# NEMA EIA

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## DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

**PROPOSED YOCTOLUX COAL MINE LOCATED ON PORTION 38 OF THE FARM ELANDSPRUIT 291 JS, MPUMALANGA PROVINCE**

**October 2014**

**MDEDET REF: 17/2/3N-247**
**ENVASS REF: 089/12_13**

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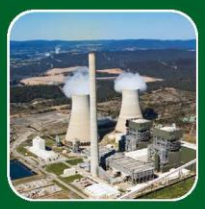


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## EXECUTIVE SUMMARY

### Introduction and project description

The Applicant, Yoctolux Investments (Pty) Ltd, (who is both the mineral right and surface right holder of Portion 38 of the farm Elandspruit 291 JS) is making an application for Environmental Authorisation for the establishment of a new coal mine on Portion 38 of the farm Elandspruit 291 JS, in Middelburg, Mpumalanga Province, in terms of the National Environmental Management Act, Act No. 107 of 1998 (as amended). This Application for Environmental Authorisation is being made to the Competent Authority namely the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET), and is required because the proposed development includes activities which are listed in terms of the NEMA Environmental Impact Assessment (EIA) Regulations 2010.

Environmental Assurance (Pty) Ltd. (ENVASS) was appointed by Yoctolux Investments (Pty) Ltd. to undertake the Scoping and Environmental Impact Assessment process which requires compliance with the EIA Regulations of 2010, promulgated in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA) (as amended).

The proposed mining operations will be conducted by the standard Truck and Shovel method. Top-soil, subsoil and overburden will be stripped ahead of the cuts by an excavator. The excavated material will be transported and stockpiled at designated areas. The exposed coal seam will be cleaned by a rubber-tyred dozer to prevent contamination. The roll-over method will be utilised, which entails concurrently backfilling the de-coaled areas with spoil. Once levelled to the required height, topsoil will be deposited and vegetation established. All rehabilitation will be done as per the Environmental Management Programme (EMPr) requirements. By utilising this method, the spoils will be rehabilitated as the mining operation advances resulting in the rehabilitation of the disturbed area being no further than two cuts behind the active mining void. The ROM will be loaded and hauled to the designated area adjacent to the Crush & Screen plant from where the coal will be initially fed to the crushing and screening plant. The plant is designed to process 200 tonnes ROM (>0-300mm) per hour from the Mine, which is first fed into the plant's crusher (primary) and screening section, which crushes and screens out the material to a 0-90mm range. From there it is screened to a 30-60mm product, creating nuts. All > 60 – 90mm particles go through a secondary crusher that crushes the material and the screening section removes 0-30mm particles of which the 9-30mm particles are called peas and the 0-8/9mm duff. The plant will produce nuts, duff and peas. The plant covers a footprint of 82 meters in length by 50 meters in width. From an environmental point of view the plant has minimal impact. It is also situated within the Pollution Control Dam section of the Mine.

Coal will also be beneficiated on site. The Dense Medium Separation (DMS) Plant will be installed to treat the peas and duff generated from the crushing and screening plant. The plant is designed with two cyclone sections. The first section (cyclone) treats the Duff and Peas (0-30mm). The second section (cyclone) treats the fines material (0-3mm) (slurry), normally 10% of the plant feed. The major benefit of this design is that from an environmental point of view there is basically no pollution, because of the filter press section which treats the slurry generated from the second cyclone of the plant, which on its own eliminates the slurry. This slurry generated from the second cyclone section flows through the thickener and the filter press, which compresses the slurry into a coal cake, with clean water being released to the 60 000 litre reservoir. The plant footprint covers an area of 25 meters by 52 meters and will be mounted on a concrete slab (300 - 400 mm thick). The plant is also designed to be 100% environmentally compliant, in that a filter press section is added to the plant, eliminating the slurry created in the plant. This results in a clean operation, therefore being environmentally friendly. The washed coal will therefore once again be stockpiled, loaded and transported to the market via road. During the construction phase, clean water will be diverted around the construction site of the main infrastructure area (including the crushing and screening and the Wash plant area).

A pollution control dam will be constructed at the site to contain the dirty/contaminated water. A dirty water system, (consisting of drains/trenches/channels) will also be constructed in order to convey the dirty/contaminated water to the said pollution control

dam/dirty water dam. Potable water will be required at the workshop, office complex and Contractor's yard, and will be used for human consumption only. The potable water to be utilised will be supplied from the boreholes. This activity has been included in the Water Use License Application (WULA) as a water use activity. No accommodation will be provided at the Mine site. Sewage treatment/ Chemical ablution facilities will be provided, as will be required for the staff during working hours. Above ground diesel tanks will be installed on site in order to provide the haul trucks, and other equipment on site with diesel. These diesel tanks will be located in the Contractor's yard.

**Legislative requirements**

***National Environmental Management Act (no. 107 of 1998) [as amended):***

The proposed development requires compliance with the EIA Regulations of 2010, promulgated in terms of the National Environmental Management Act, Act 107 of 1998 (as amended). The proposed activity requires a Scoping and EIA process as listed activities 9, 11, 13, 18 and 22 under Government Notice No R. 544 as well as listed activities 5, 10 and 15 of Government Notice No R. 545 and listed activities 13 and 14 of Government Notice No R. 546 of the EIA 2010 Regulations are triggered.

***National Water Act, 1998 (Act 36 of 1998):***

The proposed development also requires compliance with the National Water Act, 1998 (Act 36 of 1998). An application for an integrated water use licence (IWULA) in terms of Section 21 to undertake the following activities is being applied for:

- Section 21(a) Taking water from a water resource;
- Section 21(c) Impeding or diverting the flow of water in a watercourse;
- Section 21(g) Disposing of waste in a manner which may detrimentally impact on a water resource;
- Section 21(i) Altering the bed, banks, course or characteristics of a watercourse; and
- Section 21(j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.

The requirements of the following legislation have also been considered:

- Constitution of South Africa (Act No. 108 of 1996);
- National Biodiversity Act (Act No. 10 of 2004) [as amended];
- National Heritage Resources Act (Act No. 25 of 1999);
- National Environmental Management: Air Quality Act (No. 39 of 2004) [as amended];
- National Environmental Management Waste Act (No. 59 of 2008) [as amended];
- Minerals and Petroleum Resources Development Act (No. 28 of 2002) [as amended]; and
- Mine Health and Safety Act (No. 29 of 1996).

**Alternatives**

Alternatives are defined in the NEMA EIA Regulations (2010) as "different means of meeting the general purpose and requirements of the activity, which may include alternatives to: (a) the property on which or location where it is proposed to undertake the activity; (b) the type of activity to be undertaken; (c) the design or layout of the activity; (d) the technology to be used in the activity; and (e) the operational aspects of the activity and (f) the option of not implementing the activity".

For the purpose of this application, the following Alternatives were investigated:

- Location;

- Activity;
- Design;
- Demand;
- Timing; and
- No-go.

**Public Participation**

A Public Participation Process (PPP) was undertaken in accordance with the NEMA EIA (2010) Regulations and in terms of the DEA's Guideline on Public Participation (October 2012):

**PUBLIC PARTICIPATION ACTIVITIES TAKEN TO DATE (REGULATION 31 (2) (e) (i)**

The following PPP tasks were conducted to date for the proposed Yoctolux Coal mine:

- Identification of key Interested and Affected Parties (affected and adjacent landowners) and other stakeholders (organs of state and other parties);
- Formal notification of the application to key I&APs (all adjacent landowners) and other stakeholders;
- Consultation and correspondence with I&APs and Stakeholders and the addressing of their comments; and
- The Draft Scoping Report and the Final Scoping Report were released to I&APs and stakeholders for review and comment.

**PUBLIC PARTICIPATION ACTIVITIES STILL TO BE UNDERTAKEN (REGULATION 31 (2) (e) (i)**

The following PPP tasks are still to be conducted:

- **The Draft Environmental Impact Assessment Report (EIR) is hereby released to I&APs and stakeholders for review and comment for 40 days (03 November to 15 December 2014). All stakeholders and I&APs have been notified of the availability of reports for comment. Hardcopies were submitted to all organs of state and relevant authorities. The reports and supporting documentation were made available for review at the Gerald Sekoto Public Library (Wanderers Avenue, Middelburg. Tel: 013 249 7314) and on Environmental Assurance's website: www.envass.co.za**.
- The Final Environmental Impact Assessment Report (EIR) will be released in due course to I&APs and stakeholders for review and comment for a period of 21 days.

**Impact statement**

The purpose of this report is to assess the identified potential impacts associated with the proposed development. Potential impacts were identified in consultation with I&APs, and through the technical expertise and experience of Environmental Assurance. The report sought to identify and assess the impacts of the proposed development on the biophysical environment and socio-economic status of the area and the probability of the impacts occurring. The proposed new coal mine can pose various risks to the environment as well as the residents in the vicinity of the development, although these risks are likely to be limited in its extent.

**PREFERRED ALTERNATIVE (CONSTRUCTION PHASE)**

| NATURE | DESCRIPTION OF IMPACT | POST-MITIGATION |
|---|---|---|
| **Geological and Soils** | Loss of topsoil and soil erosion through vegetation clearance, wind and stormwater. | Very low (-) |

| NATURE | | DESCRIPTION OF IMPACT | POST-MITIGATION |
|---|---|---|---|
| | | Soil compaction by heavy duty vehicles | Low (-) |
| | | Contamination of soils through:<br>• Indiscriminate disposal of construction waste; and<br>• Accidental spillage of chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from construction vehicles and other chemicals from construction activities e.g. paints. | Low (-) |
| **Agricultural potential and land capability** | | Loss of soil resources for agricultural and other land uses. | Low (-) |
| | | Possibility of "hot" work (e.g. welding) and workers causing veld fires destroying veld and loss of flora and fauna on the study area and on adjacent farms, impacting on the livelihood of farmers. | Very Low (-) |
| | | Altered landforms due to construction of roads and excavation. | Very Low (-) |
| **Existing Land Use of Surrounding Properties** | | Impact of blasting on existing infrastructure on surrounding land. | Low (-) |
| **Hydrology** | **Surface Water and Groundwater** | Stormwater, erosion and siltation impacts due to a lack of implementing temporary measures to manage stormwater run-off quantity and quality during the construction phase. | Very Low (-) |
| | | Contamination of stormwater runoff and groundwater, caused by:<br>• Spills and leaks of cement;<br>• Sediment release;<br>• Chemical toilets;<br>• Chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from construction vehicles;<br>• Indiscriminate storage and disposal of hazardous waste;<br>• Other chemicals from construction activities e.g. paints; and<br>• Effluent discharges, due to a lack of stormwater management. | Very Low (-) |
| | | Altered drainage patterns and stormwater runoff flows, especially due to vegetation clearance | Very Low (-) |
| | | Dewatering of the groundwater aquifer | Low (-) |
| **Biodiversity** | **Flora and Fauna** | Decrease in biodiversity on the study and surrounding area. | Low (-) |
| | | Spill-over impacts, which may occur on adjacent ecological systems especially the sensitive riparian area. | Medium (-) |
| | | Spreading of alien and invasive species | Low (-) |
| | | Impact on natural migratory routes and faunal dispersal patterns. | Medium (-) |
| | | Disturbance of fauna through noise, light and dust pollution and hunting, trapping and killing of fauna. | Low (-) |
| **Archaeological/Heritage Resources** | | Potential for alteration of archaeological, historical and paleontological resources, should it be discovered during the construction phase. | Very Low (-) |

| NATURE | DESCRIPTION OF IMPACT | POST-MITIGATION |
|---|---|---|
| **Visual and Lighting** | Visibility from sensitive receptors / visual scarring of the landscape as a result of the construction activities. | Medium (-) |
| | Visibility of solid domestic waste, building rubble and dust. | Very Low (-) |
| | Impact of security lighting on surrounding landowners and animals. | Very Low (-) |
| **Noise and Vibration** | Nuisance and health risks caused by an increase in the ambient noise level as a result of noise impacts associated with the operation of construction vehicles and equipment. | Very Low (-) |
| | Disturbance due to vibrations caused by construction vehicles and blasting. | Very Low (-) |
| **Air Quality** | Increased dust pollution due to vegetation clearance as well as construction vehicles and activities. | Very Low (-) |
| | Settling of dust on the surrounding area and pasture for livestock may impact on livestock. | Very Low (-) |
| | Windborne dust (soil), vehicle fumes and stockpile particulate matter of $PM_{10}$ and lower which alters air quality and pose a health risk. | Low (-) |
| **Waste (including hazardous materials)** | Generation of additional general waste/ litter / building rubble and hazardous material during the construction phase. | Low (-) |
| | Indiscriminate disposal of waste could pollute natural resources and ecosystems and pose a risk of injury and death of animals and people. | Very Low (-) |
| **Traffic** | The change in the traffic patterns as a result of traffic entering and exiting the proposed mine on the surrounding road infrastructure and existing traffic. | Low (-) |
| | Nuisance, health and safety risks caused by increased traffic on and adjacent to the study area including cars, busses and other heavy vehicles. | Low (-) |
| **Health and Safety** | Possibility of construction activities and workers causing veld fires, which can potentially cause injury and or loss of life to construction workers and surrounding landowners, visitors and workers. | Very Low (-) |
| | Increased risk to public health and safety: Dangerous areas and construction activities including blasting, pose health risks and possible loss of life to construction workers and visitors to the site. | Very Low (-) |
| | Security risks: Trespassing of construction workers on adjacent properties and possible crime. | Very Low (-) |
| | Spreading of diseases such as diarrhoea, HIV and TB. | Low (-) |
| **Socio-economic** | Creation of short term employment opportunities for the local communities, during the construction phase. | Medium (+) |

| NATURE | DESCRIPTION OF IMPACT | POST-MITIGATION |
|---|---|---|
| | Sourcing supplies from local residents and businesses. | Medium (+) |

**PREFERRED ALTERNATIVE (OPERATIONAL PHASE)**

| NATURE | | DESCRIPTION OF IMPACT | SIGNIFICANCE POST-MITIGATION |
|---|---|---|---|
| Geological and Soils | | Loss of topsoil, soil erosion and soil compaction by heavy duty vehicles on site. | Very low (-) |
| | | Contamination of soils through:<br>• Indiscriminate disposal of waste; and<br>• Accidental spillage of chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from vehicles and other chemicals from operational and maintenance activities e.g. paints. | Low (-) |
| | | Flooding of open cast pit. | Low (-) |
| Agricultural potential and land capability | | Possibility of "hot" work (e.g. welding) and workers causing veld fires destroying veld and animals on the study area and on adjacent farms, impacting on the livelihood of farmers. | Very Low (-) |
| Existing Land Use | | Blasting may disturb infrastructure on surrounding land. | Low (-) |
| Hydrology | Surface Water and Groundwater | Stormwater, erosion and siltation impacts due to a lack of implementing temporary measures to manage stormwater run-off quantity and quality during the operational phase. | Very Low (-) |
| | | Contamination of stormwater runoff and groundwater, caused by:<br>• Spills and leaks of cement;<br>• Sediment release;<br>• Chemical toilets;<br>• Chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from construction vehicles;<br>• Indiscriminate storage and disposal of hazardous waste;<br>• Other chemicals from maintenance activities e.g. paints; and<br>• Effluent discharges, due to a lack of stormwater management. | Very Low (-) |
| | | Altered drainage patterns and stormwater runoff flows. | Very Low (-) |
| | | Dewatering on the groundwater aquifer | Low (-) |
| | | Acid Mine Drainage | Low (-) |
| | | Seepage from product stockpiles and from mining operations could cause a contamination plume affecting the underground resources. | Low (-) |
| Biodiversity | Flora and Fauna | Decrease in biodiversity on the study and surrounding area. | Low (-) |
| | | Spill-over impacts, which may occur on adjacent ecological systems. | Low (-) |
| | | Spreading of alien and invasive species | Low (-) |

| NATURE | DESCRIPTION OF IMPACT | SIGNIFICANCE POST-MITIGATION |
|---|---|---|
| | Impact on natural migratory routes and faunal dispersal patterns. | Medium (-) |
| **Archaeological/Heritage Resources** | Potential for alteration of archaeological, historical and paleontological resources, should it be discovered during the operational phase. | Very Low (-) |
| **Visual and Lighting** | Visibility from sensitive receptors / visual scarring of the landscape and impact on 'Sense of Place' as a result of the visibility of the mining site including stockpiles and waste dumps and activities. | Medium (-) |
| | Visibility of solid domestic, dust and operational waste. | Very Low (-) |
| | Impact of security lighting on surrounding landowners and animals. | Very Low (-) |
| **Noise and Vibration** | Nuisance and health risks caused by an increase in the ambient noise level as a result of noise impacts associated with the operation of the mine. | Very Low (-) |
| | Disturbance due to vibrations caused by vehicles and blasting. | Low (-) |
| **Air Quality** | $CO_2$ and Methane emissions from coal mining. | Low (-) |
| | Increased dust pollution due to stockpiles and vehicles on gravel roads as well as other mining activities. | Very Low (-) |
| | Settling of dust on the surrounding area and pasture for livestock, may impact livestock. | Very Low (-) |
| | Windborne dust (soil and ore fines) as well as vehicle fumes and particulate matter of $PM_{10}$ and smaller, altering air quality. | Very Low (-) |
| **Waste (including hazardous materials)** | Generation of additional general waste/ litter / building rubble and hazardous material during the operational phase. | Low (-) |
| | Indiscriminate disposal of waste could pollute natural resources and ecosystems and poses a risk of injury and death of animals and people. | Very Low (-) |
| **Traffic** | The change in the traffic patterns as a result of traffic entering and exiting the new mine, on the surrounding road infrastructure and existing traffic. | Low (-) |
| | Nuisance, health and safety risks caused by increased traffic on and adjacent to the study area including cars, busses and other heavy vehicles. | Low (-) |
| **Health and Safety** | Possibility of mining activities and workers causing veld fires, which can potentially cause injury and or loss of life to mine workers and surrounding landowners, visitors and workers. | Very Low (-) |
| | Increased risk to public health and safety: Dangerous areas and mining activities including blasting, pose health risks and possible loss of life to mine workers and visitors to the site. | Very Low (-) |
| | Security risks: Trespassing of mine workers on adjacent properties and possible crime. | Very Low (-) |
| | Spreading of diseases such as diarrhoea, HIV and TB. | Low (-) |
| **Socio-economic** | Skills development for historically disadvantaged individuals (HDI's) and others from the local communities in the Mpumalanga Province. | Medium (+) |

| NATURE | DESCRIPTION OF IMPACT | SIGNIFICANCE POST-MITIGATION |
|---|---|---|
| | Individuals will be more employable after the operational phase, which will benefit themselves, the workforce, the community and the economy. | |
| | Development and upliftment of the surrounding communities and infrastructure. | Medium (+) |
| | Development of the economic environment, by job provision and sourcing supplies for and from local residents and businesses. | Medium (+) |
| | Creation of short to long term employment during all the phases of mining for local residents and skills transfer to unskilled and semi-skilled unemployed individuals. | Medium (+) |
| | Positive - Sourcing supplies from local residents and businesses. | Medium (+) |

**PREFERRED ALTERNATIVE (DECOMMISSIONING AND REHABILITATION PHASE)**

| NATURE | | DESCRIPTION OF THE IMPACT | POST-MITIGATION |
|---|---|---|---|
| Geological and Soils | | Loss of topsoil and soil erosion through vegetation clearance, wind and stormwater. | Very low (-) |
| | | Soil compaction by heavy duty vehicles. | Low (-) |
| | | Contamination of soils through:<br>• Indiscriminate disposal of construction waste; and<br>• Accidental spillage of chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from construction vehicles and other chemicals from construction activities e.g. paints. | Low (-) |
| Agricultural potential and land capability | | Possibility of operational activities and workers causing veld fires destroying veld and animals on the study area and on adjacent farms, impacting on the livelihood of farmers. | Very Low (-) |
| | | Restoring altered landforms due to excavation. | High (+) |
| Existing Land Use and Capability | | Possibility of decommissioning and rehabilitation activities and workers causing veld fires destroying veld and animals on the study area and on adjacent farms, impacting on the livelihood of farmers. | Very Low (-) |
| Hydrology | Surface water and Groundwater | Stormwater, erosion and siltation impacts due to a lack of implementing temporary measures to manage stormwater run-off quantity and quality during the decommissioning phase. | Very Low (-) |
| | | Contamination of stormwater runoff and groundwater, caused by:<br>• Spills and leaks of cement;<br>• Sediment release;<br>• Chemical toilets;<br>• Chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from construction vehicles;<br>• Indiscriminate storage and disposal of hazardous waste; | Very Low (-) |

| NATURE | | DESCRIPTION OF THE IMPACT | POST-MITIGATION |
|---|---|---|---|
| | | • Other chemicals from construction activities e.g. paints; and<br>• Effluent discharges, due to a lack of stormwater management. | |
| | | Altered drainage patterns and stormwater runoff flows. | Very Low (-) |
| | | Impacts of dewatering on the groundwater aquifer should water be abstracted from groundwater during the decommissioning phase. | Low (-) |
| | | Acid Mine Drainage. | Low (-) |
| **Biodiversity** | **Flora and Fauna** | Disturbance of fauna through noise, light and dust pollution and hunting, trapping and killing of fauna. | Very Low (-) |
| | | Spreading of alien invasive species. | Low (-) |
| | | Impact on natural migratory routes and faunal dispersal patterns. | Medium |
| **Archaeological/Heritage Resources** | | Potential for alteration of archaeological, historical and paleontological resources, should it be discovered during the construction phase. | Very Low (-) |
| **Visual and Lighting** | | Visibility from sensitive receptors / visual scarring of the landscape as a result of the decommissioning and rehabilitation activities. | Medium (-) |
| | | Visibility of solid domestic waste and building rubble. | Very Low (-) |
| | | Impact of security lighting on surrounding landowners and animals. | Very Low (-) |
| **Noise and Vibration** | | Nuisance and health risks caused by an increase in the ambient noise level as a result of noise impacts associated with heavy duty vehicles and equipment. | Very Low (-) |
| | | Disturbance due to vibrations caused by construction vehicles. | Very Low (-) |
| **Air Quality** | | Increased dust pollution due to vegetation clearance and construction vehicles and decommissioning activities. | Very Low (-) |
| | | Settling of dust on the surrounding area and pasture for livestock, may impact livestock. | Very Low (-) |
| | | Windborne dust (soil), vehicle fumes and particulate matter of $PM_{10}$ and smaller, altering air quality. | Very Low (-) |
| **Waste (including hazardous materials)** | | Generation of additional general waste/ litter / building rubble and hazardous material during the decommissioning phase. | Low (-) |
| | | Indiscriminate disposal of waste could pollute natural resources and ecosystems and poses a risk of injury and death of animals and people. | Very Low (-) |
| **Services Water, Sewage, Electricity** | | Need for services i.e. water, electricity and sewerage systems during the decommissioning phase causing additional strain on natural resources. | Medium (-) |
| **Traffic** | | The change in the traffic patterns as a result of traffic entering and exiting the proposed mine on the surrounding road infrastructure and existing traffic. | Low (-) |
| | | Nuisance, health and safety risks caused by increased traffic on and adjacent to the study area including cars, busses and other heavy vehicles. | Low (-) |

| NATURE | DESCRIPTION OF THE IMPACT | POST-MITIGATION |
|---|---|---|
| Health and Safety | Possibility of when 'hot' work is done (e.g. welding) and workers causing veld fires, which can potentially cause injury and or loss of life to construction workers and surrounding landowners, visitors and workers. | Very Low (-) |
| | Increased risk to public health and safety: Dangerous areas and decommissioning activities poses health risks and possible loss of life to construction workers and visitors to the site. | Very Low (-) |
| | Security risks: Trespassing of construction workers on adjacent properties and possible crime. | Very Low (-) |
| | Spreading of diseases such as diarrhoea, HIV and TB. | Low (-) |
| Socio-economic | Creation of short term employment opportunities for the local communities, during the decommissioning phase. | Medium (+) |
| | Sourcing supplies from local residents and businesses. | Medium (+) |

**Recommendations**

Based on the outcome of the impact assessment, our recommendation is that the application for the proposed development should continue, and that the Applicant be allowed to investigate the establishment of the coal mine on Portion 38 of the farm Elandspruit 291 JS. This authorisation should be in line with sensitive planning, design and good environmental management. If the concept of sustainable development is considered, it is proposed that the mine will have a positive impact on the provision of social and economic criteria. With the recommended guidelines provided by the various specialists' studies; the ecological component can also be brought into balance. In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through physical measures, the recommendations from the EIA are included within the Environmental Management Programme (EMPr). It is also our recommendation that this EMPr is approved. It will ultimately be the proponent's responsibility to ensure that all involved parties comply with the EMPr and the conditions of the Environmental Authorisation (EA). If the concept of sustainable development is considered it is proposed that the coal mine will have a positive impact on the provision of social and economic criteria. With the recommended guidelines which would be provided by the various specialists' studies; the ecological component can also be brought into balance.

**Conclusion**

A variety of mitigation measures have been identified that will serve to mitigate the scale, intensity, duration or significance of the potential negative impacts identified. These include guidelines to be applied during the construction, operational and decommissioning phases of the proposed project. The EMPr contains more detailed mitigation measures which are also incorporated into this Environmental Impact Report (EIR). The proposed mitigation measures, if implemented, will reduce the significance of the majority of the identified impacts. It is therefore the recommendation of ENVASS, based on the assessment of the current available information, that the Environmental Impact Report for the proposed Yoctolux Opencast Coal Mine be accepted by the Competent Authority. The authorisation should be in line with sensitive planning, design and good environmental management. Though mining undoubtedly always has an impact on the environment it should be noted that the proposed construction and operation of the mine will have some positive social and economic impact as it will allow for employment of individuals in the Middelburg area during the construction and operational phase, which is an area where unemployment is rife.

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| | Originated By: | Reviewed By: | Approved By: |
|---|---|---|---|
| **Name:** | Nicolene Lotter | Retha Weir | Rachelle Stofberg |
| **Designation:** | Environmental Consultant | Quality Reviewer | Senior Operations Manager |
| **Signature:** |  |  |  |
| **Date:** | 2014/09/26 | 2014/10/04 | 2014/10/29 |

## ABBREVIATIONS

| | |
|---|---|
| **AIA** | Archaeological Impact Assessment |
| **ADT** | Articulated Dump Trucks |
| **ASAPA** | Association of South African Professional Archaeologists |
| **BID** | Background Information Document |
| **CA** | Competent Authority |
| **DAFF** | Department of Agriculture, Forestry and Fisheries |
| **DEA** | Department of Environmental Affairs |
| **DEAT** | Department of Environmental Affairs and Tourism (currently known as DEA) |
| **DMS** | Dense Medium Separation |
| **DWA** | Department of Water Affairs |
| **DWS** | Department of Water and Sanitation |
| **EIA** | Environmental Impact Assessment |
| **EIR** | Environmental Impact Report |
| **EMPr** | Environmental Management Programme |
| **ENPAT** | Environmental Potential Atlas |
| **EP** | Equator Principles |
| **EPC** | Engineering and Procurement Contract |
| **EPFI** | Equator Principles Financial Institutions |
| **ESA** | Early Stone Age |
| **FGM** | Focus Group Meeting |
| **FSR** | Final Scoping Report |
| **GDP** | Gross Domestic Product |
| **GGP** | Gross Geographic Product |
| **GHG** | Green House Gas |
| **GIS** | Geographic Information System |
| **GPS** | Global Positioning System |
| **HIA** | Heritage Impact Assessment |
| **I&APs** | Interested and Affected Parties |
| **IDP** | Integrated Development Plan |
| **IUCN** | International Union for the Conservation of Nature |
| **KSW** | Key Stakeholder Workshop |
| **LSA** | Late Stone Age |
| **LIA** | Late Iron Age |
| **LTI** | Latitude Tilt Irradiation |
| **MDEDET** | Mpumalanga Department of Economic Development, Environment and Tourism |
| **MIA -** | Middle Iron Age |
| **MHSA** | Mine Health and Safety Act (Act No. 29 of 1996) as amended |
| **MSA** | Middle Stone Age |
| **MWP** | Mining Works Program |
| **NEMA** | National Environmental Management Act, 1998 (Act No. 107 of 1998) |
| **NEMBA** | National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) |
| **NHRA** | National Heritage Resources Act, 1999 (Act No. 25 of 1999) |
| **NSBA** | National Spatial Biodiversity Assessment |
| **NWA** | National Water Act, 1998 (Act No. 36 of 1998) |

| | |
|---|---|
| **O&M** | Operations and Maintenance |
| **PHRA** | Provincial Heritage Resources Agency |
| **PSSA** | Paleontological Society of South Africa |
| **PM** | Public Meeting |
| **PPP** | Public Participation Process |
| **ROM** | Run of Mine |
| **SADC** | Southern African Development Community |
| **SAHR** | South African Heritage Resources Agency |
| **SALA** | Subdivision of Agricultural Land of 1970 |
| **SANBI** | South African National Biodiversity Institute |
| **SAWS** | South African Weather Service |
| **SDF** | Spatial Development Framework |
| **VT** | Vegetation Type |

## GLOSSARY OF TERMS

**Alien species**: A plant or animal species introduced from elsewhere: neither endemic nor indigenous.

**Applicant**: Any person who applies for an authorisation to undertake an activity or undertake an Environmental Process in terms of the Environmental Impact Assessment Regulations – National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) as contemplated in the scheduled activities listed in Government Notice (GN) No R. 543, 544 and 545.

**Arable potential**: Land with soil, slope and climate components where the production of cultivated crops is economical and practical.

**Archaeological resources:** This includes:

- material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
- rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- wrecks, being any vessel or aircraft, or any part thereof which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation; features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

**Biodiversity:** The variety of life in an area, including the number of different species, the genetic wealth within each species, and the natural areas where they are found.

**Cultural significance:** This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

**Cumulative impact:** In relation to an activity, cumulative impact means the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

**Ecology**: The study of the interrelationships between organisms and their environments.

**Environment**: All physical, chemical and biological factors and conditions that influence an object.

**Environmental impact assessment:** In relation to an application, to which Scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of the application.

**Environmental impact report:** In-depth assessment of impacts associated with a proposed development. This forms the second phase of an Environmental Impact Assessment and follows on from the Scoping Report.

**Environmental management programme:** A legally binding working document, which stipulates environmental and socio-economic mitigation measures which must be implemented by several responsible parties throughout the duration of the proposed project.

**Gangue:** Commercially valueless material in which ore is found.

**Heritage resources:** This means any place or object of cultural significance. See also archaeological resources above.

**Local relief:** The difference between the highest and lowest points in a landscape. For this study, it is based on 1:50 000 scale.

**$NO_x$:** A generic term for mono-nitrogen oxides (NO) and ($NO_2$ (nitric oxide and nitrogen dioxide).

**Precipitation:** Any form of water, such as rain, snow, sleet, or hail that falls to the earth's surface.

**Red data species:** All those species included in the categories of endangered, vulnerable or rare, as defined by the International Union for the Conservation of Nature and Natural Resources.

