFFECT	MAGNITUDE (M)	DURATION (D)	SCALE (S)	PROBABILITY (P)	SIGNIFICANCE		MITIGATION AND MANAGEMENT MEASURES	MONITORING
								RATING	VALUE		
		<ul style="list-style-type: none"> Loss of Middle as well as Late Stone Age tools at Site 3 								can be found in Section 8.4.7.	
Air Quality	<ul style="list-style-type: none"> Use of heavy machinery in mining of the opencast pit Disturbance and blasting of land cover in mining of the opencast pit Waste rock removal by shovel and truck Ore removal by shovel and truck 	<ul style="list-style-type: none"> Increased dust fallout Emissions and particulate matter from machinery / vehicles which results in a local reduction in air quality Wind erosion from exposed areas Blasting and vibration (Section 8.4.11) 	Negative	8 [4]	4 [4]	2 [2]	5 [4]	High [Medium]	70 [40]	Air quality mitigation measures associated with the operation phase in Section 8.4.8.	Implement and maintain air quality monitoring programme in Section 5.7 of the EMP.
	<ul style="list-style-type: none"> Clearance of groundcover for surface infrastructure Use of heavy machinery to transport materials Coal and overburden handling Crushing of coal and overburden material 	<ul style="list-style-type: none"> Increased dust fallout due to materials relocation and transport Emissions and particulate matter from machinery / vehicles resulting in a local reduction in air quality Wind erosion from topsoil and overburden stockpiles 	Negative	8 [6]	4 [4]	2 [2]	5 [4]	High [Medium]	70 [48]		

RECEPTOR / RESOURCE	ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT	IMPACT EFFECT	MAGNITUDE (M)	DURATION (D)	SCALE (S)	PROBABILITY (P)	SIGNIFICANCE		MITIGATION AND MANAGEMENT MEASURES	MONITORING
								RATING	VALUE		
Traffic	<ul style="list-style-type: none"> Use of heavy vehicles in construction activities The use of vehicles in constant activities for transportation of men and materials 	<ul style="list-style-type: none"> Additional traffic Damage to local roads Impacts associated with road safety (mortalities) 	Negative	2 [2]	4 [4]	2 [2]	5 [4]	Medium [Medium]	40 [32]	Traffic mitigation measures associated with the construction phase can be found in Section 8.4.9.	
Noise	<ul style="list-style-type: none"> Use of heavy machinery and equipment in mining operations Noise generated by blasting and pit excavation 	<ul style="list-style-type: none"> Increase in noise levels 	Negative	8 [6]	4 [4]	2 [2]	5 [4]	High [Medium]	70 [48]	Noise mitigation measures associated with the operation phase in Section 8.4.10.	Implement and maintain noise monitoring programme in Section 5.8 of the EMP.
		<ul style="list-style-type: none"> The removal and transport of overburden to waste rock dumps 	Negative	8 [6]	4 [4]	2 [2]	5 [4]	High [Medium]	70 [48]		
		<ul style="list-style-type: none"> Machinery and equipment at the CHPP 	Negative	6 [4]	4 [4]	2 [2]	4 [3]	Medium [Medium]	48 [30]		
		<ul style="list-style-type: none"> The use of vehicles to transport coal product 	Negative	2 [2]	4 [4]	2 [2]	3 [2]	Low [Low]	24 [16]		
Blasting / Vibrations	<ul style="list-style-type: none"> Pit excavation 	<ul style="list-style-type: none"> Ground vibrations 	Negative	10 [8]	4 [4]	2 [2]	5 [4]	High [Medium]	80 [56]	Blasting mitigation measures associated with the operation phase in Section 8.4.11.	Implement and maintain blasting monitoring programme in Section 5.9 of the EMP.
		<ul style="list-style-type: none"> Air-blasting 	Negative	10 [6]	4 [4]	2 [2]	5 [4]	High [Medium]	80 [48]		
		<ul style="list-style-type: none"> Dust and fumes 	Negative	8 [4]	4 [4]	2 [2]	5 [4]	Medium [Medium]	70 [40]		
		<ul style="list-style-type: none"> Fly-rock 	Negative	10 [10]	4 [4]	2 [2]	5 [3]	High [Medium]	80 [48]		

8.5. Decommissioning phase

At decommissioning, which is to commence in June 2034, the rehabilitation measures described in Volume 2 (EMP) will be implemented. The decommissioning phase expected to be approximately 6 months in duration.

8.5.1. Terrestrial Ecology

Impact Assessment

- Rehabilitated areas could potentially deteriorate due to factors such as invasion by alien species, and contamination by hazardous materials e.g. hydrocarbon spills from heavy vehicles transporting infrastructure off-site; and
- Any failure to adequately rehabilitate the mined area, as well as the surrounding natural areas, will lead to wide-ranging environmental degradation e.g. loss of ecological function and biodiversity. This is expected to have a **high** significance which can be reduced to **medium** through the implementation of proposed management measures.

Mitigation Measures

- The biodiversity management plan (Section 4.4 of the EMP) must be implemented to mitigate potential impacts to biodiversity and soil resources which may affect terrestrial ecology;
- During the decommissioning phase, projects that increase biodiversity within the rehabilitated areas should be implemented by suitably qualified ecologists or organisations such as the Endangered Wildlife Trust or South African National Biodiversity Institute; and
- At the closure of the mine, the closure measure defined in Section 10.2.1 of the EMP must be implemented.

8.5.2. Wetlands

Impact Assessment

- Sub-optimal rehabilitation of disturbed areas can lead to erosion which could create preferential and concentrated water flows and enhance dispersal alien invasive species into watercourses which in turn leads to ecological degradation of wetlands. This has a **high** significance rating which can be reduced to a **medium** significance rating if the mitigation measures below are implemented.

Mitigation Measures

- There is the opportunity to use a diffused and steady flow regime to enhance wetland functionality and use the flows to enhance surface roughness and vegetation structure. This will have biodiversity and flow regulation benefits to the system;
- If grazing regimes, burning frequencies and cultivation are substantially reduced accompanied by the above rehabilitation measures (especially plugging of drains and erosion gullies) a slight improvement in wetland health could be expected; and

- The wetland management plan (Section 4.8 of the EMP), soil management plan (Section 4.10 of the EMP) and biodiversity management plan (Section 4.4 of the EMP) must be implemented to mitigate potential impacts to surface water, biodiversity and soil resources which may affect wetlands.

8.5.3. Soil Quality

Impact Assessment

- The inadequate rehabilitation of the area and of the soils will lead to a loss of the resource due to incorrect or inadequate fertilisation of replaced soils and vegetation. These impacts can be maintained at a **medium** significance rating if the correct mitigation measures are applied;
- Any spillage of chemicals or polluted water in instances where the dirty water system has already been removed may lead to the contamination of soils. This has a **high** significance impact on the soils but can be reduced to a **low** impact;
- The loss of vegetation cover due to animal and human impacts, e.g. where cattle are allowed to overgraze in areas where topsoil has been applied, may also occur. This may lead to soil erosion or soil compaction and thus a loss of soil quality. Hydrocarbon or chemical spillages from vehicles as well as the dismantling of infrastructure may lead to the contamination or salinisation of soils due to inclusion of infrastructural debris and waste, such as carbonaceous coal, above the regional water level. This has a **medium** impact on the soils that can be reduced to a **low** impact; and
- The loss of the soil resource through the incorrect order of soil replacement during rehabilitation, cracking to the soil surface from areas of unconsolidated rehabilitation as well as ponding on areas due to bulking failure and lack of compaction of the soils will have a **high** impact on the soils that can be reduced to a **medium** impact through the proper implementation of mitigation measures.

Mitigation Measures

- The biodiversity management plan (Section 4.4 of the EMP), soil management plan (Section 4.10 of the EMP) and hydrocarbon management plan (Section 4.9 of the EMP) must be implemented to mitigate potential impacts to soil resources which may affect land capability.

8.5.4. Groundwater

Impact Assessment

- Decommissioning of the mine will be initiated once rehabilitation of the mined-out pits commences. Rehabilitation will lead to the recovery of the groundwater levels due to the mine ceasing its dewatering activities. This impact has a **high positive** significance rating;
- For pits rehabilitated during the operational phase (i.e. during progressive rehabilitation) the numerical modelling simulations show that the water level in the rehabilitated areas

will not recover sufficiently during the LOM to allow for significant contamination to migrate away from the opencast pits and therefore contamination will be contained to the mine for the duration of operations;

- Rehabilitation of the opencast area will entail all discard/carbonaceous material being moved first so as to ensure that the carbonaceous material lies at the bottom of the opencast pits to a height not exceeding that of the original coal seam. Material will then be backfilled in the same sequence as that of the original material i.e.: hards, softs, sub-soil and finally topsoil. The decommissioning phase is not expected to span more than 6 months, which will not allow for significant chemical reactions to take place and sulphate contamination forming. Thus, the impact of this is expected to be **low**, which can be kept **low** through the implementation of the suggested mitigation measures; and
- During the rehabilitation process, the potential will still exist for impacts on groundwater quality due from potential hydrocarbon spills. Should hydrocarbon contamination enter the aquifer material outside the zone of influence of the mine dewatering the contamination will migrate down gradient away from the mining area. This has a **medium** impact rating on the groundwater, which can be reduced to **low** if the appropriate mitigation measures are implemented.

Mitigation Measures

- The groundwater monitoring programme implemented during the LOM must be ongoing during the rehabilitation phase;
- Any external users whose boreholes have been affected in terms of volume (lower water levels or drying out of boreholes) or quality must be provided with an equivalent volume of water of a similar- or better quality than that noted pre-mining;
- The numerical groundwater model must be updated with the information obtained during ongoing monitoring to continually improve the long-term strategy in terms of groundwater management. Cognisance of new technologies that may become available must be taken account of; and
- The groundwater management plan (Section 4.6 of the EMP) must be implemented to mitigate potential impacts to groundwater resources which may affect groundwater quality and quantity.

8.5.5. Surface Water

Impact Assessment

- The potential for contamination of the surface water resources exists if the dirty water system is removed before all point sources of pollution are removed or if the system is kept in place but fails during the occurrence of hydrocarbon spills. This has a **medium** significance impact rating which can be reduced to **low** if the proper mitigation measures are implemented.

Mitigation Measures

- The surface water management plan (Section 4.7 of the EMP) must be implemented to mitigate potential impacts to surface water resources which may affect surface water quality.

