Environmental Impact Assessment for the Dorstfontein East Mine Extension of Pit 1 and Water Transportation Pipeline from Dorstfontein West to Dorstfontein East, Emalahleni Local Municipality, Mpumalanga

Report Prepared for

Exxaro Coal Central (Pty) Ltd

exxaro
POWERING POSSIBILITY

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Executive Summary

Dorstfontein Coal Mines (Pty) Ltd (DCM) holds 2066 Hectares of coal rights and 1230 Hectares of surface rights, which make up the DCM operations. All of these farms lie within the Emalahleni Local Municipality and Nkangala District Municipality. The proposed project is located near the town of Ga-Nala and approximately 30 km northwest of Bethal and 25 km northeast of Secunda. DCM is a joint venture between Exxaro Coal Central (Pty) (Ltd) (Exxaro) and Mmakau Mining (Pty) Ltd.

Opencast techniques are currently employed to mine the DCM reserves. The remainder of the deeper reserves will be mined by conventional mechanised underground bord and pillar mining method. Opencast mining activities currently targets the No. 2 and 4 seam lower reserves, however all seams thicker than 0.5 m are considered during mining operations, where treatment of coal seams only occurs where studies show a negative value add component on the production and beneficiation costs incurred (Exxaro Coal Central (Pty) Ltd B, 2017).

Project Description

DCM plans to expand the opencast mining of Pit 1 (referred to as Pit 2 in the existing authorisation) at their Dorstfontein East mine in a north western direction of approximately 85 Hectares (ha), ensuring a constant Run of Mine (RoM) of 3 mega tonnes per annum (mtpa). In addition to this, DCM would like to construct a pipeline from the Dorstfontein West Mine to the Dorstfontein East Mine of approximately 11 kilometres (km) for the transportation of process water from the existing Pollution Control Dams (PCD), which will be recycled. The exploitation of the Pit 1 expansion area will run concurrently with the DCM operations.

It is anticipated that the mine expansion and pipe construction will include the following infrastructure and activities:

- Selective vegetation clearance would be required for the extension of the Pit 1 expansion and the footprint of the pipeline;
- Stripping and stockpiling topsoil and sub-soil and the establishment of a topsoil stockpile area and berms;
- Mining of the Pit 1 expansion area (Including blasting);
- Erection of the pipeline;
- The development of a maintenance road along the pipeline route;
- Loading, hauling and transportation of ROM, product and materials;
- The dredging, excavation and moving of soil, sand and rock from the non-perennial streams for the erection of the pipeline;
- Operation of storm water control systems; and
- The establishment of construction camps by contractors and the operation of earth moving vehicles and equipment.

In accordance with Section 24 of the National Environmental Management Act (Act No. 107 of 1998) (NEMA) an Environmental Authorisation will be required for the proposed project. In addition to this, application will be made for an Integrated Water Use License Application (IWULA) in terms of Section 21 of the National Water Act (Act No. 36 of 1998) (NWA). Stakeholder engagement is required in order to enable landowners, adjacent landowners, lawful occupiers, and any directly

affected or interested party to raise any issues, concerns or comments regarding the proposed project.

In this regard Exxaro is undertaking the following environmental legal processes:

- Environmental Impact Assessment (EIA) and Environmental Management Programme (EMPr) in terms of the NEMA and associated Regulations (Governmental Notice Regulation (GNR) 982 – 985) of 2014, as amended;
- IWULA and accompanying Integrated Waste and Water Management Plan (IWWMP) under the NWA.

SRK Consulting (South Africa) (Pty) Ltd (SRK) has been appointed by Exxaro as the independent Environmental Assessment Practitioner (EAP) to conduct the Environmental Authorisation and IWULA processes.

Project Need and Desirability

DCM is able to produce specific coal products for each of the local, regional and international markets. Coal produced is split between the South African and export markets. Coal mining remains a significant contributor to the Gross Domestic Product (GDP) and the sector is becoming more important from a total economic growth point.

The South African coal industry is the second biggest sector after gold. Coal produced for the local market is consumed mostly for power generation by Eskom and Sasol for synthetic fuel production. The remainder of the coal is used in the metallurgical industry for the production of steel and Ferro – alloys

An extension to the DCM will generate economic returns for stakeholders such as employees, their dependents, shareholders, the community, local, provincial and national government. The project will thus increase economic activities in the area and will earn valuable foreign exchange for South Africa. The GDP of the local municipality would increase simultaneously with that of the province.

Due to the mine currently in operation, the extension of the Pit 1 and construction of the water pipeline will create more employment, which will be drawn from the local community. Multiple mining activities will be increased during the Pit extension and water pipe construction. As a result, capital will be put back into the surrounding communities.

Alternatives Considered

The following alternatives were taken into account during for the proposed project:

Pipeline

- Proposed Alternative running along farm boundary fences, north west of the project area;
- Alternative 2 running south of Pit 1 and the discard dump;
- Alternative 3 running south of the project area.

Mining

- Opencast Mining;
- Opencast and Underground Mining.

If the project does not go ahead, then the economic benefits of expanding Pit 1 will not be realised through Exxaro. If Exxaro were not to proceed with the proposed operation, mining of these reserves

will not necessarily be avoided, as another application in terms of the Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA) and NEMA, can be made by another company.

The proposed project will lengthen the Life of Mine (LoM), which directly affects job opportunities in the area, through lengthening their terms of employment. Should the project not go ahead the identified biophysical, social and cultural impacts will not be experienced and the DCM will be forced to close prematurely.

Summary of the Baseline Environment

The baseline environment was assessed during each of the specialist studies undertaken as part of the Environmental Authorisation process. This was to determine the current status of the environment surrounding the proposed Pit 1 expansion and water pipeline. The baseline environment associated with the project is broadly summarised below with detailed baseline descriptions for each of the environmental aspects discussed in Section 10.

Socio-Economic

The project-affected socio-economic context is geographically determined to be located in Ward 25 of the Emalahleni Local Municipality. According to stats derived from StatsSA, Ward 25 spans a geographical area of 219.7 km^2. It has a population of 14 938, with a median age of 25 and isiZulu (54.0%) being the most widely spoken language. The majority of the population is male (52.0%), and 76.0% of the population is currently residing in the ward, were born in the Mpumalanga Province.

The employment rate in the study area (46.7%) is superior to both Nkangala District Municipality (40.7%) and the province (37.5%). However, unemployment levels in the study area (25.0%) are poor when compared with those of the Nkangala District Municipality (18.0%) and the province (17.0%). There is also a large percentage of the working population currently not economically active (24.0%). This would indicate high levels of dependency on household members who are employed and vulnerability to poverty where breadwinners cease to be employed (Stats SA, 2016).

Most of those employed are employed in the formal sector (78.0%), however as is the case in many parts of South Africa, the informal sector employs 11.0% of the working population in the study area. Specialist feedback from the area suggest that many small spaza shops were to be found, particularly around busy road intersections and close to mine and energy generation activities, where workers and contractors were the foremost customers.

Groundwater

Dorstfontein East has an active groundwater monitoring programme, with a number of monitoring boreholes involved. Many of the privately owned boreholes which were investigated within the immediate study area were either equipped or being pumped which prevented the measurement of static water levels (they are used on a daily basis for domestic water supply to farmers, communities and drinking water for livestock). Three principal aquifers are identified: the weathered aquifer; the fractured Karoo aquifer; and the fractured pre-Karoo aquifer.

Surface water

Dorstfontein East Mine is situated in Quaternary catchments B11B and B11D in the Upper Olifants Water Management Area (WMA) which is situated in the north eastern part of South Africa, in the Mpumalanga Province. The Olifants River originates east of the mine and then flows in a northerly direction. The Steenkoolspruit is located west of the mine. These two rivers converge north of the mine, from which point the river is called the Olifants River.

Biodiversity

Following the assessment of the proposed project and the associated habitat, it has been concluded that there are 3 main habitat units that will be impacted upon. The proposed expansion Pit comprised primarily of transformed agricultural land used for the production of crops. The north western corner of the expansion Pit contained a small area of both secondary and moist grassland, whilst the southwestern corner was associated with transformed grassland. Impacts from agricultural activities has had an impact on the overall expansion Pit area.

Wetlands

During the field assessment, one freshwater resource, comprising three hydro-geomorphic types (HGM), was identified along the proposed pipeline routes. The resource was characterised as an inland system (i.e. a system having no existing connection to the ocean but which is inundated or saturated with water, either permanently or periodically), located within the Highveld Aquatic Ecoregion. No wetlands were observed within the Pit 1 expansion area, with this area being characterised almost wholly of agricultural land. However, a wetland system was observed approximately 120 m to the east of the proposed Pit 1 expansion area.

Air Quality

The project area and surrounding land can be described as rural/industrial with large scale industrial activities in the area. The area is characterised by one large town (Witbank), smaller towns such as Ogies, Bethal, Kriel, and smaller settlements and farms in the area. The following sources of air emissions have been identified in the area:

- Mining activities;
- Power generation;
- Vehicle emissions;
- Fugitive dust sources (windblown dust especially during the dry season);
- Farming activities such as land preparation and harvesting;
- Biomass burning.

Vibration

The evaluation of effects yielded by blasting operations was evaluated over an area as wide as a 3500 m radius from where blasting will take place. The range of structures observed and considered in this evaluation ranged between rural buildings, farm buildings, industrial buildings, power lines and provincial roads.

Nineteen Points of Interest (POI)'s were identified that showed concerns with regards to ground vibration levels expected. These POI's varies in distance from the Pit 1 area – directly next to the Pit 1 area up to 864 m. The concern may also not just be ground vibration but due to close proximity to the Pit 1 area the blasting operations could have a negative effect on the livelihood of people within close proximity of the mine.

Visual

The visual character of the study can be described as being degraded/modified grassland, interspersed with mining activities. In terms of the rating system, the visual character of the study area can therefore be described as being a modified rural landscape, attributed to the various mining operations and open fields of indigenous vegetation.

Noise

The ambient noise levels in immediate environment of the DCM Pit 1 Extension are dominated by road traffic on the R547 and R544 which includes a large percentage of heavy vehicles. These noise

contributions will to a large extent mask the impact of the noise emissions caused by the future mining operations. The resulting total ambient noise levels largely conform to those recommended by SANS 10103.5.

Soils, Land Use and Land Capability

The largest part of the study site is currently used for crop production. All the soil forms encountered at the study site are suitable and highly suitable for crop production with the exception of the Katspruit, Rensburg, Longlands, Dresden and Arcadia soil forms. The annual precipitation is sufficient for successful maize production. Eighteen different soil forms were identified within the study area. The soil chemistry of the samples analysed indicate that soil at the project site has the chemical suitability for crop production.

Heritage

A total of nine sites, which were suspected to have a heritage value, were recorded during the survey, however, only seven sites are older than 60 years and are therefore protected under the National Heritage Resources Act (Act No. 25 of 1999) (NHRA). As such a total of four graveyards (Sites 3, 4, 5, and 8) were recorded as well as two farmhouse complexes (Sites 1 and 6) and a historical power line (Site 9) (consisting of several pylons). Several of the pylons have been destroyed during mining activities. Note two sites are not older than 60 years, namely the farmworker home complex (Site 7) and a modern farmhouse complex (Site 2).

Palaeontology

Fossils likely to be found are mostly plants 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. The marine bivalve Megadesmus is found in the upper part of the Volksrust Formation near Newcastle.

Topography

The catchment consists of moderately hilly to flat areas. The proposed expansion of Pit 1 can be found at an elevation of 1560 metres above sea level (mbsl) to the north and 1600 mbsl to the south. The pipeline has an elevation of 1560 mbsl at the Dorstfontein West and 1540 mbsl at Dorstfontein East.

Geology

The coal reserves located at Dorstfontein East forms part of the coal-bearing sandstones and siltstones of the Vryheid Formation which rest either conformably on diamictites and associated glaciogenic sediments of probable Dwyka age, or uncomformably on basement rocks of the Lebowa Granite suite, which in turn is underlain by volcanic rocks of the Loskop Formation.

Stakeholder Engagement Process

The stakeholder engagement process being undertaken for this project aims to comply with the relevant legislative requirements of the various Environmental Authorisation processes, namely the EIA process in terms of NEMA and the IWULA in terms of the NWA.

The various authorisation processes and associated stakeholder engagement process are all run concurrently in a single integrated process to meet the requirements of the above-mentioned legislation. During the initiation and scoping phases of the proposed project, minimal Stakeholder comments have been received. SRK were committed to source comments from the I&APs throughout the EIA process.

Table ES 1: Key Comments Received from Interested and Affected Parties

Comment Date	Comment raised by	Comment	SRK Response
Comments on the Initial Phase			
09/05/2017	Mr. Kenneth Mavhunga	May you please register the following official from the department of agriculture, forestry and fisheries Nelspruit office	Mr. Kenneth from the Department of Agriculture, Forestry and Fisheries have been registered as an I&AP.
10/05/2017	Ms Lindy	Additional information was requested by Lindy telephonically regarding the proposed project.	(10/05/2017) A letter with additional information as telephonically discussed was sent. The letter also included a map, which provides an indication of all affected properties. The Stakeholder was added on the Database
12/05/2017	Noxolo Jakalase	Kindly contact the Office of the Head of Department. Said Department can be contacted at 013-766 6020.	The Head of Department Office were on the Database and they were notified during the Initial Phase of the proposed project
Scoping Phase			
21/07/2017	Betty Mnguni	If I may, the proposed project falls under which quaternary code?	The proposed project falls within quaternary catchment B11B and B11D.
30/07/2017	Doreen Sithole	Kindly email the document for comments.	The report has been loaded onto our website, herewith the link: http://www.srk.co.za/en/za-proposed-extension-exxaro-dorstfontein-east-coal-mine
31/07/2017	P Skosana	I appreciate the effort in inviting me to the public meeting. I do not have any issue with the project but emphasis the need to good communication with all affected parties	SRK takes cognisance of this statement and will do its upmost best to ensure communication channels are effectively followed.

Summary of the Impact Assessment Process

This section contains the assessment of potentially positive and negative environmental impacts that can be caused by the proposed Pit 1 expansion and construction of the water pipeline. The impacts are linked to the activities conducted for the proposed development, broadly relating to pre-construction, construction, operations and decommissioning phases. Specific emphasis was placed on any relevant environmental, social and economic impacts identified by the specialist studies, comments received during the stakeholder engagement process, issues highlighted by relevant authorities; as well as a professional judgement of the EAP team through appraisals on the project description, listed activities and the receiving environment.

The objectives for each of the potential environmental impacts identified was to determine their significance and to promote mitigation measures to reduce the impacts to an acceptable level where required.

All of the identified impacts are assessed in this section. Considering the general nature of the proposed project, this section will take cognisance of the pre-construction, construction, operational, and decommissioning phases.

This is intended to:

- Enable to facilitate the preferred alternative during the decision making process of the DMR; and
- Enable stakeholders to understand the potential impact of the project.

The anticipated impacts were rated against a set impact rating methodology ranging from Low to High. The anticipated impacts for the proposed project, which were rated HIGH to MEDIUM HIGH, can be found in Table ES 2.

Table ES-2: Summary of High and Medium High Impacts Only

POTENTIAL ENVIRONMENTAL IMPACT (NATURE OF THE IMPACT)	Before Mitigation	After Mitigation
Pre-Construction		
Social Impacts		
Grievances as a result of possible grave relocation.	Medium High	Low
Groundwater Impacts		
Monitoring borehole on the border of the Pit 1 expansion area may be a conduit of flow to the groundwater unless sealed.	Medium High	Low
Surface Water Impacts		
Increase in erosion from cleared areas.	Medium High	Low
Increase in turbidity, suspended solids and sedimentation of nearby water resources .	Medium High	Low
Accidental hazardous substances spillage during site establishment.	Medium High	Low
Biodiversity Impacts		
Destruction of potential faunal and floral habitats for species of conservational concern.	Medium High	Low
Insufficient planning of infrastructure placement and design leading to faunal and floral habitat loss of potential species of conservational concern.	Medium High	Low
Failure to initiate a rehabilitation plan and alien control plan during the pre-construction phase may lead to further impacts during the construction and operation phase.	Medium High	Low
Wetland and Aquatic Environmental Impacts		
Placement of infrastructure in sensitive wetland habitat areas resulting in the loss of ecological structure.	Medium High	Low
Potential poor planning, resulting in the placement of the linear development within wetland habitat, leading to altered habitat.	Medium High	Low
Increased anthropogenic activity within the wetland feature leading to an increased impact on the biological structure of the wetland features and the associated effects that this will have on service provision.	Medium High	Low
Failure to initiate a rehabilitation plan and alien control plan during the pre-construction phase may lead to further impacts during the construction and operation phase.	Medium High	Low
Air Quality Impacts		
Possible increase in dust generation as a result of bulk earthworks, operation of heavy machinery, and material movement.	Medium High	Low
Visual Impacts		
Scaring of the landscape as a result of the clearance of vegetation.	Medium High	Low
Visual intrusion as a result of the movement of machinery and the erection of contractor camps.	Medium High	Low
Soils, Land Use, and Land Capability Impacts		
Clearing of vegetation and compaction of the construction footprint will result in the soils being particularly more vulnerable to soil erosion.	Medium High	Low
Palaeontology Impacts		
Sealing-in or destruction of the fossils during earth moving activity.	Medium High	Low
Climate Impacts		
Emissions of Green House Gases as a result of the use of plant and heavy moving machinery.	Medium High	Low
Construction		
Socio - Economic Impacts		
Negative impact as a result of the extension of the open Pit, loss of cultivated land to leasing farmers, impacting on potential crop yield.	Medium High	Low
Negative impact Due to the occurrence of additional trucks on the roads, and the incidence of construction workers on site.	Medium High	Low
Groundwater Impacts		
Monitoring borehole on the border of the Pit 1 expansion area may be a conduit of flow to the groundwater unless sealed.	Medium High	Low

POTENTIAL ENVIRONMENTAL IMPACT (NATURE OF THE IMPACT)	Before Mitigation	After Mitigation
Surface Water Impacts		
Impact on surface water flow as a result of impeding flow while under construction of the pipeline over the non-perennial streams.	Medium High	Low
Impact on surface water quality as a result of accidental spillages of hazardous substances from construction vehicles used during construction of the crossings, as well as from hazardous storage areas.	Medium High	Low
Contaminated dirty water runoff to surrounding areas resulting in the impact on local surface water quality.	High	Medium High
Increase in turbidity of the local water streams as a result of runoff of cleared areas.	Medium High	Low
Increase of surface runoff and potentially contaminated water that needs to be maintained, in the areas where site clearing occurred.	Medium High	Low
Construction of possible river diversion may temporarily disturb the water course affecting the hydrology of the water courses.	Medium High	Low
Contamination of runoff by poor materials/waste handling practices, impacting on surface water quality.	Medium High	Low
Biodiversity Impacts		
Impact on floral species of conservational concern as a result of clearing, anthropogenic activity, and uncontrolled fires.	Medium High	Low
Potential spreading of alien invasive species as a result of floral disturbance.	Medium High	Low
Generation of waste and incorrect disposal from construction material leading to disturbance of natural vegetation.	Medium High	Low
Impact of faunal species of conservational concern due to habitat loss and collision with construction vehicles.	Medium High	Low
Failure to initiate a rehabilitation plan and alien control plan during the construction phase may lead to further impacts during the operation phase.	Medium High	Medium Low
Loss of faunal divert and ecological integrity as a result of construction activities, erosion, poaching and faunal specie trapping.	Medium High	Medium Low
Insufficient planning of infrastructure placement and design leading to floral habitat loss of potential species of conservational concern.	High	Medium High
Wetland and Aquatic Impacts		
Loss of habitat and wetland ecological structure as a result of site clearance activities and uncontrolled wetland degradation.	Medium High	Low
Impact on the wetlands systems as a result of changes to the sociocultural service provisions .	Medium High	Low
Increased runoff due to topsoil removal and vegetation clearance leading to possible erosion and sedimentation of wetland and riparian resources.	Medium High	Medium Low
Soil compaction and levelling as a result of construction activities and vehicle movement leading to loss of wetland and riparian habitat.	Medium High	Medium Low
Blast and Vibration Impacts		
Impact of ground vibration on houses, boreholes and roads, resulting in possible damage to infrastructure.	Medium High	Medium Low
Air blast impact on houses, boreholes and roads, resulting in possible damage to infrastructure.	Medium High	Medium Low
Noise Impacts		
The use of vehicles and machinery during the construction phase may generate noise in the immediate vicinity.	Medium High	Low
Soil, Land Use and Land Capability Impacts		
Clearing of vegetation and compaction of the construction footprint will result in the soils being particularly more vulnerable to soil erosion.	Medium High	Medium Low
Loss of soil resource and utilisation as a result of the cleaning and topsoil stripping of the construction footprint, ultimately impacting on food production.	Medium High	Medium Low
Heritage Impacts		
The proposed project has the potential to impact on local graves within the area. Two grave sites were observed within the footprint of the proposed pipeline route.	Medium High	Medium Low
The proposed project has the potential to impact on sites of archaeological importance. Historic power line pylons are present within the proposed footprint.	Medium High	Low

POTENTIAL ENVIRONMENTAL IMPACT (NATURE OF THE IMPACT)	Before Mitigation	After Mitigation
Palaeontology Impacts		
Sealing-in or destruction of the fossils during earth moving activity.	Medium High	Low
Geology Impacts		
Removal of local geology as a result of pipeline trenching and expansion of Pit 1.	Medium High	Low
Climate Impacts		
Emissions of Green House Gases as a result of the use of plant, heavy moving machinery, generators etc.	Medium High	Low
Operation		
Socio - Economic Impacts		
Negative impact on, local community health and safety due to influx of employees, the presence of job seekers, which may lead to prostitution and conflict with the local communities. Illegal informal settlement of job seekers in the area may exacerbate the situation.	Medium High	Low
Groundwater Impacts		
Monitoring borehole on the border of the Pit 1 expansion area may be a conduit of flow to the groundwater unless sealed.	Medium High	Low
Surface Water Impacts		
High rate of ground water ingress causing flooding of the Pit.	High	Medium High
The rainfall water within the designated dirty water area of the Pit 1 expansion area that forms part of the MAR to the local water courses will be removed from the catchment. This will result in a lower intensity potential on the local surface water resource.	Medium High	Low
Increase in volume of contaminated water that needs to be managed within the footprint.	Medium High	Low
Erosion of stream banks as a result of crossings and diversions leading to siltation of the streams.	Medium High	Low
Wetland and Aquatic Impacts		
Loss of habitat and wetland ecological structure as a result of continual wetland disturbance and uncontrolled wetland degradation.	Medium High	Low
Impact on the wetlands systems as a result of changes to the sociocultural service provisions through uncontrolled vegetation clearance, waste management and wetland disturbance.	Medium High	Low
Impact on the hydrological functioning of the wetland systems as a result of reduce wetland footprints and uncontrolled disturbance during maintenance activities.	Medium High	Low
Impacts on the hydrological functioning of the wetland as a result of the Pit 1 expansion.	Medium High	Medium Low

POTENTIAL ENVIRONMENTAL IMPACT (NATURE OF THE IMPACT)	Before Mitigation	After Mitigation
Air Quality Impacts		
Possible increase in dust generation, PM10 and PM2.5 as a result of stockpiling material, use of heavy machinery, and material movement.	Medium High	Low
Blast and Vibration Impacts		
Impact of ground vibration on houses, boreholes and roads, resulting in possible damage to infrastructure.	Medium High	Medium Low
Air blast impact on houses, boreholes and roads, resulting in possible damage to infrastructure.	Medium High	Medium Low
Noise Impacts		
The use of vehicles and machinery during the construction phase may generate noise in the immediate vicinity.	Medium High	Low
Soil, Land Use and Land Capability Impacts		
Operation of opencast Pits, use of haul roads, and permanent displacement of soil from buildings will reduce the land capability and agricultural potential and sterilise the soils.	Medium High	Low
Soil contamination as a result of operational activities can be as a result of a number of activities (i.e. hazardous substance storage, incidental hydrocarbon leakages from construction vehicles).	Medium High	Low
Heritage Impacts		
The proposed project has the potential to impact on local graves within the area. Two grave sites were observed within the footprint of the proposed pipeline route.	Medium High	Low
The proposed project has the potential to impact on sites of archaeological importance. Historic power line pylons are present within the proposed footprint.	Medium High	Low
Palaeontology Impacts		
Sealing-in or destruction of the fossils during earth moving activity.	Medium High	Low
Topography Impacts		
Progressive mining of the Pit 1 expansion area will ultimately alter the topography.	Medium High	Medium Low
Climate Impacts		
Emissions of Green House Gases as a result of the use of plant, heavy moving machinery, generators etc.	Medium High	Low
Decommissioning and Closure		
Contaminated groundwater seepage to streams (salt load).	Medium Low	Medium Low
Groundwater contaminant plume.	Medium Low	Medium Low
Mine decant.	High	Medium Low
Deterioration in water quality.	High	High

Environmental Management

In terms of the proposed project, all negative environmental impacts identified will be managed and mitigated whilst positive impact will be mitigated to enhance the potential positive impacts through the implementation of the commitments stipulated in the EMPr. Exxaro will be responsible for ensuring that all environmental obligations pertinent to the proposed project are met. The implementation of the EMPr and the meeting of the environmental objectives and targets is also the responsibility of Exxaro. An EMPr specific to the proposed project has been prepared and documented in Appendix B of this report.

Conclusion

SRK has undertaken the EIA and EMPr for the proposed Pit 1 expansion and construction of the water pipeline in accordance with the requirements of the NEMA. This has included a comprehensive stakeholder engagement process which has sought to identify stakeholders, provide these parties with an adequate opportunity to participate in the project process and guide technical investigations that have taken place as part of the Impact Assessment Phase of this study. Extensive specialist input has been sought for all key environmental aspects.

To date, there are no serious flaws that have been identified for the proposed project. However, certain of the identified, potential impacts require careful mitigation and monitoring.

An EMPr has been developed as part of this EIA to ensure the mitigation of these impacts as far as practicable. It is anticipated that it will be possible to successfully mitigate the majority of the environmental impacts to acceptable levels and the implementation will be monitored and audited to determine the effectiveness of the measures implemented.

It is recommended that the proposed project is allowed to proceed, given the relatively potential contribution of the project to cumulative impacts (given appropriate environmental management) and also considering the positive social impacts associated with the project.

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Disclaimer

The information provided in this Environmental Impact Assessment (EIA) are based on information supplied to SRK Consulting (South Africa) (Pty) Ltd (SRK) by Exxaro Coal Central (Exxaro). This report has been compiled to comply with the specific requirements of the National Environmental Management Act (No. 107 of 1998) (NEMA) Environmental Impact Assessment (EIA) Regulations (2014).

SRK has exercised all due care in reviewing the supplied information provided by Exxaro and the independent specialists during the course of the Environmental Assessment process and has included the requirements of commenting authorities. The appropriateness and practicality of the management measures has been considered in terms of comments received and discussed with Exxaro as necessary. Exxaro is fully responsible for the implementation of the EIA.

The EIA has been provided to Exxaro for review, prior to submission, to determine whether the management measures are implementable and accurate. SRK cannot be held responsible for failure of Exxaro to comply with the EIA for any reason whatsoever. The EIA by nature is a dynamic document and the NEMA provides for continual updating of the management measures, with approval from the Competent Authority.

SRK does not accept responsibility for any errors or omissions in the information supplied by Exxaro and do not accept any consequential liability arising from commercial decisions, design changes or actions resulting from such decisions and/or changes. Management measures presented in this report relate to the project description and plans as they existed at the time of SRK's investigations, and those reasonably foreseeable. These management measures do not necessarily apply to conditions and aspects that may arise after the date of this report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

List of Abbreviations

Term/Abbreviation	Description
BAP	Biodiversity Action Plan
BBBEE	Broad Based Black Economic Empowerment
BCP	Biodiversity Conservation Plan
BID	Background Information Document
BPG	Best Practice Guidelines
CARA	Conservation of Agricultural Resources Act (Act No. 43. of 1983)
CBA	Critical Biodiversity Area
dBA	Decibels
D/R	Drain and Rinse
DCM	Dorstfontein Coal Mines
DEA	Department of Environmental Affairs
DEAT	National Department of Environmental Affairs and Tourism
DFO	Dust Fallout
DMR	Department of Mineral Resources
DWA	Department of Water Affairs now DWS
DWAF	Department of Water Affairs and Forestry now DWS
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EIS	Ecological Importance and Sensitivity
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
GNR	Governmental Notice Regulation
HDPE	High-Density Polyethylene
HGM	Hydrogeomorphic Types
HIA	Heritage Impact Assessment
Hz	Hertz
I&APs	Interested and Affected Parties
IBA	Important Bird Areas
IDP	Integrated Development Framework
IWULA	Integrated Water Use Licence Application
IWWMP	Integrated Water and Waste Management Plan
JSE	Johannesburg Stock Exchange
JV	Joint Venture
Km	Kilometres
kV	Kilo Volt

Term/Abbreviation	Description
LDV	Light Delivery Vehicles
LOM	Life of Mine
MAR	Mean Annual Runoff
mbgl	meters above ground level
masl	Metres above sea level
mamsl	Metres above mean sea level
MHSA	Mine Health and Safety Act (Act No. 29 of 1996)
MP	Measuring Points
MPRDA	Minerals and Petroleum Resources Development Act (Act no 22 of 2008)
mtpa	Mega tons per annum
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEMA:BA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEMA:AQA	National Environmental Management: Air Quality Act (Act No. 39 of 2004)
NEM:WA	National Environmental Management: Waste Act (Act No. 59 of 2008
NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
NSA	Noise Sensitive Areas
NWA	National Water Act (Act No. 36 of 1998
OC	Open Cast
PAIA	Promotion of Access to Information Act (No. 2 of 2000)
PCLU	Post Closure Land Use
PM	Particulate Matter
POC	Probability of Occurrence
POI	Points of Interest
POS	Plan of Study
PRECIS	Pretoria Computer Information Systems
QDS	Quarter Degree Square
REC	Recommended Ecological Class
RDL	Red Data Listed
RoM	Run of Mine
SANS	South African National Standards
SANBI	South African National Biodiversity Institute
SAHRA	South African National Heritage Resources Agency
species of conservational concernSIS	Species of Conservation Concern Sensitivity Index Score
SDF	Spatial Development Framework
SLP	Social and Labour Plan
SMS	Short Message Service
SRK	SRK Consulting SA (Pty) Ltd
SSV2	Soil Screening Values
PAIA	Promotion of Access to Information Act (Act No. 2 of 2000)

Term/Abbreviation	Description
PES	Present Ecological State
ToR	Terms of Reference
tpm	Tonnes per month
TSP	Total Suspended Particles
UG	Underground
VEGRAI	Vegetation Response Assessment Index
VIS	Vegetation Index Score
WET-IHI	WET-Index of Habitat Integrity
WRD	Waste Rock Dump
WUL	Water Use Licence

1 Introduction

Dorstfontein Coal Mines (Pty) Ltd (DCM) is a joint venture between Exxaro Coal Central (Pty) (Ltd) (Exxaro) and Mmakau Mining (Pty) Ltd. DCM plans to expand the opencast mining of Pit 1 at their Dorstfontein East Mine in a North Western direction of approximately 85 Hectares (Ha). This will ensure a constant Run of Mine (RoM) of 3 mega tonnes per annum (mtpa). In addition to this, DCM would like to construct a pipeline from the Dorstfontein West Mine to the Dorstfontein East Mine of approximately 11 kilometres (km) for the transportation of process water which will be recycled.

DCM holds 2066 Ha of coal rights and 1230 Ha of surface rights, which make up the DCM operations. All of these farms lie within the Emalahleni Local Municipality and Nkangala District Municipality. The proposed project is located near the town of Ga-Nala and approximately 30 km northwest of Bethal and 25 km northeast of Secunda.

Opencast techniques are currently employed to mine the DCM reserves. The remainder of the deeper reserves will be mined by conventional mechanised underground bord and pillar mining methods. Opencast mining activities currently targets the No. 2 and 4 seam lower reserves, however all seams thicker than 0.5 m are considered during mining operations, where treatment of coal seams only occurs where studies show a negative value add component on the production and beneficiation costs incurred (Exxaro Coal Central (Pty) Ltd B, 2017).

Initial mining started with the removal of the top soil. Excavated material is placed on pre-determined dumps. Waste from the mining will be backfilled into the voids post mining, during rehabilitation.

Originally the tonnage mined at DCM was set at 300 000 tonnes per month. This target was achieved. The current target for the Pit 1 expansion project is aimed at 180 000 tonnes per month. The Life of Mine (LoM) for the opencast operations is 7 years, whereby underground mining will commence on the remainder of the coal reserves.

It must be noted that the Pit 1 was referred to as Pit 2 and visa versa in the existing environmental authorisation.

1.1 Dorstfontein East Operations

This section provides background on the Dorstfontein East operations in support of the application for the Pit 1 expansion and construction of the water pipeline.

1.1.1 Mine Process

From the anticipated tonnage from the reserve to be beneficiated at a RoM feed rate of 3.6 million tonnes per annum from the existing plant will be to treat all the tonnes produced. The current daily feed rate is 15 350 tonnes per day, which is beneficiated in 5.5 days per week at 700 tonnes per module.

Coal is delivered via 773/777 dump trucks into a crushing plant (rotary crushers.) and the coal sized to 50 mm via primary, secondary and tertiary crushers and stockpiled (at the RoM stockpile) from which it is fed to the washing plant.

A standard 700 tonnes per hour plant with screens, cyclones and spirals separate the coal from the waste product. A description of the process flow can be found in Figure 1-1.

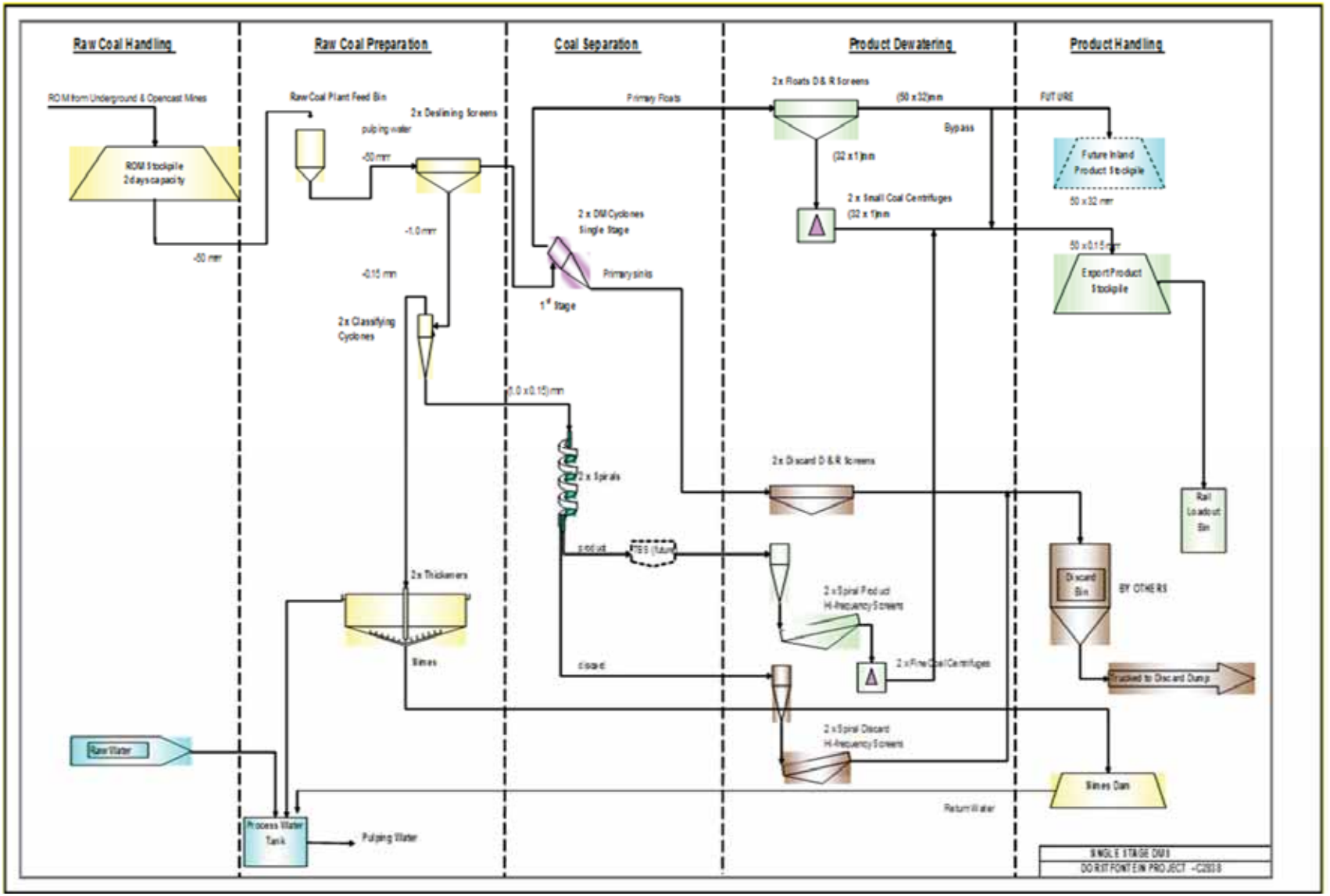


Figure 1-1: Dorstfontein East Process Flow Diagram (Exxaro Coal Central (Pty) Ltd A, 2017)

1.1.2 Process Plant Description

Front-End Material Handling

Raw coal with a top size of – 50 mm discharges to a ~7400 tone surge stockpile. Material is withdrawn from the stockpile via three feeders (two fixed and one variable speed) and is conveyed to a plant feed bin. The plant feed bin distributes the coal vial two independent vibrating feeders and conveyors to the two modules. A weightometer and variable speed feeders maintain a constant feed rate for each plant feed (Exxaro Coal Central (Pty) Ltd B, 2017).

Dense Medium Pant

A conventional dense medium cyclone plant is used for single stage washing. As the two modules are identical, the process explained below is for one module. The raw coal is deslimed at 1 mm prior to being introduced into the plant, with the 50 x 1 mm fraction reporting to the dense medium plant and the 1 mm to a spiral plant.

The desliming screen discharge combines with circulating medium from the head box and is pumped to the DM cyclone for separation. The cyclone underflows gravitate over static panels as well as vibrating drain and rinse (D/R) screens for medium recovery.

Correct medium returns to the circulating medium tank whilst dilute medium is pumped to the magnetic separator. Over dense medium recovered by the magnetic separator returns to the circulating medium tank and magnetic separator effluent reports to the effluent distribution box. Water from the distribution box gravitates to the desliming screen, while the overflow reports to the sink D/R screen as well as the float screen as primary rinse water.

The plant also has a densification circuit consisting of a cyclone and an actuated splitter, which splits the overflow in different ratios between the tanks to vary the densification intensity.

The design yield range significantly influences the size of the equipment in each option. In all cases the design minimum yield dictates the cyclone size and consequently circulating medium quantity which in turn dictates the tank, and cyclone feed pump and floats screen size (to provide sufficient medium drainage)

Spiral Plant

The desliming screen underflow is pumped to the classifying cyclones in the spiral circuit. The -150 micron cyclone overflow gravitates to the plant thickener. The -1 mm +0.15 mm cyclone underflow is diluted to approximately 30% solids and reports to the spirals. Spiral product is dewatered via a combination of dewatering cyclones and a fine coal centrifuge. A high frequency dewatering screen is provided as a standby to the centrifuge. Spiral rejects are dewatered via cyclone and a dewatering screen.

Slimes Circuit

The spiral circuit classifying cyclone overflow and spiral reject cyclone overflow gravitate to the plant thickener. Thickener underflow reports to a slimes tank and is then pumped to the tailings dam, whilst the thickener overflow is recycled as process water via the process water surge tank. One slimes tank is provided to pump the thickener underflow of both modules' thickeners to the slimes dam.

An automated flocculent make up and dosing plant is provided to supply flocculent to both thickeners.

Product

Discard arising from the modules is conveyed to a discard bin for out loading and trucking to the discard dump.

The product from both cyclones will be screened on the discharge end of the floats screen. The screen undersize will pass via a centrifuge onto the export product collecting conveyor to join the oversize.

The export product conveyor will also collect the spiral product. Both wash plant modules share the export product conveyor, and hence the entire plant produces a single combined product stream.

The combined export product is transferred onto a ~24000 tonne intermediate product stockpile; from which it gets transferred to the export product stockpile (24 000 tonne capacity load-out) feeding with a sacrificial conveyor onto the overland conveyors (overland conveyors are in a different contract). Mass meters are provided to measure the quantity of export product going onto the export product stockpile. A hammer sampler will also be installed on the intermediate product stockpile feed conveyor.

Coal is conveyed from the export stockpile to the rapid load-out system (vendor package) that load the trains. The floats screen oversize (50 x 32 mm) chute is designed to allow for separate collection (future) of the oversize as an inland product, which could be discharged onto a conveyor and be stockpiled separately from the export product.

Magnetite Make-Up System

Magnetite medium will be provided from a dedicated make up system comprised of make-up sump with 2 x spillage pumps and magnetic separator for producing over dense and recycling of water to the monitor guns. Off-loading is by bulk truck for discharging into the magnetite make-up sump.

Flocculent System

Flocculent will be provided from an automated powder flocculants make up and dosing system.

Dust Suppression

Dust suppression will be allowed for at the plant feed stockpile withdrawal points. Dust suppression will not be necessary on plant product and discard (once the material has been through the wet process).

Air

The compressed air supply system consists of two compressors (45 kW), with one being a standby. A single compressor will provide air for both agitation and instrumentation via two separate air receivers (process air receiver and instrument air receiver).

2 Background to the Proposed Project

DCM is planning to expand the opencast mining of Pit 1 at their Dorstfontein East mine in a north western direction of approximately 85 Ha, ensuring a constant RoM of 3 mtpa. In addition to this, DCM would like to construct a pipeline from the Dorstfontein West Mine to the Dorstfontein East Mine of approximately 11 km for the transportation of process water, which will be recycled. The exploitation of the Pit 1 expansion area will run concurrently with the DCM operations.

It is anticipated that the Mine expansion and pipe construction will include the following infrastructure and activities:

- Selective vegetation clearance would be required for the extension of the Pit 1 expansion and the footprint of the pipeline;
- Stripping and stockpiling topsoil and sub-soil and the establishment of a topsoil stockpile area and berms;
- Mining of the Pit 1 expansion area (Including blasting);
- Erection of the pipeline;
- The development of a maintenance road along the pipeline route;
- Loading, hauling and transportation of ROM, product and materials;
- The dredging, excavation and moving of soil, sand and rock from the non-perennial streams for the erection of the pipeline;
- Erection of pipe racks and culvert at the stream crossings;
- Operation of storm water control systems; and
- The establishment of construction camps by contractors and the operation of earth moving vehicles and equipment.

An illustration of the proposed layout can be found in Figure 2-1 and Figure 2-2.

In accordance with Section 24 of the National Environmental Management Act (Act No. 107 of 1998) (NEMA), an environmental authorisation will be required for the proposed project. In addition to this, application is made for a Water Use License Application (WULA) in terms of Section 21 of the National Water Act (Act No. 36 of 1998) (NWA). Stakeholder engagement is required in order to enable landowners, adjacent landowners, lawful occupiers, and any directly affected or interested party to raise any issues, concerns or comments regarding the proposed project.

In this regard, DCM is undertaking the following environmental legal processes:

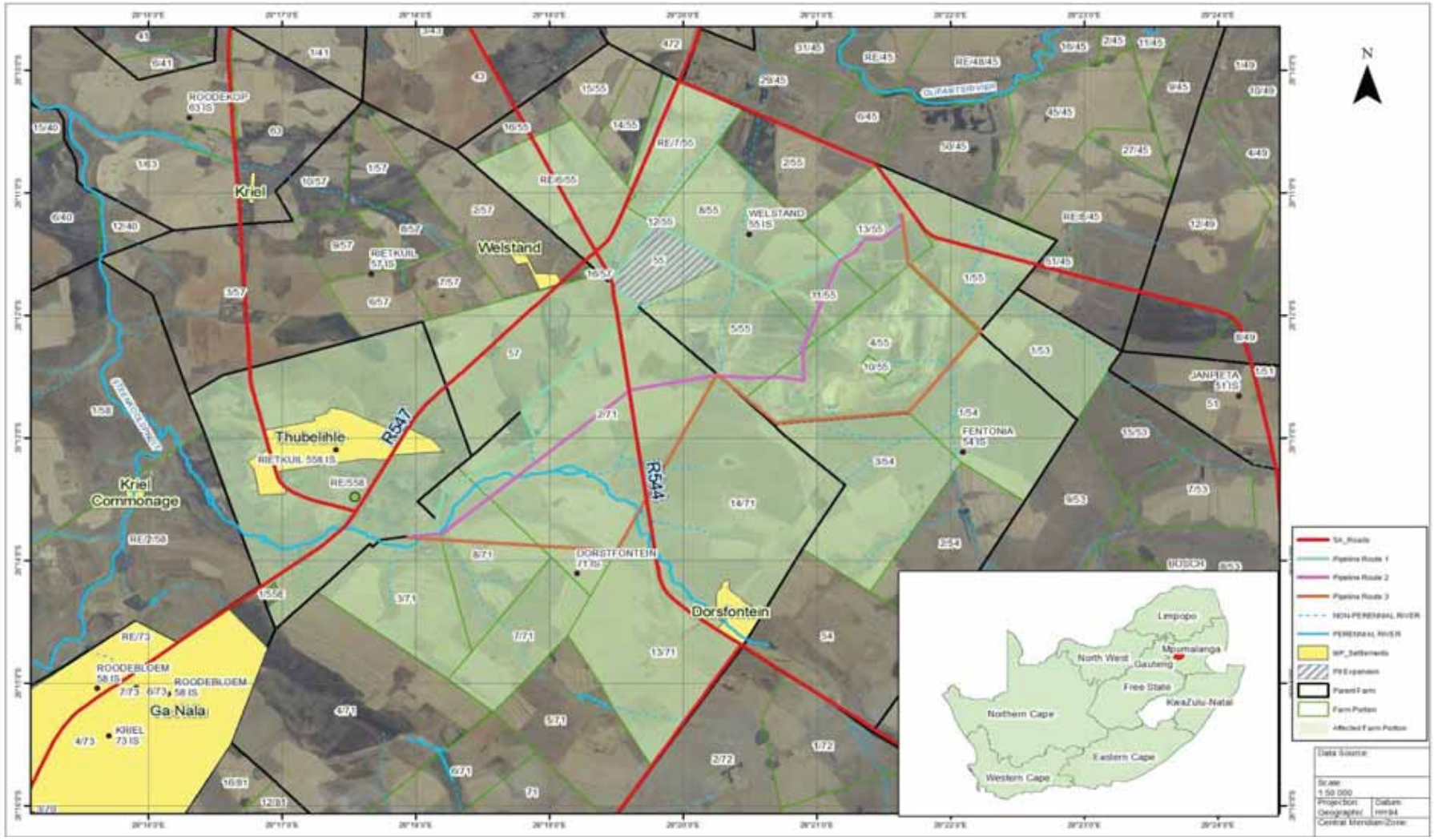
- Environmental Impact Assessment (EIA) and Environmental Management Plan (EMPr) in terms of the NEMA and associated Regulations (Governmental Notice Regulation [GNR] 982 – 985) of 2014; and
- Integrated Water Use License Application (IWULA).

SRK Consulting (South Africa) (Pty) Ltd (SRK) has been appointed by Exxaro as the independent Environmental Assessment Practitioner (EAP) to conduct the environmental authorisation process and IWULA.

The reports and documentation from the above process are compiled and finalised for submission to the Department of Mineral Resources (DMR) for the environmental authorisation in terms of the NEMA, and the Department of Water and Sanitation (DWS) for the IWULA, for consideration and decision making. The DMR is to consult with other government authorities as required in terms of Section 24(K) of the NEMA. Figure 2-1 and Figure 2-2 illustrate the farm portions which are affected by the project and the existing and proposed mining infrastructure respectively.