**Riparian:** The area of land adjacent to a stream or river that is influenced by stream induced or related processes.

## 1. BACKGROUND

Environmental Assurance (Pty) Ltd [herein after referred to as ENVASS], as independent environmental consultant, has been appointed by the Applicant, Yoctolux Investments (Pty) Ltd, to undertake all the authorisations required for the development of the proposed Yoctolux Coal Mine on Portion 38 of the farm Elandspruit 291 JS, near Middelburg and some 20 km north of the Duvha Power Station, in the Mpumalanga Province.

The proposed coal mine together with its associated infrastructure and activities requires the following authorisations:

- Environmental Authorisation (EA) from the Competent Authority (CA) regulation environmental aspects, the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET);
- Mining right from the CA regulating mining aspects, the Department of Mineral Resources (DMR); and
- Water Use License (WUL) from the CA regulating water use aspects, the Department of Water and Sanitation (DWS).

It was against this backdrop that ENVASS was appointed to ensure that the development will be carried out in accordance with the Environmental Impact Assessment (EIA) Regulations (as amended) which were promulgated in June 2010 under the National Environmental Management Act (no. 107 of 1998) [NEMA], as amended. All relevant legislation have been consulted during the Scoping and EIA process and will be complied with at all times.

The MDEDET on 20 June 2014 accepted the scoping report of the proposed development which ENVASS undertook and ENVASS accordingly advised the Environmental Assessment Practitioner (EAP) in terms of Regulation 31 (1) (a) of the NEMA EIA Regulations to proceed with the steps as contemplated in the Plan of Study (PoS) for EIA, including the public participation process for EIA referred to in Regulation 28 (h) (i – iv) and prepare the EIA report in respect of the proposed activity.

## 2. INTRODUCTION

This section presents the CA with the details of the Applicant applying for authorisation as well as the details of the Environmental Assessment Practitioner (EAP) who compiled this Draft EIA and the expertise of ENVASS which enables them to carry out EIAs.

### 2.1 Details of Applicant

**Table 1: Applicant details**

| | |
|---|---|
| **NAME OF APPLICANT** | Yoctolux Investments (Pty) Ltd |
| **NAME OF MINE** | Yoctolux Coal Mine |
| **CONTACT PERSON** | Nicholus Maloba |
| **POSTAL ADDRESS** | P.O. Box 14522<br>Hatfield<br>PRETORIA<br>0028 |
| **PHYSICAL ADDRESS** | Tijger Valley Office Park<br>Concept House<br>Block A<br>Unit 15<br>10 Pony Street<br>Silver Lakes<br>0081 |

| | |
|---|---|
| **TELEPHONE NUMBER** | 012 809 3505 |
| **FAX NUMBER** | 086 696 4891 |
| **CELL PHONE NUMBER** | 083 476 1247 |
| **EMAIL** | nicholus@talaresources.co.za |
| **LOCATION OF MINE** | Portion 38 of the farm Elandspruit 291 JS near Middelburg, Mpumalanga Province |
| **MINERAL TYPE** | Coal |
| **ESTIMATED LIFE OF MINE** | Estimated at approximately 29 months |

## 2.2 Details and expertise of the Environmental Assessment Practitioner [Regulation 31 (2) (a) (i - ii)]

**Table 2: Details and expertise of the Environmental Assessment Practitioner**

| | |
|---|---|
| **NAME OF ENVIRONMENTAL CONSULTANCY** | Environmental Assurance (Pty) Ltd [ENVASS] |
| **PROJECT TEAM** | ENVASS TEAM<br>- Emile van Druten (Specialist, Pri. Sci. Nat) [BSc Honns Environmental Management (PUK / MSc MPM (3) Project Management (UP) / Environmental Training Dip (Rhodes)];<br>- Rachelle Stofberg (Senior Environmental Consultant) [B.Sc. Cons. Ecol. / M Env. Man.];<br>- Nicolene Lotter (WULA Specialist) [B.Sc. Honns. Env. Man.] ;<br>- Monica Niehof (Public Participation Consultant) [B.Sc. Honns. Env. Man.];<br>- Vuyokazi April (Ecological Specialist, Pri. Sci. Nat) [M.Sc. Entomology]; and<br>- Du Toit Wilken (Visual, Noise and Air Quality Specialist) [M.Sc. Env. Sci.]. |
| **EXPERTISE OF EAP** | ENVASS has the necessary experience within our project team to carry out Scoping and EIA processes. Auditing, WULA, MPRDA and EIA (NEMA) projects have been completed for various mining companies throughout South Africa:<br>• Samancor Chrome;<br>• Amari Resources;<br>• South African Coal Mine Holdings Limited;<br>• Canyon Coal;<br>• Eastplats;<br>• Makoya Supply Chain Holdings;<br>• Coal of Africa;<br>• Assmang BRMO; and<br>• Shanduka Coal. |
| **ENVIRONMENTAL CONSULTANT** | Nicolene Lotter |
| **PHYSICAL AND POSTAL ADDRESS** | 394 Tram Street<br>Brooklyn<br>Pretoria<br>0181 |
| **TELEPHONE NUMBER** | 012 460 9768 |
| **FAX NUMBER** | 012 460 3071 |
| **EMAIL** | nicolene@envass.co.za |

## 2.3 Details of the specialist project team

**Table 3: Details of specialist team**

| ORGANISATION | SPECIALIST INFORMATION / STUDY |
|---|---|
| **ENVASS** | Baseline Visual Assessment |
| **Tobias Coetzee and Leanne George** | Heritage Impact Assessment |
| **ENVASS** | Ecological Assessment |
| **AED** | EIA and SASS Bio-monitoring, baseline wetland and riparian delineation |
| **AED** | Surface Water Assessment |
| **ENVASS** | Land Capability Assessment |
| **Tala Mineral Services (Pty) Ltd** | Geological Assessment |
| **GPT** | Geohydrological Assessment |
| **ENVASS** | Noise Assessment |
| **ENVASS** | Air quality Assessment |

# 3. LOCATION AND DESCRIPTION OF THE PROPOSED ACTIVITY [REGULATION 31 (2) (b) and (c) (i-ii)]

## 3.1 Location of the proposed mine

The proposed Yoctolux Coal Mine will be located on Portion 38 of the farm Elandspruit 291 JS (T0JS000000000029100038), Middelburg **(Figure 1)** and falls within the municipal boundaries of the Nkangala district and Steve Tshwete local municipalities. The two main products that will be produced by the mine are bituminous (thermal) and anthracite to semi-anthracite coal. The Mining method to be employed on site is that of opencast strip mining (Roll-over) and beneficiation of the coal will take place on the site. The reserve to be mined consists of a single opencast mining block the actual resource area is 30 ha.

**Table 4: Coordinates**

| LOCATION | COORDINATE |
|---|---|
| North eastern corner | 25°48'31.81"S<br>29°23'8.16"E |
| South eastern corner | 25°48'50.43"S<br>29°23'10.10"E |
| South western corner | 25°48'51.88"S<br>29°22'39.03"E |
| North western corner | 25°48'31.10"S<br>29°22'39.91"E |
| Centre | 25°48'42.10"S<br>29°22'55.14"E |

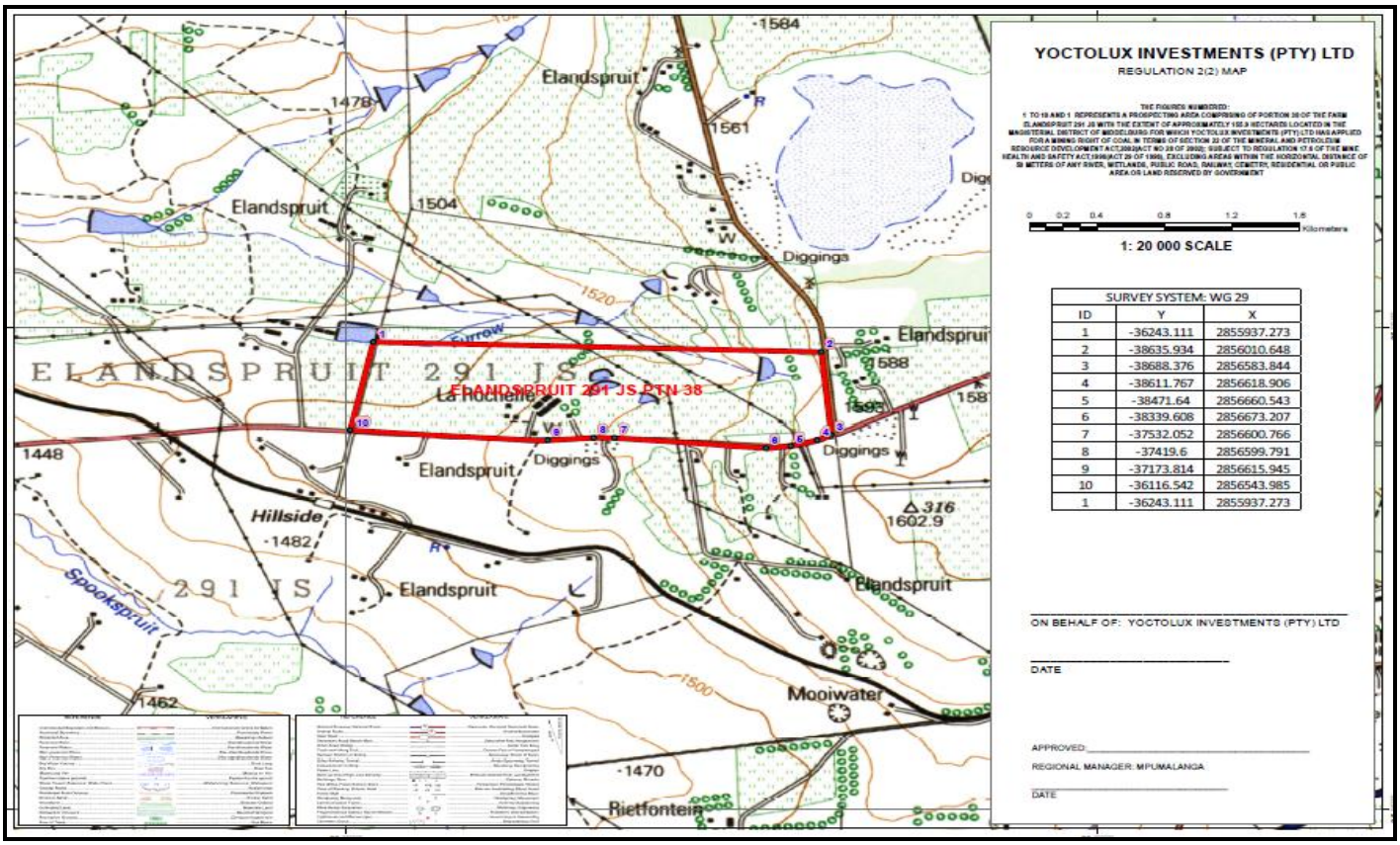


**Figure 1: Locality (Yoctolux MWP)**

## 3.2 Description of the mining project

### 3.2.1 Mining method

The Mining method to be employed on site is that of opencast strip mining (Roll-over). Mining operations will commence in a double box cut and operations will advance to a steady state over a year and then till end of life of mine. A conventional strip mining [roll-over] method will be employed. Material from the box cut phase will be stored per overburden classification, with the bulk of the material placed in a position alongside the final strip, to facilitate filling of the final void. Earthmoving will be done by both truck and shovel operation and by dozing, once the opencast mining has entered the strip mining [steady-state] phase. Hard overburden and coal will be blasted to an acceptable fragmentation. Box cut 1 (70m width) will be established during the construction phase. Topsoil and overburden from the box cut will be stockpiled separately for final rehabilitation. Once the box cut has been established the normal strip mining roll-over methodology will be applied to the mining operation whereby topsoil is stripped two strips in advance of the current working strip and is either stockpiled or place directly on the rehabilitated area behind the advancing strips, thereafter subsoil is removed. The overburden is drilled and blasted and approximately 40% is dozed into the void behind the current strip, after which the balance of overburden is loaded and hauled to the rehabilitation side and back-tipped. This sequence continues to the end of the pit. Once reaching the limit of the pit the overburden which has been stockpiled is dozed in to fill the final void and the stockpiled topsoil is then placed on to the levelled area (Yoctolux MWP).

Rehabilitation of the opencast mining area will be done concurrently with the opencast mining according to a stated mining sequence. Materials will be placed back into the void in the former strata graphical sequence i.e. topsoil on the surface, subsoil directly below the topsoil and all hard material [sandstone and shale] in the bottom of the void. It is envisaged that the final reinstated surface level will be approximately 0.29 m above the original surface level. However the existing surface drainage pattern will remain unchanged and the total disturbed area will be free draining. On completion of surface reinstatement, the area will be re-

vegetated with suitable pasture grass species. The estimated post surface profile has been calculated by bulking [Soft 10% and Hards 30%] the overburden and deducting the volume of coal that will have been removed over the area. Excess material will result in a higher surface after mining and a depression if there is insufficient material. In the case of Elandspruit the re-instated surface will be nominally higher at 0.29 m (Yoctolux MWP) **[Refer to Annexure 4]**.

### 3.2.2 Infrastructure

The construction of infrastructure for the mining operations will only commence once the environmental authorisation has been granted. This mining operation will make use of existing infrastructure as much as possible (i.e. existing fencing and access road). The following infrastructure will be established on site:

- Access & Haul roads (with necessary security) including the upgrading of the access point to the gravel road;
- Contractor's Yard with septic/chemical ablution facilities;
- Weighbridge, workshop and stores (with septic/chemical ablution facilities);
- Diesel facilities and a hard park;
- Box cut and opencast pit (drill & blast);
- Stockpiles (topsoil, overburden, subsoil/softs, ROM, Processed & Washed Coal);
- Crushing and Screening Plant;
- DMS Wash Plant; and
- Surface water management measures (stormwater diversion berms and trenches; pollution control dams, etc.) [Yoctolux MWP];

## 4. PROJECT MOTIVATION: NEED AND DESIRABILITY [REGULATION 31 (2) (f)]

According to the Western Cape Department of Environmental Affairs and Development Planning's (WC DEADP) Guideline on Need and Desirability: EIA Guideline and Information Document Series (2011), to describe the need for a development, it must be determined whether it is the right *time* for locating the type of land use and/or activity being proposed. To describe the desirability for a development, it must be determined) whether it is the right *place* for locating the type of land use and/or activity being proposed. Need and desirability can be equated to the concept of *wise use of land which can be determined through* the question of what is the most sustainable use of land. In light of the above, the need and desirability of an application must be addressed separately and in detail answering *inter alia* the following questions:

**Table 5: Need and desirability considerations**

| A) NEED (TIMING) | |
|---|---|
| **QUESTION A1:** Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved SDF agreed to by the relevant environmental authority? | The project is aligned with the objectives of the Spatial Development Framework (SDF) and Integrated Development Plan (IDP) and will not compromise the integrity of these respective forward planning documents. |
| YES **X** / NO | |
| **QUESTION A2:** Should development, or if applicable, expansion of the town/area concerned in terms of this land use (associated with the activity | This section presents an overview of the current South African consumers putting the mining of coal by Yoctolux into perspective. Eskom is a South African electricity public utility, established in 1923 as the Electricity Supply Commission (ESCOM) by the government of South Africa in terms of the Electricity Act (1922). Total coal |

| | | |
|---|---|---|
| being applied for) occur here at this point in time? | | production in South Africa is approximately 244 million tonnes per annum. Of this, thermal coal exports has remained stagnant around the 68 million tonnes per annum level for the last couple of years although the current export capacity of the Richards Bay Coal Terminal (RBCT) is 72 million tonnes per annum. An additional 3 million tonnes per annum are exported through the Matola Coal Terminal in Maputo and Bulk Connections in Durban, resulting in total exports in the order of 65 million tonnes per annum (DME, 2011) Coal produced for Eskom and Sasol. The top four coal mining companies (BHP Billiton, Anglo Coal, Sasol Mining and Exxarro Resources) in South Africa produce more than 80% of the country's total production and are also major players in the thermal export market. Around 53 million tonnes of the 65 million tonnes exported are produced by these four producers, as well as approximately 100 million tonnes of the 110 million tonnes consumed by Eskom. A number of projects are under development by junior mining companies. The current project list predicts the production of an additional 55 million tpa within the next four to five years. South Africa consumes approximately 175 million tonnes of coal per annum.<br><br>The utility is the largest producer of electricity in Africa, is among the top seven utilities in the world in terms of generation capacity and among the top nine in terms of sales. The company is divided into Generation, Transmission and Distribution divisions and together ESKOM generates approximately 95% of electricity used in South Africa. Currently, ESKOM has 24 power stations in commission, consisting of 13 coal-fired stations (3 of which are in cold reserve storage, 1 nuclear station, 2 gas turbine stations, 6 hydroelectric stations and 2 pumped storage schemes. The total nominal capacity of ESKOM Power Stations is 42 011 MW. The net maximum capacity of ESKOM Power Stations is 36 208 MW (ESKOM Annual Report: 2008). ESKOM consumes an estimated 110 million tonnes of coal per annum (DME Statistics, 2009). SASOL Synthetic Fuels consumption is estimated at 42.5 million tonnes per annum (DME Statistics 2009). The coal is consumed mostly for gasification feedstock and utilises coal for SASOL's complexes in Secunda and Sasolburg, and is produced mainly by SASOL Mining operations. SASOL is the second largest consumer of thermal coal in South Africa. Remaining coal consumption is estimated at 22.7 million tonnes per annum. This includes approximately 4 million tonnes of anthracite and semi-soft coking coal. The estimated thermal coal consumption is 18 million tonnes per annum (DME, 2008).<br><br>At a macro-level there are essentially three market segments for bituminous coal, these are:<br>• Eskom - Low Grade Coal (19.0Mj/kg – 23.3Mj/kg);<br>• Export - High Grade Steam Coal (>5,900Kcl/kg); and<br>• Metallurgical - High Grade Low Phos, High Fixed Carbon.<br><br>Given the size and quality of the reserve, the proposed Yoctolux Coal mine will target primarily mining companies that have existing contracts and supplier relationships with the above-mentioned markets and in particular the Eskom market. Several potential consumers have been identified and include but are not limited to the |
| YES **X** | NO | |

| | | |
|---|---|---|
| | | following companies:<br>• Mbuyelo Colliery (Pty) Ltd.;<br>• Wescoal (Pty) Ltd.;<br>• Elandspruit Colliery (SAMM) (Pty) Ltd.;<br>• Eskom (Direct marketing agreement);<br>• Blackwattle Colliery (Pty) Ltd.;<br>• Shanduka Coal (Pty) Ltd.; and<br>• Eskom – Duvha Power Station.<br><br>The companies have been selected based on their proximity to the proposed Yoctolux Coal Mine, all being less than 50km by road from the proposed operation. All of these companies together have the demand to purchase 60 000 tons per month. |
| **QUESTION A3:** Does the community/area need the activity and the associated land use concerned (is it a societal priority)? | | Unemployment is a major problem within the Steve Tshwete Local and Nkangala District Municipalities. The Yoctolux Coal Mine will have a significant positive impact on the baseline socio-economic conditions of the local communities involved. The mine will create several employment opportunities and preference will be given to the locally unemployed, wherever possible. The mine will furthermore contribute towards the socio-economic development of the region as a whole through social upliftment and job creation as primary agents. |
| YES **X** | NO | |
| **QUESTION A4:** Are the necessary services with the adequate capacity currently available (at the time of application), or must additional capacity be created to cater for the development? | | Infrastructure will have to be constructed for the mining operations. For detail refer to section 7.2. |
| YES | NO **X** | |
| **QUESTION A5:** Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services and opportunity costs)? | | No municipal infrastructure will be required for the study area. |
| YES | NO **X** | |
| **QUESTION A6:** Is this project part of a national programme to address an issue of national concern or importance? | | The project is not part of a national program, however it is addressing the national concern of limited coal resources in South Africa, especially for purposes of electricity generation. |
| YES | NO **X** | |
| **B) DESIRABLILITY (PLACING)** | | |
| **QUESTION B1:** Is the development the best practicable environmental option for this land/site? | | The study area has been transformed due to agricultural activities. However the study area is underlain by a belt containing coal which will be utilised to improve social and economic environments. Leaving the area in its current state could potentially, if not adequately managed, result in degradation and transformation due to further overgrazing etc. Through implementing good practice environmental |
| YES **X** | NO | |

| | | |
|---|---|---|
| | | management and mitigation measures, it will ensure that both human and environment benefit from the development. |
| **QUESTION B2:** Would the approval of this application compromise the integrity of the existing approved and credible municipal IDP and SDF as agreed to by the relevant authorities? | | The project is aligned with the objectives of the municipal SDF and IDP and will not compromise the integrity of these respective forward planning documents. |
| YES | NO **X** | |
| **QUESTION B3:** Would the approval of this application compromise the integrity of the existing environmental management priorities of the area (e.g. as defined in EMFs), and if so, can it be justified in terms of sustainability considerations? | | The project is aligned with the objectives of the EMF and will not compromise the integrity of these respective forward planning documents. |
| YES | NO **X** | |
| **QUESTION B4:** Do location factors favour this land use (associated with the activity applied for) at this place, etc.)? | | No location alternatives are applicable to this project since the coal is contained in an underlying belt in the development area. Locating the development in another area will resulting in the ore not being utilised and the economy and society will not be benefiting from the Yoctolux Coal Mine. |
| YES **X** | NO | |
| **QUESTION B5:** Will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)? | | The development will impact on the Elandspruit and Elandspruit spring. For more detail refer to section 6.1.7. |
| YES **X** | NO | |
| **QUESTION B6:** Will the development impact on people's health and wellbeing (e.g. in terms of noise, odours, visual character and sense of place, etc.)? | | Noise, dust and odours will increase, however with the proper mitigation measures and good practice environmental management measures, it will result in minimal impacts. |
| YES **X** | NO | |
| **QUESTION B7:** Will the proposed land use result in unacceptable cumulative impacts? | | As already mentioned, through the implementation of good practice environmental management measures, all direct and cumulative impacts which may result from the proposed development will be addressed and ensure that the environment is affected to the minimum. |
| YES | NO **X** | |

# 5. LEGISLATIVE FRAMEWORK

## 5.1 National legislative framework

This section provides an overview of the legislative requirements applicable to this project and it includes the acts, guidelines and policies considered in the compilation of this report.

### 5.1.1 Constitution of the Republic of South Africa (Act no. 108 of 1996)

The legislative motivation for this project is underpinned by the Constitution of South Africa, 1996 (Act No. 108 of 1996), which states: "The State must, in compliance with Section 7(2) of the Constitution, respect, protect, promote and fulfil the rights enshrined in the Bill of Rights, which is the cornerstone of democracy in South Africa".

Section 24 of the Constitution states:
*"Everyone has the right-*
*(a) To an environment that is not harmful to their health or well-being; and*
*(b) To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that-*
*(i) Prevent pollution and ecological degradation;*
*(ii) Promote conservation; and*
*(iii) Secure ecologically sustainable development and use of natural resources while promoting a justifiable economic and social development"*.

Section 24 of the Constitution requires that all activities that may significantly affect the environment and require authorisation by law must be assessed prior to approval. In addition, it provides for the Minister of Environmental Affairs or the relevant provincial Ministers to identify:

- New activities that require approval;
- Areas within which activities require approval; and
- Existing activities that should be assessed and reported on.

Section 28 (1) of the Constitution states 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".* If such pollution or degradation cannot be prevented then appropriate measures must be taken to minimise or rectify such pollution or degradation. These measures may include:

- Assessing the impact on the environment;
- Informing and educating employees about the environmental risks of their work and ways of minimising these risks;
- Ceasing, modifying or controlling actions which cause pollution/degradation;
- Containing pollutants or preventing movement of pollutants;
- Eliminating the source of pollution or degradation; and
- Remedying the effects of the pollution or degradation.

### 5.1.2 National Environmental Management Act (no. 107 of 1998) and Environmental Impact Assessment Regulations (2010) [both as amended]:

Yoctolux Investments (Pty) Ltd is applying for an EA in terms of the National Environmental Management Act (no. 107 of 1998) (as amended) [NEMA] and the Environmental Impact Assessment (EIA) Regulations of 2010 (Government Notice No's R 543, 544 and 545 in Government Gazette No. 33306 of 18 June 2010) [as amended] for the construction and operation of an opencast coal mine. NEMA strives to regulate national environmental management policy and is focussed primarily on co-operative governance, public participation and sustainable development. NEMA makes provisions for co-operative environmental governance by establishing

principles for decision making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by Organs of State and to provide for matters connected therewith.

The proposed construction and operational activities associated with the coal mine falls within the ambit of the scheduled activities listed in Government Notice (GN) No. 544 and 545 **(Table 6**Error! Reference source not found.**)**. A full Scoping and EIA process is being undertaken in terms of the requirements stipulated in GN. No. 543.

Regulation 31 deals with the EIA Report (EIAR) and depicts the contents of an EIA:

*31 (2) An EIAR 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:*

- *(a) Details of*
  - *(i) The EAP who compiled the report; and*
  - *(ii) The expertise of the EAP to carry out an EIA;*
- *(b) A detailed description of the proposed activity;*
- *(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;*
- *(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;*
- *(e) Details of the Public Participation Process (PPP) conducted in terms of Sub regulation (1), including*
  - *(i)Steps undertaken in accordance with the PoS;*
  - *(ii) A list of persons, organisations and organs of state that were registered as Interested and/or Affected Parties (I&APs);*
  - *(iii) A summary of comments received from, and a summary of issues raised by registered I&APs, the date of receipt of these comments and the response of the EAP to those comments;*
  - *(iv) Copies of any representations and comments received from registered I&APs;*
- *(f) A description of the need and desirability of the proposed activity;*
- *(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;*
- *(h) An indication of the methodology used in determining the significance of potential environmental impacts;*
- *(i) A description and comparative assessment of all alternatives identified during the EIA process;*
- *(j) A summary of the findings and recommendations of any specialist report or report on a specialised process;*
- *(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;*
  - *(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 cause irreplaceable loss of resources;*
  - *(vii) The degree to which the impact can be mitigated;*
- *(m) A description of any assumptions, uncertainties and gaps in knowledge;*

*(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 the authorisation;*

*(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;*

*(p) A draft Environmental Management Program (EMPr) containing the aspects contemplated in Regulation 33;*

*(q) Copies of any specialist reports and reports on specialised processes complying with Regulation 32;*

*(r) Any specific information that may be required by the CA; and*

*(s) Any other matters required in terms of Sections 24 (4) (a) and (b) of NEMA*

*(3) The EAP managing the application must provide the CA with detailed, written proof of an investigation as required by Section 24 (4) (b) (i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in Sub regulation 31 (2) (g), exist.*

*Regulation 32 deals with specialist reports as well as reports on specialised processes and depicts the contents of these reports:*

*32 (1) An Applicant or the EAP managing an application may appoint a person to carry out a specialist study or specialised processes.*

*(2) The person referred to in Sub regulation (1) must comply with the requirements or regulation 17;*

*(3) A specialist report or a report on specialised processes prepared in terms of the Regulations must contain*

*(a) Details of*

*(i) The person who prepared the report;*

*(ii) The expertise of that person to carry out the specialist study or specialised process;*

*(b) A declaration that the person is independent in a form as may be specified by the CA;*

*(c) An indication of the scope of, and the purpose for which, the report was prepared;*

*(d) A description of the methodology adopted in preparing the report or carrying out the specialised processes;*

*(e) A description of any assumptions made and any uncertainties or gaps in knowledge;*

*(f) A description in findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment;*

*(g) Recommendations in respect of any mitigation measures that should be considered by the Applicant and the competent authority;*

*(h) A description of any consultation process that was undertaken during the course of carrying out the study;*

*(i) A summary and copies of any comments that were received during any consultation process; and*

*(j) Any other information requested by the CA.*

The proposed development triggers the following listed activities as set out in the EIA Regulations of 2010:

**Table 6: Listed activities associated with the proposed mine**

| NOTICE | ACTIVITY | ACTIVITY DESCRIPTION | PROJECT RELEVANCE |
|---|---|---|---|
| 544 | 9 | The construction of facilities or infrastructure exceeding 1 000 metres in length for the bulk transportation of water, sewage or storm water -<br>i) With an internal diameter of 0.36 metres or more; or<br>ii) With a peak throughput of 120 litres per second or more, excluding where:<br>a) Such facilities or infrastructure are for bulk transportation of water, sewage or storm water or | It is likely that infrastructure exceeding 1000 metres in length is required for the mining operations. Such infrastructure will be constructed for bulk (water / waste water) transportation, during the construction phase. |

| | | | |
|---|---|---|---|
| | | storm water drainage inside a road reserve; or<br>b) Where such construction will occur within urban areas but further than 32 meters from a watercourse, measured from the edge of a watercourse. | |
| 544 | 11 | The construction of:<br>i) Canals;<br>ii) Channels;<br>iii) Bridges;<br>iv) Dams;<br>v) Weirs;<br>vi) Bulk stormwater outlet structures;<br>vii) Marinas;<br>viii) Jetties exceeding 50 square metres in size;<br>ix) Spillways exceeding 50 square meters in size;<br>x) Buildings exceeding 50 square meters in size; or<br>xi) Infrastructure or structures covering 50 square meters or more:<br>where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse excluding where such construction will occur behind the development setback line. | Infrastructure (associated with the mining operations) exceeding 50 sqm metres will be constructed within a water course and within 32m of the edge of a watercourse, as the study area is characterised by a number of water courses such as streams, fountain and dams. |
| 544 | 13 | The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres. | Mining operations will require the storage and handling of coal ore which is classified as a dangerous goods, the coal stockpiles may have a combined capacity of more than 80 cubic metres. |
| 544 | 18 | The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock from:<br>i) A watercourse;<br>ii) The sea;<br>iii) The seashore;<br>iv) The littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater -<br>but excluding where such infilling, depositing, dredging, excavation, removal or moving<br>a) Is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or<br>b) Occurs behind the development setback line. | The construction and operational activities associated with the mining operations will require the infilling or depositing of material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand or rock from a watercourse. |
| 544 | 22 | The construction of a road outside urban areas -<br>i) With a road reserve wider than 13,5 meters;<br>ii) Where no reserve exists where the road is wider than 8 meters or | The existing access route which is currently a gravel road may be upgraded or reconstructed so as to meet the infrastructure requirements of |

| | | | |
|---|---|---|---|
| | | iii) For which an environmental authorization was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Notice 545 of 2010. | the mine. |
| 545 | 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. | Construction of pollution control dams and dirty water and clean water diversion trenches. |
| 545 | 10 | The construction of facilities or infrastructure for the transfer of 50 000 cubic metres or more water per day, from and to or between any combination of the following:<br>(i) water catchments,<br>(ii) water treatment works; or<br>(iii) impoundments, excluding treatment works where water is to be treated for drinking purposes. | To ensure the safe continuation of the mining activity seepage water may need to be removed from the box cuts and transferred away from the active mining area, such transfer of water may exceed 50 000 cubic metres or more per day). Such infrastructure is required for the mining operations. |
| 545 | 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 hectares or more;<br>except where such physical alteration takes place for:<br>i) Linear development activities; or<br>ii) Agriculture or afforestation. | More than 20 hectares of land will be transformed by the construction of the mine and associated mining activities. |
| 545 | 20 | Any activity which requires a mining right or renewal thereof as contemplated in section 22 of the Mining and Petroleum Resources Development Act, 2002 (Act 28 of 2002). | The proposed mine and associated operations requires a mining right in terms of the Mineral and Petroleum Resources Development Act, 2002. |
| 546 | 13 | The clearance of an area of 300 square metres or more of vegetation where 75% or more or vegetative cover constitutes indigenous vegetation. | The establishment of the proposed mine (155.9 hectares) will require the clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation. |
| 546 | 14 | The clearance of an area of 1 hectare or more of vegetation where 75% or more of vegetative cover constitutes indigenous vegetation. | The establishment of the proposed mine (155.9 hectares) may require the clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation. |

### 5.1.3 Mineral and Petroleum Resources Development Act (no. 28 of 2002)

The proposed coal mining operations requires authorisation from the Department of Mineral Resources (DMR). The principles of the Mineral and Petroleum Resources Development Act (no. 28 of 2002) [MPRDA] is based on sustainable development by integrating social, economic, and environmental factors into the planning and implementation of mining projects, in order to ensure that exploitation of mineral resources serves present and future generations. Special consideration shall be given to the Environmental Management Programme (EMPr) to be and this shall include fulfilment of the requirements of Regulation 51 of the MPRDA.