8.5.6. Air Quality

Impact Assessment

- The use of heavy machinery and equipment in decommissioning activities, the transport of decommissioned infrastructure, hauling of overburden to the pits and the subsequent backfilling of the opencast pits as part of continuous rehabilitation causes particulate matter fallout, emissions from machinery and vehicles, as well as exposed areas arising from mining activities that have not yet been rehabilitated could be subject to increased wind erosion. This results in the continued exposure of sensitive receptors to conditions of poor air quality. There is an impact of **medium** significance the air quality due to the rehabilitation activities on-site which can be reduced to a **low** significance impact if the suggested mitigation measures are adhered to.

Mitigation Measures

- The air quality management plan (Section 4.2 of the EMP) must be implemented to mitigate potential impacts to air quality which may affect surrounding communities

8.5.7. Traffic

Impact Assessment

- The use of heavy vehicles in decommissioning activities, e.g. dismantling of infrastructure, as well as the use of vehicles for the transportation of men and materials away from site, while fewer in number than during operation, will still exert an impact on local traffic conditions including potential damage to the road surface;
- The above can also potentially be associated with road safety; and
- The significance of potential impacts associated with the decommissioning activities will be of a **medium** significance, which, through the implementation of mitigation measures can be reduced to **low**.

Mitigation Measures

- The traffic management plan (Section 4.12 of the EMP) must be implemented to mitigate potential impacts to road traffic which may affect surrounding communities.

8.5.8. Noise

Impact Assessment

- Some traffic on roads surrounding and bisecting the project area will be associated with the decommissioning phase and utilised for the transport of men and materials to- and

from site. While the number of these vehicles will be less than during the operational phase, they will still contribute towards noise generation in the receiving environment; and

- Decommissioning activities such as the dismantling of surface infrastructure and land rehabilitation, which will require the use of bulldozers, trucks and related heavy vehicles, will be sources of noise. The impact of the noise generated from decommissioning activities on the surrounding communities will be **medium** without mitigation and **medium** if the mitigation measures listed below are implemented.

Mitigation Measures

- In general, decommissioning activities should meet the noise standard requirements of the Occupational Health and Safety Act (No. 85 of 1993); and
- The noise management plan (Section 4.11 of the EMP) must be implemented to mitigate potential impacts to noise levels which may affect surrounding communities.

8.5.9. Socio-economic

Impact Assessment

- At the time of decommissioning of the proposed Mine, a process of downscaling and retrenchment of workers will be implemented. This will lead to a loss of mining-related jobs. This will exert a **high** significance impact on the socio-economic conditions of the surrounding communities due to the multiplayer effect and dependency ratio;
- Due to the decommissioning of the mine, associated land can again be made available for agricultural / grazing purposes. This positive impact has a **medium** significance rating which can be increased to a **high** impact rating if the proper mitigation measures are implemented; and
- At the conclusion of mining operations, there will also be a cessation of nuisance impacts such as those created by noise and blasting. This has a **medium** rating positive impact on the area which can be increased to a **high** positive impact if the procedures as outlined in the relevant sections of this EMP for the decommissioning phase are adhered to.

Mitigation Measures

- It is important to ensure that the rehabilitation measures proposed in this EMP are incorporated into a formal closure and rehabilitation plan for the proposed Canyon Springs Coal Mine once operational. This plan should be updated on an ongoing basis so as to ensure that it remains relevant. At closure, this plan should be implemented to ensure that land affected by mining activities are returned as near as possible to the original state or an end land use agreed upon wherever possible. This will ensure that the land may be used for agricultural practices and provide grazing land for livestock;
- The various commitments made in the SLP as regard skills development should be implemented during operation to ensure that as many employees as possible are provided with permanent skills to aid them in their future search for employment; and
- Procedures outlined in the SLP for the downscaling and retrenchment process must be adhered to.

RECEPTOR / RESOURCE	ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT	IMPACT EFFECT	MAGNITUDE (M)	DURATION (D)	SCALE (S)	PROBABILITY (P)	SIGNIFICANCE		MITIGATION AND MANAGEMENT MEASURES	MONITORING
								RATING	VALUE		
Terrestrial Ecology	<ul style="list-style-type: none"> Backfilling and surface rehabilitation (continuous) Dismantling and rehabilitation of the footprint of surface infrastructure and stockpiles. 	<ul style="list-style-type: none"> Deterioration of natural vegetation and faunal habitat and the subsequent loss of ecological function due to unsuccessful rehabilitation 	Negative	8 [6]	5 [4]	2 [2]	4 [3]	High [Medium]	60 [36]	Terrestrial ecology mitigation measures associated with the decommissioning phase in Section 8.5.1.	Implement and maintain Terrestrial ecology monitoring programme in Section 5.1 of the EMP
Wetlands	<ul style="list-style-type: none"> Unsuccessful rehabilitation of disturbed areas 	<ul style="list-style-type: none"> Erosion which leads to alien species invasion 	Negative	8 [6]	4 [2]	2 [1]	5 [4]	High [Medium]	70 [36]	Wetlands mitigation measures associated with the decommissioning phase in Section 8.5.2.	Implement and maintain wetlands monitoring programme in Section 5.3 of the EMP.
Soil Quality	<ul style="list-style-type: none"> Disturbance of soils from heavy vehicle movement 	<ul style="list-style-type: none"> Reduction in soil capability Increased erosion potential Disturbance of soil horizons Soil compaction 	Negative	8 [6]	4 [4]	1 [1]	4 [3]	Medium [Medium]	52 [33]	Soil mitigation measures associated with the decommissioning phase in Section 8.5.3.	Implement and maintain soil monitoring programme in Section 5.4 of the EMP.
	<ul style="list-style-type: none"> Hydrocarbon or chemical spillages 	<ul style="list-style-type: none"> Contamination of soil and reduced soil quality. 	Negative	6 [6]	4 [4]	1 [1]	4 [2]	Medium [Low]	55 [22]		
	<ul style="list-style-type: none"> Unprotected areas of ground yet to be re-vegetated 	<ul style="list-style-type: none"> Erosion and loss of soil resource 	Negative	8 [6]	4 [4]	1 [1]	4 [2]	Medium [Low]	52 [22]		

RECEPTOR / RESOURCE	ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT	IMPACT EFFECT	MAGNITUDE (M)	DURATION (D)	SCALE (S)	PROBABILITY (P)	SIGNIFICANCE		MITIGATION AND MANAGEMENT MEASURES	MONITORING
								RATING	VALUE		
	▪ Backfilling and repositioning of soils	▪ Loss of resource through contamination and the incorrect order of soil replacement.	Negative	8 [6]	4 [4]	1 [1]	5 [3]	High [Medium]	65 [33]		
	▪ Inadequate rehabilitation	▪ Loss of resource due to incorrect or inadequate fertilisation of replaced soils and vegetation.	Negative	6 [6]	4 [4]	1 [1]	4 [3]	Medium [Medium]	44 [33]		
		▪ Loss of vegetation cover due to animal and human impacts (over grazing and movement over rehabilitated lands).	Negative	6 [6]	4 [4]	1 [1]	4 [2]	Medium [Low]	44 [22]		
	▪ Dismantling of infrastructure ▪ Inclusion of infrastructural debris and waste (Carbonaceous coal) above the due to regional water level	▪ Contamination /salinisation of soils	Negative	6 [6]	4 [4]	1 [1]	4 [2]	Medium [Low]	44 [22]		
	▪ Spillage of waste from dams.	▪ Contamination of soils	Negative	8 [6]	4 [4]	1 [1]	5 [2]	High [Low]	65 [22]		
Groundwater	▪ Rehabilitation	▪ Recovery of groundwater levels due to mine dewatering being stopped	Positive	8 [8]	5 [5]	3 [3]	5 [5]	High [High]	80 [80]	Groundwater mitigation measures	Implement and maintain groundwater

RECEPTOR / RESOURCE	ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT	IMPACT EFFECT	MAGNITUDE (M)	DURATION (D)	SCALE (S)	PROBABILITY (P)	SIGNIFICANCE		MITIGATION AND MANAGEMENT MEASURES	MONITORING
								RATING	VALUE		
	<ul style="list-style-type: none"> Hydrocarbon or chemical spillages Seepage through discard dumps until they have been removed Backfilling of discard material 	<ul style="list-style-type: none"> Impacts on groundwater quality due to contaminant migration 	Negative	4 [2]	5 [5]	2 [2]	4 [3]	Medium [Low]	44 [21]	associated with the decommissioning phase in Section 8.5.4.	monitoring programme in Section 5.5 of the EMP.
			Negative	2 [1]	5 [3]	2 [2]	2 [1]	Low [Low]	18 [6]		
Surface Water	<ul style="list-style-type: none"> Dirty water system removed before pollution sources have been removed 	<ul style="list-style-type: none"> Infiltration of polluted surface water into surface water bodies 	Negative	6 [4]	2 [2]	2 [1]	3 [3]	Medium [Low]	30 [21]	Surface water impact mitigation measures associated with the construction phase in Section 8.5.5.	Implement and maintain a surface water monitoring programme in Section 5.6 of the EMP.
Air Quality	<ul style="list-style-type: none"> Use of heavy machinery in closure / filling of the opencast pit and removal of surface infrastructure 	<ul style="list-style-type: none"> Emissions and particulate matter from machinery / vehicles which results in a local reduction in air quality Wind erosion from exposed areas 	Negative	4 [4]	2 [2]	2 [1]	4 [3]	Medium [Low]	32 [21]	Air quality mitigation measures associated with the decommissioning phase in Section 8.5.6.	Implement and maintain air quality monitoring programme in Section 5.7 of the EMP.
Traffic	<ul style="list-style-type: none"> Use of heavy vehicles in decommissioning activities The use of vehicles in constant activities for transportation of men and materials 	<ul style="list-style-type: none"> Road safety impacts Damage to local roads Additional traffic 	Negative	2 [2]	4 [4]	2 [2]	5 [4]	Medium [Low]	40 [32]	Traffic mitigation measures associated with the decommissioning phase in Section 8.5.7.	