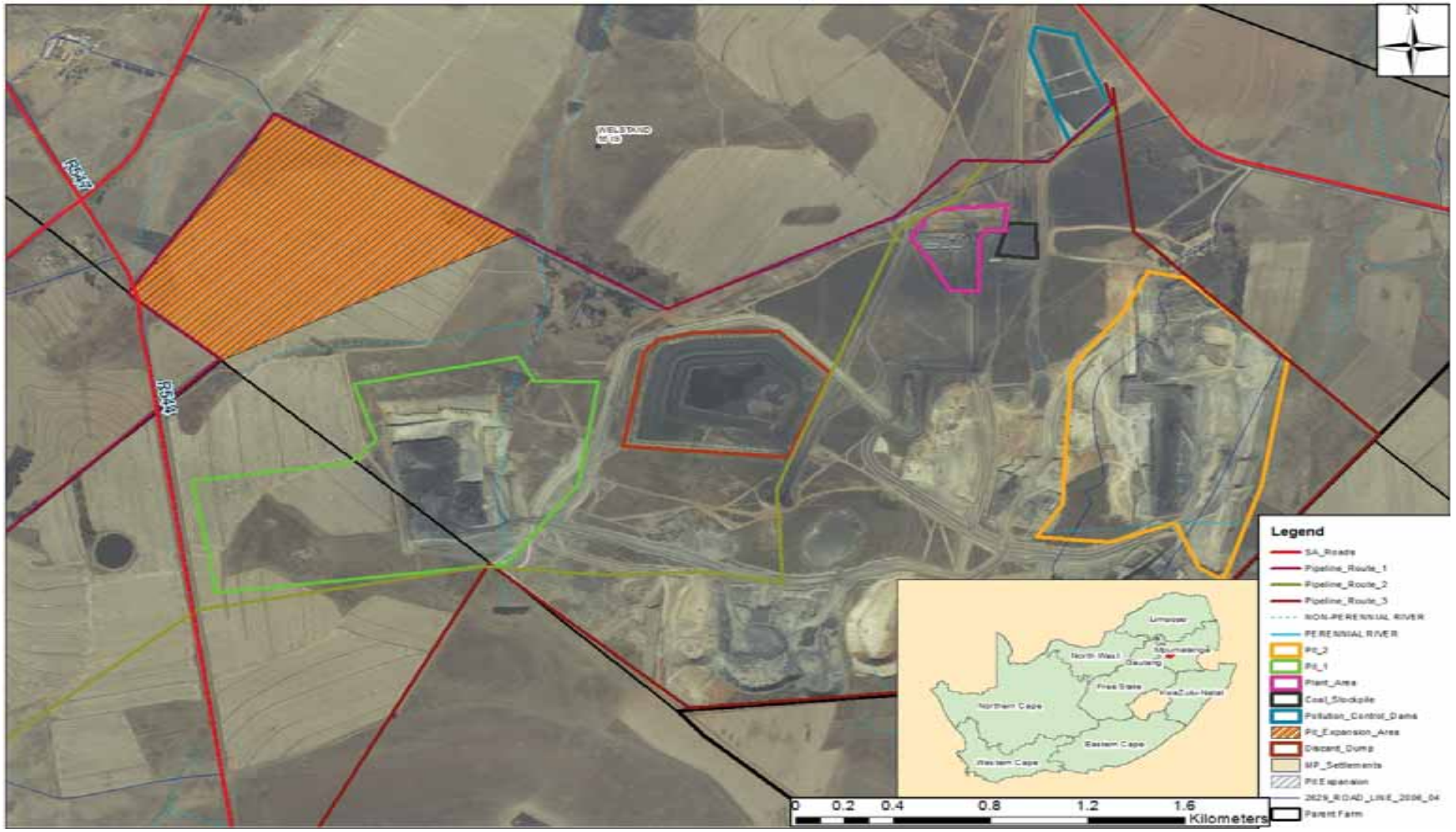
2.1 Resource Particulars

The Witbank coal seams (No. 1 – No. 5 seam) are present within the proposed mining area. The mining activities at DCM focus mainly on the No. 2 and No, 4 seam for economic exploitation. The No. 4 seam averages 2.83 m in seam thickness and ranges in depth from approximately 25 to 45 m below surface. The No. 2 seam averages approximately 19 – 102 m from surface.



srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** Layout Plan of Affected Farm Portions	Project No 499507

Figure 2-1: Layout Plan and Affected Farm Portions



srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** Illustration of existing and proposed infrastructure	Project No 499507

Figure 2-2: Illustration of Existing and Proposed Infrastructure

2.2 Purpose of this Environmental Impact Assessment Report

The first phase of the Environmental Authorisation Process was the Scoping Phase, which was completed on 4 August 2017 and submitted to the DMR on 8 August 2017. During the Scoping Phase, various stakeholder groups were identified and stakeholders were encouraged to participate in the project so that significant issues requiring further investigation and assessment by specialists could be identified. Stakeholders also had the opportunity to verify that the issues raised by them were captured, understood, interpreted and contextualised.

The Scoping Report was submitted to the DMR and DWS on 5 July 2017 for comment. The Scoping Report was also made available to registered Interested and Affected Parties (I&APs) for a commenting period of 30 days from 5 July to 4 August 2017.

The second phase of the authorisation process is the Impact Assessment Phase, which includes specialist investigations, the assessment of impacts, and the preparation of an EMPr. Registered stakeholders are invited to participate in the public review period of the Impact Assessment Phase of the project to ensure that the assessment of impacts and proposed management of impacts have addressed their concerns. The EIA/EMPr Report has been made available for comment to registered I&APs .

This report provides a description of the proposed project and sets out the scope of the EIA and EMPr that were undertaken for the proposed expansion of Pit 1 and construction of the water pipeline:

This EIA/EMPr provides further details on the:

- Proposed project including associated activities and infrastructure requirements;
- Alternatives that were evaluated for various specific aspects of the project;
- Anticipated potential environmental impacts that may be associated with the project;
- Specialist studies that were undertaken; and
- Issues raised by stakeholders during the Scoping Phase.

All comments received during the EIA/EMPr public review period have been captured and addressed in the Comments and Response Report (Appendix D).

This EIA/EMPr will be submitted to the DMR to make a decision on the project. Figure 2-3 provides an illustration of the proposed EIA process that were

followed.

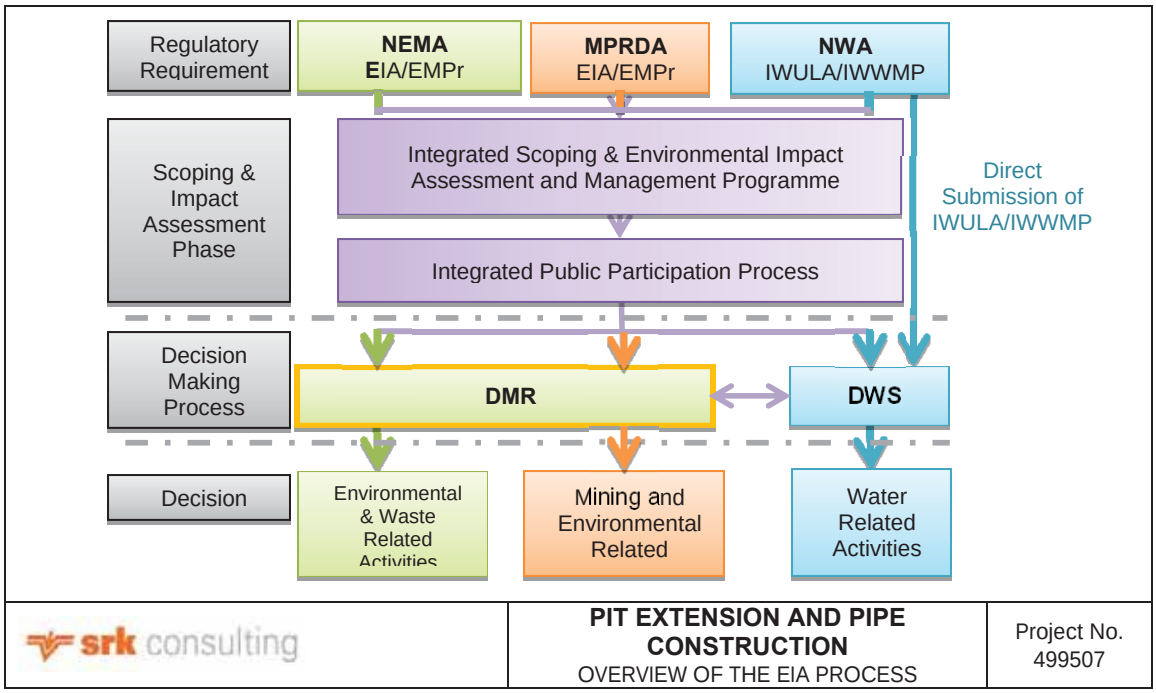


Figure 2-3: Overview the Environmental Impact Assessment Process

2.3 Location of the Proposed Activity

The proposed project falls within the Nkangala District Municipality and the Emalahleni Local Municipality in the Mpumalanga Province. The proposed project is located on the farm portions as illustrated in Figure 2-1. Table 2-1 provides a description of the proposed activities on each farm portion.

Table 2-1: List of Affected Farms and Farm Portions Illustrating the Relevant Activities

Farm and 21 Digit Survey General Code	Portions	Owner	Proposed Activities
Dorstfontein 71 IS T0IS00000000007100003	2	Dorstfontein Coal Mines (Pty) Ltd	Portion of pipeline Alternative 1, 2, and 3
Dorstfontein 71 IS T0IS00000000007100002	3	Dorstfontein Coal Mines (Pty) Ltd	Portion of pipeline Alternative 2 and 3
Dorstfontein 71 IS T0IS00000000007100008	8	Dorstfontein Coal Mines (Pty) Ltd	Portion of pipeline Alternative 1, 2, and 3
Welstand 55 IS T0IS00000000005500004	4	Dorstfontein Coal Mines (Pty) Ltd	Portion of pipeline Alternative 2 and 3
Welstand 55 IS T0IS00000000005500005	5	Dorstfontein Coal Mines (Pty) Ltd	Portion of pipeline Alternative 1, 2, and 3
Welstand 55 IS T0IS00000000005500011	11	Dorstfontein Coal Mines (Pty) Ltd	Portion of pipeline Alternative 1 and 2

Farm and 21 Digit Survey General Code	Portions	Owner	Proposed Activities
Welstand 55 IS	13	Dorstfontein Coal Mines (Pty) Ltd	Portion of pipeline Alternative 1, 2, and 3
T0IS00000000005500013			
Welstand 55 IS	Remainder	Dorstfontein Coal Mines (Pty) Ltd **	Pit extension and portion of Alternative 1 pipeline
T0IS00000000005500000			
T0IS00000000055800000			

2.4 Land Ownership

DCM is a joint venture between Exxaro Coal Central (Pty) Limited and Mmakau Mining (Pty) Ltd. DCM holds 2066 Ha of coal rights and 1230 Ha of surface rights, which make up the Dorstfontein East Mine Operations. The proposed extension of Pit 1, is located on the farm Welstand 55 IS Portion 5 on which Exxaro holds the mineral and surface rights. DCM owns surface rights of Portions 2, 3 and 8 of Dorstfontein 71 IS and 4, 5, 11 and 13 of Welstand 55 IS of the affected farms.

2.5 Report Index in Relation to the NEMA Regulations

Regulation 3, Appendix 3 of GNR 982 printed in terms of NEMA precisely stipulates the minimal requirement and issues that need to be addressed in the Environmental Impact Assessment Report (EIAR). This report strives to address all these requirements as per regulations. Table 2-2 indicates the regulations that have been addressed and the section of the EIAR where these requirements can be found.

Table 2-2: Requirements of Regulation 3, Appendix 3 of GNR 982

Appendix 3 Section	Description of EIA Regulations Requirements for an Environmental Impact Assessment Report	Section	Page
3 (a)	Details of – (i) The EAP who prepared the report; (ii) The expertise of the EAP, including curriculum vitae.	Section 3	p 13
3 (b)	The location of the activity, including – (i) The 21 digit Surveyor General code of each cadastral land parcel; (ii) Where available, the physical address and farm name; (iii) Where the required information in items (i) and (ii) is not available, coordinates of the boundary of the property or properties.	Section 2.3	p 9
3 (c)	A plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is –	Figure 2-1	p 6
	A linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or		
	On land where the property has not been defined, the coordinates within which the activity is to be undertaken.	N/A	N/A

Appendix 3 Section	Description of EIA Regulations Requirements for an Environmental Impact Assessment Report	Section	Page
3 (d)	A description of the scope of the proposed activity, including –	Section 5	p 18
	(i) All listed and specified activities triggered;		
	(ii) A description of the activities to be undertaken, including associated structures and infrastructure.	Section 2	p 4
3 (e)	A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process.	Section 5	p 18
3 (f)	A motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location.	Section 8.1	p 39
3 (g)	A motivation for the preferred development footprint within the approved site.	Section 17	p 167
3 (h)	A full description of the process followed to reach the proposed development footprint within the approved site, including-		
	(i) Details of the development footprint alternatives considered;	Section 11	p 98
	(ii) Details of the public participation process undertaken in terms of Regulation 41 of the regulations, including copies of the supporting documents and inputs;	Section 9	p 40
	(iii) A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	Section 9	p 47
	(iv) The environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 10	p 48
	(v) The impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration, and probability of the impacts, including the degree to which the impacts-	Section 13	p 104
	(aa) can be reversed;		
	(bb) may cause irreplaceable loss of resources; and		
	(cc) can be avoided, managed, or mitigated.	Section 12	p 101
	(vi) The methodology used in deterring and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;		
	(vii) Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographic, physical, biological, social, economic, heritage and cultural aspects;	Section 13	p 104
	(viii) The possible mitigation measures that could be applied and level of residual risk;	Section 13	p 104
	(ix) If no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and	Section 13	p 104
		N/A	N/A

Appendix 3 Section	Description of EIA Regulations Requirements for an Environmental Impact Assessment Report	Section	Page
	(x) A concluding statement indicating the preferred alternative development location within the approved site.	Section 17	p 167
3 (i)	A full description of the process undertaken to identify, assess, and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including -		
	(i) A description of the environmental issues and risks that were identified during the environmental impact assessment process; and	Section 13	p 104
	(ii) An assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.	Section 13	p 104
3 (j)	An assessment of each identified potentially significant impact and risk, including – (i) Cumulative impacts; (ii) The nature, significance and consequence of the impact and risk; (iii) The probability of the impact and risk occurring; (iv) The degree to which the impact and risk can be reversed; (v) The degree to which the impact and risk may cause irreplaceable loss of resource; and (vi) The degree to which the impact and risk can be mitigated.	Section 13	p 104
3 (k)	Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these regulations and an indication as to how these findings and recommendations have been included in the final assessment report.	Section 14	p 155
3 (l)	An environmental impact statement which contains –	Section 16	p 160
	(i) A summary of the key findings of the environmental impact statement;		
	(ii) A map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and	Figure 10-20, Figure 10-22, Figure 10-25, and Figure 10-26	p 76, 83, 88, and 90
	(iii) A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.	Section 16	p 160
3 (m)	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the management outcomes for the development for inclusion in the EMPr as well as conditions of authorisation	Section 17	p 167
3 (n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment.	Section 15	p 160

Appendix 3 Section	Description of EIA Regulations Requirements for an Environmental Impact Assessment Report	Section	Page
3 (o)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.	Section 17	p 167
3 (p)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed.	Section 18	p 169
3 (q)	A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any condition that should be made in respect of the authorisation.	Section 17	p 167
3 (r)	Where the proposed activity does not include operational aspects, the period for which the Environmental Authorisation is required and the date on which the activity will be concluded as the post construction monitoring requirements finalised.	N/A	N/A
3 (s)	An undertaking under oath or affirmation by the EAP in relation to- (i) The correctness of the information provided in the reports; (ii) The inclusion of the comments and inputs from stakeholders and interested and affected parties; (iii) The inclusion of inputs and recommendations from the specialist reports where relevant; (iv) Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties.	Section 0	p 182
3 (t)	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts.	Section 19	p 171
3 (u)	An indication of any deviation from the approved scoping report, including the plan of study, including – (i) Any deviation from the methodology used in determining the significance of potential environmental impacts and risk; and (ii) A motivation for the deviation.	N/A	N/A
3 (v)	Any specific information that may be required by the competent authority.	N/A	N/A
3 (w)	Any other matter in terms of Section 24(4)(a) and (b) of the NEMA	N/A	N/A

An EMPr has been compiled in accordance to Appendix 4 of GNR 982 and can be found in Appendix B. The EMPr details the mitigation measures required as well as the monitoring responsibilities and frequency.

3 Project Details

DCM has an approved EMPr for the Dorstfontein East Mine from the DMR, reference number **(MP 30/5/1/2/2/51MR**). Dorstfontein East is currently mining two opencast Pits (Pit 1 and Pit 2). The opencast production rate has been determined at a constant rate of 3 mtpa of RoM equating to an overall coal extraction of 21 million tons RoM. RoM from the opencast Pits is transported via conveyors to the plant. Discard is conveyed from the plant to the discard dump located between Pit 1 and Pit 2. Exxaro plan to expand the opencast mining of Pit 1 in a North Western direction of approximately 85 Ha, ensuring a constant RoM of 3 mtpa. In addition to this, Exxaro would like to relay a pipeline from the Dorstfontein West Mine to the Dorstfontein East Mine of approximately 11

km for the transportation of process water, which will be recycled. An illustration of the existing infrastructure can be found in Figure 2-2.

3.1.1 Details of the Applicant

Table 3-1 presents the details of the applicant and mine owner.

Table 3-1: Applicant Contact Details

Contact details of the Environmental Applicant:	
Exxaro Coal Central (Pty) Ltd Private Bag x 5007 Ganala 2271 Tel: (011) 441 6890 Fax: (011) 268 6734	
Contact details of the Mine Management Service Provider:	
Exxaro Coal (Pty) Ltd Roger Dyson Road Pretoria West, 0183 Tel: (011) 441 6857 Fax: (012) 323 3400	
Contact details of the Mine Manager Responsible Person:	
Business Unit Manager – Daniel Jacobus Chrisstoffel Stapelberg Private Bag X 5007 Ganala 2271 Tel: (011) 441 6857 Fax: (012) 323 3400	
For the purpose of the application process the following people may be contacted at Exxaro:	
Lorenzo van den Heever Environment Specialist, Sustainability Tel: (011) 441 7911 Lorenzo.vandenHeever@exxaro.com	William Seabi Sustainability Manager, ECC Tel: (011) 441 6857 William.Seabi@exxaro.com

3.1.2 Details of the Environmental Assessment Practitioner

SRK was established in 1974 and has since undertaken a large variety of environmental studies. SRK is a South African founded international organisation of professionals providing a comprehensive range of consulting services to natural resource industries and organisations. South African offices are staffed with over 350 professional consultants in nine offices, operating in a range of disciplines, mainly related to the environment, water, social and mining sectors. Back-up and peripheral expertise is available within these offices for all environmental projects. SRK has been appointed by Exxaro as the EAP. The project team members as stipulated in Table 3-2 can be contacted for the purposes of this project.

Table 3-2: Details of the Project Team

Details	Name			
	Ms Manda Hinsch	**Andrew Caddick**	**Donne Du Toit**	**Myuri Basdew**
Designation	Project Manager	Project Coordinator, Stakeholder Engagement and Report Preparation.	Stakeholder Engagement Officer	Report writing
Address	PO Box 35290 Menlo Park 0081	PO Box 35290 Menlo Park 0081	PO Box 35290 Menlo Park 0081	PO Box 35290 Menlo Park 0081
Telephone	(012) 361 9821	(012) 361 9821	(012) 361 9821	(012) 361 9821
Fax	(012) 361 9912	(012) 361 9912	(012) 361 9912	(012) 361 9912
E Mail	mhisnch@srk.co.za	acaddick@srk.co.za	ddutoit@srk.co.za	mbasdew@srk.co.za

The project manager, Ms Manda Hinsch is a Partner at SRK, with 35 years' experience in the environmental industry. Ms Manda Hinsch is appropriately qualified and registered with the relevant professional bodies as a Professional Natural Scientists (Pr.Sci.Nat. 400164/09) with the South African Council of Natural Scientific Professions and has extensive experience in compilation, implementation, amendment and assessing environmental compliance of a diverse set of EIA's and EMPrs in terms of the NEMA.

Mr Andrew Caddick holds a Master's degree in Geography and Environmental Science. He is an environmental scientist at SRK with 8 years' experience in the environmental field. His experience lies in the management of EIA and EMPr processes, coordination and execution of stakeholder engagement, and management of multi-disciplinary project teams, mainly for mining related projects. He is also involved in conducting EMPr audits and site assessments. Mr Andrew Caddick is appropriately qualified and registered with the relevant professional bodies as a Professional Natural Scientists (Pr.Sci.Nat. 400021/156) with the South African Council of Natural Scientific Professions.

Ms Donne Du Toit is a Stakeholder engagement specialist with 7 years' experience. Ms Donne Du Toit has been involved with many stakeholder engagement plans across the mining industry.

Ms Myuri Basdew is a graduate working at SRK, with 1-year experience. Ms Myuri Basdew has a MSc in Geography and Environmental Management from the University of Kwazulu- Natal.

Appendix A contains the curriculum vitae's of the impact assessment project team.

3.1.3 Details of the Specialists

The following specialist team conducted the relevant specialist assessments for the impact assessment phase of this proposed project. Table 3-3 lists the specialists assessments conducted for this proposed project as well as the respective companies and contact personnel.

Table 3-3: Specialist Team

Specialist field	Company	Contact Person
Hydrology Assessment	SRK	Peter Shepherd
Socio – Economic Assessment	SRK	Anita Bron
Air Quality Assessment	SRK	Dhiren Naidoo
Soil, Land Use and Land Capability	Terraafrica	Marine Pienaar
Wetland Assessment	Scientific Aquatic Services	Stephen van Staden
Biodiversity Assessment	Scientific Aquatic Services	Stephen van Staden
Heritage Assessment	Francois Coetzee	Francois Coetzee
Noise Assessment	Independent Contractor	Francois Malherbe
Vibration Assessment	Blast Management Consulting	Danie Zeeman
Closure and Rehabilitation	SRK	James Lake

3.1.4 Competent Authority Details

Environmental authorisation for the proposed project is required from the DMR. Details of the competent authorities are given in Table 3-4.

Table 3-4: Competent Authority Details

Department	Contact Person	Contact Details	
DMR	Mr A Tshivhandekano (Regional Manager)	**Tel**	(013) 653 0500

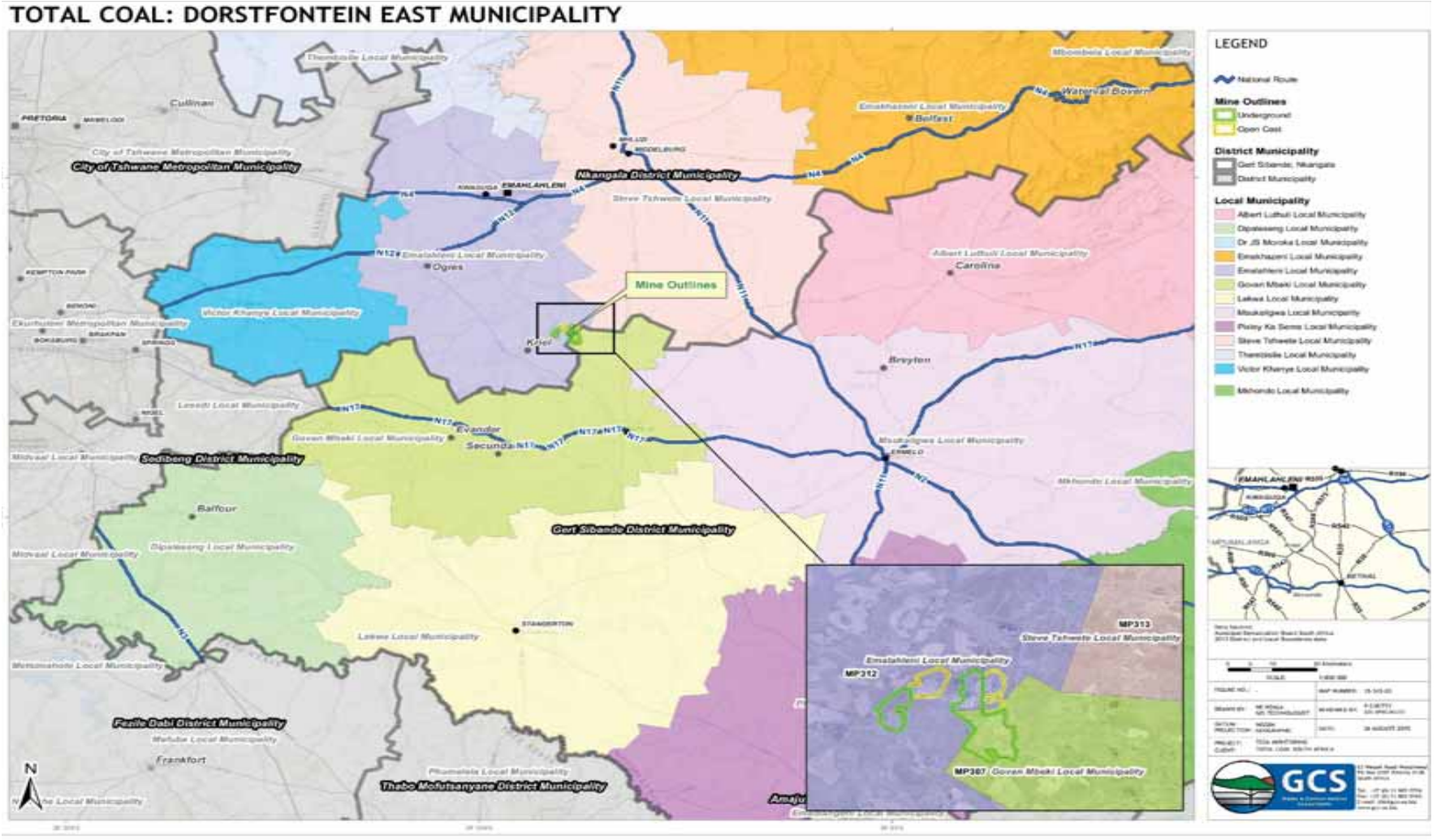
3.1.5 Municipality and Ward Details

The project area is located within the jurisdiction of the Nkangala District Municipality and eMalaheni Local Municipality. Welstand is the closest rural village approximately 1.2 km West of the Pit expansion area and Ga-Nala (Kriel) is the closest town, being approximately 7 km South West of the mining activities. Details of the relevant municipality are given in the table below. The relevant municipalities are shown in Table 3-5.

Table 3-5: Local and District Municipality Details

Department	Contact Person	Contact Details	
Nkangala District Municipality	Mr. V. Mahlangu	**Tel**	(013) 249 2000
		Email	mahlanguvm@nkangaladm.gov.za
Emalahleni Local Municipality.	Mr. E. Nkabinde	**Tel**	(013) 690 6555
		Email	nkabindeej@emalahleni.gov.za

Figure 3-1 provides an illustration of the relevant district and local municipalities surrounding the proposed project.



srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** RELEVANT DISTRICT/LOCAL MUNICIPALITIES	Project No 599507

Figure 3-1: Relevant District and Local Municipalities Relevant to the Proposed Project (GCS, 2015)

4 Methodology Applied to Conduct the Environmental Impact Assessment

4.1 Objectives and Approach

The objectives of the EIA/EMPr for the proposed Pit 1 expansion and water pipeline are to:

- Gain a better understanding of the immediate baseline environment of the proposed site;
- Determine and assess the potential direct, indirect and cumulative biophysical and social impacts resulting from the proposed development;
- Identify potential weaknesses associated with the proposed development;
- Consider and assess proposed alternatives in terms of environmental impacts;
- Develop environmental management measures to mitigate negative impacts and enhance positive impacts;
- Engage with stakeholders to ensure feedback on the results of the study is provided and that the assessment and management of impacts are identified and concerns considered;
- Provide sufficient information to the authorities to inform the environmental authorization decision.

The Impact Assessment Phase of the EIA process has been undertaken in two components: technical investigations and reporting, and public involvement feedback. The EIA Process and IWULA processes are being conducted simultaneously as integrated processes complemented by a combined stakeholder engagement process.

5 Legal and Policy Framework

The DCM currently operates under the existing approved EMPr for its mining operation (Reference Number: **MP 30/5/1/2/2/51MR**) under the MPRDA) and an existing WUL, Licence Number: 04/B11B/ACGIJ/957, issued under the NWA.

Dorstfontein East is currently mining two opencast Pits (Pit 1 and Pit 2). The opencast production rate has been determined at a constant rate of 3 mtpa of RoM equating to an overall coal extraction of 21 million tons RoM.

The proposed expansion of Pit 1 and construction of the water pipeline requires Environmental Authorisation in terms of the following:

- EIA/EMPr in terms of the NEMA for the proposed activities with the DMR as the competent authority;
- IWULA and accompanying IWWMP under the NWA with the DWS as the competent authority.

The following Acts and Regulations are applicable during the construction and operation of the proposed project and associated infrastructure. Environmental legislation most applicable to the proposed project has been described in detail in Section 5.1 to Section 5.11.

5.1 The Constitution of the Republic of South Africa

In terms of Section 24 of the Constitution of the Republic of South Africa (108 of 1996), everyone has the right to an environment that is not harmful to their health or well-being and to have the

environment protected, for the benefit of present and future generations, through reasonable legislation and other measures that prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development and use of natural resources while prompting justifiable economic and social development. The needs of the environment, as well as affected parties, should thus be integrated into overall project management in order to fulfil the requirements of Section 24 of the Constitution.

5.2 National Environmental Management Act (Act No. 107 of 1998)

The NEMA as amended in 2014 contains a set of principles in Chapter 2 that govern environmental management. These principles were adhered to and taken into consideration during the Impact Assessment Phase for the construction, operation, and decommissioning phases of a project. GNR 982 - 985 is the specific regulations that should be taken into consideration.

The environment is defined in the NEMA as the following:

“environment“ means the surroundings within which humans exist and that are made up of –

1. the land, water and atmosphere of the earth;
2. micro-organisms, plant and animal life;
3. any part or combination of (i) or (ii) and the interrelationship among and between them; and;
4. the physical, chemical, aesthetic and cultural, properties and conditions of the foregoing that influence human health and wellbeing.

Section 28 of the NEMA should be adhered to at all times during construction, operation and decommissioning of the proposed project. Section 28 (Duty of Care) applies to all activities taking place, and not solely focused on the listed activities being applied for.

5.3 Environmental Impact Assessment Regulations, Amended 2017

The EIA Regulations (GNR 982) were promulgated in terms of Sections 24 of the NEMA, to manage the process, methodologies and requirements for the undertaking of an EIA. The EIA regulations were published on 4 December 2014 and came into effect on 8 December 2014, and further amended in 2017. Subsequent amendments to the EIA regulations on the date of publication of this report will be taken into cognisance during the EIA process. The GNR 982 stipulates that the applicant for a development listed under GNR 983, 984 or 985 must appoint an independent EAP to manage the EIA process. It defines two broad categories of EIA, namely a basic assessment and a full EIA. A basic assessment is generally intended for smaller scale projects, or activities whose impacts are well understood and can be easily managed. The process for a basic assessment is described in Appendix 1 of GNR 982 and the environmental consultant must conduct a stakeholder engagement process as set out in Regulation 39 to 44.

A full EIA as stipulated in GNR 982 consists of a scoping and Impact Assessment Phase. This form of an EIA is generally intended for larger scale projects, whereby the environmental impacts are more diverse and extensive thereby a more comprehensive means of impact identification is required. The impacts of such a project may lead to extensive environmental degradation, or solely require a Scoping Phase in order to assess and identify impacts not easily predicted or identified.

The process for a full EIA is described in Appendix 3 and 4 of GNR 982 and the environmental consultant must conduct a scoping process, followed by an impact assessment process, with stakeholder engagement as set out in Regulation 39 to 44. Considering that a basic assessment and full EIA will be triggered for the purposes of the proposed developments, a single full EIA process will be followed in order to meet the requirements of both processes. Table 5-1 provides a description of

the listed activities in terms of GNR 983, 984, and 985 that will be triggered by the Pit 1 expansion and construction of the water pipeline.

5.3.1 Listed Activities

The listed activities triggered under GNR 983, 984, and 985 are listed in Table 5-1 below.

Table 5-1: Listed NEMA activities

Number and date of relevant notice	Activity No(s) (in terms of the relevant notice)	Description of each listed activity as per the government notice and the detailed project description
GNR 983-Listing Notice 1	10	The development of infrastructure exceeding 1000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, return water, industrial discharge or slimes – With an internal diameter of 0.36 metres or more; With a peak throughput of 120 litres per second or more. The proposed pipeline will be approximately 11 km in length with an internal diameter of 250 mm. This will equate to a peak throughput exceeding 120 litres / second.
	12	The development of canals, channels, dams, and bulk stormwater outlet structures, buildings, and infrastructure exceeding 100 square metres in size, where such development occurs within a watercourse. The construction of canals, channels, bulk stormwater outlet structures, buildings, and infrastructure associated with the pipeline and maintenance road crossings of the Steenkoolspruit Stream as well as the associated non-perennial tributaries.
	19	Infilling or depositing of any material of more than 10 m^3 into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from: a littoral active zone, a watercourse or the seashore but excluding where such infilling, depositing, dredging, excavation, removal or moving will occur behind a development setback, is for maintenance purposes undertaken in accordance with a maintenance plan or falls within the ambit of Activity 21 in Listing Notice 1, in which case that activity applies. The construction of the drainage system and support infrastructure associated with the pipeline and maintenance road crossings of the Steenkoolspruit Stream as well as the associated non-perennial tributaries.
	24	The development of a road- for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or with a reserve wider than 13.5m or where no reserve exits where the road is wider than 8m but excluding a road which is identified and included in Activity 27 in Listing Notice 2 of 2014 or roads where the entire road falls within an urban area or which is 1km or shorter The construction of a maintenance road associated with the proposed pipeline. The length of the road will be longer than 1 km and wider than 8 metres.
	28	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 1 April 1998 and where such development will occur outside an urban area, where the total land to be developed is bigger than 1 hectare. The expansion of Pit 1 of approximately 85 hectares will be undertaken on existing agricultural land.

Number and date of relevant notice	Activity No(s) (in terms of the relevant notice)	Description of each listed activity as per the government notice and the detailed project description
	34	The expansion or changes to existing facilities or infrastructure for any process or activity where such expansion or changes will result in the need for a permit or license or an amended permit or license in terms of national or provincial legislation governing the release of emissions or pollution excluding the expansion or changes to existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water or sewage where the capacity will be increased by less than 15000cm^3 per day. The expansion of Pit 1 will result in the need for a WUL for the dewatering of underground water for the safety of employees. Furtherance to this, a WUL will be required for the stream crossings of the proposed pipeline and maintenance road as well as for the use of process water for dust suppression around the mine.
GNR 984-Listing Notice 2	6	The development of facilities or infrastructure for any process or activity which requires a permit or license or an amended permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. The expansion of Pit 1 will result in the need for a WUL for the dewatering of underground water for the safety of employees. Furtherance to this, a WUL will be required for the stream crossings of the proposed pipeline and maintenance road as well as for the use of process water for dust suppression around the mine.
	17	Any activity including the operation of that activity which requires a mining right as contemplated in Section 22 of the Mineral and Petroleum Development Act (Act No. 28 of 2002) (MPRDA) including associated infrastructure, structures and earth works, directly related to the extraction of a mineral resources. The expansion of Pit 1 will require an amendment to the existing mine works programme in terms of the MPRDA for construction activities and the operation thereof directly relating to the extraction of coal.
	21	Ay activity including the operation of that activity associated with the primary processing of a mineral resource including winning, reduction, extraction, classifying, concentrating, crushing, screening and washing but excluding the smelting, beneficiation, refining, calcining or gasification of the mineral resource. The expansion of Pit 1 will ultimately increase the volume of coal extraction for the DCM.

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

The National Environmental Management: Waste Act (Act No. 59 of 2008) (NEM:WA) was implemented on 1 July 2009 and Section 20 of the Environment Conservation Act (Act No. 73 of 1989), under which waste management was previously governed, was repealed. The main objectives of the NEM:WA is 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; and to provide for:

- *National norms and standards for regulating the management of waste by all spheres of government;*

- *Specific waste management measures;*
- *The licensing and control of waste management activities;*
- *The remediation of contaminated land; to provide for the national waste information system; and*
- *Compliance and enforcement.*

The objectives of NEM:WA involve the protection of health, wellbeing and the environment by providing reasonable measures for the minimization of natural resource consumption, avoiding and minimizing the generation of waste, reducing, recycling and recovering waste, and treating and safely disposal of waste as a last resort.

In terms of the NEM:WA, all waste management activities must be licensed. According to Section 44 of the Act, the licensing procedure must be integrated with an EIA process in accordance with the Regulations GNR 982 printed in terms of the NEMA. Government Notice 719, which was implemented on 3 July 2009, removed all waste management activities from the EIA regulations GNR 386 and GNR 387, resulting in new NEMA listed activities namely GNR 544 and GNR 545 which were further amended to form GNR 983, 984, and 985. GNR 718 listed the waste management activities that require licensing. On 29 November 2013, GNR 718 was repealed and replaced by a new list of waste activities under GNR 921. A distinction is made between Category A waste management activities, which require a basic assessment, and Category B activities, which require a full EIA, and Category C waste management activities which do not require a waste management licence but compliance with relevant requirements or standards. On 24 July 2015, the waste management activities were further amended in GNR 633, which included the establishment or reclamation of a residue stockpile or residue deposit resulting from prospecting or mining activities as a listed activity.

No waste listed activities will be triggered for the proposed expansion to the Pit 1 and water pipeline project, however during the construction and operation of the proposed project, the basis of the NEM:WA hierarchy focusing on waste reduction and reuse will be implemented and has been laid out in the EMPr.

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

The National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEM:AQA) was implemented on 24 February 2005 and reforms the law regulating air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government; for specific air quality measures; and for matters incidental thereto.

On 22 November 2013 the list of activities which result in atmospheric emissions which have or may have a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage was published under GNR 893 in Governmental Gazette 37054, in terms of section 21(1)(b) of the NEM:AQA thereby repealing the previous list of activities which were promulgated on 31 March 2010. No listed activities will be triggered as a result of the proposed project, however the principles of the act focusing on minimisation of pollutant emissions have been taken cognisance of in the development of the EMPr.

5.6 National Heritage Resources Act (Act No. 25 of 1999)

The protection and management of South Africa's heritage resources are controlled by the National Heritage Resources Act (Act No. 25 of 1999) (NHRA). The enforcing authority for this act is the South African National Heritage Resources Agency (SAHRA). In terms of the Act, historically important features such as graves, trees, archaeology and fossil beds are protected. Similarly, culturally significant symbols, spaces and landscapes are also afforded protection. In terms of Section 38 of the NHRA, SAHRA can call for a Heritage Impact Assessment (HIA) where certain categories of development are proposed. The Act also makes provision for the assessment of heritage impacts as part of an EIA process and indicates that if such an assessment is deemed adequate, a separate HIA is not required. Should a permit be required for the damage or removal of specific heritage resources, Exxaro will submit a separate application for these activities to the SAHRA for approval, should these resources be potentially damaged or removed. The activities identified in the Act requiring a notification from SAHRA include:

Section 38

(1) (a): "The construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m 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 5 years; or*
- *iv. the costs of which will exceed a sum in terms of regulations by SAHRA or a provincial heritage resource authority.*

A HIA has been conducted as part of this project.

5.7 National Water Act (Act No. 36 of 1998)

The NWA is the primary regulatory legislation, controlling and managing the use of water resources as well as the pollution thereof. This act provides for fundamental reformation of legislation relating to water resource use. The preamble to the NWA recognises that the ultimate aim of water resource management is to achieve sustainable use of water for the benefit of all users and that the protection of the quality of water resources is necessary to ensure sustainability of the nation's water resources in the interests of all water users. The purpose of the NWA is stated in Section 2 and enforced by the DWS.

The Act presents strategies to facilitate sound management of water resources, provides for the protection of water resources, and regulates use of water by means of Catchment Management Agencies, Water User Associations, Advisory Committees and International Water Management.

As this Act is founded on, the principle the government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, an industry (including mines) can only be entitled to use water if the use is permissible under the NWA.

5.7.1 GNR 704 of the NWA

The NWA is the primary regulatory legislation, controlling and managing the use of water resources as well as the pollution thereof. This act provides for fundamental reformation of legislation relating

to water resource use. The preamble to the NWA recognises that the ultimate aim of water resource management is to achieve sustainable use of water for the benefit of all users and that the protection of the quality of water resources is necessary to ensure sustainability of the nation's water resources in the interests of all water users. The purpose of the Act is stated in Section 2 and enforced by the DWA. Section 2 of the Act relates to the following:

- Promoting the efficient, sustainable and beneficial use of water in the public interest;
- Facilitating social and economic development;
- Protecting aquatic and associated ecosystems and their biological diversity;
- Reducing and preventing pollution and degradation of water resources; and
- Meeting international obligations.

The Act presents strategies to facilitate sound management of water resources, provides for the protection of water resources, and regulates use of water by means of Catchment Management Agencies, Water User Associations, Advisory Committees and International Water Management.

As this Act is founded on, the principle the government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, an industry (including mines) can only be entitled to use water if the use is permissible under the NWA.

Anticipated water uses in terms of Section 21 of the NWA for the proposed project are included in Table 5-2.

Table 5-2: Anticipated Water Uses

NWA Section 21	Description of each listed activity as per the government notice and the detailed project description
21 (c) and (i)	Impeding, diverting and altering the flow of water in a watercourse. The development of a maintenance road along the pipeline route, which includes a 10 m servitude of approximately 11 km. This will include surface and ground water management, erosion and soil controls and stormwater management. All three pipeline route options traverse various perennial, non-perennial, channelled valley bottom wetlands and floodplain wetlands. All activities taking place within 500 m of a wetland or watercourse will be licensed under Section 21 (c).
21 (e)	Engaging in a controlled activity identified as such in Section 37 (1) or declared under Section 38 (1). As a result of the proposed mining activities, dust suppression activities will be undertaken using process water.
21 (g)	Disposing of waste in a manner which may detrimentally impact on a water resource. Because of the proposed mining activities, dust suppression activities will be undertaken using process water.
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 dewatering process associated with the continuation of mining activities in the Pit 1 expansion.

5.8 National Environmental Management: Biodiversity Act (Act 10 of 2004)

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEM:BA) provides for listing of threatened or protected ecosystems, in one of four categories: critically endangered, endangered, vulnerable or protected. Threatened ecosystems are listed in order to reduce the rate of ecosystem and species extinction by preventing further degradation and loss of structure, function and composition of threatened ecosystems. The purpose of listing protected ecosystems is primarily to conserve sites of exceptionally high conservation value.

In line with the Convention on Biological Diversity, the NEM:BA aims to legally provide for biodiversity conservation, sustainable use and equitable access and benefit sharing. The NEM: BA established the South African National Biodiversity Institute (SANBI). The NEM:BA creates a basic legal framework for the formation of a national biodiversity strategy and action plan and the identification of biodiversity hotspots and bio-regions, which will then be given legal recognition. It imposes obligations on landowners (state or private) governing alien invasive species as well as regulates the introduction of genetically modified organisms. Furthermore, the NEM:BA serves to regulate bio-prospecting, making provision for communities to share the profits of any exploitation of natural materials involving indigenous knowledge.

Biodiversity hotspots and bio-regions have been investigated to determine the potential effect, which the project may have on the receiving environment. The establishment of alien invasive species on the impacted areas during all the phases of the project will be governed by the NEM:BA. The NEM:BA ensures that provision is made by the site developer to remove any aliens, which have been introduced to the site or are present on the site.

5.9 Promotion of Access to Information Act (Act No. 2 of 2000)

The Promotion of Access to Information Act (Act No. 2 of 2000) (PAIA) recognises that everyone has a right of access to any information held by the state and by another person when that information is required to exercise or protect any right. The purpose of the Act is to promote transparency and accountability in public and private bodies and to promote a society in which people have access to information that enables them to exercise and protect their right. The EIA/EMPr process undertaken in terms of the NEMA and NWA, with the associated stakeholder consultation process has been aligned with the PAIA in the sense that all I&APs will be given an opportunity to register as an I&AP prior to the initiation of the project and all registered stakeholders have in turn be provided a fair opportunity to review and comment on any reports submitted to the competent authorities for decision making.

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

The Mine Health and Safety Act (Act No. 29 of 1996) (MHSA) aims to provide for protection of the health and safety of all employees and other personnel at the mines of South Africa. The main objectives of the act and subsequent amendments are:

- Protection of the health and safety of all persons at the mines;
- Require employers and employees to identify hazards and eliminate, control and minimise the risks relating to health and safety at the mines;
- Give effect to the public international law obligations of the Republic that concern health and safety at all mines;

- Provide for employee participation in matters of health and safety through health and safety representatives and the health and safety committees at the mines;
- Provide for effective monitoring of health and safety conditions at the mines;
- Provide for enforcement of health and safety measures at the mines;
- Provide for investigations and inquiries to improve health and safety at mines; and
- To promote:
    - A culture of health and safety in the mining industry;
    - Training in health and safety in the mining industry; and
    - Co-operation and consultation on health and safety between the State, employers, employees and their representatives.

The proposed project will be located within the mining lease area and Exxaro will therefore need to ensure that employees, contractors, sub-contractors and visiting personnel, adhere to this Act and subsequent amendment regulations on site. This is especially pertinent during the construction phase of the water pipeline associated infrastructure, like the road.

5.11 Conservation of Agricultural Resources Act (Act No. 43 of 1983)

The Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA) aims to provide for control over the utilisation of natural agricultural resources in order to promote the conservation of soil, water resources and vegetation and to combat weeds and invader plants. The Act makes provision for control measures to be applied in order to achieve the objectives of the Act, these measures relate to inter alia:

- Cultivation of virgin soil;
- Utilisation/protection of wetlands, marshes, water sponges, water courses/sources;
- The regulating of the flow pattern of run-off water;
- The utilisation and protection of vegetation;
- The grazing capacity of veld and the number and type of animals;
- The control of weeds and invader plants; and
- The restoration or reclamation of eroded land or land, which is disturbed or denuded.

The surface area is owned by Exxaro but is primarily used for agriculture. Exxaro will take cognisance of the proposed project and its impacts on agriculture land with regards to water flow patterns, protection of vegetation and control of alien vegetation encroachment. The end land use of the project will be discussed with relevant stakeholders to ensure that the rehabilitation of the disturbed areas are reinstated to the desired use at closure.

5.12 Provincial and Municipal Bylaws

The Nkangala District Municipality, Emalahleni Local Municipality and the Mpumalanga Province have developed local bylaws and various policies relating to waste disposal, water, economic development, air quality etc. The proposed project must ensure that such policies and bylaws are adhered to as far as possible, during the installation and operation of the proposed Pit 2 expansion and pipeline construction.

5.13 Guidelines

The following guidelines have been taken cognisance of during the EIA/EMPr phase of the proposed project:

- Mpumalanga Biodiversity Conservation Plan (MBCP);
- Nkangala Integrated Development Plan (IDP);
- Emalahleni Local Municipality Spatial Development Framework (SDF);
- Nkangala SDF;
- DWS, 2010. Operational Guideline: Integrated Water and Waste Management Plan. Resource Protection and Waste;
- Department: Water Affairs and Forestry, 2007. Best Practice Guideline A2: Water Management For Mine Residue Deposits;
- Department: Water Affairs and Forestry, 2007. Best Practice Guideline A4: Pollution control dams;
- Department of Water Affairs and Forestry, 2008. Best Practice Guideline A6: Water Management for Underground Mines.
- Department of Water Affairs and Forestry, 2006. Best Practice Guideline G1 Storm Water Management;
- Department of Water Affairs and Forestry, 2006. Best Practice Guideline G2: Water and Salt Balances;
- Department of Water Affairs and Forestry, 2006. Best Practice Guideline G3. Water Monitoring Systems;
- Department of Water Affairs and Forestry, 2008. Best Practice Guideline G4: Impact Prediction;
- Department of Water Affairs and Forestry, 2008. Best Practice Guideline H1: Integrated Mine Water Management;
- Department of Water Affairs and Forestry, 2006. Best Practice Guideline H3: Water Reuse and Reclamation;
- DEAT. 2002. Integrated Environmental Management, Information series 2: Scoping. Department of Environmental Affairs and Tourism (DEAT. 2002);
- DEAT. 2002. Integrated Environmental Management, Information series 3: Stakeholder Engagement. Department of Environmental Affairs and Tourism (DEAT. 2002);
- DEAT. 2002. Integrated Environmental Management, Information series 4: Specialist Studies. Department of Environmental Affairs and Tourism (DEAT. 2002);
- DEAT. 2002. Integrated Environmental Management, Information series 12: Environmental Management Programmes. Department of Environmental Affairs and Tourism (DEAT. 2002);
- DEA. 2010. Companion to the EIA Regulations 2010 for Comment, Integrated Environmental Management Guideline Series 5, Department of Environmental Affairs;

- DEA. 2010. Companion to the EIA Regulations 2010 for Comment, Integrated Environmental Management Guideline Series 7, Department of Environmental Affairs;
- DEA. 2012. Companion to the EIA Regulations 2010, Integrated Environmental Management Guideline Series 5, Department of Environmental Affairs;
- DEA. 2012. Companion to the EIA Regulations 2010, Integrated Environmental Management Guideline Series 7, Department of Environmental Affairs; and
- Western Cape Department of Environmental Affairs and Tourism. 2010. EIA Guideline and Information Document Series: Guideline on Need and Desirability.

6 Scope of the Proposed Activity

Exxaro plan to expand the opencast mining of Pit 1 at their Dorstfontein East mine in a North Western direction of approximately 85 Ha, ensuring a constant RoM of 3 mtpa. In addition to this, Exxaro would like to construct a pipeline from the Dorstfontein West Mine to the Dorstfontein East Mine of approximately 11 km for the transportation of process water, which will be recycled. It is anticipated that the Mine expansion and Pipe construction will include the following infrastructure and activities:

- Selective vegetation clearance would be required for the extension of the Pit 1 expansion and the footprint of the pipeline;
- Stripping and stockpiling topsoil and sub-soil and the establishment of a topsoil stockpile area and berms;
- Mining of the Pit 1 expansion area (Including blasting);
- Erection of the pipeline;
- The development of a maintenance road along the pipeline route;
- Loading, hauling and transportation of ROM, product and materials;
- The dredging, excavation and moving of soil, sand and rock from the non-perennial streams for the erection of the pipeline;
- Erection of pipe racks and culvert at the stream crossings;
- Operation of storm water control systems; and
- The establishment of construction camps by contractors and the operation of earth moving vehicles and equipment.