A Prospecting Right and subsequent Mining Right application was lodged at the DMR respectively in terms of Sections 16 and 22 of the MPRDA has been applied for and the required Scoping and EIA was undertaken in accordance with the requirements of the MPRDA. The DMR granted the Applicant with a Prospecting Right (MP 30/5/1/1/2/5483PR) on 30 March 2012. The Mining Right (MP 30/5/1/2/2/10066 MR) was granted to the Applicant on 25 July 2014.

### 5.1.4 National Water Act, 1998 (no.36 of 1998)

The National Water Act (no. 36 of 1998) [NWA] aims to provide management of the national water resources to achieve sustainable use of water for the benefit of all water users. This requires that the quality of water resources is protected as well as integrated management of water resources with the delegation of powers to institutions at the regional or catchment level.

The purpose of NWA is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways, which take into account:

- Meeting the basic human needs of present and future generations;
- Promoting equitable access to water;
- Redressing the results of past racial discrimination;
- Promoting the efficient, sustainable and beneficial use of water in the public interest;
- Facilitating social and economic development;
- Providing for growing demand for water use;
- Protecting aquatic and associated ecosystems and their biological diversity;
- Reducing and preventing pollution and degradation of water resources;
- Meeting international obligations and
- Managing floods and droughts.

The construction and operational activities associated with the proposed coal mine requires compliance with the requirements of NWA as listed under GN No. 19182. In November 2013, an application for an Integrated Water Use License (IWULA) [Ref: 16/2/7/B100/C654] have been lodged with the Bronkhorstspruit regional office of the former Department of Water Affairs (DWA) in terms of Section 21 of the NWA to undertake the following activities:

a) Abstraction of water;
c) Impeding or diverting the flow of water in a watercourse;
g) Disposing of waste in a manner which may detrimentally impact on a water resource;
i) Altering the bed, banks, course or characteristics of a watercourse; and
j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.

### 5.1.5 National Heritage Resources Act (no. 25 of 1999)

The proposed coal mine must comply with the requirements stipulated in the National Heritage Resources Act, 1999 (Act 25 of 1998) (NHRA). NHRA legislates the necessity for Cultural and Heritage Impact Assessment (HIA) in areas earmarked for development, which exceed 0.5 ha or linear development exceeding 300 metres in length. The Act makes provision for the potential destruction to existing sites, pending the archaeologist's recommendations through permitting procedures. Permits are administered by the South African Heritage Resources Agency (SAHRA).

Section 38 (1) of NHRA, subject to the provisions of subsections (7), (8) and (9), requires that any person who intends to undertake a development categorised as:

(a) The construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
(b) The construction of a bridge or similar structure exceeding 50m in length;
(c) Any development or other activity which will change the character of a site-
    (i) Exceeding 5 000 $m^2$ 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 $m^2$ in extent; or
(e) Any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

Archaeological impact assessments (AIAs) are often commissioned as part of the heritage component of an EIA and are required under Section 38(1) of the NHRA of 1999, Section 38(8) of the NEMA and the MPRDA. A phase 1 assessment has been undertaken for the proposed project in accordance with Section 38 (1) (a).

### 5.1.6 National Environmental Management: Biodiversity Act (no. 10 of 2004) [as amended]

The overarching aim of the National Environmental Management: Biodiversity Act (no. 10 of 2004) [NEMBA], within the framework of NEMA, is to provide for:

- The management and conservation of biological diversity within South Africa as well as for the components of such biological diversity;
- The use of indigenous biological resources in a sustainable manner and
- The fair and equitable sharing among stakeholders of benefits arising from bio-prospecting involving indigenous biological resources.

As part of its implementation strategy of NEMBA, the National Spatial Biodiversity Assessment was developed. This assessment classifies areas as worthy of protection based on its biophysical characteristics, which are ranked according to priority levels. The approach used for biodiversity planning is systematic and entails the following three key principles:

- The need to conserve a representative sample of biodiversity pattern, such as species and habitats (the principle of representation);
- The need to conserve the ecological and evolutionary processes that allow biodiversity to persist over time (the principle of persistence); and
- The need to set quantitative biodiversity targets that quantifies the degree of conservation required for each biodiversity feature in order to maintain functioning landscapes and seascapes.

Furthermore, the South African National Biodiversity Institute (SANBI) was established by the NEMBA, its purpose being (*inter alia*) to report on the status of the country's biodiversity and the conservation status of all listed threatened or protected species and ecosystems. NEMBA provides for a range of measures to protect ecosystems and for the protection of species that are threatened or in need of protection to ensure their survival in the wild, including a prohibition on carrying out a "restricted activity" involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 8 of the Act. Lists of critically endangered, endangered, vulnerable and protected species have been published and a permit system for listed species has been established. It is also appropriate to undertake an Ecological (Fauna and Flora) Impact Assessment for developments in an area that is considered ecologically sensitive and which requires environmental authorisation in terms of NEMA, with such assessment taking place during the Scoping or EIA phase. The Applicant is therefore required to take appropriate reasonable measures to limit the impacts on biodiversity, to obtain permits if required.

### 5.1.7 National Environmental Management: Air Quality Act (no. 39 of 2004) [as amended]

Section 28 (1) of NEMA places a general duty of care on any person who causes pollution, to take reasonable measures to prevent such pollution from occurring. The objective of the National Environmental Management: Air Quality Act, 2004 (NEM:AQA) is to regulate air quality in order to protect, restore and enhance the quality of air in the Republic, taking into account the need for sustainable development. Furthermore, the provision of national norms and standards regulating air quality monitoring, management and the control by all spheres of government determine that specific air quality measures should be adhered to. Dust created during the construction and operational phases of the proposed coal mine could influence air quality and thus make this legislation relevant to this development. Air quality monitoring during the operational phase of the mine will be considered to be a measure to exercise this duty of care, since it will establish the types and volumes of dust emissions emanating from the operational activities.

### 5.1.8 Conservation of Agricultural Resources Act (Act 43 of 1983)

The aim of the Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA) is to provide for control over the utilisation of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants and for matters connected therewith. The EIA phase of the project will take into account the requirements of CARA as well as determine the potential direct and indirect impacts on agricultural resources as a result of the proposed mining development.

The soils occurring on the proposed area will be disturbed in the construction phase. Any medium to long-term impacts after construction needs to be limited. A land capability assessment has been undertaken to identify the present soil forms as well as their physical and chemical characteristics and how they will react to any disturbance.

### 5.1.9 National Environmental Management: Waste Act (no. 59 of 2008) [as amended]

The National Environmental Management: Waste Act (no. 59 of 2008) [NEM:WA], as amended, and Waste Classification and Management Regulations, 2003 (GNR: 634 – 635) [as amended]. To reform the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development; to provide for institutional arrangements and planning matters; to provide for national norms and standards for regulating the management of waste by all spheres of government; to provide for specific waste management activities; to provide for the remediation of contaminated land; to provide for the national waste information system; to provide for compliance and enforcement; and to provide for matters connected therewith. The construction and operational activities associated with the proposed coal mine shall be in accordance with the requirements of (NEM:WA) and Waste

Classification and Management Regulations, 2003 (GNR: 634 – 635). On 02 June 2014, the National Environmental Management: Waste Amendment Act (No. 26 of 2014) [NEM:WAA] came into effect. The regulation and management of mine residue stockpiles and tailings facilities are now regulated under NEM:WAA. Reference is made to the Schedule 3 (Defined Wastes) definitions of NEM:WAA:

Hazardous waste is waste that contains organic or inorganic elements or compound that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environmental and includes hazardous substances, materials or object within business waste, residue deposits and residue stockpiles. Residue deposits are residue stockpiles remaining at the termination, cancellation or expiry of a prospecting right, mining permit, mining right, exploration right or production right. Residue Stockpiles are any debris, discard, tailings, slimes, screening, slurry, waste rock, foundry sand, mineral processing waste, ash or any other product derived from or incidental to a mining operation and which is stockpiled, stored or accumulated within the mining operation and which is stockpiled, stored or accumulated within the mining area for a potential re-use, or which is disposed of, by the holder of a mining right, mining permit or, production right or an older order right, including historic mines and dumps created prior to the implementation of the NEM:WAA.

Residue deposits and residue stockpiles include:

- Wastes resulting from exploration, mining, quarrying as well as physical and chemical treatment of minerals:
  - Wastes from mineral excavation;
  - Wastes from physical and chemical processing of metalliferous minerals;
  - Wastes from physical and chemical processing of non-metalliferous minerals; and
  - Wastes from drilling muds and other drilling operations.

Currently no transitional arrangements are in place and the EAP is currently in consultation with the Department of Environmental Affairs and the DMR to confirm whether a Waste Management License (WML) is required.

### 5.1.10 Mine Health and Safety Act (no. 29 of 1996) [as amended]

The following is an extract from the Act:
"Objectives of Act:

1. The objectives of this Act are:
   (a) To protect the health and safety of persons at mines;
   (b) To require employers and employees to identify hazards and eliminate, control and minimise the risks relating to health and safety at mines;
   (c) To give effect to the public international law obligations of the Republic that concern health and safety at mines;
   (d) To provide for employee participation in matters of health and safety through health and safety representatives and the health and safety committees at mines;
   (e) To provide for effective monitoring of health and safety conditions at mines;
   (f) To provide for enforcement of health and safety measures at mines;
   (g) To provide for investigations and inquiries to improve health and safety at mines; and
   (h) To promote –
      (i) A culture of health and safety in the mining industry;
      (ii) Training in health and safety in the mining industry; and
      (iii) Co-operation and consultation on health and safety between the State, employers, employees and their representatives"

The construction and operational activities associated with the proposed manganese mine shall be in accordance with the requirements of the Act.

### 5.1.11 National Forest Act (no. 84 of 1998)

The purposes of the National Forest Act, 1998 (Act 84 of 1998) as amended (NFA) includes inter alia:
(c) Provide special measures for the protection of certain forests and trees:
(d) Promote the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes.
The study area contains protected tree species identified in terms of Section 12 (1) (d) read with Section 15 (1) and Section 62 (2) (c) of the NFA. The listed of protected tree species was published in GN 877 of 22 November 2013. Protected trees likely to be found in the study area includes: A*cacia erioloba* (commonly known as Camel Thorn or Kameel Doring)*, Acacia haematoxylon* (commonly known as Grey Camel Thorn) and *Boscia albitrunca* (commonly known as Shepherd's tree). A permit for the removal / destruction of protected trees will be applied for with the Department of Agriculture, Forestry and Fisheries (DAFF).

### 5.1.12 National Veld and Forrest Fire Act (no. 101 of 1198)

The purpose of the act is to prevent and combat veld, forest and mountain fires throughout the Republic. The act provides for a variety of institutions, methods and practices for achieving the purpose. There is a risk of veld fires during the construction and operational phases of the mine. The Applicant and all contractors and employees have roles and responsibilities in terms of this act that have to be implemented.

## 5.2 Provincial legislative framework

**Table 7: Provincial legislation, policies and guidelines considered**

| TITLE OF LEGISLATION, POLICY OR GUIDELINE | APPLICABILITY TO THIS PROJECT | ADMINISTERING AUTHORITY | DATE |
|---|---|---|---|
| Nkangala Spatial Development Framework (2012) | This framework was consulted to inform whether the proposed development is aligned with the objectives and strategies of the Municipality's Policies and Spatial Planning. The PSDF accordingly recognises and is aligned with the applicable statutes, policies, protocols and agreements that regulate land-use at all levels throughout the biosphere, including:<br>Relevant international agreements, protocols and conventions. National and provincial legislation and policy. Regional and local SDFs, structure plans and other policy. | Nkangala District Municipality Administration | 2012 |
| Steve Tshwete Local Municipality Integrated Development Plan 2012 | This plan was consulted to inform the Need and Desirability of the proposed development as the Socio-Economic characteristics of the area. In addition, this plan was consulted to inform whether the proposed development is aligned with the objectives and strategies of the municipality's planning objectives. | Steve Tshwete Local Municipality | 2012 |

| | | | |
|---|---|---|---|
| DEA&DP and DEA Guidelines on Public Participation | Used as a guide to inform of the public participation process. | • Department of Environmental Affairs and Development Planning<br>• Department of Environmental Affairs | 2012 |
| DEA&DP and DEA Guidelines on Alternatives | Used as a guide to inform on the use and presentation of alternatives in the EIA process. | • Department of Environmental Affairs and Development Planning<br>• Department of Environmental Affairs | 2012 |
| DEA&DP and DEA Guidelines on Need and Desirability | Used as a guide to inform on the need and desirability in conjunction with the above mentioned SDF's and IDP's. | • Department of Environmental Affairs and Development Planning<br>• Department of Environmental Affairs | 2013 |
| The Vegetation of South Africa, Lesotho and Swaziland. Mucina & Rutherford (2006). SANBI, Pretoria | Utilised as a reference guide for the identification specific environmental information. | SANBI | 2006 |
| Mpumalanga Biodiversity Conservation Plan (MBCP) | The MBCP builds on other national plans at the provincial level in Mpumalanga. It is intended to be used by all who are involved in land-use and development planning, most particularly those specialists who need a comprehensive source of biodiversity information. It provides a basis for the Mpumalanga Tourism and Parks Agency (MTPA) to review its biodiversity conservation policy and to focus its attention on high value areas for future protection initiatives. | • Mpumalanga Tourism and Parks Agency (MTPA)<br>• Department of Agriculture and Land Administration (DALA) | |
| Mpumalanga Tourism and Parks Agency Act | Provide for the sustainable management and promotion of tourism and nature conservation in the Province and to ensure the sustainable utilisation of natural resources | • MTPA | 2005 |
| Highveld priority area air quality management plan | The plan has been designed at a strategic level, indicating high-level tasks for responsible parties. The specific planning at an operational level, such as budgeting, human resource allocation, and detailed activity planning, has been excluded from the plan. This is to allow parties to tailor their implementation activities to their specific context, particularly organisational constraints, while still achieving the overall objective of the Air Quality Management Plan (AQMP). | Nkangala District Municipality | 2011 |
| Environmental | Integrates policies and frameworks, and align different | MDEDET | 2009 |

| | | | |
|---|---|---|---|
| Management Framework for the Olifants and Letaba Rivers Catchment Areas (OLEMF) | government mandates in a way that will streamline decision-making to improve cooperative governance and guide future development in an environmentally responsible manner. | | |
| Mining and biodiversity guideline | With the primary purpose of improving consistency in dealing with biodiversity issues this Guideline assists relevant authorities in implementing and enforcing the law, and assists companies to comply with the law, implement good practice and reduce business risk. Importantly, this is a Guideline to aid the integration of biodiversity issues into the mining life cycle rather than a set of rules which can be applied unilaterally without interpretation and regard for the context. | • Department of Environmental Affairs;<br>• Department of Mineral Resources | 2013 |
| State of the environment report: Background Information Document for the identification of environmental indicators | Understanding the current condition of the environment, to assist in dealing with any change that may take place. | Nkangala District Municipality | 2005 |

## 6. DESCRIPTION OF THE BASELINE ENVIRONMENT [REGULATION 31 (2) (d)]

### 6.1 Physical environment

#### 6.1.1 Temperature and precipitation

Portion 38 of the farm Elandspruit 291 JS occurs in an area with typical Highveld conditions. The summers are moderate and wet while the winters are harsh, cold and dry. Average daily temperatures are in the middle 20 °C range in summer (October to March) and are lower than 15 °C in winter (April to September). Winter minima fall below 0°C in June, July and August. Annual rainfall ranges between 550 mm and 750 mm. The summer temperatures range from 9 ˚C to 32 ˚C and winter temperatures from -6 ˚C to 22 ˚C. Frost occurs frequently between May and September. The area where the proposed Coal Mine will be located falls in the summer rainfall region, which is characterised by thunderstorm activity and relatively low average rainfall. The mean annual rainfall is 735 mm compared to the mean annual potential evaporation of 1500 mm. Pertinent climate data was obtained from the Middelburg (No. 0515/826) and Belfast (No. 0517/0190) weather stations. The average number of days per month having rainfall depths in excess of 0.1 mm, together with the average monthly depth of rainfall, is presented in **Table 8: Average monthly rainfall depths and days having a rainfall of <0.1mm.**

**Table 8: Average monthly rainfall depths and days having a rainfall of <0.1mm**

| Month | Average Depth (mm) | Average Days |
|---|---|---|
| **January** | 132 | 13.8 |
| **February** | 103 | 11.2 |
| **March** | 88 | 9.5 |
| **April** | 42 | 6.5 |
| **May** | 19 | 2.9 |

| | | |
|---|---|---|
| **June** | 7 | 1.5 |
| **July** | 9 | 1.7 |
| **August** | 8 | 0.9 |
| **September** | 22 | 3.7 |
| **October** | 63 | 8.3 |
| **November** | 124 | 13.0 |
| **December** | 118 | 13.1 |
| **TOTAL** | **735** | **86.1** |

The maximum rainfall intensities at the relevant weather stations are shown in **Table 9: Maximum rainfall intensitiesError! Reference source not found.**.

**Table 9: Maximum rainfall intensities**

| **24 HOUR RAINFALL DEPTHS (mm)** | | | |
|---|---|---|---|
| Maximum recorded | 1:50 year storm event | 1:100 year storm event | 1:200 year storm event |
| 117 | 104 | 118 | 134 |

In 1939, 1133 mm of rain was recorded at Bethal. This is the highest annual rainfall recorded to date. The lowest annual rainfall of 433 mm was recorded in Middelburg in 1935. The most rain recorded in 24 hours was 117 mm in Bethal on 28 December 1940. The average and actual maximum and minimum temperatures between the weather stations are presented in Table 10.

**Table 10: Mean monthly maximum and minimum temperatures (˚C)**

| MONTH | DAILY MAXIMUM | DAILY MINIMUM | HIGHEST TEMPERATURE | LOWEST TEMPERATURE |
|---|---|---|---|---|
| January | 27.2 | 13.7 | 32.0 | 9.1 |
| February | 26.8 | 13.4 | 30.8 | 9.0 |
| March | 26.8 | 11.4 | 30.2 | 6.4 |
| April | 23.9 | 7.4 | 27.9 | 1.4 |
| May | 21.3 | 2.2 | 26.1 | -2.9 |
| June | 18.5 | -1.8 | 22.4 | -6.0 |
| July | 18.4 | -1.7 | 23.0 | -5.8 |
| August | 21.4 | 0.8 | 26.0 | -4.1 |
| September | 24.0 | 5.3 | 29.2 | -1.3 |
| October | 26.0 | 10.1 | 31.2 | 4.4 |
| November | 26.2 | 11.8 | 31.8 | 5.9 |
| December | 27.1 | 13.2 | 31.2 | 7.8 |
| **YEARLY AVERAGE** | **23.9** | **7.2** | **28.4** | **2.0** |

6.1.2 Wind

The prevailing wind direction is from the northwest at an average speed of less than 5 m/s. The windiest months are September, October and November. No data on wind patterns is available for the proposed Coal Mine site, but the relatively close proximity and similar topography to Middelburg will result in similar wind data to that of the CSIR station in Middelburg. The mean monthly evaporation figures recorded at the relevant weather stations are given in Table 11**Error! Reference source not found.**. The data in the table was obtained using an 'A'

**Table 11: Mean monthly evaporation figures**

| MONTH | EVAPORATION (mm) | RAINFALL (mm) | MONTHLY DEFICIT (mm) |
|---|---|---|---|
| **January** | 160 | 132 | 28 |
| **February** | 140 | 103 | 37 |
| **March** | 110 | 88 | 22 |
| **April** | 110 | 42 | 68 |
| **May** | 85 | 19 | 66 |
| **June** | 70 | 7 | 63 |
| **July** | 75 | 9 | 66 |
| **August** | 110 | 8 | 102 |
| **September** | 140 | 22 | 118 |
| **October** | 160 | 63 | 97 |
| **November** | 160 | 124 | 36 |
| **December** | 180 | 118 | 62 |
| **TOTAL** | **1500** | **735** | **765** |

Being located on the Highveld, the Coal Mine will be exposed to extreme weather on regular basis. The weather conditions include draughts, floods and strong gusty winds prior to and during thunderstorms. Frost also occurs on an average of 120 to 150 days between April and September.

### 6.1.3 Geology

The area where the proposed Yoctolux Coal Mine is to be situated falls within the Springs-Witbank Coalfield. The sediments of the coalfield were deposited on an undulating pre-Karoo floor and consequently the distribution and thickness of the Karoo Sequence sediments vary significantly. Dolerite dyke intrusions are ubiquitous throughout the area and in the southern sections of the coalfield the dykes are typically up to 5m thick with an east-west orientation. The sediments of the Karoo basin were deposited in fluvial floodplains and shallow shelves over a period of more than one hundred million years extending from the late Carboniferous (290 million years ago) to the early Jurassic (190 million years ago). Locally, siltstones and sandstones of the Vryheid Formation, Ecca Group are encountered. These rock types weather to fine grained sands, silts and clays. In the lower terrain units transported, wet, clayey sand with occasional gravel overlies the residual profile. The underlying geology of the area forms part of the Vryheid Formation which consists of a sequence of sandstone and shale, with carbonaceous shale overlying the coal seams. The Witbank Coalfield in the Mpumalanga Province of South Africa is situated on the northern sector of the main Karoo basin. The main Karoo basin is described as an asymmetric depository with a stable, passive cratonic platform (Kaapvaal Craton) in the northwest and a fore deep to the south with the Cape Fold Belt on its southern margin. A simplified stratigraphic column of the Karoo Super group occur here. Table 12 introduces the general geology of the basin (April, 2013 and Huisaman, 2013).

**Table 12: Simplified stratigraphic column of the Karoo Super group in the northern portion of the Karoo basin**

| PERIOD (AGE) | GROUP | FORMATION | ROCK TYPES |
|---|---|---|---|
| Jurrasic (150 my) | | Drakensberg | Basaltic lava |
| Triassic (195 my) | | Clarens | Rine-grained sandstone |
| | | Elliot | Red sandstone, mudstone |

| | | | |
|---|---|---|---|
| | | Molteno | Sandstone, sub-ordinate coal |
| Permian (225 my) | Beaufort | Tarkastad | Sandstone, shale |
| | | Estcourt | Sandstone, shale and sub-ordinate coal |
| | Ecca | Volksrust | Shale, sandstone and sub-ordinate coal |
| | | Vryheid | Sandstone, shale and coal |
| | | Pietermaritzburg | Shale |
| Upper Carboniferous (285 my) | | Dwyka | Tillite and varved shale |

Coal seams developed in the Witbank Coalfield are contained within the Vryheid Formation, which ranges in thickness between 80m and 200m. Dolerite dykes and sills outcrop over two thirds of South. The structural complexity of these intrusives is phenomenal and has not received much attention in the past published literature. These intrusives form a complex network within the coal bearing Vryheid Formation of the Ecca Group, leaving these sedimentary rocks of sequences of succession structurally and metamorphically disturbed. The structural disruptions of the coal seams in the Witbank Coalfield are mainly due to the intrusion of dolerite dykes and sills. However, small-scale graben type faulting and fracturing within the coal seams also occur. Exposure of the dolerites is limited to where it intersects the coal seams in underground and opencast mines. Information on the pre-Karoo rocks in this area is also sparse, as it is not the intention of exploration and mining companies to penetrate the pre-Karoo basement during drilling of boreholes, but rather to terminate penetration beneath the coal seam of interest (April, 2013 and Huisaman, 2013).

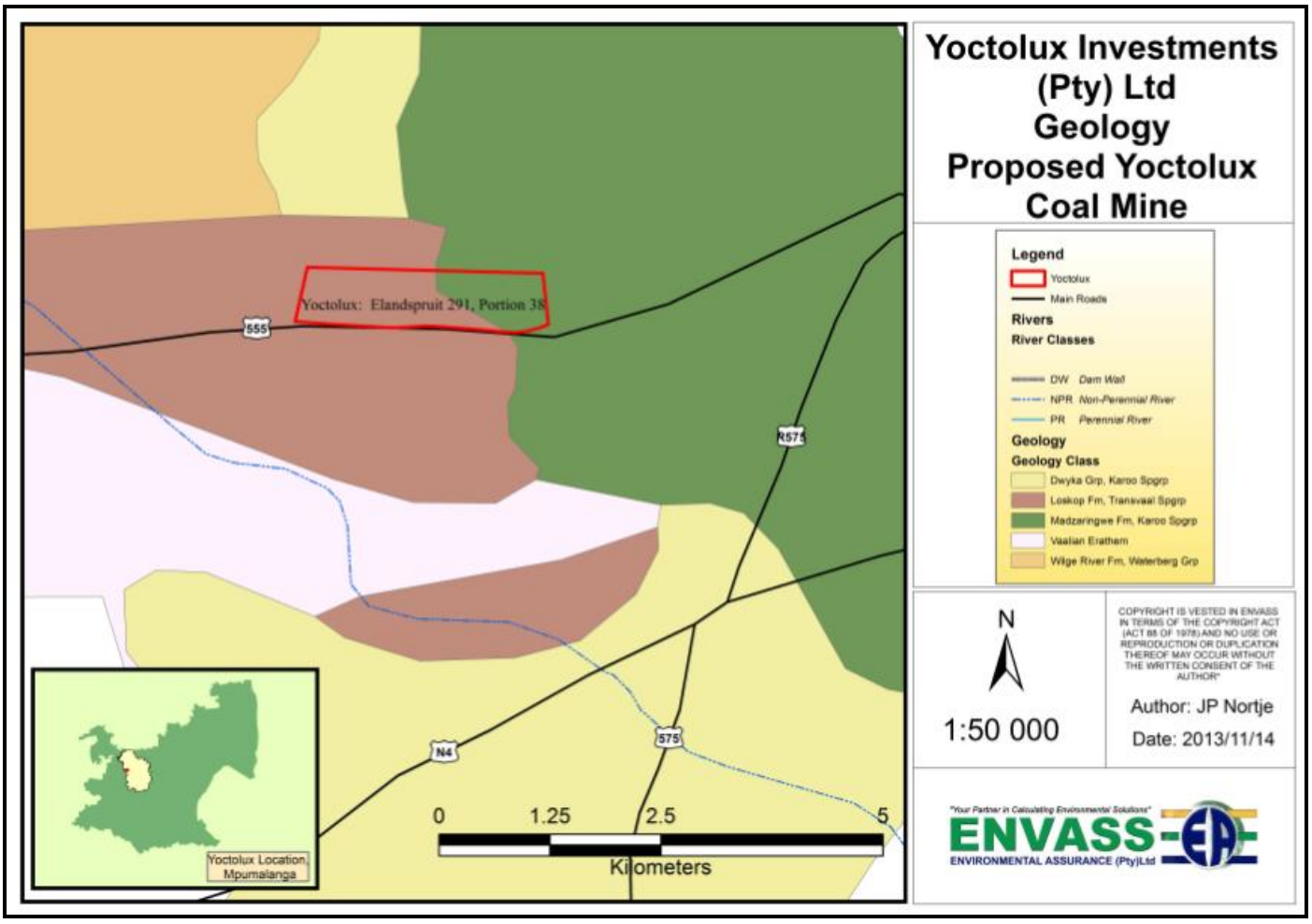


**Figure 2: Geology associated with the study area (ENVASS)**

### 6.1.4 Soil and agricultural potential

Land capability of the majority of the local region is classed as arable and agriculture is extensively practiced. However the agricultural potential for the site is low, but the soils are good for grazing. The predominant land uses in the area are electricity generation and transmission facilities, coal mining operations and agricultural activities with pockets of residential areas supporting these activities. The area proposed for the Yoctolux Coal Mine is currently used for agricultural purposes however the predominant land use in the area is coal mining, with coal mines located in at least four directions of the study area. The soil found at the study area are all classified as sand or loamy sands based on the Sand, Silt and Clay compositions. The soil type offers a relatively fast hydraulic conductivity and will therefore not hold water for long periods. This will in effect influence the soils ability to react to any form of treatment and or enrichment as water will effectively just not be held long enough through capillary suctions in the soils. It is also clear the soils (due to the mother material), present a very high homogeneity, meaning that soil particles are all more or less the same size affecting the compatibility of the soils and also in effect increasing the credibility (Van Druten, 2013).

The soils that occur at the study area are as follow:

- **Mispah (Ms):** It has a thin Orthic A Horizon solid rock. The soils vary from 10 – 30 cm in depth. There are large boulders on the surface. It is marginal for agricultural production.
- **Oakleaf (Oa):** It has an Orthic A Horizon over a Neocutanic B Horizon. The soil varies in depth from 75 – 100 cm. They are highly erodible and therefore low to medium potential soils (Van Druten, 2013).