RECEPTOR / RESOURCE	ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT	IMPACT EFFECT	MAGNITUDE (M)	DURATION (D)	SCALE (S)	PROBABILITY (P)	SIGNIFICANCE		MITIGATION AND MANAGEMENT MEASURES	MONITORING
								RATING	VALUE		
Noise	<ul style="list-style-type: none"> Use of heavy machinery in pit rehabilitation and to remove surface infrastructure 	<ul style="list-style-type: none"> Increase in ambient noise levels 	Negative	6 [4]	2 [2]	3 [3]	5 [4]	Medium [Medium]	55 [36]	Noise mitigation measures associated with the decommissioning phase in Section 8.5.8.	Implement and maintain noise monitoring programme in Section 5.8 of the EMP.
Socio-economic	<ul style="list-style-type: none"> Retrenchment and downscaling 	<ul style="list-style-type: none"> Loss of mining jobs 	Negative	10 [8]	4 [4]	3 [3]	5 [4]	High [High]	85 [60]	Details of mitigation measures to reduce negative impacts and increase potential positive impacts on the socio-economic environment are described in Section 8.5.9.	The SLP should be adhered to (Appendix 14).
	<ul style="list-style-type: none"> Land recovery 	<ul style="list-style-type: none"> Land returned to agricultural land Cessation of nuisance impacts such as noise and blasting. 	Positive	6 [8]	5 [5]	2 [2]	3 [4]	Medium [High]	39 60		

8.6. Post-Closure Phase

Post-closure is largely associated with long term rehabilitation of the mining area. During this time, the groundwater table re-establishes. Vegetation and faunal communities will begin to re-establish across the rehabilitated footprint of the mining area. This phase is expected to commence in January 2035.

8.6.1. Aquatic Ecology and Wetlands

Impact Assessment

- The potential for the generation of decant from the closed mine is discussed below in Section 8.6.2;
- Issues related to sub-optimal rehabilitation as discussed in Section 8.5.2 above. This will have an impact of **high** significance on the wetland that can be reduced to a **medium** level of significance should the correct mitigation measures be applied;
- Following closure of the mine, it is likely that water seeping into the rehabilitated pit will decant into the surrounding catchment. This decanted water is very likely to be high in salinity and heavy metals, particularly iron, aluminium and manganese which have a high toxicity towards aquatic biota. Such input into the natural system within the catchment will have a significant impact on the aquatic biota inhabiting the watercourses, and decrease the future fisheries potential of the Rhenosterkop Dam. The breeding cycles of aquatic biota within the catchment which rely on hydrological triggers to initiate breeding. This will have an impact of **medium** significance that can be reduced to **low** if the correct mitigation measures are implemented; and
- Whether treated or untreated, decant water is likely to contribute to an increase in the basal flow of the associated watercourses, as discussed in the Section 8.6.2 below. This may have an impact of **medium** significance on the characteristics of the watercourse (especially on the dispersive soils) depending on the volume of decanted water, and may result in negative impacts on biodiversity within the wetlands. This can be reduced to an impact of **low** significance if the correct mitigation measures are implemented.

Mitigation Measures

- The conceptual closure design as per Section 10.2.1 of the EMP will accommodate for future decant and also be a self-contained passive system requiring no further input after closure (see Appendix 15). Should this system be successfully implemented, decant of AMD is not foreseen to have a negative impact on wetland systems;
- There is the opportunity to use a diffused and steady flow regime to enhance wetland functionality and use the flows to enhance surface roughness and vegetation structure which could in turn have biodiversity and flow regulation benefits to the system;
- Rehabilitation programmes should be advised by biodiversity management plans to increase species diversity in rehabilitated areas;

- Water should be treated to a degree representative of the natural water quality found within the catchment;
- The wetland management plan (Section 4.8 of the EMP), aquatic ecology management plan (4.5 of the EMP) and biodiversity management plan (Section 4.4 of the EMP) must be implemented to mitigate potential impacts to surface water and biodiversity which may affect wetlands and aquatic ecology.

8.6.2. Groundwater and Surface Water

Impact Assessment

- Groundwater Levels
 - In the post closure phase groundwater levels in the rehabilitated mine area will continue to recover to near pre-mining levels. During the first 8 to 25 years after final decommissioning and closure the groundwater level recovery will be rapid (Table 16), after which the groundwater level will start to stabilise.

Table 16: Time required for groundwater levels to stabilise

PIT AREA	RECOVERY TIME BEFORE GROUNDWATER LEVELS STABILISE (YEARS)
1	22
2	Ongoing
3	5
4	15

- Acid Mine Drainage
 - The ABA and leach test results show that the formation of AMD from the carbonaceous mudstone and the coal seam is likely and, while calcrete and non-carbonaceous mudstone has a fairly high neutralising potential (although the non-carbonaceous mudstone often has carbonate stringers and carbonate fillings in the fractures), the topsoil and weathered sandstone have a very low potential to either generate or neutralise acid-mine drainage;
 - The carbonaceous material in the rehabilitated opencast area will be subjected to oxidation of the sulphides and therefore it can be expected that acid mine drainage conditions could form. The degree to which acidification will occur will depend on the exclusion of oxygen from the carbonaceous material and the availability of material rich in carbonate minerals to neutralise any acidity produced;
 - Carbonaceous material will generate a medium to high salt load. Before acidification SO_4 will leach close to gypsum saturation at approximately 1 800 – 2 500 mg/L. If carbonaceous material could be excluded from oxygen no acidification will occur and the mine is expected to only generate a low salt load of < 1 000 mg/L SO_4 ;
 - As per the findings of Section 3.10.5 above, metals are not expected to be present at concentrations that are non-compliant with SANS 241:2011 guidelines in near-neutral leachate. Aluminium, iron, manganese (and to a lesser degree metals like nickel, cobalt, antimony etc.) may be present at concentrations that are marginal to non-

compliant compared to SANS 241:2011 guidelines after acidification (if acidification occurs);

- As such, the numerical models were used to simulate two Contaminant Migration Scenarios:
 - Contaminant Migration Scenario 1: Best case scenario where carbonaceous material is excluded from oxygen and no acidification occurs – the maximum sulphate concentration is expected to be less than 1 000 mg/L. The simulated plumes at 25, 50, 75 and 100 years after mine closure for Scenario 1 are shown in Figure 52, Figure 53, Figure 54 and Figure 55;
 - Contaminant Migration Scenario 2: Worst case scenario where sulphate concentrations will reach 2 500 mg/L. The simulated plumes at 25, 50, 75 and 100 years after mine closure for Scenario 2 are shown in Figure 56, Figure 57, Figure 58 and Figure 59.