6.1 Employment

Dorstfontein Complex mine provides employment opportunities to approximately 836 workers on a contract basis. The mine is operated by a few large contracting companies and only employs a full-time staff compliment at the mine of 85 employees, excluding vacancies. To facilitate the upliftment of the previously disadvantaged labour force, a programme is in place for the upgrading of literacy levels. Dorstfontein Complex Mine also partakes in the graduate intake programme, which provides relevant job-related training and placement opportunities for individuals who successfully complete the programme. Current interventions are implemented in line with the company's Employment Equity and Skills Development Plans (Exxaro Coal Central (Pty) Ltd A, 2017).

The Social and Labour Plan (SLP) for Dorstfontein Complex is based on the following strategic approach:

- Promotion of employment and advancing the social and economic welfare of all South Africans;
- Contribution to the transformation of the mining industry; and
- Promotion of sustainable economic development and poverty eradication.

6.2 Stripping and Stockpiling of Soil

6.2.1 Stripping

The original opencast Pits were planned and developed in 50-meter-wide strips, throughout the extent of the various Pits in the advance direction. The opencast Pits are also developed in various benches to ensure adequate slope stability and flexibility in exposed coal reserves. The mining Pits with regard to Option 1 of Pit 1 Extension are designed and planned in strips of 50 m wide. With the inception of roll over mining techniques all waste from mining strips will be back filled into previous voids. Option 2 accounts for shorter strips but increased underground production activity (Exxaro Coal Central (Pty) Ltd B, 2017).

6.2.2 Stockpiling

Coal reserves are transported via truck and shovelled out to a main tipping arrangement from where the ROM coal is crushed and screened and delivered to a stockpile from where it is fed to the processing plant. Material is withdrawn from the stockpile via three feeders (two fixed and one variable speed) and is conveyed to a plant feed bin. Raw coal with a top size of – 50 mm discharges to a ~7400 ton surge stockpile.

The combined export product is transferred onto a ~24000-ton intermediate product stockpile, from which it is transferred to the export product stockpile (24 000-ton capacity load-out) feeding with a sacrificial conveyor onto the overland conveyors. Mass meters will be provided to measure the quantity of export product going onto the export product stockpile. A hammer sampler will also be installed on the intermediate product stockpile feed conveyor. Coal is conveyed from the export stockpile to the rapid load-out system (vendor package) that load the trains. The floats screen oversize (50 x 32 mm) chute is designed to allow for separate collection (future) of the oversize as an inland product, which could be discharged onto a conveyor and be stockpiled separately from the export product (Exxaro Coal Central (Pty) Ltd B, 2017).

6.2.3 Topsoil and Subsoil

Topsoil will be removed during the dredging and excavation activities undertaken in order to erect the pipeline. Soil, sand and rock will also be moved from the non-perennial streams. The topsoil stockpile will be utilized for rehabilitation purposes of surface areas for decommissioned infrastructure. Mitigation activities will include a plan to decrease soil erosion and conserve the status of the soil as well as effectively manage the waste produced.

The underground layers of minerals have been identified as economically viable for the purposes of the Dorstfontein East Mine. These account for No. 2 Seam, No.4 Seam and to a lesser extent, the No.3 Seam, which occurs in some isolated areas in Pit 2. The in-situ Reserve tonnage is known to be 27 million tonnes of 2 Seam and 57.6 million tonnes of 4 Seam select or some 83 million tonnes of complete 4 Seam. The No. 4 Seam Upper is considered to be of inferior quality. The No.4 Seam is therefore considered to consist of some 57.6 million tons (original estimates) of in-situ coal which varies in depth from sub outcrop to 43 meters. The mining height of the seam varies from 2.5 meters to 4.9 meters with an average mining height of 2.83 meters, which affords the seam to high speed,

high production mining with continuous miners. In addition to the above-mentioned Reserves, the Pit 1 North West Extension is estimated to have a known mineable tonnes in situ Resource of 3.5 million tonnes of the No. 2 Seam and 2.5 million tonnes of the No.4 Seam select or some 2.8 million tons of No.4 Seam complete.

6.3 Blasting and Vibration

Blasting of overburden and the coal will be conducted by a dedicated drilling and blasting crew. An appointed Blast Engineer designs each blast for optimal fragmentation and minimum environmental impact. Surrounding property owners will be informed of the blasting procedures and schedules in advance in and around the mining area. Blasting boards at access routes to construction areas will be updated 24 hours prior to the blast, displaying details regarding the time and date of the blast. An exclusion zone on 500 m will be in place for the life on the mine. Employees and external contractors will be informed of the blasting procedures and the associated safety measures during induction. Vehicles and machinery will be removed prior to the blasting and parked at designated sites. Personnel with red flags will block all access roads.

Vibrations will occur due to the blasting. As a result, controls will be set in place to monitor the noise and vibrations, surface and ground water. Electrical Crack monitors will be installed if requested by the surrounding property owners. They will employ a single sensor that measures both weather-induced micrometre changes in crack width and those produced by the habitation and ground motion-induced vibrations. The air over pressure level and vibration, (audible and the inaudible – concussion - noise), to be monitored and controlled during the blasting operation. The standards implemented by the USA Bureau of Mine Standards, RU 8507, are used as a guideline to monitor and control blasting operations in South Africa:

Monitoring of the vibrations will be done continuously during the opencast operations, and when required as the mining face underground approaches dwellings overhead. Vibration sensing equipment will be used, which should be placed near residential dwellings (near communal land border and at the nearest commercial farmer’s homestead) to record blast over pressure and vibration. No specific blasting designs are proposed since available equipment may vary, however, the blasting constraints will be considered as the limiting criteria. Proposed criteria would be a maximum peak particle velocity of 12.5 mm/s at frequencies of 4 to 15 Hz, higher frequencies as per the USBM RU 8507 graph. Air blast recordings at the residential houses should not exceed 128 dB, with no more than a maximum of 4 occurrences in excess of 128 dB per calendar month, but no more than 134 dB. of a transgression, the mining concern to proactively communicate corrective action to the DMR.

6.4 Proposed Pipeline

The proposed pipeline will be approximately 11 km in length with an internal diameter of 250 mm. This will equate to a peak throughput exceeding 120 litres / second. The pipeline will be constructed from the Dorstfontein West to the Dorstfontein East Mine. The pipeline will be used for the transportation of process water to Dorstfontein East to be recycled in their operations. This pipeline will assist Exxaro to optimise their water management between the two mines.

6.5 Supporting Infrastructure

The proposed extension of the DCM Pit 1 will make use of existing road-, rail-, water- and electricity infrastructure. The DCM has its own rapid loading terminal connected to the Richards Bay Coal Terminal rail line.

6.6 Exploration

Approximately 590 boreholes have been drilled over the DCM mining right area. A further 57 boreholes were drilled between 2012 and 2015 of which 16 were placed in the Pit 1 extension area on portion 55 the farm Welstand 55 IS.

7 Technical Investigation and Reporting

7.1 Specialist Studies

The following specialist studies have been undertaken based on the outcome of the Scoping Phase of the project and issues raised during the stakeholder engagement process. The specialist studies include the baseline of the existing environment which is summarised in Section 10 of this report. The findings of these studies have been used to prepare the EIAR. The following specialist studies were completed for the purpose of the proposed project:

- Air quality assessment;
- Biodiversity assessment;
- Wetland assessment;
- Heritage assessment;
- Soils, Land use and land capability;
- Blasting assessment;
- Noise impact assessment;
- Hydrology (surface water and groundwater);
- Closure/rehabilitation plan;
- Social assessment;
- Phase 1 palaeontology assessment;

7.2 Terms of Reference

During the Scoping Phase, a number of potential environmental, social and cultural impacts associated with the proposed development were identified. A Terms of Reference (ToR) was developed for specialists to undertake specific studies to investigate these. The Specialist's ToR is provided in Table 7-1.

Table 7-1: Specialist Terms of Reference

Specialist Study	Scope
Air Quality assessment	The Air Quality Impact Assessment ToR is not limited to, but must include the following: • Review of available project documentation such as project descriptions; • Collate ambient air quality monitoring data received from the client and provide a baseline air quality assessment of the project site; • Preparation of an emission inventory for the proposed operations for dust (Particulate Matter [PM]10, PM2.5 and dust fallout) and gases (if any); • Setup and undertake atmospheric dispersion modelling for dust and gases (if any) for the proposed operations;

Specialist Study	Scope
	• Recommendation of management and mitigation measures; • Specialist input and review of impact assessment; • Reporting.
Faunal assessment	The Scope of Work includes a full ecological investigation, which includes an aquatic assessment, faunal, floral and wetland assessment of the study area. The assessment will fulfil the ecological assessment requirements of the EIA and EMP as required in terms of the MPRDA, NEMA (1998) and associated regulations, as well as other legal requirements applicable on both a national and provincial level, including the requirements of the NWA and associated guidelines and regulations. The assessment will also be conducted to best meet all relevant stakeholders' requirements for ecological assessments. The faunal assessment will be conducted using the following methods: • Extensive consideration will be given to determining the Ecological Importance and Sensitivity (EIS) of the subject property according to relevant databases. The relevant • Mpumalanga Province databases for the QDS will also be consulted and will serve as the reference data to which field surveys will be compared to; • Visual observations of actually occurring species; • Identification of evidence of occurrence, e.g. call spoor, droppings, etc.; • Capture of fauna by various methods including netting, trapping and dragging. In this regard, special mention is made of the use of Pitfall traps and sweep netting for invertebrates as well as the use of Sherman traps to determine the composition of the small mammal community on the site. Rope dragging methods will also be used to flush birds from areas where RDL avifaunal species are deemed likely to occur; • Nocturnal studies to identify nocturnal animals in the area may take place if it is deemed necessary; • The reports produced will include sensitive habitat types and impacts from habitat disturbance, faunal assemblages at risk and an assessment of impacts on migratory routes; • The RDSIS index will also be considered in order to quantify the importance of the subject property in terms of Red Data Listed (RDL) faunal conservation; • Based on the findings a detailed impact assessment on all identified significant risks will take place; and • Recommendations on management and mitigation measures (including opportunities and constraints) about the construction and operation of the proposed development in order to manage and mitigate impacts on the faunal assemblage of the area will be provided. The following field assessment will be conducted as deemed necessary: • Avifauna; • Mammals; • Herpetofauna; • Invertebrate Assessments.
Floral assessment	The proposed methodology includes both a desktop review and a field work component. A desktop review of distribution lists (including RDL species) and available literature will be conducted to guide the field work component. The vegetation type of the area will be defined according to sources such as Mucina & Rutherford (2006). Extensive consideration will also be given to determining the EISC of the subject property according to relevant provincial and national conservation databases. The SANBI and Pretoria Computer Information Systems (PRECIS) databases for the Quarter Degree Square (QDS) will also be consulted and will serve as the reference data to which field surveys will be compared to.

Specialist Study	Scope
	The assessment will include a detailed assessment for the entire area to be affected by mining activities as well as the surrounding zone of influence. The field assessment will identify: • Various habitat types; • A description of each habitat type based on conservation importance and present ecological state; • Floral species associated with each habitat component: • Focus on sensitive habitat types and impacts associated to them in order to fulfil the requirements of the study. Such sensitive areas will be mapped where detail will be given of the ecological aspect of concern in each sensitivity zone; • Focus on establishing the presence of RDL species and other sensitive species identified as well as suitable habitats for any of these species; • Specific focus will also be given to identifying areas of severe weed and alien vegetation encroachment, which will be mapped; • Medicinal plant species will also be identified and the location of special medicinal species will be presented on maps; • Veld condition will be quantitatively assessed according to a pre-defined veld condition index and will also be quantitatively compared to the typical vegetation for the vegetation type of the area according to Mucina & Rutherford (2006); • Species lists for each habitat unit will be developed; • Based on the findings a detailed impact assessment on all identified significant risks will take Recommendations on management and mitigation measures with regards to the construction and operation of the proposed development in order to manage and mitigate impacts on the ecology of the area; and • Rehabilitation and closure requirements will be considered.
Wetland Assessment and Delineation	The Wetland Assessment is included in the Ecological Investigation, and will be conducted by a Wetland Specialist • The wetland assessment will comprise of detailed desktop assessments of the National Freshwater Ecosystem Priority Areas (NFEPA) database as well as available regional wetland layers in order to define the wetland features based on existing desktop data. The wetlands will then be delineated in the field according to the Department of Water Affairs (DWA) (2005) guideline methodology. Once the wetland boundary has been defined it will be mapped and the relevant buffers applied. • Delineation of the wetland resources will take place according to the DWAF (2005) guidelines and an assessment of the wetland Present Ecological State (PES), Index of Habitat Integrity (IHI), WET-Health, wetland vegetation (VEGRAI) and wetland function and eco-services will take place according to DWS approved protocols. Recommendations for mitigating impacts on the aquatic environment will also be provided. • The assessment will be undertaken to best meet the requirements of the DWS in order to supply specialist information in support of the mandatory supplementary information required for Section 21 (c) & (i) licenses Form DW781 suppl. • Results will be compiled into a report, which will include a discussion on the findings. Specific attention will be given to the impacts associated with the proposed development with impacts being assessed according to a pre-defined impact assessment methodology. • Extensive attention will be given to the development of recommendations for mitigating impacts on the receiving environment. These mitigation measures can then be incorporated into the EMPr for the development to ensure that the wetland ecology of the area is adequately protected.

Specialist Study	Scope
	Aquatic Baseline Assessment An assessment of the aquatic resources within the study area will take place. Allowance has been made for two representative points which will be assessed to define the PES of aquatic resources at strategic points within on the system. Allowance has been made for one round of assessment. The points below will define the indices that will be used in the ecological assessment of the sites: • On site biota specific water quality testing will take place for parameters including pH, conductivity, dissolved oxygen and temperature; • Habitat integrity will be assessed according to the IHIA index (Kleynhans, 1999); • Habitat conditions for aquatic macro-invertebrates according to the IHAS index; • Assessment of the aquatic macro-invertebrate community. Assessments will be based on the SASS5 index according to the protocol of Dickens & Graham (2001). All assessments will be undertaken by an SA RHP accredited practitioner. Analyses of data will take place by comparing the data to the classification of Dallas (2007) Dickens & Graham (2001). In addition, the MIRIA Eco status tool will be used to further characterise and define the PES and potential risks to the aquatic macro- invertebrate community; • The fish community will be assessed based on the FRAI Eco status tool to characterise and define the PES and potential risks to the aquatic macro-invertebrate community; • Allowance has been made for toxicological assessment according to the Direct Estimation of Ecological Effect Potential order to assist in defining the requirements for the discharge in term so volumes that can be released; Findings will be compiled into a report which will highlight the PES, Eco status and EIS of the system. In addition, an impact assessment will be undertaken according to a pre-defined impact assessment methodology. The report will also highlight key recommendations to be considered in the implementation of the project.
Heritage Impact Assessment	Heritage surveys usually involve the following aspects: • Archival and desktop survey of existing archaeological and heritage information of the survey area (baseline assessment); • Geographical information (maps and aerial photographs); • Pedestrian survey of the survey area; • Photographic recording of heritage sites • Random consultation with local people to ascertain aspects of intangible heritage; • Recording and documenting sites with a GPS (GPS and GLONASS capable) and compiling maps using GIS.
Noise Impact Assessment	The study to determine the prevailing noise levels in and around the proposed Pit extension, pipe line and tailings dams will be based on: • South African National Standard (SANS) 10328 – Methods for environmental noise impact assessments; • SANS 10103:2008 – The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication and the; • Guidelines for community noise impact assessments; • International Finance Corporations Environmental Health and Safety Guidelines; • The Scottish Government – Controlling the Environmental Effects of Surface Mineral Workings; • Relevant Noise Control Regulations and/or by-laws applicable in the Exxaro study area.

Specialist Study	Scope
	This noise survey from an environmental noise point of view will have to be done during the daytime period and the night-time period in order to evaluate the recommended residual noise levels laid down by SANS 10103:2008 and to get a representative residual noise level for the areas where the proposed activities will or takes place. The construction, operational and closure phases will be addressed in the report and the baseline information existing and newly acquired data will be used to determine the potential impact and management measures. It is proposed to make use of the following six-stage process approach: • Step1- Define the project requirements and noise problem – gather technical support information; • Step 2 – Agree on the assessment criteria, establish baseline noise environment and determine extent of the noise impact of initial proposal; • Step 3 – Identify and agree on noise mitigations options; • Step 4 – Assess noise impact against criteria of Step 2 and evaluate key considerations and significance for each mitigation option; • Step 5 – Determine optimal noise control solution; • Step 6 – Review, implement, monitor and audit. There will be two types of noise sources of which the one is a point source at the proposed concentrator site with its own noise sources, which will have to be identified and addressed, and the line source, which will be the pipe line and haul routes. These two categories of noise sources will determine how mitigation and the management thereof will be addressed. The proposed noise survey will consist out of the following: • Preliminary survey and identification of measuring points; • All measurements will be done on the boundary of the property; • Sound pressure readings will also be done at the closest residential area – if applicable; • Noise survey at the identified measuring sites – Ambient noise measurements; • Calculation of noise propagation; • Analyses of results; • Results of the survey, report and recommendations and mapping of noise contours for the sites. o Estimated time of noise surveys and collecting of relevant information – weather permitted - 2 working days. The report will be in line with SANS ISO 14001.
Soil, Land Use and Land Capability Assessment	The soil study will include the following components: <u>Preliminary assessment</u> • Outline of the study approach and identification of the assumptions and sources of information to be used. • A desktop study of existing maps, broad soil classes, etc. to establish broad baseline conditions and areas of environmental sensitivity. <u>Soil survey</u> A detailed soil survey (150 m x 150 m) will be conducted at the proposed area where the proposed development project will be. The maps generated during the desktop study phase will be used to determine a grid and these areas will be traversed on the pre-determined transects and auger samples will be studied. In areas of great soil form variety, more samples points will be evaluated as well as to establish soil form boundaries. Observations will be made regarding soil texture, depth of soil, soil structure, organic matter content and slope of the area. The soil characteristics of each sample point will be noted and logged with a global positioning system. The location of these auger points will be indicated in a Survey Points Map to be included in the final specialist report. Soil samples for chemical analysis will be taken at 25 sampling points and at each point both topsoil (0-300mm) and subsoil (300-600mm) will be sampled.

Specialist Study	Scope
	The soils will be described using the S.A. Soil Classification Taxonomic System (Soil Classification Working Group, 1991) published as memoirs on the Agricultural Natural Resources of South Africa No.15. Soils will be grouped into classes with relatively similar soil properties and paedogenesis. A cold 10% hydrochloric acid solution will be used on site to test for the presence of carbonates in the soil. Chemical analyses The 24 representative soil samples will be stored in perforated soil sampling plastic bags on site and sent by courier to SGS Soil Laboratory in Somerset West for chemical soil analysis. Samples will be analysed for pH, phosphorus content, cations (calcium, magnesium, potassium and sodium), electrical conductivity, organic carbon content and relative fractions of sand, silt and clay. Reporting The results of the soil survey will be mapped and zones of similar soil forms indicated. Once soil form groups have been outlined, soil potential and land capability will be determined using the guidelines developed by the Agricultural Research Council unless otherwise specified by the client. The possible impacts of the proposed project on soil, agricultural potential and land capability will then be evaluated using the method as prescribed by Scientific Aquatic Services. The results of the study will be provided in a comprehensive electronic document and will include geo-referenced maps, photos, diagrams, as well as the following: • Details and expertise of specialist; • Declaration of independence; • Scope and purpose of the report; • Description of methodology; • Identification of gaps and assumptions; • Results of impact assessment; and • Findings and conclusions.
Blasting Assessment	The following scope of work is presented to ensure proper evaluation of possible influences and will be undertaken by Danie Zeeman from Blast Management Consulting. The proposed scope of work can be summarised as follows: • Part 1: Site Review and Information Capture • Part 2: Modelling and report, • Part 3: Final Feedback, Public Meeting and Report. • Part 4: Site Review and Information Capture The following minimum requirements are proposed. • It will be required that a site visit be done in order to obtain all relevant information onsite and offsite of the mining area, • Review of site considering the various installations in and around the proposed blasting area, • Definition of existing structures and review of possible concerns. • The project is an extension of existing operation. A base line will need to be done from the current operations. This will define the current levels of ground vibration, air blast and fly rock. The information obtained will help defining the prediction model for the Pit 1 Part 2: Modelling and Report A detailed EIA study report will be prepared and presented using data captured and information provided. The following aspects will be considered and presented as different sections in a final report: • Introduction; • Background information of the proposed site; • Mining operations and / or Blasting Operation Requirements; • Site-specific aspects applicable: The following aspects are generally

Specialist Study	Scope
	considered by this company for projects in South Africa – some of these aspects may not be applicable to this project. Consideration will be given if applicable to this project as well: o Ground vibration explanation, prediction, modelling and related impacts; o Air blast explanation, prediction, modelling and related impacts; o Fly rock explanation, prediction, modelling and related impacts; o Noxious fumes Information. • Impact Evaluation; • Mitigations and recommendations. Basic structure information – A structure profile that will indicate what is typical of the area. This is not a full photographic survey but will assist in making a proper evaluation of allowable ground vibration and air blast levels. Conclusion Part 5 & 6: Meetings and Review • Public feedback, presentations and report review where necessary.
Ground Water assessment	The following tasks will be completed during the hydrogeological investigation: • Data collection; • Hydrocensus; • Assess monitoring network and gap analysis; • Pollution plumes: o Determination of the existence and extent of the pollution plume at the site; o Determination of the source of the pollution plume based on current activities as revealed by the current monitoring network; • Determine short-term and long term pollution (post-closure) potential of the codisposal facility; • Mine decant: o Determine or confirm decant points; o Determine the quantity and quality of water that might decant from the underground workings post-closure and also the timing of such decant; o Determine possible options on the post-closure water treatment based on the predicted decant quantity and quality; • Determine the quantity and quality of water that might originate from the co-disposal facility in the short-term and post-mine closure; • Conduct necessary best practice scientific tests as required to ensure credible data and information is obtained as part of this hydrogeological study (e.g. acid base accounting); • Make recommendations: o For short term and long-term interventions that can be implemented to prevent or mitigate pollution; and o To further increase the confidence of the modelling work done in future.
Surface Water assessment	The Surface Water Assessment TOR is not limited to, but must include the following: • This proposal outlines the scope of work, approach and cost to undertake the stormwater study. • A site audit to understand the existing stormwater layout and the future stormwater controls; • Hydrology of the site to indicate the storm volumes emanating from the various sub catchments within the site (Calculation of the stormwater runoff based on impervious surface of the site); • Describe the hydrology in relation to the position of the major pans in

Specialist Study	Scope
	the area; • Provide layout drawings (3 drawings) of the following elements. • indicate the site in relation to watercourses in the area; (No floodline assessments have been allowed for); • indicate the existing layout of where the stormwater flows are; • Detailed property designed layout and demarcation clean and dirty water areas as well as proposed stormwater controls and monitoring points; • Describe what stormwater controls are required to ensure that the site will be environmentally compliant from a stormwater point of view. • The deliverable will be a report and plans operation reuses, which include monitoring, storm events, maintenance action, disposal of silt or waste from the containment to ensure the Dorstfontein East Mine Complex is compliant with the legal requirements. • A water and salt balance on a spreadsheet to be used after the project by the mine
Rehabilitation/Closure Plan and Closure cost assessment	Based on SRK understanding of the requirements of the legislation, which remain to be tested with the authority, SRK interprets the requirement relating to closure for Dorstfontein to be: • Prepare plans to be consistent with the requirements of GN R1147 as stated in the various Appendices to the regulations with this to include: o An annual rehabilitation plan; o A final rehabilitation, decommissioning and closure plan; o A report documenting the outcomes of a Risk Assessment. Based on SRK understanding of the requirements of the regulations the following are the material items where focus will be required. • Stakeholder issues and comments that have informed the plan • The mine plan and schedule; • Findings of an environmental risk assessment and associated requirements; • A description and evaluation of alternative closure and post closure options; • Motivation for preferred closure actions; • A definition and motivation of the closure and post closure periods; • Details associated with ongoing research on closure options; • Development and maintenance of a list and assessment of threats; and opportunities and uncertainties; • A schedule for the closure actions, including organisational capacity; • Development of an environmental risk report to be consistent with the requirements specified in Appendix 5 of the NEMA Financial Provision Regulations. The completion of the above requirements will be undertaken by collating and incorporating existing information, but will also require engagement with project personnel in the form of two workshops. One being to undertake the Risk Assessment and the second being to be develop the scheduling and capacity requirements. • As the DMR is familiar with the current format of reporting liability, the liability associated with the project will be calculated and presented using the approach contained in the Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provisions Provided by a Mine (2005). The total liability will be split to indicate the liability for the implementation of the final rehabilitation, decommissioning and closure plan as well as the implementation of measures to address residual risks.
Social Impact Assessment	The SIA will be compiled as follows: social baseline, followed by an impact assessment with mitigation measures.

Specialist Study	Scope
	The social baseline will be compiled using existing social baseline information that the mine already has, for example information contained in SLP, relevant HR reports, and supply chain information. The social baseline will focus on areas that are applicable to the proposed expansion and will include descriptions of: land use, movement patterns, local content, community health and safety, economic development. A maximum of two telephonic interviews will be held with relevant stakeholders to substantiate the social baseline, if required. A site visit will not be conducted to observe the social environment and ground truth it against secondary data sources. The project description will be interrogated to understand the potential social changes that may occur in the baseline because of the project. To assist with these predictions, relevant project staff will be consulted. The pipeline routes will be assessed to identify the preferred route from a social perspective. • Following the baseline assessment, the impact assessment will be conducted. SRK will employ impact assessment methodologies that align with local legal requirements. SRK will make recommendations for mitigation and management of these impacts; however will not develop specific management plans as a component of this project.
Phase 1 Palaeontology Study	The Palaeontology Assessment must include: • A description of significant fossil occurrences; • Recommendation and mitigation measures on the preservation of Palaeontology findings.

7.3 Assessment of Impacts

An assessment of the anticipated impacts was undertaken for both pre-and post-mitigation. The impact assessment methodology is provided in Section 12.

7.4 Reporting and Development of an Environmental Management Programme

An EMPr specific to the Exxaro Pit 1 expansion and construction of a water pipeline was developed to mitigate, or enhance, the anticipated impacts of the project. A copy of the EMPr is provided in Appendix B.

The results of this study, Impact Assessment and EMPr, were collated and recorded in this EIA and have been released for public comment from 27 October until 24 November 2017.

8 Project Motivation

8.1 Project Need and Desirability

DCM are able to produce coal for each specific product in terms of local, regional and international markets. Coal produced is split between the South African and export markets. Coal mining remains a significant contributor to the Gross Domestic Product (GDP) and the sector is becoming more important from a total economic growth point.

The South African coal industry is the second biggest sector after gold. Coal produced for the local market is consumed mostly for power generation by Eskom ad Sasol for synthetic fuel production. The remainder of the coal is used in the metallurgical industry for the production of steel and Ferro – alloys.

The growth demand for coal by Eskom is expected to continue as the government pursues a policy of expanded domestic and urban electrification to rectify the deficit. Approximately 53% of South

African coal production is used for power generation. The World Bank has acknowledged that coal-fired power stations are the only source of power that is large enough and can be built rapidly enough to meet South Africans rising power demand.

An extension to the DCM will generate economic returns for stakeholders such as employees, their dependents, shareholders, the community, local, provincial and national government. The project will thus increase economic activities in the area and will earn valuable foreign exchange for South Africa. The GDP of the local municipality would increase simultaneously with that of the province.

Due to the mine currently in operation, the extension of the Pit 1 and construction of the water pipeline will create more employment, which will be drawn from the local community. Multiple mining activities will be increased during the Pit extension and water pipe construction. As a result, capital will be put back into the surrounding communities.

8.2 Benefits of the Project

A number of benefits associated with the proposed project have been identified which include:

- Exploiting the natural mineral resources as appropriate under the MPRDA;
- Creating employment opportunities during the construction, operation and decommissioning phase;
- Retaining, and possible creation, of employment opportunities on local and regional scale during operational phase;
- Enhancing water conservation and recycling between the DCM East and West mines; and
- Continued long term supply of coal for further electricity production to assist in meeting the energy requirements of South Africa.

8.3 No- Go Option

If the project does not go ahead, then the economic benefits of expanding Pit 1 will not be realised through Exxaro. If Exxaro were not to proceed with the proposed operation, mining of these reserves will not necessarily be avoided, as another application in terms of the MPRDA and NEMA can be made by another company.

The proposed project will lengthen the LoM, which directly affects job opportunities in the area, through lengthening their terms of employment. Should the project not go ahead the identified biophysical, social and cultural impacts will not be experienced and the Dorstfontein Mines will be forced to close down prematurely.

Although a number of biophysical, social and cultural impacts have been identified, these can be mitigated and managed in accordance through the implementation of the EMPr and monitoring recommendations.

9 Stakeholder Engagement

The stakeholder engagement process forms an important part of the scoping phase of the project. The stakeholder engagement process is primarily aimed at affording I&APs and stakeholders the opportunity to gain an understanding of the proposed project. In addition, the purpose of consultation with the landowners, key stakeholders, and I&APs is to provide them with the necessary information about the proposed project so that they can make informed decisions as to whether the project will affect them, and provide the EIA team with local knowledge of the area and raise concerns relating

to the biophysical, socio-economic and cultural impacts that may arise. Additional objectives of stakeholder engagement process include the following:

9.1 Distinction Between I&AP's and Registered I&APs

The NEMA Regulations (GNR R982) distinguishes between I&APs and registered I&APs. I&APs, as stated in Section 24(4)(d) of the NEMA include:

a. (a) any person, group of persons or organisation interested in or affected by an activity; and

b. (b) any organ of state that may have jurisdiction over any aspect of the activity.

In terms of the Regulations "registered interested and affected parties" means:

An I&APs whose name is recorded in the register opened for that application. For that purpose, an EAP managing an application must open and maintain a register which contains the names, contact details and addresses of:

a. All persons who have submitted written comments or attended meetings with the applicant or EAP; and

b. All persons who have requested the applicant or EAP managing the application, in writing, for their names to be placed on the register.

c. All organs of state which have jurisdiction in respect of the activity to which the application relates.

9.2 Objectives

The objectives of stakeholder engagement are:

9.2.1 During Scoping

To provide sufficient and accessible information to stakeholders in an objective manner to enable them to:

- Raise issues of concern and suggestions for enhanced benefits;
- Verify that their issues have been recorded;
- Provide input for consideration in the ToR for specialist studies, Impact Assessment and management planning; and
- Contribute relevant local and traditional knowledge to the environmental assessment.

9.2.2 During Impact Assessment

- Verify that their issues have been considered in the environmental assessment;
- Inform stakeholders on the possible impacts and the management thereof; and
- Comment on the findings of the environmental assessment.

9.2.3 During the Decision-making Phase

Advise stakeholders of the outcome, i.e. the authority decision on the project, and how and by when the decision can be appealed.

Figure 9-1 briefly outlines the broad timeframes and the various technical and stakeholder engagement activities being undertaken during the three phases (Scoping, Impact Assessment,

Decision-making) of the integrated environmental decision-making process relating to the proposed project.

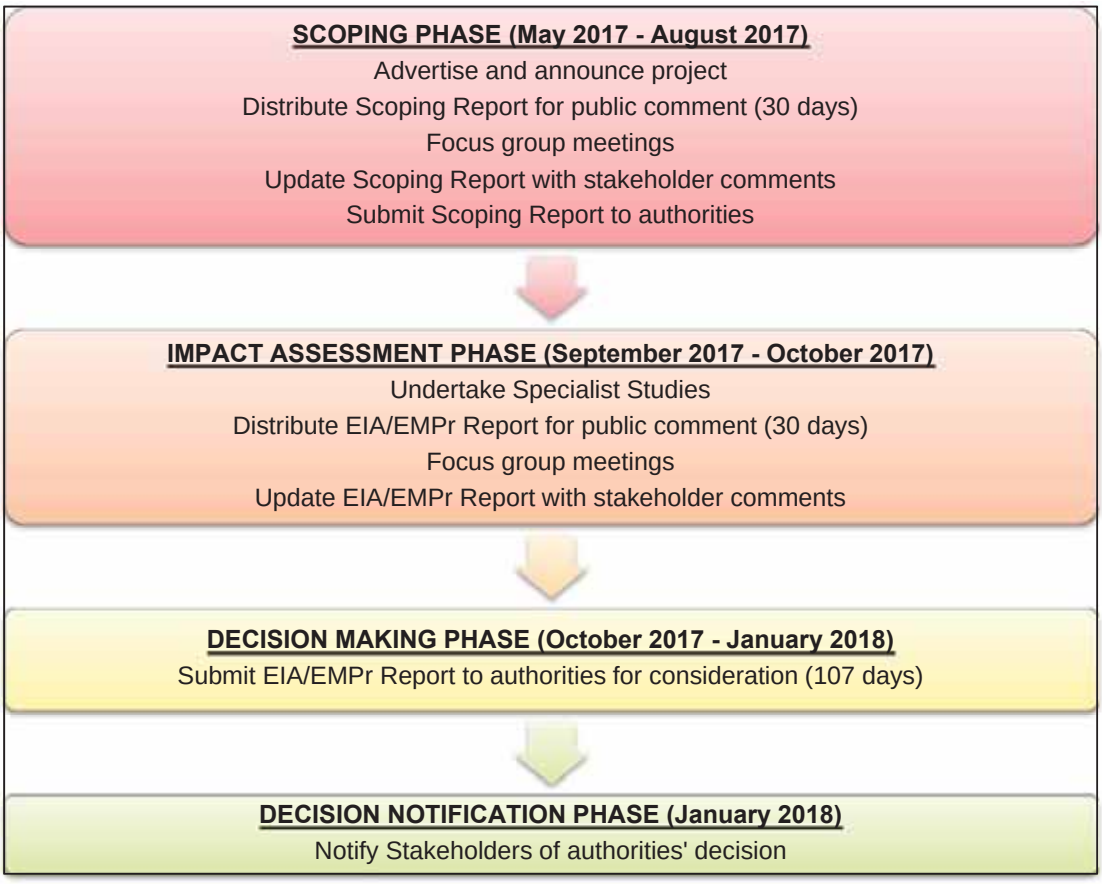


Figure 9-1: Stakeholder engagement process as part of the integrated Environmental Authorisation process

The sections below describe the stakeholder engagement process being followed through the various phases of the integrated authorisation process for the proposed Exxaro Pit 1 extension and construction of the water pipeline.

9.3 Interested and Affected Parties Register

An I&APs register was developed using Exxaro's existing databases compiled during stakeholder and I&AP consultation, as well as from I&AP databases from other projects conducted in the area.

Registered I&APs were further sourced from responses to the advertisements, site notices, public review of reports, and written notification to I&APs associated with this specific project.

The I&APs register will be maintained for the duration of the study where the details of stakeholders are captured and automatically updated upon communication to the EAP. The identification, registration, and comments from I&APs will be an on-going activity.

9.4 Identification of Land Owners

The SRK stakeholder engagement office commenced with the stakeholder identification process prior to the Scoping Phase of the project. The identification of landowners in the Study Area is an important part of the stakeholder engagement process. SRK conducted a deeds search to identify the current landowners in the Study Area.

DCM is a joint venture between Exxaro Coal Central (Pty) Limited and Mmakau Mining (Pty) Ltd. DCM holds 2066 Ha of coal rights and 1230 Ha of surface rights, which make up the Dorstfontein East Mine Operations. The amended Mine works plan for Dorstfontein East is in regards to the extension of Pit 1 called the North West Extension, which are located on the farm Welstand 55 IS Portion 5 on which Exxaro holds the mineral and surface rights. DCM owns surface rights of Portions 2, 3 and 8 of Dorstfontein 71 IS and 4, 5, 11 and 13 of Welstand 55 IS of the affected farms.

Adjacent land owners are listed in Table 2-1:

9.5 Site Notices

Sites notice boards (Size A2: 600 mm X 420 mm) notifying stakeholders and I&APs of the proposed activity were placed at conspicuous places in the project area on 5 May 2017. These areas of placement were determined according to the quantity of I&APs that may pass by. A copy of the site notices and proof of their placement is provided in Appendix C. Table 9-1 provides a list of these site notices and Figure 9-2 illustrates the location of these notices.

Table 9-1: Site Notice Location and Coordinates

Site Notice	Location	Coordinates	
		Latitude	Longitude
1	Dorstfontein East Mine	29° 21' 38.88" E	26° 11' 13.48" S
2	Dorstfontein West Mine	29° 17' 45.27" E	26° 13' 30.61" S
3	Farmstead Next to Dorstfontein East Mine	29° 20' 22.90" E	26° 10' 48.24" S
4	Impilo Primary School	29° 19' 39.76" E	26° 10' 49.04" S
5	Kriel Library	29° 15' 47.92" E	26° 14' 51.06" S
6	R544 and Road to Dorstfontein East Mine	29° 19' 20.28" E	26° 11' 29.33" S
7	Road Crossing R547& R544	29° 19' 58.39" E	26° 10' 5.71" S
8	Road Crossing Thubelihle	29° 17' 53.66" E	26° 12' 58.41" S
9	Settlements Next to Dorstfontein Mine	29° 17' 24.58" E	26° 13' 26.03" S

9.6 Background Information

Background information was sent to all I&APs on the proposed project which outlined the EIA process in the form of a letter. The letter gave the public the opportunity to register as I&APs. I&APs for whom no e-mail address could be located were sent a Short Message Service (SMS) notifying them of the proposed project, and the contact number of SRK personnel where additional information could be obtained. The document also requested the readers to respond as to their understanding as to how the project may impact on their own biophysical and socio economic environment.

9.7 Comments and Response Report

All views, issues and concerns raised throughout the EIA process to date have been captured and addressed in the Comments and Response Report. All comments received on the Scoping Report during the public review period have been captured and addressed in the Comments and Response

Report. A copy of the Comments and Response Report detailing the comments received to date and the respective responses from SRK can be found in Appendix D.

9.8 Advertisements

An advertisement was placed in the Witbank News on 5 May 2017. Proof of the newspaper advertisement can be found in Appendix C.

9.9 Public Review During the Scoping Phase

The Scoping Report was compiled in terms of Appendix 2 of GNR 982. All comments received at the time of completion of the Scoping Report were incorporated into the Scoping Report. The Scoping Report was made available for a 30-day commenting period from Wednesday 5 July to Friday 4 August 2017. The availability of the Scoping Report was announced by means of letters, emails and SMSs to I&APs and key Organs of State and commenting authorities.

The Scoping Report aimed amongst other to provide I&APs with documentary proof that their contributions have been captured and addressed. The issues and comments raised by I&APs as well as issues raised by the environmental technical specialists have been used to inform the ToR compiled for the specialist assessments, which will be conducted during the impact assessment phase of the project. Copies of the Scoping Report were placed at the following venues listed in Table 9-2.

Table 9-2: List of places the Scoping Report was Placed for Public Review

Public Place	Locality	Telephone
Kriel Public Library	eMalahleni	(017) 648 6249
Dorstfontein East	Dorstfontein East Mine	(011) 441 6857
SRK Website	www.srk.co.za	(012) 361 9821

The Scoping Report was made available to the competent and commenting authorities during the stakeholder engagement process. The following authorities were consulted and informed of the availability of the Scoping Report:

- Mpumalanga Department of Agriculture, Rural Development and Land Administration
- DMR;
- DWS;
- Nkangala District Municipality;
- Emalahleni Local Municipality.

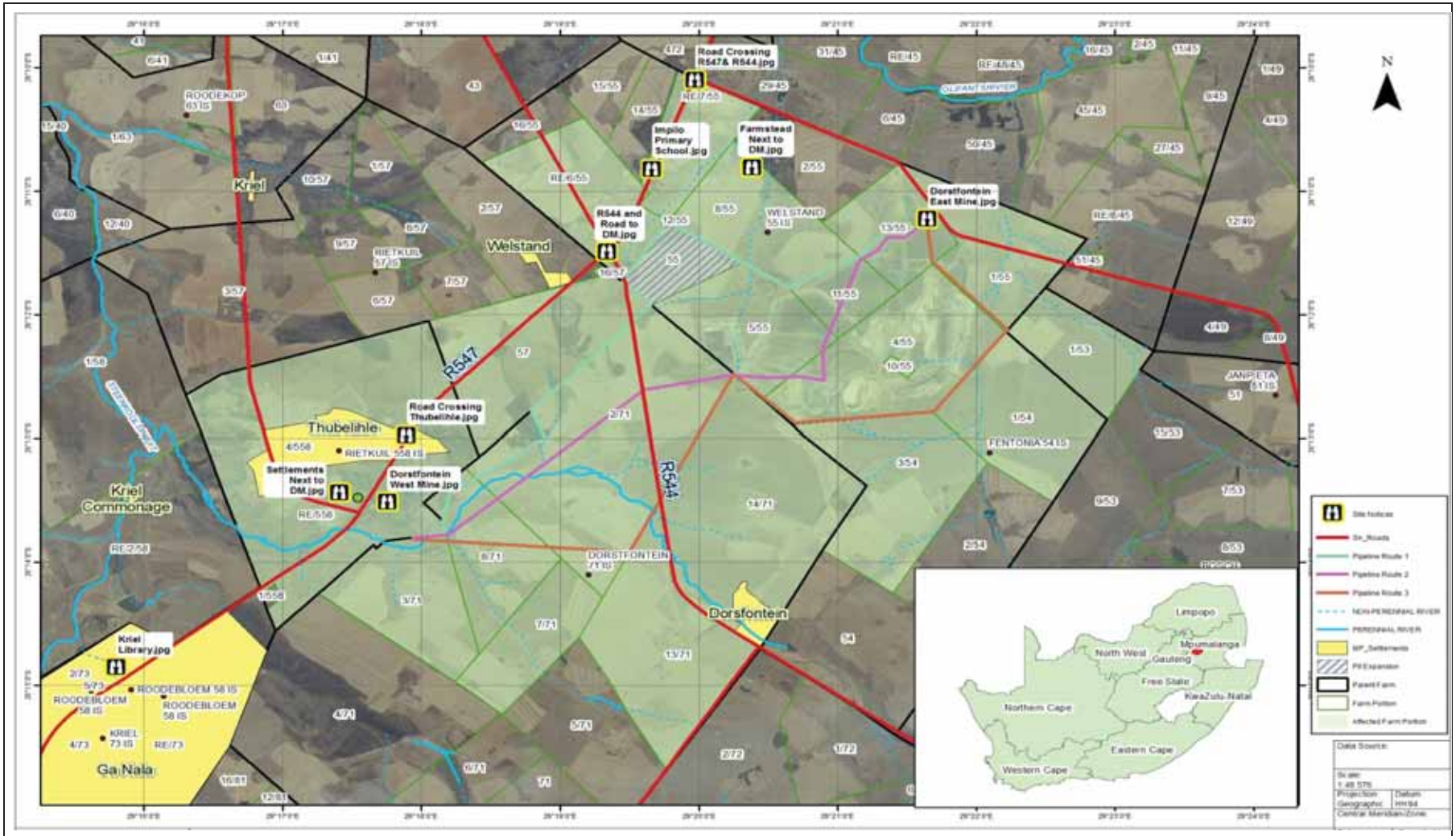
9.9.1 Public Meeting

A public meeting was held on 31 July at the following venues and times during the Scoping Phase:

- Kriel High School – 10h00;
- Impilo Primary School – 14h00.

Once individual attended the meeting at the Impilo Primary School. The comments received during this meeting were captured and addressed in the Comments and Response Report. No body attendedthe meeting held at the Kriel Primary School.

A public meeting will be held during the EIA phase of the proposed project. Details of the meeting will be communicated to the relevant stakeholders.



srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** Location of Site Notices	Project No 599507

Figure 9-2: Location of Site Notices

9.10 Stakeholder Engagement during the Impact Assessment Phase

DMR have accepted the Scoping Report and the Plan of Study (POS) for the EIA and gave permission to proceed with undertaking of the Impact Assessment Phase of the process.

Stakeholder engagement during the Impact Assessment Phase revolves around a review of the findings of the Impact Assessment presented in the EIA, which has now been made available for public comment.

9.10.1 Public comment on EIA/EMPr Amendment Report

The EIA/EMPr has been made available for public comment for a period of 30 days from 26 October 24 November 2017. The availability of the report was announced as follows:

- Distribution of a notification letter to registered stakeholders, accompanied by a comment form;
- Making the EIA/EMPr and Executive Summary available for public viewing and comment in the same public places as was done during the Scoping Phase;
- Posting the invitation letter, EIA/EMPr, Executive Summary and comment forms on the SRK website; and
- SMS and telephonic notification of the availability of the EIA/EMPr as well as of stakeholder engagement meetings.

Comments received during the public review period of the EIA/EMPr will be collated and addressed in the EIA/EMPr submitted to the DMR and commenting authorities.

9.10.2 Opportunities for Comment

In addition to opportunities to comment verbally at engagement meetings, stakeholders are encouraged to submit written comments to SRK's stakeholder engagement office. Stakeholders could also view the documents and complete a comment form at one of the public review places as per at the Scoping Phase, contact the SRK stakeholder engagement office via telephone, email or fax to submit comments and to discuss any issues of concern.

9.10.3 Notification of Authority Decision

Stakeholders will be advised in writing (mail, email, fax and SMS) of the authority decision on the EIA/EMPr and IWULA, and details on the procedure to appeal the decision, should registered stakeholders wish to, relating to each authorisation.

9.11 Key Comments Received

Table 9-3 describes the comments received to date following the newspaper advert, site notices, and written notification of the project.

Table 9-3: Key Comments Received

Comment Date	Comment raised by	Comment	SRK Response
Comments on the Initial Phase			
09/05/2017	Mr. Kenneth Mavhunga	May you please register the following official from the department of agriculture, forestry and fisheries Nelspruit office	Mr. Kenneth from the Department of Agriculture, Forestry and Fisheries have been registered as an I&AP.

Comment Date	Comment raised by	Comment	SRK Response
10/05/2017	Ms Lindy	Additional information was requested by Lindy telephonically regarding the Proposed project Project	(10/05/2017) A letter with additional information as telephonically discussed was sent. The letter also included a map which provides an indication of all affected properties. The Stakeholder was added on the Database
12/05/2017	Noxolo Jakalase	Kindly contact the Office of the Head of Department. Said Department can be contacted at 013-766 6020.	The Head of Department Office were on the Database and they were notified during the Initial Phase of the proposed Project
Scoping Phase			
21/07/2017	Betty Mnguni	If I may, the proposed project falls under which quaternary code?	The proposed project falls within quaternary catchment B11B and B11D.
30/07/2017	Doreen Sithole	Kindly email the document for comments.	The report has been loaded onto our website, herewith the link: http://www.srk.co.za/en/za-proposed-extension-exxaro-dorstfontein-east-coal-mine
31/07/2017	P Skosana	I appreciate the effort in inviting me to the public meeting. I do not have any issue with the project but emphasis the need to good communication with all affected parties	SRK takes cognisance of this statement and will do its upmost best to ensure communication channels are effectively followed.

10 Description of the Baseline Environment

The following section presents an overview of the biophysical and socio-economic environment in which the proposed project will be undertaken, to:

- Understand the general sensitivity of and pressures on the affected environment;
- Inform the identification of potential issues and impacts associated with the proposed project, which will be assessed during the Impact Assessment Phase;
- Identify gaps in available information to inform specialist study requirements; and
- Start conceptualising practical mitigation measures.

This section has been compiled on the basis of the following:

- Available information from the existing EIA/EMPr for the DCM;;
- Existing information on the environmental parameters of the area;
- Agricultural Geographic Information Systems (GIS) ;
- Specialist Studies conducted for the project; and
- South African Weather Service.

Specialists as indicated in Section 7.1 have been appointed to undertake the necessary specialist impact assessments. During this study a baseline description as well as the potential impacts of the

proposed amendment project on them has been reported on, and findings incorporated into this report.

10.1 Socio - Economic Environment

This section gives an overview of the existing socio-economic environment in and around the proposed project area. The socio-economic information provided in this section is a summary of the information provided in the Socio-Economic Impact Assessment Report. Please refer to Appendix S for the full report.

10.1.1 Regional Environment

Emalahleni Local Municipality has a population density of 148 people per km², and as per Table 10-1 ((Stats SA, 2016) and population growth rate of 3.6% between 2001 and 2011. The Emalahleni Local Municipality's population density is nearly two times higher than that of the Nkangala District Municipality, which has a density of 78 people per km² (SRK Consulting (Pty) Ltd, 2017).

A similar pattern is evident for the growth in the number of households, with Emalahleni Local Municipality and Nkangala District Municipality showing a growth of 3.6% and 2.6% respectively from 2001 to 2011. The size of households had decreased, and was at 3.2 persons per Emalahleni Local Municipality household in 2011. If the Emalahleni Local Municipality population continues to grow at or above 3.6% per annum, the following issues identified in the Emalahleni Local Municipality 2016/17 Integrated Development Plan will continue to be exacerbated:

- Growth in formal settlements and back rooms (it is estimated that 10 000 people reside in these);
- Water supply to informal settlements costing about R 800 000 per month and the residents are not contributing to the cost of these services;
- Strain on water, sanitation, electricity and roads resulting in quality and capacity problems;
- Increase in unemployment particularly amongst the youth and unskilled; and
- Issues of crime, prostitution and drug abuse.