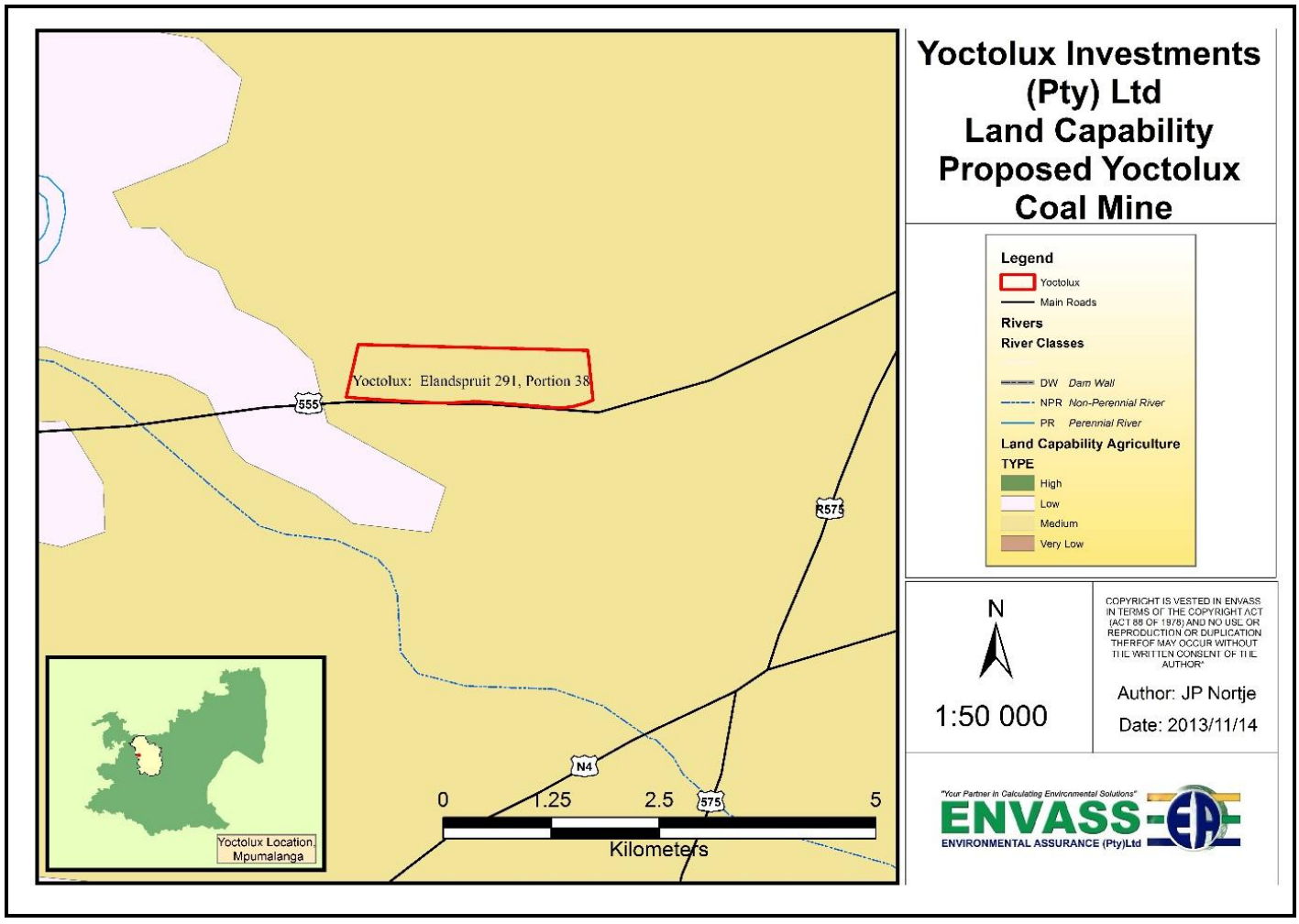


**Figure 3: Land capability (ENVASS)**

| Properties | Soil 1 | Soil 2 |
|---|---|---|
| Soil form | Mispah | Oakleaf |
| Sub Dominant soil | Glenrosa | Hutton |
| Soil family | 1100 | 1110 |
| Soil Depth | 0-20cm | 80-100cm |
| Effective rooting depth | 20cm | 60cm |
| Infiltration rate | Low <5mm/h | Moderate 5-10mm/h |
| Consistency | Friable | Friable |
| Structure | Apedal | Loose |
| Texture | Lm Sa | Lm Sa |
| Drainage | Fast | Fast |
| Gravel/Rocks A Horizon | 80% | 10%- |
| Gravel/rocks B1 Horizon | 100% | 30% |
| Gravel/rocks B2 Horizon | - | - |
| Wetness | - | - |
| Compactability | Low | Low |
| Erodability | Very High | Very High |
| Potential Nematode Infestation | Low | High |
| Irrigation classification | 5 | 4 |
| Land capability (Ag) | 8 | 4 |
| Land Capability (mining) | Wilderness | Arable |

**Figure 4: Physical properties of the soil found at the study area (Van Druten, 2013)**

### 6.1.5 Topography and hydrology

Surface topography of the Yoctolux coal mine area is characterised by a flat to gentle undulating topography and in the area of the proposed mining site, the slope is more or less in the order of 2:100 (0.02). Locally drainage is towards furrows and streams which flow from west to east around the opencast mining area. A single spring was also identified to the east of the proposed mining area. On larger scale, drainage occurs towards the northwest, towards the generalised flow of the Olifants River.

### 6.1.6 Groundwater

Groundwater resources are spatially widespread (18 boreholes and 1 spring was found in the area) **[Refer to Annexure 3 for the Geohydrological Report]**. Based on exploration borehole logs, percussion drilling and pump testing the following local hydro-geological (within the mining rights area) description from top (surface) to bottom (Dwyka Tilites) can be deduced as follows (Huisaman, 2013):

#### 6.1.6.1 *Shallow perched aquifer (unconfined)*

Although not observed this aquifer probably develops during high rainfall season in low lying areas. The aquifer is characteristic of clay, colluviums, alluvium and weathered sandstone. Within this unconfined (water table) aquifer, perched groundwater conditions

often occur. These shallow perched aquifers are essentially restricted to the soil (soft overburden) horizon. The hydraulic conductivity value for the aquifer is estimated at 1x10-5 m/d to 0.10 m/d. The estimated thickness of the aquifer ranges from a minimum of 3.3 m to a maximum of 9.6 m at an average of 6.6 m (Huisaman, 2013).

#### 6.1.6.2 *Shallow weathered aquifer (unconfined)*

This aquifer comprises of white erinaceous sandstones located just above the S5 coal seam horizon. The Ecca sediments are weathered below surface throughout the area. The upper aquifer is associated with this weathered zone and water is often found within a few metres of the surface. The hydraulic conductivity value for the aquifer is estimated at 1x10-6 m/d to 0.10 m/d. The estimated thickness of the aquifer ranges from a minimum of 3.2 m to a maximum of 66.9 m at an average of 8.9 m (Huisaman, 2013).

#### 6.1.6.3 *Deeper fractures aquifer (confined)*

The pores within the Karoo and more specifically the Ecca sediments are too well-cemented to allow any significant flow of water. All groundwater movement therefore occurs along secondary structures, such as fractures and joints in the sediments. These structures are better developed in competent rocks, such as sandstone, hence the better water-yielding properties of the latter rock type. It should be emphasised, however, that not all secondary structures are water-bearing. Many of these structures are constricted because of compression forces that act within the earth's crust. The chances of intersecting a water-bearing fracture by drilling decrease rapidly with depth. At depths of more than 30 m, water-bearing fractures with significant yield were observed to be spaced at 100 m or greater. The estimated thickness of the aquifer ranges from a minimum of 3.3 m to a maximum of 94.3 m at an average of 28.9 m (Huisaman, 2013).

#### 6.1.6.4 *Lateral extent of aquifers*

The lateral extent of the groundwater zone is a severely complex issue. For the perched aquifer zone, the lateral extent is usually finite, varying as a function of the lateral extent of soil and clay lenses. The weathered and fractured Karoo aquifers, barring the occurrence of dolerite intrusions and hydraulic boundaries on the scale of the area of investigation can be taken as infinite. It is obvious however that their lateral extent in the study area is highly dependent on the distribution of dolerite dykes and sills. Ignoring the effects of geological features, the maximum lateral extent of the aquifers is also limited by hydraulic boundaries as formed by major rivers/streams which act as groundwater discharge boundaries, topographical watersheds which act as no-flow boundaries and surface infiltration sources which usually represent constant head influxes. A hydro census was conducted for the proposed opencast mining site and in the surrounding area, during April 2013. A total of 18 boreholes and 1 spring were identified during this hydro census study. Most boreholes that were identified were found to be privately owned. The majority of identified boreholes are used for domestic purposes, irrigation and livestock watering. A flow measurement was done on Spring ELS during the hydro census. The flow in the spring was estimated to be in the order of 4l/s. The spring is used currently for domestic purposes and livestock watering (Huisaman, 2013).

#### 6.1.6.5 *Groundwater quality associated with the area*

During the hydro census water samples were collected from 18 boreholes **(Figures 5 and 6)** on and around the site. Ten of those samples were submitted for major cation and anion analyses to determine the water quality of the area. The groundwater results were compared with the maximum recommended concentrations for domestic use and livestock watering as defined by the former DWAF Water Quality Guidelines (Huisaman, 2013).

| ID | Latitude | Longitude | Elevation | Owner | Property | Casing height | Static water level (mbgl) | Analysed/ not analysed | Use |
|---|---|---|---|---|---|---|---|---|---|
| ELS1 | -25.81158 | 29.38598 | 1586 | J. Kruger | Elandspruit | - | 20 | Analysed | Irrigation, livestock and domestic |
| ELS2 | -25.80384 | 29.37876 | 1566 | Dine Katzen | Elandspruit | 150mm | nm | Analysed | Livestock and domestic |
| ELS3 | -25.80295 | 29.37968 | 1571 | Dine Katzen | Elandspruit | none | 9.63 | Not analysed | Not in use |
| ELS4 | -25.80246 | 29.37856 | 1567 | Dine Katzen | Elandspruit | none | 14.12 | Not analysed | Not in use |
| ELS5 | -25.81199 | 29.38463 | 1581 | Barrie Venter | Elandspruit | 700mm | 5.55 | Not analysed | Not in use |
| ELS6 | -25.81258 | 29.38483 | 1583 | Barrie Venter | Elandspruit | 130mm | 7.99 | Analysed | Not in use |
| ELS7 | -25.8165 | 29.38324 | 1584 | Barrie Venter | Elandspruit | 150mm | 19.2 | Not analysed | Not in use |
| ELS8 | -25.81476 | 29.38313 | 1569 | Barrie Venter | Elandspruit | 160mm | 10.58 | Not analysed | Not in use |
| ELS9 | -25.81546 | 29.37194 | 1535 | Barrie Venter | Elandspruit | none | 5.85 | Analysed | Not in use |
| ELS10 | -25.82345 | 29.3689 | 1500 | Gys du Plessis | Elandspruit | none | nm | Not analysed | Irrigation, livestock and domestic |
| ELS11 | -25.82369 | 29.3655 | 1505 | Ronnie Claasens | Elandspruit | none | nm | Analysed | Irrigation, livestock and domestic |
| ELS12 | -25.82438 | 29.37341 | 1571 | S. C. Badenhorst | Elandspruit Plot 65 | 300mm | 12.18 | Analysed | Livestock and domestic |
| ELS13 | -25.81699 | 29.35634 | 1506 | Simon Mudau | Elandspruit Plot 16 | 300mm | 23.07 | Not analysed | Livestock and domestic |
| ELS14 | -25.81713 | 29.36215 | 1509 | Virginia Ward | Elandspruit | none | 18.19 | Analysed | Livestock and domestic |
| ELS15 | -25.81826 | 29.3617 | 1510 | Virginia Ward | Elandspruit | none | 13.94 | Not analysed | Not in use |
| ELS16 | -25.82523 | 29.36013 | 1491 | P. A. Vistenbury | Elandspruit | none | nm | Not analysed | Domestic |
| ELS17 | -25.82102 | 29.37977 | 1562 | Loot Burger | Elandspruit Plot 67 | none | 53.23 | Analysed | Domestic |
| ELS18 | -25.81199 | 29.39783 | 1599 | Marietjie de Wet | Elandspruit | none | nm | Analysed | Domestic |
| Spring ELS | -25.81311 | 29.38386 | 1577 | Barrie Venter | Elandspruit | n/a | n/a | Analysed | Livestock and domestic |
| Average Elevation | | | | Average Water Level | | | 10.8575 | | |

**Figure 5: Hydro census sampling points (Huisaman, 2013)**

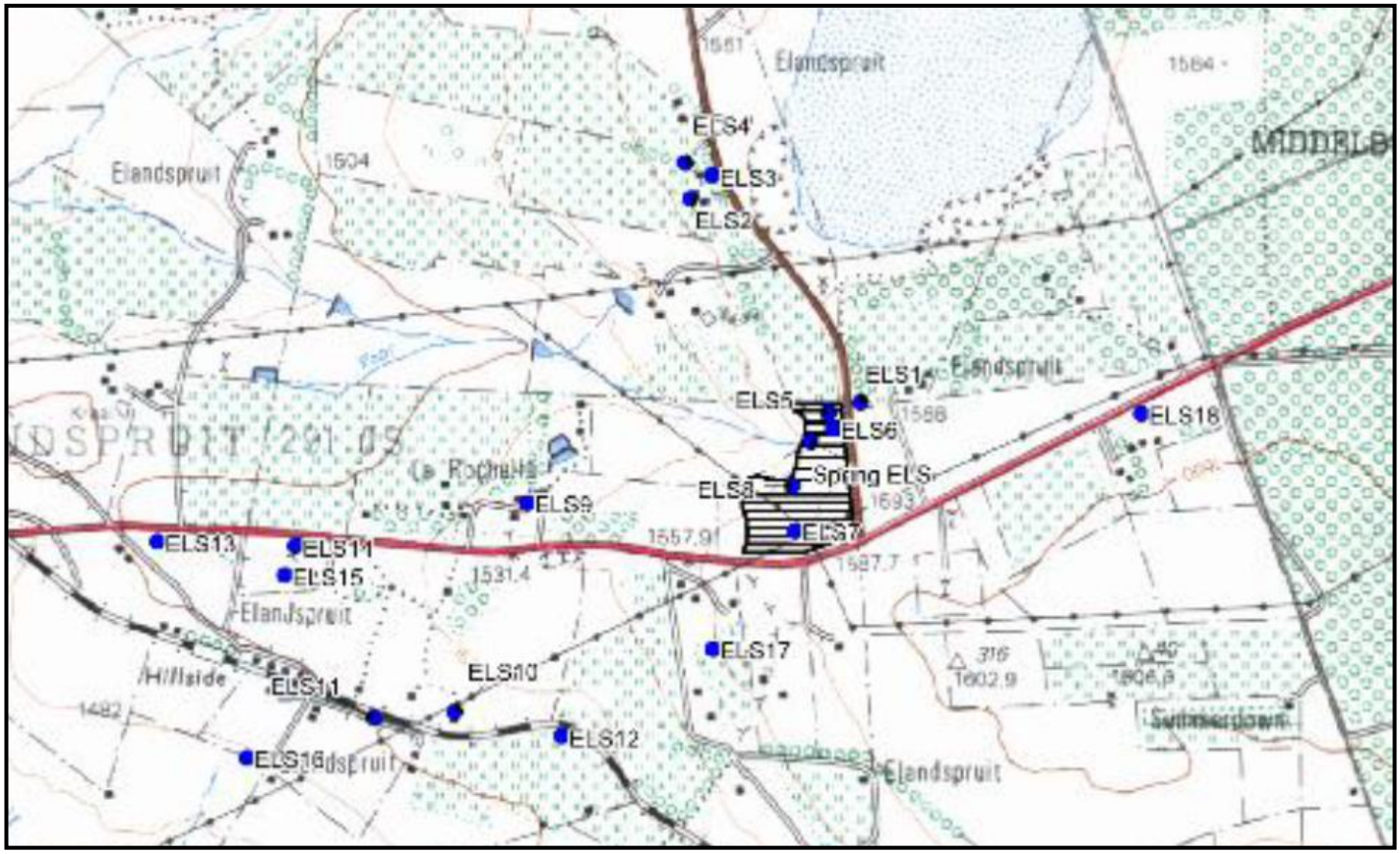


**Figure 6: Positions of hydro census sample points (Huisaman, 2013)**

The only constituents that were found to be elevated when compared to the guidelines for domestic use were Ca, $NO_3$ and pH. The Ca and $NO_3$ concentrations were only found to exceed the tolerable water quality range in ELS14. The elevated concentration of these constituents in ELS14 may be a result of nearby farming activities. Low pH values can be seen in ELS1and ELS 18 and therefore do not comply with the guidelines for domestic use. The low pH in ELS18 can be attributed to its close proximity to the opencast mine on the neighbouring farm. A number of boreholes have metal concentrations that fall within the tolerable water quality range when compared to the DWA guidelines. The concentrations of Al (ELS18), Fe (ELS6 and ELS9), Mg (ELS14) and Mn (ELS2, ELS6 and ELS9) are elevated above the target water quality range (Huisaman, 2013).

It was found that the sulphates are within the target quality water range for all samples when compared to the DWA guidelines. This indicates that the groundwater in the area has not been significantly impacted by mining as sulphate is a conservative tracer and good indicator of mine drainage. When compared to the DWA guidelines for domestic use ELS1, ELS14 and ELS18 do not comply and therefore are not acceptable for domestic use. All the samples analysed comply with the DWA guidelines for livestock water.
Water in the area has a very similar signature with the $NO_3$ and Cl. The boreholes ELS12 and ELS17 have a Na-Ca/$HC0_3$ signature, while ELS14, ELS11 and ELS9 have a Ca-Mg/$HCO_3$ signature. The signature for ELS6 is Ca/$HCO_3$ while ELS18, SLS1 and Spring ELS have a Na/ ($NO_3$)-$HCO_3$ signature. The borehole ELS2 has a Ca-Mg/$SO_4$ signature (Huisaman, 2013).

The groundwater around the proposed mine generally has a low alkalinity compared to the other boreholes sampled and therefore a low buffer capacity. ELS11, ELS6, ELS14 and ELS9 have a chemistry that shows a water type of shallow fresh groundwater while ELS12 and ELS17 have a water type that is moving away from shallow fresh groundwater and towards deeper fresh groundwater. ELS1, ELS18 and SpringELS have a water type that is moving towards that of deep ancient groundwater and ELS2 has a water type that is between deep ancient groundwater and mine waters. The water type of ELS2 could be due to its proximity to an old digging. From the above chemical analysis an overall assumption can be made that the groundwater sampled in the proposed mining area is acceptable for domestic use (with the exception of ELS1, ELS14 and ELS18) according to the DWA guidelines. The

groundwater in the mining area is also acceptable for livestock watering according to the DWA guidelines. Spring ELS complies with DWA guidelines for both Domestic use and livestock watering and is therefore acceptable for use (Huisaman, 2013).

### 6.1.7 Surface water

#### 6.1.7.1 *Wetlands, functionality and ecological importance and sensitivity*

Although the primary driving force behind all wetlands is water, due to its dynamic nature, varying daily, seasonally and annually – it is not a very useful parameter for accurately identifying the outer boundary of a wetland. Long-term monitoring is needed to accurately characterise the hydrology of a wetland and the extent of its saturation zones. As a result of this dynamic hydrology within and between wetlands, it is difficult to define the minimum frequency and duration of saturation that creates a wetland (DWAF; 2008). Instead, an approach is commonly followed which identifies the indirect indicators of prolonged saturation by water: wetland plants (hydrophytes) and wetland (hydromorphic) soils. The presence of these distinctive indicators in an area implies that the frequency and duration of saturation is sufficient to classify the area as a wetland. Terrain unit is another indicator, which will help identify those parts of the landscape where wetlands are more likely to occur (DWAF; 2008).

In many wetlands, not all parts are saturated for the same length of time. Generally, there are three different zones in a wetland, which are distinguished according to the changing frequency of saturation **(Figure 7)**. These three zones may not be present in all wetlands. The central part of the wetland, which is nearly always saturated, is referred to as the permanent zone of wetness. This is surrounded by the seasonal zone, which is saturated for a significant duration of the rainy season. The temporary zone in turn surrounds the seasonal zone, and is saturated for only a short period of the year that is sufficient, under normal circumstances, for the formation of hydromorphic soils and the growth of wetland vegetation (DWAF; 2008).

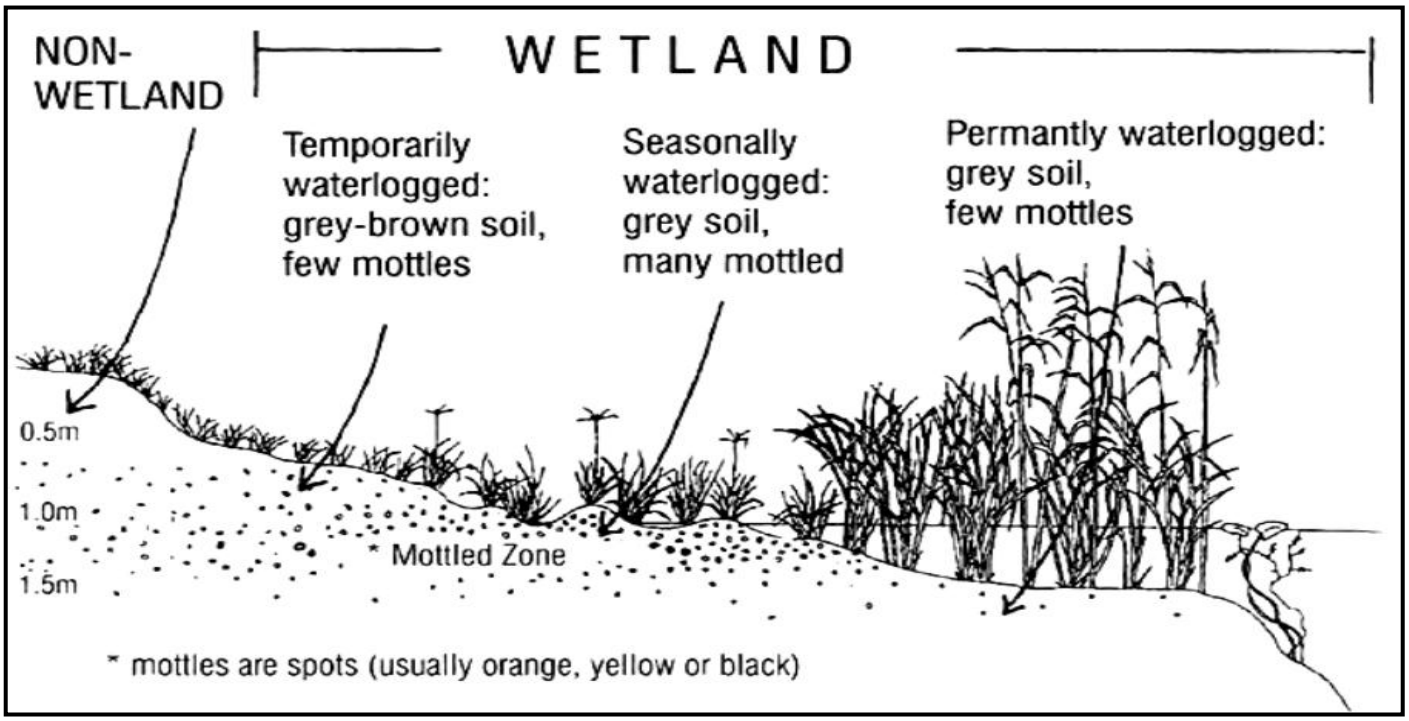


**Figure 7: Cross section through a wetland (DWAF; 2008)**

The object of the delineation procedure is to identify the outer edge of the temporary zone. This outer edge marks the boundary between the wetland and adjacent terrestrial areas. The DWAF (2008) protocol was used to confirm the presence of a wetland and to delineate it (if present).

The methodology is as follows:

- Starting the delineation procedure from the downstream part of the area to be delineated, look for the wettest part of the wetland using cues such as the presence of water or obligate hydrophilic vegetation such as sedges, bulrushes or reeds;
- Use a soil auger to examine the first 50cm of the soil profile for the presence of soil wetness and/or soil form indicators;
- Determine the wetness zone according to the soil and vegetation indicators;
- Proceed outwards towards the estimated edge of the wetland, sampling at regular intervals to check soil wetness and vegetation indicators;
- The outer boundary of the wetland is defined as the point where the indicators are no longer visible.
- Once the wetland boundary has been identified, mark the position with a flag;
- Complete several further transects at strategic points in the wetland, always moving from the wettest to the driest zone;
- After several flags have been placed, use these points to identify a contour that defines the wetland boundary;
- Follow the contour and check periodically that the relationship between the contour and the wetland boundary is still holding true; and
- Pay particular attention to features that may disrupt this relationship, such as seeps entering the wetland.
- Record the boundary on a topographic map, preferably using GIS technology.

Based on the above mentioned criteria, the terrain unit indicator, the soil form indicator, the soil wetness indicator and the vegetation unit indicators were used to determine if a wetland exists. The wetland study confirmed that no wetland exists on site, however it was confirmed that 8.36 Ha of the area is affected by the riparian zone and its associated 30 m buffer **(Refer to Annexure 3 for the Wetland and riparian delineation)**.

Based on the assessment conducted, the riparian zone potentially serves the following purposes and need to be managed accordingly:

- Store water and help reduce flood peaks;
- Stabilise stream banks;
- Improve water quality by trapping sediment and nutrients;
- Maintain natural water temperature through shading for aquatic species;
- Provide shelter, food and migration corridors for movement of both aquatic and terrestrial species; and
- Act as a buffer between aquatic ecosystems and adjacent upslope land uses.

#### 6.1.7.2 *Elandspruit and Elandspruit spring*

The Elandspruit rises on the higher areas immediately to the east of the study area. In these upstream areas it is a non-perennial stream, however, roughly in the centre of the study area, some 200 m from the eastern boundary of the study area is a spring, the Elandspruit Spring, which causes the Elandspruit to become a perennial stream from this point onwards to its confluence with the Olifants River. The Elandspruit is roughly 6.4 Km long, from its origin to its confluence with the Olifants River.

The Elandspruit is fed by a spring immediately upstream from Dam 1, which ensures that it is always full, even during the dry season. Some of the water from the spring gets diverted to another dam at the farm homestead. The Elandspruit spring is presumably fed by a perched water table which daylights at a sharp drop-off in the topography within the study area. Although the area occupied by Dam 1 and the downstream part of the Elandspruit is presently excluded from the mining operation, as the mine will be removing the source of the spring on the up gradient side of the spring (i.e. to the east of the spring), the spring is bound to dry up, and as this will mean the end of the spring and Dam 1, the section presently reserved as the watercourse and Dam 1 will be mined during Phase 2 of the mining operation.

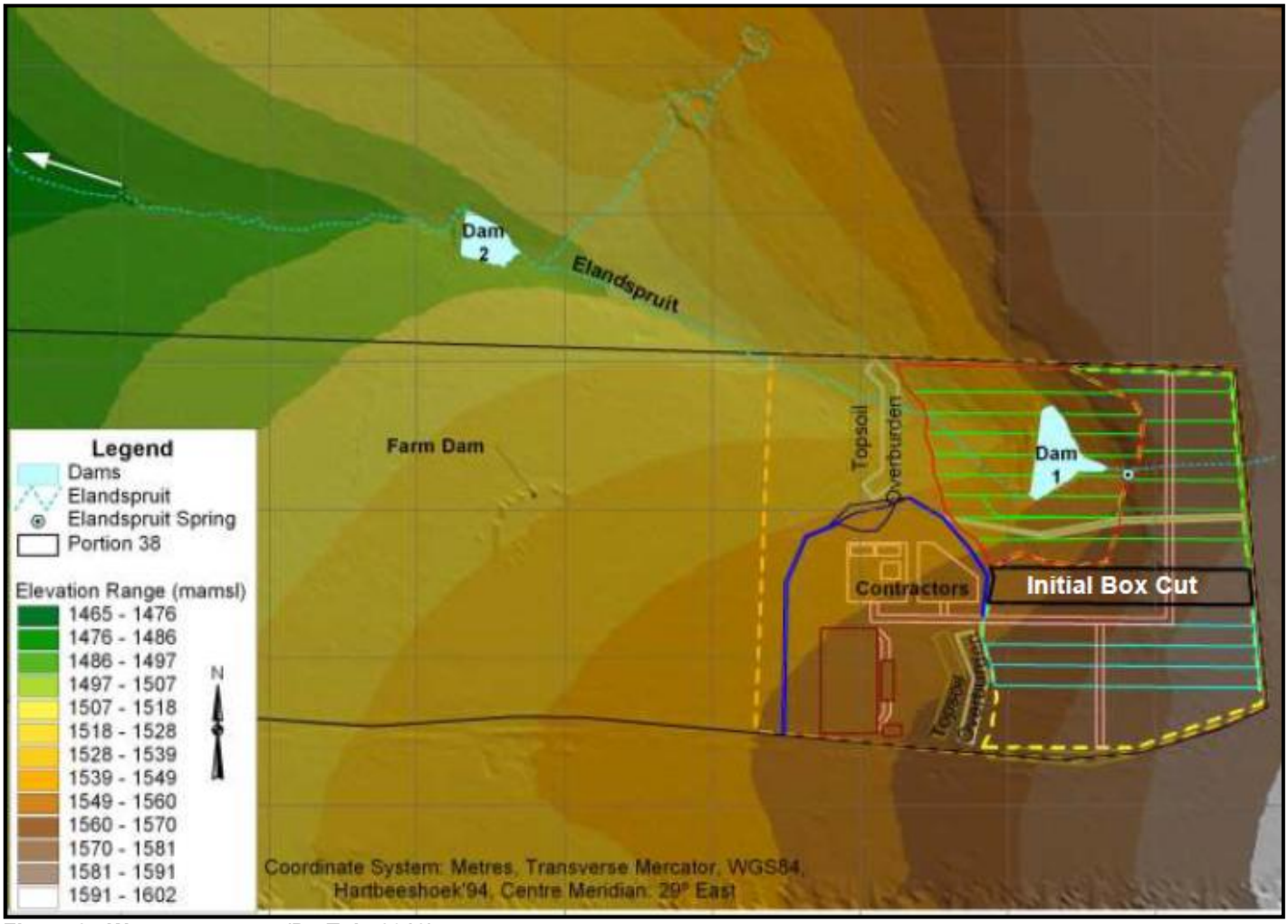


**Figure 8: Water resources (Du Toit, 2013)**

**Figure 8:** Water resources presents the Elandspruit watercourse (blue dotted line), the Elandspruit spring (blue point to the east of the dam), the initial box cut (black), the area to be mined to the south (blue) and north (green) of the box cut, as well as the area that will not be mined initially (outlined in red). This latter part is reserved for the Elandspruit and associated wetland, but, as the source of the spring, supplying the water to the spring, will be intersected by the mining operations to the east of the spring, it is almost a certainty that this spring will dry up and subsequently it is planned to mine the area shown in red at a later stage.

6.1.7.3 *Surface water quality*

The proposed Yoctolux coal mine lies within the B11J quaternary catchment of the Olifant River Basin. The only stream of importance near the study area is the Elandspruit, subsequently it must be expected that all surface run-off water will drain towards this river. Anticipated impacts stemming from the development and operation of the coal mine has identified that effluent from the coal mine could contribute towards further water resource degradation should appropriate water management measures not be implemented. These measures include the implementation of storm water management systems and a containment facility for impoundment of polluted water.