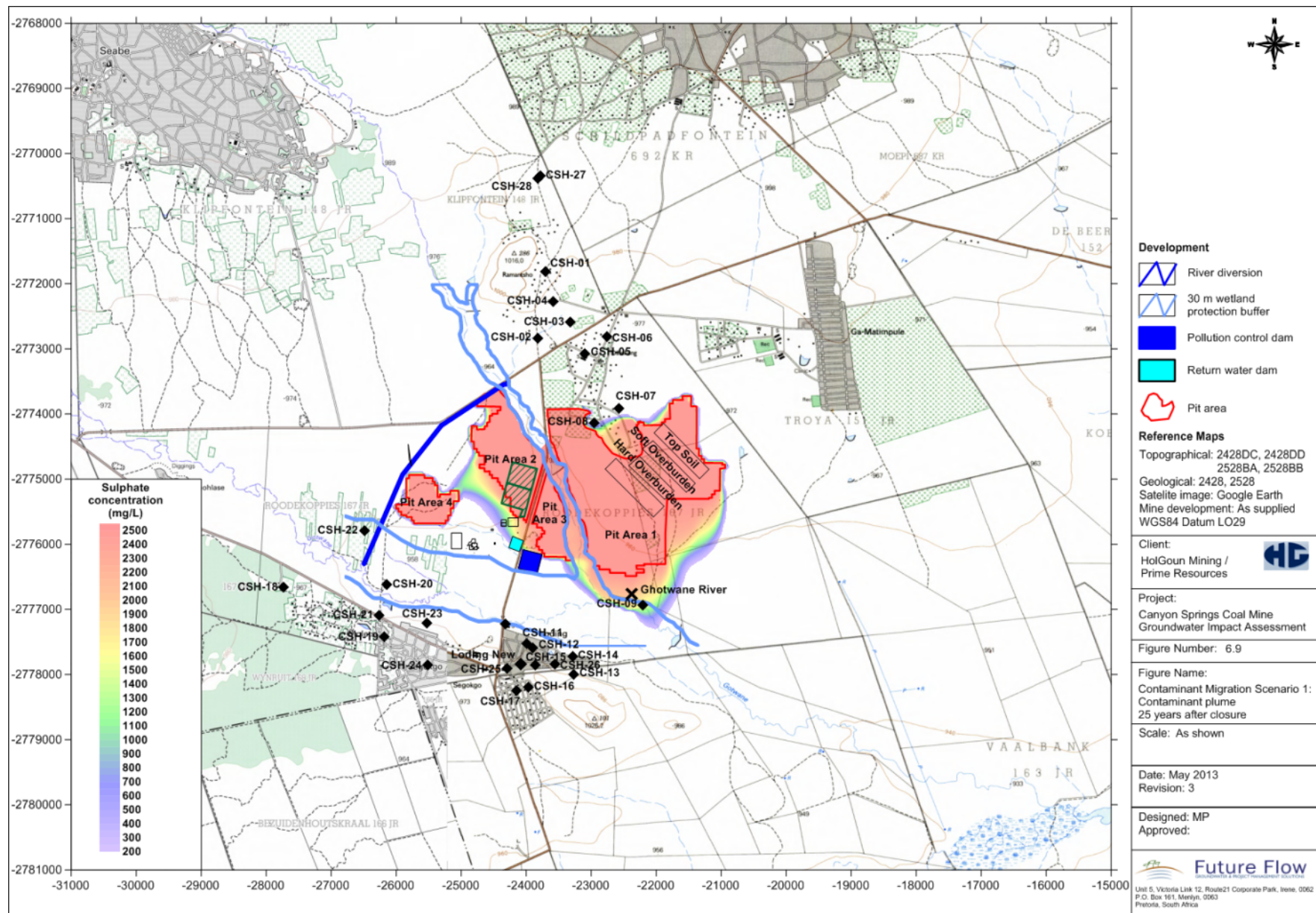


Figure 52: Scenario 1 - 25 years after closure

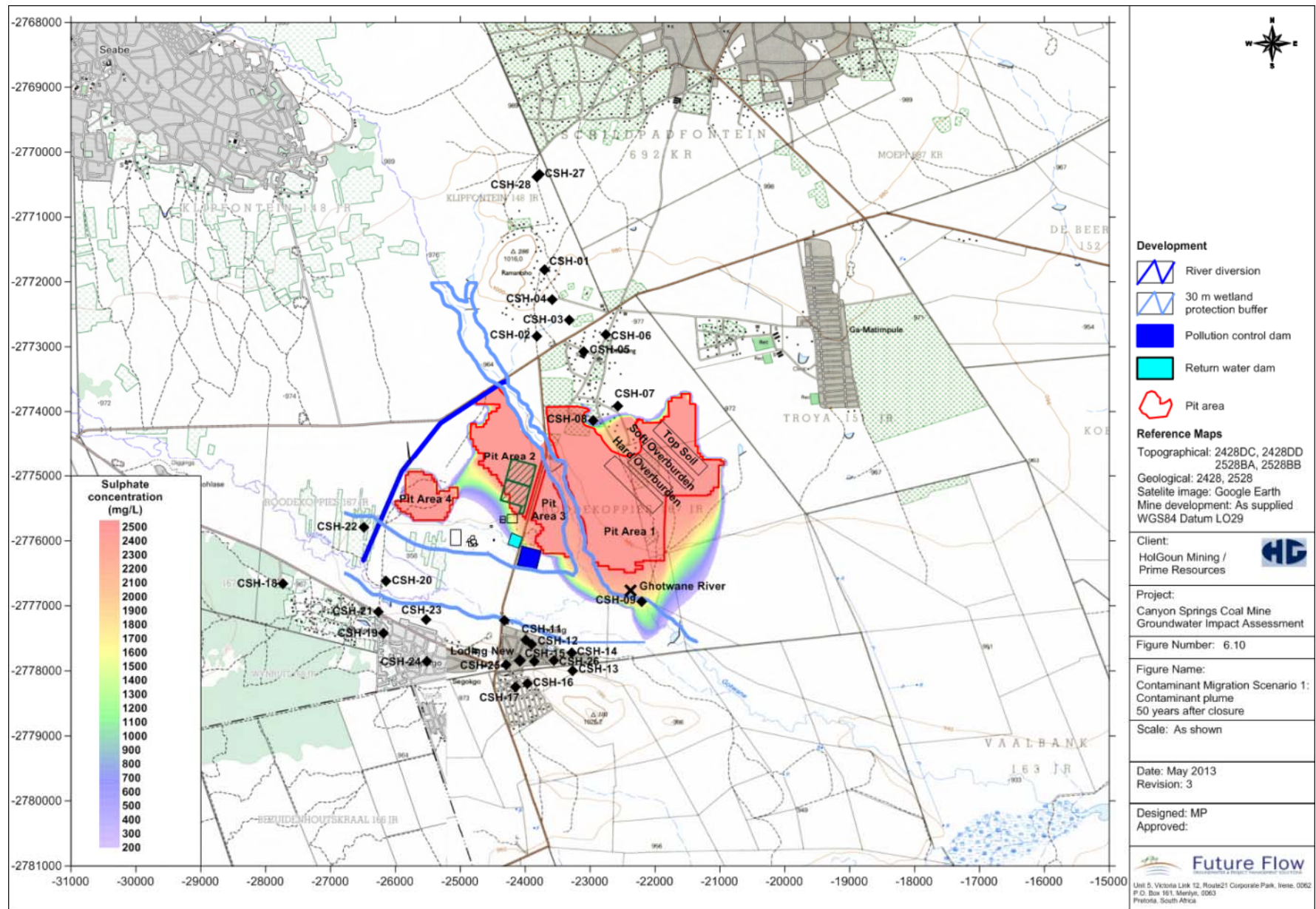


Figure 53: Scenario 1- 50 years after closure

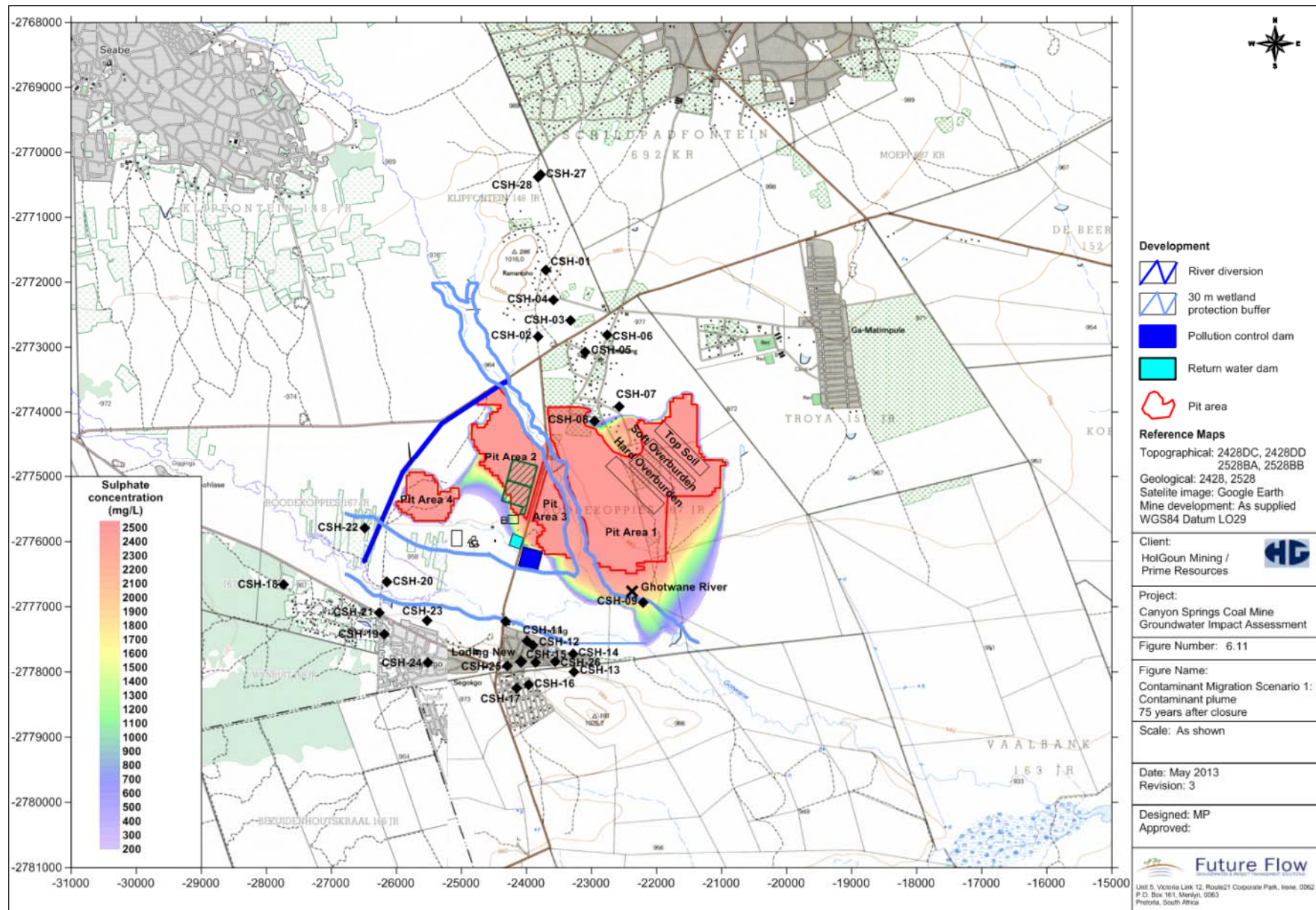


Figure 54: Scenario 1 - 75 years after closure

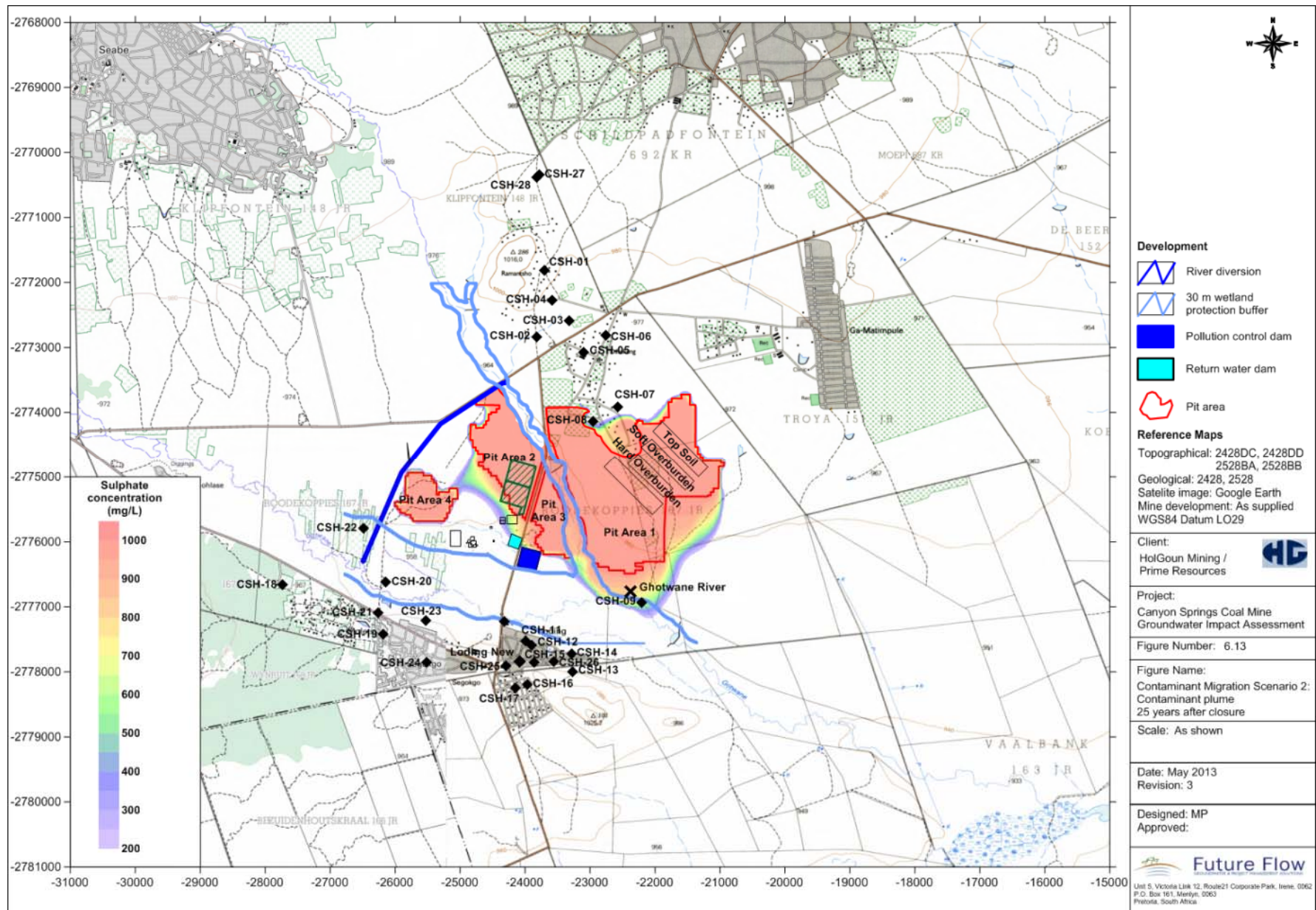


Figure 56: Scenario 2 - 25 years after closure

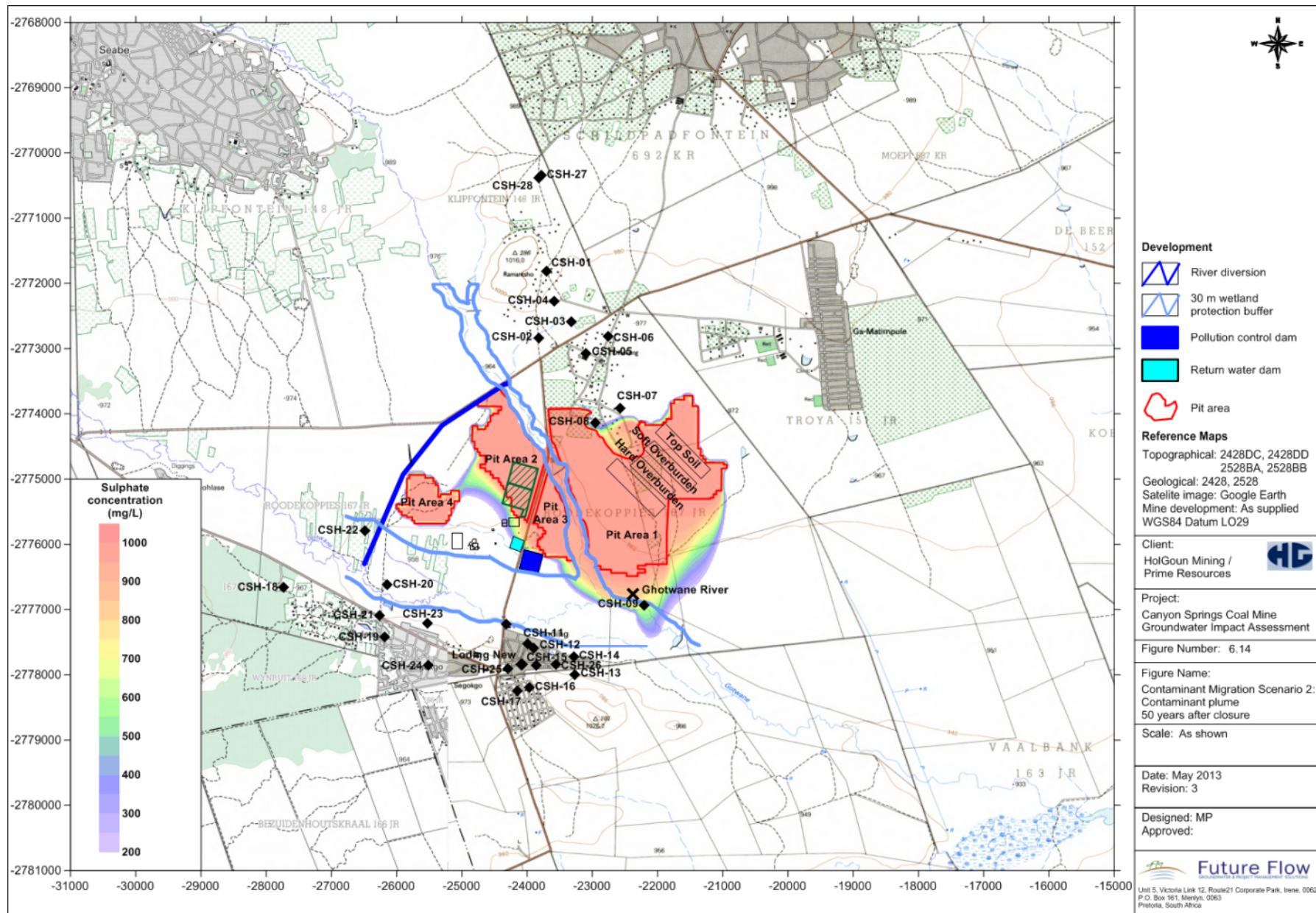


Figure 57: Scenario 2 - 50 years after closure

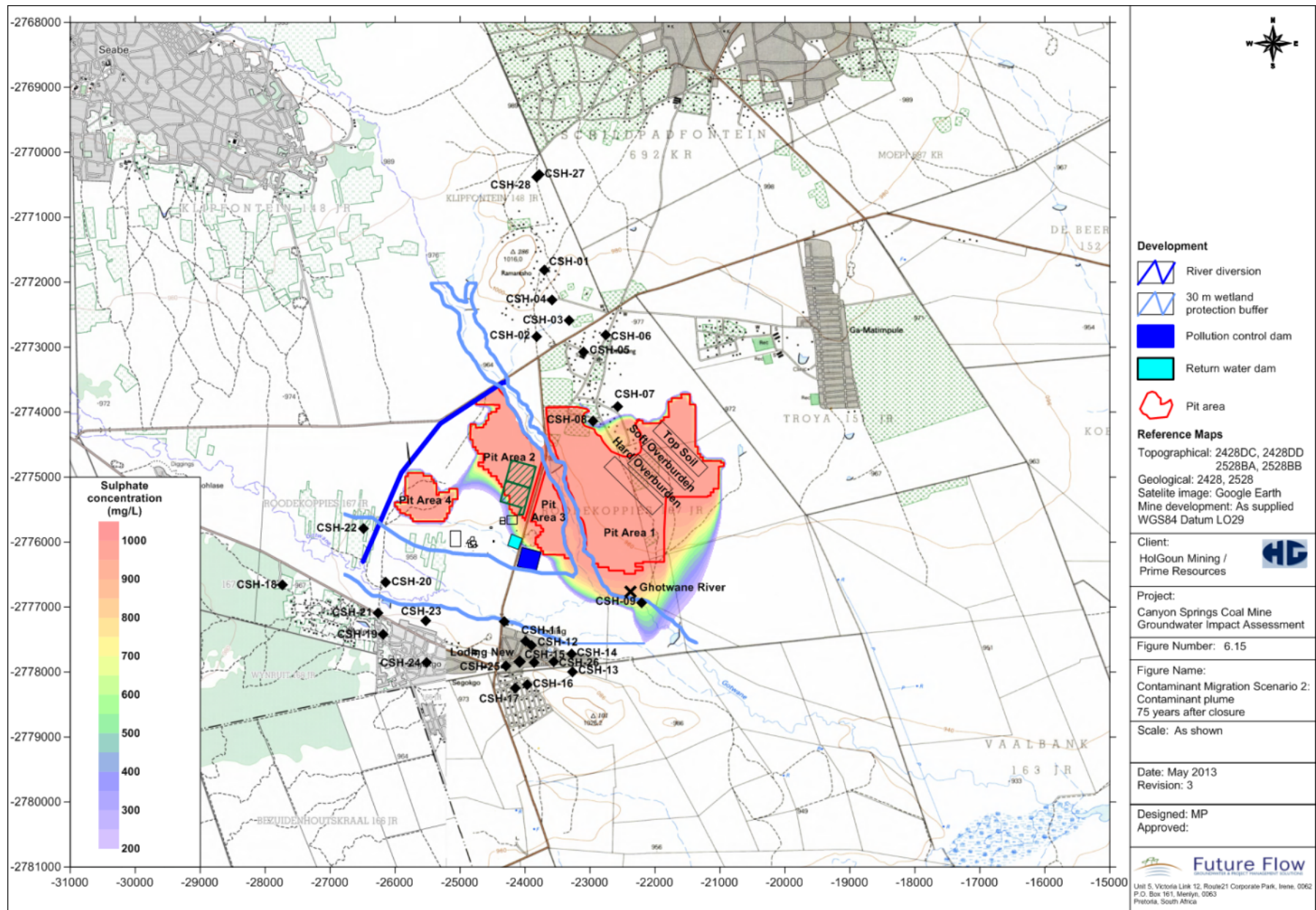


Figure 58: Scenario 2 - 75 years after closure

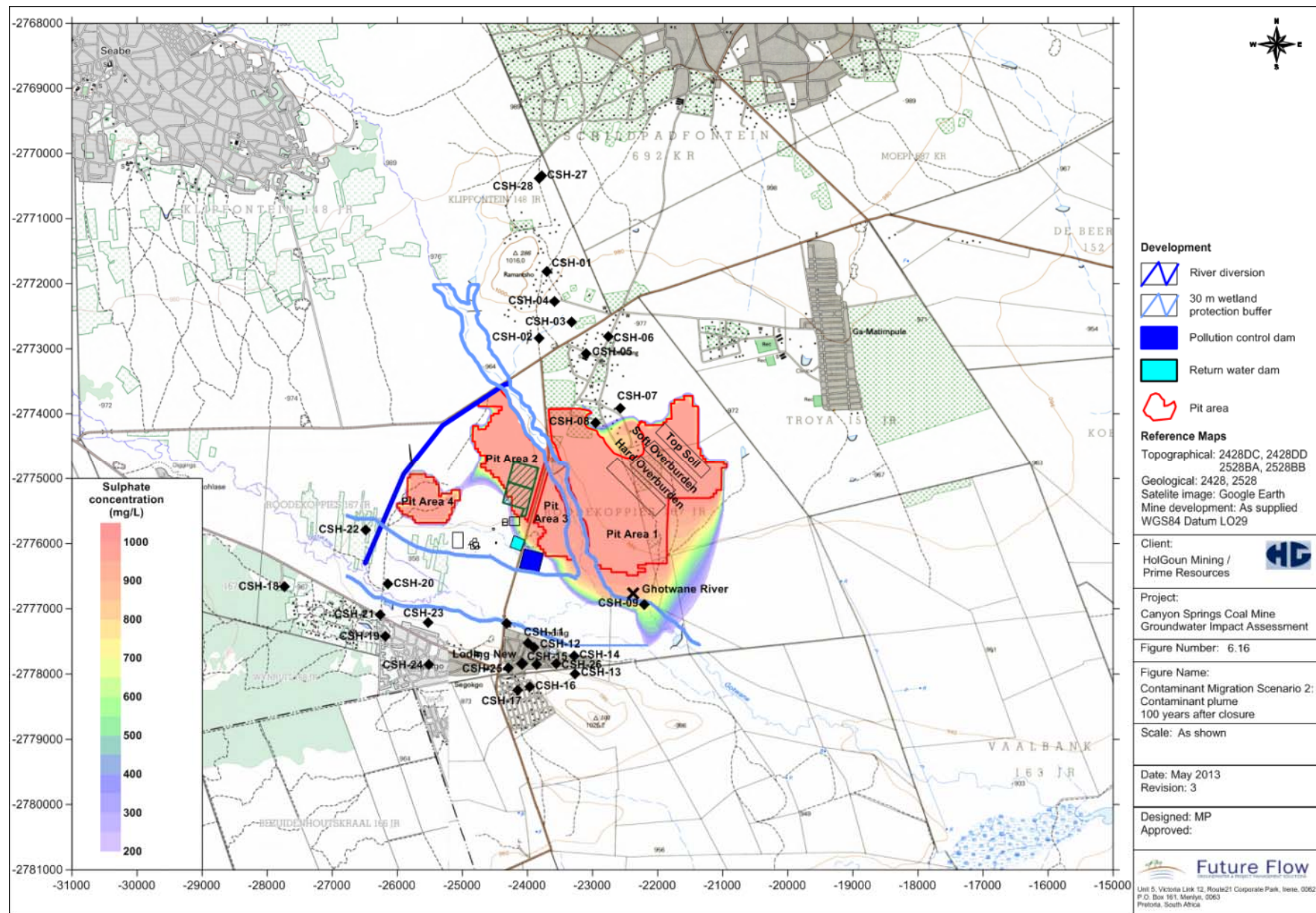


Figure 59: Scenario 2 - 100 years after closure

- From the figures it can be seen that groundwater contamination is expected to generally migrate southwards away from the mining areas, towards the Ghotwane River. There will also be some contaminant migration towards the topographically low lying non-perennial "No-Name" stream that is a tributary to the Ghotwane River and dissects the pit areas. Private borehole CSH-09 will also likely be impacted;
 - Contaminants are expected to reach the Ghotwane River around 10 to 15 years after closure and will continue to increase up to 100 years after closure as the plume migrates through the area. Without kinetic leach testing, the existing model reflects concentrations which show no indication of stabilising at 100 years after closure. It is recommended that kinetic leach testing is undertaken prior to mining to improve the accuracy of this modelling;
 - Borehole CSH-09 shows contaminants reaching the borehole around 15 years after closure. At 100 years after closure contaminant concentrations can be 500 to 600 mg/L under the worst case scenario, and 200 to 240 mg/L under the best case scenario. There is no indication of the contaminant concentrations stabilising during the first 100 years after closure; and
 - Sulphate salt load contribution to the Ghotwane River under the two scenarios is calculated based on the expected sulphate concentrations and seepage volumes. From the calculated salt load contributions over time under the two scenarios are summarised, it is expected that:
 - Contaminant Migration Scenario 1: approximately 6 to 12 g of sulphate will seep into the Ghotwane River as part of baseflow contribution; and
 - Contaminant Migration Scenario 2: approximately 15 to 30 g of sulphate will seep into the Ghotwane River as part of baseflow contribution.
- Decant
- The transmissivity of the rehabilitated material in the opencast pit will be higher than that of the surrounding non-mined material. In addition, the recharge from rainfall will be higher than that of the non-mined areas (8% of the MAR as opposed to 1-3% in non-mined areas). Therefore, the rehabilitated material will act as a holding reservoir for groundwater with very low outflows to the surrounding area due to the naturally high groundwater level in the surrounding aquifers (thereby neutralising most of the outwards pressure) and the relatively low transmissivity of the non-mined material;
 - Due to the high recharge percentage onto the rehabilitated areas there will be a further rise in the already shallow groundwater level within the rehabilitated areas and decant from the following positions can be expected:

PIT AREA	DECANT POINT			DECANT VOLUME (M ³ /DAY)
	EASTING (LO29, WGS84)	NORTHING (LO29, WGS84)	ELEVATION (MAMSL)	
Pit Area 1	-22 638	-2 776 389	955	412.9
Pit Area 2	-23 759	-2 774 552	961	122.1
Pit Area 3	-25 720	-2 775 672	964	48.1
Pit Area 4	-23 323	-2 776 171	955	48.9