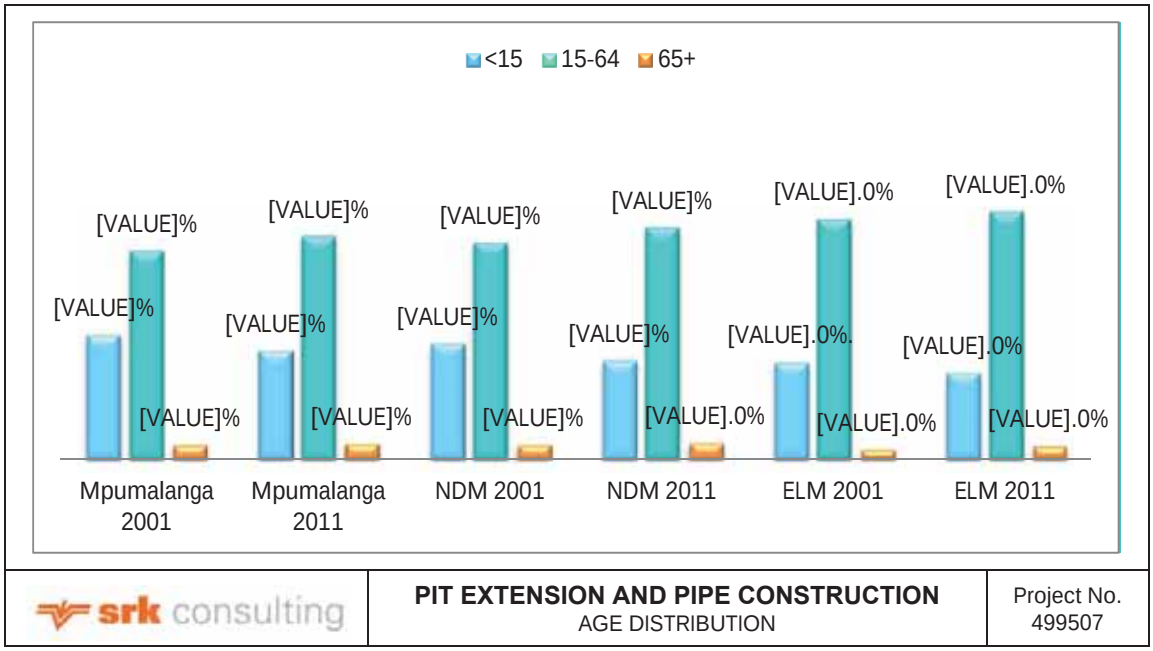
From 2001 to 2011, the number of formal dwellings in the Emalahleni Local Municipality, the Nkangala District Municipality and Mpumalanga Province had increased by 23.1%, 9.3% and 20.0% respectively.

Table 10-1: Key Socio-Demographic Information

Variable	Mpumalanga Province	Nkangala District Municipality	Emalahleni Local Municipality
km²	76 495	16 758	2 678
2001 population	3 365 554	1 018 422	276 413
2011 population	4 039 939	1 308 129	395 466
% growth between 2001 and 2011	0.9	2.5	3.6
2001 households	785 424	245 429	74 917
2011 households	1 075 488	356 911	119 874
% increase from 2001 to 2011	20.0	9.3	23.1
Average household size 2011	3.8	3.4	3.2
% Female headed households 2011	40.0	36.0	27.9
% Formal dwellings 2001 and 2011	68.5 and 83.8	74.8 and 82.8	67.1 and 77.2

Source: StatsSA, census 2011

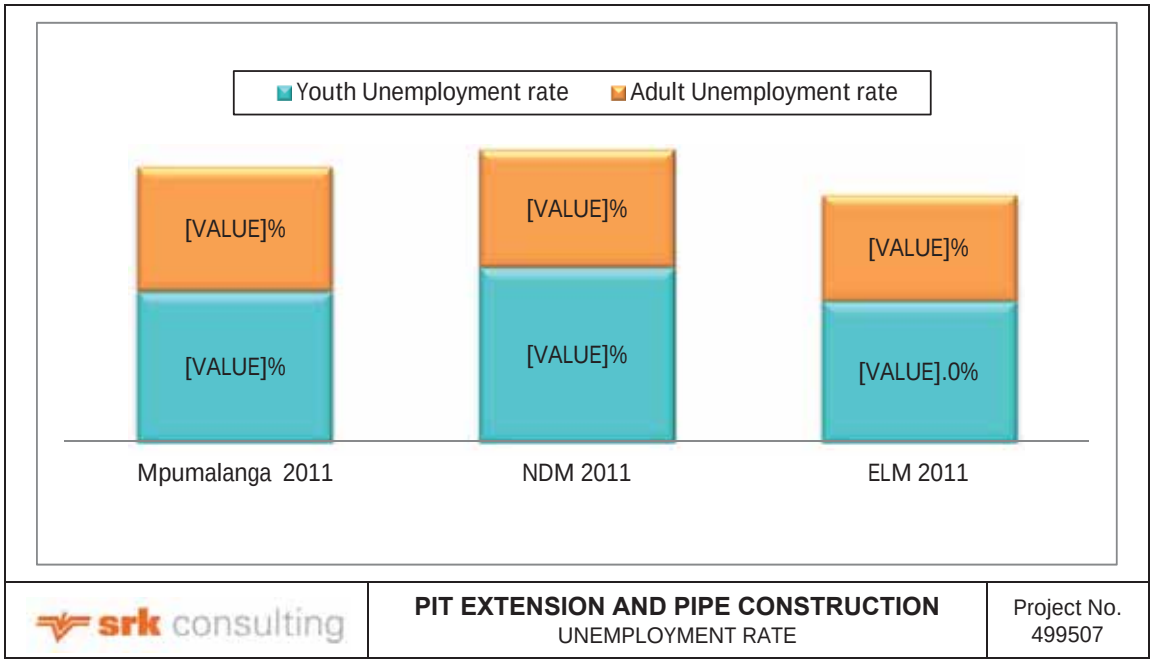
Figure 10-1 shows a similar age distribution pattern for the Mpumalanga Province, Nkangala District Municipality and the Emalahleni Local Municipality, with the highest percentage of 15 - 64 year olds in Emalahleni Local Municipality. This group is considered to be the working age group. Figure 10-2 reflects the unemployment rate for the working age group and the youth (15-34). The unemployment rate for youth exceeds 40.0% and exceeds 30.0% for the working population.



srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** AGE DISTRIBUTION	Project No. 499507

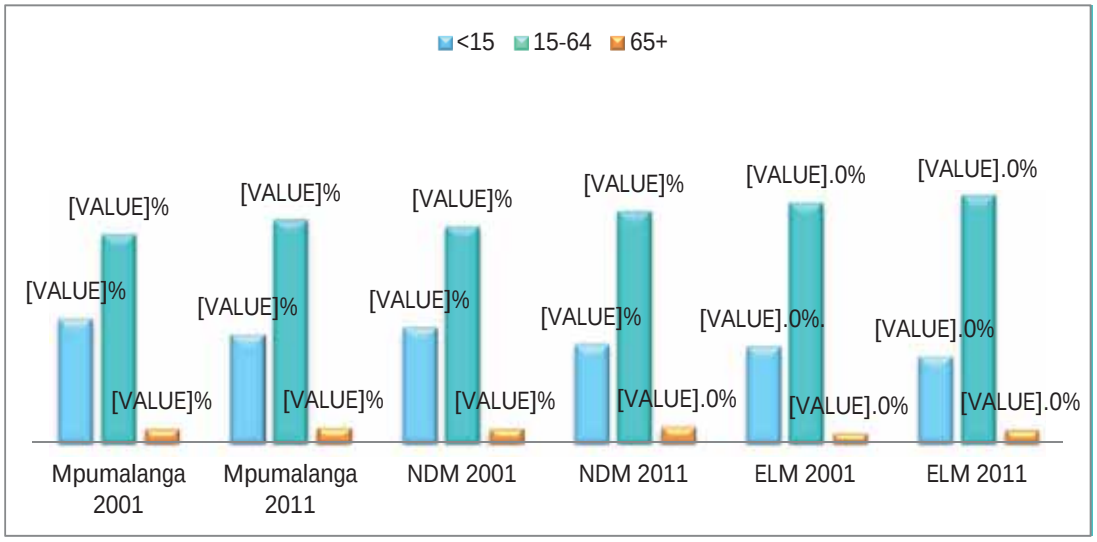
Figure 10-1: Age distribution

Source: StatsSA, census 2001 and 2011



srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** UNEMPLOYMENT RATE	Project No. 499507

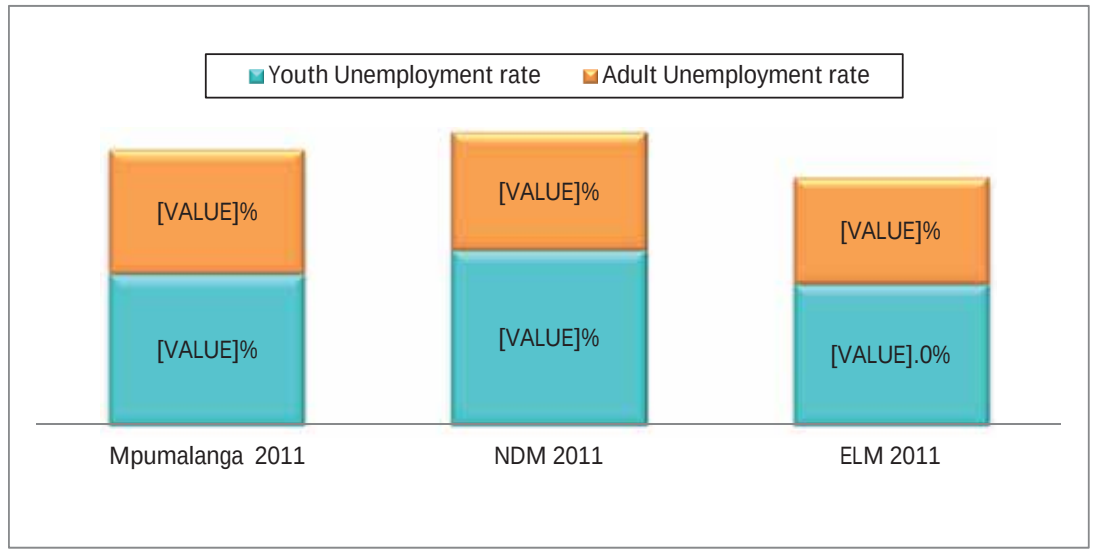
Figure 10-2: Unemployment rate



srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION**AGE DISTRIBUTION	Project No. 499507

Figure 10-3: Age distribution

Source: StatsSA, census 2001 and 2011



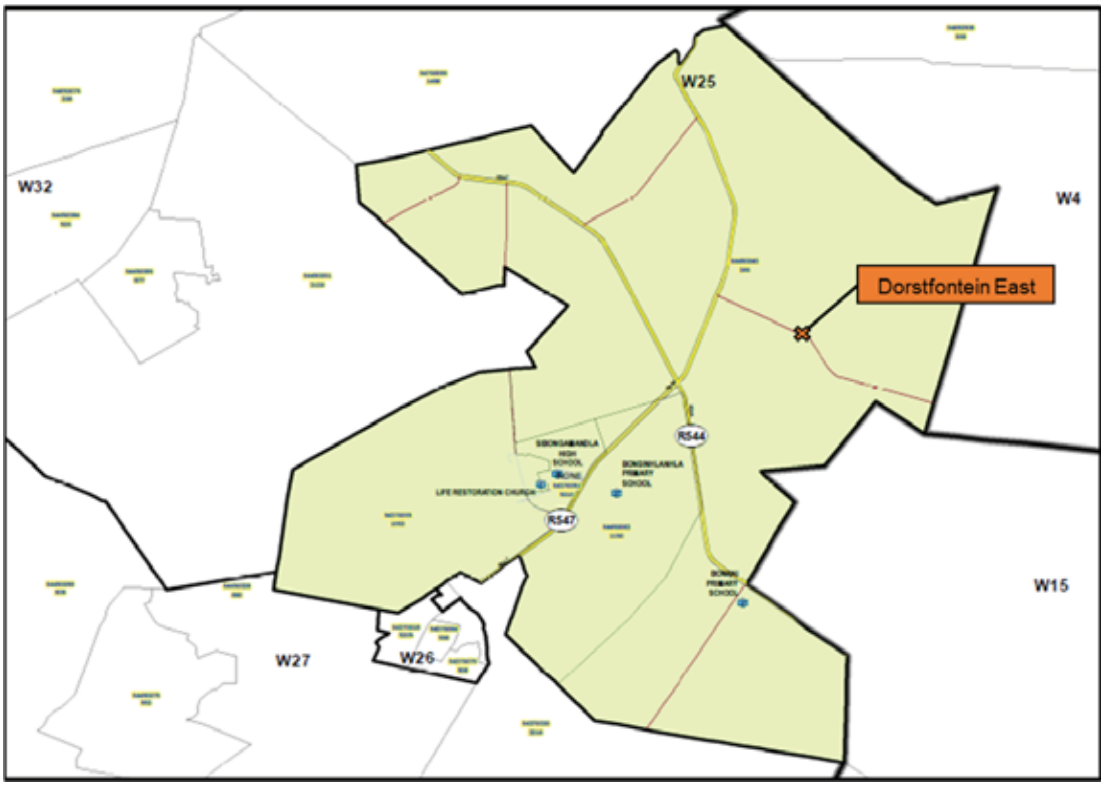
srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** UNEMPLOYMENT RATE	Project No. 499507

Figure 10-4: Unemployment rate

Source: StatsSA, census 2001 and 2011

10.1.2 Project Specific Socio – Economical Environment

The project-affected socio-economic context is geographically determined to be located in Ward 25 of the Emalahleni Local Municipality (Figure 10-5). A baseline summary of key socio-economic information for the ward is provided in the sub-sections below.



srk consulting	PIT EXTENSION AND PIPE CONSTRUCTION WARD 25 LOCALITY MAP	Project No. 499507

Figure 10-5: Ward 25 locality map

10.1.3 Key Population Demographics

According to stats derived from StatsSA (see Figure 10-6), Ward 25 spans a geographical area of 219.7 km ^{2}. It has a population of 14 938, with a median age of 25 and isiZulu (54.0%) being the most widely spoken language. The majority of the population is male (52.0%), and 76.0% of the population is currently residing in the ward were born in the Mpumalanga Province (Stats SA, 2016).

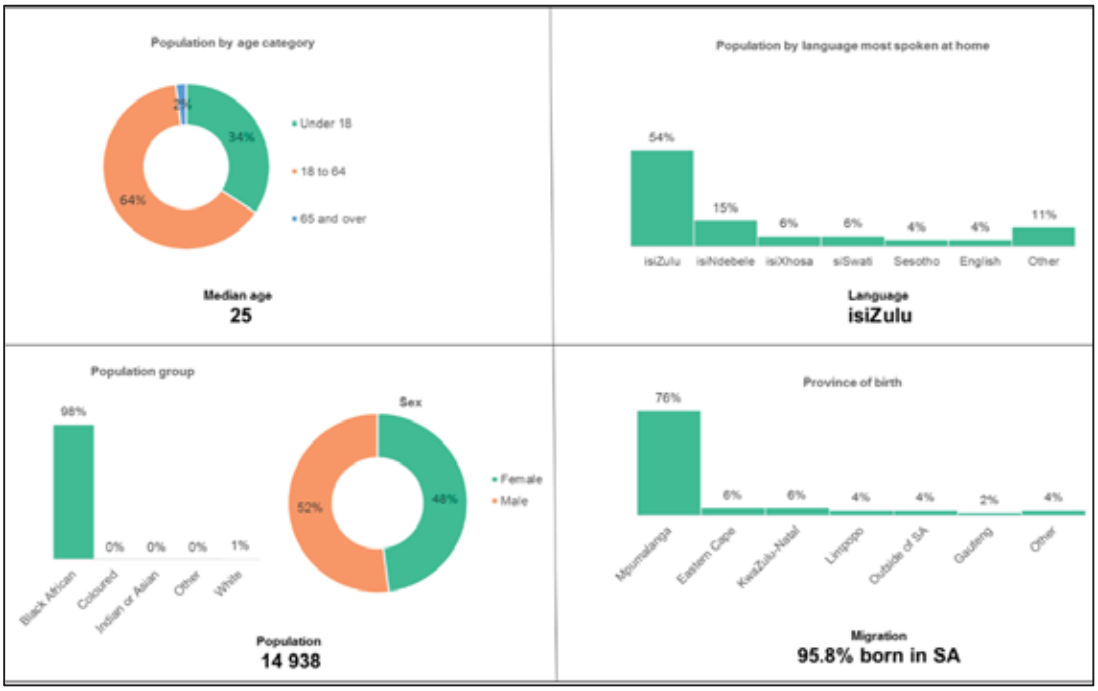


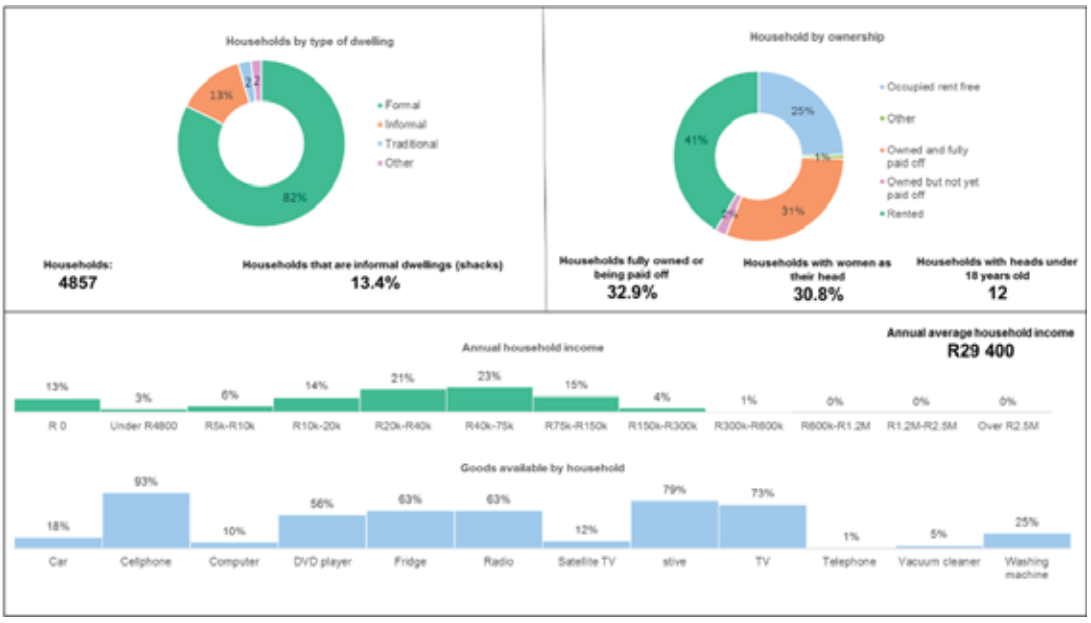
Figure 10-6: Ward 25 demographics

10.1.4 Key Household Information

Of the 4857 dwellings in Ward 25, 82.0% are considered to be formal, while 13.4% are informal (shack) dwellings. The majority of households are renters (41.0%), while 31.0% are owned and fully paid off. A significant amount of the households are female-headed (30.8%). These households, along with the 12 households that were identified as child-headed signify the presence of vulnerable groups in the study area (Stats SA, 2016).

The average annual household income in Ward 25 is R 29 400, signifying that a significant percentage of the population earn a low to moderate income. However, 13.0% of households do not earn a formal income, and would be reliant on subsistence lifestyles and grant systems. Like most surrounding wards, Ward 25 has developed around mining and energy generation activities, and as such those that are employed are often dependent on the mines for both income and social upliftment programmes (Stats SA, 2016).

See Figure 10-7 for a summary of household statistics for the study area.



srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** WARD 25 HOUSEHOLDS	Project No. 499507

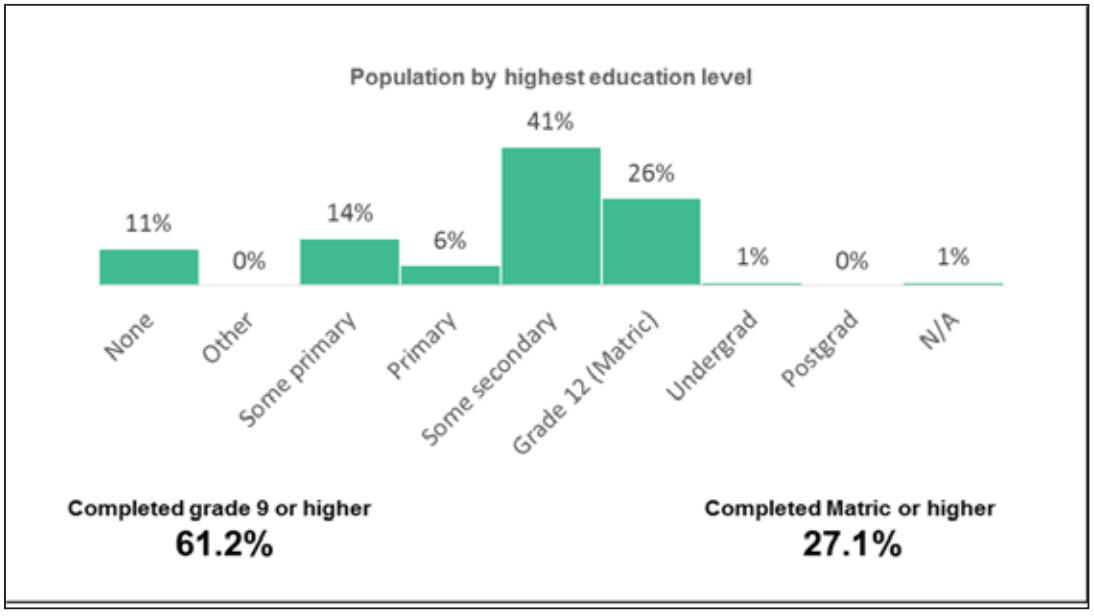
Figure 10-7: Ward 25 Households

10.1.5 Education

Education levels in the study area are lower than those in the province and district municipality. While 61.2% had competed Grade 9 or higher in the study area, the Nkangala District Municipality level was 65.3%, while the provincial level sat at 62.8%. The study area also demonstrates lower levels of students having completed Matric or tertiary education. The province recorded 37.5% of students having achieved matric or higher, Nkangala District Municipality 38.3% and the study area 27.1%. However, the statistics representing those having not received any formal education is the same as Nkangala District Municipality (1.0%) and lower than that of the province (14.0%) (Stats SA, 2016).

The reasons for low education levels in the study area could be attributed to the lack of educational infrastructure, transport restrictions and access to funding. Sustaining livelihoods, which require children to leave school early so as to help with work around the house and earning an income, also contribute to lower education levels in peri-urban parts of the country. This theory is supported by the fact that an estimated 15.9% of 15-17 year olds in the study area are in the labour force, which is significantly higher than the rate in both Mpumalanga (11.7%) and Nkangala District Municipality (11.5%) (Stats SA, 2016).

See Figure 10-8 for a summary of education levels in the study area.



srk consulting	PIT EXTENSION AND PIPE CONSTRUCTION WARD 25 EDUCATION	Project No. 499507

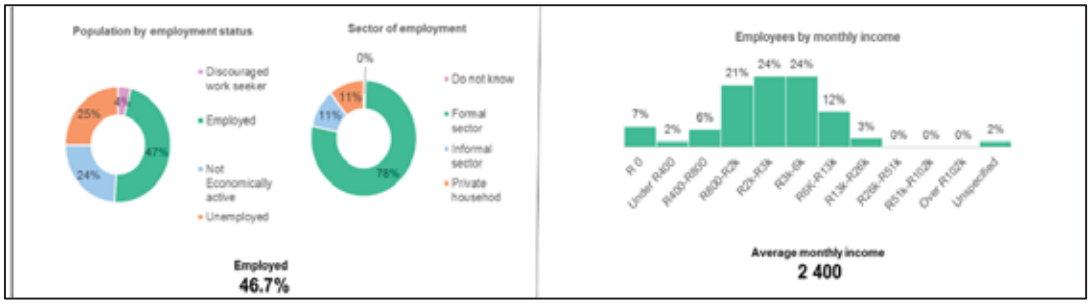
Figure 10-8: Ward 25 Education

10.1.6 Socio-economic Profile

See Figure 10-9 for a summary of socio-economics in the study area. The employment rate in the study area (46.7%) is superior to both Nkangala District Municipality (40.7%) and the province (37.5%). However, unemployment levels in the study area (25.0%) are poor when compared with those of the Nkangala District Municipality (18.0%) and the province (17.0%). There is also a large percentage of the working population currently not economically active (24.0%). This would indicate high levels of dependency on household members who are employed and vulnerability to poverty where breadwinners cease to be employed (Stats SA, 2016).

Most of those employed are employed in the formal sector (78.0%), however as is the case in many parts of South Africa, the informal sector employs 11.0% of the working population in the study area. Specialist feedback from the area suggest that many small spaza shops were to be found, particularly around busy road intersections and close to mine and energy generation activities, where workers and contractors were the foremost customers.

Average individual monthly income in the study area was as per that in both the province and Nkangala District Municipality, around R2 400. This is low; but, considered to be above the World Banks' poverty line ($1 a day) and just above the South African minimum wage, which is currently R 2 340 a month. Low income averages here are associated with low skills levels and low skilled job-requirements in many of the mining operations in the wider study area surrounds (Stats SA, 2016).



srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** WARD 25 ECONOMICS	Project No. 499507

Figure 10-9: Ward 25 economics

10.1.7 Service Delivery

See Figure 10-10 for a summary of service delivery in the study area. The status of service delivery to the study area is better than that in both the province and Nkangala District Municipality, however ongoing service delivery constraints and legacy reliance on industry and not the municipality for provision is an ongoing issue that remains unresolved.

While there are a significant number of people living in informal dwellings (shacks), the vast majority (80.0 %+) have access to formalised water, electricity, refuse and sanitation services. However, access to electricity is varied, whereby only 57.0% of households have access to electricity for cooking, lighting and heating and 12.0% do not have access to electricity at all. The study area demonstrates particularly good sanitation statistics, as only 8.0% of households make use of Pit latrines and 90.0% have access to chemical and/or flushing toilets (Stats SA, 2016).

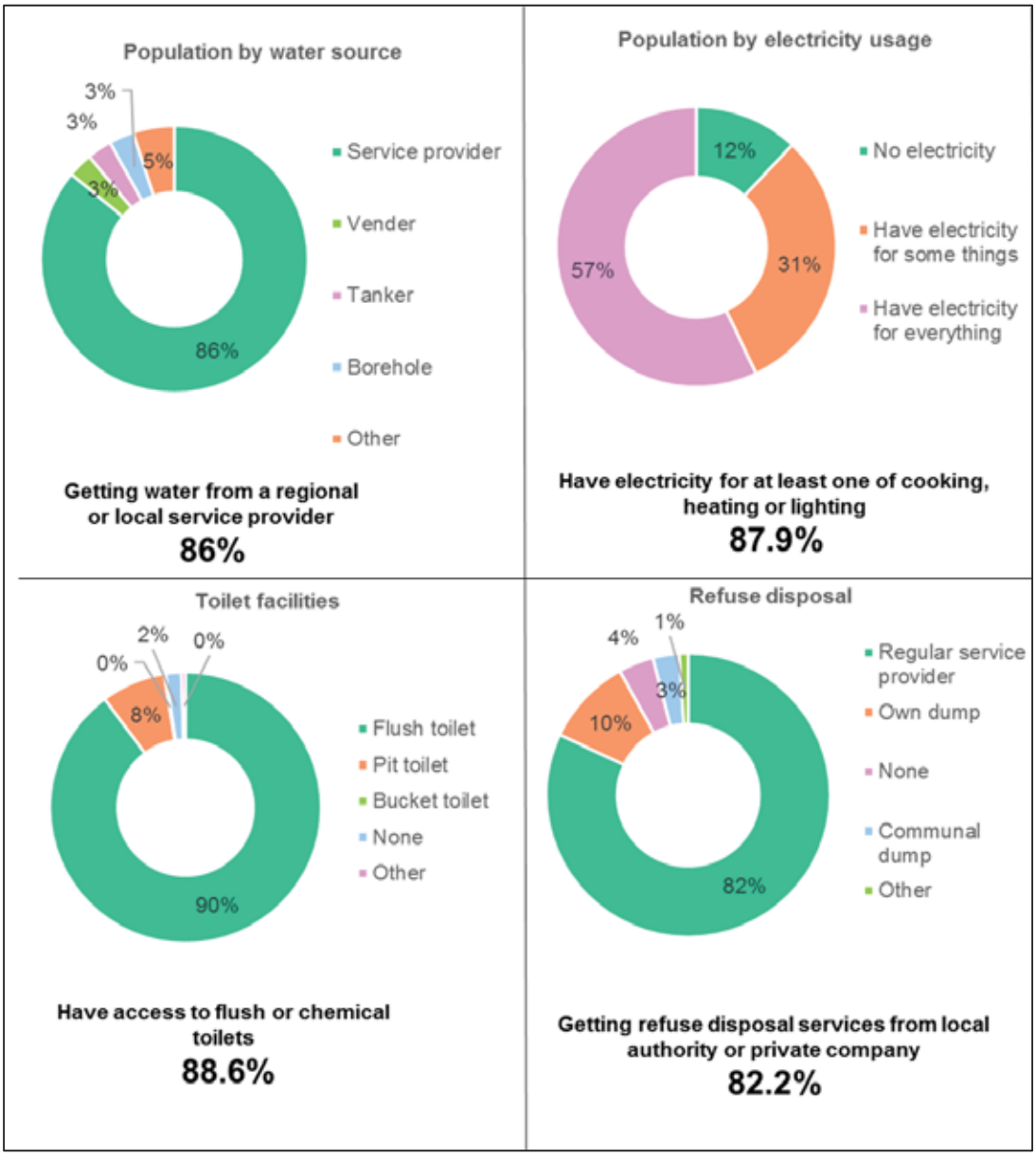


Figure 10-10: Ward 25 Service Delivery

10.2 Groundwater

The following section describes the geo-hydrological conditions around the immediate surrounding of the proposed Pit 1 extension. This information was extracted from the geo-hydrological study conducted for the project and can be found in Appendix J.

10.2.1 Aquifers

The conceptual geohydrological model of the area is based on the generally accepted model for the Mpumalanga coal fields. Three principal aquifers are identified: the weathered aquifer; the fractured Karoo aquifer; and the fractured pre-Karoo aquifer. The Karoo rocks are not known for the development of aquifers but occasional highyielding boreholes may be present. The aquifers that occur in the area can therefore be classified as minor aquifers (low yielding), but of high importance.

According to WRC report 291/1/98, three distinct superimposed groundwater systems are present within the Olifants River Catchment. They can be classified as:

- •The upper weathered Ecca aquifer (shallow aquifer formed in the weathered zone of the Karoo sediments and which is locally perched on the fresh bedrock);
- The fractured aquifers within the unweathered Ecca sediments; and
- The aquifer below the Ecca sediments (deeper aquifer formed by fracturing of the Karoo sediments and dolerite intrusions).

These types of groundwater systems are common to the groundwater regime that characterises a Karoo environment. The systems do not necessarily occur in isolation of one another; more often than not forming a composite groundwater regime that is comprised of one, some, or all of the systems. Good hydraulic connectivity often exists between the two top aquifers and they have consequently been treated as a single unit in the modelling of groundwater flow. -related systems are also often characterised by discrete and/or erratic development (GCS (Pty) Ltd, 2016).

Intrusion-related systems are also often characterised by discrete and/or erratic development. The weathered aquifer is perched and occurs at depths of 0 – 15 metres below ground level (mbgl). The lower 5 to 10 meters of the perched aquifer is saturated due to the impervious nature of the competent, horizontally stratified lithologies of the underlying Vryheid Formation, which occur at depths of 5 – 15 mbgl. The saturated depth of this aquifer is dependent on rainfall recharge, thus influx of water into a bord and pillar or opencast mining operation is also expected to vary seasonally. Highly variable recharge occurs over the area, but generally values are between 1 and 3% of the Mean Annual preciPitation (MAP) (GCS (Pty) Ltd, 2016).

10.2.2 Shallow Weathered Aquifer

The Ecca sediments consist of in-situ weathered material and transported material with a thickness which varies between 5 to 15 meters below surface in the area surrounding the DCM. The upper aquifer is associated with this weathered zone and water is often found within a few meters below surface. This aquifer is recharged by rainfall.

Rainfall that infiltrates the weathered rock soon reaches an impermeable layer of shale underlying the weathered zone. The movement of groundwater on top of this shale is lateral and in the direction of the surface slope. This water reappears on surface at fountains where the flow paths are obstructed by a barrier, such as a dolerite dyke, paleo-topographic highs in the bedrock, or where the surface topography cuts into the groundwater level at streams.

The aquifer within the weathered zone is generally low-yielding (range 100 – 2000 l/h) because of its insignificant thickness. Few farmers therefore tap this aquifer by borehole. Wells or trenches dug into the upper aquifer are often sufficient to secure a constant water supply of excellent quality (GCS (Pty) Ltd, 2016).

10.2.3 Fractured Karoo Rock Aquifer

The pores within the Ecca sediments are too well cemented to allow any significant permeation of water. All groundwater movement is therefore along secondary structures, such as fractures, cracks 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.

Of all the un-weathered sediments in the Ecca, the coal seams often have the highest hydraulic conductivity. Packer testing of the No. 2 seam and underlying Dwyka tillite has hydraulic conductivity distribution.

In terms of water quality, the fractured Karoo aquifer always contains higher salt loads than the upper weathered aquifer. These higher concentrations are attributed to the longer contact time between the water and the rock. The occasional high chloride and sodium levels are attributed to boreholes in the vicinity of areas where salts naturally accumulate on surface, such as pans and some of the fountains (GCS (Pty) Ltd, 2016).

10.2.4 Hydrocensus

A hydrocensus was conducted within a 5 km radius of the Dorstfontein West and East workings. A total of 26 boreholes were visited. The purpose of the hydrocensus was to update regional groundwater users and hydrogeological information. The scope of this task included the following (GCS (Pty) Ltd, 2016):

- Identify/update all water users within this surrounding area;
- Obtain GPS locations all production boreholes, monitoring boreholes, and springs;
- Verify the general status of boreholes;
- Update the groundwater user information, including purpose of abstraction, abstraction rates etc.; and
- Take hydrogeological field measurements (static water levels and borehole depths).

All of the data collected during both of the hydrocensus investigations were captured and analysed. The results of the hydrocensus are presented in Appendix J (GCS (Pty) Ltd, 2016).

Information pertaining to water use of the 26 boreholes is shown below:

- 21 boreholes were used for domestic, stock watering purposes and irrigation;
- 3 boreholes were dormant/not in use;
- 2 boreholes, owned by Exxaro and BHP Billiton respectively, are used for monitoring purposes; the borehole owned by Exxaro is still part of the current monitoring network.

10.2.5 Water Quality

Groundwater samples were collected from six hydrocensus boreholes. Sample analyses results were compared to the South African National Standard (SANS) 241:2011 Class 1 water quality standards for drinking water. No measured parameters exceeded the SANS standards. In DTNM18 the nitrate concentration of 8.03 mg/l was slightly elevated, exceeding 50% of the SANS standard of 11 mg/l.

It can be concluded that the groundwater quality measured in third party boreholes is of good quality when compared to drinking water standards. There is no indication that mining activities are impacting on the groundwater quality in these boreholes (GCS (Pty) Ltd, 2016).

10.2.6 Groundwater Use

Many of the privately owned boreholes which were investigated within the immediate study area were either equipped or being pumped which prevented the measurement of static water levels (they are used on a daily basis for domestic water supply to farmers, communities and drinking water for livestock). In many of the instances water is used for single or several households for domestic use, as a water supply for farm workers and in two cases for small communities of 50 – 100 people. Most of the farmers have to filter the water before it is used for drinking water for the salt content of groundwater is very high.

Three springs were found as part of the hydrocensus. All three springs are on privately owned land and are used for livestock.

10.2.7 Groundwater Monitoring

Dorstfontein East has an active groundwater monitoring programme, with a number of monitoring boreholes involved including the boreholes described in Figure 10-11. The associated water level data and quality analyses are discussed in quarterly monitoring reports.

Fourteen (14) groundwater monitoring sites exist on the Dorstfontein East site of which two are inaccessible due to being covered with soil and two boreholes are damaged or destroyed. All boreholes are sampled quarterly and water levels are taken monthly.

The existing groundwater monitoring boreholes exceeded the following compliance objectives:

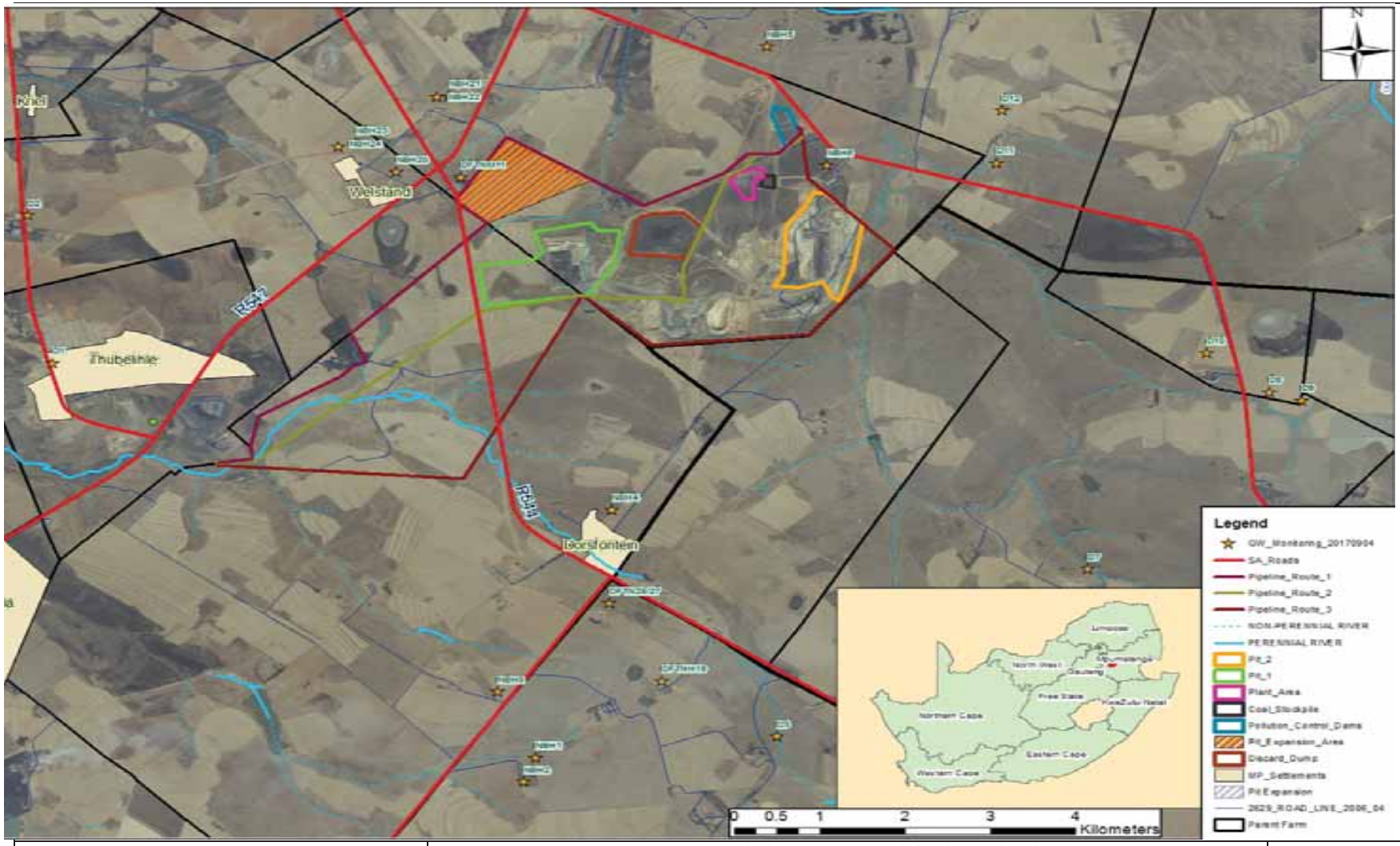
- At DFTNM10 the sulphate concentration has increased since March 2014 and exceeds the SANS limit of 500 mg/l in the last quarter of 2014;
- Nitrate was previously elevated at DFTNH1 as well as sulphate, although sulphate was still compliant;
- DFTNM7 only fluoride was elevated;
- Borehole DFBH indicated significant spikes in conductivity, total dissolved solids, sulphate and manganese in March 2011 and December 2013. As borehole in DFBH is drilled into the old underground workings contamination in this borehole could be related to the old underground mine.

10.2.8 Decanting

For open pit mining the decant point can be established as the lowest topographical point of the pit outline at the end of life of mine. When mining dewatering has ceased the groundwater level will tend to recover to pre-mining conditions. Decant will occur when the groundwater level recovers to above the lowest surface elevation of the pit. This can occur long after the end of life of mine and is referred to as the time-to-decant. For underground mines decanting occurs mainly at entrances to the underground workings such as shafts and box cuts.

The time-to-decant and decant volumes calculations were carried out using spreadsheet calculations. The volume of the opencast mines at Dorstfontein East was based on the depth and extent of the No. 2 and No. 4 coal seams. It is assumed the pits will be backfilled.

Values for porosity and recharge to opencast areas were taken from information on rehabilitation of the DCME opencast areas as obtained from Golder & Associates and du Plessis, J.L., 2010, “Decant Calculations and Groundwater – Surface Water Interaction in an Opencast Coal Mining Environment”. The porosity of the backfill material was taken to be between 15% and 25% of the total mined volume. A recharge rate of between 6.5% and 16% was used for the time-to-decant and decant volume calculations. The lower recharge rate was taken based on the information of the current rehabilitation plan. The calculations show that the time-to-decant ranges between approximately 25 and 150 years. Decant volume calculations show discharge rates of between approximately 91 and 585 m^3/d.



srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** Groundwater Monitring Locations	Project No 599507

Figure 10-11: Groundwater Monitoring Locations

10.3 Surface Water

This section provides a description of the surface water and stormwater aspects in and around the proposed development.

10.3.1 Catchment Description

Dorstfontein East Mine is situated in Quaternary catchments B11B and B11D in the Upper Olifants Water Management Area (WMA) which is situated in the north eastern part of South Africa, in the Mpumalanga Province. The Olifants River originates east of the mine flows in a northerly direction. The Steenkoolspruit is located west of the mine. These two rivers converge north of the mine, from which point the river is called the Olifants River .

10.3.2 Floodlines in Relation to the Proposed Project

The floodlines for the DEM need to be estimated in order to prevent loss and damage to infrastructure, through water damage; namely the pipeline. The 1:100-year floodline are shown in Figure 10-12.

10.3.3 Mean Annual Runoff

The 0.85 km^2 open cast Pit extension will reduce runoff generated within the immediate catchment. The catchment in which the Pit extension is located is 17.4 km^2. In addition, the DEM is situated in quaternary catchment B11B, which is 435 km2. The catchments are shown in Figure 10-14 and Figure 10-15.

The reduction in MAR included in Table 10-2 was estimated using the runoff depth given in WR2012 (Midgley, Pitman and Middleton, 1994).

Table 10-2: Quaternary natural MAR and loss of MAR due to dirty water containment

Catchment	B11B Area (km^2)	B11B MAR contributing rainfall (mm)	MAR from B11B (mill m^3)	Dirty water area (km^2)	MAR from dirty water (m^3)	Loss of MAR B11B (%)
B11B	435	54	23.65	0.85	45,900	0.2

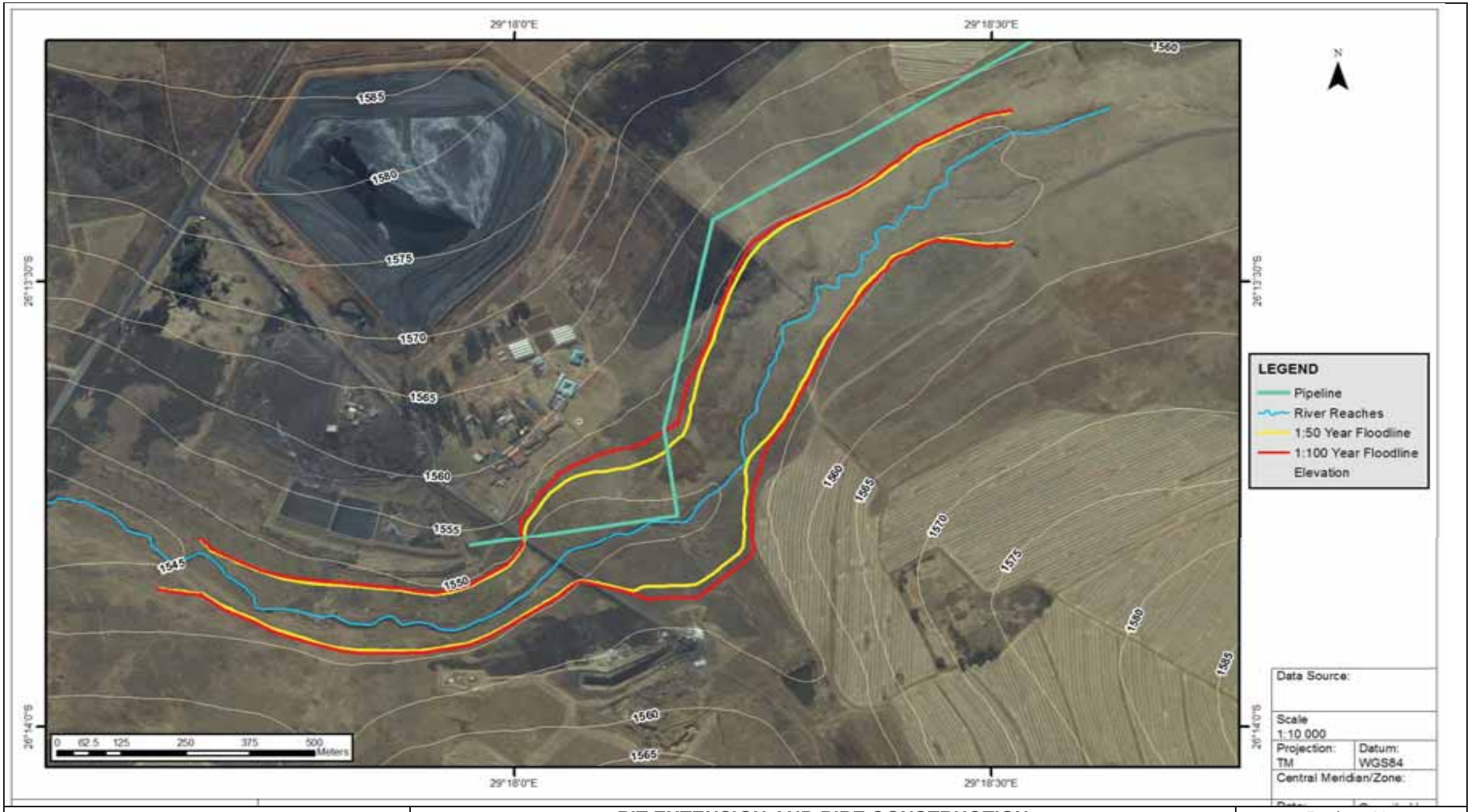
10.3.4 Dirty Water Management

The dirty water at DEM is confined to the open cast Pit extension. As per common practice, the edges of the open cast will have a berm built up to prevent ingress of surface water, in addition to the sized and designed clean water canal. The source of water to the open cast section is therefore limited to direct rainfall and ground water seep (SRK Consulting (Pty) Ltd, 2016).

Removal of water from the open cast area requires a localised sump and installed pumping capacity to deal with collected water. The results for the volume of water captured and temporarily stored prior to pumping are shown in Table 10-3.