Government Notice, GN704, specifically dealing with the location of mines relative to flood lines, promulgated in terms of the NWA legislates that no residue deposit, dam, reservoir or any of its associated infrastructure may be placed within the 100-year flood lines or within 100 m from a river's edge, whichever distance is the greatest. It continues that no opencast or underground mine may be

located within the 50-year flood line of a stream or river (or within 100 m from the edge of a river, whichever distance is the greatest) and neither may one erect any sanitary convenience, fuel depots, reservoir or depots for any substance which may cause, or is likely to cause, pollution of a water resource within the 50-year flood line of any watercourse. Subsequently, as far as mining is concerned, both the 50- and 100-year flood lines must be determined and indicated on the mine plan maps Du Toit, 2013).

As the Elandspruit rises immediately to the east of the gravel road passing along the eastern boundary of the proposed Yoctolux mine, it has a very small catchment of only 2.43 km², upstream from the study area about 150 m beyond the northern boundary of the study area. A storm with a duration of less than 1 hour produced the highest discharge at the study area. The discharge will be 74.12 m³/s for the 100-year flood. The elevations containing the maximum discharge, at each cross section along the stream at the study area, were plotted on either side the stream's centre-line and transferred, in plan, to the drawing, to demarcate the 100-year flood lines for this stream section. Although there is a section of the Elandspruit upstream from the Elandspruit Spring, this stream section is not perennial as the section downstream from the spring is. However, the stream channel, even if it is very small, is nevertheless still classified as a watercourse, and in terms of GN704, mining cannot just take place through this watercourse without the correct permission from DWA Du Toit, 2013).

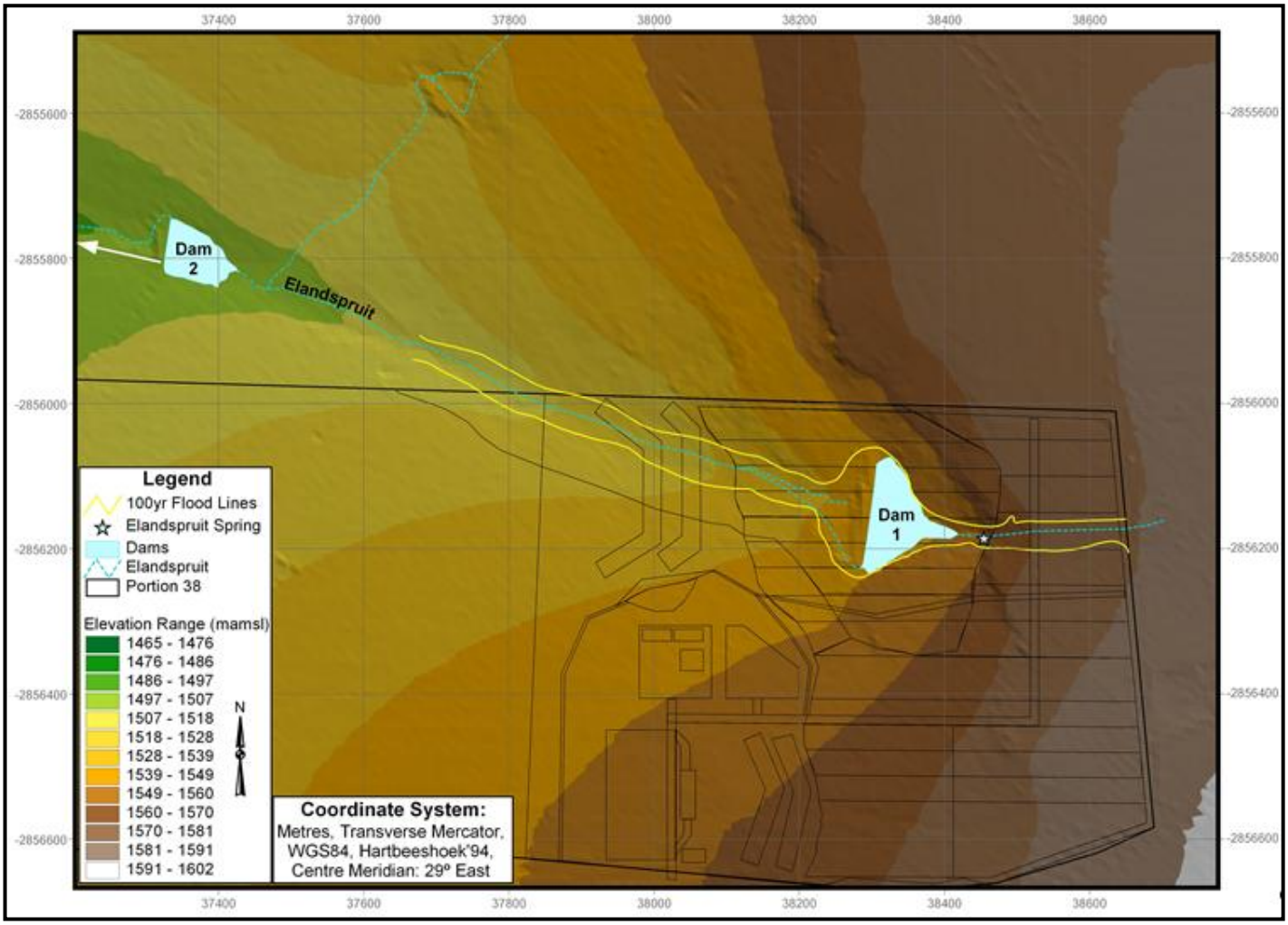


**Figure 9: 100-year flood lines (Du Toit, 2013)**

6.1.8 Flora

The Yoctolux Coal Mine project area falls in the Highveld grasslands region which is considered ecologically sensitive due to the high diversity of bulb and other plant species, the potential occurrence of red data bird and mammal species and the poor

conservation status of the habitat **(Refer to Annexure 3 for the Ecological Assessment)**. The proposed Coal Mine site is located within the Eastern Highveld Grassland. The site falls within the Moist Sandy Highveld Grassland veldt type of the Grassland Biome. This veldt type was previously referred to as the North western Sandy Highveld (Veldt Type 57) and the Eastern Bankenveld (April, 2013). The Grassland type is normally dominated by *Eragrostis plana* (Fan Lovegrass), *Eragrostis curvula* (Weeping Lovegrass), *Heteropogon contortus* (Speargrass), *Trachypogon spicatus* (Giant Speargrass) and *Themeda triandra* (Rooigrass). This vegetation type is however impacted on by the agricultural activities, road and transport infrastructure constructed in the area. Natural vegetation within the area has largely been disturbed as a result of operational activities and is invaded by a number of alien plant species. The drainage areas, although largely artificial, may still support species of conservation importance (April, 2013).

### 6.1.9 Fauna

Red Data Faunal species that may occur in the area is listed in Table 13. A total of 11 Red Data faunal species may occur in the area **(Refer to Annexure 3 for the Ecological Assessment)**.

**Table 13: Red Data faunal species**

| BIOLOGICAL NAME | COMMON NAME |
|---|---|
| *Aloeides dentatis* | - |
| *Aloeides merces* | - |
| *Amblysomus septentrionalis* | Highveld Golden Mole |
| *Chrysospalas villosus* | Rough haired golden mole |
| *Circus maurus* | Black Harrier |
| *Coracias garrulous* | European roller |
| *Crex crex* | Corncrake |
| *Falco naumanni* | Lesser kestrel |
| *Grus carunculatus* | Wattled Crane |
| *Grus paradise* | Blue Crane |
| *Mystromys albicaudatus* | White tailed mouse |

It is widely accepted that vegetation structure, rather than actual plant species, influences bird species' distribution and abundance. The study area is dominated by grassland biome. Many grassland bird species show a preference for sour grassland over sweet or mixed grassland. The grassland biome is very important from a Red Data perspective, as it is the preferred habitat of several endangered grassland birds. The study area however, has been transformed to a large degree by intensive cultivation, which has placed it under severe pressure. Parts of the study area have been extensively transformed through dry land cultivation. Data from the CAR project indicates that agricultural land is used to a limited extent by large terrestrial birds in the Mpumalanga Highveld as they prefer natural grassland. Fallow fields are used to a limited extent by Blue Cranes in summer, and pastures are used by Southern Bald Ibis *Geronticus calvus*. Blue Cranes also use recently ploughed fields in winter. Indications are that Blue Korhaan *Eupodotis caerulescens* may also utilise agricultural fields to a limited extent (Young et al, 2003). A Red Data species that could also occur from time to time in the habitat is the Black-winged Pratincole *Glareola nordmanni*. Overall though, agricultural lands are not as important for birds in the study area as natural grass. The existing manmade pond with its associated reeds (e.g. *Typha capensis, Phragmites australis*) could also provide habitat for birds (April, 2013).

## 6.2 Socio-economic environment

### 6.2.1 Population Demographics

The Nkangala District Municipality is one of three District Municipalities in the Mpumalanga Province. It is principally rural, and is divided into five Local Municipalities. The district covers an area of 188,118 ha, and has an estimated population size of 1,226,500 people. Twenty-five percent of the population has had no formal schooling and only 1.9% has tertiary education. Steve Tshwete Local Municipality, the local municipality were the proposed mine is to be located is situated at the centre of Nkangala District Municipality. It covers a geographical area of approximately 3,976 square kilometres. The towns and settlements within Steve Tshwete include Middelburg, Mhluzi, Hendrina, Kwazamokuhle, Rietkuil, Pullenshope, Komati, Presidentsrus, Naledi, Lesedi, Kranspoort, Blinkpan, Koornfontein, Kwa-Makalane and Doornkop. The Steve Tshwete municipal area has an estimated population of 173,800 residents, largely based in the towns of Middelburg and Mhluzi, smaller mining towns, and rural areas. Land-use within the local municipality is characterized by high intensity crop production, cultivated grazing, opencast coal mining, and in the northwest of the municipality, game farms supported by the ecotourism industry. High natural resource potential means employment within the primary sectors, comprising agriculture and mining, is almost twice as high in Steve Tshwete LM as at the national level. However, Steve Tshwete's Spatial Development Framework (SDF) notes the existence of competing interests between the two sectors (STLM IDP).

Despite this, the economic value of mining cannot be ignored. Mining is well-established as the largest economic contributor in the municipality, also impacting the economic status of the province. Employment opportunities associated with the primary sector have resulted in an above average population growth in the last 10 years, increasing the levels of informal housing in the municipality. Any potential impact of the Yoctolux Coal Mine project on the socio-economic environment must be considered in the light of existing levels of mining operations in the area, the current loss of agricultural land to mining, and the significance of mining on the local economy. The project must also take account of the existing migration and influx levels into the local municipality and consider potential impacts related to expectations of employment opportunities and population influx leading to increased pressure on local services (STLM IDP).

### 6.2.2 Heritage resources

Cultural resources are all non-physical and physical man-made occurrences as well as natural occurrences associated with human activity. These include all sites, structures and artefacts of importance; whether individually or in a group, in the history, architecture and archaeology of human (cultural) development. Graves and cemeteries are also included. The significance of the sites, structures and artefacts is determined by means of their historical, social, aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. The various aspects are not mutually exclusive, and the evaluation of any site is done with reference to any number of these aspects. During the pedestrian survey on the demarcated section, the eastern section of Portion 38 on the farm Elandspruit 291 JS, no sites of heritage importance were observed. However, a number of archaeological sites were observed on other sections of the farm. These sites are: nine unmarked, unfenced graves 300 m from the area demarcated for development in the north-eastern corner of Portion 38 and graves and homesteads in close proximity to the residential and commercial areas, some of which date to the Historical Period.

There are two Voortrekker graves in an open field, and 50 workers' graves, the oldest of which dates to 1958, under a canopy of black wattle trees. Family members pay yearly visits to the workers' graves. Farm workers currently occupy the original Voortrekker farm homestead, which dates to the 1880s. Modern bricks were added to the original building during later stages. The second homestead also originated in historical times, but is currently being demolished. Due to no visible material remains found pertaining to heritage resources, on the demarcated section, the eastern section of Portion 38 on the farm Elandspruit 291 JS, development may continue. Should culturally significant material or skeletal remains be exposed during development and

construction phases, all activities must be suspended pending further investigation by a qualified archaeologist [National Heritage and Resources Act, 25 of 1999 section 36 (6)].

### 6.2.3 Paleontological resources

All Karoo Supergroup geological formations are ranked as LOW to VERY HIGH, and here the impact is potentially VERY HIGH for the Vryheid Formation, Ecca Group. Rocks of Permian age in South Africa are particularly rich in fossil plants (Rayner and Coventry 1985). The fossils are present in the grey shale interlayered with the coal seams. The fossils are not very rare and also occur in other parts of the Karoo stratigraphy. The pollen of the Greenside Colliery also on the Vryheid formation was the focus of a Ph.D study. It is often difficult to spot the greyish fossils as they are the same colour as the grey shale in which they are present as these coalified compressions have been weathered to leave surface replicas on the enclosing shale matrix. A locality close to Ermelo, also Vryheid Formation, has yielded *Scutum, Glossopteris* leaves, *Neoggerathiopsis* leaves, the lycopod *Cyclodendron leslii,* and various seeds and scale leaves (Prevec 2011).

Fossils likely to be found are mostly plants (Appendix 1) such as '*Glossopteris* flora' of the Vryheid Formation. The aquatic reptile *Mesosaurus* and fossil fish may also occur with marine invertebrates, arthropods and insects. Trace fossils can also be present (Johnson 2009).

During storms a great variety of leaves, fructifications and twigs accumulated and because they were sandwiched between thin films of mud, they were preserved to bear record of the wealth and the density of the vegetation around the pools. They make it possible to reconstruct the plant life in these areas and wherever they are found, they constitute most valuable palaeobotanical records (Plumstead 1963) and can be used in palaeoenvironmental reconstructions.

Details of the location and distribution of all significant fossil sites or key fossiliferous rock units are often difficult to be determined due to thick topsoil, subsoil, overburden and alluvium. Depth of the overburden may vary a lot. The vast coal mining industry provides palaeontologists with fantastic access to coal-associated plant fossils, while simultaneously resulting in the destruction of important National palaeontological heritage.

## 7. PROPOSED MINING DESIGN, METHODOLOGY AND INFRASTRUCTURE

Mining methods vary widely and depend on the location, type and size of mineral resources. Typical mine infrastructure includes haul roads; spoil dumps, surface and underground facilities (e.g. offices, workshops, parking, warehouses, etc.), tailings and waste rock disposal areas; transport and service corridors (e.g. roads, pipelines, conveyors, power and water corridors), product stockpiles, chemicals and fuel storage and housing facilities.

Unless otherwise stated, the information contained below regarding the mining design, methodology and infrastructure proposed for the proposed Yoctolux Coal Mine, has been extracted directly from the latest Mining Works Program **(Annexure 4)**.

### 7.1 Mining design and methodology

#### 7.1.1 Mining method

When coal seams are near the surface, it may be economical to extract the coal using open cut (also referred to as open cast, open pit, roll over or strip) mining methods. Open cast coal mining recovers a greater proportion of the coal deposit than underground methods, as more of the coal seams in the strata may be exploited. The Mining method to be employed on site is that of open cast strip mining. The reserve to be mined consists of a single open cast mining block the actual resource area is 30Ha. The average depth of the roof of the first intersected coal seam is approximately 14.61 m below surface, with an average parting thickness of 0.97 m between the 2 and 2L Seams, and a total coal thickness average of 6.09 m thick. Mining operations will commence in a double box cut and operations will advance in a steady state for a period of 2 years. Material from the box cut phase will be stored

per overburden classification, with the bulk of the material placed in a position alongside the final strip, to facilitate filling of the final void. Earthmoving will be done by both truck and shovel operation and by bulldozing, once the open cast mining has entered the strip mining [steady-state] phase. Hard overburden and coal will be blasted to an acceptable fragmentation

Box cut 1 (70 m width) will be established during the construction phase. Topsoil and overburden from the box cut will be stockpiled separately at the northern extremity of the pit for final rehabilitation. Once the box cut has been established the normal strip mining roll-over methodology will be applied to the mining operation whereby topsoil is stripped two strips in advance of the current working strip and is either stockpiled or place directly on the rehabilitated area behind the advancing strips, thereafter subsoil is removed. The overburden is drilled and blasted and approximately 40% is dozed into the void behind the current strip, after which the balance of overburden is loaded and hauled to the rehabilitation side and back-tipped. This sequence continues to the end of the pit. Once reaching the limit of the pit the overburden which has been stockpiled is dozed in to fill the final void and the stockpiled topsoil is then placed on to the levelled area. The mining will be outsourced to a suitably qualified mining contractor. Mining will be undertaken by diesel powered mining equipment in the form of front end loaders, excavators, haul and dump trucks, water carts and graders. Waste material overlying the coal seam will be removed by truck and shovel and these waste materials will be backfilled immediately behind the coal strip currently being mined. The backfilled waste and subsoil will be profiled, top soiled and re-vegetated as part of the mining operation, and hence rehabilitation will be undertaken concurrently with the mining process. The final void and mine ramps will be backfilled to proximate pre-mining topography.

### 7.1.2 Life of Mine Schedule

The planned scheduling for the proposed Yoctolux coal mine open cast operation is presented below. The timeframes are divided into a compliance period, an operatinal period and a rehabilitation/closure period.

#### 7.1.2.1 *Pre-construction/Compliance Phase*

Permitting applications and granting of:

- Mining Right,
- Scoping Report;
- Environmental Impact Assessment;
- Environmental Authorisation;
- Water Use License; and
- Appointment of mining contractor.

#### 7.1.2.2 *Operational Period*

The actual operational timeframe was calculated from the date of granting of a mining right. The operational period has been subdivided into a construction and implementation phase as well as a production phase.

#### 7.1.2.3 *Construction Phase*

The construction phase commenced immediately upon granting of the mining right and includes the following:

- Preperation of access roads;
- Construction of contractor's yard;
- Construction of workshop;
- Fencing and fencing of the mining area;

- Construction of Security infrastructure (security house, boom gates, etc.);
- Installation of weighbridge;
- Construction of ablution facilities;
- Construction of diesel bunds;
- Installation of diesel tanks;
- Construction of mine haul roads;
- Development of trenches and pollution control facilities; and
- Box cut development.

7.1.2.4 *Operational Phase*

The operational phase, known as the steady-state, will commence after the completion of the box cut. A conventional strip mining (roll-over) method will be employed. Material from the box-cut phase will be stored per overburden classification, with the bulk of the material placed in position alongside the final strip, to facilitate filling of the final void. Steady-state mining includes the process and equipment presented below in **Error! Reference source not found.**

7.1.2.5 *Operational Phase*

Rehabilitation will run concurrently with the mining program, however filling of the final void, re-instatement of dams and roads will commence during month 30 and a total allowed period for completion of this exercise is 24 months. It is envisaged that the surface re-instatement will be completed well within this period, however this timeframe has been conservatively planned for, in the event that the operational phase has to extend, for whichever reasons. A total period of 5 years is required to ensure that re-vegetation is successfully implemented and to conduct adequate aftercare and monitoring.

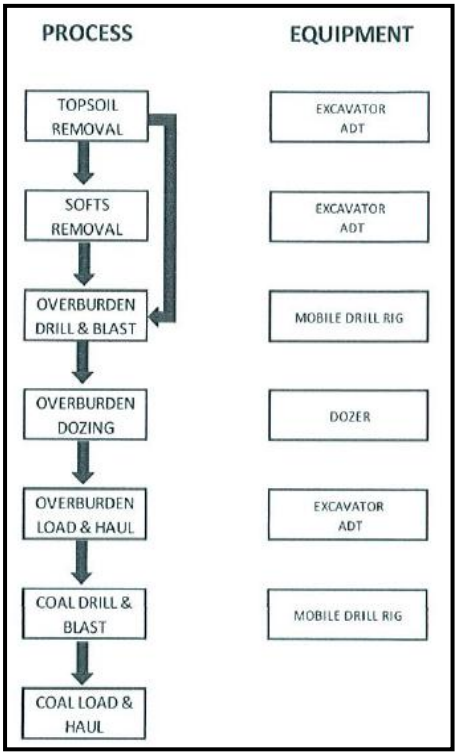


**Figure 10: Steady-state mining layout (Yoctolux MWP)**

**Topsoil Removal:** Topsoil will be removed two strips in advance of the current working strip and will be either stockpiled separately or placed directly on the rehabilitated area behind the advancing strip. Topsoil will be removed using excavators and hauled with articulated dump trucks (ADTs).

**Softs Removal**: Soft subsoil will be removed one strip in advance of the current working strip and will be either stockpiled separately or placed directly on the rehabilitated area behind the advancing strip. Softs will be removed using excavators and hauled with Articulated Dump Trucks (ADTs).

**Overburden Dozing:** The first overburden removal process will be to doze overburden material to the spoil side. For modelling purposes it is assumed that 40% of the overburden can be dozed. The assumption is based on current mining practice at similar sites where the contractor is employed.

**Overburden Load and Haul:** The remaining overburden, after dozing, will be load and hauled and dumped on the spoil side of the current strip. The load and haul will be conducted using excavators and ADTs.

**Coal drill and blast:** Drilling of the coal will be done using a mobile drill rig which will drill a hole of 110 mm diameter and with a planned burden and spacing of 7 x 8 m.

**Coal load and haul:** The coal will be loaded, hauled and dumped on the Run of Mine (RoM) stockpile. The load and haul will be conducted using excavators and ADTs.

**Rehabilitation:** Rehabilitation of the opencast mining area will be done concurrently with the opencast mining according to a stated mining sequence. Materials will be placed back into the void in the former strata graphical sequence i.e. topsoil on the surface, subsoil directly below the topsoil and all hard material (sandstone and shale) in the bottom of the void. It is envisaged that the final reinstated surface level will be approximately 0.29 m above the original surface level. However the existing surface drainage pattern will remain unchanged and the total disturbed area will be free draining. On completion of surface reinstatement, the area will be re-vegetated with suitable pasture grass species. The estimated post surface profile has been calculated by bulking (soft 10 % and hard 30 %) the overburden and deducting the volume of coal that has been removed over the area. Excess material will result in a higher surface after mining and a depression if there is insufficient material. In the case of Elandspruit, the re-instated surface will be nominally higher at 0.29 m.

7.1.2.6 *Rehabilitation/Closurel Phase*

Rehabilitation will run concurrently with the mining program, however filling of the final void, re-instate of dams and roads will commence during month 30 and a total allowed period for completion of this exercise is 24 months. It is envisaged that the surface re-instatement will be completed well whiting this period, however this timeframe has been conservatively planned for, in the event that the operational phase has to be extended, for whichever reason. A total period of 5 years is required to ensure that the re-vegetation is successfully implemented and to conduct adequate aftercare and monitoring.

### 7.1.3 Production build up

Production rates for the proposed mine were calculated based on the proposed equipment match to the mining layout and linked to the envisaged market demand. The payloads and loads/hour assumptions were based on actual performance at other sites. The calculation assumed two ten hour shifts working five days a week. Based on the overburden volumes, planned equipment and pit

length constraints, the monthly production capacity of coal is 38.71 $m^3$ or 60 000 tons per month. A monthly production of 60 000 tons is therefore assumed for steady-state mining, which excludes the box cut phase

### 7.2 Mining infrastructure

**Access Roads:** Currently there is an existing intersection, used by local farmers, with the provincial road. The access road from the mine to the provincial road is to be upgraded. The upgrade will include excavating the road base to a depth of 0. 5m and to backfill with sandstone to create a permeable base. A 0.30 m ferricrete layer will be placed on the sandstone base to create the road surface. The road will be shaped to ensure adequate drainage.

**Contractor's yard:** The topsoil and sofs over the area will be excavated to a depth of 1 m and a sandstone base levelled and to accommodate offices, workshops, diesel storage facilities for the appointed contractor. The topsoil will be stockpiled as per the EMPr. The contractor already has most of these facilities and all that is required is levelling and fencing of the area.

**Workshop:** A 10 x 10 m workshop will be constructed within the contractor's yard. A reinforced concrete platform will be constructed as the base of the workshop.

**Fencing and trenching, of the Mining Area:** A fence (5 strand barbed wire) will be established around the perimeter of the mining area. A 2 m deep trench will be dug along the western and northern boundaries.

**Security and access control:** A permanent security house and boom gates will be constructed at the mine entrance. The structures will comprise of brick and mortar and will be supplied with electricity from a diesel driven generator.

**Ablution facilities:** An area has been identified between the security and contractors camp area for ablution facilities. The ablutions will be constructed from brick and mortar and will comply with the requirements of the EMPr.

**Haul roads:** Permanent haul roads will be constructed of suitable material such as laterite and will conform to minimum safety requirements in terms of slopes and widths etc. The haul roads will be utilised for the transportation of coal, machinery, general goods, etc.

**Drainage and Pollution Control Facilities:** The principle of keeping clean water out of the mining operation and retaining dirty water shall apply to the proposed mine. A series of clean water drains are to be constructed along the western boundary and along the sub-outcrop line to divert clean water away from the opencast pit. A series of dirty water drains are to be constructed to channel water. A PCD will be constructed to the south of the access road.

**Weighbridge:** An area adjacent to the security has been identified for the accredited weighbridge and will require limited cut and fill prior to installation.

**Stores and Material:** The equipment will be serviced and maintained using mobile servicing facilities and therefore there will not be a need to maintain stores on the site. The contractor will make use of the centralized store facility in Middelburg [34 Litre Street]. A limit containerized store will be provided by the contractor, in the contractor's yard, to hold a limited store of high use items such as oils, grease, air filters etc. These stores will meet the requirements of the various health and safety and environmental legislation.

**Offices:** The contractor will provide 3 mobile offices (4 x 10m), the price of which has been included in the contractor's site establishment costing. An office for the weighbridge will be constructed by the contractor.

**Electricity:** it is envisaged that the contractor will provide for a generator in the costing. The generator will provide electricity for lighting of the contractor's yard, weighbridge and other limited onsite activities.

## 8. ALTERNATIVES [REGULATION 31 (2) (g)]

### 8.1 Identification of Alternatives

Feasible and reasonable alternatives have to be identified for a development as required by the NEMA EIA Regulations and applicable to BAs, SRs and EIARs. Each alternative is to be accompanied by a description and comparative assessment of the advantages and disadvantages that such development and activities will pose on the environment and socio-economy. When no feasible and/or reasonable alternatives could be identified and investigated in terms of a comparative assessment during the Scoping phase, no alternatives could be investigated during the EIA phase. Alternatives forms a vital part of the initial assessment process through the consideration of modifications in order to prevent and/or mitigate environmental impacts associated with a particular development. Alternatives are to be amended when the development's scope of work is amended. It is vital that original as well as amended alternative identification, investigation and assessment together with the generation and consideration of modifications and changes to the development and activities are documented (WC DEADP, 2011).

The EIA Regulations defines alternatives as the different means of meeting the general purpose and requirements of the activity, which may include alternatives to:

a) The property on which or location where it is proposed to undertake the activity;
b) The type of activity to be undertaken
c) The design or layout of the activity;
d) The technology to be used in the activity
e) The operational aspects of the activity; and
f) The option of not implementing the activity.

Although an array of alternatives could be investigated for each project, such alternatives will not necessarily be applicable to each project and/or project phase. However there must always be strived to seek alternatives that maximises efficient and sustainable resource utilisation and minimise waste production.

### 8.2 Feasible Alternatives

| TYPE OF ALTERNATIVE: **Location** | ALTERNATIVE EXPLANATION:<br>• *Develop on an alternative property*<br>• *Develop on alternative sites on the same property/properties* |
|---|---|
| When considering the allocation of land for development and in deciding applications for planning permission affecting agricultural land, the agricultural implications must be considered together with the environmental, cultural and socio-economic aspects. In particular, prime quality land should normally be protected against permanent development or irreversible damage. Consideration of land use alternatives is one of the cornerstones of community planning. Land use decisions must be evaluated in terms of sustainability, broadly defined as balancing environmental, economic and social equity concerns. The primary land use categories that encompass basic functions are residential, commercial, industrial, recreational, institutional, and agricultural uses. Land use is determined by a number of factors. These include climate, resources, population growth, economic activity and topography. When considering a new development for an area, it is required that other land use alternatives are considered | |

to ensure that the development is justified and viable. In the project area, present land use includes agriculture, residential and mining. Possible alternative land uses in the case that the project is not implemented, include agriculture combined with low-density residential (current land use) and low-cost housing.

With regards to agriculture, the soils and land use impact assessment has found that the project site is situated on prime agricultural land. The aforementioned study considers the financial impact the proposed project will have on the maize production industry; this impact is therefore not considered again in this study. Due to the increasing prevalence of mining in the surrounding area, the viability of using the proposed project site for low-density residential purposes is decreasing; other mining operations in the area have resulted in a decreased quality of life for residents located on or surrounding the project site under consideration in this study. In fact, most surrounding landowners indicated their desire to be relocated elsewhere. Similarly, the viability of low-cost housing is jeopardised by the presence of other mining operations in the area. Additionally, there is a trend in the local municipal area of individuals moving out of more rural settings into the town of Delmas, in search of employment opportunities and for the sake of better access to services. Mining thus appears to be the most viable and appropriate land use for the project site from a social perspective.

No location alternatives are applicable to this project since the coal is contained in an underlying belt in the development area. Locating the development in another area will resulting in the ore not being utilised and the economy and society will not be benefiting from the Yoctolux Coal Mine.

| TYPE OF ALTERNATIVE: **Activity** | ALTERNATIVE EXPLANATION: *Develop an alternative activity ex. Incineration of waste vs. landfill disposal, abstraction of water vs. re-use/recycling of water.* |
|---|---|

The Yoctolux coal resource is located at a depth of 30 m or less. To mine coal by underground means at these shallow depths is not feasible. There is insufficient roof support at these depths to enable safe underground mining exploitation of the reserve. Consequently, exploitation of the reserve must be by opencast methods. Therefore it is not a feasible alternative in this instance. Two opencast mining methods were considered initially namely dragline based opencast mining or truck and shovel based opencast mining methods.

- Dragline: the high capital cost of dragline precluded consideration of dragline by Yoctolux; and
- Truck and shovel: this mining method affords considerably more flexibility in execution of a mine plan given the manoeuvrability of the relatively small mining equipment within the pit environment. In addition, capital cost of equipment can be better managed in conjunction with the increase in tonnage of mining as equipment volumes on site can be ramped up as mining expands. Consequently truck and shovel was favoured.

The reserve to be mined consists of a single open cast mining block the actual resource area is 30Ha. The average depth of the roof of the first intersected coal seam is approximately 14.61 m below surface, with an average parting thickness of 0.97 m between the 2 and 2L Seams, and a total coal thickness average of 6.09 m thick.