- The time until decant starts will fall within the range of time required for the groundwater levels to recover pre-mining levels as indicated in Table 16 above. Decant quality is not expected to be very poor, with proper management (placing carbonaceous material at the bottom of the pit), it can be expected that the decant will exhibit a sulphate concentration of less than 1 000 mg/L and few elevated metals concentrations;
- Water decanting from rehabilitated mine workings can, however, lead to the pollution of water entering the catchment. The impact significance of this expected to be **medium** and can be maintained with the implementation of proposed mitigation measures;
- The recovery of groundwater levels will have a positive **high** impact due to the dewatering of the pits ceasing; and
- The general regional groundwater flow directions are directed towards the south, the bulk of the contaminant migration will also be towards the south. Private borehole CSH-09 will also be impacted. Contaminant migration due to seepage from fractures in the aquifer rock is expected to have a **low** impact on the quality of the groundwater, which can be further reduced through the implementation of the below mitigation measures.

Mitigation Measures

- The groundwater management plan (Section 4.6 of the EMP) must be implemented to mitigate potential impacts to groundwater resources which may affect groundwater quality and quantity.
- The relevant closure measures described in Section 10.2.1 of the EMP must be implemented.

RECEPTOR / RESOURCE	ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT	IMPACT EFFECT	MAGNITUDE (M)	DURATION (D)	SCALE (S)	PROBABILITY (P)	SIGNIFICANCE		MITIGATION AND MANAGEMENT MEASURES	MONITORING
								RATING	VALUE		
Aquatic Ecology and Wetlands	<ul style="list-style-type: none"> Contaminant migration Water decanting from rehabilitated mine workings 	<ul style="list-style-type: none"> Negative effect on aquatic biota Increased volumes of water entering the catchment 	Negative	6 [4]	4 [4]	3 [2]	4 [3]	Medium [Low]	52 [30]	Aquatic Ecology impact mitigation measures associated with the post-closure phase in Section 8.6.1. Wetlands mitigation measures associated with the post-closure phase in Section 8.6.1.	Aquatic Ecology monitoring is detailed in Section 5.2 of the EMP. Implement and maintain wetlands monitoring programme in Section 5.3 of the EMP.
	<ul style="list-style-type: none"> Mine dewatering ceasing 	<ul style="list-style-type: none"> Recovery of groundwater levels Decreased water quality 	Negative	8 [6]	4 [2]	2 [1]	5 [4]	High [Medium]	70 [36]		
	<ul style="list-style-type: none"> Unsuccessful rehabilitation of wetlands 	<ul style="list-style-type: none"> Wetland degradation Alien invasive species encroaching 	Negative	6 [4]	5 [5]	2 [2]	4 [3]	High [Medium]	80 [60]		
Groundwater	<ul style="list-style-type: none"> Mine dewatering activities ceasing 	<ul style="list-style-type: none"> Recovery of groundwater levels 	Positive	8	5	3	5	High	80	Groundwater mitigation measures associated with the post-closure phase in Section 8.6.2.	Implement and maintain a groundwater monitoring programme in Section 5.5 of the EMP.
	<ul style="list-style-type: none"> Contaminant migration 	<ul style="list-style-type: none"> Impacts on groundwater quality 	Negative	2 [1]	5 [3]	2 [2]	2 [1]	Low [Low]	18 [6]		
	<ul style="list-style-type: none"> Decant from the rehabilitated mining area 	<ul style="list-style-type: none"> Potential generation of acid mine drainage and pollution of surface water resources 	Negative	6 [4]	5 [5]	2 [2]	4 [3]	Medium [Medium]	52 [33]		
Surface Water	<ul style="list-style-type: none"> Water decanting from rehabilitated mine workings Remaining infrastructure on-site 	<ul style="list-style-type: none"> Acid mine drainage and pollution of surface water resources 	Negative	4 [2]	5 [5]	2 [2]	3 [2]	Medium [Low]	33 [18]	Surface water mitigation measures associated with the post-closure phase in Section 8.6.2.	Implement and maintain a surface water monitoring programme in Section 5.6 of the EMP.