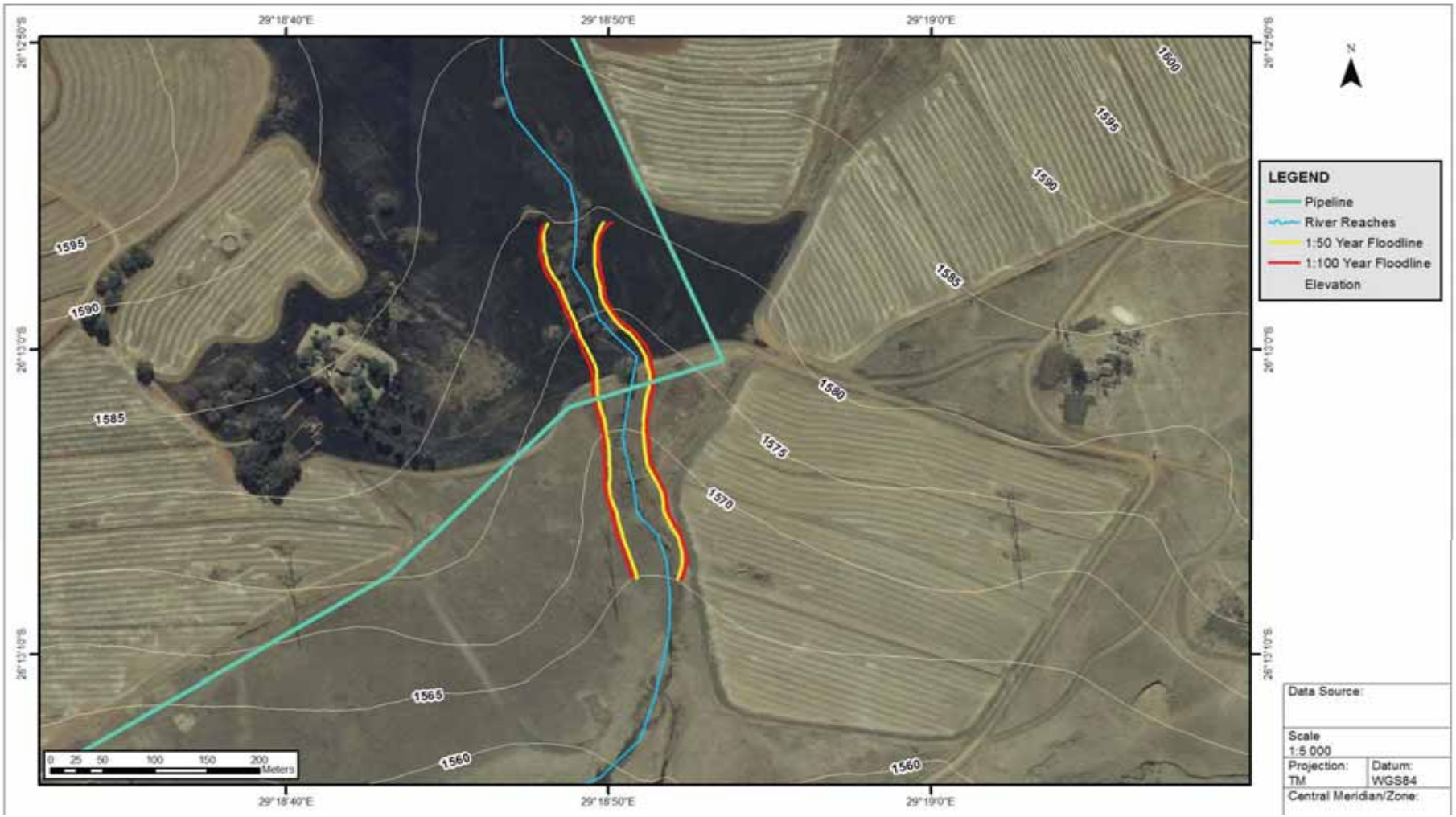
Table 10-3: Dirty water stormflow volume

Catchment Name	Area (km^2)	1:50 (m^3)	1:100 (m^3)
Pit Extension	0.85	100,755	115,093
Existing Pit	1.83	216,920	247,790
Total	2.68	317,675	362,884



srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** Dorstfontein West complex 1:50 and 1 in 100 year flood line	Project No 599507

Figure 10-12: Dorstfontein West complex 1:50 and 1 in 100 year flood line



srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** Watercourse 1:50 and 1 in 100 year flood line	Project No 599507

Figure 10-13: Watercourse 1:50 and 1 in 100 year flood line

10.3.5 Clean Water Management

The 0.85 km^2 East Pit extension is positioned mid-slope. The result is that it is a requirement to manage potential ingress of clean water, to the Pit. A clean water diversion canal positioned uphill of the Pit, will allow for the water to be collected and routed away from the dirty area, for release to the environment (SRK Consulting (Pty) Ltd, 2016).

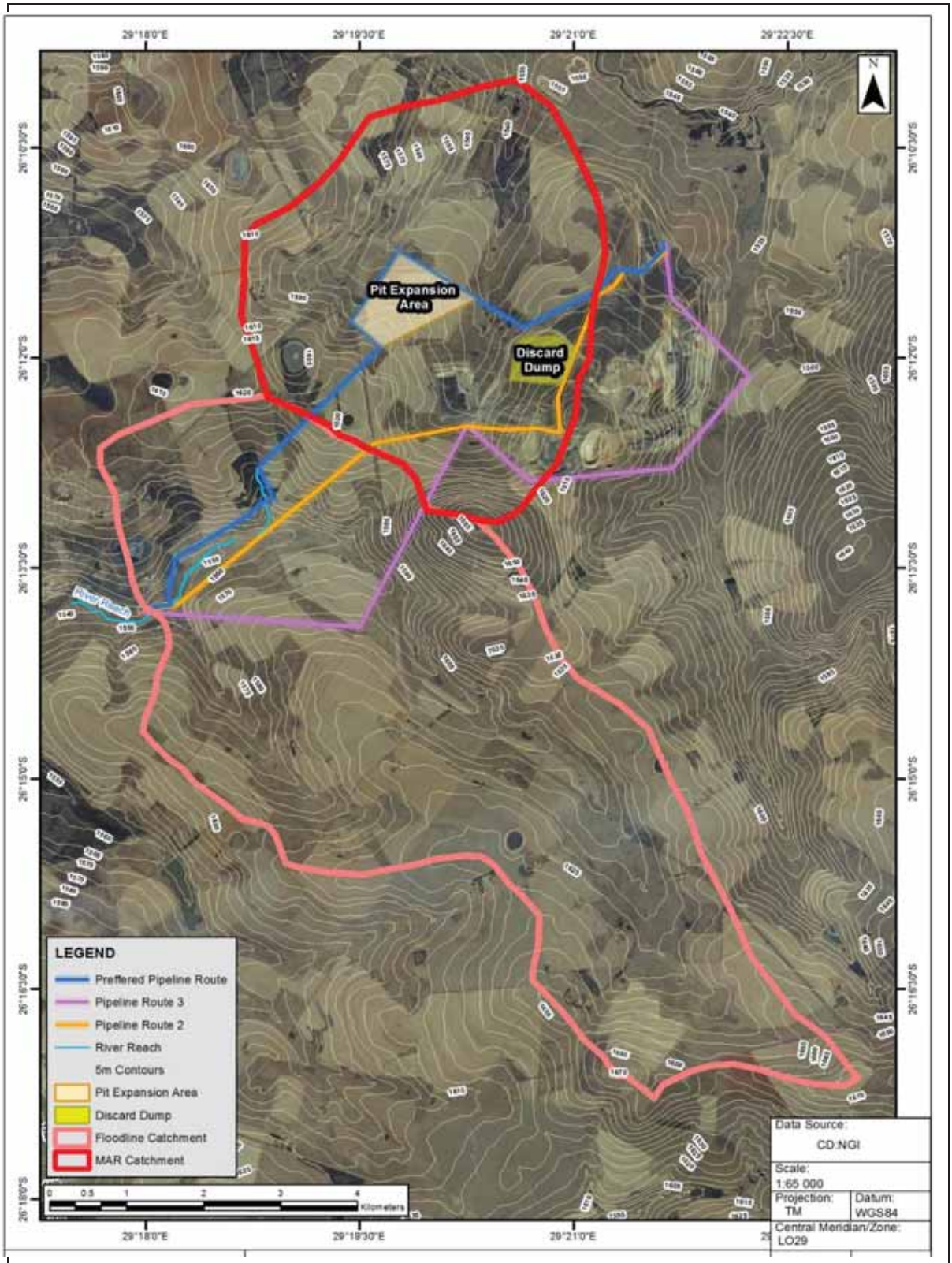
The clean water area and associated channel sizes are presented in Table 10-4 and Table 10-5.

Table 10-4: East clean water diversion canal

Label	Channel Slope (m/m)	Normal Depth (m)	Left Side Slope (m/m (H:V))	Right Side Slope (m/m (H:V))	Bottom Width (m)	Discharge (m³/s)	Velocity (m/s)	Froude Number
Trapezoidal Channel - 1	0.012	0.16	2	2	1	0.2	0.92	0.81
Trapezoidal Channel - 2	0.042	0.19	2	2	1	0.48	1.85	1.53
Trapezoidal Channel - 3	0.005	0.63	2	2	1	1.72	1.22	0.61
Trapezoidal Channel - 4	0.007	0.83	2	2	1	3.72	1.68	0.75

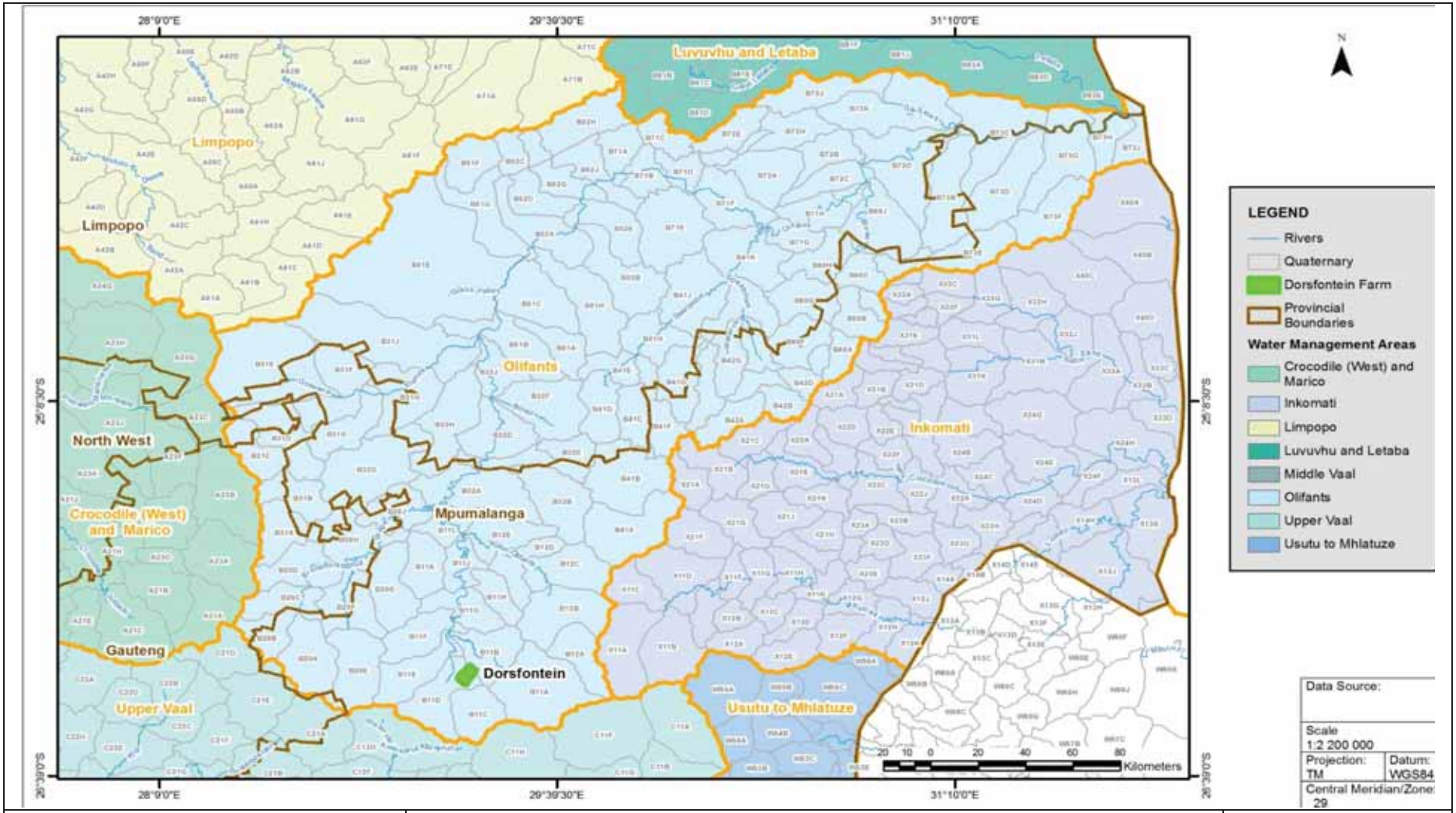
Table 10-5: West clean water diversion canal

Label	Channel Slope (m/m)	Normal Depth (m)	Left Side Slope (m/m (H:V))	Right Side Slope (m/m (H:V))	Bottom Width (m)	Discharge (m³/s)	Velocity (m/s)	Froude Number
Trapezoidal Channel - 1	0.046	0.12	2	2	1	0.21	1.48	1.51
Trapezoidal Channel - 2	0.005	0.33	2	2	1	0.46	0.86	0.57
Trapezoidal Channel - 3	0.034	0.25	2	2	1	0.72	1.93	1.43
Trapezoidal Channel - 4	0.02	0.83	2	2	1	6.2	2.83	1.27



srk consulting	PIT EXTENSION AND PIPE CONSTRUCTION Groundwater Monitring Locations	Project No 599507

Figure 10-14: Dorstfontein local catchments and river reach along preferred pipeline route



srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** Illustration of Surrounding Catchments	Project No 599507

Figure 10-15: Illustration of Surrounding Catchments

Further, the stance is taken that in the process of opening, operating and closing the Pit extension, the complete 0.85 km^2 area will be open and therefore contributing to rainfall volume in the base of the Pit. The new values for use in the stormwater management of dirty water are shown in Table 10-6 (Stats SA, 2016).

Table 10-6: Dirty water stormflow volume for the Pit extension

Catchment Name	Area (km^2)	1:50 (m^3)	1:100 (m^3)
Pit Extension	0.85	100,755	115,093

The nature of open cast mine requires a temporary sump to collect the water and allow pumping. The position of the sump will move in relation to the mining operations. For the management of dirty water in the Pit at DEM, the sump will be approximately 30 m by 30 m with a depth of approximately 3 m. The sump will provide a holding capacity of 2,700 m3 which will be sufficient for the more common rainfall events. The 1:50 and the 1:100-year rainfall events are more severe and will require the bottom bench to accumulate water in addition to the sump. The overflow volume and required pumping rate to remove ponded water over three days is shown in Table 10-7.

Table 10-7: Dirty water stormflow volume for the Pit extension on reduced open area

Catchment Name	Area (km^2)	1:50	1:100
Pit Extension rainfall (m3)	0.85	100 755	115 093
Sump capacity (m^3)		2 700	2 700
Overflow (m^3)		98 055	112 393
Pumping from sump over 3 days (m^3/h)		1,361.88	1,561.01
Decant rate (m^3/s)		0.38	0.43

The Pit extension pumping network will be fitted to the existing pumping infrastructure, used at the existing Pit. This approach allows for cost saving at the mine by reducing the length of pipe required to achieve the dewatering process. Pumped water is to be contained in appropriate holding facilities for reuse on the mine where possible. The conceptual setup for the dirty water pumping system for the Pit extension is shown in Figure 10-16.

srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** Dirty water management	Project No 599507

Figure 10-16: Dirty water management

10.3.6 Surface Water Quality

The water quality of the Pollution Control Dams and Erikson dams remained poor with elevated total dissolved solids, sulphate and manganese in Erikson dam 1 exceeding the SANS limits. As process water, this water is expected to be contaminated and should not be released into the environment. Process water should be stored in dams that comply with Government Notice 704 and Best Practice Guidelines A4: Pollution Control Dams (GCS (Pty) Ltd, 2015).

The water quality at the pond downstream from Pit 1, could be classified as unacceptable (Class 4) for domestic use for the variables analysed. The water quality of localities within the Olifants River, north east of the proposed project could be classified as good (Class 1) for domestic use (Aquatico (Pty) Ltd, 2015).

10.4 Biodiversity

This section provides a description of the biodiversity of the surrounding pipeline as well as the Pit 1 expansion. The baseline results have been obtained from the biodiversity specialist study conducted for the project and can be found in Appendix P.

10.4.1 Floral Assessment

Following the assessment of the proposed project and the associated habitat, it has been concluded that there are 3 main habitat units that will impacted upon. These habitat units are described below:

Transformed (Agricultural and Mining) Habitat

This habitat unit comprises of land that is currently being utilised for agricultural purposes or has been disturbed as a result of mining activities. This habitat type has been largely transformed either through monoculture (Maize fields) or as a result of mining activities resulting in habitat clearing and dumping of waste material from mining activities. In terms of habitat provision this habitat is considered to have very low habitat provision capabilities, and is under constant land changing impacts from either ploughing or earth moving/ dumping activities (SAS (Pty) Ltd, 2016).

Wetland Habitat

Wetlands predominated within the lower valley regions of the linear development, as well as the hillslopes between the agricultural fields. The seep wetlands are largely impacted upon by Route 1, whilst Route 2 impacts upon both valley bottom and seep wetlands. Route 3 has a large impact on the Unchannelled valley bottom wetland that is located alongside the DCM East mining area. Although edge impacts from edge effects were evident, the valley bottom wetland habitats are considered to still be in a fairly good condition, capable of providing suitable habitat to number of floral wetland species as well as floral Species of Conservational Concern (species of conservational concern) species such as *Crinum bulbispermum*. The wetland areas are currently utilised for grazing however the grazing impact on this habitat unit was not considered to be high, as a dense herbaceous layer was still evident (SAS (Pty) Ltd, 2016).

Grassland Habitat

Transformed Grassland Habitat

Large scale edge effects from farming and mining activities as well as grazing has resulted in an altered grassland habitat. Some areas are likely to be old lands previously under cultivation. Alien plant proliferation (*Bidens pilosa* and *Tagetes minuta*) was high within this habitat.

Moist Grassland Habitat

Seepage from the artificial dams and water runoff from roads have created moist conditions for facultative wetland species (species occurring within wetland or terrestrial areas) to occur. Soil samples were taken within these habitat units; however, no hydromorphic characteristics were evident in these soil samples. This habitat unit is located within all the proposed routes alongside the agricultural fields, and as such edge effects from farming activities has impacted upon this habitat unit, with a small number of alien invasive species being observed. Areas of moist grassland were observed within all of the proposed routes.

Secondary Grassland

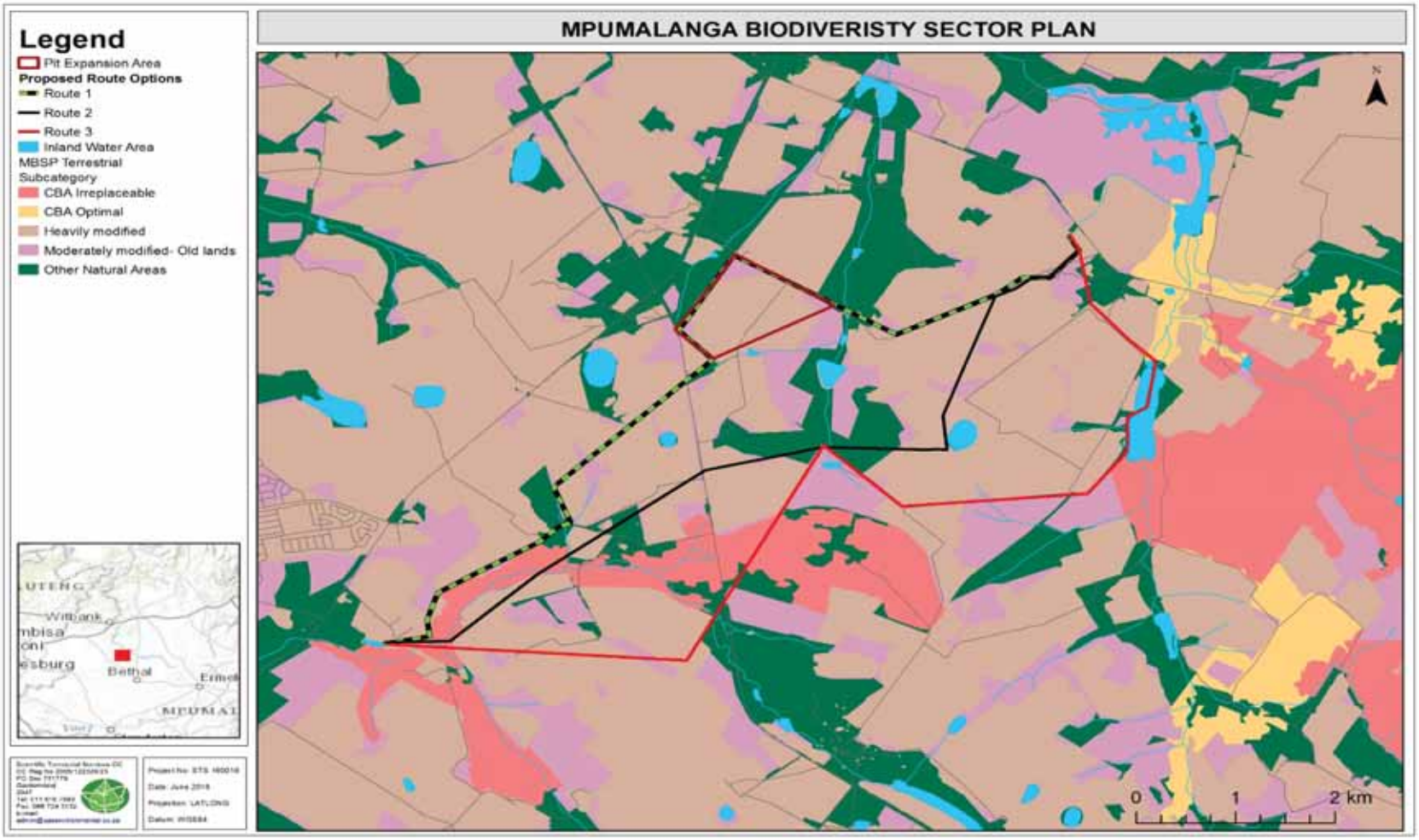
This grassland is characterised by a very low forb diversity, largely isolated between agricultural land. Grassland species observed were a mixture of pioneer (*Cynodron dactylon*), sub-climax and climax species (*Themeda triandra*), indicating that this habitat unit is not in a climax stage of succession, but rather maintained in a sub-climax or secondary stage as a result of edge effects and possibly altered fire regimes. Grazing activities were evident in this habitat unit however they were not impacting heavily and appeared to be infrequent, resulting in a fairly tall grass structure.

Rocky Grassland

The rocky grassland located within Route 3 comprised of very shallow soils over quartzite rocks. The herbaceous layer within this habitat unit had been grazed very short at the time of assessment. Species composition and overall veld condition indicates that this habitat unit has been systematically overgrazed. Species such as *Seriphium plumosum* were observed, which along with the very short herbaceous layer, is an indicator of an overgrazed veld.

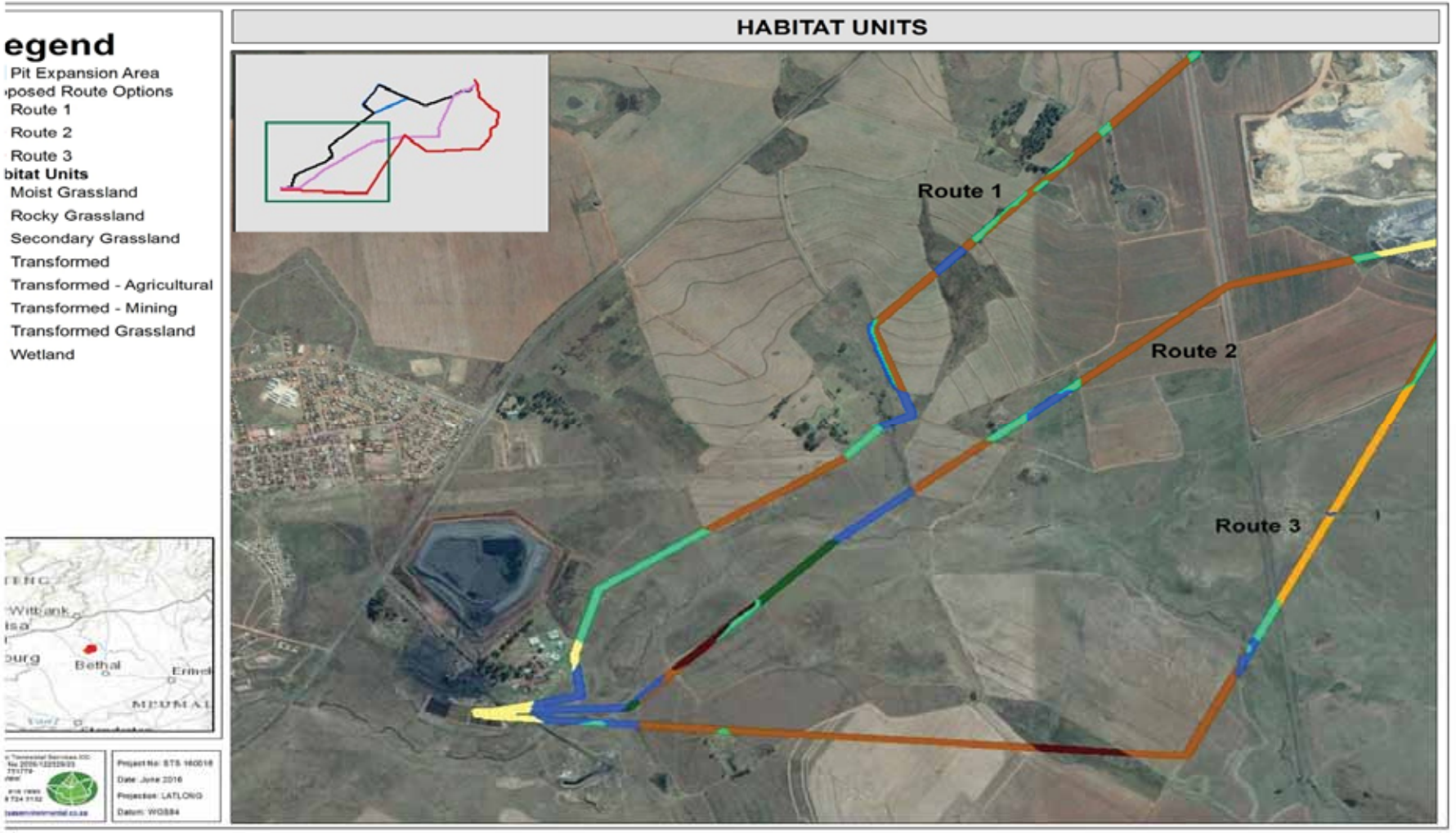
Pit expansion Area

The proposed expansion Pit comprised primarily of transformed agricultural land used for the production of crops. The north western corner of the expansion Pit contained a small area of both secondary and moist grassland, whilst the south western corner was associated with transformed grassland. Impacts from agricultural activities has had an impact on the overall expansion Pit area, and is not expected to provide habitat to any floral or faunal species of conservational concern (SAS (Pty) Ltd, 2016).



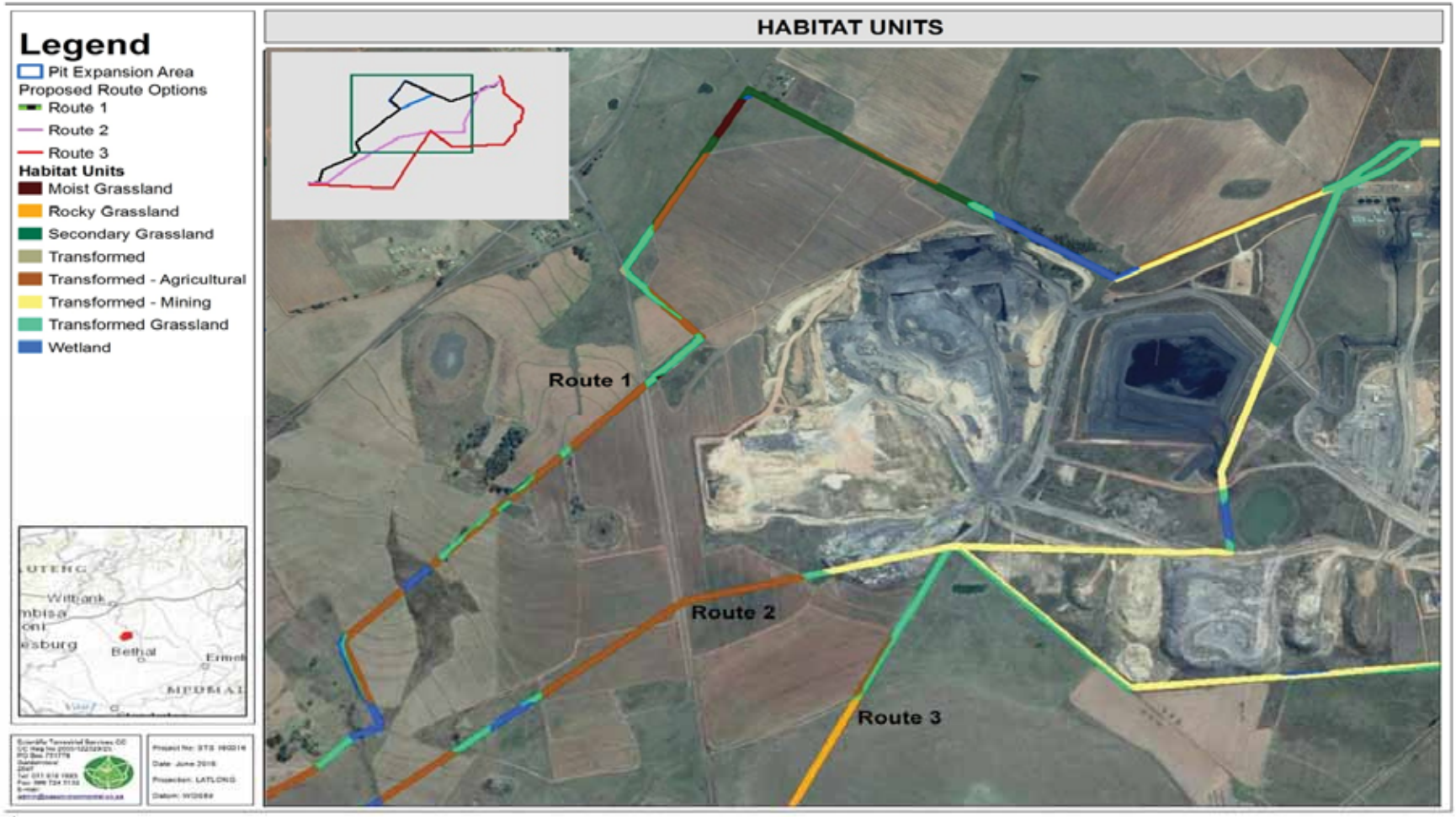
srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** The Terrestrial Mpumlanga Biodiversity Sector Plan	Project No 599507

Figure 10-17: The Terrestrial MBSP Associated with the Proposed Development and its Surroundings



srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** Habitat units encountered within the 30m survey zone of the linear development	Project No 599507

Figure 10-18: Habitat Units Encountered Within the 30m Survey Zone of the Linear Development



srk consulting	PIT EXTENSION AND PIPE CONSTRUCTION Habitat units encountered within the 30m survey zone of the linear development	Project No 599507

Figure 10-19: Habitat Units Encountered Within the 30m Survey Zone of the Linear Development

10.4.2 Faunal Assessment

During field assessments it is not always feasible to identify or observe all species within an area, largely due to the secretive nature of may faunal species, possible low population numbers or varying habits of species. As such, and to specifically assess an area for faunal species of conservational concern, a Probability of Occurrence (POC) matrix is used, utilising a number of factors to determine the probability of faunal species of conservational concern occurrence within the linear development. Species listed in Appendix G whose known distribution ranges and habitat preferences include the linear development were taken into consideration. The species listed in Table 10-8 are considered to have an increased probability of occurring within or being affected by the linear development.

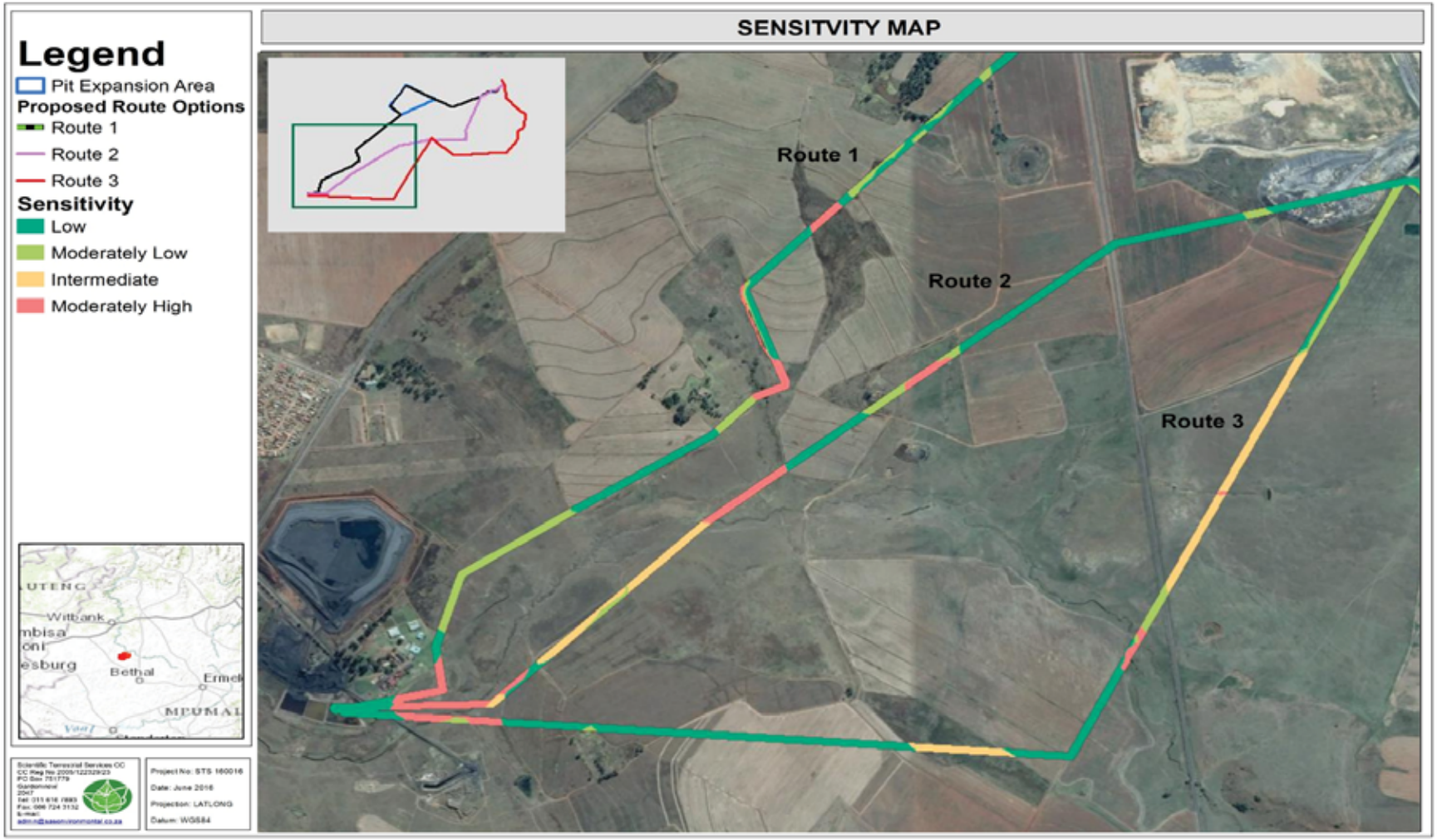
Table 10-8: Faunal species of conservational concern that obtained a POC score of 60% or more.

Scientific Name	Common Name	MP SoER 2003	POC %
Pyxicephalus adspersus	Giant Bullfrog	Vulnerable	60%
Sagittarius serpentarius	Secretary bird	Vulnerable	100%
Phoenicopterus minor	Lesser Flamingo	Not Threatened	100%
Metisella meninx	Marsh Sylph	Vulnerable	60%

From the Table 10-8 it is evident that only two species of conservational concern have an increased POC and may occur within the wetland habitats. *Pyxicephalus adspersus* (Giant Bullfrog) and *Metisella meninx* (Marsh Sylph) are under threat as a result of habitat loss, namely wetlands and moist grasslands. *Sagittarius serpentarius* (Secretarybird) and *Phoenicopterus minor* (Lesser Flamingo) were both observed along the linear development, with *Sagittarius serpentarius* being observed hunting within the borders of the valley bottom wetlands along Route 2, whilst *Phoenicopterus minor* was observed within the large dam present within the mining area.

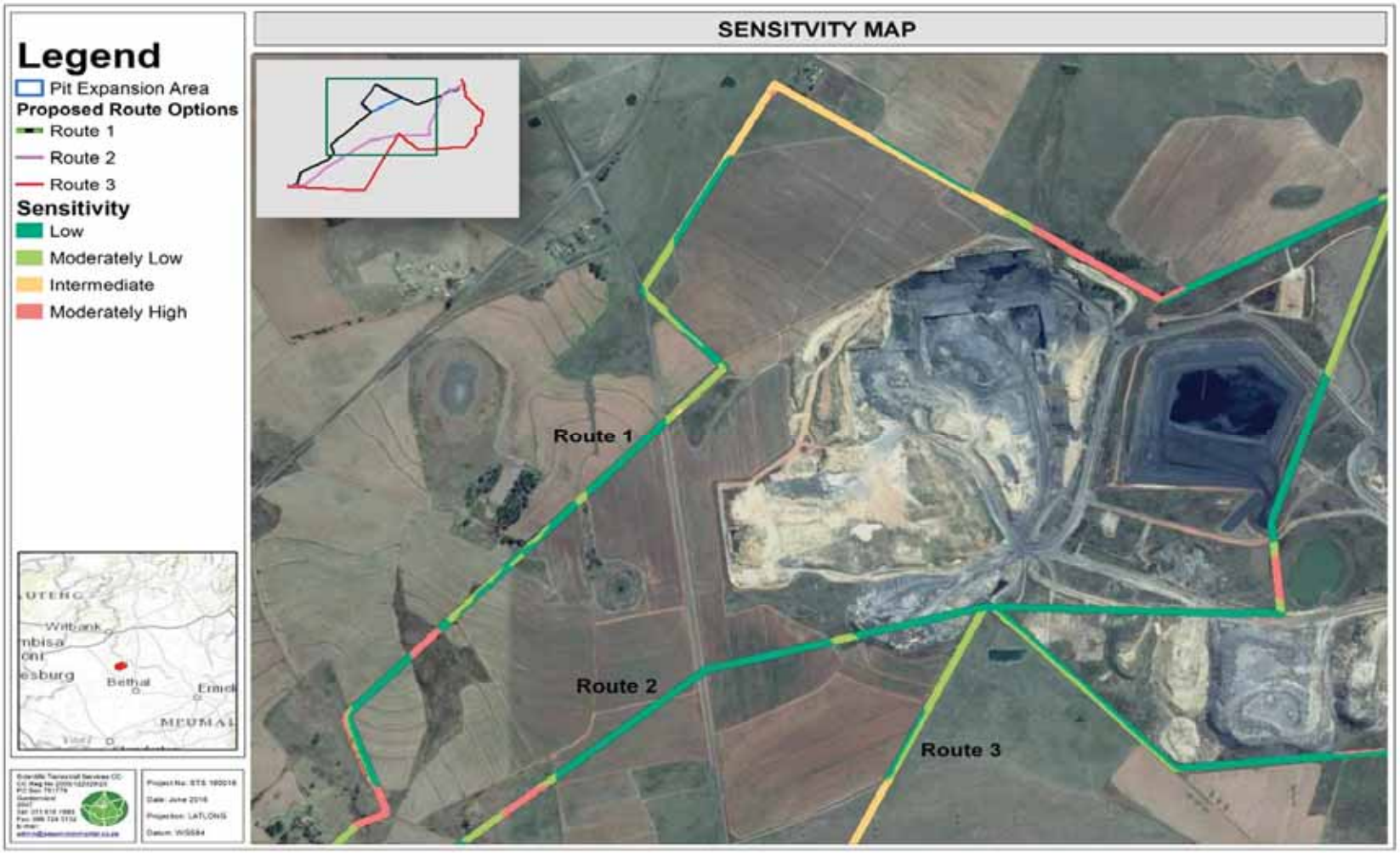
The Wetlands and Secondary and Moist grasslands are considered to be the most likely habitats in which these species may be found, and as such increased importance needs to be placed on limiting, and where applicable, mitigating impacts that occur within these habitat units.

The proposed expansion of Pit 1 comprised primarily of transformed agricultural land used for the production of crops. The north western corner of the expansion Pit contained a small area of both secondary and moist grassland, whilst the south western corner was associated with transformed grassland. Impacts from agricultural activities has had an impact on the overall expansion Pit area, and is not expected to provide habitat to any floral or faunal species of conservational concern. The habitats within the proposed expansion Pit area had a very low faunal abundance and diversity, and as such the expansion of operations into this area is not expected to have any impact on faunal species



srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** Sensitivity map of the linear development for fauna and flora	Project No 599507

Figure 10-20: Sensitivity Map of the Linear Development for Fauna and Flora



srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** Habitat units encountered within the 30m survey zone of the linear development	Project No 599507

Figure 10-21: Sensitivity Map of the Linear Development for Fauna and Flora

10.5 Wetlands

During the field assessment, one freshwater resource, comprising three hydrogeomorphic types (HGM), was identified along the proposed pipeline routes. The resource was characterised as an inland system (i.e. a system having no existing connection to the ocean but which is inundated or saturated with water, either permanently or periodically), located within the Highveld Aquatic Ecoregion. The applicable WetVeg group is the Mesic Highveld Grassland Group 4. The characterisation of this resource is summarised in Table 10-9 (SAS (Pty) Ltd, 2016).

Table 10-9: Characterisation of the resources identified along the linear development.

Freshwater Resource	Level 3: Landscape unit	Level 4: HGM Type
Dorstfontein Wetland	Valley: The typically gently sloping, lowest surface of a valley.	Channelled valley bottom: A valley bottom wetland with a river channel running through it.
		Unchannelled valley bottom: A valley-bottom wetland without a river channel running through it.
	Slope: an included stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, hill or valley.	Hillslope Seep: a wetland area located on (gently to steeply) sloping land, which is dominated by the colluvial (i.e. gravity-driven), unidirectional movement of material down-slope. Seeps are often located on the side-slopes of a valley but they do not, typically, extend into a valley floor.

It was noted during the site assessment that a number of small artificial dams have been excavated in some of the areas nearby the proposed linear development routes. Route 1 traverses one of these artificial dams, however the dam at the time of assessment was dry, with a portion of the dam wall broken, so that the dam is no longer functional and does not retain any water.

No wetlands were observed within the Pit expansion area, with this area being characterised almost wholly of agricultural land. However, a wetland system was observed approximately 120 m to the east of the proposed Pit expansion area. As such it must be noted that the expansion Pit may impact on this system.

10.6 Air Quality

This section provides an overview of the Air Quality within the surrounding environment of the proposed development. The findings in this section are developed from the Air Quality Assessment conducted for the proposed development and can be found in Appendix O.

Identifying the sources that contribute to airborne particulate emissions in the project area is important for establishing sources of air pollution and cumulative impacts associated within the DCM East Mining Area, and the impact that the activities at the facility could have on air quality (SRK Consulting (Pty) Ltd, 2017) .

10.6.1 Existing Emission Sources

lThe project area and surrounding land can be described as rural/industrial with large scale industrial activities in the area. The area is characterised by one large town (Witbank), smaller towns such as Ogies, Bethal, Kriel, and smaller settlements and farms in the area. The following sources of air emissions have been identified in the area:

- Mining activities;
- Power generation;
- Vehicle emissions;
- Fugitive dust sources (windblown dust especially during the dry season);
- Farming activities such as land preparation and harvesting;
- Biomass burning.

10.6.2 Mining Activities

Numerous coal mines and activities at these mines such as drilling and blasting, crushing, hauling, and materials handling all contribute to pollutants in the atmosphere. The main pollutant of concern is particulate matter as this dust is inhalable and can cause respiratory illnesses. The main mines that are within 50 km of East Dorstfontein are:

- New Clydesdale Coal;
- Douglas Colliery;
- Goedehoop Colliery;
- Ilanga Colliery;
- Dorstfontein Coal Mine;
- Arthur Taylor Colliery;
- Polmaise Colliery;
- Anglo Coal SA (Pty) Ltd – Kriel;
- Waterpan Colliery;
- South Witbank Colliery;
- Koorfontein Mines;
- Siyanda;
- Coal Kleinkopje Colliery;
- Exxaro Coal (Pty) Ltd – Matla Colliery.

10.6.3 Power Generation

Coal is the main product mined in the area and coal power stations have been built in close proximity to these mines. These power stations supply electricity to the national power grid. The main pollutants emitted from these power stations are sulphur dioxide (SO_2), carbon monoxide (CO), carbon dioxide (CO_2), nitrogen dioxide (NO_2) and particulate matter (PM). The closest power stations to East Dorstfontein are:

- Matla (23 km southwest).
- Kriel (18 km southwest).
- Duvha (27km north).
- Komati (17 km northeast).

- Kendal (40 km northwest).and
- Hendrina (31 km northeast).

10.6.4 Vehicle Emissions

Vehicle tailpipe emissions are always present and depending on whether the vehicle is maintained efficiently, the tailpipe emissions can contribute heavily or minimally to air pollution. Vehicle emissions can be classified into two groups, namely, primary and secondary pollutants. Pollutants such as carbon monoxide (CO), carbon dioxide (CO_2), sulphur dioxide (SO_2), oxides of nitrogen (NO_x), particulates and lead are generally released into the atmosphere depending on the type of fuel that is used. These pollutants are termed primary pollutants. Secondary pollutants exist only because of the chemical reactions that take place in the atmosphere. Pollutants formed during this process include nitrogen dioxide (NO_2), photochemical oxidants (e.g. ozone), sulphates and nitrates. Vehicle tailpipe emissions are expected to be relatively low due to the relatively low vehicle usage in the area.

10.6.5 Fugitive Dust Sources

All pollutants that arise from fugitive dust sources are termed primary pollutants as they are unlikely to undergo any physical or chemical reactions. Fugitive dust sources can be the vehicle entrainment of dust from gravel or unpaved roads and wind erosion of open areas. Particulate emissions from roadways depend on the road and the number of vehicles using the road. Windblown dust resulting from the erosion of bare ground depends on the velocity of the wind, the size of the exposed area and moisture and silt content of such areas. Areas that receive high amounts of rainfall will experience lower levels of fugitive dust being released into the air as higher moisture content makes the soil heavier and more compact, resulting in the soil being more resistant to wind erosion. At DCM East, fugitive dust emissions are expected to be low as the rainy season is from October to March and the wind speeds are generally low during the winter months. However, based on dust fallout monitoring results, there are instances where higher dust fallout concentrations are observed in the wet months when compared to the drier months. Fugitive dust from the roads network in the area is expected to be low-medium as a result of the frequency and number of vehicles that use the roads in the area.

10.6.6 Farming Activities such as Land Preparation and Harvesting

Farming is one of the main activities that occurs in the project area and include -land preparation and harvesting. Tractors are used to prepare large areas of land for cultivation. Dust emissions related to this activity is expected to be high as soils are loosened and suspended thereby allowing wind to easily transport the finer particles. The remaining vegetation is burned prior to the preparation of land and gases such as SO_2, NO_x, CO and CO_2 are released from this activity. Dust is also generated during the harvesting activity and this adds to the ambient dust load. The fields are left bare at the end of the harvesting and before the preparation of land and this could increase windblown dust in the area, especially during the warmer months when wind speeds tend to increase.

10.6.7 Biomass Burning

The burning of crop residue and veld fires are sources of emissions that can be associated with areas that are densely vegetated. Biomass burning, such as the grasslands in Witbank, is significant as these areas are cleared for agricultural purposes by slash and burn methods. Biomass burning is an incomplete combustion process with carbon monoxide, methane and nitrogen dioxide emitted during the process. Biomass burning in the local area and regionally could negatively impact on air quality, albeit on a seasonal basis.

10.6.8 Emission Sources from Proposed Development

This assessment is based on assumptions arising from plans for the construction and operational phases of the proposed development, notably the proposed extension of the opencast mining area. This assessment represents a conservative (worst case, full production) approach to the evaluation of the impact of potential emissions arising from the activities.

Construction activities include the following:

- Clearing of land i.e. topsoil and vegetation;
- Grading and bulldozing;
- Haulage of topsoil and vegetation;
- Vehicle entrainment of dust on access roads;
- Stockpiling of topsoil;
- Materials handling of topsoil;
- Vehicle tailpipe emissions.

Operations activities for the project include the following:

- Mining at the open Pit. Mining at the open Pit may be undertaken by the following methods (that are still to be investigated):
    - In Pit Crushing with underground feeder breakers and Conveying;
    - Dragline Overburden Removal; and
    - Truck and Shovel Operations (preferred alternative).
- The various mining processes in the general operational cycle will include:
    - Top soil removal;
    - Drill and blast of the hard overburden;
    - Dozing;
    - Loading (truck and shovel or dragline);
    - Coal removal (blast and haul);
    - Transporting (hauling or conveying);
    - Placing (dumping and/or spreading); and
    - Rehabilitation.
- Road transport of coal from the Pit to the plant.
- Materials handling.
- Coal storage at the ROM stockpile.
- On-site vehicle movements associated with mining activities.
- Vehicle tailpipe emissions.

Based on observations during the site visit in February 2016, windblown dust is considered to be the dominant pollutant type that will be generated from the various activities listed above. Materials handling, wind erosion (e.g. discard dumps, coal stockpiles, roads) and vehicle entrainment of dust from unpaved roadways are expected to be the main sources of dust in the area during the operational phase of the mine.