Furthermore fissure water will be re-used in the mining processes. Water from the polluted water containment dam as well as the PCDs will be utilised for dust suppression.

| TYPE OF ALTERNATIVE: **Design** | ALTERNATIVE EXPLANATION: *Adapt architectural and/or engineering designs.* |
|---|---|

The DMS plant will be installed, to treat up to 60 000 tons of material per month. The plant will be mounted on a concrete slab (300 - 400 mm thick). The plant footprint will extend about 52 m x 2 5 m. The plant will need a 200 KVA electricity feed which initially will be from the generator until Eskom install the electricity supply for the Mine. The DMS Plant will be installed to treat the peas and duff generated from the crushing and screening plant. The plant is designed with two cyclone sections. The first

| | |
|---|---|
| section (cyclone) treats the Duff and Peas (0 – 30 mm). The second section (cyclone) treats the fines material (0 – 3 mm) (slurry), normally 10% of the plant feed. The major benefit of this design is that from an environmental point of view there is basically no pollution because of the filter press section which treats the slurry generated from the second cyclone of the plant, which on its own eliminates the slurry. This slurry generated from the second cyclone section flows through the thickener and the filter press, which compresses the slurry into a coal cake, with process water being released to the 60 000 litre reservoir. The DMS plant is designed to treat 20 000 tons of material per month. The plant is also designed to be 100% environmentally compliant, in that a filter press section is added to the plant, eliminating the slurry created in the plant. This results in a clean operation therefore being environmentally friendly. The washed coal will therefore once again be stockpiled, loaded and transported to the market via road (Yoctolux Investments MWP). | |
| TYPE OF ALTERNATIVE: **Layout** | ALTERNATIVE EXPLANATION: *Adapt spatial configurations of an activity on any particular site ex. Locate manure dams away from water resources.* |
| No layout alternatives have been investigated. | |
| TYPE OF ALTERNATIVE: **Technological** | ALTERNATIVE EXPLANATION: *Adapt methods or processes that can be implemented to achieve the same goal ex. Introduction of bacteria rather than chemicals to waste water.* |
| No technological alternatives were investigated. | |
| TYPE OF ALTERNATIVE: **Demand** | ALTERNATIVE EXPLANATION: *The demand for products and/or services can be met by other means ex. The demand for paper can be met through deforestation or rather by efficient and viable recycling.* |
| Coal will be selectively mined as a raw Run of Mine (RoM) product, beneficiated and delivered to a stockpile on site, from where it will be loaded onto road transport and transported to the purchaser. The proposed market is local (Metallurgical/Eskom). Various companies have expressed an interest in purchasing RoM and beneficiated coal from the mine. Proposed contractual negotiation details have already been determined. | |
| TYPE OF ALTERNATIVE: **Input** | ALTERNATIVE EXPLANATION: *Implement different input materials and/or sources ex. Utilisation of woodchips for fuelling boilers rather than electricity.* |
| No input alternatives were investigated. | |
| TYPE OF ALTERNATIVE: **Routing** | ALTERNATIVE EXPLANATION: *Implement alternative routes for linear developments such as power line servitudes, transportation and pipeline routes ex. Elongate and divert a railway line to exclude a sensitive environment.* |
| No routing alternatives have been investigated. | |
| TYPE OF ALTERNATIVE: **Scheduling and Timing** | ALTERNATIVE EXPLANATION: *Adapt the order and/or scheduling of a number of measures which plays a part in a program as it will influence the overall effectiveness of the end result.* |
| Rehabilitation of the opencast mining area will be done concurrently with the opencast mining according to a stated mining sequence. | |
| TYPE OF ALTERNATIVE: **Scale** | ALTERNATIVE EXPLANATION: *Adapt the scale of an activity ex. 15 vs. 35 housing units, 12m$^2$ vs. 0.5km$^2$.* *P.S. Scale and magnitude is inter related.* |
| No alternatives in terms of scale have been investigated. | |
| TYPE OF ALTERNATIVE: **Magnitude** | ALTERNATIVE EXPLANATION: *Adapt the magnitude which is directly related to the extent of an activity.* *P.S. Scale and magnitude is inter related. An activity may be very small scale but can pose an extensive* |

| | |
|---|---|
| | *magnitude ex. Destroying an extremely sensitive wetland on a very small scale could result in a magnitude of such as destroying the whole wetland and/or ecological system.* |
| No alternatives in terms of magnitude have been investigated. | |
| TYPE OF ALTERNATIVE: **No-go** | ALTERNATIVE EXPLANATION: *The option of not undertaking and implementing the activity at all.* |
| The current land use is predominantly agriculture, where land is planted to crops or pastures for grazing. The no-mining option will result in the continuation of such land use. Although economically viable, the continuation of agriculture will not provide the level of short-term economic growth to the area that mining would offer. Economic growth benefits include: employment opportunities for residents in the area, greater economic input as a result of the mine's implementation of their approved social and labour plan, allowing better development of the municipal infrastructure and greater socio-economic stability in the area. After mine closure and rehabilitation of mined areas, the land capability may return to grazing or crop cultivation, allowing the continuance of certain agricultural practices. The mine will also promote sustainable local economic development, to give communities the skills required to remain economically viable and successful after mine closure. If the project were not to proceed, the additional economic activity and skills development would not be created. The coal reserves would remain unutilised, the current land uses and economic activities would continue as at present, with little economic growth developing in the region. If Yoctolux were not to proceed with the proposed operation, mining of these coal reserves will not necessarily be avoided, as another application in terms of the MPRDA can be made by another company. Unless the government declares the area "off limits" to mining by sterilising the reserves, mining houses will continue to attempt to mine the coal reserves. By not mining the coal reserves on the farm Elandspruit; this scenario will prevent the use of a valuable coal reserve for the generation of electricity at a time when there is a serious shortage of electricity that is hampering economic growth in the country. | |

## 9. PUBLIC PARTICIPATION PROCESS [REGULATION 31 (2) (e) (i-iv) AND REGULATION 54-57)]

### 9.1 Introduction to public participation

Guideline 7 on "Public Participation in the Environmental Impact Assessment Process", published by Department of Environmental Affairs (DEA) in October 2012, states that public participation is one of the most important aspects of the environmental authorisation process. This stems from the requirement that people have a right to be informed about potential decisions that may affect them and that they must be afforded an opportunity to influence those decisions. Effective public participation also facilitates informed decision-making by the Competent Authority and may result in better decisions as the views of all parties are considered.

The benefits of public participation include the following:

- Provides an opportunity for I&APs, EAPs and the competent authority (CA) to obtain clear, accurate and understandable information about the environmental impacts of the proposed activity or implications of a decision;
- Provides I&APs with an opportunity to voice their support, concerns and questions regarding the project, application or decision;
- Provides I&APs with the opportunity of suggesting ways of reducing or mitigating negative impacts of an activity and for enhancing positive impacts;
- Enables the Applicant to incorporate the needs, preferences and values of affected parties into the application;
- Provides opportunities for clearing up misunderstandings about technical issues, resolving disputes and reconciling conflicting interests;
- It is an important aspect of securing transparency and accountability in decision-making; and
- Contributes toward maintaining a healthy, vibrant democracy.

All PPP undertaken is in accordance with the requirements of the EIA Regulations (2010) **[Refer to the Public Participation Report as per Annexure 7].**

## 9.2 Public participation activities taken to date [Regulation 31 (2) (e) (i)]

The following PPP tasks were conducted to date for the proposed Yoctolux Coal mine:

- Identification of key Interested and Affected Parties (affected and adjacent landowners) and other stakeholders (organs of state and other parties);
- Formal notification of the application to key I&APs (all adjacent landowners) and other stakeholders;
- Consultation and correspondence with I&APs and Stakeholders and the addressing of their comments; and
- Release of the Draft Scoping Report and the Final Scoping Report to I&APs and stakeholders for review and comment.

### 9.2.1 Formal notification of the application (Regulation 31 (2) (e) (i)

The project was announced as follows:

*Newspaper advertisement*

Publication of a media advertisement in Middelburg Observer was placed on Friday 31 May 2013. Refer to Annexure 7 for the Public Participation Report for proof of placement of the newspaper advert.

*Site notice placement*

In order to inform surrounding communities and adjacent landowners of the proposed development, four (4) site notices were erected on site and at visible locations close to the site. Refer to Annexure 7 for the Public Participation Report for proof of site notice placement.

*Written notification*

I&APs and other key stakeholders, who included the abovementioned sectors, were directly informed of the proposed development by e-mail. The Background Information Document (BID) and Registration and Comment sheets were also supplied to all parties. I&APs were given 30 days to comment and / or raise issues of concern regarding the proposed development. The commenting period expired on 30 June 2013. Refer to the Public Participation Report in Annexure 7 for a copy of the BID and proof of email notification.

### 9.2.2 Release of the draft and final scoping report

The Scoping Report (DSR) and Plan of Study (POS) were submitted to the Competent Authority as per the requirements of Regulation 56 (4). The Draft Scoping Report (DSR) and Plan of Study (POS) were made available for public review for a period of 40 days from 31 January 2014 to 11 March 2014, following which the final scoping report was made available for public review and comment from the 11 April 2014 to 09 May 2014. All stakeholders and I&APs were notified of the availability of reports for comment. Hardcopies were submitted to all organs of state and relevant authorities. The reports and supporting documentation were made available for review at the Gerald Sekoto Public Library (Wanderers Avenue, Middelburg. Tel: 013 249 7314) and on Environmental Assurance's website: www.envass.co.za. The Final Scoping Report have been accepted on 20 June 2014.

### 9.2.3 I&AP and stakeholder identification, registration [Regulation 31 (2) (e) (ii)]

Public participation is the involvement of all parties who are either potentially I&AP by the proposed development. The principle objective of public participation is to inform and enrich decision-making. This is also its key role in this EIA process.

Interested and Affected parties and stakeholders representing the following sectors of society have been identified:

- National, provincial and local government;
- Agriculture, including local landowners;
- Community Based Organisations;
- Non-Governmental Organisations;
- Water bodies;
- Industry and mining;
- Historically disadvantaged groups, including women, youth and the disabled;
- Research; and
- Other stakeholders.

Key stakeholders, who included the abovementioned sectors, were directly informed of the proposed development by mail, e-mail and fax on 30 July 2013. Nineteen public interested and affected parties of who most are adjacent landowners registered. Sixteen state departments were registered as interested and affected parties. Refer to Annexure 6 for a comprehensive register of all registered interested and affected parties.

### 9.2.4 Consultation and correspondence with interested and affected parties [Regulation 31 (2) (e) (iii)]

Interested and Affected Parties had the opportunity to raise issues either in writing, by telephone, fax and/or email. **Refer to Annexure 7 for the Public Participation Report.**

**Table 14: List of issues raised and summary of comments and responses**Error! Reference source not found. contains a list of the issues raised by interested and affected parties and a summary of the comments and responses. Comments and responses will be added as the process proceeds and as comments are received. Copies of all correspondence between the Environmental Assessment Practitioner (EAP) and interested and affected parties and stakeholders and the comments and responses report recording comments and responses in detail are included in Public Participation Report [Regulation 31 (2) (e) iv)] in **Annexure 7**.

**Table 14: List of issues raised and summary of comments and responses**

| ISSUE RAISED | COMMENTS | RESPONSE |
|---|---|---|
| Terrestrial and freshwater sensitivities | The Mpumalanga Biodiversity Sector Plan (MBSP) doesn't indicate any known sensitive areas for both categories on the proposed mining area.<br><br>A 100 m wetland delineation zone should be implemented and adhered to on both sides of the wetland. | Noted<br><br>A baseline investigation into the presence of wetlands and riparian delineation of the Elandspruit has been undertaken which confirmed that no wetland exists. The riparian zone delineation was, however, determined. It was confirmed that 8.36 Ha of Yoctolux Freehold area is affected by the riparian zone and its associated 30-m buffer. |

| | | |
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| Protected and threatened species | The study area consists of the Rand Highveld Grassland vegetation type which is Nationally Gazetted threatened Ecosystems with allocated status of vulnerable and protected by the NEM:BA. All natural grassland areas, clusters of indigenous trees and shrubs or similar clumps that may contain a large biodiversity component or protected and threatened species, must be avoided.<br><br>Should threatened species be found during the phases of the project, a plan to protect or rescue them should be included within the EIA report. | An Ecological Assessment has been undertaken which confirmed that the Rand Highveld Grassland vegetation is present onsite and that is vulnerable.<br><br>The Ecological Assessment identified all the impacts as well as management measures to address the concerns with regards to vulnerable and threatened species and it will also form part of the Environmental Management Program. |
| EIA process | It is recommended that the EIA and their associated specialist studies should focus on confirming the presence and significance of biodiversity features, if any, identifying features not included in the existing datasets (e.g. threatened species), and on providing site-specific information to guide the application of the mitigation hierarchy (mining and biodiversity guideline) | An Ecological Assessment together with a baseline assessment of the ecological importance and sensitivity class (EISC) of the Elandspruit have been undertaken to identify all impacts associated with the presence and significance of biodiversity features together with management measures to ensure that the development is in line with all environmental legislation. |
| Compliance | All negative environmental impacts that could arise as a result of the mining phases should be avoided, minimised, mitigated and rehabilitated, whichever is applicable.<br><br>The mine need to effectively implement and adhere to all the condition of the EMPr and all the associated action plans. | All the necessary impact assessments have been undertaken to determine the different impacts associated with each phase of the development. Each assessment identified management measures in line with the principle of duty of care which will ensure that the Applicant comply with all requirements and obligations as set out in the EMPr and relevant authorisations. |
| Water quality management | Decanting is inevitable for a coal mine and a water management plan is required that should include costs of a 100 year operational water purification plant for the discharge of potable water for downstream users and the receiving environment. | An application has been lodged with the Department of Water and Sanitation's Bronkhorstspruit regional office. All management measures as set out in the Integrated Water and Waste Management Plan (IWWMP) and conditions set out in the Water Use License (WUL) will be adhered to.<br><br>No water will be discharged of into any water resources. |
| Paleontological resources | The development lies on a very high paleontological sensitive ground and as such a Paleontological Impact Assessment needs to be undertaken and included into the EIA phase.<br><br>Al graves including those older than 60 years need | A Paleontological Impact Assessment will be undertaken and included in the EIA phase<br><br>Noted |

| | | |
|---|---|---|
| | to be properly demarcated and visible signage must be erected where the graves are located.<br><br>Should the mine impact on the homesteads, a permit must be applied for in terms of Section 35 (4) of the NHRA. | <br><br>Noted. |
| Servitudes | Eskom Tx's Arnot-Vulcan 400 kV power line is affected by the proposed mine. The extent and with of the Eskom servitude is 27.5 m on either side of the centre line of the power line.<br><br>The mine shall at all times provide unobstructed access to and egress form its servitudes.<br><br>The Applicant is not relieved from obtaining the necessary statutory, land owner or municipal approvals and adhere to all relevant environmental legislation | Noted.<br><br>Noted<br><br>All the necessary impact assessments have been undertaken to determine the different impacts associated with each phase of the development. Each assessment identified management measures in line with the principle of duty of care which will ensure that the Applicant comply with all requirements and obligations as set out in the different statutory applications, authorisations and management programs. |

9.2.5 Next phases of the public participation process

All stakeholders and registered I&APs will have the opportunity to review and comment on all the documents released in the Draft EIA and Final EIA phases respectively. The draft EIA will be released for 40 calendar days and the final EIA will be released for a period of 21 days for review and comment. During all the PPP phases, hardcopies and CDs of all reports and supporting documents will be submitted to the organs of state and relevant authorities. All the reports will be placed at the Gerald Sekoto Public Library (Wanderers Avenue, Middelburg. Tel: 013 249 7314) on Environmental Assurance's website: www.envass.co.za As well as on site at the La Rochelle Guest House to enable ease of access for the neighbours.

## 10. ENVIRONMENTAL IMPACT ASSESSMENT PROCESS [REGULATION 31 (2) (h, k, and l)]

### 10.1 Impact assessment methodology [Regulation 31 (2) (h)]

A "significant impact" is defined as it is defined in the EIA Regulations (2010): "an impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect of one or more aspects of the environment". The objective of this EIA methodology is to serve as framework for accurately evaluating impacts associated with current or proposed activities in the biophysical, social and socio-economical spheres. It aims to ensure that all legal requirements and environmental considerations are met in order to have a complete and integrated environmental framework for impact evaluations. The process of determining impacts to be assessed is one of the most important parts of the environmental impact assessment process. It is of such high importance because the environmental impacts identified can and are often linked to the same impact stream.

In this method all impacts on the biophysical environment are assessed in terms of the overall integrity of ecosystems, habitats, populations and individuals affected. For example the removal of groundcover for the sloping or scraping of an embankment, can lead to higher amounts of water runoff which increases the rate of erosion. Further down in the river the amount of sediment increases because of the increased erosion. A number of fish species cannot endure the high amount of sediment and moves off. The habitat is thus changed or in the process of changing. Thus one needs to understand that the root of the problem (removal of groundcover) is assessed in terms of the degree of change in the health of the environment and/or components in relation to their conservation value. Thus if the impact of removal of groundcover of a definable system is high and the conservation value is also high then the impact of removal of groundcover is highly significant.

## 10.2 Environmental impact assessment (EIA) 2010 requirements

The Environmental Impact Assessment (EIA) 2010 Regulations promulgated in terms of Sections 24 (5), 24M and 44 of the National Environmental Management Act (NEMA) (Act 107 of 1998) requires that all identified potential impacts associated with the proposed project be assessed in terms of their overall potential significance on the natural, social and economic environments.

The criteria identified in the EIA Regulations (2010) include the following:

- Nature of the impact;
- Extent of the impact;
- Duration of the impact;
- Probability of the impact occurring;
- Degree to which impact can be reversed;
- Degree to which impact may cause irreplaceable loss of resources;
- Degree to which the impact can be mitigated; and
- Cumulative impacts.

ENVASS has developed an impact assessment methodology (as defined in point 6.3 below) whereby the Significance of a potential impact is determined through the assessment of the relevant temporal and spatial scales determined of the Extent, Magnitude and ***Duration*** criteria associated with a particular impact. This method does not explicitly define each of the criteria but rather combines them and results in an indication of the overall significance.

## 10.3 ENVASS impact assessment methodology

### 10.3.1 Nature of the impact

The nature of an impact can be defined as “a brief description of the impact being assessed, in terms of the proposed activity or project, including the socio-economic or environmental aspect affected by this impact”.

### 10.3.2 Extent of the impact

The extent of an impact can be defined as “a brief description of the spatial influence of the impact or the area that will be affected by the impact”.

**Table 15: Determining the extent of an impact**

| | | |
|---|---|---|
| **EXTENT** | **Footprint** | Only as far as the activity, such as footprint occurring within the total site area |
| | **Site** | Only the site and/or 500m radius from the site will be affected |

| | | |
|---|---|---|
| Extent or spatial influence of impact | **Local** | Local area / district (neighbouring properties, transport routes and adjacent towns) is affected |
| | **Region** | Entire region / province is affected |
| | **National** | Country is affected |

10.3.3 Magnitude of the impact

The magnitude of an impact can be defined as: "a brief description of the intensity or amplitude of the impact on socio-economic or environmental aspects".

**Table 16: Determining the magnitude of an impact**

| | | |
|---|---|---|
| **MAGNITUDE** Magnitude / intensity of impact (at the specified scale) | **Zero** | Natural and/or social functions and/or processes remain *unaltered* |
| | **Very low** | Natural and/or social functions and/or processes are *negligibly* altered |
| | **Low** | Natural and/or social functions and/or processes are *slightly* altered |
| | **Medium** | Natural and/or social functions and/or processes are *notably* altered |
| | **High** | Natural and/or social functions and/or processes *severely* altered |

10.3.4 Duration of the impact

The duration of an impact can be defined as "a short description of the period of time the impact will have an effect on aspects".

**Table 17: Determining the duration of an impact**

| | | |
|---|---|---|
| **DURATION** Duration of the impact | **Short term** | Construction phase |
| | **Medium term** | Operational phase and/or up to 3 years after construction |
| | **Long term** | Up to or more than 6 years after construction |

10.3.5 Probability of the impact occurring

The probability of an impact can be defined as "the estimated chance of the impact happening".

**Table 18: Determining the probability of an impact**

| | | |
|---|---|---|
| **PROBABILITY** | **Unlikely** | *Unlikely* to occur (0 – 25% probability of occurring) |
| | **Possible** | *May* occur (26 – 50% chance of occurring) |
| | **Probable** | *Likely* to occur (51 – 75% chance of occurring) |
| | **Definite** | Will *certainly* occur (76-100% chance of occurring) |

10.3.6 Degree to which impact can be reversed

The reversibility of an impact can be defined as "the ability of an impact to be changed from a state of affecting aspects to a state of not affecting aspects".

**Table 19: Determining the reversibility of an impact**

| | | |
|---|---|---|
| **REVERSIBILITY** | **Reversible** | Impacts can be reversed through the implementation of mitigation measures |
| | **Irreversible** | Impacts are permanent and can't be reversed by the implementation of |

| | | |
|---|---|---|
| | | mitigation measures |

10.3.7 Degree to which impact may cause irreplaceable loss of resources

The irreplaceability of an impact can be defined as "the amount of resources that can/can't be replaced".

**Table 20: Determining the irreplaceability of an impact**

| | | |
|---|---|---|
| **IRREPLACEABILITY**<br><br>Irreplaceable loss of resources | **No loss** | *No* loss of any resources |
| | **Low** | *Marginal* loss or resources |
| | **Medium** | *Significant* loss of resources |
| | **High** | *Complete* loss of resources |

10.3.8 Degree to which the impact can be mitigated

The degree to which an impact can be mitigated can be defined as "the effect of mitigation measures on the impact and its degree of effectiveness".

**Table 21: Determining the mitigation rating of an impact**

| | | | |
|---|---|---|---|
| **MITIGATION RATING** | **MITIGATED**<br>**Degree impact can be mitigated** | High | *Impact 100% mitigated* |
| | | Medium | *Impact >50% mitigated* |
| | | Low | *Impact <50% mitigated* |

10.3.9 Confidence Rating

Confidence in the assessment of an impact can be defined as the "level of certainty of the impact occurring".

**Table 22: Determining the confidence rating of an impact**

| | | | |
|---|---|---|---|
| **CONFIDENCE RATING** | **CONFIDENCE** | Certain | Amount of information on and/or understanding of the environmental factors that potentially influence the impact is *unlimited and sound* |
| | | Sure | Amount of information on and/or understanding of the environmental factors that potentially influence the impact is *reasonable and relatively sound* |
| | | Unsure | Amount of information on and/or understanding of the environmental factors that potentially influence the impact is *limited* |

10.3.10 Cumulative Impacts

The effect of cumulative impacts can be described as "the effect the combination of past, present and "reasonably foreseeable" future actions have on aspects".

**Table 23: Determining the confidence rating of an impact**

| | | | |
|---|---|---|---|
| **CUMULATIVE RATING** | **CUMULATIVE EFFECTS** | Low | *Minor* cumulative effects |
| | | Medium | *Moderate* cumulative effects |
| | | High | *Significant* cumulative effects |

10.3.11 Significance of impacts

**Table 24: Significance determination**

| | | | |
|---|---|---|---|
| SIGNIFICANCE RATING | SIGNIFICANCE | **Neutral** | • Zero magnitude with any combination of extent and duration. |
| | | **Very low** | • Low magnitude with a site specific extent and short term duration; OR<br>• Very low magnitude with any combination of extent and duration except regional and long term duration. |
| | | **Low** | • High magnitude with a site specific extent and short term duration; OR<br>• Low magnitude with any combination of extent and duration except site specific and short term duration or regional and long term duration; OR<br>• Medium magnitude with a site specific extent and short term duration; OR<br>• Very low magnitude with a site specific extent and long term duration. |
| | | **Medium** | • High magnitude with a local extent and medium term duration; OR<br>• High magnitude with a regional extent and short term duration / a site specific extent and long term duration; OR<br>• High magnitude with a regional extent and short term duration / a site specific extent and long term duration; OR<br>• High magnitude with either a local extent and construction period duration or a site specific extent and medium term duration; OR<br>• Low magnitude with a regional extent and long term duration; OR<br>• Medium magnitude with any combination of extent and duration extent site specific and construction period or regional and long term. |
| | | **High** | • High magnitude with a regional extent and long term duration; OR<br>• High magnitude with either a regional extent and medium term duration / a local extent and long term duration; OR<br>• Medium magnitude with a regional extent and long term duration. |
| | | **Very high** | • High magnitude with a regional extent and long term duration; OR<br>• High magnitude with either a regional extent / long term duration. |

## 10.4 Environmental impact assessment and mitigation measures [Regulation 31 (2)]

**Please refer to Annexures 8 and 9.**

## 10.5 Findings and recommendations of any specialist report or report on a specialised process [Regulation 31 (2) (j)]

10.5.1 Archaeological Impact Assessment

No archaeological material of heritage significance was observed on the section demarcated for development on Portion 38 of the farm Elandspruit 291 JS. The historical homesteads are older than 60 years, and are protected under the National Heritage and

Resources Act (25 of 1999). These homesteads will not be affected by the proposed development, but it should be noted that these structures should be properly recorded by a qualified archaeologist in the event that they are impacted on by the proposed development. Neither the two Voortrekker graves and 50 workers' graves on the same section as the homesteads, nor the nine graves 300 m from the section demarcated for development will be affected by the proposed development. However, in the event that these graves are affected or on discovery of other graves during the course of development, the following will apply: The National Heritage Resources Act (25 of 1999) and the Human Tissues Act (65 of 1983) protect graves older than 60 years. Graves younger than 60 years, however, are protected under the Human Tissue Act (65 of 1983) and fall under Section 2 (1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925). The exhumation of graves falls under the jurisdiction of the National Department of Health and the relevant Provincial Department of Health. Exhumation permission must also be obtained from the relevant local or regional council where graves are located, and from the relevant regional and local council to where the grave will be relocated.

No heritage material was observed on the section demarcated for development on the farm Elandspruit 291 JS. Because archaeological artefacts generally occur below surface, the possibility exists that culturally significant material and skeletal remains may be exposed during the development and construction phases, in which case all activities must be suspended pending further archaeological investigations by a qualified archaeologist (See National Heritage and Resources Act, 25 of 1999 section 36 (6)). From a heritage point of view, development may proceed on the demarcated section on Portion 38 of the farm Elandspruit 291 JS subject to the abovementioned conditions and recommendations. Should the need arise to expand the development beyond the 45 hectare demarcated area mentioned in this study, the following applies: a qualified archaeologist must conduct a full Phase One assessment on the sections beyond the demarcated areas which will be affected by the expansion, in order to determine the occurrence and extent of any archaeological sites and the impact development might have on these sites.

### 10.5.2 Land Capability Assessment

The proposed mining area does not hold a high land use capability. This largely due the combination of land use stressors associated with property size, inconsistent topography, soil depths and ultimately soil structures and chemistry. However, not scoped in this report should care be taken and shown continuously that more sensitive soils in and around the natural water course on the northern boundary of the property not be disturbed and or impeded.

- It is recommended, that based on the identified land capability of the land portion under study that mining should be allowed on the above mentioned mitigation measures are all followed and implemented;
- Further and in addition to the required mitigation is it recommended to establish and document the closure objectives of the mine as it pertains to land use post mining;
- Thereafter initiate a process for the compilation of a conceptual closure plan including the application of selected and applicable specialist studies and conceptual engineering designs;
- Initiate a process for the compilation of an interim closure plan to guide the on-going and concurrent rehabilitation on the mining operation and associated closure-related costing over its operational life, including (not exhaustive):
  - Topsoil's and cover balance modelling (cut and fill) and calculations;
  - Soil treatment and soil amelioration applications;
  - Seeding and planting programmes;
  - Monitoring and reporting programme;
  - Engineering design (prelim) of dumps, trenches, void closure; and
- Initiate a monthly monitoring and investigations/assessments/trials as stipulated in the interim rehabilitation and closure plan.

### 10.5.3 Visual Impact Assessment

The construction and operation of the Yoctolux mine related activities and its associated infrastructure will have a visual impact on the natural scenic resources and the topography. However, with the correct mitigation measures the impact can be decreased to a point where the visual impact can be seen as insignificant.

The moderating factors of the visual impact of the facility in the close range are the following:

- Short exposure time of road users;
- The time the structure will be visual due to roll-over mining;
- Number of human inhabitants located in the area;
- Natural topography and vegetation;
- Mitigation measures that will be implemented such as the establishment of barriers or screens;
- The size of the operation; and
- Medium to high absorption capacity of the landscape.

In light of the above mentioned factors that reduce the impact of the facility, the visual impact is assessed as low visual impact after mitigation measures have been implemented.

**Table 25: Summary of the visual impact assessment**

| Nature of impact: The overall Assessment of the Visual Impact of the area. | | |
|---|---|---|
| | No Mitigation | With Mitigation |
| | Proposed | Proposed |
| **Extent** | Regional (3) | Regional (3) |
| **Duration** | Short term (2) | Short term (2) |
| **Magnitude** | Moderate (6) | Low (4) |
| **Probability** | Likely (3) | Likely (3) |
| **Significance Rating (SR)** | Medium (33) | Low (27) |
| **Status (positive, neutral or negative)** | Negative | |
| **Reversibility** | Yes | |
| **Irreplaceable loss of resources** | Yes | |
| **Can impact be mitigated** | Yes | |
| **Mitigation:** | The visual impact can be minimized by the creation of a visual barrier. The area will be rehabilitated after mining is concluded and thus the visual impact will be removed and the area will be restored. | |

The Visual Impact that will occur due to the Mining activities and associated infrastructure can be seen as having Medium impact on the surrounding environment and inhabitants before mitigation measures are implemented. After mitigation has taken place, the visual impact can be seen as Low. The visual impact that will occur from the mining activities can be sufficiently mitigated to a point where it can be seen as insignificant. Thus, mitigation measures are very important and one of the most significant mitigation measures are the rehabilitation of the area after mining has been concluded. If the rehabilitation of the impact is not done correctly and the final landform do not fit into the surrounding area then the visual impact will remain high and thus become of concern. However, with correct rehabilitation, the impact will be minimal and there should be no visual impact after the landform has been restored.

Mitigation measures may be considered in two categories. Primary measures that intrinsically comprise part of the development design through an iterative process. Mitigation measures are more effective if they are implemented from project inception when alternatives are being considered. Mine closure is one of the concepts that are used. The mine closure and rehabilitation, final landform and land-use must be planned before the opencast mining is initiated. Secondary measures designed to specifically address the remaining negative effects of the final development proposals. Primary measures that will be implemented will mainly be measures that will minimise the visual impact by softening the visibility of the mining activities by "blending" with the surrounding areas. Such measures will include rehabilitation of the mining area by re-vegetation of the mining site and surrounding area. Secondary measures will include final rehabilitation, after care and maintenance of the vegetation and to ensure that the final landform is maintained.