8.7. Cumulative Impacts

8.7.1. Terrestrial Ecology

The Springbokvlakte Thornveld Vegetation Type is listed as a VU ecosystem in terms of NEMBA. There are thus few elements of the original vegetation types still remaining. According to the MBSP, the project area contains CBA Irreplaceable and CBA Optimal areas. The eastern side of the project area is used for agricultural purposes; overgrazing and subsistence farming have thus resulted in land degradation. The western portion of the project area is fenced in and covered with fairly dense, natural vegetation. The residential areas surrounding the project area are associated with areas of degraded and cultivated land. Land degradation compounded with constant human movement has had an adverse effect on the faunal and floral species diversity of the area.

It is generally accepted that mining plays a role in reducing the terrestrial biodiversity and species richness of an area i.e. due to land clearance, increased human activity, poaching etc. The potential impacts associated with the mining activities to be conducted at the proposed Canyon Springs Coal Mine in terms of terrestrial ecology are discussed in Sections 8.3.1, 8.4.1 and 8.5.1.

8.7.2. Aquatic Ecology

During the drier periods of the year, the aquatic habitat at the Canyon Springs Coal Mine will comprise of isolated pools that are dominated by sandy or muddy substrate, and will progressively dry to a point where no surface water is available. The field survey conducted by SEF in April 2013 confirmed the non-perennial nature of the system; the "No-Name" stream was found to be completely dry, whilst the Ghotwane River was also largely dry with the exception of some isolated pools. There is evidence of significant erosion in certain areas, which is due to increased catchment runoff caused by uncontrolled grazing from livestock and a lack of attenuation within the catchment, as well as the presence of bridges and culverts which channelize the flows during the wet season. Based on the nature of the aquatic habitats likely to be present within the study area, the diversity of aquatic macroinvertebrates associated with the proposed Canyon Springs Coal Mine is limited. The PES rating according to the aquatic macroinvertebrate assemblage represents a Category D or lower. Only one species of a conservation concern had a high probability of occurrence within the study area, namely the Mozambique Tilapia (*Oreochromis mossambicus*) which listed as Near Threatened.

The clearing of natural vegetation and the stripping of topsoil, as well as the failure of rehabilitation measures regarding re-vegetation of land, can result in the increased runoff of sediment from the site into watercourses associated with the project area. The transport of eroded soil into surrounding surface water resources can increase the TSS, which may further affect the aquatic fauna e.g. a further reduction in the suitability of spawning habitat, the hindering of the development of eggs, larvae and juveniles, and the modification of migration patterns

The dewatering of the pit during the construction and operation phase of the opencast mine may result in the drawdown of groundwater levels. The Ghotwane River subsequently falls within the

zone of impact of mine dewatering. It is likely that the baseflow contribution to the Ghotwane River by groundwater will be reduced, thus reducing stream flow volumes and further affecting aquatic life found in the surrounding surface water bodies.