10.7 Blast and Vibration

The evaluation of effects yielded by blasting operations was evaluated over an area as wide as a 3500 m radius from where blasting will take place. The range of structures observed and considered in this evaluation ranged between rural buildings, farm buildings, industrial buildings, power lines and provincial roads.

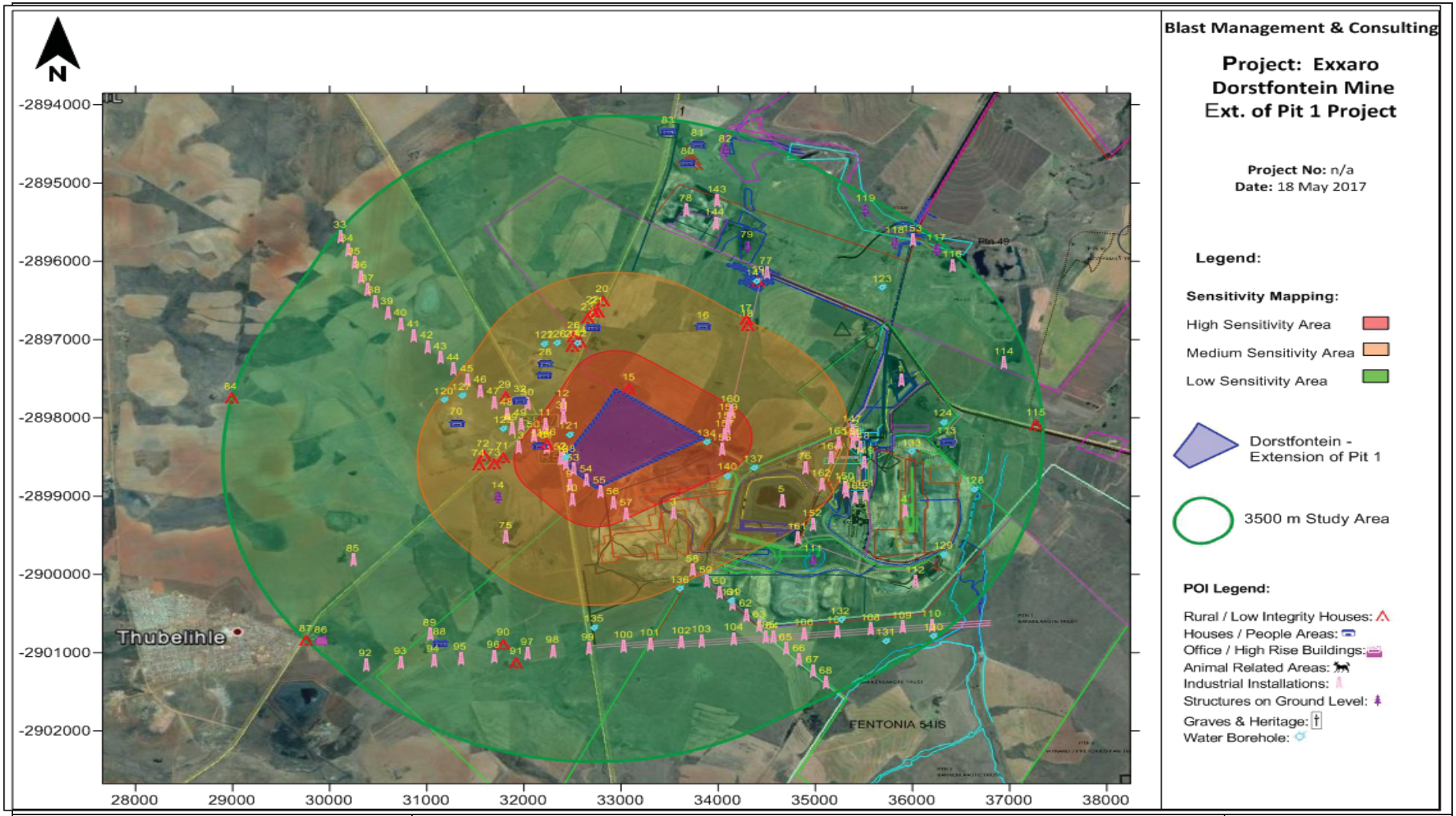
The project area does have houses and communities at very close distance to the project area. The nearest house or buildings is found 293 m away. There are various farmsteads and small settlements in the area. Specific attention will be required for adjustments in the blasting operations to ensure expected levels of ground vibration and air blast are within the required limits. Consideration will need to be given to relocation of households in close proximity to the Pit area. A recommended distance should at least be all within 500 m from area. There are also regulations that will need to be followed for permission to conduct blasting operations as these installations area within 500 m from the blast operations (Blast Management & Consulting, 2017).

Ground vibration at structures and installations other than the identified problematic structures is well below any specific concern for inducing damage. The ground vibration levels predicted for all installations evaluated surrounding the Pit area ranged between 0.9 mm/s and very high. Ground vibration levels at the nearest buildings where people may be present is 28.7 mm/s.

Air blast predicted for the maximum charge ranges between 105 and 143 dB for all the points of interest considered. Air blast observed and predicted showed greater concern than ground vibration. In view of the predicted levels the probability of damages exists if blasting operations does not take careful planning of stemming length and material into consideration. Damages are only expected to occur at levels greater than 134 dB. On prediction it is expected that air blast will be greater than 134 dB at a distance of 500 m and closer to the Pit boundary. Various private installation occur within 500 m from the Pit boundary. Air blast that could lead to complaints is expected to reach distances of 1250 m from the Pit area. The levels at other private houses or settlements are expected to be within limits and not damaging (Blast Management & Consulting, 2017).

An exclusion zone for safe blasting was also calculated. The exclusion zone was established to be at least 297 m. Normal practice observed in mines is a 500 m exclusion zone. The minimum distance recommended is 297 m. This distance may be greater but not less.

Nineteen POI’s were identified that showed concerns with regards to ground vibration levels expected. These POI’s varies in distance from the Pit area – directly next to the Pit area up to 864 m. The concern may also not just be ground vibration but due to close proximity to the Pit area the blasting operations could have a negative effect on the livelihood of people within close proximity of the mine. Figure 10-22 illustrates the location of the sensitive areas and infrastructure while a detailed list of the points can be found in the Blasting Assessment in Appendix L.



srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** Identified Sensitive Areas	Project No 599507

Figure 10-22: Identified Sensitive Areas

10.8 Noise

This section provides a description of the noise baseline assessment. Details of this assessment were obtained from the noise assessment conducted which can be found in Appendix N.

Four measuring points were chosen to monitor the baseline noise emissions in the areas and to determine the possible impact that may arise from the proposed project. The monitoring points are illustrated in Figure 10-24 and listed in Table 10-10 (Malherbe, 2017).

Table 10-10: Noise Monitoring Points

Measuring Point	East	South
Measuring Point 1	732672.00	7101674.00
Measuring Point 2	732159.00	7101506.00
Measuring Point 3	731947.00	7100623.00
Measuring Point 4	731590.00	7100888.00

Table 5 of SANS 10103 5 provides a guideline for estimating community response to an increase in the general ambient noise level caused by an intruding noise. If a change (Δ) is the increase in noise level, the following criteria are of relevance:

- Δ ≤ 0 dB: An increase of 0 dB or less will not cause any response from a community. Any increase of less than 1 dB is negligible. For a person with average hearing acuity an increase of less than 3 dB in the general ambient noise level will not be noticeable. Therefore, 3 dB is a useful ‘significance indicator’ that will be used in this study to assess whether a noise impact is significant or not;
- 0 dB < Δ ≤ 10 dB: An increase of between 0 dB and 10 dB will elicit ‘little’ community response with ‘sporadic complaints’. However, between 5 dB and 15 dB the strength of the response will gradually change to ‘medium’ with ‘widespread complaints’;
- 5 dB < Δ ≤ 15 dB: An increase of between 5 dB and 15 dB will elicit a ‘medium’ community response with ‘widespread complaints’. It is also worth noting that an increase of 10 dB is subjectively perceived as a doubling in the loudness of a noise. For an increase of more than 15 dB the community reaction will be ‘strong’ with ‘threats of community action’;
- 15 dB < Δ: For an increase in excess of 15 dB the community response will gradually increase in strength to ‘very strong’ with ‘vigorous community action’; and
- 10 dB < Δ ≤ 20 dB: For an increase of between 10 dB and 20 dB the community response will gradually increase in strength to ‘strong’ with ‘threats of community action’.

The measurement results are summarised in Tables 5.1.1 (day-time) and 5.1.2 (night-time). The detailed results are given in Appendix D to this report.

Figure 10-23: Summary of the Day Time Measurement Results

Measurement Point	Start time hh:mm:ss	LAeq (20 min) dBA	LA90 dBA	LAeq - LA90 dB	Comments
MP1	16:00:05	52.5	43.7	8.8	Constant noise from traffic. Noise caused by rumble strips. Humming of mining operations in the background. Bird calls. Constant light wind in grassland foliage. Occasional hammering sounds from nearby work site.

Measurement Point	Start time hh:mm:ss	LAeq (20 min) dBA	LA90 dBA	LAeq - LA90 dB	Comments
MP2	16:41:03	54.9	45.2	9.7	Constant noise from traffic flow dominates. Noise caused by rumble strips very noticeable. Bird calls and farm animal sounds. Constant light wind in grass lands.
MP3	17:11:10	54.0	47.1	6.9	Constant noise from traffic including numerous heavy vehicles. Noise caused by rumble strips clearly audible. Bird calls and insect noise. Crackling of veldt fire in the distance. No wind.
MP4	17:38:05	51.7	42.9	8.9	Constant noise from traffic. Noise caused by rumble strips. Voices and calls from people in nearby settlement. Bird calls and insect noise. Light wind in grass land foliage. Three warning gun shots at nearby farm house. Later measurement paused when security patrol arrives.

It is clear that the high noise levels measured at all the measurement points is dominated by road traffic. This includes the impulsive noise caused by the rumble strips at the crossing of the R547 and R544. The traffic flow includes a large number of heavy vehicles. The traffic flow reduces slightly later at night although the noise it causes still dominates;

During day-time mining operations have less of an influence on measurement results than road traffic, although it is noticeable at times. During night-time, when traffic flow is somewhat lower and meteorological and other atmospheric conditions favour the propagation of sound over long distances, mining activities become much more audible.

The differences between the concurrently measured averages during night-time are significantly higher than during day-time. The deduction can be made that although ambient background noise levels were lower during night-time the single noise events caused by passing road traffic, the effect of the rumble strips and the more audible noise contributions from the mining operation very much determined the measurement results.

The ambient noise levels in immediate environment of the DCM Pit 1 Extension are dominated by road traffic on the R547 and R544 which includes a large percentage of heavy vehicles. These noise contributions will to a large extent mask the impact of the noise emissions caused by the future mining operations. The resulting total ambient noise levels largely conform to those recommended by SANS 10103 5.

srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** Location of Noise Monitoring Points	Project No 599507

Figure 10-24: Location of Noise Monitoring Points

10.9 Soils, Land Use and Land Capability

This section describes the soils, land use and land capability of the proposed development footprint. The baseline conditions were extracted from the Soil, Land Use and Land Capability Assessment conducted for the proposed development, and can be found in Appendix R.

10.9.1 Soils

Eighteen different soil forms were identified within the study area. These are illustrated in Figure 10-25.

The pH of the majority of the analysed soil samples in the study area ranges from 4.33 (extremely acid) to 6.39 (slightly acid). For successful crop production, a pH of between 5.8 and 7.5 is optimum and crops produced in soils with lower pH may suffer aluminium (Al) toxicities if toxic levels of Al are present. The danger of Al toxicity in maize only exists when the pH (KCl) is lower than 4.5. Even under these low pH levels, Al toxicity may not prevail. The pH of the soil can be improved by the addition of dolomitic lime or gypsum. However, this process is costly and adds to production costs of crops (TerraAfrica Consult, 2017).

Phosphorus levels are low to sufficient (ranging between 1 mg/kg in the veld and 130 mg/kg P in the crop fields). The clay plus silt content in the top 150 mm of the soil ranges between 20% and 44% in the majority of the topsoil samples taken. For crop production optimum extractable P levels in the soil according to Bray 1 are 25.1 mg/kg for soils with a clay plus silt content of 20% and 17.2 mg/kg P for soils with clay plus silt content of 40%.

The calcium and magnesium levels are higher than what is adequate for crop plants but is not considered as toxic. The potassium levels are higher than what are adequate at all sampling points. The balance between these three cations can be corrected with chemical fertilizer.

The soil chemistry of the samples analysed indicate that soil at the project site has the chemical suitability for crop production. Intensive annual crop production would however require proper fertilization as soil nutrients should be balanced and will be depleted. No serious soil chemical issues such as soil salinity or sodicity occur on site. Where the sodium (Na) concentration is more than 15% of the sum of all cations, crop production may be impaired. The sodium concentration at all the sampling points were sufficiently low except for one sampling point (DF07 and DF08) where both topsoil and subsoil samples have concentrations above 15% (20.53% and 16.32% respectively).

10.9.2 Agricultural Potential

The largest part of the study site is currently used for crop production. All the soil forms encountered at the study site are suitable and highly suitable for crop production with the exception of the Katspruit, Rensburg, Longlands, Dresden and Arcadia soil forms. The annual preciPitation is sufficient for successful maize production. The plinthic soils such as Avalon, Glencoe and Lichtenburg are prized by maize farmers on the Highveld because the plinthic layer dams water in the lower profile which can be used by maize roots during periods of drought.

The study site did not have any current irrigation infrastructure that was being used for irrigation purposes. No large dams with irrigation potential have been observed on site. The soil forms identified on the site have medium suitability for irrigated crop production as the presence of phreatic water in soil forms such as Avalon, Longlands and Glencoe may prove problematic during high rainfall years when dry land production methods will suffice. Although the establishment of irrigation infrastructure requires high initial caPital investment, the site has potential for this production method should it ever become a future land use possibility (TerraAfrica Consult, 2017).

srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** Soil Types of the area	Project No 599507

Figure 10-25: Soil Types of the Area

The grazing capacity of a specified area for domestic herbivores is given either in large animal unit per hectare or in hectares per large animal unit. One large animal unit is regarded as a steer of 450 kg whose weight increases by 500 g per day on veld with a mean energy digestibility of 55%.

The grazing capacity of the veld around the study area is 5 to 6 hectares per large animal unit or large stock unit (LSU) according to Morgenthal et al. (2004) in a report to the Institute for Soil, Climate and Water of the ARC. Areas where the wetland soils are dominant (Katspruit,Rensburg and Longlands soil forms) and where high clay content impedes drainage (Arcadia soil form) are more suitable for cattle farming than crop production.

10.9.3 Land Use

The entire subject property and its immediate surrounds can be broadly defined as Eastern Highveld Grassland. The land use on the study area can be defined as crop production and a smaller part as livestock farming. Some 44% of the Eastern Highveld Grassland in which the study area falls is transformed primarily by cultivation, plantations, mines, urbanization and by building of dams. Cultivation may have had a more extensive impact, indicated by land cover data.

Cattle farming will be a viable post mining land use of the site as long as the field quality is maintained by never exceeding the grazing capacity. Post-mining land use should aim to re-establish the cattle farming potential of the land (TerraAfrica Consult, 2017).

10.9.4 Land Capability

The soil and land types identified in the study area could all be classified into four different land capability classes. Deeper soils of the Bloemdal, Glencoe, Hutton, Lichtenburg, Clovelly and Avalon soil forms have arable land capability which could also have been suitable for irrigated crop production should irrigation water and infrastructure be available. The Katspruit, Longlands and Rensburg soil forms indicates areas of seasonal to permanent wetness in the study area and has wetland land capability. Soil of the Witbank form has wilderness land capability since it has already been significantly altered by mining activities and the potential of this land to be used for agriculture after rehabilitation is very limited (TerraAfrica Consult, 2017).

srk consulting	PIT EXTENSION AND PIPE CONSTRUCTION Land capability map of the Dorstfontein East Coal Mine Extension Project	Project No 599507

Figure 10-26: Land capability map of the Dorstfontein East Coal Mine Extension Project

10.10 Heritage

This section highlights the baseline information and findings from the Heritage Assessment conducted for the proposed project. Please refer to Appendix M for the full report.

10.10.1 Isolated Occurrences

Throughout the survey the only isolated occurrence that was recorded is a multi-facetted Acheulian Earlier Stone Age (ESA) core tool. This surface find was recorded near the main mining Pit in the north section of the survey area.

10.10.2 Heritage Sites

A total of nine sites were recorded during the survey, however, only seven sites are older than 60 years and are therefore protected under the NHRA (Act No. 25 of 1999). As such a total of four graveyards (Sites 3, 4, 5, and 8) were recorded as well as two farmhouse complexes (Sites 1 and 6) and a historical power line (Site 9) (consisting of several pylons). Several of the pylons have been destroyed during mining activities. Note two sites are not older than 60 years, namely the farmworker home complex (Site 7) and a modern farmhouse complex (Site 2). The heritage findings are illustrated in Figure 10-27 and listed in Table 10-11 (Coetsee, 2017).

Table 10-11: Locations of Heritage Findings

Site No	Coordinates	Site Type	Field Rating of Significance
1	26.193523°S 29.364223°E	Historical farmhouse complex	Generally protected B: Medium significance
2	26.187109°S 29.331012°E	Modern farmhouse & structures	Generally protected C: Low significance
3	26.205577°S 29.320201°E	Graveyard	Generally protected A: High significance
4	26.207642°S 29.318044°E	Graveyard	Generally protected A: High significance
5	26.216761°S 29.316495°E	Graveyard	Generally protected A: High significance
6	26.217462°S 29.311251°E	Historical farmhouse complex	Generally protected C: Low significance
7	26.231409°S 29.308235°E	Farm worker houses and livestock kraal	Generally protected C: Low significance
8	26.230972°S 29.329867°E	Graveyard	Generally protected A: High significance
9	26.186580°S 29.314496°E 26.225042°S 29.355773°E	Historical power line	Generally protected B: Medium significance

srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** Heritage Sites within Dorstfontein East Coal Mine Extension Project	Project No 599507

Figure 10-27: Heritage Sites within Dorstfontein East Coal Mine Extension Project

10.11 Palaeontological Context

This section describes the palaeontological context of the surrounding area. Details from this section were sourced from the Palaeontological assessment, and can be found in Appendix U.

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. 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. 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 (Fourie, 2017).

Fossils likely to be found are mostly plants 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. The marine *bivalve Megadesmus* is found in the upper part of the Volksrust Formation near Newcastle.

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.

The threats the Palaeontological environment are earth moving equipment/machinery (for example haul trucks, front end loaders, excavators, graders, dozers) during construction, the sealing-in or destruction of fossils by development, vehicle traffic, mining activities, and human disturbance. Fossils were not found during the walk through, however, a protocol for finds and management must be compiled and adhered to. The project is located within a high palaeontological sensitivity zone as illustrated in Figure 10-28.

srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** Palaeontological High Sensitivity Zone	Project No. **499507**

Figure 10-28: Palaeontological High Sensitivity Zone

10.12 Topography

The catchment consists of moderately hilly to flat areas. The Dorstfontein West Mine is bordered by a small stream in the south, flowing in a westerly direction, away from the mine.

Rainfall that infiltrates the weathered rock soon reaches an impermeable layer of shale underlying the weathered zone. The movement of groundwater on top of this shale is lateral and in the direction of the surface slope. This water reappears on surface at fountains where a barrier, such as a dolerite dyke, paleo-topographic highs in the bedrock, obstructs the flow paths or where the surface topography cuts into the groundwater level at streams. It is suggested that less than 60% of the water recharged to the weathered zone eventually emanates in streams.

The proposed expansion of Pit 1 can be found at an elevation of 1560 metres above sea level (mbsl) to the north and 1600 mbsl to the south. The pipeline has an elevation of 1560 mbsl at the Dorstfontein West and 1540 mbsl at Dorstfontein East. An illustration of the Topography can be found in Figure 10-29.

10.13 Geology

The coal reserves located at Dorstfontein forms part of the coal-bearing sandstones and siltstones of the Vryheid Formation which rest either conformably on diamictites and associated glaciogenic sediments of probable Dwyka age, or uncomformably on basement rocks of the Lebowa Granite suite, which in turn is underlain by volcanic rocks of the Loskop Formation (GCS (Pty) Ltd, 2016).

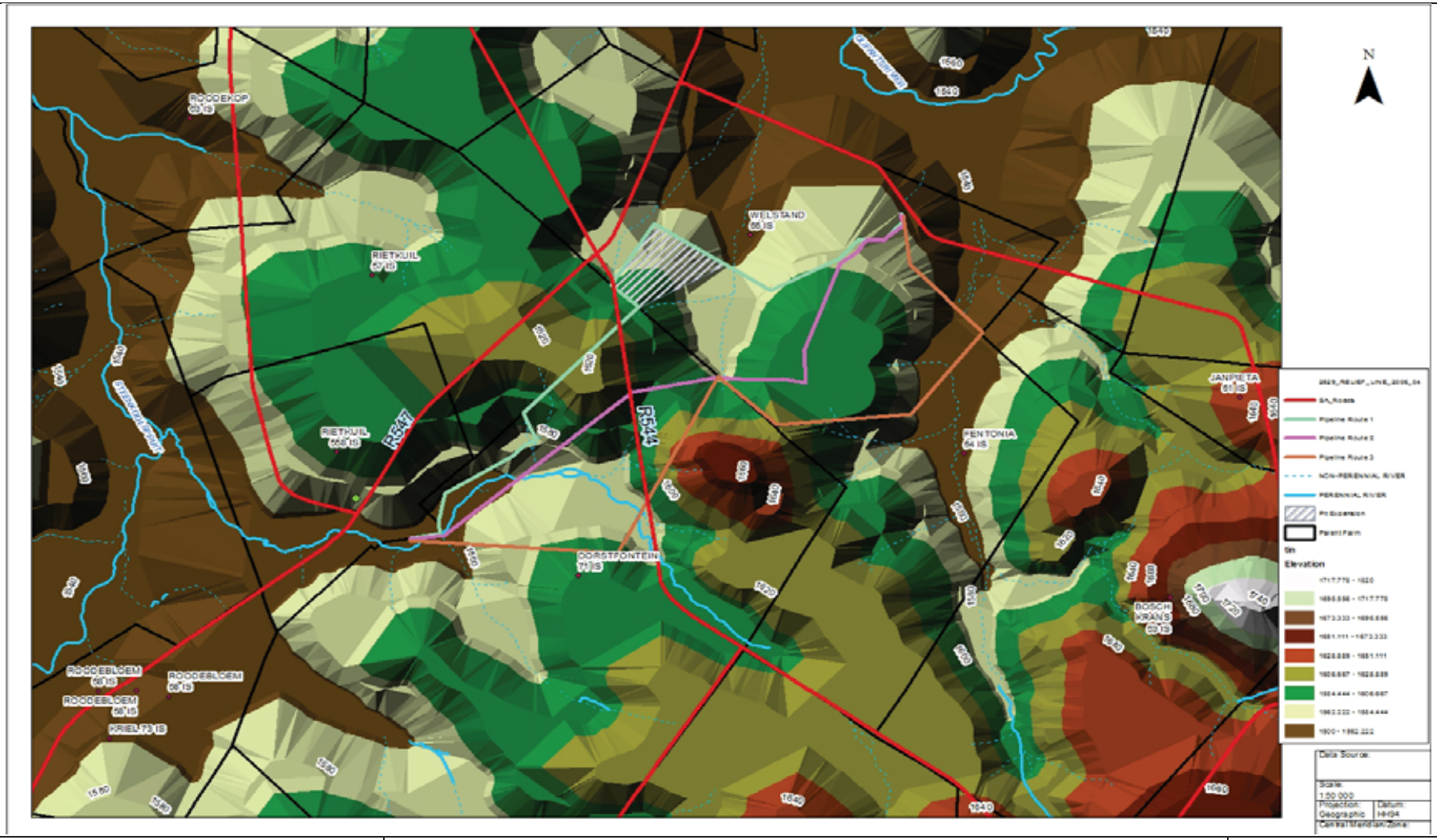
10.13.1 Regional Geology

The Karoo Supergroup in the Olifants Catchment compromises the Ecca Group and Vryheid Formation. The total thickness of these sediments ranges from 0 – 100 m. The area is underlain by coal-bearing sandstones and siltstones of the Vryheid Formation which rest either conformably on diamictites and associated glaciogenic sediments of probable Dwyka age, or uncomfortably on basement rocks of the Basement Granite. The Ecca sediments overlie the Dwyka Group. Refer to Figure 6.1 for the regional geology map.

Pre-Karoo basement rocks outcrop along the eastern section of the farming portion, bordering the Van Dyksdrfit–Bethal road, which belong to the Lebowa Granite suite (granite), which in turn is underlain by volcanic rocks of the Loskop formation.

10.13.2 Local Geology

The structural nature of the coal seam and the overburden formation has resulted in suboutcropping occurring in the western portions of the farm Dorstfontein. The seams targeted at DCME are mainly the No. 2 seam and No. 4 seam. In addition, The No. 1, 3 and 5 seams will be targeted in the opencast mines. The No. 4 Seam is divided into an Upper and Lower Seam. Both seams are widely developed, but it is the No. 4 Lower Seam that is the prime economic target of this coal field. Dolerite sills and dykes are also common in the coalfield.



srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** Illustration of the Topography in the Area	Project No 599507

Figure 10-29: Illustration of the Topography in the Area

10.14 Climate

Based on the meteorological data from the on-site weather station the climate in the project area is expected to be seasonal, with distinct warm months (September to February) and cool months (March to August). Rainfall is higher during the months from October to April and lower from May to September. The prevailing winds for this period are from the north, west-southwest and southeast, with lower occurrences from the east, east-southeast and south-southeast as observed on the site windroses. The average wind speed measured for all hours is 4.47 m/s with maximum speeds less than 11.1 m/s and with calms (<0.5 m/s) of 1.72%.

The data from Lakes Environmental shows average temperatures range from 8.5-20.4°C with maximum temperatures reaching a high of 30.1°C (December) and minimum temperatures at a low of -3.4 °C (July). A comparison between onsite data, and data obtained from Lakes Environmental is illustrated in Table 10-12.

Table 10-12: Temperature Comparison between on-site and Lakes Environmental

Month	On-site weather station			Lakes Environmental		
	Average	Maximum	Minimum	Average	Maximum	Minimum
January	20.1	36.1	7.4	20.3	29.6	10.8
February	20.5	44.0	11.5	20.1	29.4	10.6
March	19.0	30.7	6.8	18.3	26.8	9.6
April	16.7	28.9	4.6	14.5	25.1	4.1
May	13.9	26.9	2.5	11.8	20.6	1.4
June	10.1	23.0	-3.7	8.8	18.5	-1.1
July	10.2	22.5	-2.3	8.5	17.9	-3.4
August	14.1	29.0	-3.3	11.0	23.6	-1.1
September	17.3	32.3	4.5	14.8	25.2	0.6
October	19.8	33.5	2.0	16.6	27.9	3.1
November	19.6	30.9	4.8	18.6	28.1	4.9
December	21.4	34.2	12.8	20.4	30.1	9.9

10.14.1 Rainfall and Evaporation

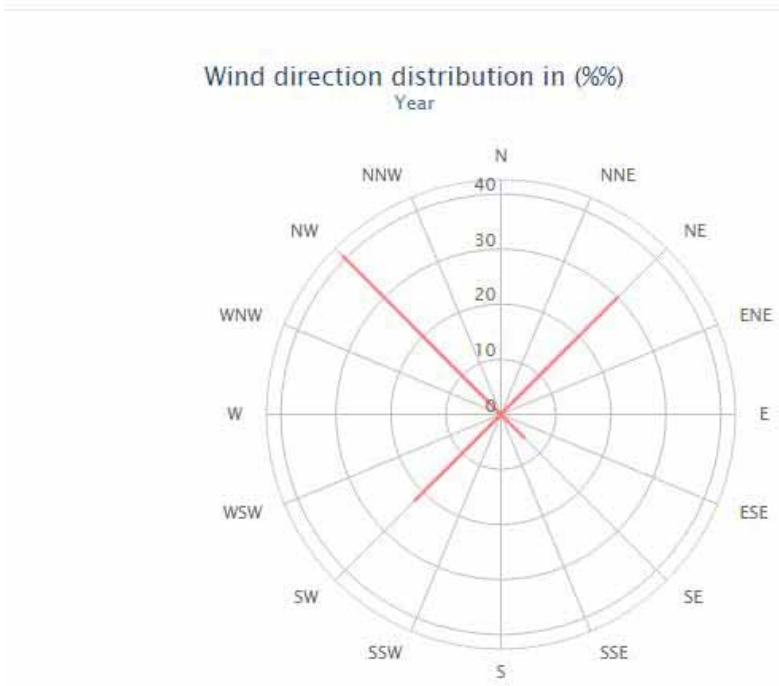
Relative humidity ranges from a minimum of 34% to a maximum of 94%, with dry atmospheric conditions dominating. The average annual rainfall of 700 mm is considerably less than the average annual A-pan evaporation of 1 840 mm. This results in the project area experiencing a negative water balance in relation to rainfall and evaporation. Evaporation, off open surfaces of water (lake evaporation), though less than A-pan values, will be significant (calculated at 1500 mm per annum) and plant-life in natural local grasslands will be dormant for long periods during the year. Although local climate change assessments do not indicate significant changes between long-term Mean Annual PreciPitation (MAP) and modelled ‘now climate’, a trend of increased early summer rainfall and decreased late summer rainfall is evident. Normal Dry Weather Conditions (rainfall and runoff values exceeded on average 70% of time) are used to describe climate change impacts. Trends of change in rainfall are magnified in modelled runoff. Table 10-13 illustrates the average rainfall patterns in millimetres.

Table 10-13: Average Rainfall Patterns

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Minimum	18.0	0.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0	5.3	28.4	25.6	307.2
Average	119.5	91.4	77.3	40.1	18.0	6.4	6.7	9.5	24.3	79.5	121.7	116.6	710.9
Maximum	231.6	317.4	235.5	144.1	184.1	78.3	67.8	66.6	179.7	204.4	458.0	278.2	1382.3

10.14.2 Wind Speed

The predominant wind direction within the proposed project area arises from the northwest to the southeast. Winds mainly ridge of the Indian Ocean high from the east but also occasionally passage of fronts from south or south-west. The winds generally bring in cold fronts. Mpumalanga has strong hourly mean winds in the northeast. On average, the wind probability is 33 % (Windfinder, 2017). The wind rose illustrating the wind direction and distribution for the area can be found in Figure 10-30.



srk consulting	**PIT EXTENSION AND PIPE CONSTRUCTION** Wind Direction and Distribution	Project No. 499507

Figure 10-30: Wind Direction and Distribution (Windfinder, 2017).

11 Alternatives Considered

Currently, only opencast mining is practiced and in future undermining will be undertaken. Two opencast Pit are currently mined on the eastern side and western side of the resource area with mining taking place in both the 2 and 4 seams. Dorstfontein Mines is now planning to extend its operations on the western side of the mine referred to as Pit 1 extension. The area is part of the current approved mining right area but it has not been included in the current Environmental Management Programme Report and Life of Mine. Additionally, a water pipeline is to be constructed.

Although there is little difference between the proposed opencast methods between Option 1 and Option 2, the decision to go with either has apparent negligible socio-economic impacts. However, the continuation and assumed extension of employment of workers currently working on the Dorstfontein East operations suggests that Option 2 is the preferred option. This is because the livelihoods and employment status of those workers will be maintained, resulting in job security and sustainable livelihood outcomes for both workers and their dependants. This is of particular importance to those employed form the local area because of the low socio-economic base and vulnerability to poverty and unemployment.

11.1 Alternative 1

In Alternative 1, the opencast method of mining will continue as normal from the existing Pit 1 until the planned Pit is depleted. The Pit 1 Extension will follow with a slight change in the mining direction until the complete Reserve is depleted. The production rates may be adjusted from time to time during the life of Pit 1 extension. The planned production rates at the time of compiling the depending on the strip lengths. Mining Work Program was to mine the opencast at a RoM production of ± 180 Kt per month mining both the No. 4 Seam Upper and Lower and the No. 2 Upper and Lower seam in a roll over method of opencast mining. Production is planned to ramp up from 500 Kt to 1.3 Mt per annum over a 10-year period. Current estimates indicate a LoM of 10 years for the Pit 1 NW Extension. The LOM for the Pit 1 Extension was determined using a scheduled production rate of 180 Kt per month (2.16 Mt per annum) for the extraction of the Coal Resource.

11.2 Alternative 2

11.2.1 Opencast and Underground Mining Phases

Option 2 is to mine the Pit 1 Extension by means of opencast methods on the right hand side (right hand side of the igneous intrusion-sill break through) North Eastern side of the Pit 1 Extension and to mine the left hand side North West of the Pit 1 Extension by means of conventional mechanised underground mining using continuous miners.

11.2.2 Opencast Mining for the Area to the East

Earth moving mining equipment will be used to conduct the OC mining on the right hand side of the igneous intrusion (sill break through), that will be a combination of excavators, front-end-loaders as well as in-Pit coal drilling machines, haul trucks and track bulldozers (as in option 1). Underground operations will commence once the OC operation has been completed. The production will be at a reduced rate of ~40 Kt per month (480 Kt per annum). This reduction in tonnes is due to limited Pit length. The estimated LoM for the opencast mine will be ~7 years.

11.2.3 Underground Phase of Alternative 2

The UG construction phase in Option 2 will commence at the end of 2021 with first production planned for April 2022 ramping up to full production by June 2022. The second section will be

introduced in Mach 2023 as Pit room is opened up by the first section. Estimates show that the UG LOM for No. 4 Seam Lower mining is two years. No UG mining for the No. 2 Seam is planned.

Table 11-1: Summary of Proposed Alternatives

Option 1	Option 2 Opencast Phase	Option 2 Underground Phase
Mining Method		
• Opencast method of mining will continue as normal from the existing Pit 1 until the planned Pit is depleted; • Pit 1 Extension will follow with a slight change in the mining direction; and • Roll over method suggested. The roll over method involves the removal of a long strip of overburden. This method is favoured where coal is located close to the surface.	• Pit 1 Extension will follow existing Pits depletion; and • Mining of Pit 1 Extension by means of opencast methods on the right hand side of the North Eastern side of the Pit 1 Extension and to mine the left hand side North West of the Pit 1 Extension.	• Underground construction phase in Option 2 will commence at the end of 2021; • First production is planned for April 2022 ramping up to full production by June 2022; • The second phase will be introduced in March 2023 as Pit room is opened up by the first section; and • Will be mining the No. 4 seam only.
Equipment Used		
• Combination of excavators, front-end-loaders as well as in-Pit coal drilling machines, haul trucks and track bulldozers.	• Opencast mining for the area to the east through the use of earth moving mining equipment to conduct the opencast mining on the right hand side of the igneous intrusion (sheet of newer rock that has “intruded” between older layers of rock); and • Here, the addition of a combination of excavators, front-end-loaders as well as in-Pit coal drilling machines, haul trucks and track bulldozers (as in Option 1).	• Conventional mechanized underground mining using continuous miners.
Estimated Production		
• Production rates may be adjusted during the life of the Pit 1 Extension; • Opencast will be mined at a run of mine production of ± 180 Kilotons per month	• Production at a reduced rate of estimated 40 Kilotons per month (480 Kilotons per annum); and • Reduction due to limited Pit length.	• 1 191 630 tons in 2022, reducing to 688 908 tonnes in 2023.

Option 1	Option 2 Opencast Phase	Option 2 Underground Phase
mining both the No. 4 and No. 2 seam; and • Production is planned to ramp up from 500 Kilotons to 1.3 Megatons per annum over a 10 year period.		
Life of Mine		
• Estimated LOM: 10 years.	• Estimated LOM: 7 years.	• Estimated LOM: 2 years.

11.2.4 Pipeline Routes

Table 11-1 indicates the position of the three alternative pipeline routes that were identified for the proposed Dorstfontein expansion Project. All three routes, to some extent, use existing roads and infrastructure corridors. This is particularly true of Route 1, which makes use of existing farm and mine roads and crosses the R544. As such, Route 1 is the preferred route, as it does not dissect as many of the surrounding cultivated farms, which is the case for both Routes 2 and 3. Importantly, all three routes are in close proximity to or dissect agricultural areas; however, it has been assumed that the majority of the pipeline infrastructure will be buried. As such, the real interruptions to everyday access and farm activity will occur at construction as the pipes are excavated and installed on agriculture lands. Following this, farmers would be able to continue their activities, if the pipelines largely run underground.



srk consulting | PIT EXTENSION AND PIPE CONSTRUCTION Photographs along the Pipeline Routes | Project No. 499507

Figure 11-1: Photographs along the Proposed Pipeline Route 1

11.2.5 No-Go Alternative

If the project does not go ahead, then the economic benefits of expanding Pit 1 will not be realised through Exxaro. If Exxaro were not to proceed with the proposed operation, mining of these reserves will not necessarily be avoided, as another application in terms of the MPRDA and NEMA can be made by another company.

The proposed project will lengthen the LoM, which directly affects job opportunities in the area, through lengthening their terms of employment. Should the project not go ahead the identified biophysical, social and cultural impacts will not be experienced and the Dorstfontein Mines will be forced to close down prematurely.

Although a number of biophysical, social and cultural impacts have been identified, these can be mitigated and managed in accordance through the implementation of the EMPr and monitoring recommendations.

12 Methodology for the Assessment of Impacts

All specialists were required to assess each identified potential impact according to the following Impact Assessment Methodology as described below. This methodology has been utilised for the assessment of environmental impacts where the consequence (severity of impact, spatial scope of impact and duration of impact) and likelihood (frequency of activity and frequency of impact) have been considered in parallel to provide an impact rating and hence an interpretation in terms of the level of environmental management required for each impact.

The first stage of any impact assessment is the identification of potential environmental activities[1], aspects[2] and impacts which may occur during the commencement and implementation of a project. This is supported by the identification of receptors[3] and resources[4], which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. Environmental impacts[5] (social and biophysical) are then identified based on the potential interaction between the aspects and the receptors/resources.

The significance of the impact is then assessed by rating each variable numerically according to defined criteria as outlined in Table 12-1. The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity6, spatial scope7 and duration8 of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity9 and the frequency of the impact10 together comprise the likelihood of the impact occurring and can obtain a maximum value of 10. The values for likelihood and consequence of the impact are then read off a significance rating matrix table as shown in Table 12-2.

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[1]An ***activity*** is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or pieces of infrastructure that are possessed by an organisation.

[2]An ***environmental aspect*** is an 'element of an organisations activities, products and services which can interact with the environment'. The interaction of an aspect with the environment may result in an impact.

[3]***Receptors*** comprise, but are not limited to people or man-made structures.

[4]***Resources*** include components of the biophysical environment.

[5]***Environmental impacts*** are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. Receptors can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as aquifers, flora and palaeontology. In the case where the impact is on human health or well-being, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is.

[6]***Severity*** refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.

[7]***Spatial scope*** refers to the geographical scale of the impact.

[8]***Duration*** refers to the length of time over which the stressor will cause a change in the resource or receptor.

[9]***Frequency of activity*** refers to how often the proposed activity will take place.

[10]***Frequency of impact*** refers to the frequency with which a stressor (aspect) will impact on the receptor.

This matrix thus provides a rating on a scale of 1 to 150 (low, medium low, medium high or high) based on the consequence and likelihood of an environmental impact occurring.

Natural and existing mitigation measures, including built-in engineering designs, are included in the pre-mitigation assessment of significance. Measures such as demolishing of infrastructure, and reinstatement and rehabilitation of land, are considered post-mitigation.

Table 12-1: Criteria for Assessing Significance of Impacts

SEVERITY OF IMPACT	RATING
Insignificant / non-harmful	1
Small / potentially harmful	2
Significant / slightly harmful	3
Great / harmful	4
Disastrous / extremely harmful	5

SPATIAL SCOPE OF IMPACT	RATING
Activity specific	1
Mine specific (within the mine boundary)	2
Local area (within 5 km of the mine boundary)	3
Regional	4
National	5

DURATION OF IMPACT	RATING
One day to one month	1
One month to one year	2
One year to ten years	3
Life of operation	4
Post closure / permanent	5

CONSEQUENCE

FREQUENCY OF ACTIVITY / DURATION OF ASPECT	RATING
Annually or less / low	1
6 monthly / temporary	2
Monthly / infrequent	3
Weekly / life of operation / regularly / likely	4
Daily / permanent / high	5

FREQUENCY OF IMPACT	RATING
Almost never / almost impossible	1
Very seldom / highly unlikely	2
Infrequent / unlikely / seldom	3
Often / regularly / likely / possible	4
Daily / highly likely / definitely	5

LIKELIHOOD

Table 12-2: Interpretation of Impact Rating

Likelihood \ Consequence	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
3	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
4	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
5	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
6	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
7	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
8	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
9	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
10	10	20	30	40	50	60	70	80	90	100	110	120	1	140	150

	High	76 to 150	Improve current management
	Medium High	40 to 75	Maintain current management
	Medium Low	26 to 39	
	Low	1 to 25	No management required

SIGNIFICANCE = CONSEQUENCE x LIKELIHOOD

13 Impact Assessment

This section contains the assessment of potentially positive and negative environmental impacts that can be caused by the proposed project. The impacts are linked to the activities conducted for the proposed development, broadly relating to pre-construction, construction, operations and decommissioning phases. Specific emphasis was placed on any relevant environmental, social and economic impacts identified by the specialist studies, comments received during the Stakeholder Engagement Process, issues highlighted by relevant authorities; as well as a professional judgement of the EAP team through appraisals on the project description, listed activities and the receiving environment.

The objectives for each of the potential environmental impacts identified was to determine their significance and to promote mitigation measures to reduce the impacts to an acceptable level where required.

All of the identified impacts are assessed in this section. Considering the general nature of the proposed project, this section will take cognisance of the pre-construction, construction, operational, and decommissioning phases. This is intended to:

- Enable to facilitate the preferred alternative during the decision making process of the DMR; and
- Enable stakeholders to understand the potential impact of the project.

Key potential positive and negative environmental issues relating to the proposed project were identified based on the finding from I&APs responses, specialist studies, as well as the professional judgement from the EAP conducting the EIA, according to the adopted methodology for assessing impacts as described in Section 12.

13.1 Pre-Construction Phase

During the pre-construction phase, the following main activities will take place:

- Site clearing and grubbing of the footprint areas associated Pit 1 extension and pipeline route;
- Site surveillance for any RDL species;
- Surveillance and marking of graves and cultural artefacts;
- Conduct a Phase 2 Heritage assessment and grave relocation;
- Removal of vegetation (shrubs and trees) to be relocated, monitored and maintained;
- Stripping and stockpiling of soils on a topsoil stockpile area;
- Preparation of the contractor's yard. All equipment and vehicles to be used during the pre-construction and construction phases will be stored at this facility;
- Possible grave relocation and application for destruction permits from SAHRA.

Where significance ratings differ between alternatives, these are indicated in the assessment tables. The impact assessment for the pre-construction phase can be found in Table 13-1. The following impacts are envisaged during the pre-construction phase.

13.1.1 Socio – Economic Impacts

The following socio – economic impacts are envisaged as a result of the pre-construction phase of the proposed project:

- Positive impact on the possible temporary job opportunities. The pre-construction of proposed project will inherently require additional employment opportunities. Contractors will be appointed for the pre-construction activities;

- Positive impact on local economy due to economic opportunities for local and regional business
- Grievances as a result of possible grave relocation;
- Due to the occurrence of additional trucks on the roads, and the incidence of construction workers on site, health and safety impacts on local communities may include construction workers lighting fires on site, littering and driving irresponsibly;
- Potential increase in social pathologies and negative health impacts due to contractor camp and potential squatting of job seekers.

13.1.2 Groundwater Impacts

The Pit 1 expansion and pipeline construction may possible result in the following impacts on the geo-hydrology of the area during the pre-construction phase are as follows:

- Machinery and equipment used for the construction of the contractor's camps and local earthworks pose a risk of local spillages of oils which may leach to groundwater. Clearing of clay soils and vegetation could involve the use of machinery. The clearing of the vegetation and stripping of clay top soil could potentially result in slightly higher infiltration rate to the unsaturated zone. The removal of vegetation could furthermore lower the evapotranspiration rates, thereby allowing a greater volume of potentially contaminated water to percolate to the underlying aquifer in the event of an accidental spill from the machinery;
- Monitoring borehole on the border of the Pit 1 expansion area may be a conduit of flow to the groundwater unless sealed;
- Site clearing and grubbing is unlikely to materially affect the groundwater within the project area. However, care should be taken during the utilisation and storage of hydrocarbons and chemicals, which may impact on groundwater as a result of spillages and uncontrolled release.

13.1.3 Surface Water Impacts

The potential impacts on surface water during the pre-construction phase of the proposed project are as follows:

- Direct Impact as a result of an increase in erosion from cleared areas, topsoil stockpiles or any other area where there are exposed soils can occur during storm events;
- Indirect impact due to Increased erosion can result in an increase in turbidity, suspended solids and sedimentation of nearby water resources (unnamed tributary);
- Accidental hazardous substances spillage during site establishment.

Some level of sedimentation is expected to occur in the unnamed tributary pre-development as runoff is naturally anticipated to pick up environmental debris as it crosses natural areas. Increased turbidity is reversible and surface water should return to pre-impact turbidity levels once sediment levels entering the watercourse are reduced. Settled sediments should naturally move downstream during periods of high flow flowing storm events.

13.1.4 Biodiversity Impacts

The Pit 1 expansion and construction of the water pipeline may result in the following impacts on the floral environment during the pre-construction phase:

- Destruction of potential floral habitats for species of conservational concern;

- Insufficient planning of infrastructure placement and design leading to floral habitat loss of potential species of conservational concern;
- Potential spreading of alien invasive species as a result of floral disturbance;
- Failure to initiate a rehabilitation plan and alien control plan during the pre-construction phase may lead to further impacts during the construction and operation phase.

The Pit 1 expansion and construction of the water pipeline may result in the following impacts on the faunal environment during the pre-construction phase:

- Placement of infrastructure within areas of potential faunal species of conservational concern habitats;
- Fragmentation of species migration as a result of the pipeline construction;
- As a result of bush clearing RDL species may be removed or killed. Careful planning and relocated of RDL species will be necessary;
- Failure to initiate a rehabilitation plan and alien control plan during the pre-construction phase may lead to further impacts during the construction and operation phase.

13.1.5 Wetland and Aquatic Environmental Impacts

The Pit 1 expansion and water pipeline construction may result on the following envisaged impacts during the pre-construction phase:

- Placement of infrastructure in sensitive wetland habitat areas resulting in the loss of ecological structure;
- Potential poor planning, resulting in the placement of the linear development within wetland habitat, leading to altered habitat;
- Increased anthropogenic activity within the wetland feature leading to an increased impact on the biological structure of the wetland features and the associated effects that this will have on service provision;
- Bush clearing and erosion may cause localised impacts on water quality which may affect the aquatic habitats and ecology within the area;
- Failure to initiate a rehabilitation plan and alien control plan during the pre-construction phase may lead to further impacts during the construction and operation phase.

13.1.6 Air Quality Impacts

The impact the postposed project is envisaged to have on the air quality of the area during the pre-construction phase are as follows:

- Possible increase in dust generation as a result of bulk earthworks, operation of heavy machinery, and material movement;
- Increase in carbon emissions and ambient air pollutants (NO_2 and SO_2) as a result of movement of vehicles and operation of machinery/equipment.

13.1.7 Blast and Vibration Impacts

No blasting and vibration impact is envisaged as a result of the pre-construction phase of the proposed project. Should any vibration activities be required at the time of the pre-construction phase, mitigation and management measures as proposed during the construction and operation phase of the proposed Pit 1 expansion will be implemented.

13.1.8 Visual Impacts

The following impacts on the visual character as a result of the proposed Pit 1 expansion and construction of a water pipeline are envisaged during the pre-construction phase:

- Scaring of the landscape as a result of the clearance of vegetation;
- Visual intrusion as a result of the movement of machinery and the erection of contractor camps.

13.1.9 Noise Impacts

The following noise impact is envisaged as a result of the pre-construction phase of the proposed project:

- The use of vehicles and machinery during the pre-construction phase may generate noise in the immediate vicinity.

13.1.10 Soils, Land Use and Land Capability Impacts

The following impacts on soils, land use and land capability are envisaged as a result of the pre-construction phase of the proposed project:

- Clearing of vegetation and compaction of the construction footprint will result in the soils being particularly more vulnerable to soil erosion. The impact can persist long after cessation of mining activities depending on mitigation strategies. Strategic stormwater management should be put in place to minimise soil losses. Impact significance can be reduced to low with implementation of appropriate soil management practices;
- Soil contamination as a result of pre-construction activities can be as a result of a number of activities (i.e. hazardous substance storage, incidental hydrocarbon leakages from construction vehicles);
- Loss of soil resource and utilisation as a result of the cleaning and topsoil stripping of the construction footprint. Although soils will be stripped and stockpiled, loss of seed reserve and organic matter depletion through decomposition during stockpiling will severely reduce soil quality and its ecological function if not managed appropriately. This phenomenon would be aggravated and worsen with time and ultimately lower the effectivity of the rehabilitation. Re-vegetation should be imposed as far as is possible to maintain soil fertility through natural nutrient cycling during soil storage prior to rehabilitation phase;
- As a result of pre-construction activities, the land use will have altered from grazing and agriculture to that of construction for mining activities. The land capability will be changed and will be used primarily for construction activities and subsequent mining activities;
- The land capability will be reduced as a result of a decreased nutrient status through de-nitrification and leaching due to stripping and stockpiling footprint areas;
- Generation of dust resulting in the reduction of the land capability.