In addition the following measures are recommended:

- Dust from Stockpile areas, roads and other activities must be managed by means of dust suppression to prevent excessive dust;
- Blasting must be done under controlled conditions (i.e. Windy days must be avoided) and must be done in such a way that dust is minimised;
- Blasting should not take place before 08:00 and after 16:00;
- Stockpiles should not exceed 15m in height; and
- Rehabilitation of the area must be done as the mining is completed.

### 10.5.4 Traffic Impact Assessment

With regard to traffic generation and impact, it is estimated that in a worst case scenario 20 truck movements will be made to and from the mine during each hour of the day. The intersection of the R555 and Petrusrus Road still has sufficient capacity therefore no upgrades will be necessary.

### 10.5.5 Ecological Impact Assessment

The natural veldt-type which occurs in the project area can be described as 'Bankenveld vegetation' classified under the Grassland Biome (Acocks 1988). In the new vegetation map the study area falls within the Loskop Mountainlands (MP 19) a vulnerable ecosystem (Threaten Ecosystem Listing 34809, 2011). The Loskop Mountainlands intersects with Rand Highveld Grassland (Gm11) (Mucina & Rutherford 2006) and lies within a highly variable landscape with extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The vegetation is species-rich, it is rich in plant taxa and constitutes of sour grassland dominated by graminiods such as *Themeda*, *Heteropogon*, *Eragrostis* and *Elionurus*. The forb composition is equally diverse and well represented by members of the Asteraceae family, while the woody community forms a typical, albeit sparse, component. Using a Mpumalanga Province systematic biodiversity plan, Loskop Mountainlands is considered a priority area for meeting explicit biodiversity targets. However, this vegetation is poorly conserved and large areas occupied by it have been transformed by agriculture (Mucina & Rutherford 2006). The study site where the proposed project is applicable is mainly transformed by stock farming activities.

Periodic wetlands were observed within the proposed site and around the vicinity of the study area. There was a spring fountain and two manmade dams observed. Due to agricultural transformation these areas had succumbed to artificial human interference and have been vastly invaded by invasive alien plants such as *Acacia mearnsii* (Black wattle). The desktop faunal search results showed that on 75 butterflies' species recorded on the South African Butterfly Conservation Assessment (SABCA) only one species in 2529CD is on the Red list and declared vulnerable, *Metisella meninx* (Marsh sylph). This butterfly species is associated with

wetlands and marshy areas and its vulnerability is due to wetland degradation. No frog or mammal species within the quarter degree square 2529CD were in critical conservation Red list, of the 12 frog species results yielded none were endemic to the area and all were least concern. Similarly, the mammal searches results of 7 species which were least concern. The South African Reptile Conservation Assessment search for grid 2529CD yielded 44 reptile species of which 7 are endemic to the area and one of them the *Homoroselaps dorsalis* (Stripped Harlequin snake) is considered as a lower risk near threatened species. Furthermore, the Plants of Southern Africa (POSA version 3) results yielded 480 plant species associated with grid 2529CD of which 10 are plant species of conservation importance. The plant species compromises of geophytes (*Crinum bulbispermum*, *C. macowanii* and *Hypoxis hemerocallidaes*), herbs (*Pachycarpus sauveolens* and *Callilepis leptophylla*), succulents (*Khadia carolinensis*) and shrubs (*Ilex mitis* var. *mitis*, *Pavetta zeyheri* subsp. *middelburgensis*, *Encephalartos lanatus* and *Encephalartos middelburgensis*).

The site visit and field assessment results for the study site showed that the proposed area is situated in a predominated agricultural area. Observed were intact but yet transformed vegetation cover compromising of:

- *Themeda triandra;*
- *Digitaria monodactyla;*
- *Monocymbium ceresiiforme;*
- *Protea welwitschii;*
- *Erogrostis racemosa;*
- *Andropogon shirensis;*
- *Loudetia simplex;*
- *Brachiara serrata;*
- *Schizachyrium senguineum;*
- *Lopholaenia corifolia;*
- *Juncus rigidus;*
- *Verbena sp.; and*
- *Acacia mearnsii.*

There was limited bird or avian activity observed, only Barn swallows (*Hirundo rustica*) and Yellow crowned bishop (*Euplectes afer*). No faunal (reptiles or mammals) were encountered or observed during the assessment. There was limited insect activity which included butterflies and dragon flies none was considered to be of conservation importance.
Initially, the ecosystem could be regarded as transformed thus considered of no conservational value. However, looking at the ecosystem aspects falling within the area, the area is of high sustainability value as its biodiversity carrying capacity although transformed it still has potential to sustain ecosystem functioning. Therefore, shouldn't there be no alternatives explored there would be a need of a very concise and well implemented biodiversity rehabilitation plan in place. However, the proposed open cast mining will impact severely on vegetation cover thus destructing flora and fauna habitats. It is thus concluded that first an alternative sight be sought after or consider a change in mining methodology. However should the proposed activity take place, a 200m buffer around the ecological sensitive zones has to be adhered to (i.e. no mining nor infrastructure development should fall within this area and disturbance of any sort should be avoided). A rehabilitation plan pre and post mining should be implemented in conjunction with the mining activities to minimise the negative environmental impacts associated with the proposed activity.

### 10.5.6 Surface Water Assessment

The report has described the surface water aspects under two general sections, hydrology and water quality. In the first part, the general hydrology of the Olifants River, and its tributary, flowing from the proposed mine to the Olifants River, the Elandspruit, was discussed. The Elandspruit begins on the area where the coal reserves, earmarked for mining by Yoctolux Colliery, are located. In fact, the stream begins as a natural spring with an average yield of ~10 l/s. Unfortunately this spring locates in the centre of the area

to be mined, it is fed from shallow groundwater flowing from higher land to the west and north of the proposed mine and it is unlikely that mining can take place at this site without having to destroy this spring or the groundwater flow to the spring. In addition, it was also shown that, even if the mine is right at the headwaters of the Elandspruit, the reserve is located in such a place that mining cannot occur without having to mine within the 100-year flood lines of the stream. In fact, the upper reaches of the stream, including the spring mentioned above, will have to give way to an opencast pit if mining of this resource is, at all, going to be possible.

Although the mine plan has left an area around the part of the Elandspruit downstream from (and including) the spring, in our opinion, this will not benefit anybody, as mining by Yoctolux to the east of the spring will destroy it anyhow, and the source of the water presently in Dam 1 will no longer flow in the stream. The greatest impact will, however, come from the neighbouring mine to the north and east of Yoctolux. This mine has already been granted mining authorisation by DMR. There is nothing Yoctolux can do within their area of mining to prevent the destruction of the spring and the Elandspruit, even though the spring actually locates on their land. Although our report has assumed two phases of mining, the first including the mining of the area to the east of the spring, with the second being mining of the spring and the part of the Elandspruit up to the edge of the coal resource, to the west of the spring, in reality, it does not matter if both phases are mined at once. If mining is allowed to the east of the spring (and that includes mining of adjacent land outside the Yoctolux mining rights area), mining of the spring itself and the section of the Elandspruit west of the spring may as well be authorised too, as the spring will be destroyed anyhow. After mining, the water that flowed from the spring will once again, flow in the Elandspruit, being discharged from a decant point at the lowest part of the mine, but unless it is treated, will have high sulphate concentrations, and apart from the fact that it will not be usable for present uses (irrigation and watering of livestock) the flow in the Elandspruit will also increase the sulphate load already in the Olifants River.

The recommendation is that if permission for mining is to be granted by DMR, permission can just as well be granted for the entire area to be mined as a single operation. The second part of the report discusses the water quality of the Elandspruit and the Olifants River. We have shown that, although the amount of flow in the Elandspruit is not highly significant, its water at the proposed colliery is close to pristine in quality. Surface water in these parts of the country cannot be of a higher quality! It is clear that the Karoo sandstone and its erosion products through which the water, daylighting at the Elandspruit spring, presumably flows, is a perfect filter for improving even the quality of rainwater. As stated in the above section, if permission is granted for mining to occur (and permission has already been granted to a neighbouring mine to destroy the spring), it may as well include the entire resource area, as it is impossible to isolate the spring and its source from being mined out. During mining, water collected in the mine pit will have to be pumped somewhere and the only feasible possibility is to pump it into the Elandspruit. The water will be of varying quality, but significantly poorer that the water flowing currently from the Elandspruit Spring, depending on what measures are taken at the mine to remove water from the pit as soon as possible after it enters the pit. It is planned for mining to be completed within about 29 months.

The greatest problem with mining in this area will come after closure of the mine, and in particular, the closure of the neighbouring mine. The groundwater table will eventually reach equilibrium (probably some years after closure of the mine) and then poor quality AMD will begin decanting from the backfilled mine pit. From experience, water with a sulphate concentration of anything from 2 000 mg/l to >4 000 mg/l can be expected to decant into the Elandspruit. On a similar note, the groundwater report suggests that the flow after mining could very well be greater than the current flow from the spring, as, among other things, the transmissivity of the backfilled material would be orders of magnitude greater than what there were before the rocks were broken. This does not even consider the impact from the neighbouring mine which will increase the problem by another order of magnitude! Although often many mitigation methods are suggested in the mining industry and in environmental impact reports, in reality there are only very few measures that actually work. All of these are “active” methods (opposed to passive, no-cost methods). Given the time span over which the water from the “new” Elandspruit spring will have to be treated (ranging anything from a few decades to centuries), this will not be a cheap operation. The scope of this report does not include the after-mining treatment. It suffices to say that Anglo American has implemented such a water treatment plant in the Witbank area and this plant is currently producing excellent water

quality (even drinking water!). However, this is a large corporation, which is still in operation. They can still afford the maintenance of such a plant. Smaller operations may not necessarily have these financial resources.

### 10.5.7 Baseline Assessment of the Ecological Importance and Sensitivity Class

The study is the first of its kind in this particular stream segment under summer conditions. This applies to both the EIS Protocol (developed by Kleynhans, 2000) and the assessment of the PES by means of various aquatic bio monitoring indices (i.e. SASS5; IHAS; IHIA). Given the significant role the habitat conditions (and number of biotopes that could be sampled) in the assessment of macro-invertebrate communities, the current findings should be used as baseline data for future references in order to confirm if the particular river segment of the Elandspruit has improved or deteriorated. The proportion air breathers will rise under conditions of reduced availability of dissolved oxygen, such as experienced when there are high loads of readily decomposable organic matter in streams or when oxidation of high ammonia concentrations takes place. In addition to the above, the fact that the Elandspruit flows very slowly, due to the relative gentle slope in the study area, could also be a significant cause of the low oxygen level in this stream segments. It requires a lot of turbulence and waterfalls to re-aerate oxygen-deficient water flowing in the streams. It is suggested that the water in the Elandspruit is somewhat oxygen-deficient, hence the higher than usual proportion of air breathers recorded during this study. The findings of this study confirm that the Elandspruit and its associated riparian zones are potentially hosting a unique and rich biodiversity in the form of various Red and Orange Data Plant species; Red Data Bird species; and Red Data Insect species. Other contributing factors to ecological deterioration of the sub-catchment were found to be related to alien invader plant species within the stream and on the riparian zone. It is therefore not surprising that the natural conditions (assessed in terms of the EIS protocol) are significantly scoring higher in terms of both importance and in significance than the present conditions. In this regard, AED confirmed that woody alien plants (e.g. poplar; black wattle; blue gum; etc.) have invaded most of Elandspruit's riparian zone. This has led to reduced flow and the destabilisation of riverbanks and even dam walls.

It has been scientifically shown that certain species of invading alien plants create unacceptable fire risks, significantly reduce stream flow thus affecting water security, impact on biodiversity and the ecological functioning of systems and they directly and indirectly reduce the productive and agricultural potential of land. Seed pollution from these plants has meant that the problem of invading alien plants is escalating daily. In order to responsibly address this problem the government, through the national Department of Agriculture, Forestry & Fisheries (DAFF), Directorate: Land Use and Soil Management (LUSM) promulgated amended regulations in terms of the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) on 30 March 2001. These regulations identify a range of species that are declared as weeds and invader plants. The regulations restrict the circumstances in which declared weeds and invader plants may be allowed to grow. In order to do so, the regulations create three categories of plants:

- Category 1 are those plants which are declared “weeds”. These plants ay not occur, or be allowed to occur, on any land or inland water surface.
- Category 2 are those plants which may only be grown in an area demarcated by the Executive Officer for that purpose. These plants are generally species that are used for commercial purposes.
- Category 3 are those plants which, generally, may continue to grow where they already exist. However, new plantings are prohibited. These plants are generally of an ornamental nature. It is a criminal offence for a land user to allow plants to grow in contravention of the prohibitions in Regulation 15. Yoctolux management is therefore under an obligation to control declared weeds and invader plants that are growing unlawfully.

If a land user fails to clear land of declared weeds and invader plants the Executive Officer of DAFF may issue a directive to clear the land. It is also evident that the area earmarked for the proposed colliery is situated upstream from the Elandspruit spring and is situated in a Biodiversity Conservation Category 6 (No Natural Habitat) where all forms of development is supported. The EIS protocol also produced findings to confirm that the Elandspruit sub-catchment is considered to be not unique at any scale. The Elandspruit (in terms of biota and habitat) is generally not very sensitive to flow modifications, but it has not a substantial capacity

for use. A moderate risk of modifying the abiotic template and exceeding the resource base may be allowed. Risks to the well-being and survival of intolerant biota (depending on the nature of the disturbance) may generally be increased with some reduction of resilience and adaptability at a small number of localities. However, the impact of local and acute disturbances must at least partly be mitigated by the presence of sufficient refuge areas.

The best AEMC for the Elandspruit has therefore established to be a Class D (i.e. Largely Modified, which means that a large change in natural habitat, biota and basic ecosystem functions can occur). It was also determined that the Elandspruit is a resilient system. A large risk of modifying the abiotic template and exceeding the resource base may be allowed. Risks to the wellbeing and survival of intolerant biota (depending on the nature of the disturbance) may be allowed to generally increase substantially with resulting low abundances and frequency of occurrence, and a reduction of resilience and adaptability at a large number of localities. However, the associated increase in the abundance of tolerant species must not be allowed to assume pest proportions. The impact of local and acute disturbances must, at least to some extent, be mitigated by refuge areas.

The MBCP (2007) confirmed that the lower section of the Elandspruit is situated in an ecological corridor. The land-use and administrative options for positive biodiversity outcomes in ecological corridors that should be considered are as follows:

- Corridors need to retain at least existing natural vegetation cover and in some key 'critical-link' areas undergo active repair and restoration of ecosystem functioning;
- Land-use planners to refer development applications to MTPA/DALA for all applications involving probable biodiversity impacts, e.g. Land Uses 5 - 15;
- Prioritise the monitoring of changes in land use and loss of natural habitat to protect ecosystem functioning and connectivity;
- Conduct focused public awareness and/or extension efforts on biodiversity values and connectivity to limit natural habitat loss and encourage free movement of plants and animals through biodiversity barriers;
- Identify critical link areas where local sites are protected and promoted to a higher biodiversity conservation category;
- Corridors are pre-disposed towards conservancy-type protection and cooperative management arrangements to provide for cross-barrier movement;
- Treat corridors as priority areas for Working for Water and other alien plant control projects to deny these species the benefits intended for indigenous species;
- Develop activities/procedures for encouraging free movement of indigenous plants and animals across boundaries and barriers in
- agricultural landscapes;
- EIA applications should assess the impact of the proposed development on the functionality of the ecological corridor; and
- Compensatory offsets in corridors can be considered if they result in a net biodiversity gain.

The MBCP (2007) also confirmed that the Elandspruit is affected by three biodiversity conservation categories. The land-use and administrative options for positive biodiversity outcomes in terrestrial biodiversity conservation categories that need to be considered include:

- ***Category 3 (Highly Significant):***
  - All land in this category should be maintained as natural vegetation cover;
  - Land-use planners to refer all development applications in HIGHLY SIGNIFICANT land to MTPA and or DALA for evaluation by
  - biodiversity specialists;
  - Consider economic development only via land use Types 1 – 4 only, and within specified limits, to benefit biodiversity, e.g. extensive livestock management without routine supplementary feeding or pasture enhancement;
  - Encourage cooperative conservation arrangements, e.g. Protected Environments or conservancies where appropriate;

- Conduct focused public awareness and/or extension effort on biodiversity values and uses of these areas, especially to land owners;
- Prioritise for MTPA/DALA to carry out environmental monitoring and reporting on biodiversity status and/or change of land use;
- Develop a more detailed list of unsustainable land uses that are site or area- specific, including relevant aspects of scale and extent;
- Require a biodiversity specialist study as part of the EIA for all development applications;
- Develop best practice guidelines for all permitted land uses;
- Provision for biodiversity offsets being exchanged for biodiversity loss should only be considered at an exchange rate of at least 250%, i.e. more than twice the area or biodiversity value, calculated as a comparable contribution to targets, and only as a last resort;
- Devise new financial and other incentives (e.g. resource economic approaches) for achieving sustainable conservation management;
- Unavoidable development requires special mitigation measures such as dispersed and/or small scale placement of site;
- Consider special projects to develop biodiversity management / sustainable use guidelines and procedures for communal land;
- Develop and apply appropriate legal penalties for noncompliance subject to regulation;
- Prioritise these areas for land care projects: i.e. MTPA, DALA, WfW, Working on Wetlands and NGOs to redirect their conservation projects, programmes and activities.

- ***Category 4 (Important and Necessary):***
  - Actively encourage economically sustainable land uses that are dependent on natural habitat such as Types 1 – 4;
  - Actively discourage intensive land uses which result in biodiversity loss, Types 5 – 9;
  - Prioritise the monitoring of changes in land use and loss of natural habitat to guide management response to protect ecosystem
  - functioning and connectivity;
  - Conduct focused public awareness and/or extension effort on biodiversity values and uses of these areas, especially to land owners;
  - Develop best practice guidelines for all permitted land uses;
  - Encourage cooperative conservation arrangements, e.g. Protected Environments / conservancies;
  - Develop best-practice guidelines for encouraging free movement of indigenous plants and animals across boundaries and barriers in agricultural landscapes;
  - Regulate for compulsory, full EIA procedures;
  - Compensatory offsets of at least 150% may be considered;
  - Prioritise these areas for land-care projects: i.e. MTPA, DALA, WfW, Working on Wetlands and NGOs to redirect their conservation projects, programmes and activities.

- ***Category 6 (No Natural Habitat):***
  - Where this category of land occurs close to areas of high biodiversity value, and is located to potentially serve useful ecological
  - connectivity functions, such as in ecological corridors, encourage restoration and re-vegetation options;
  - For individual parcels of land identified as having specific biodiversity values, actual or potential, develop incentives to restore lost
  - biodiversity and connectivity;
  - Consider the negative impacts of land uses on these areas which have off-site impacts, e.g. controlling use of pesticides, on neighbouring areas of natural habitat, especially if they are of high biodiversity value;

- Encourage landowners and developers to use indigenous plants, especially trees, where aesthetic or functional options exist.

Any proposed development, especially mining, is likely to impact on a river's ecological drivers and can potentially alter its functioning. Therefore, all such developments are subject to a full EIA. Impact assessment requires knowledge of the appropriate ecological reserve flow. This study therefore assists DWA to determine the ecological reserve and involves setting standards for the quantity and quality of water required to satisfy present and future human needs and to protect aquatic ecosystems. The following recommendations should be considered:

***Water extraction:***

No significant amount of water may be extracted from a river for public, private or commercial purposes, without a water use license provided by DWA. This applies to direct extraction from a river or a dam, whether on private or public land. Water use licences are controlled by Water and Irrigation Boards located in every catchment. Allocations are made according to the possession of 'water rights', which are officially allocated so as to be shared between public and private users of water. Water for human consumption has priority in the allocation of water rights, and may not be exchanged with rights for other uses such as irrigation.

***Flow-control or impoundment structures – dams and weirs:***

Surface water in Mpumalanga is already over-committed to various forms of development and human consumption. All major rivers are impacted by water extraction and dam construction, leading to severely reduced flows in lower reaches. Because of this, all proposals for dams require detailed planning and strict adherence to formal EIA. Large public development structures will go through a full EIA process with mandatory public participation. Small farm dams, however, are often thought to be too small to justify impact assessment. Historically farm dams were subsidised by the state, being considered good water conservation practice. Subsequent study has shown their cumulative effect has been to reduce stream-flow dramatically as well as several other negative impacts. In many areas small farm dams are being deliberately breached to correct this error. All farm dams and weirs are subject to EIA legislation.

***Fish passes:***

Any structure that obstructs or modifies the flow in a river or creates a sharp increase in water velocity may require a fish pass to allow for upstream (as well as downstream) movement of fish. Fish passes are gently inclined, sometimes stepped, shallow channels that allow fish to swim upstream to breed. Specialised expertise is required to design and build fish passes. These structures should be compulsory wherever movement of fish up or downstream is necessary. This is particularly important in the identified priority sub-catchments, important aquatic corridors and in the lower reaches of rivers. These corridors are identified on the Aquatic Biodiversity Map as critical movement links to retain some connectivity in our fractured river systems.

***In-stream engineering - channel or bank modification:***

Wherever engineering works will disturb water courses or when structures such as road and rail crossings, have to be built through them, special measures must be taken to ensure minimal disturbance, limiting obstruction to fish movement or restriction of the channel. This provision must take into account a generous assessment of expected flood volumes, as there is every indication that flood peaks (and droughts) will become more extreme as global climate change proceeds. Design specifications for such structures must be based on South African conditions and information. Imported specifications may be from less extreme climates and have inadequate margins to accommodate extremes.

***Canalisation of watercourses:***

This is often proposed as a means to reduce flooding in built-up areas as a reaction to poor catchment management or a symptom of poorly planned existing development. The hard-surfacing of the land in urban areas with roads, roofs and concrete creates severe flash floods by increasing the speed and volume of water run-off and hence its capacity for erosion and destruction. Flood events

are increasing and floodplains and low-lying wetlands near rivers should never be built on. Canalisation to speed up water flow in highly built-up areas may sometimes be necessary, but only as a last resort. Environmentally friendly planning for these sites should allow for areas to be inundated to delay runoff and keep the water on the land to recharge the water table.

***Return-water and effluent water quality:***

Water that is returned to rivers and wetlands after urban, industrial or agricultural use must adhere to the biological and chemical standards set by DWA. This is particularly important where discharge water comes from sewage treatment plants and from industries that use water for processing and cleansing. All of this water may be referred to as effluent and considered potentially toxic for people and the environment. Municipalities and most mining and manufacturing industries produce substantial waste and effluent. This includes solid waste that may convert rainfall into toxic seepage. The liquid and soluble chemical component ends up in rivers. River flow moves the problem to other places, where other people have to bear the cost of upstream pollution. The temptation to simply flush waste down the drain is strong and the level of this sort of illegal toxic waste disposal is high. This is particularly the case with the hundreds of small and medium enterprises in every municipality. The National Environmental Management Act requires the polluter to pay, and provides for very substantial compensation to be recovered through legal action. Continual and widespread water quality monitoring, using reliable and sophisticated technology, is the only defence against this practice.

***Return-water outflow structures:***

Second-hand water, when returned to a river, must achieve DWA quality standards. Depending on the chemical characteristics of the effluent different disposal strategies may be prescribed. This is a specialised field of expertise and appropriate advice must be obtained. Whether sprayed on the land as irrigation water or channelled directly into a watercourse, special precautions must be taken to minimise environmental impact.

***Water Quality and Quantity Monitoring (Surface & Ground)***

It is strongly recommended that Yoctolux management proceed with a monitoring programme that should address the following:
Groundwater quality: Monthly (hydrochemistry) of upstream and downstream boreholes;

- Surface water quality: Monthly (hydrochemistry) at sites monitored during this assessment;
- Surface water quantity: Monthly (flow measurements) at sites monitored during this assessment;
- Aquatic Bio monitoring: Twice per year (summer & winter cycles) making use of the SASS5; IHAS; IHIA indices at sites monitored
- during this assessment;
- Toxicological assessments: Twice per year (summer & winter cycles) by making use of the Whole Effluent Toxicity (WET) procedures and the hazard classification used is the unofficial method used by the DWA.

### 10.5.8 Baseline Wetland Assessment

Riparian areas perform a variety of functions that are of value to society, especially the protection and enhancement of water resources, and provision of habitat for plant and animal species. Based on the Riparian Assessment at Yoctolux Freehold area, the riparian zoned potentially serves the following purposes:

- Store water and help reduce flood peaks;
- Stabilise stream banks;
- Improve water quality by trapping sediment and nutrients;
- Maintain natural water temperature through shading for aquatic species;
- Provide shelter, food and migration corridors for movement of both aquatic and terrestrial species;
- Act as a buffer between aquatic ecosystems and adjacent upslope land uses.

As described above, there are different characteristics of riparian zones depending largely on what zones of a stream they are associated with. Thus not all riparian areas would be able to perform these functions to the same extent. The protection of the riparian zone enables a suitable buffer to be maintained between land use activities in the terrestrial areas and the possible impacts within the aquatic river channel itself. Maintaining riparian zones – including their naturally dense vegetation - also allows for bank stabilisation to be maintained and the risks of erosion of alluvial banks to be minimised. Invasive species are a major threat to South Africa's biodiversity and the region's natural capital. Many invasive species have substantial negative effects on ecosystem functioning and the capacity of ecosystems to deliver sustainable ecosystem services. These species are affecting, or have the potential to affect South Africa's water resources. AED confirmed that woody alien plants (e.g. poplar; black wattle; blue gum; etc.) have invaded most of Elandspruit's riparian zone. This has led to reduced flow and the destabilisation of riverbanks and even dam walls. It has been scientifically shown that certain species of invading alien plants create unacceptable fire risks, significantly reduce stream flow thus affecting water security, impact on biodiversity and the ecological functioning of systems and they directly and indirectly reduce the productive and agricultural potential of land. Seed pollution from these plants has meant that the problem of invading alien plants is escalating daily. In order to responsibly address this problem the government, through the national Department of Agriculture, Forestry & Fisheries (DAFF), Directorate: Land Use and Soil Management (LUSM) promulgated amended regulations in terms of the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) on 30 March 2001. These regulations identify a range of species that are declared as weeds and invader plants.

The regulations restrict the circumstances in which declared weeds and invader plants may be allowed to grow. In order to do so, the regulations create three categories of plants:

- Category 1 is those plants, which are declared "weeds". These plants may not occur, or be allowed to occur, on any land or inland water surface.
- Category 2 is those plants, which may only be grown in an area demarcated by the Executive Officer for that purpose. These plants are generally species that are used for commercial purposes.
- Category 3 is those plants, which, generally, may continue to grow where they already exist. However, new plantings are prohibited. These plants are generally of an ornamental nature. It is a criminal offence for a land user to allow plants to grow in contravention of the prohibitions in Regulation 15. Yoctolux management is therefore under an obligation to control declared weeds and invader plants that are growing unlawfully. If a land user fails to clear land of declared weeds and invader plants the Executive Officer of DAFF may issue a directive to clear the land.

### 10.5.9 Geohydrological Assessment

**Current Groundwater Conditions**

Groundwater levels were measured in thirteen boreholes during a hydro census conducted in April 2013 for the proposed opencast colliery on the farm Elandspruit 291 portion 38. The depth of the groundwater was found to vary between 5.5m and 53m below ground level. The flow at Spring ELS was also measured to be approximately 4l/s during the April 2013 hydro census. A seasonal aquifer perched on the bedrock probably develops in the upper weathered soil layer, especially after high rainfall events. Flow in this perched aquifer is expected to follow the surface contours closely and emerge as spring or seepage at lower elevations.
From the chemical analysis conducted an overall assumption can be made that the groundwater sampled in the proposed mining area is acceptable for domestic use (with the exception of ELS1, ELS14 and ELS18) according to the DWA guidelines. The groundwater in the mining area is also acceptable for livestock watering according to the DWA guidelines. Spring ELS complies with the DWA guidelines for both domestic use and livestock water. It can be deduced from the water quality of the sampled boreholes and the spring that the groundwater (including Spring ELS) has not been widely negatively affected by historic mining related contaminants.

**Predicted Impacts of Mining**

The impacts on the groundwater regime normally associated with mining is dewatering of the aquifer during mining and pollution of the groundwater following mine closure. The dewatering is essential to allow access to the mining areas, while the pollution is due to chemical weathering by oxidation of the sulphide containing minerals (mostly pyrite). During mining, groundwater seeping into the opencast mining area will have to be pumped out to facilitate access. This will inevitably lead to a lowering of the groundwater table and the development of a local cone of depression. This cone of depression will also contain pollution resulting from mining. Polluted groundwater pumped from the mine will be used for mining purposes. Post mining, following the closure of the pit and discontinuing of dewatering, the groundwater levels will return to equilibrium. The cone of depression that contained polluted groundwater will cease to exist and movement of a groundwater pollution plume will commence.
Numerical groundwater modelling is considered to be the best method of anticipating and quantifying these likely impacts on the groundwater regime. For this purpose, a numerical model was created using the Department of Defence Groundwater Modelling System (GMS) software as Graphical User Interface (GUI) for the well-established Modflow and MT3DMS numerical codes. Based on the results of the modelling, the following conclusions are made:

**Construction Phase:**

The construction phase will consist of preparations for the opencast, which is assumed to consist mainly of establishment of infrastructure on site and the mobilisation of earth moving equipment. This phase is not expected to influence the groundwater levels. With the exception of lesser oil and diesel spills, there are also no activities expected that could impact on regional groundwater quality.

**Operational Phase:**
Since the coal seam is situated below the groundwater level, the lowering of the groundwater level during mining will be important:

- The dam to the west of the opencast may be largely dewatered if no clayey bottom and significant inflow of water is present;
- Base flow of the stream draining from this dam could also be affected due to the effect of drawdown resulting from the dewatering of the opencast;
- The identified spring (SpringELS) falls within the mining area and may be completely destroyed by mining; and
- There are 5 privately owned boreholes in the potential affected area that might be impacted upon, during mining. Four of these boreholes (ELS5, ELS6, ELS7 and ELS8) are located within the opencast area and will most likely be destroyed during mining. ELS1 may experience a decline in water level in the event that this borehole is not destroyed due to mining activities and kept for abstraction purposes.

All of the above conclusions were based on the assumption that the dam/stream has not been previously affected by mining activities.

**Post Mining Phase:**

Post mining, after closure, the water table will rise to reinstate equilibrium with the groundwater systems. The mined areas will have a large hydraulic conductive compared to the pre-mining situation. This will result in a relative flattening of the groundwater table over the extent of mining, in contrast to the gradient that existed previously.

- Following closure of the opencast, the groundwater level will rise to an equilibrium that will differ from the pre-mining level due to the disturbance of the bedrock and increase in recharge from rainfall.

- Intuitively, it would be expected that this raise in groundwater could result in decanting of the opencast. Although direct decanting was not predicted, this elevated water level into the regolith could lead to increased seepage at lowering lying areas which could be interpreted as decant. The exact locations of these seepage points will be determined by the geometry of the sub-surface.
- Groundwater within the mined areas is expected to deteriorate due to chemical interactions between the geological materials and the groundwater. The resulting groundwater pollution plume will commence with downstream movement.
- The sulphate pollution plume emanating from the opencast is expected to reach the dam to the west, closest to the opencast, as well as the stream draining the dam and the borehole ELS1, within 10 years post mining.