Following closure of the mine, it is likely that water seeping into the rehabilitated pit will decant into the surrounding catchment. This decanted water is very likely to be high in salinity and heavy metals, particularly iron, aluminium and manganese which have a high toxicity towards aquatic biota. Such input into the natural system within the catchment will further decrease the quality of the surrounding aquatic habitat negatively impact the aquatic biota inhabiting the watercourses, and decrease the future fisheries potential of the Rhenosterkop Dam. The potential impacts that mining operations will have on the aquatic ecology are further discussed in Sections 8.3.2, 8.4.2 and 8.6.1.

8.7.3. Wetlands

Wetlands within the study area have been largely modified as a result of current and historic anthropogenic activities, and have experienced a large loss of natural habitats and basic ecosystem functions. Hydrological functioning, however, appears to not have been affected.

The clearing of natural vegetation, the stripping of topsoil, and the installation of clean and dirty water separation infrastructure during construction leads to soils becoming exposed, thereby increasing the runoff of sediment, and creating concentrated flows of water into surrounding watercourses thereby further exacerbating erosion processes. The seed of alien invasive species that occurs within the project area could spread into the disturbed soils thereby reducing the persistence of indigenous flora in the wetlands. Hydrocarbon spills could potentially occur due to construction and operation activities which could further decrease the quality of the wetland systems. The potential impacts that the mining activities at the proposed Canyon Springs Coal Mine will have on wetlands located in the project area are further discussed in Sections 8.3.3, 8.4.3, 8.5.2 and 8.6.1.

8.7.4. Soil Quality

There is evidence of significant erosion processes having occurred in certain areas (pre-mining), due to increased catchment runoff caused by uncontrolled grazing from livestock and a lack of attenuation within the catchment. Due to erosion and over-grazing the soil fertility is considered to be low. The mining process will further degrade the soils and soil potential through disturbance of the soil profile and compaction of already vulnerable soil layers. The potential impacts in this regard and the management thereof are discussed further in Section 8.3.4, 8.4.4 and 8.5.3.

8.7.5. Groundwater

Groundwater Quantity

Two aquifers are located at the proposed Canyon Springs Coal Mine i.e. a shallow weathered aquifer and a deep, fractured aquifer. Borehole yields in the shallow weathered aquifer located were found to be typically low, yielding from 0.5-2 l/s except for areas underlain by Basalt, where

yields can range from 2-5 l/s. Sediment yields of groundwater are less than 0.5 l/s and in the dolerite dykes are 0.5-2 l/s. Boreholes in the deep fractured aquifer generally yield in the region of 1 l/s although occasionally, high-yielding boreholes in may be intersected. The coal seams themselves often show the highest hydraulic conductivity.

Dewatering of the mine will likely be associated with a decrease in groundwater level by ways of a dewatering cone within the zone of influence. The maximum drawdown in groundwater level within the zone of influence will likely be around 45 m, while the zone of influence itself may extend up to 4 km from the edge of the proposed mining areas. Almost all the boreholes identified during the hydrocensus surveys fall directly in the zone of influence of the cone of dewatering. This means that groundwater levels in each of the boreholes can be expected to reduce over time, thereby possibly impacting on the sustainable yields of the boreholes.

Potential impacts associated with the lowering of the groundwater levels at the proposed Canyon Springs Coal Mine are further discussed in Sections 8.3.5, 8.4.5, 8.5.4 and 8.6.2.

Groundwater Quality

The groundwater quality of the shallow weathered is considered good due to the dynamic recharge from rainfall. The groundwater quality in the deep fractured aquifer is generally of a poorer quality than the shallow weathered aquifer due to the concentration of salts and slower rate of recharge.

The predominant water type of the groundwater found in the proposed project area is sodium-calcium / chloride-bicarbonate, which is typical of water that is described as brackish. The expected water type in such a pristine environment would be Ca-Mg-HCO₃ which is typical of recharging water. It is thus likely that there is a confining layer preventing recharge to the aquifer and therefore increasing residence time. Increased residence time allows salts to become concentrated in the groundwater.

The negative impacts associated with the generation of AMD during post-closure can thus further decrease the quality of groundwater at the proposed Canyon Springs Coal Mine (refer to Section 8.6.2).

8.7.6. Traffic

All three roads running through the Roodekoppies farm, namely the R516, D626 and the R573, were found to be in a poor condition. The roads have not been well maintained and have been eroded in certain areas. During mining, the processed coal and other men and materials will be transported by heavy vehicles via these roads, which can lead to further degradation of the local road network.

8.7.7. Socio-economic

As discussed in Chapter 3.17, the communities surrounding the proposed mining project are subject to high unemployment levels. Only 25% of males and 13% of females were employed in 2007 and the majority of employment is either part-time or contract positions, which has a negative impact on job security. Although the proposed Mine will endeavour to employ a large

number of their work force from the local communities, these employment opportunities will only exist for the LOM with downscaling and retrenchment occurring at closure. Although, benefitting local communities in the short term (over the LOM), unemployment due to mine closure will result in further unemployment levels in the surrounding communities (albeit the socio-economic conditions in 20-years cannot be alluded to and it is unknown what the level of unemployment will be at that time. This assumption is thus based on current-day circumstances).

9. GAP ANALYSIS AND ASSUMPTIONS

9.1. Terrestrial Ecology

- In order to obtain a comprehensive understanding of the dynamics of the biota on the site, including species of conservation concern, on a specific site, studies should include investigations through different seasons, over a number of years and should include extensive sampling. Due to project time constraints, such long term research was not feasible;
- At the time of the initial scan in October 2011, the study area had not experienced any significant rainfall. The vegetation, especially the grass layer, was dry and bulbous plants were likely to still be dormant; and
- At the time of the second season floral survey from 28 February until 01 March 2012, some areas were severely overgrazed which hampered the identification of the grass layer. Many forb and herb species encountered during the three day survey were sterile which hampered species identification.

9.2. Aquatic Ecology

- Ecological studies should ideally be conducted during various times of the year so as to account for seasonal variation in aquatic assemblages due to migration, breeding cycles, etc. Given the time constraints generally associated with the EIA process, such long-term studies are not deemed feasible. Furthermore, watercourses associated with the study area were regarded as non-perennial, containing little to no water during the winter months; and
- Due to the remote location of the study area and the lack of any available previous data from other assessments or the Rivers Database, very little information was available in order to adequately assess the aquatic macroinvertebrates likely to be present within the watercourses associated with the study area.

9.3. Wetlands

- In order to obtain definitive data regarding the biodiversity, hydrology and functioning of particular wetlands, studies should ideally be conducted over a number of seasons and over a number of years. This study relied on information gained field surveys conducted, desktop information for the area, information obtained from provincial conservation authorities and similar organisations, as well as professional judgement and experience gained during similar assessments. Delineations of wetlands were therefore dependent on the extrapolation of data obtained during field surveys and from interpretation of orthophotos and other imagery. The potential for errors in delineating boundaries therefore exists; and

- It is also likely that some seepages could have been overseen due to their cryptic nature and impact of anthropogenic activities. In addition, large portions of the study site were dominated by vertic soils which form part of special case studies according to the Department of Waters Affairs and Tourism (2005). In many instances, the accurate classification of the Rensburg soil form, a hydric soil, is dependent on features several meters below the soil surface which would require the use of profile pits (which did not form part of the current studies terms of reference). A conservative approach using other indicators such as the terrain unit indicator was therefore relied on more heavily for the delineation process.

9.4. Soil Quality

- It has been assumed that the total area of possible disturbance was included in the area of study, and that the mining plan as tabled has documented and catered for all actions and activities that could potentially have an impact on the soils and land capability. Although no new infrastructure is envisaged to be built on-site, the possibility exists that the position and extent of surface infrastructure might be altered and thus the effects that the surface infrastructure might have on the underlying soils will change i.e. increase;
- The redirection of the surface water body crossing the study site may potentially affect the quality of the underlying soils due to the excavation of soils, the removal and transport of topsoil, and the destruction of soil layers to create space for the new location of the stream;
- Limitations to the accuracy of the pedological mapping are accepted at between 50% (reconnaissance mapping) and 80% (detailed mapping), while the degree of certainty for the soils physical and chemical (analytical data) results has been based on "composite" samples taken from the dominant soil types mapped in the study area;
- The area in question has been mapped on a comprehensive reconnaissance base, the degree and intensity of mapping and geochemical sampling being considered and measured based on the complexity of the soils noted in field during the field mapping, and the interplay of geomorphological aspects (ground roughness, slope, aspect and geology etc.);
- In addition to the grid point observations made at the study site, a representative selection of the soil forms mapped were sampled and analysed to determine their chemistry and physical attributes. The possibility exists that details regarding the type of soils present at the study site might be overlooked sure to the nature of sampling processes; and
- None of the geotechnical or geological (strengths of materials, structures etc.) variables have been taken into account in the assessment of the possible impacts.

9.5. Cultural / Heritage

- Very little data exists about the project area. Background information therefore only gives a broad outline; and

- Seeing as the location of all cultural resources is an extremely time consuming process, it is unfeasible to locate all of the potential heritage resources. It is thus possible that some sights may have been missed due to human error, but management measures are proposed in the EMP (Volume 2) to address this.

9.6. Air Quality

- Conservative estimates were made for inputs to the model to estimate the worst-case scenario. This may result in an overestimation of expected ambient concentrations. Where these estimates exceed ambient guidelines and standards, the different inputs could be further refined, however, the requirement for this can be assessed by the results of on-going monitoring once operational;
- Whilst care has been taken to assess the potential air pollution impact from the proposed development, changes to the proposed design may result in different conclusions;
- No local ambient air monitoring was available to aid the assessment of cumulative impacts;
- Tailpipe particulate emissions were not included. Although the activities at the proposed Canyon Springs Coal Mine would emit gases, primarily by haul trucks and mining vehicles, the impact of these compounds were not included in this assessment. The sulphur content of South African diesel is too low and mining equipment is too widely dispersed over mine sites to cause sulphur dioxide (SO₂) levels to be exceeded even in mines that use large quantities of diesel. For the same reason, nitrous oxides (NO_x) and carbon monoxide (CO) emissions have also not undergone a detailed modelling assessment; and
- Isopleth plots (as those illustrated in Figure 47 and Figure 48) reflecting daily averaging periods contain only the highest predicted ground level concentrations for that averaging period. This is done over the entire period for which simulations were undertaken. It is possible that, even though a high daily concentration is predicted to occur at certain locations, this may only be true for one day during the entire period.