13.1.11 Heritage Impacts

The following impacts are envisaged on archaeological artefacts and graves as a result of the pre-construction phase of the proposed project:

- The proposed project has the potential to impact on local graves within the area. Two grave sites were observed within the footprint of the proposed pipeline route;
- The proposed project has the potential to impact on sites of archaeological importance. Historic power line pylons are present within the proposed footprint;

13.1.12 Palaeontology Impacts

The following impacts are envisaged on the Palaeontology context during the pre-construction phase of the proposed project:

- Sealing-in or destruction of the fossils during earth moving activity.

13.1.13 Topography Impacts

As a result of pre-construction activities the following impacts are envisaged as a result of the pre-construction phase:

- Minor changes in the topography may be experienced as a result of bush clearing and construction vehicles on site. This will be minimal and of a short duration.

13.1.14 Geology Impacts

As a result of pre-construction activities no significant impacts on the Geology are anticipated.

13.1.15 Climate Impacts

As a result of pre-construction activities the following impact is envisaged on the climate in the area:

- Emissions of Green House Gases as a result of the use of plant and heavy moving machinery.

Table 13-1: Potential Impacts and mitigation measures associated with the pre-construction phase of the proposed Pit 1 expansion and water pipeline

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelihood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating		Management and Mitigation Measures	Timeframe	Consequence			Likelihood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact						Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Socio – Economic Impacts																		
Direct	Positive impact on the possible temporary job opportunities.	3	3	2	2	2	**32**	**ML Maintain Current Management**	Increase local employment.	1. Where it is possible, hire/use local personnel; 2. Identify opportunities for the employment/procurement and training of people and contractors from the local area; 3. Opportunities for local employment may include activities related to site clearance, digging of trenches and building of the open Pit; 4. Based on these opportunities, develop a recruitment and training strategy that the main construction contractors will have to adhere to; 5. Monitor implementation of local recruitment and training strategies, including monitoring of corruption and nepotism; 6. Employment and training of the youth and females where possible; 7. Implementation of employment and procurement policy; 8. Communication with locals regarding job opportunities and skills requirements to manage expectations.	1 month to 1 year	3	3	5	4	3	**77**	**H Improve Current Management**
Indirect	Impact on local economy due to economic opportunities for local and regional business	2	2	2	2	2	**24**	**L No Management Required**	Increase local procurement.	1. Procurement of suppliers must be as per the SLP and Exxaro policy and standards; 2. Develop a register of local business; 3. Open communication channel with the local community around Exxaro regarding opportunities to register on the Exxaro suppliers list to manage expectations; 4. Potential upskilling and training allowances to be included as per the SLP; 5. Where it is possible, request contractors hire/use local personnel; 6. Identify opportunities for the employment/procurement and training of people and contractors from the local area. 7. Opportunities for local employment may include activities related to site clearance, digging of trenches and building of the open Pit; 8. Based on these opportunities, develop a recruitment and training strategy that the main construction contractors will have to adhere to; 9. Monitor implementation of local recruitment and training strategies, including monitoring of corruption and nepotism; 10. Employment and training of the local youth and females where possible; 11. Communication with locals regarding service/job opportunities and skills requirements to manage expectations.	Life of Mine	3	3	2	2	2	**32**	**ML Maintain Current Management**
Direct	Grievances as a result of possible grave relocation.	4	3	5	2	2	**48**	**MH Maintain Current Management**	Reduce the impacts on local cultural sense of place.	1. Communication must be transparent and open with stakeholders; 2. Conduct the stakeholder engagement as per the NHRA during the relocation process.	1 month to 1 year	2	1	3	2	2	**24**	**L No Management Required**
Indirect	Due to the occurrence of additional trucks on the roads, and the incidence of construction workers on site, health and safety impacts on local communities may include construction workers lighting fires on site, littering and driving irresponsibly	2	2	3	2	2	**28**	**ML Maintain Current Management**	Limit the risks posed by heavy machinery	1. Construction vehicles to be road worthy and drivers to adhere to speed limits; 2. Fires are prohibited on site and emergency procedures are in place; 3. Contractors adhere to Exxaro standards and requirements, Exxaro Safety Health and Environmental policies, as well as relevant South African regulations such as the Occupational Health and Safety Act No. 181 of 1993, as amended; 4. Inform Exxaro employees and neighbouring landowners and inhabitants about construction timeframes and activities, and give regular updates; 5. Ensure a grievances procedure is in place and communicated.	1 month to 1 year	2	2	2	2	2	**24**	**L No Management Required**

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelihood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating		Management and Mitigation Measures	Timeframe	Consequence			Likelihood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact						Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Indirect	Potential increase in social pathologies and negative health impacts due to contractor camp and potential squatting of job seekers.	3	2	2	2	2	**28**	**ML Maintain Current Management**	To minimise social pathogens and unhealthy behaviour	1. Ensure a grievances procedure is in place for local people to log grievances; 2. Implement local recruitment and training strategies and policies, and clearly communicate these locally through relevant authorities and media; 3. Do not recruit informally at the gate but follow a formal recruitment process; 4. Make use of local accommodation for workers, as opposed to a construction camp; 5. Inform Exxaro employees and neighbouring landowners and inhabitants about local recruitment strategies and policies, and give regular updates; 6. Monitor the surrounding area for illegal informal settlement and develop a strategy to deal with illegal settlement; 7. Ensure that all contractors and their employees attend inception training, addressing Exxaro standards and requirements, Exxaro Safety Health and Environmental policies, relevant South African regulations, the environmental management plan, and recruitment strategies	1 month to 1 year	3	1	3	2		**14**	**L No Management Required**
Groundwater Impacts																		
Direct	Local spillages of hydrocarbons and chemicals which may leach to groundwater.	3	2	2	2	2	**28**	**ML Maintain Current Management**	To prevent a significant increase in alien invasive species abundance and spread	1. All spillages will need to be cleaned up as soon as practically possible; 2. Proper management of stormwater drainage infrastructure should be ensured; 3. Vehicles and machinery will be maintained in good order to minimise leakages; 4. Employees will report spillages as soon as they are discovered and the spillages will be cleaned up immediately.	1 month to 1 year	2	2	2	2	2	**24**	**L No Management Required**
Indirect	Monitoring borehole on the border of the Pit 1 expansion area may be a conduit of flow to the groundwater unless sealed.	4	2	3	3	3	**54**	**MH Maintain Current Management**	To prevent habitat fragmentation with specific reference to the proposed pipeline	1. Grouting and capping of boreholes located within the footprint of construction camps be required prior to construction activities.	1 month to 1 year	2	1	2	3	2	**25**	**L No Management Required**
Surface Water Impacts																		
Direct	Increase in erosion from cleared areas	4	3	3	3	3	**60**	**MH Maintain Current Management**	Prevent erosion and sedimentation.	1. Construct in the dry season and install silt bunds; 2. Erosion control measures will be implemented as soon as erosion has become evident. Water velocity will be reduced as far as feasible.	1 month to 1 year	1	2	2	2	2	**20**	**L No Management Required**
Indirect	Increase in turbidity, suspended solids and sedimentation of nearby water resources	4	3	3	3	3	**60**	**MH Maintain Current Management**		2. Limit disturbed footprint and install retardation structures	1 month to 1 year	1	2	2	2	2	**20**	**L No Management Required**
Direct	Accidental hazardous substances spillage during site establishment	4	3	3	3	3	**60**	**MH Maintain Current Management**	Prevent surface water contamination and reduction in water quality.	1. Operate using best practises by storing hazardous substances in an adequately sized bunded area, with appropriate safety equipment; 2. Place spill kits on site which are operated by trained staff members for the *adhoc* remediation of minor chemical and hydrocarbon spillages.	1 month to 1 year	1	2	2	2	2	**20**	**L No Management Required**
Biodiversity Impacts																		
Direct	Destruction of potential faunal and floral habitats for species of conservational concern.	3	2	2	3	3	**42**	**MH Maintain Current Management**	Conserve species of conservational concern.	1. Should any floral or faunal species of conservational concern be encountered within the linear development during the construction phase, the following should be ensured: 2. Effective relocation of individuals to suitable similar habitat in the vicinity of the linear development must be ensured; 3. All rescue and relocation plans should be overseen by a suitably qualified specialist. 4. It is recommended that site clearing takes place in a phased manner to allow for any faunal species present to move away from the linear development; 5. Avoid placement of the linear development within the sensitive wetland habitat unit	1 month to 1 year	1	1	2	2	2	**16**	**L No Management Required**

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelihood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating		Management and Mitigation Measures	Timeframe	Consequence			Likelihood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact						Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
	Insufficient planning of infrastructure placement and design leading to faunal and floral habitat loss of potential species of conservational concern	3	3	4	2	2	**40**	**MH Maintain Current Management**		1. Avoid placement of the linear development within the sensitive wetland habitat unit. If this is unavoidable, wetland crossing are to be made at an acute angle to the wetland.	1 month to 1 year	2	2	2	2	2	**24**	**L No Management Required**
Direct	Failure to initiate a rehabilitation plan and alien control plan during the pre-construction phase may lead to further impacts during the construction and operation phase	3	3	4	2	2	**40**	**MH Maintain Current Management**	Reduce impacts arising from insufficient rehabilitation.	1. Restrict vehicles to travelling only on designated roadways to limit the ecological footprint of the proposed development activities; 2. No dumping of waste should take place. If any spills occur, they should be immediately cleaned up; 3. No trapping or hunting of any faunal species is to take place.	1 month to 1 year	2	2	2	2	2	**24**	**L No Management Required**
Direct	Fragmentation of species migration as a result of the pipeline construction	2	2	3	2	3	**35**	**ML Maintain Current Management**	Conserve species diversity and migration.	1. No uncontrolled fires whatsoever should be allowed.	1 month to 1 year	1	2	3	2	2	**24**	**L No Management Required**
Direct	As a result of bush clearing RDL species may be removed or killed. Careful planning and relocated of RDL species will be necessary	2	2	3	2	3	**35**	**ML Maintain Current Management**	Protect Red Data Listed Species	1. A rehabilitation plan must be compiled and implemented at the start of the project; 2. Rehabilitation should be conducted concurrently during construction.	1 month to 1 year	1	2	3	2	2	**24**	**L No Management Required**
Wetland and Aquatic Environmental Impacts																		
Direct	Placement of infrastructure in sensitive wetland habitat areas resulting in the loss of ecological structure.	3	3	3	4	4	**72**	**MH Maintain Current Management**	Conserve ecological structure.	1. Access roads for support vehicles, and vehicles used in the construction of the crossings, should not encroach into the freshwater features	1 month to 1 year	1	2	3	2	2	**24**	**L No Management Required**
Direct	Potential poor planning, resulting in the placement of the linear development within wetland habitat, leading to altered habitat.	4	3	4	3	3	**66**	**MH Maintain Current Management**	Prevent the destruction of wetland habitats.	1. Wetland areas other than the immediate areas of crossing are to be demarcated as no-go areas for vehicles and construction personnel; 2. Vegetation removal should be kept at a minimum to avoid loss of freshwater features' assimilation and attenuation abilities	1 month to 1 year	1	2	2	2	2	**20**	**L No Management Required**
Direct	Increased anthropogenic activity within the wetland feature leading to an increased impact on the biological structure of the wetland features and the associated effects that this will have on service provision.	2	3	4	4	3	**63**	**MH Maintain Current Management**	Conserve the biological structure of wetlands	1. Rehabilitation should be conducted in a manner that ensures that the wetland features' conditions are reinstated to as natural a state as possible	1 month to 1 year	1	1	2	3	3	**24**	**L No Management Required**
Direct	Bush clearing and erosion may cause localised impacts on water quality which may affect the aquatic habitats and ecology within the area	1	1	2	4	4	**32**	**ML Maintain Current Management**	Minimise the impact on water quality.	1. All construction must be done in such a manner so as to ensure species migration will take place by ensuring a suitable structure height to allow species to move under or over the pipelines and roads.	1 month to 1 year	1	1	2	3	3	**24**	**L No Management Required**

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		Consequence			Likelihood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating		Management and Mitigation Measures	Timeframe	Consequence			Likelihood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact						Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Direct	Failure to initiate a rehabilitation plan and alien control plan during the pre-construction phase may lead to further impacts during the construction and operation phase	4	3	3	3	4	**70**	**MH Maintain Current Management**	Reduce impacts following closure.	1. Any storage facilities and all other non-essential activities should be located away from the identified wetlands in order to avoid water and soil contamination.	1 month to 1 year	1	2	2	2	3	**25**	**L No Management Required**
Air Quality Impacts																		
Direct	Possible increase in dust generation as a result of bulk earthworks, operation of heavy machinery, and material movement;	3	3	2	2	4	**48**	**MH Maintain Current Management**	Re-vegetate as soon as possible	1. The relevant exposed construction site areas and access gravel roads will be irrigated on a regular basis, with just enough moisture to keep the dust down without creating undue runoff; 2. Construction material and debris will be kept wet with just enough moisture to keep the dust down without creating undue runoff; 3. Volumes of water used for dust suppressant will be monitored monthly; 4. A dust monitoring programme must be implemented that effectively monitors dust related impacts from the project area; 5. A dust monitoring programme will be established. Any results exceeding the legal limit will be addressed as soon as possible; 7. Speed limited will be restricted.	1 month to 1 year	1	2	2	3	2	**25**	**L No Management Required**
Direct	Increase in carbon emissions and ambient air pollutants (NO2 and SO2) as a result of movement of vehicles and operation of machinery/equipment	3	3	2	2	2	**32**	**ML Maintain Current Management**	Ameliorate topsoil fertility	1. Prohibit unnecessary idling of vehicles; 2. All vehicles and equipment used during the pre-construction phase will be serviced and maintained on a regular basis.	1 month to 1 year	1	2	2	3	2	**25**	**L No Management Required**
Blast and Vibration Impacts																		
The activities associated with the pre-construction phase are unlikely to cause any significant blast and vibration impacts. No material impact is anticipated thus no mitigation measures are required.																		
Visual Impacts																		
Indirect	Scaring of the landscape as a result of the clearance of vegetation.	2	3	4	3	3	**54**	**MH Maintain Current Management**	To minimise visual disturbance and sense of place.	1. The relevant exposed construction site areas and access gravel roads will be irrigated on a regular basis, with just enough moisture to keep the dust down without creating undue runoff; 2. Natural vegetation, wherever practical, must be retained on and around the preconstruction sites; 3. Cleared areas will be kept as small as possible; 4. All lights used for illumination (except for lighting associated with security) should be faced inwards and shielded to avoid light escaping above the horizon.	1 month to 1 year	1	2	2	2	3	**25**	**L No Management Required**
Direct	Visual intrusion as a result of the movement of machinery and the erection of contractor camps.	2	3	3	3	3	**48**	**MH Maintain Current Management**		1. Construction activities will have been screened from sensitive receptors and rubble removed from site on a regular basis; 2. Litter and dust management measures should be in place at all times; 3. The sites should be kept neat and tidy at all times; 4. On site pre-construction activities will be limited to be undertaken between 6am and 6pm.	1 month to 1 year	1	2	3	2	2	**24**	**L No Management Required**
Noise Impacts																		
Indirect	The use of vehicles and machinery during the pre-construction phase may generate noise in the immediate vicinity.	1	1	2	2	3	**20**	**L No Management Required**	Minimise the generation of noise.	1. Hauling vehicles with low noise levels to be used and must be maintained in a good order at all times; 2. Maintenance plan to be put in place and to be followed; 3. Conduct baseline noise monitoring prior to constriction activities; 4. Implement a noise monitoring programme to measure against the baseline noise assessment; 5. The project will investigate using equipment and applying technology that results in the generation of less noise than existing equipment and technology; 6. Building activities to take place during daytime only; 7. Safe blasting methods to be used under controlled conditions; 8. Emergency generators to be placed in such a manner that it is away from residential areas.	1 month to 1 year	3	1	3	2	3	**35**	**ML Maintain Current Management**

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		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact						Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Soils, Land Use, and Land Capability Impacts																		
Direct	Clearing of vegetation and compaction of the construction footprint will result in the soils being particularly more vulnerable to soil erosion.	2	3	2	3	3	**42**	**MH Maintain Current Management**	Minimise soil erosion	1. Protect the existing topsoil stockpile area from impacts of erosion, compaction and contamination. If necessary, vegetate and/or cover with appropriate and suitable indigenous grass species; 2.Maintain vegetation cover on rehabilitated land and topsoil stockpiles; 3. Construct soil erosion protection measures should erosion be identified.	1 month to 1 year	1	1	2	2	2	**16**	**L No Management Required**
Direct	Soil contamination as a result of pre-construction activities.	2	2	2	2	2	**24**	**L No Management Required**	Reduce soil sterilisation	1. All vehicles should be serviced on a regular basis at the specific demarcated areas; 2. Any spillage from vehicles should be cleaned up as soon as possible; 3. Rehabilitate areas where the planned tasks have been completed; 4.The Katspruit, Rensburg and Longlands soil forms on the boundaries of the site be excluded from the area proposed for the mining development as far as feasible.	1 month to 1 year	1	1	2	2	2	**16**	**L No Management Required**
Direct	Loss of soil resource and utilisation as a result of the cleaning and topsoil stripping of the construction footprint	2	2	3	2	3	**35**	**ML Maintain Current Management**			1 month to 1 year	2	2	2	2	2	**24**	**L No Management Required**
Direct	Alternation of land use to mining and construction.	2	2	4	2	2	**32**	**ML Maintain Current Management**	Minimise land use alternation	1. Restrict vehicle movement to areas of need; 2. Keep stripped soils with vegetative cover intact (after trees have been removed and relocated where applicable in accordance with the relevant permission), and stockpile utilisable soils in accordance to the Soil Conservation Plan;	1 month to 1 year	1	2	2	2	2	**20**	**L No Management Required**
Indirect	Generation of dust reducing land capability.	2	2	2	2	2	**24**	**L No Management Required**	Minimise soil erosion	1. Cover the dust source with closely knit vegetation; 2. Keep dust source damp; 3. Keep speed limit below 40 km/h.	1 month to 1 year	1	1	2	2	2	**16**	**L No Management Required**
Direct	The land capability will be reduced as a result of a decreased nutrient status through de-nitrification and leaching due to stripping and stockpiling footprint areas	2	2	2	2	2	**24**	**L No Management Required**	Prevent a reduction in land capability	1. All soils compacted as a result of the pre-construction activities falling outside the infrastructure footprint areas should be ripped and profiled.	1 month to 1 year	1	1	2	2	2	**16**	**L No Management Required**
Heritage Impacts																		
Direct	Destruction of historical artefacts.	3	3	2	2	2	**32**	**ML Maintain Current Management**	Protection of archaeological, historical and any other site or land considered being of cultural value	1. Known sites should be clearly marked in order that they can be avoided during pre-construction activities; 2. The contractors and workers should be notified that archaeological sites might be exposed during the construction activities; 3. Should any heritage artefacts be exposed during excavation, work on the area where the artefacts were discovered, shall cease immediately and the Environmental Control Officer shall be notified as soon as possible; 4. Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site; 5. In areas where the vegetation is threatening the heritage sites, e.g. growing trees pushing walls over, it should be removed, but only after permission for the methods proposed has been granted by SAHRA. A heritage official should be part of the team executing these measures. 6. Maintain a buffer zone of 10 metres during construction and mining phase from the historical power line.	1 month to 1 year	2	2	1	2	2	**20**	**L No Management Required**

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		Consequence			Likelihood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating				Consequence			Likelihood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Management and Mitigation Measures	Timeframe	Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Direct	Impact on local graves within the project footprint.	3	3	3	2	2	**36**	**ML Maintain Current Management**	Protection of graves.	1. Fenced off and install a gate around graves; 2. Maintain a buffer zone of 100 metres during construction and mining phase form all graves; 3. Should this buffer zone not be feasible, a phase 2 study is required followed with a destruction permit application from SAHRA;	1 month to 1 year	1	2	1	2	2	**16**	**L No Management Required**
Palaeontology Impacts																		
Direct	Sealing-in or destruction of the fossils during earth moving activity	4	3	3	2	2	**40**	**MH Maintain Current Management**	Protection of Palaeontological findings	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 for shallow caves.	1 month to 1 year	2	1	1	2	2	**16**	**L No Management Required**
Topography Impacts																		
Direct	Minor changes in the topography may be experienced as a result of bush clearing and construction vehicles on site	2	2	2	2	2	**24**	**L No Management Required**	Protection of Palaeontological findings	1. Bush clearance will only take place in designated areas and as minimal as possible; 2. The construction site will be kept neat and tidy and free of litter; 3. Rubble will be removed frequently; 4. The construction activities will be screened to minimise the visual disturbance to surrounding land owners.	1 month to 1 year	1	2	2	2	2	**20**	**L No Management Required**
Geology Impacts																		
Direct	No material impacts are anticipated.								No material impacts are anticipated.	No mitigation measures are required as no material impact is anticipated during the pre-construction phase.								
Climate Impacts																		
Indirect	Emissions of Green House Gases as a result of the use of plant and heavy moving machinery	2	3	2	3	3	**42**	**MH Maintain Current Management**	Reduce Green House Gas emissions	1. Plant and machinery will be maintained so that no unnecessary emissions are expelled; 2. Appropriate technology and machinery will be utilised for the job at hand; 3. A Green House Gas Emissions assessment will be calculated as part of the initiative to reduce greenhouse gas emissions.	1 month to 1 year	2	1	3	2	2	**24**	**L No Management Required**

13.2 Construction Phase

During the construction phase, the following main activities will take place:

- Construction and ground preparation for the planned Pit 1 expansion and water pipeline;
- Construction and maintenance of stormwater control measures;
- Stockpiling of topsoil for the pipeline construction as well as for the Pit 1 expansion;
- Trench excavations for the pipeline;
- Laying of the pipeline;
- Backfilling of trenches associated with the pipeline;
- Preparation of mining activities associated with the Pit 1 expansion;
- Vegetation clearing of the construction footprint;
- Demarcating no-go areas;

Where significance ratings differ between alternatives, these are indicated in the assessment tables. The impact assessment for the construction phase can be found in Table 13-2. The following impacts are envisaged during the construction phase.

13.2.1 Socio – Economic Impacts

The following socio – economic impacts are envisaged as a result of the construction phase of the proposed project:

- Negative impact associated with construction activities, including the clearing of land and excavation for a pipeline dissecting the landscape which will impact on the rural and agricultural sense of place;
- Negative impact as a result of the extension of the open Pit, loss of cultivated land to leasing farmers, impacting on potential crop yield;
- Negative impact as a result of the dissecting of land by clearing and excavations for construction of proposed pipeline, constraints to access to cultivated land to leasing farmers, impacting on day to day farm activity;
- Positive impact on local economy due to economic opportunities for local and regional business (informal as well) from supplying services and materials to contractors during the construction phase;
- Negative impact Due to the occurrence of additional trucks on the roads, and the incidence of construction workers on site, health and safety impacts on local communities may include construction workers lighting fires on site, littering and driving irresponsibly;
- Potential increase in social pathologies and negative health impacts due to contractor camp and potential squatting of job seekers;
- As a result of construction activities, potential local employment opportunities will become available, increasing access to financial caPital for workers;
- As a result of blasting activities during construction, potential damage to adjacent landowner's/occupiers infrastructure and/or crops.

Additional impacts relating to underground mining follow:

From a socio – economical perspective, there is no preferred alternative as the impact on the socio – economic environment remains relatively consistent throughout the proposed alternatives.

13.2.2 Groundwater Impacts

The Pit 1 expansion and pipeline construction may possible result in the following impacts on the geo-hydrology of the area during the construction phase are as follows:

- Accidental spillages or leaks of hydrocarbons from construction machinery may occur during construction of the planned infrastructure. The hydrocarbons may infiltrate to the underlying groundwater system reducing the groundwater quality;
- Monitoring borehole on the border of the Pit 1 expansion area may be a conduit of flow to the groundwater unless sealed;
- Site clearing and grubbing is unlikely to materially affect the groundwater within the project area. However, care should be taken during the utilisation and storage of hydrocarbons and chemicals, which may impact on groundwater as a result of spillages and uncontrolled release.

The assessment of the groundwater impacts during the construction phase, has illustrated that there is no preferable alternative to the mining methodology or pipeline route alternative. Minimal groundwater impacts are envisaged as a result of the construction phase.

13.2.3 Surface Water Impacts

The potential impacts on surface water during the construction phase of the proposed project are as follows:

- Impeding flow while under construction of the pipeline over the non-perennial streams. During the construction of the stream crossings surface water will need to be diverted in order assist in construction of the pipeline in a dry environment;
- Accidental spillages of hazardous substances from construction vehicles used during construction of the crossings, as well as from hazardous storage areas;
- Contamination of runoff by poor materials/waste handling practices;
- Debris from poor handling of materials and/or waste blocking watercourses;
- Contaminated dirty water runoff to surrounding areas resulting in the impact on local surface water quality;
- Increase in turbidity of the local water streams as a result of runoff of cleared areas;
- Increase of surface runoff and potentially contaminated water that needs to be maintained in the areas where site clearing occurred;
- Construction of possible river diversion may temporarily disturb the water course affecting the hydrology of the water courses;
- Increase of erosion potential during construction activities associated with the river crossings and Pit 1 expansion;
- Removal of MAR from the catchment, as this runoff will now be considered dirty water and will need to be contained within the mining area.

Some level of sedimentation is expected to occur in the unnamed tributary pre-development as runoff is naturally anticipated to pick up environmental debris as it crosses natural areas. Increased turbidity is reversible and surface water should return to pre-impact turbidity levels once sediment levels entering the watercourse are reduced. Settled sediments should naturally move downstream during periods of high flow flowing storm events.

The assessment of the surface water impacts during the construction phase, has illustrated that there is no preferable alternative to the mining methodology or pipeline route alternative. Surface water impacts experienced will be experienced across all alternatives.

13.2.4 Biodiversity Impacts

The Pit 1 expansion and construction of the water pipeline may result in the following impacts on the floral environment during the pre-construction phase:

- Destruction of potential floral habitats for species of conservational concern as a result of site clearing, alien species, waste management and soil compaction;
- Insufficient planning of infrastructure placement and design leading to floral habitat loss of potential species of conservational concern;
- Impact on floral diversity as a result of site clearance, anthropogenic activity, and possible uncontrolled fires;
- Impact on floral species of conservational concern as a result of clearing, anthropogenic activity, and uncontrolled fires;
- Potential spreading of alien invasive species as a result of floral disturbance;
- Failure to initiate a rehabilitation plan and alien control plan during the construction phase may lead to further impacts during the operation phase;
- Generation of waste and incorrect disposal from construction material leading to disturbance of natural vegetation;
- Habitat fragmentation as a result of construction activities of the pipeline leading to loss of floral diversity;

The Pit 1 expansion and construction of the water pipeline may result in the following impacts on the faunal environment during the pre-construction phase:

- Loss of faunal habitat and ecological structure as a result of site clearing, alien invasive species, erosion, and general construction activities;
- Loss of faunal divert and ecological integrity as a result of construction activities, erosion, poaching and faunal specie trapping;
- Impact of faunal species of conservational concern due to habitat loss and collision with construction vehicles;
- Failure to initiate a rehabilitation plan and alien control plan during the construction phase may lead to further impacts during the operation phase.

The biodiversity assessment has indicated that the proposed route alternative will be the most preferred alternative. However, mitigation and management of species of conservational concern needs to be adhered to. The mining methodology proposed will not inherently impact on the biodiversity of surrounding areas.

13.2.5 Wetland and Aquatic Environmental Impacts

The Pit 1 expansion and water pipeline construction may result on the following envisaged impacts during the pre-construction phase:

- Loss of habitat and wetland ecological structure as a result of site clearance activities and uncontrolled wetland degradation;

- Impact on the wetlands systems as a result of changes to the sociocultural service provisions though site clearance. Waste management and wetland disturbance;
- Potential poor planning, resulting in the placement of the linear development within wetland habitat, leading to altered habitat;
- Impact on the hydrological functioning of the wetland systems;
- Soil compaction and levelling as a result of construction activities and vehicle movement leading to loss of wetland and riparian habitat;
- Increased runoff due to topsoil removal and vegetation clearance leading to possible erosion and sedimentation of wetland and riparian resources.

The wetland assessment has concluded that the most preferable option for the pipeline is the proposed alternative. Alternative 2 and Alternative 3 cross sensitive ecological services, resulting in a significant impact on the sociocultural service provision and hydrological functioning.

13.2.6 Air Quality Impacts

The impact the postposed project is envisaged to have on the air quality of the area during the pre-construction phase are as follows:

- Possible increase in dust generation, PM_{10} and $PM_{2.5}$ as a result of bulk earthworks, operation of heavy machinery, and material movement;
- Increase in carbon emissions and ambient air pollutants (NO_2 and SO_2) as a result of movement of vehicles and operation of machinery/equipment.

The Air Quality assessment has concluded that there is no preferable alternative to the pipeline routes. The opencast operations proposed will inherently generate additional dust compared to the underground working. A combination of opencast and underground mining methodologies will not reduce dust, PM_{10} and $PM_{2.5}$ generation compared to individual opencast or underground mining.

13.2.7 Blast and Vibration Impacts

The construction and preparation of the Pit 1 expansion area, may result in the need for blasting. The following impacts are envisaged as a result of blasting activities:

- Impact of ground vibration on houses, boreholes and roads, resulting in possible damage to infrastructure;
- Air blast impact on houses, boreholes and roads, resulting in possible damage to infrastructure;
- Fly rock impact on houses, boreholes and roads, resulting in possible damage to infrastructure;
- Impact of fumes on nearby land occupiers, boreholes and road users.

No blasting activities are anticipated for the construction of the pipeline. Therefore, the blasting assessment has concluded that there is no preferable pipeline route. Blasting will be inevitable during mining activities, thus the impact will be continuous from opencast through to underground methodologies.

13.2.8 Visual Impacts

The following impacts on the visual character as a result of the proposed Pit 1 expansion and construction of a water pipeline are envisaged during the pre-construction phase:

- Scaring of the landscape as a result of the clearance of vegetation and preparation of the Pit 1 expansion;

- Visual intrusion as a result of the movement of machinery and the erection of contractor camps;
- Indirect visual impact due to dust generation as a result of the movement of vehicles and materials, to and from the site area.

13.2.9 Noise Impacts

The following noise impact is envisaged as a result of the pre-construction phase of the proposed project:

- The use of vehicles and machinery during the construction phase may generate noise in the immediate vicinity;
- Increase in ambient noise levels as a result of the mining activities. The assembling of mine related equipment and/or structures during the construction phase will inherently generate a degree of noise emissions.

The noise assessment has concluded that the noise generation across all alternatives will be negligible. The proposed alternative can thus be employed with minimal difference in noise levels across between alternatives.

13.2.10 Soils, Land Use and Land Capability Impacts

During the construction phase, all infrastructure and activities required for the operational phase will be established. The main envisaged activities include the following:

- Transport of materials and labour with trucks and buses as well as other light vehicles using the existing access roads. This will compact the soil of the existing roads and fuel and oil spills from vehicles may result in soil chemical pollution;
- Clearing of vegetation and compaction of the construction footprint will result in the soils being particularly more vulnerable to soil erosion. The impact can persist long after cessation of mining activities depending on mitigation strategies. Strategic stormwater management should be put in place to minimise soil losses. Impact significance can be reduced to low with implementation of appropriate soil management practices;
- Soil contamination as a result of construction activities can be as a result of a number of activities (i.e. hazardous substance storage, incidental hydrocarbon leakages from construction vehicles);
- Loss of soil resource and utilisation as a result of the cleaning and topsoil stripping of the construction footprint. Although soils will be stripped and stockpiled, loss of seed reserve and organic matter depletion through decomposition during stockpiling will severely reduce soil quality and its ecological function if not managed appropriately. This phenomenon would be aggravated and worsen with time and ultimately lower the effectivity of the rehabilitation. Re-vegetation should be imposed as far as is possible to maintain soil fertility through natural nutrient cycling during soil storage prior to rehabilitation phase;
- As a result of construction activities, the land use will have altered from grazing and agriculture to that of construction for mining activities. The land capability will be changed and will be used primarily for construction activities and subsequent mining activities;
- Other activities in this phase that will impact on soil are the handling and storage of building materials and different kinds of waste. This will have the potential to result in soil pollution when not managed properly;

- In areas of permanent changes such as road upgrades, the sinking of open Pits and the erection of infrastructure and stockpiles, the current land capability and land use will be lost permanently.

13.2.11 Heritage Impacts

The following impacts are envisaged on archaeological artefacts and graves as a result of the construction phase of the proposed project:

- The proposed project has the potential to impact on local graves within the area. Two grave sites were observed within the footprint of the proposed pipeline route;
- The proposed project has the potential to impact on sites of archaeological importance. Historic power line pylons are present within the proposed footprint.

13.2.12 Palaeontology Impacts

The following impacts are envisaged on the Palaeontology context during the pre-construction phase of the proposed project:

- Sealing-in or destruction of the fossils during earth moving activity.

13.2.13 Topography Impacts

As a result of pre-construction activities the following impacts are envisaged as a result of the pre-construction phase:

- Minor changes in the topography may be experienced as a result of bush clearing and construction vehicles on site. This will be minimal and of a short duration.

13.2.14 Geology Impacts

As a result of construction activities the following impact on Geology are anticipated:

- Removal of local geology as a result of pipeline trenching and expansion of Pit 1.

13.2.15 Climate Impacts

As a result of the construction activities the following impact is envisaged on the climate in the area:

- Emissions of Green House Gases as a result of the use of plant, heavy moving machinery, generators etc.

13.2.16 Cumulative Impacts

The following cumulative impacts are envisaged as a result of the proposed Pit 1 expansion and construction of the water pipeline:

- Increased generation of dust, PM_{10} and $PM_{2.5}$ within the local area;
- Reduced land availability for agricultural use.

Table 13-2: Potential Impacts and mitigation measures associated with the construction phase of the proposed Pit 1 expansion and water pipeline

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating				Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Management and Mitigation Measures	Timeframe	Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Socio - Economic Impacts																		
Direct	Negative impact associated with construction activities which will impact on the rural and agricultural sense of place	3	2	2	2	1	**21**	**L No Management Required**	Protect social - economic environment of local land users.	1. Where possible, pipeline infrastructure should be located as far away from private infrastructure as possible; 2. Where possible, pipeline infrastructure should run along existing farm and regional roads to avoid disturbing rural/agricultural features; 3. Where possible, allow surface farmers to continue farming activities despite pipeline presence; 4. Implement noise and dust management measures as recommended by relevant specialists; 5. Stakeholder engagement channels and grievance procedure mechanisms need to be developed prior to operation and need to be ongoing and frequent.	1 month to 1 year	2	2	2	1	1	**12**	**L No Management Required**
Direct	Negative impact as a result of the extension of the open Pit, loss of cultivated land to leasing farmers, impacting on potential crop yield	4	2	5	3	2	**55**	**MH Maintain Current Management**		1. Timeous communication with farm leaser on open Pit expansion land to give sufficient notice as to when construction will commence so he/she may plan accordingly; 2. Disbursement of agreed upon compensation package for loss of portion of the farmer's potential harvest, or compensation for the entire harvest where a season is interrupted.	1 month to 1 year	1	2	2	3	2	**25**	**L No Management Required**
Direct	Negative impact as a result of the dissecting of land by clearing and excavations for construction of proposed pipeline, constraints to access to cultivated land to leasing farmers, impacting on day to day farm activity	3	2	2	2	2	**28**	**ML Maintain Current Management**	Minimise loss of agricultural land and crop yields.	1. Where possible, avoid pipeline options which dissect farmland; 2. Where possible, attempt to install the route which runs along existing service corridors, including along roads; 3. Should the above not be possible, compensation and or replacement land processes must be considered according to land and crop market value?	1 month to 1 year	2	2	2	2	1	**18**	**L No Management Required**
Direct	As a result of construction activities, potential local employment opportunities will become available, increasing access to financial capital for workers	3	3	2	2	1	**24**	**L No Management Required**	To prevent a significant increase in alien invasive species abundance and spread	1. Where it is possible, hire/use local personnel; 2. Identify opportunities for the employment/procurement and training of people and contractors from the local area; 3. Opportunities for local employment may include activities related to site clearance, digging of trenches and building of the open Pit; 4. Based on these opportunities, develop a recruitment and training strategy that the main construction contractors will have to adhere to; 5. Monitor implementation of local recruitment and training strategies, including monitoring of corruption and nepotism; 6. Employment and training of the youth and females where possible; 7. Implementation of employment and procurement policy; 8. Communication with locals regarding job opportunities and skills requirements to manage expectations.	1 month to 1 year	3	3	3	2	2	**36**	**ML Maintain Current Management**

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating		Management and Mitigation Measures	Timeframe	Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact						Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Direct	As a result of blasting activities during construction, potential damage to adjacent landowner's/occupiers infrastructure and/or crops	3	3	2	2	2	**32**	**ML Maintain Current Management**	To minimise loss of floral habitat	1. Alert adjacent land owners of construction blasting activities and times in a timeous manner; 2. Ensure requirements for human health and safety relating to blasting are adhered to avoid unnecessary damage to infrastructure and/or crops; 3. Ensure management measures indicated by blasting specialist study are adhered to; 4. Stakeholder engagement channels and grievance procedure mechanisms need to be developed prior to construction and need to be ongoing and frequent.	1 month to 1 year	3	2	2	2	1	**21**	**L No Management Required**
Indirect	Positive impact on local economy due to economic opportunities for local and regional business	2	4	2	1	1	**16**	**L No Management Required**	Improve on local economy through utilisation of local resources.	1. Procurement of suppliers must be as per the SLP and Exxaro policy and standards; 2. Develop a register of local business; 3. Open communication channel with the local community around Exxaro regarding opportunities to register on the Exxaro suppliers list to manage expectations; 4. Potential upskilling and training allowances to be included as per the SLP; 5. Where it is possible, request contractors to hire/use local personnel; Identify opportunities for the employment/procurement and training of people and contractors from the local area. 6. Opportunities for local employment may include activities related to site clearance, digging of trenches and building of the open Pit; 7. Based on these opportunities, develop a recruitment and training strategy that the main construction contractors will have to adhere to; 8. Monitor implementation of local recruitment and training strategies, including monitoring of corruption and nepotism; 9. Employment and training of the local youth and females where possible; 10. Communication with locals regarding service/job opportunities and skills requirements to manage expectations.	1 month to 1 year	3	4	2	2	2	**36**	**ML Maintain Current Management**
Indirect	Negative impact due to the occurrence of additional trucks on the roads, and the incidence of construction workers on site	3	3	2	3	2	**40**	**MH Maintain Current Management**	Minimise harm to local land users and owners.	1. Construction vehicles to be road worthy and drivers to adhere to speed limits; 2. Fires are prohibited on site and emergency procedures are in place; 3. Contractors adhere to Exxaro standards and requirements, Exxaro Safety Health and Environmental policies, as well as relevant South African regulations such as the Mine Health and Safety Act (Act No. 29 of 1996); 4. Inform Exxaro employees and neighbouring landowners and inhabitants about construction timeframes and activities, and give regular updates; 5. Ensure a grievances procedure is in place and communicated.	1 month to 1 year	2	3	2	2	1	**21**	**L No Management Required**
Indirect	Potential increase in social pathologies and negative health impacts due to contractor camp and potential squatting of job seekers	3	3	3	2	2	**36**	**ML Maintain Current Management**	To minimise loss of floral biodiversity	1. Ensure grievances procedures are in place for local people to log grievances; 2. Implement local recruitment and training strategies and policies, and clearly communicate these locally through relevant authorities and media; 3. Do not recruit informally at the gate but follow a formal recruitment process; 4. Make use of local accommodation for workers, as opposed to a construction camp; 5. Inform Exxaro employees and neighbouring landowners and inhabitants about local recruitment strategies and policies, and give regular updates; 6. Monitor the surrounding area for illegal informal settlement and develop a strategy to deal with illegal settlement; 7. Ensure that all contractors and their employees attend inception training, addressing Exxaro standards and requirements, Exxaro Safety Health and Environmental policies, relevant South African regulations, the environmental management plan, and recruitment strategies.	1 month to 1 year	2	3	2	2	1	**21**	**L No Management Required**

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating				Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Management and Mitigation Measures	Timeframe	Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Groundwater Impacts																		
Direct	Impact on groundwater quality because of hydrocarbon spillages from machinery.	2	2	2	3	3	**36**	**ML Maintain Current Management**	Prevent groundwater contamination.	1. All spillages will need to be cleaned up as soon as practically possible; 2. Proper management of stormwater drainage infrastructure should be ensured; 3. Maintain construction vehicles and encourage contractors to report, react and manage all spills and leaks so that action can be taken to immediately minimise contamination to the groundwater; 4. Groundwater monitoring of boreholes should continue as per the WUL and approved monitoring programme. 5. Spill kits will be made available in areas of likely spillage; 6. All hydrocarbon storage containers will be stored within a bunded areas which are water tight and able to contain 110% of the stored volume; 7. All equipment utilising hydrocarbons will be stored on a hard-standing surface.	1 month to 1 year	1	2	2	2	2	**20**	**L No Management Required**
Direct	Storage of hydrocarbons and chemicals, which may impact on groundwater as a result of spillages and uncontrolled release	2	2	2	3	3	**36**	**ML Maintain Current Management**			1 month to 1 year	1	2	2	2	2	**20**	**L No Management Required**
Indirect	Monitoring borehole on the border of the Pit 1 expansion area may be a conduit of flow to the groundwater unless sealed	3	3	4	3	3	**60**	**MH Maintain Current Management**		1. Grouting and capping of boreholes located within the footprint of construction camps be required prior to construction activities.	1 month to 1 year	1	2	2	2	3	**25**	**L No Management Required**
Surface Water Impacts																		
Direct	Impact on surface water flow as a result of impeding flow while under construction of the pipeline over the non-perennial streams	3	3	2	3	3	**48**	**MH Maintain Current Management**	Protect surface water flow and associated pollution.	1. Construction must take place within the dry season as far as possible; 2. Gabions and mattresses will be used to protect the river banks; 3. All litter and debris will be continuously removed during construction.	1 month to 1 year	1	1	1	1	1	**6**	**L No Management Required**
Direct	Impact on surface water quality as a result of accidental spillages of hazardous substances from construction vehicles used during construction of the crossings, as well as from hazardous storage areas	3	3	3	2	3	**45**	**MH Maintain Current Management**	Protect surface water quality.	1. Access to the construction site will be controlled; 2. Refuelling areas will be bunded and nozzles protected from spillage during refuelling; 3. Vehicular access to the stream will be restricted; 4. All spillages will need to be cleaned up as soon as practically possible; 5. Proper management of stormwater drainage infrastructure should be ensured; 6. Hazardous substances stored on site will be stored within a designated bunded areas fitted with a sump and value. Collection of water within the bunded areas will be deemed hazardous and disposed of as such; 7. Bunded areas will be water tight and inspected for leaks on a frequent basis; 8. Leaks to the bunded areas will be rectified as soon as possible; 9. Drip trays will be utilised for the collection of leaks from vehicles and machinery parked for long period of time; 10. Should a spill occur, this will be handled at the source of the leak and prevented from transpiring to nearby watercourse; 11. Ensure that routine maintenance on all vehicles is undertaken as per maintenance schedule and records are kept; 12. Sewage spillages will be seen as hazardous waste and will be handled as such.	1 month to 1 year	1	1	1	1	1	**6**	**L No Management Required**
Direct	Debris from poor handling of materials and/or waste blocking watercourses, resulting in flow impediment and pollution.	2	1	1	1	1	**8**	**L No Management Required**	Protect surface water quality.	1. Operate using best practises in separating waste streams and disposing of the waste correctly.	1 month to 1 year	1	1	1	1	1	**6**	**L No Management Required**
Direct	Contaminated dirty water runoff to surrounding areas resulting in the impact on local surface water quality	4	4	3	4	3	**77**	**H Improve Current Management**	Ensure adequacy clean and dirty water separation.	1. Construct diversion drains around the site timeously prior to operation; 2. Ensure adherence to GNR 704 of the NWA;	1 month to 1 year	3	2	3	2	3	**40**	**MH Maintain Current Management**

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		Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating				Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Management and Mitigation Measures	Timeframe	Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Direct	Increase in turbidity of the local water streams as a result of runoff of cleared areas	2	3	2	4	2	42	MH Maintain Current Management	Protection of Surface water	1. Where necessary, and as defined when the final detailed project design is confirmed, construct sediment collection paddocks downstream of the working activities to minimise uncontrolled runoff from the site; 2. Minimise the areas that are to be stripped of vegetation; 3. Adequate storm water management should be considered in the detailed design of the proposed infrastructure in order to minimize undue erosion; 4. Erosion can also be limited by ensuring that mine vehicles and human movement is limited to project specific dedicated access ways; 5. Stormwater culverts and clean water diversions will be designed and constructed to accommodate the 1:50 year storm event around the mining areas; 6. Stormwater runoff will be directed towards natural watercourses; 7. Construction will be undertaken during the dry season, where possible, to minimise the potential for stormwater runoff; 8. Routine surface water quality monitoring up and down stream of construction activities and position of infrastructure and activities associated with the Project will be undertaken on a monthly basis.	1 month to 1 year	1	2	2	2	1	15	L No Management Required
Direct	Increase of surface runoff and potentially contaminated water that needs to be maintained in the areas where site clearing occurred.	2	2	3	3	3	42	MH Maintain Current Management	Protection of Surface water	1. Adequate protection measures at river crossings will be included in the pipeline designs.	1 month to 1 year	1	2	1	1	1	8	L No Management Required
Direct	Construction of possible river diversion may temporarily disturb the water course affecting the hydrology of the water courses	3	2	2	3	4	49	MH Maintain Current Management	Protection of water resources and prevention of erosion.	1. The point where the diversion re-enters the natural system must enter the system at the same elevation as the receiving aquatic environment as well as consist of an energy dissipation structures thereby preventing erosion and incision of the natural watercourse; 2. The point where the diversion re-enters the natural watercourse must enter the system where possible at an acute angle to prevent the creation of turbulent flow, erosion and incision.	1 month to 1 year	2	2	2	2	2	24	L No Management Required
Direct	Increase of erosion potential during construction activities associated with the river crossings and Pit 1 expansion	1	2	4	3	2	35	ML Maintain Current Management	Prevention of sedimentation as a result of erosion.	1. Adequate storm water management should be considered in the detailed design of the proposed infrastructure in order to minimize undue erosion; 2. Ensure erosion protection measures are adequately implemented and monitored; 3. Erosion can also be limited by ensuring that mine vehicles and human movement is limited to project specific dedicated access ways.	1 month to 1 year	1	2	2	2	1	15	L No Management Required
Indirect	Removal of MAR from the catchment, as this runoff will now be considered dirty water and will need to be contained within the mining area.	2	2	1	2	2	20	L No Management Required	Minimise loss of water to the catchment.	1. The stormwater will be diverted into the natural environment which further mitigates the impact; 2. Stormwater dams need to be assessed to ensure that the capacity of water pumped during construction will be adequately catered for; 3. Recycle waste water as far as feasible.	1 month to 1 year	1	1	1	1	1	6	L No Management Required
Indirect	Contamination of runoff by poor materials/waste handling practices, impacting on surface water quality.	3	3	3	2	3	45	MH Maintain Current Management		1. Waste will be disposed of in accordance to the waste management procedure; 2. Housekeeping will be kept up to standard. Housekeeping should be done after every shift.	1 month to 1 year	1	1	1	1	1	6	L No Management Required

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		Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating		Management and Mitigation Measures	Timeframe	Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact						Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Biodiversity Impacts																		
Direct	Destruction of potential floral habitats for species of conservational concern as a result of site clearing, alien species, waste management and soil compaction (Proposed Alternative).	3	3	2	2	2	**32**	**ML Maintain Current Management**	Protection of floral habitats	1. Should any floral or faunal species of conservational concern be encountered within the linear development during the construction phase, the following should be ensured: - Effective relocation of individuals to suitable similar habitat in the vicinity of the linear development must be ensured; - All rescue and relocation plans should be overseen by a suitably qualified specialist. 2. Appropriate sanitary facilities must be provided during the construction phase and all waste must be removed to an appropriate waste facility.	1 month to 1 year	2	2	2	2	2	**24**	**L No Management Required**
	Alternative 2	3	3	3	3	3	**54**	**MH Maintain Current Management**				2	2	2	2	2	**24**	**L No Management Required**
	Alternative 3	3	3	3	3	3	**54**	**MH Maintain Current Management**				2	2	2	2	2	**24**	**L No Management Required**
Direct	Impact on floral diversity as a result of site clearance, anthropogenic activity, and possible uncontrolled fires (Proposed Alternative)	3	3	2	2	2	**32**	**ML Maintain Current Management**	Prevent impacts on floral diversity.	1. Fertilize and re-vegetate topsoil stockpiles as soon as possible; 2. The construction and operational footprint must be kept as small as possible in order to minimise impact on the surrounding environment.	1 month to 1 year	2	2	2	2	2	**24**	**L No Management Required**
	Alternative 2	3	3	2	2	2	**32**	**ML Maintain Current Management**				2	2	2	2	2	**24**	**L No Management Required**
	Alternative 3	3	3	2	2	2	**32**	**ML Maintain Current Management**				2	2	2	2	2	**24**	**L No Management Required**
Direct	Impact on floral species of conservational concern as a result of clearing, anthropogenic activity, and uncontrolled fires.	3	3	2	3	3	**48**	**MH Maintain Current Management**	Protection of species of Conservational Concern.	1. If possible, avoid placement of the linear development within the sensitive wetland habitat unit. If this is unavoidable, wetland crossings are to be made at an acute angle to the wetland, and where possible directional drilling is to be used, running the pipe below the wetland surface whilst avoiding any excavation activities directly within the wetlands themselves; 2. No uncontrolled fires whatsoever should be allowed.	1 month to 1 year	2	1	2	2	2	**20**	**L No Management Required**
	Alternative 2	3	3	2	2	2	**32**	**ML Maintain Current Management**				2	1	2	2	2	**20**	**L No Management Required**
	Alternative 3	3	3	2	2	2	**32**	**ML Maintain Current Management**				2	1	2	2	2	**20**	**L No Management Required**