The plume is expected to reach a second and third dam downstream from the mine as well as ELS9 and ELS17 within 50 years post mining.

- The plume is expected to reach a fourth and fifth dam downstream from the mine as well as ELS10 and ELS12 within 100 years post mining.
- Following this eventual period, seepage of AMD will increase in concentration and could reach very high levels in the streams surrounding the opencast, due to evapotranspiration.

It must be kept in mind that the modelling was done within the limitations of the scope of work of this study and the limited amount of monitoring data available. Although all efforts have been made to base the model on sound assumptions and has been calibrated to observed data, the results obtained from this exercise should be considered in accordance with the assumptions made.

**Groundwater Management and Mitigation Measures**

Since it is inevitable that a mining operation of this scale will impact on the groundwater regime, measures to manage and reduce these impacts to the absolute minimum must be considered. The identified negative impacts of reduction of the groundwater levels during mining and the spread of groundwater pollution after closure of the opencast will be addressed in the following paragraphs.

**Lowering of Groundwater Levels during Mining**

Since the drawdown or the groundwater levels during mining could influence some boreholes, the following measures are recommended:

- The static level of groundwater in all boreholes within a distance of less than one kilometre must be measured regularly to establish a database against which future groundwater levels can be compared;
- Such measurements must be made preferably quarterly, but at least twice annually, following the dry and rainy seasons;
- In the event of unacceptable decrease of the yield of any affected boreholes, alternative water supply should be supplied to the affected parties until such time that the groundwater recovers following closure of the pit;
- As the stream to the west could be affected, monitoring of the stream is essential. Should clean mine water be available, it is suggested that it be released in the stream. A hydrologist should be consulted to ensure correct volumes and timing of the added water;
- Another very important aspect to consider is the layout and order of the opencast cuts. The best possible scenario for minimising impacting on the dam/stream is to start the box cut parallel to the stream and at the farthest point from the dam. In such a mining scenario the dewatering impact will be delayed to the latest possible time before closure of the opencast; and
- As one of the major impacts is the destruction of the spring and boreholes, active offset strategies such as supplying water will have to be developed to negate the water produced by the spring and boreholes. The following options should be investigated:
    - Investigate whether the spring can be re-established at a point downstream of the opencast with water abstracted from the opencast. This should however be approved by DWAF as the current water quality of the spring is pristine

Re-drilling of destroyed boreholes at other locations outside the area of mining to compensate for the destroyed boreholes. These boreholes should be sited by geophysics

**Rise of Groundwater Levels Post-Mining**

Although decanting *per se* was not predicted, the model indicated increased groundwater seepage in the stream to the west of the opencast and a maximum rise in groundwater level of 5 meters in the lower sections of the opencast, without mitigation. As it is predicted that there will be a rise in groundwater levels in the lower sections of the opencast, some measures are needed to mitigate this.

- The final backfilled opencast topography should be engineered such that runoff is directed away from the opencast areas.
- The final layer (just below the topsoil cover) should be as clayey as possible and compacted if feasible, to reduce recharge to the opencasts.
- Leaving a final void in the opencast areas must be investigated. Once final mining plans are available, it will be essential to model this option.

**Spread of Groundwater Pollution Post-mining**

Predictions in the previous sections regarding groundwater pollution have been based on the assumption that the rehabilitated pit will be a constant source of sulphate pollution of 2000 mg/l, representing a worst-case scenario. With appropriate measures, the oxidation rate of pyrite can be limited, resulting in lower starting concentrations. Furthermore, the migration of the pollution plume from the void can also be limited by surface rehabilitation measures preventing excessive infiltration of groundwater to the mined area. Thus, although it has been predicted that only a limited area of the aquifer might be polluted to such an extent that acceptable standards for domestic water is exceeded, further reduction is achievable.

To minimise the effect of groundwater pollution on the receiving environment, the following measures are suggested:

- All mined areas should be flooded as soon as possible to bar oxygen from reacting with remaining pyrite;
- Mining should remove all coal from the opencasts and as little as possible should be left;
- Quarterly groundwater sampling must be done to establish a database of plume movement trends, to aid eventual mine closure;
- Regular sampling and chemical analyses of the groundwater is imperative to establish a sound database:
    - Groundwater in all boreholes within a distance of less than two kilometres must be sampled regularly to establish a database against which future groundwater levels can be compared.
    - Sampling must be preferably quarterly, but at least twice annually, following the dry – and rainy seasons.
    - If it is found during such a sampling event that groundwater from any extraction borehole is polluted beyond acceptable standards, alternative water will have to be supplied to the affected party.

Additionally, a cut off trench of 3m depth to the west of the rehabilitated area was modelled. This depth was chosen as a cut off trench that is deeper may prove to be financially unfeasible. This model was constructed to evaluate the feasibility of such a trench to capture contaminated groundwater. However, according to the available data and model, a cut off trench could be unsuccessful in contaminant capture as the contamination migrates predominantly in the deeper aquifer and groundwater is not intercepted effectively for contaminant capture purposes. Therefore: the use of active methods such as a water treatment facility to intercept polluted groundwater should be also investigated.

**Impacts Indirectly Related to Mining**

During all phases of mining, vehicles and personnel will be operative in the opencast. Minor spills such as diesel, petrol and oil could results from machinery operations. Also, domestic water and waste disposal could also affect the groundwater quality. The following is thus recommended:

- It must be ensured that a credible company removes used oil after vehicle servicing.
- A sufficient supply of absorbent fibre should be kept at the site to contain accidental spills.
- Used absorbent fibre must be land-farmed, using approved methodologies.
- Domestic waste water, especially sewage, must either be treated at site according to accepted principles, or removed by credible contractors.
- Solid waste must similarly either be stored at site on an approved waste dump, or removed by credible contractors.

**Further work:**

The following further work is recommended

- Between 4 and 6 monitoring holes must be constructed around the opencast upstream and downstream of the site;
- A monitoring network should be dynamic. This means that the network should be extended over time to accommodate the migration of contaminants through the aquifer as well as the expansion of infrastructure and/or addition of possible pollution sources. An audit on the monitoring network should be conducted annually;
- The numerical model should be recalibrated as soon as more hydrogeological data such as monitoring holes are made available. This would enhance model predictions and certainty;
- The stream should be measured for flow upstream and downstream to determine the effect that the dewatering of the opencast has on the stream before mining commences;
- In both cases the monitoring should commence before mining to establish background values for future reference;
- The cumulative pollution and dewatering impacts of all current mining in addition to the proposed new opencast could not be calculated as no data on surrounding mines were available. It is recommended that such a study be undertaken, incorporating monitoring data from surrounding mines. This should especially be done for the spring (SpringELS) as cumulative dewatering of all mining in addition to Elandspruit may dry up the spring before opencast mining on Elandspruit commences;
- A detailed study should be done on the feasibility of establishing the spring downstream of the opencast; and
- A detailed study should be done on the feasibility of establishing a water treatment facility downstream of the opencast to intercept and treat polluted groundwater.

### 10.5.6 Paleontological Assessment

The Paleontological Assessment (Fourie, 2014) concluded the following:

a. All the land involved in the development was assessed and none of the property is unsuitable for development.
b. Areas that would involve mitigation and may need a permit from the South African Heritage Resources Agency are discussed.
c. The following should be conserved: if any palaeontological material is exposed during digging, excavating, drilling or blasting, SAHRA must be notified. All development activities must be stopped and a palaeontologist should be called in to determine proper mitigation measures. Especially shallow caves.
d. Condition in which development may proceed: It is further suggested that a Section 37(2) agreement of the Occupational, Health and Safety Act 85 of 1993 is signed with the relevant contractors to protect the environment and adjacent areas as well as for safety and security reasons.

## 11. ASSUMPTIONS AND LIMITATIONS [REGULATION 31 (2) (m)]

- All information provided to the environmental team by the Applicant and I&APs was correct and valid at the time that it has been provided;
- The investigations undertaken by specialists during the EIA process, indicated that the development site is suitable and technically acceptable;
- It is not always possible to involve all I&APs individually, however every effort has been made to involve as many affected stakeholders as possible;
- The information provided by the Applicant and specialists was accurate and unbiased; and
- The scope of this investigation is limited to assessing the environmental impacts associated with the construction, operation and decommissioning of the proposed manganese mine.

## 12. REASONED OPINION OF THE EAP [REGULATION 31 (2) (n)]

Based on the findings of the EIA, the EAP is of the opinion that the proposed development be approved based on the extensive positive impacts it will have on the local and regional communities. These positive impacts include among others industry specific and general skills development programmes for the local community. This will result in social upliftment and will have a cumulative effect on the economy and social conditions of the population in the area. The potential negative impacts can be mitigated to acceptable levels and therefore are not a limiting factor in the approval of the environmental authorisation.

**PREFERRED ALTERNATIVE (CONSTRUCTION PHASE)**

| NATURE | | DESCRIPTION OF IMPACT | POST-MITIGATION |
|---|---|---|---|
| Geological and Soils | | Loss of topsoil and soil erosion through vegetation clearance, wind and stormwater. | Very low (-) |
| | | Soil compaction by heavy duty vehicles | Low (-) |
| | | Contamination of soils through:<br>• Indiscriminate disposal of construction waste; and<br>• Accidental spillage of chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from construction vehicles and other chemicals from construction activities e.g. paints. | Low (-) |
| Agricultural potential and land capability | | Loss of soil resources for agricultural and other land uses. | Low (-) |
| | | Possibility of "hot" work (e.g. welding) and workers causing veld fires destroying veld and loss of flora and fauna on the study area and on adjacent farms, impacting on the livelihood of farmers. | Very Low (-) |
| | | Altered landforms due to construction of roads and excavation. | Very Low (-) |
| Existing Land Use of Surrounding Properties | | Impact of blasting on existing infrastructure on surrounding land. | Low (-) |
| Hydrology | Surface Water and Groundwater | Stormwater, erosion and siltation impacts due to a lack of implementing temporary measures to manage stormwater run-off quantity and quality during the construction phase. | Very Low (-) |

| NATURE | | DESCRIPTION OF IMPACT | POST-MITIGATION |
|---|---|---|---|
| | | Contamination of stormwater runoff and groundwater, caused by:<br>• Spills and leaks of cement;<br>• Sediment release;<br>• Chemical toilets;<br>• Chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from construction vehicles;<br>• Indiscriminate storage and disposal of hazardous waste;<br>• Other chemicals from construction activities e.g. paints; and<br>• Effluent discharges, due to a lack of stormwater management. | Very Low (-) |
| | | Altered drainage patterns and stormwater runoff flows, especially due to vegetation clearance | Very Low (-) |
| | | Dewatering of the groundwater aquifer | Low (-) |
| **Biodiversity** | **Flora and Fauna** | Decrease in biodiversity on the study and surrounding area. | Low (-) |
| | | Spill-over impacts, which may occur on adjacent ecological systems especially the sensitive riparian area. | Medium (-) |
| | | Spreading of alien and invasive species | Low (-) |
| | | Impact on natural migratory routes and faunal dispersal patterns. | Medium (-) |
| | | Disturbance of fauna through noise, light and dust pollution and hunting, trapping and killing of fauna. | Low (-) |
| **Archaeological/Heritage Resources** | | Potential for alteration of archaeological, historical and paleontological resources, should it be discovered during the construction phase. | Very Low (-) |
| **Visual and Lighting** | | Visibility from sensitive receptors / visual scarring of the landscape as a result of the construction activities. | Medium (-) |
| | | Visibility of solid domestic waste, building rubble and dust. | Very Low (-) |
| | | Impact of security lighting on surrounding landowners and animals. | Very Low (-) |
| **Noise and Vibration** | | Nuisance and health risks caused by an increase in the ambient noise level as a result of noise impacts associated with the operation of construction vehicles and equipment. | Very Low (-) |
| | | Disturbance due to vibrations caused by construction vehicles and blasting. | Very Low (-) |
| **Air Quality** | | Increased dust pollution due to vegetation clearance as well as construction vehicles and activities. | Very Low (-) |
| | | Settling of dust on the surrounding area and pasture for livestock may impact on livestock. | Very Low (-) |
| | | Windborne dust (soil), vehicle fumes and stockpile particulate matter of $PM_{10}$ and lower which alters air quality and pose a health risk. | Low (-) |

| NATURE | DESCRIPTION OF IMPACT | POST-MITIGATION |
|---|---|---|
| **Waste (including hazardous materials)** | Generation of additional general waste/ litter / building rubble and hazardous material during the construction phase. | Low (-) |
| | Indiscriminate disposal of waste could pollute natural resources and ecosystems and pose a risk of injury and death of animals and people. | Very Low (-) |
| **Traffic** | The change in the traffic patterns as a result of traffic entering and exiting the proposed mine on the surrounding road infrastructure and existing traffic. | Low (-) |
| | Nuisance, health and safety risks caused by increased traffic on and adjacent to the study area including cars, busses and other heavy vehicles. | Low (-) |
| **Health and Safety** | Possibility of construction activities and workers causing veld fires, which can potentially cause injury and or loss of life to construction workers and surrounding landowners, visitors and workers. | Very Low (-) |
| | Increased risk to public health and safety: Dangerous areas and construction activities including blasting, pose health risks and possible loss of life to construction workers and visitors to the site. | Very Low (-) |
| | Security risks: Trespassing of construction workers on adjacent properties and possible crime. | Very Low (-) |
| | Spreading of diseases such as diarrhoea, HIV and TB. | Low (-) |
| **Socio-economic** | Creation of short term employment opportunities for the local communities, during the construction phase. | Medium (+) |
| | Sourcing supplies from local residents and businesses. | Medium (+) |

**PREFERRED ALTERNATIVE (OPERATIONAL PHASE)**

| NATURE | DESCRIPTION OF IMPACT | SIGNIFICANCE POST-MITIGATION |
|---|---|---|
| **Geological and Soils** | Loss of topsoil, soil erosion and soil compaction by heavy duty vehicles on site. | Very low (-) |
| | Contamination of soils through:<br>• Indiscriminate disposal of waste; and<br>• Accidental spillage of chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from vehicles and other chemicals from operational and maintenance activities e.g. paints. | Low (-) |
| | Flooding of open cast pit. | Low (-) |

| NATURE | | DESCRIPTION OF IMPACT | SIGNIFICANCE POST-MITIGATION |
|---|---|---|---|
| **Agricultural potential and land capability** | | Possibility of "hot" work (e.g. welding) and workers causing veld fires destroying veld and animals on the study area and on adjacent farms, impacting on the livelihood of farmers. | Very Low (-) |
| **Existing Land Use** | | Blasting may disturb infrastructure on surrounding land. | Low (-) |
| **Hydrology** | **Surface Water and Groundwater** | Stormwater, erosion and siltation impacts due to a lack of implementing temporary measures to manage stormwater run-off quantity and quality during the operational phase. | Very Low (-) |
| | | Contamination of stormwater runoff and groundwater, caused by:<br>• Spills and leaks of cement;<br>• Sediment release;<br>• Chemical toilets;<br>• Chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from construction vehicles;<br>• Indiscriminate storage and disposal of hazardous waste;<br>• Other chemicals from maintenance activities e.g. paints; and<br>• Effluent discharges, due to a lack of stormwater management. | Very Low (-) |
| | | Altered drainage patterns and stormwater runoff flows. | Very Low (-) |
| | | Dewatering on the groundwater aquifer | Low (-) |
| | | Acid Mine Drainage | Low (-) |
| | | Seepage from product stockpiles and from mining operations could cause a contamination plume affecting the underground resources. | Low (-) |
| **Biodiversity** | **Flora and Fauna** | Decrease in biodiversity on the study and surrounding area. | Low (-) |
| | | Spill-over impacts, which may occur on adjacent ecological systems. | Low (-) |
| | | Spreading of alien and invasive species | Low (-) |
| | | Impact on natural migratory routes and faunal dispersal patterns. | Medium (-) |
| **Archaeological/Heritage Resources** | | Potential for alteration of archaeological, historical and paleontological resources, should it be discovered during the operational phase. | Very Low (-) |
| **Visual and Lighting** | | Visibility from sensitive receptors / visual scarring of the landscape and impact on 'Sense of Place' as a result of the visibility of the mining site including stockpiles and waste dumps and activities. | Medium (-) |
| | | Visibility of solid domestic, dust and operational waste. | Very Low (-) |
| | | Impact of security lighting on surrounding landowners and animals. | Very Low (-) |
| **Noise and Vibration** | | Nuisance and health risks caused by an increase in the ambient noise level as a result of noise impacts associated with the operation of the mine. | Very Low (-) |
| | | Disturbance due to vibrations caused by vehicles and blasting. | Low (-) |
| **Air Quality** | | $CO_2$ and Methane emissions from coal mining. | Low (-) |
| | | Increased dust pollution due to stockpiles and vehicles on gravel roads | Very Low (-) |

| NATURE | DESCRIPTION OF IMPACT | SIGNIFICANCE POST-MITIGATION |
|---|---|---|
| | as well as other mining activities. | |
| | Settling of dust on the surrounding area and pasture for livestock, may impact livestock. | Very Low (-) |
| | Windborne dust (soil and ore fines) as well as vehicle fumes and particulate matter of $PM_{10}$ and smaller, altering air quality. | Very Low (-) |
| **Waste (including hazardous materials)** | Generation of additional general waste/ litter / building rubble and hazardous material during the operational phase. | Low (-) |
| | Indiscriminate disposal of waste could pollute natural resources and ecosystems and poses a risk of injury and death of animals and people. | Very Low (-) |
| **Traffic** | The change in the traffic patterns as a result of traffic entering and exiting the new mine, on the surrounding road infrastructure and existing traffic. | Low (-) |
| | Nuisance, health and safety risks caused by increased traffic on and adjacent to the study area including cars, busses and other heavy vehicles. | Low (-) |
| **Health and Safety** | Possibility of mining activities and workers causing veld fires, which can potentially cause injury and or loss of life to mine workers and surrounding landowners, visitors and workers. | Very Low (-) |
| | Increased risk to public health and safety: Dangerous areas and mining activities including blasting, pose health risks and possible loss of life to mine workers and visitors to the site. | Very Low (-) |
| | Security risks: Trespassing of mine workers on adjacent properties and possible crime. | Very Low (-) |
| | Spreading of diseases such as diarrhoea, HIV and TB. | Low (-) |
| **Socio-economic** | Skills development for historically disadvantaged individuals (HDI's) and others from the local communities in the Mpumalanga Province. Individuals will be more employable after the operational phase, which will benefit themselves, the workforce, the community and the economy. | Medium (+) |
| | Development and upliftment of the surrounding communities and infrastructure. | Medium (+) |
| | Development of the economic environment, by job provision and sourcing supplies for and from local residents and businesses. | Medium (+) |
| | Creation of short to long term employment during all the phases of mining for local residents and skills transfer to unskilled and semi-skilled unemployed individuals. | Medium (+) |
| | Positive - Sourcing supplies from local residents and businesses. | Medium (+) |

**PREFERRED ALTERNATIVE (DECOMMISSIONING AND REHABILITATION PHASE)**

| NATURE | | DESCRIPTION OF THE IMPACT | POST-MITIGATION |
|---|---|---|---|
| Geological and Soils | | Loss of topsoil and soil erosion through vegetation clearance, wind and stormwater. | Very low (-) |
| | | Soil compaction by heavy duty vehicles. | Low (-) |
| | | Contamination of soils through:<br>• Indiscriminate disposal of construction waste; and<br>• Accidental spillage of chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from construction vehicles and other chemicals from construction activities e.g. paints. | Low (-) |
| Agricultural potential and land capability | | Possibility of operational activities and workers causing veld fires destroying veld and animals on the study area and on adjacent farms, impacting on the livelihood of farmers. | Very Low (-) |
| | | Restoring altered landforms due to excavation. | High (+) |
| Existing Land Use and Capability | | Possibility of decommissioning and rehabilitation activities and workers causing veld fires destroying veld and animals on the study area and on adjacent farms, impacting on the livelihood of farmers. | Very Low (-) |
| Hydrology | Surface water and Groundwater | Stormwater, erosion and siltation impacts due to a lack of implementing temporary measures to manage stormwater run-off quantity and quality during the decommissioning phase. | Very Low (-) |
| | | Contamination of stormwater runoff and groundwater, caused by:<br>• Spills and leaks of cement;<br>• Sediment release;<br>• Chemical toilets;<br>• Chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from construction vehicles;<br>• Indiscriminate storage and disposal of hazardous waste;<br>• Other chemicals from construction activities e.g. paints; and<br>• Effluent discharges, due to a lack of stormwater management. | Very Low (-) |
| | | Altered drainage patterns and stormwater runoff flows. | Very Low (-) |
| | | Impacts of dewatering on the groundwater aquifer should water be abstracted from groundwater during the decommissioning phase. | Low (-) |
| | | Acid Mine Drainage. | Low (-) |
| Biodiversity | Flora and Fauna | Disturbance of fauna through noise, light and dust pollution and hunting, trapping and killing of fauna. | Very Low (-) |
| | | Spreading of alien invasive species. | Low (-) |
| | | Impact on natural migratory routes and faunal dispersal patterns. | Medium |
| Archaeological/Heritage Resources | | Potential for alteration of archaeological, historical and paleontological resources, should it be discovered during the construction phase. | Very Low (-) |
| Visual and Lighting | | Visibility from sensitive receptors / visual scarring of the landscape as a result of the decommissioning and rehabilitation activities. | Medium (-) |
| | | Visibility of solid domestic waste and building rubble. | Very Low (-) |

| NATURE | DESCRIPTION OF THE IMPACT | POST-MITIGATION |
|---|---|---|
| | Impact of security lighting on surrounding landowners and animals. | Very Low (-) |
| **Noise and Vibration** | Nuisance and health risks caused by an increase in the ambient noise level as a result of noise impacts associated with heavy duty vehicles and equipment. | Very Low (-) |
| | Disturbance due to vibrations caused by construction vehicles. | Very Low (-) |
| **Air Quality** | Increased dust pollution due to vegetation clearance and construction vehicles and decommissioning activities. | Very Low (-) |
| | Settling of dust on the surrounding area and pasture for livestock, may impact livestock. | Very Low (-) |
| | Windborne dust (soil), vehicle fumes and particulate matter of $PM_{10}$ and smaller, altering air quality. | Very Low (-) |
| **Waste (including hazardous materials)** | Generation of additional general waste/ litter / building rubble and hazardous material during the decommissioning phase. | Low (-) |
| | Indiscriminate disposal of waste could pollute natural resources and ecosystems and poses a risk of injury and death of animals and people. | Very Low (-) |
| **Services Water, Sewage, Electricity** | Need for services i.e. water, electricity and sewerage systems during the decommissioning phase causing additional strain on natural resources. | Medium (-) |
| **Traffic** | The change in the traffic patterns as a result of traffic entering and exiting the proposed mine on the surrounding road infrastructure and existing traffic. | Low (-) |
| | Nuisance, health and safety risks caused by increased traffic on and adjacent to the study area including cars, busses and other heavy vehicles. | Low (-) |
| **Health and Safety** | Possibility of when 'hot' work is done (e.g. welding) and workers causing veld fires, which can potentially cause injury and or loss of life to construction workers and surrounding landowners, visitors and workers. | Very Low (-) |
| | Increased risk to public health and safety: Dangerous areas and decommissioning activities poses health risks and possible loss of life to construction workers and visitors to the site. | Very Low (-) |
| | Security risks: Trespassing of construction workers on adjacent properties and possible crime. | Very Low (-) |
| | Spreading of diseases such as diarrhoea, HIV and TB. | Low (-) |
| **Socio-economic** | Creation of short term employment opportunities for the local communities, during the decommissioning phase. | Medium (+) |
| | Sourcing supplies from local residents and businesses. | Medium (+) |

## 13. ENVIRONMENTAL IMPACT STATEMENT [REGULATION 31 (2) (o) (i-ii)]

The purpose of this report is to assess the identified potential impacts associated with the proposed development. Potential impacts were identified in consultation with I&APs, and through the technical expertise and experience of Environmental Assurance. The report sought to identify and assess the impacts of the proposed development on the biophysical environment and socio-economic status of the area and the probability of the impacts occurring. The proposed new coal mine can pose various risks to the environment as well as the residents in the vicinity of the development, although these risks are likely to be limited in its extent.

## 14. RECOMMENDATIONS [REGULATION 31 (2)]

Our recommendation, based on the information currently available, is that the application for the proposed development should continue, and that the Applicant be allowed to investigate the establishment of the coal mine on Portion 38 of the farm Elandspruit 291 JS. This authorisation should be in line with sensitive planning, design and good environmental management. If the concept of sustainable development is considered it is proposed that the mine will have a positive impact on the provision of social and economic criteria. With the recommended guidelines provided by the various specialists' studies; the ecological component can also be brought into balance. In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through physical measures, the recommendations from the EIA are included within the EMPr which should form part of the contract with the contractors appointed to construct and maintain the proposed development. The EMPr would be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases (i.e. construction, operation and decommissioning) of the proposed project is considered to be key in achieving the appropriate environmental management standards as detailed for this project.

It is also recommended that the EMPr, attached as **Annexure 9** be approved. The EMPr is based on all the information contained in this report as well as all the specialists' reports. It is recommended that the conditions of the Environmental Authorisation include that an independent Environmental Control Officer (ECO) should be appointed by the Applicant to monitor the implementation of the Environmental Management Programme through the site establishment and construction phase, the operational, decommissioning and rehabilitation phases. The ECO should also compile audit reports to be provided to the Applicant for submission to the competent authority. Audit reports should be submitted on a monthly basis during the site establishment and construction phase as well as the decommissioning phase. During the operational phase audit reports should be submitted quarterly. It is imperative that all mitigation measures provided in the specialists' reports, this Environmental Impact Assessment Report as well as the Environmental Management Programme (attached as Annexure 8) be implemented and strictly monitored. If the concept of sustainable development is considered it is proposed that the coal mine will have a positive impact on the provision of social and economic criteria. With the recommended guidelines which would be provided by the various specialists' studies; the ecological component can also be brought into balance.

## 15. ANNEXURES [REGULATION 31 (2)]

Annexure 1: Maps and design layouts
Annexure 2: Authority Correspondence
Annexure 3: Specialists Reports
Annexure 4: Mining Works Program
Annexure 5: Social and Labour Plan
Annexure 6: Engineering Design report
Annexure 7: Public Participation
Annexure 8: Impact Assessment
Annexure 9: Environmental Management Program

## 16. DIRECT AND INDIRECT REFERENCES


- Cohen B, Winkler H. Greenhouse gas emissions from shale gas and coal for electricity generation in South Africa. S Afr J Sci. 2014; 110(3/4), Art. #2013-0194, 5 pages. http://dx.doi.org/10.1590/ sajs.2014/20130194

- Shengchu, H., Yuhong, H., Wenge, L., Xin L., Binchuan. Z, Schultz, K. *Optimal Projects for China's Coal Mine Methane Mitigation* http://urbanearth.co.za/articles/south-african-mandatory-ghg-reporting-system-be-implemented-2014 - accessed 16 July 2014

- Antunes, Q.C. 2010. A Desktop Study on the Yoctolux Coal Project, Mpumalanga, South Africa.

- April, V. 2013. Ecological Assessment of the flora and fauna on portion 38 of the farm Elandspruit 291 IS. ENVASS.

- Barrow, C.J. 2006. Environmental Management for Sustainable Development. 2nd Ed. Routledge.

- Department of Water Affairs and Forestry (2008). Best Practice Guideline G2: Water and Salt Balances;

- Draft Operational Guideline in M-Series: Operational Guideline to Assist in the Compilation of an Integrated Water and Waste Management Plan. 2008. The Department of Water Affairs. Version 0.4

- Du Toit, S. 2013. A baseline assessment of the ecological importance and sensitivity class of the Elandspruit at the proposed Yoctolux Colliery, with special reference to the assessment of macro-invertebrate communities: first summer cycle 2013. AED.

- Du Toit, S. 2013. A baseline investigation into the presence of wetlands and riparian delineation of the Elandspruit on portion 38 of the Farm Elandspruit 291 JS, the site for the proposed Yoctolux colliery. AED.

- Du Toit, S. 2013. Surface water and hydrological aspects pertaining to the proposed Yoctolux colliery on portion 38 of the farm Elandspruit 291 JS, Mpumalanga. AED.

- DWA. 2011. Development of a reconciliation strategy for the Olifants River Water Supply System: Water Quality Report.

- DWA. 2009. Directorate National Water Resource Planning. Department of Water Affairs and Forestry. South Africa, July 2009. Integrated Water Resource Management Plan for the Upper and Middle Olifants Catchment: Integrated Water Resource Management Plan. Report Number P WMA 04/000/00/7007.

- DWAF, 2006: Best Practice Guideline – G1: Storm water Management

- DWAF, 2006: Best Practice Guideline – G2: Water and Salt Balances

- DWAF, 2006: Best Practice Guideline No. A4: Pollution control dams.

- DWAF, 2008. Best Practice Guideline H1: Integrated Mine Water Management.

- DWAF, 2008: Best Practice Guideline – A2: Water Management for Mine Residue Deposits.
- DWAF, 2008: Best Practice Guideline – G3: Water Monitoring Systems
- DWAF, 2008: Best Practice Guideline – G4: Impact Prediction
- DWAF, 2008: Best Practice Guideline – H2: Pollution Prevention and Minimization of Impacts
- DWAF, 2008: Best Practice Guideline A6: Water Management for Underground Mines.
- Huisamen, A. 2013. Geohydrological report for the proposed open cast colliery on the farm Elandspruit 291 JS, Portion 38, Middelburg, Mpumalanga. GEO Pollution Technologies.
- Minimum Requirements for water monitoring at waste management facilities (1998). Department of Water Affairs & Forestry, Waste Management Series, 1998).
- Nkangala District Municipality. Final Reviewed Integrated Development Plan for 2013/2014.
- Operational Guideline: Integrated Water and Waste Management Plan. 2010. The Department of Water Affairs. 1st edition.
- Steve Tshwete Local Municipality Integrated Waste Management By-Laws.
- Australian Environmental Protection Agency (AEPA). 1996. Fuggle & Rabie, 1996; Ashton, 1999; Weaver & Caldwell, 1999)
- Yoctolux Mining Works Program.
- Department of Environmental Affairs, Department of Water Affairs, Limpopo and Mpumalanga Departments of Economic Development, Environment and Tourism. Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas (OLEMF). Environmental Management Framework Report. 2009.
- Department of Environmental Affairs, Department of Mineral Resources, Chamber of Mines. South African Mining and Biodiversity Forum, and South African National Biodiversity Institute. 2013. Mining and Biodiversity Guideline: Mainstreaming biodiversity into the mining sector.
- State of the environment report: Background Information Document for the identification of environmental indicators. 2005. Nkangala District Municipality.