9.7. Traffic

- Due to extremely low traffic volumes on the local road network, the study conducted by Goba Consulting Engineers in August 2012 only focused on the local road network as this is where the only noteworthy impact is expected;
- The following assumptions were made regarding construction phase traffic at the mine:
 - Out of the 500 expected staff members, 90% will travel by bus and 10% will use their private cars;
 - For lack of tangible information, the passenger buses to be used are assumed to be 40 seaters;
 - Passenger vehicle occupancy of 1.2 persons per vehicle;
 - For calculation of passenger car units the buses and trucks are assumed to be equivalent to 3 passenger car units;
 - In: Out split of 85:15 in the morning peak hour and 15:85 in the afternoon peak hour; and

- Construction truck traffic: 10 trucks per peak hour – this assumption is based on previous traffic impact studies undertaken for the development of power stations where 20 truck per peak hour were assumed. The construction of a mine is a much smaller project compared to a power station thus it is assumed that 10 trucks per peak hour would be generated during construction.
- Assumptions that can be made during the operations phase of the Canyon Springs Coal Mine include that the ROM is expected to be around 3 million tons of coal per annum. Of this approximately 1.6 million tons of coal will be transported from the site per annum to the end users. This equals approximately 133 500 tons per month. Assuming 22 working days per month, this equals approximately 6 100 tons per day. Assuming coal transport contractors work only 20 hours per day, this equals approximately 305 tons per hour. Assuming a 35 ton truck will be used, this translates 9 trucks leaving the site per hour, and 9 trucks returning per hour. This is equivalent to 360 coal trucks per day.

9.8. Noise

- The final design of the CHPP is available but as the detailed sound power levels of the equipment were not available, the anticipated noise profile was thus calculated from data at similar type facilities;
- Some of the plant and equipment will operate outdoors and some will be housed indoors or encapsulated. For the purposes of the impact assessment, however, it has been assumed that all plant and equipment will be situated outdoors (i.e. worst-case).
- Due to the complexity of the mining schedule and the numerous permutations between the various mining operations over the life of the mine, each of the types of operation at the mine have initially been analysed separately. In the case of static sources of noise (e.g. the CHPP) cumulative effects between these operations have been indicated. Cumulative effects of movable sources of noise (e.g. works in the open cast pits and on the waste dumps) can only be shown for a specific scenario at one point in time;
- Exact daytime period and night-time period continuous equivalent sound pressure levels are not possible to calculate with certainty at this stage as the final construction site layout, work programme for the various components, work modus operandi and type of equipment have not been finalised. Working on a worst case scenario basis, it is estimated that the ambient noise level from general construction activities could negatively affect noise sensitive sites within a distance of 1300 metres of the construction site. Night-time construction could have a significant impact on noise sensitive sites within a radius of 3000 metres of the construction site;
- As no specific construction details or possible locations of major ancillary activity sites are available at this stage, the anticipated noise from various types of construction activities cannot be calculated accurately. In general at this stage, it can be said that the typical noise levels of construction equipment at a distance of 15 metres lie in the range of 75 dBA to 100dBA. Based on data from similar “linear” construction sites, a one-hour equivalent noise level of between 75 dBA and 78 dBA at a point 50 metres from the construction would be typical for the earthmoving phase;

- Note that it has been assumed that construction will generally take place from 06h00 to 18h00 with no activities (or at least no noisy construction activities) at night;
- The daily construction related traffic will vary over the period of the construction. It has been estimated that the construction activities at the mine site will on average generate no more than about 100 (two-way) vehicle trips daily. This included construction personnel as well as mine supervisory staff;
- Rural residential: the noise impact on the surrounding communities in the area has been determined on the basis of rural residential district standards (SANS 10103), namely the daytime period ambient noise level should not exceed 45 dBA and that for the night-time period should not exceed 35 dBA; and
- Suburban residential: the noise impact on the villages in the area has been determined on the basis of rural, tending towards suburban residential district standards (SANS 10103), namely the daytime period ambient noise level should not exceed 50dBA and that for the night-time period should not exceed 40dBA

9.9. Blasting / Vibration

- The current blasting assessment considered the geology as it is currently known and understood, however, any changes in the geology that may be discovered once mining activities commence, may have an impact on blasting effects e.g. faults and dykes may amplify or attenuate ground vibrations in any direction from the blast;
- Changes such as these will require blast designs to be amended;
- It is not possible to make a reliable prediction on the impacts of air-blast due to the effect of wind, cloud and temperature inversion; however, it is suggested from blasting at other opencast mining sites where blasting activities are carried out successfully that air-blast amplitudes can be undertaken below 130 dB; and
- It is impossible, before the commencement of the construction phase of the mine, to be definitive on exactly how blasting of the opencast pits will be designed and conducted. It is, however, possible to propose certain relevant “worst-case” situations, which can be used to estimate the impact of blasting operations on the surrounding environment

10. ENVIRONMENTAL IMPACT STATEMENT

The purpose of this section is to provide a statement of potential impacts, listed in terms of significance after the implementation of the mitigation measures detailed in Volume 2 (EMP) for each impact. By so doing it provides a summary of the key findings of the impact assessment.

Vehicle-entrained dust emissions during the construction, operation and decommissioning phases of the proposed Canyon Springs Coal Mine potentially represent one of the most significant sources of fugitive dust. Construction and operation activities, such as infrastructure construction, drilling and blasting activities at the pits, transport of coal etc., represent intermittent sources of fugitive dust emissions. Wind erosion may occur on topsoil and overburden stockpiles leading to an increase in dust volumes at the site.

Blasting activities during the construction and operation phases lead to ground vibrations which may cause damage to buildings. Air blasts, dust generation and the danger of fly-rock may potentially lead to complaints received from the surrounding communities and may pose safety risks to the members of the surrounding communities. Intermittent loud noises emanating from construction and decommissioning activities, e.g. heavy vehicular traffic when shifting materials, are likely to be a nuisance to residents living in the communities situated in close proximity to the construction sites. The removal and transport of overburden, from the opencast pit to the designated overburden dump areas, by loaders, bulldozers and trucks will be a continuous source of noise throughout the operation phase.

The clearance of land for the surface infrastructure development footprint will alter the existing natural aesthetics of the area. The development will be associated with the loss of grazing and subsistence farming land, and the potential loss of sense of place. Canyon Springs Pty (Ltd) will aim to utilise the local communities' workforce during the LOM. Retrenchments and down-scaling at the closure of the mine will thus affect the local workforce and subsequently the local communities by way of the multiplier effect.

The extraction of coal with the associated disturbance of the soil sequence above the coal seam will alter the soil horizon and may affect the soft overburden as well as the hard rock formations above the coal and this may potentially result in the loss of resource. The soil resources may become contaminated or sterilised due to spillage of hydrocarbons and heavy vehicles utilised during construction, operation and decommissioning activities may lead to the compaction of soils and loss of land capability. Soil stockpiles may experience a reduction in soil fertility due to erosion. Rehabilitation of the area and of the soils which is not undertaken adequately can lead to a loss of the resource due to incorrect or inadequate fertilisation of replaced soils and vegetation. Soils may become sterile or contaminated due to cracking of the soil surface from areas of unconsolidated rehabilitation as well as ponding on areas due to bulking failure and lack of compaction of the soils.

The construction of infrastructure as well as stripping of topsoil for opencast mining operations will destroy faunal and floral habitat potentially leading to increased mortality rates. The seed of alien invasive species that occurs within the construction area could spread into the disturbed and

stockpiled soils and will lower the indigenous plant diversity in the area. The presence of the construction site may result in negative faunal interactions that could be associated with construction personnel including poaching, trapping and hunting of faunal species, as well as possible collisions of fauna with construction vehicles.

Water contained within the SCD and PCD, the runoff from contaminated areas (including the overburden and temporary discard dump, STP), as well as the TSE from Siyabuswa, will likely be characterised by elevated concentrations of contaminants like sulphates, iron, manganese, aluminium etc. Should any seepage or release of this water occur as a result of intentional or unintentional releases, overcapacity, permeable dam construction, etc., the result will likely have a negative impact on water quality and biodiversity within wetlands. Sub-optimal rehabilitation of disturbed areas can lead to erosion which could create preferential and concentrated water flows and enhance dispersal alien invasive species into watercourses which in turn leads to ecological degradation of wetlands.

The clearing of natural vegetation, the stripping of topsoil, and the movement of heavy vehicles and personnel during construction, operation and decommissioning may result in the onset of erosion and associated sedimentation of streams and rivers. Clean surface runoff entering the mining infrastructure area could potentially be contaminated by substances such as AMD, oils, fuel, greases, etc. in discharged water from the mine workings. Should this water escape from the dirty water catchment it may potentially lead to the contamination of surface water resources. Should any seepage or release of contaminated water from the discard dump, STP etc. escape the dirty water catchment, the result will be a significant loss of aquatic biota and a reduction of the PES of the Ghotwane catchment. If the hydrology of the system changes in terms of flow velocities due to e.g. erosion of soil creating preferential flow patterns, it may result in decreased upstream movement of fish species thus affecting their breeding patterns. The transport of eroded soil into surrounding surface water resources will increase the TSS, which may adversely affect the aquatic fauna e.g. deposition of silt on the gills of biota.

The dewatering of the opencast pit during the construction and operation phase of the mine results in the drawdown of groundwater levels; this will affect surface water resources and potentially affect aquatic life. Surrounding communities will be affected by the lowering of the groundwater table e.g. a decrease in borehole water available for domestic purposes and livestock watering (see Section 8.5.4). Groundwater and surface water quality may potentially be reduced by hydrocarbon spills from heavy vehicles and coal handling at the CHPP during the construction and operation phases. During decommissioning, the mine will cease its dewatering activities; this will lead to the recovery of the groundwater levels.

ABA and leach test results show that the formation of AMD from the carbonaceous mudstone and the coal seam is likely after closure of the mine. The carbonaceous material in the rehabilitated opencast area will be subjected to oxidation of sulphide mineral and therefore it can be expected that AMD conditions will form. This will potentially affect surface water resources and aquatic life in the post-closure environment (see Section 8.6.1 and 8.6.2).

Prime Resources (Pty) Ltd, the EAP, is of the opinion that the proposed development should go ahead, provided the following conditions are met:

- Implementation of all management measures as indicated in Volume 2 (EMP), in order to ensure that the post-significance impact ratings are maintained; and
- Strict adherence to the SLP in terms of skills development and the management of downscaling and retrenchment.