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating		Management and Mitigation Measures	Timeframe	Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact						Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Direct	Potential spreading of alien invasive species as a result of floral disturbance	3	2	4	4	4	72	MH Maintain Current Management	Minimise proliferation of alien species.	1. Implement an alien plant management and eradication program; 2. Removal of alien vegetation should commence during the construction phase and continue during the operational and decommissioning phases; 3. Care should be taken with the choice of herbicide to ensure that no additional impact or loss of indigenous plant species occur due to the use of the herbicides; 4. No vehicles should be allowed to drive through riparian areas during the eradication of alien and weed species; 5. Removal of alien and weed species must take place in accordance with existing legislation process and procedures.	1 month to 1 year	1	1	2	3	3	24	L No Management Required
Direct	Generation of waste and incorrect disposal from construction material leading to disturbance of natural vegetation.	4	3	3	3	3	60	MH Maintain Current Management	Protection of species diversity.	1. No dumping of waste should take place. If any spills occur, they should be immediately cleaned up. 2. It must be ensured that mining related waste or spillage and effluent do not affect the sensitive habitat boundaries and associated buffer zones or any other surrounding natural habitat; 3. In the event of a vehicle breakdown, maintenance of vehicles must take place with care and the recollection of spillage should be practiced near the surface area to prevent ingress of hydrocarbons into topsoil and subsequent habitat loss; 4. No construction-related waste material is to enter wetland or other natural habitats.	1 month to 1 year	2	1	2	2	2	20	L No Management Required
Direct	Loss of faunal habitat and ecological structure as a result of site clearing, alien invasive species, erosion, and general construction activities	3	3	2	2	2	32	ML Maintain Current Management	Protection of faunal habitat.	1. It is recommended that site clearing takes place in a phased manner to allow for any faunal species present to move away from the linear development; 2. All soils compacted as a result of construction activities should be ripped and profiled. Special attention should be paid to alien and invasive plant control within these areas;	1 month to 1 year	2	3	4	4	4	72	MH Maintain Current Management
	Alternative 2	3	3	2	2	2	32	ML Maintain Current Management				2	1	2	2	2	20	L No Management Required
	Alternative 3	3	3	2	2	2	32	ML Maintain Current Management				2	1	2	2	2	20	L No Management Required
Direct	Impact of faunal species of conservational concern due to habitat loss and collision with construction vehicles	2	3	4	3	3	54	MH Maintain Current Management	Protection of species of Conservational Concern.	1. Restrict vehicles to travelling only on designated roadways to limit the ecological footprint of the proposed development activities; 2. Should new road development be necessary during construction activities, the roads should be ripped and rehabilitated at the end of construction activities	1 month to 1 year	2	2	2	2	2	24	L No Management Required
Indirect	Habitat fragmentation as a result of construction activities of the pipeline leading to loss of floral diversity.	3	3	2	2	2	32	ML Maintain Current Management	Reduce loss of species diversity.	1. Access paths will be made available for migration of faunal species across the pipeline construction footprint; 2. Areas where pipeline construction has been complete, will be backfilled and rehabilitated as soon as possible to re-establish faunal migration; 3. All construction must be done in such a manner so as to ensure species migration will take place by ensuring a suitable structure height to allow species to move under or over the pipelines and roads.	1 month to 1 year	2	1	2	2	2	20	L No Management Required

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		Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating				Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Management and Mitigation Measures	Timeframe	Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
	Alternative 2	3	3	2	2	2	**32**	**ML Maintain Current Management**	Reduce loss of species diversity.			2	1	2	2	2	**20**	**L No Management Required**
	Alternative 3	3	3	2	2	2	**32**	**ML Maintain Current Management**	Reduce loss of species diversity.			2	1	2	2	2	**20**	**L No Management Required**
Indirect	Failure to initiate a rehabilitation plan and alien control plan during the construction phase may lead to further impacts during the operation phase.	2	3	4	4	4	**72**	**MH Maintain Current Management**	Protection of indigenous vegetation.	1. Upon completion of construction activities, it must be ensured that no bare areas remain and that indigenous grassland species are reintroduced; 2. As far as possible, indigenous grassland species, including grasses, should be used to revegetate bare areas. It is suggested that species such as *Cynodon dactylon* and *Eragrostis sp* be used for revegetation purposes	1 month to 1 year	2	3	2	2	2	**28**	**ML Maintain Current Management**
Indirect	Loss of faunal divert and ecological integrity as a result of construction activities, erosion, poaching and faunal specie trapping	3	2	3	3	3	**48**	**MH Maintain Current Management**	Reduce impacts on faunal ecological integrity through curbing erosion and poaching.	1. Edge effects of construction and operational activities need to be actively managed so as to minimise further impacts to the receiving environment; 2. No trapping or hunting of any faunal species is to take place; 3. The occurrence of erosion is to be monitored on a regular basis during the construction phase of the project and remedial action taken immediately if noted; 4. To prevent the erosion of top soils, management measures may include berms, soil traps, hessian curtains and stormwater diversion away from areas susceptible to erosion. It must be ensured that topsoil stockpiles are located outside of any wetland and riparian areas and areas susceptible to erosion. Stockpiles should be placed away from areas known to contain hazardous substances such as fuel and if any soils are contaminated, it should be stripped and disposed of at a registered hazardous waste dumping site; 5. The following points should serve to guide the placement of erosion berms: - Where the track has a slope of less than 2%, berms every 50m should be installed; - Where the track slopes between 2% and 10%, berms every 25m should be installed; - Where the track slopes between 10% and 15%, berms every 20m should be installed; - Where the track has a slope greater than 15%, berms every 10m should be installed. 6. To minimise the risk of erosion, the extent of disturbed vegetation and exposed soil should be kept to a minimum; 7. Adequate stormwater management must be incorporated into the design of the project throughout all phases in order to prevent erosion of topsoil and the subsequent loss of floral habitat; 8. Sheet runoff from cleared areas and access roads needs to be curtailed; 9. Runoff from compacted and built-up surfaces should be slowed down by the strategic placement of berms; 10. All topsoil and waste stockpiles must be designed in such a manner that runoff is contained.	1 month to 1 year	2	2	2	3	3	**36**	**ML Maintain Current Management**
Indirect	Insufficient planning of infrastructure placement and design leading to floral habitat loss of potential species of conservational concern.	3	4	4	3	4	**77**	**H Improve Current Management**	Ensure adequate planning to prevent habitat destruction.	1. Stripping of topsoil not earlier than required, revegetate stockpiles, erosion control measures (berms), maintain roads; 2. Prior to the start of construction activities on site a rehabilitation plan should be developed for implementation throughout the development phases.	1 month to 1 year	3	2	4	3	3	**54**	**MH Maintain Current Management**

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating		Management and Mitigation Measures	Timeframe	Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact						Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Wetland and Aquatic Impacts																		
Direct	Loss of habitat and wetland ecological structure as a result of site clearance activities and uncontrolled wetland degradation	2	3	3	3	3	48	MH Maintain Current Management	Protection of Wetland Habitat and wetland ecological structure.	1. Disturbed wetland features must be rehabilitated immediately after the construction phase; 2. During the construction phase of the development, all wetland areas other than the immediate areas of crossing are to be demarcated as no-go areas for vehicles and construction personnel; 3. Access roads for support vehicles, and vehicles used in the construction of the crossings, should not encroach into the freshwater features; 4. Activities that lead to elevated levels of sedimentation in the freshwater features should be minimised. Increased runoff due to vegetation clearance and/or soil compaction must be managed. Where necessary, access roads should have erosion berms installed in order to reduce the speed of any surface runoff, which could initiate erosion; 5. Implement alien vegetation control program within the wetland features; 6. Ensure that all activities impacting on the wetland features are managed according to the relevant DWS Licensing regulations (where applicable)	1 month to 1 year	2	2	2	2	2	24	L No Management Required
	Alternative 2	2	3	3	3	3	48	MH Maintain Current Management				2	2	2	2	2	24	L No Management Required
	Alternative 3	2	3	3	3	3	48	MH Maintain Current Management				3	2	2	2	2	28	ML Maintain Current Management
Direct	Impact on the wetlands systems as a result of changes to the sociocultural service provisions	2	3	3	3	3	48	MH Maintain Current Management	Minimise change and effectiveness of wetland service provision	1. In a case where it is impossible to avoid development within the watercourse, it is advisable to minimise the extent and duration of the activities (i.e. during construction and rehabilitation and the use of less invasive methods such as directional drilling techniques) within the watercourse in order to reduce impacts on the biodiversity and Eco services provision; 2. Any storage facilities and all other non-essential activities should be located away from the identified wetlands in order to avoid water and soil contamination, which would affect the structure and function of these resources; 3. During construction use techniques which support the hydrology and sediment control functions of the freshwater features; 4. Limit excavations to a limited extent to ensure that drainage patterns within the features returns to normal as soon as possible after construction.	1 month to 1 year	2	2	2	2	2	24	L No Management Required
	Alternative 2	2	3	3	3	3	48	MH Maintain Current Management				2	2	2	2	2	24	L No Management Required
	Alternative 3	2	3	3	3	3	48	MH Maintain Current Management				2	2	2	2	2	24	L No Management Required
Direct	Impact on the hydrological functioning and sediment balance of the wetland systems	2	3	2	2	2	28	ML Maintain Current Management	Protect hydrological functioning of the wetland systems.	1. Avoid encroachment of activities into the watercourse where feasible; 2. Rehabilitation should be conducted in a manner that ensures that the wetland features' conditions are reinstated to as natural a state as possible; 3. As much vegetation growth as possible should be promoted within the wetland features in order to protect soils. In this regard, special mention is made of the need to prevent the loss of large areas of the freshwater features' vegetation and the use of indigenous vegetation species' where hydro seeding and rehabilitation planting (where applicable) are to be implemented; 4. Any construction-related waste must not be placed in the vicinity of the wetland features; 5. Stockpiled soil must be removed and the area must be levelled to avoid sedimentation of the wetland features from runoff.	1 month to 1 year	1	2	2	2	2	20	L No Management Required
	Alternative 2	2	3	3	3	3	48	MH Maintain Current Management				1	2	2	2	2	20	L No Management Required
	Alternative 3	2	3	3	3	3	48	MH Maintain Current Management				1	2	2	2	2	20	L No Management Required

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		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Management and Mitigation Measures	Timeframe	Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Indirect	Increased runoff due to topsoil removal and vegetation clearance leading to possible erosion and sedimentation of wetland and riparian resources	3	3	2	3	2	**40**	**MH Maintain Current Management**	Reduce impact of sedimentation on wetland and riparian resources.	1. Restrict construction to the drier winter months if possible, to avoid increased water inputs and sedimentation within the wetland; 2. Adequate storm water management must be incorporated into the design of the proposed development throughout all phases in order to prevent erosion of topsoil and the loss of floral and faunal habitat. In this regard, special mention is made of: - Sheet runoff from cleared areas, paved surfaces and access roads needs to be curtailed; - Runoff from paved surfaces should be slowed down by the strategic placement of berms; - All topsoil and waste stockpiles must have berms and catchment paddocks at their toe to contain runoff of the facilities.	1 month to 1 year	2	2	2	2	3	**30**	**ML Maintain Current Management**
Indirect	Soil compaction and levelling as a result of construction activities and vehicle movement leading to loss of wetland and riparian habitat	4	3	3	4	3	**70**	**MH Maintain Current Management**	Minimise impact on wetland and riparian habitat	1. No construction of infrastructure may take place within riparian and wetland areas and associated buffer zones unless authorisation is granted by the DWS; 2. As far as possible all mining activity and infrastructure should be excluded from the wetland and riparian areas and associated 100 m buffer zone; 3. If this is not possible, pipelines should be designed to cross drainage lines at right angles and be placed outside of the active channels; 4. All areas of increased ecological sensitivity should be designated as No-Go areas and be off limits to all unauthorised construction vehicles and personnel; 5. All development footprint areas and areas affected by the proposed mining development should remain as small as possible and any disturbance of sensitive habitat must be actively avoided; 6. Construction vehicles must remain on demarcated roads and should not encroach into the wetland areas or their associated buffer zones; 7. It must be ensured that contractor laydown areas are located outside of wetland and riparian areas and associated 100 m buffer zones and excluded from clearing activities in order to minimise vegetation loss and resultant erosion and sedimentation.	1 month to 1 year	2	2	3	2	2	**28**	**ML Maintain Current Management**
Air Quality Impacts																		
Direct	Possible increase in dust generation, PM10 and PM2.5 as a result of bulk earthworks, operation of heavy machinery, and material movement.	2	2	2	2	2	**24**	**L No Management Required**	Minimise emissions to the atmosphere impacting on employees, local land users, and climate change.	1. Regular irrigation by water especially during windy conditions at the site, access road and construction material and debris with just enough moisture to keep the dust down without creating significant runoff. 2. Should water not be available as a result of drought conditions then chemical suppressants need to be considered. 3. Reduction of speed on unpaved roads to reduce the entrainment of dust into the atmosphere. 4. During grading activities, any exposed earth should be watered if it is going to be exposed for long periods of time; 5. If dust generating material such as soil, waste rock is hauled from the site, vehicles should be covered with a tarpaulin to reduce spillages; 6. On windy days, or when fugitive dust is dispersed from the Site of Works, additional application of water to the affected areas should be applied.	1 month to 1 year	1	1	1	1	1	**6**	**L No Management Required**
Direct	Increase in carbon emissions and ambient air pollutants (NO2 and SO2) as a result of movement of vehicles and operation of machinery/equipment.	3	3	2	2	2	**32**	**ML Maintain Current Management**		1. Engine idle speeds during operating times should be reduced; 2. Where applicable, use a fuel sources with low sulphur content; 3. Ensure regular servicing and maintenance of all combustion engine operated machinery;	1 month to 1 year	2	1	1	2	1	**12**	**L No Management Required**

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		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact						Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Blast and Vibration Impacts																		
Direct	Impact of ground vibration on houses, boreholes and roads, resulting in possible damage to infrastructure	4	3	3	3	4	**70**	**MH Maintain Current Management**	Minimise impacts on infrastructure and land occupiers during blasting activities.	1. Reduce Charge Mass/Delay over decreasing distance towards POI's of concern; 2. Relocate POI's of concern at least 600 m; 3. Re-drill boreholes further away which will be impacted on by the blasting activities, should these boreholes be utilised at a later stage.; 4. Reroute affected roads; 5. Notify all affected parties in advance prior to any blasting activity; 6. Prior to blasting a 500 m radius must be cleared of people and animals; 7. Immediate action will take place should thresholds exceed legal requirements for air blast (134 dB) and ground vibration (12.5 mm/s).	Life of Operation	2	2	2	3	3	**36**	**ML Maintain Current Management**
Direct	Air blast impact on houses, boreholes and roads, resulting in possible damage to infrastructure	4	3	3	3	4	**70**	**MH Maintain Current Management**		1. Reduce Charge Mass/Delay over decreasing distance towards POI's of concern; 2. Relocate POI's of concern at least 600 m;	Life of Operation	2	2	2	3	3	**36**	**ML Maintain Current Management**
Direct	Fly rock impact on houses, boreholes and roads, resulting in possible damage to infrastructure;	2	2	3	2	3	**35**	**ML Maintain Current Management**		1. Increase stemming length; 2. Put in controls for management of stemming lengths, 3. Relocate POI's of concern at least 600 m.	Life of Operation	2	2	3	2	2	**28**	**ML Maintain Current Management**
Direct	Impact of fumes on nearby land occupiers, boreholes and road users.	1	2	2	3	3	**30**	**ML Maintain Current Management**		1. Use correct products; 2. Control product quality; 3. Prevent sleep time for charged blast holes; 4. Same day charge and blast.	Life of Operation	1	2	3	2	3	**30**	**ML Maintain Current Management**
Visual Impacts																		
Direct	Visual intrusion as a result of the movement of machinery and the erection of contractor camps.	2	2	2	2	3	**30**	**ML Maintain Current Management**	To minimise visual disturbance and sense of place.	1. The relevant exposed construction site areas and access gravel roads will be irrigated on a regular basis, with just enough moisture to keep the dust down without creating undue runoff; 2. Natural vegetation, wherever practical, must be retained on and around the construction sites; 3. All lights used for illumination (except for lighting associated with security) should be faced inwards and shielded to avoid light escaping above the horizon; 4. Construction site will be screened from sensitive receptors and rubble removed from site on a daily basis; 5. Litter and dust management measures should be in place at all times; 6. The sites should be kept neat and tidy at all times; 7. On site construction activities will be limited to be undertaken between 6am and 6pm.	1 month to 1 year	1	1	2	2	2	**16**	**L No Management Required**
Direct	Scaring of the landscape as a result of the clearance of vegetation and preparation of the Pit 1 expansion.	2	2	2	2	2	**24**	**L No Management Required**			1 month to 1 year	1	1	1	1	1	**6**	**L No Management Required**
Direct	Indirect visual impact due to dust generation as a result of the movement of vehicles and materials, to and from the site area.	1	2	2	3	3	**30**	**ML Maintain Current Management**			1 month to 1 year	1	1	1	2	2	**12**	**L No Management Required**

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		Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating		Management and Mitigation Measures	Timeframe	Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact						Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Noise Impacts																		
Direct	The use of vehicles and machinery during the construction phase may generate noise in the immediate vicinity	3	3	3	4	4	**72**	**MH Maintain Current Management**	Minimise the emission of noise pollution during construction and mining activities.	1. Hauling vehicles with low noise levels to be used and must be maintained in a good order at all times; 2. Maintenance plan to be put in place and to be followed; 3. Conduct baseline noise monitoring prior to constriction activities; 4. Implement a noise monitoring programme to measure against the baseline noise assessment; 5. The project will investigate using equipment and applying technology that results in the generation of less noise than existing equipment and technology; 6. Building activities to take place during daytime only; 7. Safe blasting methods to be used under controlled conditions; 8. Emergency generators to be placed in such a manner that it is away from residential areas.	Life of Operation	1	2	2	2	3	**25**	**L No Management Required**
Direct	Increase in ambient noise levels as a result of the mining activities.	2	2	2	3	3	**36**	**ML Maintain Current Management**		1. The roll over mining method must include the construction of a noise barrier on the north west side of each current Pit area using the removed topsoil and stripped overburden; 2. It is strongly recommended that the high Pitched alarms be replaced with devices that produce high levels of broadband noise.	Life of Operation	1	1	2	3	3	**24**	**L No Management Required**
Soil, Land Use and Land Capability Impacts																		
Direct	Chemical pollution of soils as a result of vehicle hydrocarbon spillages and compaction.	2	2	2	3	3	**36**	**ML Maintain Current Management**	Prevent soil contamination and ensure rehabilitation of contamination.	1. Existing established roads should be used wherever possible; 2. Access roads should be designed with a camber to avoid ponding and to encourage drainage to side drains; where necessary, culverts should be installed to permit free drainage of existing water courses; 3. The side drains of the roads can be protected with sediment traps and/or gabions to reduce the erosive velocity of water during storm events and where necessary geo-membrane lining can be used; 4. Losses of fuel and lubricants from the oil sumps and steering racks of vehicles and equipment should be contained using a drip tray with plastic sheeting filled with absorbent material; 5. Using biodegradable drilling fluids, using lined sumps for collection of drilling fluids, recovering drilling muds and treating them off-site, and securely storing dried waste mud by burying it in a purpose-built containment area; 6. Avoiding waste disposal at the site wherever possible, by segregating, trucking out, and recycling waste.	Life of Operation	1	2	2	2	2	**20**	**L No Management Required**
Direct	Clearing of vegetation and compaction of the construction footprint will result in the soils being particularly more vulnerable to soil erosion.	3	2	3	2	3	**40**	**MH Maintain Current Management**	Minimise loss of Soil resources.	1. The activities of construction contractors or employees will be restricted to the planned areas; 2. Instructions must be included in contracts that will restrict construction work and construction workers to the clearly defined limits of the construction site; 3.Locate all topsoil stockpiles in areas where they will not have to be relocated prior to replacement for final rehabilitation; 4. The ideal is to place all overburden materials removed at mine opening in their final closure location, or as close as practicable to it; 5. Ensure all topsoil stockpiles are clearly and permanently demarcated and located in defined no-go areas; 6. Map all stockpile locations; 7. Topsoil should never be used as a filling material for roads	Life of Operation	2	2	3	2	2	**28**	**ML Maintain Current Management**

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		Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating				Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Management and Mitigation Measures	Timeframe	Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Direct	Loss of soil resource and utilisation as a result of the cleaning and topsoil stripping of the construction footprint.	3	2	3	2	3	40	MH Maintain Current Management		1. The existing pre-construction mine layout and design must aim to minimise the area to be occupied by mine infrastructure (workshops, administration, product stockpile, etc.) to as small as practically possible; 2. All footprint areas should also be clearly defined and demarcated and edge effects beyond these areas clearly defined; 3. Height of stockpiles be restricted between of 4 – 5 metres maximum. For extra stability and erosion protection, the stockpiles may be benched; 4. Stripping of topsoil should not be conducted earlier than required (maintain vegetation cover for as long as possible) in order to prevent the erosion (wind and water) of organic matter, clay and silt; 5. Reducing slope gradients as far as possible along road cuts and disturbed areas to gradients at or below the angle of repose of those disturbed surfaces; 6. Using drainage control measures and culverts to manage the natural flow of surface runoff; 7. Soil stockpiles must be sampled, ameliorated (if necessary) and re-vegetated as soon after construction as possible.	Life of Operation	2	2	3	2	2	28	ML Maintain Current Management
Direct	As a result of construction activities, the land use will have altered from grazing and agriculture to that of construction for mining activities	2	2	3	2	3	35	ML Maintain Current Management	Minimise loss of agricultural land.		Life of Operation	2	2	2	2	2	24	L No Management Required
Direct	Handling and storage of building materials and different kinds of waste leading to soil sterilisation.	2	2	2	2	2	24	L No Management Required	Prevent soil sterilisation.	1. Topsoil stockpiles can be contaminated by dumping waste materials next to or on the stockpiles, contamination by coal dust from product stockpile and the pumping out of contaminated water from the underground mine or Pits are all hazards faced by stockpiles. This should be avoided at all cost and if it occurs, should be cleaned up immediately.	Life of Operation	1	2	2	2	2	20	L No Management Required
Direct	Permanent loss of land capability and land use.	3	3	2	2	2	32	ML Maintain Current Management	Minimise loss of land capability and enhance rehabilitation.	1. Land capability and land use will be loss as a result of the Pit 1 expansion. This cannot be mitigated further; 2. Construction footprint of the pipeline will be rehabilitated to the construction land capability; 3. Pipelines will be placed at depths to allow for continuation of the previous land use.	1 month to 1 year	2	2	1	2	2	20	L No Management Required
Heritage Impacts																		
Direct	The proposed project has the potential to impact on local graves within the area. Two grave sites were observed within the footprint of the proposed pipeline route	4	1	1	4	4	48	MH Maintain Current Management	Prevent destruction of graves.	1. Change the trajectory of the proposed route. If impact cannot be prevented a Phase 2 study is required followed with a destruction permit application from SAHRA; 2. A person or entity, e.g. the Environmental Control Officer, should be tasked to take responsibility for the heritage sites and should be held accountable for any damage; 3. Known sites should be located and isolated, e.g. by fencing them off. All construction workers should be informed that these are no-go areas, unless accompanied by the individual or persons representing the Environmental Control Officer; 4. In areas where the vegetation is threatening the heritage sites, e.g. growing trees pushing walls over, it should be removed, but only after permission for the methods proposed has been granted by SAHRA. A heritage official should be part of the team executing these measures; 5. Maintain a 100 m buffer zone around identified grave that will not be relocated.	1 month to 1 year	3	2	2	2	2	28	ML Maintain Current Management
	Alternative 2	4	1	1	4	4	48	MH Maintain Current Management				2	1	1	1	1	8	L No Management Required
	Alternative 3	4	1	1	4	4	48	MH Maintain Current Management				2	1	1	1	1	8	L No Management Required

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating				Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Management and Mitigation Measures	Timeframe	Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Direct	The proposed project has the potential to impact on sites of archaeological importance. Historic power line pylons are present within the proposed footprint.	4	1	1	4	4	48	MH Maintain Current Management	Conserve heritage artefacts and buildings.	1. Monitor and control the mining activities to prevent impact on the historical power line pylons (Site 9). If impact cannot be prevented a Phase 2 study is required followed with a destruction permit application from SAHRA; 2. However, care should be taken that, when development commences, if any archaeological and/or historical sites are discovered, a qualified archaeologist be called in to investigate the occurrence.	1 month to 1 year	2	1	1	1	1	8	L No Management Required
Palaeontology Impacts																		
Direct	Sealing-in or destruction of the fossils during earth moving activity	4	3	3	2	2	40	MH Maintain Current Management	Protection of Palaeontological findings	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 for shallow caves.	1 month to 1 year	2	1	1	2	2	16	L No Management Required
Topography Impacts																		
Direct	Minor changes in the topography may be experienced as a result of bush clearing and construction vehicles on site.	3	3	2	2	2	32	ML Maintain Current Management	Reduce impacts on topographic character.	1. Bush clearance will only take place in designated areas and as minimal as possible; 2. The construction site will be kept neat and tidy and free of litter; 3. Building rubble will be removed daily; 4. The construction site will be screened to minimise the visual disturbance to surrounding land owners.	Life of Operation	2	2	2	2	2	24	L No Management Required
Geology Impacts																		
Direct	Removal of local geology as a result of pipeline trenching and expansion of Pit 1	3	2	3	3	3	48	MH Maintain Current Management	Minimise the generation of mining waste.	1. The extent of this impact is extremely localised and the impact has been rated to have a Low significance rating; 2. Mining will be conducted strictly according to the mine plan submitted to the DMR; 3. Optimally exploit this resource in terms of tonnage of rock mined and cost as provided for in the mine plan.	Life of Operation	1	2	2	2	2	20	L No Management Required
Climate Impacts																		
Direct	Emissions of Green House Gases as a result of the use of plant, heavy moving machinery, generators etc.	2	3	2	3	3	42	MH Maintain Current Management	Reduce greenhouse gas emissions.	1. Plant and machinery will be maintained so that no unnecessary emissions are expelled; 2. Appropriate technology and machinery will be utilised for the job at hand; 3. A Green House Gas Emissions assessment will be calculated as part of the initiative to reduce greenhouse gas emissions.	Life of Operation	1	1	3	2	2	20	L No Management Required
Cumulative Impacts																		
Indirect	Increased generation of dust, PM10 and PM2.5 within the local area	2	3	2	3	2	35	ML Maintain Current Management	To minimise air quality emissions and health impacts.	1. Through the implementation of all the above mentioned mitigation measures, the overall significance of the activity's impact can be lowered to LOW.	Life of Operation	2	2	2	2	2	24	L No Management Required
Indirect	Reduced land availability for agricultural use	2	3	2	3	2	35	ML Maintain Current Management	To minimise cumulative loss of natural vegetation in the region.			2	2	2	2	2	24	L No Management Required
Indirect	Increased loss of indigenous vegetation and loss of soil resources.	2	3	2	3	2	35	ML Maintain Current Management				2	2	2	2	2	24	L No Management Required
In terms of the overall construction phase it is anticipated that the significance of the cumulative impact will be MEDIUM HIGH, due to the impact occurring on site and over a short duration of time although the activity may affect the local areas' biodiversity, soils and air quality emissions have a likely potential.																		

13.3 Operational Phase

During the operational phase, the following main activities will take place:

- Mining of Pit 1 expansion area;
- Water and stormwater management;
- Maintenance of existing and new infrastructure;
- Pumping of water from Dorstfontein East to Dorstfontein West;
- Maintenance of topsoil stockpiles;
- Machinery movement during mining activities;
- Blasting as part of the mining methodology.

Where significance ratings differ between alternatives, these are indicated in the assessment tables. The impact assessment for the construction phase can be found in Table 13-2. The following impacts are envisaged during the operational phase.

13.3.1 Socio – Economic Impacts

The following socio – economic impacts are envisaged as a result of the construction phase of the proposed project:

- Negative impact as a result of the Pit 1 extension as there will be additional trucks on the roads, impacting on local communities' health and safety;
- Negative impact on, local community health and safety due to influx of employees, the presence of job seekers, which may lead to prostitution and conflict with the local communities. Illegal informal settlement of job seekers in the area may exacerbate the situation;
- Positive impact as a result of operation and associated activities, providing a potential for local employment opportunities; increasing access to financial caPital for workers;
- As a result of blasting activities during operation, potential damage to adjacent landowner's/occupiers infrastructure;
- As a result of underground mining activities, there is potential for the occurrence of subsidence, impacting on the safety surface land dwellers and users.

From a socio – economical perspective, there is no preferred alternative as the impact on the socio – economic environment remains relatively consistent throughout the proposed alternatives. There is a slight inclination to opencast mining, compared to underground mining as a result of the possible prevalence of subsidence.

13.3.2 Groundwater Impacts

The Pit 1 expansion and pipeline construction may possible result in the following impacts on the geo-hydrology of the area during the construction phase are as follows:

- Opencast and underground mining impacting on water quality as a result of groundwater inflows into the workings which needs to be pumped out for mine safety and the resultant dewatering (water level decrease) of the groundwater system in the immediate vicinity of the working;
- Analyses showed that acid mine drainage (AMD) formation is expected and poor quality leachate can occur based on the leach potential of the material, leading to impacted water quality;

- The co-disposal facility receives coal containing materials from the underground workings being exposed to water and oxygen, resulting in ARD. Contamination of the groundwater system may occur through seepage from the co-disposal facility.
- Stockpiling of coal will expose coal to water and oxygen, resulting in ARD from stockpiles. Contamination of the groundwater system may occur from these sites;
- Handling of waste and transport of materials cause various types of spills (domestic waste, sewage water, hydrocarbons) which can infiltrate and cause contamination of the groundwater system.

The assessment of the groundwater impacts during the construction phase, has illustrated that there is no preferable alternative to the mining methodology or pipeline route alternative. Minimal groundwater impacts are envisaged as a result of the construction phase.

13.3.3 Surface Water Impacts

The potential impacts on surface water during the construction phase of the proposed project are as follows:

- Impact on water quality and erosion as a result of the pipeline breaking and spillage to non-perennial streams;
- Pump failure will result in dirty water accumulation in the Pit, leading to uncontrolled dirty water management and associated pollution;
- Impact on water quality and availability as a result in ineffective dirty water separation, and dirty water entering into the wetland;
- High rate of ground water ingress causing flooding of the Pit;
- The rainfall water within the designated dirty water area of the Pit 1 expansion area that forms part of the MAR to the local water courses will be removed from the catchment. This will result in a lower intensity potential on the local surface water resource;
- Increase in volume of contaminated water that needs to be managed within the footprint;
- Erosion of stream banks as a result of crossings and diversions leading to siltation of the streams;
- Impacts on surface water resources quality as a result of incorrect waste management practises and pollution.

Some level of sedimentation is expected to occur in the unnamed tributary pre-development as runoff is naturally anticipated to pick up environmental debris as it crosses natural areas. Increased turbidity is reversible and surface water should return to pre-impact turbidity levels once sediment levels entering the watercourse are reduced. Settled sediments should naturally move downstream during periods of high flow flowing storm events.

The assessment of the surface water impacts during the construction phase, has illustrated that there is no preferable alternative to the mining methodology or pipeline route alternative. Surface water impacts experienced will be experienced across all alternatives.

13.3.4 Biodiversity Impacts

The Pit 1 expansion and construction of the water pipeline may result in the following impacts on the floral environment during the pre-construction phase:

- Destruction of potential floral habitats for species of conservational concern as a result continual disturbance of soils leading to altered floral habitats, erosion and sedimentation;
- Impact on floral diversity as a result of increased alien species proliferation and ongoing edge effects from maintenance operations;
- Impact on floral species of conservational concern as a result of an increased in alien species proliferation and ineffective rehabilitation of exposed areas;
- Generation of waste and incorrect disposal from construction material leading to disturbance of boundary natural vegetation;

The Pit 1 expansion and construction of the water pipeline may result in the following impacts on the faunal environment during the pre-construction phase:

- Loss of faunal habitat and ecological structure as a result of increased fires during operation and introduction of alien species, leading to transformation of the natural habitat;
- Loss of faunal divert and ecological integrity as a result of alien species proliferation, poaching, and collision of vehicles with animals;
- Impact of faunal species of conservational concern due to habitat loss within the operational footprint and increased alien species proliferation;
- Discharge and contamination from operational facilities may pollute receiving environment, impacting on faunal diversity.

The biodiversity assessment has indicated that the proposed route alternative will be the most preferred alternative. However, mitigation and management of species of conservational concern needs to be adhered to. The mining methodology proposed will not inherently impact on the biodiversity of surrounding areas.

13.3.5 Wetland and Aquatic Environmental Impacts

The Pit 1 expansion and water pipeline operation may result on the following envisaged impacts during the operation phase: Most of the impacts are directly related to the maintenance of the pipeline:

- Loss of habitat and wetland ecological structure as a result of continual wetland disturbance and uncontrolled wetland degradation;
- Impact on the wetlands systems as a result of changes to the sociocultural service provisions through uncontrolled vegetation clearance, waste management and wetland disturbance;
- Potential poor planning, resulting in the placement of the linear development within wetland habitat, leading to altered habitat;
- Impact on the hydrological functioning of the wetland systems as a result of reduce wetland footprints and uncontrolled disturbance during maintenance activities;
- Impacts on the hydrological functioning of the wetland as a result of the Pit 1 expansion.

The wetland assessment has concluded that the most preferable option for the pipeline is the proposed alternative. Alternative 2 and Alternative 3 cross sensitive ecological services, resulting in a significant impact on the sociocultural service provision and hydrological functioning.

13.3.6 Air Quality Impacts

The impact the postposed project is envisaged to have on the air quality of the area during the pre-construction phase are as follows:

- Possible increase in dust generation, PM_{10} and $PM_{2.5}$ as a result of stockpiling material, use of heavy machinery, and material movement;
- Increase in carbon emissions and ambient air pollutants (NO_2 and SO_2) as a result of movement of vehicles and operation of machinery/equipment.

The Air Quality assessment has concluded that there is no preferable alternative to the pipeline routes. The opencast operations proposed will inherently generate additional dust compared to the underground working. A combination of opencast and underground mining methodologies will not reduce dust, PM_{10} and $PM_{2.5}$ generation compared to individual opencast or underground mining.

13.3.7 Blast and Vibration Impacts

The construction and preparation of the Pit 1 expansion area, may result in the need for blasting. The following impacts are envisaged as a result of blasting activities:

- Impact of ground vibration on houses, boreholes and roads, resulting in possible damage to infrastructure;
- Air blast impact on houses, boreholes and roads, resulting in possible damage to infrastructure;
- Fly rock impact on houses, boreholes and roads, resulting in possible damage to infrastructure;
- Impact of fumes on nearby land occupiers, boreholes and road users.

No blasting activities are anticipated for the operation of the pipeline. Therefore, the blasting assessment has concluded that there is no preferable pipeline route. Blasting will be inevitable during mining activities, thus the impact will be continuous from opencast through to underground methodologies.

13.3.8 Visual Impacts

The following impacts on the visual character as a result of the proposed Pit 1 expansion and construction of a water pipeline are envisaged during the pre-construction phase:

- Scaring of the landscape as a result of the clearance of vegetation and mining of the Pit 1 expansion where no rehabilitation has taken place;
- Indirect visual impact due to dust generation as a result of the movement of vehicles and materials, to and from the site area;

The operation of the Pit 1 expansion will inevitably scare the landscape. However, this will be in line with the context of the surrounding environment. The pipeline will be located underground, thus minimising the visual impact on the landscape, as long as effective rehabilitation is conducted.

13.3.9 Noise Impacts

The following noise impact is envisaged as a result of the pre-construction phase of the proposed project:

- The use of vehicles and machinery during the operational phase may generate noise in the immediate vicinity;

- Increase in ambient noise levels as a result of the mining activities. The assembling of mine related equipment and/or structures during the operational phase will inherently generate a degree of noise emissions.

The noise assessment has concluded that the noise generation across all alternatives will be negligible. The proposed alternative can thus be employed with minimal difference in noise levels across between alternatives.

13.3.10 Soils, Land Use and Land Capability Impacts

During the construction phase, all infrastructure and activities required for the operational phase will be established. The main envisaged activities include the following:

- Open Pits and surface infrastructure will both lead to surface impacts on soil resources. Surface infrastructure like haul roads and product stockpiles are by far the most disruptive to current land uses, land capability as well as agricultural potential of the soil. Soil underneath buildings and stockpiles are subject to compaction and sterilisation of the topsoil;
- Impacts on soil resources due to daily traffic on roads for inspection and maintenance of infrastructure, leading to soil compaction and pollution;
- Soil contamination as a result of construction activities can be as a result of a number of activities (i.e. hazardous substance storage, incidental hydrocarbon leakages from construction vehicles).

13.3.11 Heritage Impacts

The following impacts are envisaged on archaeological artefacts and graves as a result of the construction phase of the proposed project:

- The proposed project has the potential to impact on local graves within the area. Two grave sites were observed within the footprint of the proposed pipeline route;
- The proposed project has the potential to impact on sites of archaeological importance. Historic power line pylons are present within the proposed footprint.

13.3.12 Palaeontology Impacts

The following impacts are envisaged on the Palaeontology context during the pre-construction phase of the proposed project:

- Sealing-in or destruction of the fossils during earth moving activity.

13.3.13 Topography Impacts

As a result of pre-construction activities the following impacts are envisaged as a result of the pre-construction phase:

- The continuous placement of ore material onto the demarcated ore stockpile area will modify the local topography of the site specific area;
- Progressive mining of the Pit 1 expansion area will ultimately alter the topography.

13.3.14 Geology Impacts

As a result of construction activities the following impact on Geology are anticipated:

- Removal of local geology as a result of the expansion of Pit 1.

13.3.15 Climate Impacts

As a result of the operational activities the following impact is envisaged on the climate in the area:

- Emissions of Green House Gases as a result of the use of plant, heavy moving machinery, generators etc.;
- Indirect impact as a result of coal utilisation for power generation leading to greenhouse gas emissions.

13.3.16 Cumulative Impacts

The following cumulative impacts are envisaged as a result of the proposed Pit 1 expansion and construction of the water pipeline:

- Increased generation of dust, PM_{10} and $PM_{2.5}$ within the local area;
- Reduced land availability for agricultural use.

Table 13-3: Potential Impacts and mitigation measures associated with the operational phase of the proposed Pit 1 expansion and water pipeline

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelihood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating		Management and Mitigation Measures	Timeframe	Consequence			Likelihood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact						Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Socio - Economic Impacts																		
Direct	Negative impact as a result of the Pit 1 extension as there will be additional trucks on the roads, impacting on local communities' health and safety	3	3	4	2	1	**30**	**ML Maintain Current Management**	Protect social - economic environment of local land users.	1. Operation vehicles to be road worthy and drivers to adhere to speed limits; 2. Employees and contractors adhere to Exxaro standards and requirements, Exxaro Safety Health and Environmental policies, as well as relevant South African regulations such as the Mine Health and Safety Act (Act No. 29 of 1996) as amended; 3. Inform Exxaro employees and neighbouring landowners and inhabitants about operation activities (specifically for blasting); 4. Ensure a grievances procedure is in place.	Life of Operation	3	3	4	1	1	**20**	**L No Management Required**
Direct	Negative impact on, local community health and safety due to influx of employees, the presence of job seekers, which may lead to prostitution and conflict with the local communities. Illegal informal settlement of job seekers in the area may exacerbate the situation	3	4	4	2	2	**44**	**MH Maintain Current Management**	Prevent negative social impacts on the health and safety of land users and employees.	1. Ensure a grievances procedure is in place for local people to log grievances; 2. Implement local recruitment and training strategies and policies, and clearly communicate these locally through relevant authorities and media; 3. Do not recruit informally at the gate but follow a formal recruitment process; 4. Make use of local accommodation for contract workers, as opposed to a contractor's camp; 5. Inform Exxaro employees and neighbouring landowners and inhabitants about local recruitment strategies and policies, and give regular updates; 6. Monitor the surrounding area for informal settlement and develop a strategy to deal with informal settling; 7. Ensure that all contractors and their employees attend inception training, addressing Exxaro standards and requirements, Exxaro Safety Health and Environmental policies, relevant South African regulations, the environmental management plan, and recruitment strategies.	Life of Operation	4	3	2	1	1	**18**	**L No Management Required**
Direct	Positive impact as a result of operation and associated activities, providing a potential for local employment opportunities; increasing access to financial capital for workers	3	3	4	1	1	**20**	**L No Management Required**	Improve the local financial capital for local communities and land owners.	1. Where it is possible, hire/use local people; 2. Identify opportunities for the employment/procurement and training of people and contractors from the local area; 3. Opportunities for local employment may include activities related to office cleaning, ground maintenance and mining; 4. Based on these opportunities, develop a recruitment and training strategy that operations recruiters will have to adhere to; 5. Monitor implementation of local recruitment and training strategies, including monitoring of corruption and nepotism; 6. Employment and training of the youth and females where possible; 7. Implementation of employment and procurement policy; 8. Communication with locals regarding job opportunities and skills requirements to manage expectations.	Life of Operation	3	3	4	2	1	**30**	**ML Maintain Current Management**
Direct	As a result of blasting activities during operation, potential damage to adjacent landowner's/occupiers infrastructure	3	3	2	2	2	**32**	**ML Maintain Current Management**	Protect infrastructure during blasting activities.	1. Alert adjacent land owners of operational blasting activities in a timeous manner; 2. Ensure requirements for human health and safety relating to blasting are adhered to avoid unnecessary damage; 3. Ensure management measures indicated by blasting specialist study are adhered to; 4. Stakeholder engagement channels and grievance procedure mechanisms need to be developed prior to operation and need to be ongoing and frequent.	Life of Operation	3	3	4	2	1	**30**	**ML Maintain Current Management**
Direct	As a result of underground mining activities, there is potential for the occurrence of subsidence, impacting on the safety surface land dwellers and users.	3	3	2	2	2	**32**	**ML Maintain Current Management**	Ensure the safety of the employees and land occupiers.	1. Alert adjacent land owners of blasting activities and times in a timeous manner; 2. Ensure requirements for human health and safety relating to blasting are adhered to avoid unnecessary escape of irrigational dust; 3. Ensure management measures indicated by blasting specialist study are adhered to; 4. Stakeholder engagement channels and grievance procedure mechanisms need to be developed prior to construction and need to be ongoing and frequent.	Life of Operation	3	2	2	2	1	**21**	**L No Management Required**

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)					
		Consequence			Likelihood (Probability)		Significance (Degree to	Significance Rating				Consequence			Likelihood (Probability)		Significance (Degree to	Significance Rating
Direct	Negative impact as a result of manmade features (pipeline) dissecting the landscape which will impact on the rural and agricultural sense of place.	2	3	4	2	1	27	ML Maintain Current Management	Ensure the safety of the employees and land occupiers.	1. Where possible, pipeline infrastructure should be located as far away from private infrastructure as possible; 2. Where possible, pipeline infrastructure should run along existing farm and regional roads to avoid disturbing rural/agricultural features; 3. Where possible, allow surface farmers to continue farming activities despite pipeline presence; 4. Implement noise and dust management measures as recommended by relevant specialists; 5. Stakeholder engagement channels and grievance procedure mechanisms need to be developed prior to operation and need to be ongoing and frequent.	Life of Operation	3	3	4	1	1	20	L No Management Required
Groundwater Impacts																		
Direct	Impact on groundwater quality as a result of hydrocarbon spillages from machinery.	2	2	2	3	3	36	ML Maintain Current Management	Prevent groundwater contamination.	1. All spillages will need to be cleaned up as soon as practically possible; 2. Proper management of stormwater drainage infrastructure should be ensured; 3. Maintain construction vehicles and encourage contractors to report, react and manage all spills and leaks so that action can be taken to immediately minimise contamination to the groundwater; 4. Groundwater monitoring of boreholes should continue as per the WUL and approved monitoring programme. 5. Spill kits will be made available in areas of likely spillage; 6. All hydrocarbon storage containers will be stored within a bunded areas which are water tight and able to contain 110% of the stored volume; 7. All equipment utilising hydrocarbons will be stored on a hard standing surface.	Life of Operation	1	2	2	2	2	20	L No Management Required
Direct	Storage of hydrocarbons and chemicals, which may impact on groundwater as a result of spillages and uncontrolled release.	2	2	2	3	3	36	ML Maintain Current Management			Life of Operation	1	2	2	2	2	20	L No Management Required
Indirect	Monitoring borehole on the border of the Pit 1 expansion area may be a conduit of flow to the groundwater unless sealed.	3	3	4	3	3	60	MH Maintain Current Management		1. Grouting and capping of boreholes located within the footprint of construction camps be required prior to construction activities; 2. Treat the water emanating for the opencasts to improve the decant water quality	Life of Operation	1	2	2	2	3	25	L No Management Required
Surface Water Impacts																		
Direct	Impact on water quality and erosion as a result of the pipeline breaking and spillage to non-perennial streams.	2	2	1	2	1	15	L No Management Required	Reduce the impact on water quality	1. Operation of the pipeline should be operated using best practises; 2. Frequent monitoring of the pipeline should be done to ensure leakages are identified and repaired timeously.	Life of Operation	1	1	1	1	1	6	L No Management Required
Direct	Pump failure will result in dirty water accumulation in the Pit, leading to uncontrolled dirty water management and associated pollution.	2	2	2	2	2	24	L No Management Required	Protect surface water flow and associated pollution.	1. Undertake regular structural inspections of pumps and pipes of exiting Pit. Ensure groundwater investigation is done to understand groundwater levels; 2. Stormwater culverts and clean water diversions will be designed and constructed to accommodate the 1:50 year storm event.	Life of Operation	1	1	1	1	1	6	L No Management Required
Direct	Impact on water quality and availability as a result in ineffective dirty water separation, and dirty water entering into the wetland.	2	1	1	1	1	8	L No Management Required	Ensure effective and reliable clean and dirty water separation.	1. Monitor the effective usage and functioning of the upstream bunds constructed upstream of the affected site; 2. Monitor and maintain good vegetation cover, to reduce runoff; 3. Develop and implement controls to clean up oil/diesel leaks and spillages of any designated hazardous waste.	Life of Operation	1	1	1	1	1	6	L No Management Required
Direct	High rate of ground water ingress causing flooding of the Pit	4	4	3	4	3	77	H Improve Current Management	Prevent water wastage and impact on water resources.		Life of Operation	3	2	3	2	3	40	MH Maintain Current Management
Direct	The rainfall water within the designated dirty water area of the Pit 1 expansion area that forms part of the MAR to the local water courses will be removed from the catchment. This will result in a lower intensity potential on the local surface water resource	2	3	2	4	2	42	MH Maintain Current Management	Recue the loss of water to the catchment.	1. The clean stormwater will be diverted which further mitigates the impact.	Life of Operation	1	2	2	2	1	15	L No Management Required
Direct	Increase in volume of contaminated water that needs to be managed within the footprint	2	2	3	3	3	42	MH Maintain Current Management	Ensure effective and reliable clean and dirty water separation.	1. Monitor the effective usage and functioning of the upstream bunds constructed upstream of the affected site; 2. Monitor and maintain good vegetation cover, to reduce runoff; 3. Develop and implement controls to pick up oil/diesel leaks and spillages of any designated hazardous waste.	Life of Operation	1	2	1	1	1	8	L No Management Required

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelihood (Probability)		Significance (Degree to	Significance Rating				Consequence			Likelihood (Probability)		Significance (Degree to	Significance Rating
Indirect	Erosion of stream banks as a result of crossings and diversions leading to siltation of the streams	3	2	2	3	4	**49**	**MH Maintain Current Management**	Prevent siltation of water courses.	1. River crossings and diversions will be inspected monthly; 2. Erosion control measures will be implemented should it be evident that erosion has occurred; 3. Establish vegetation around disturbed areas to prevent any erosion; 4. Stormwater runoff will be handled on surface and directed towards natural watercourses.	Life of Operation	2	2	2	2	2	**24**	**L No Management Required**
Indirect	Impacts on surface water resources quality as a result of incorrect waste management practises and pollution.	2	3	3	2	2	**32**	**ML Maintain Current Management**	Prevent water pollution as a result of waste management practises.	1. A waste management plan will be compiled and approved for implementation of site. This management plant should focus on the waste hierarchy of the NEM:WA; 2. No waste may be disposed of to land without the necessary legal permits; 3. Waste will be removed from site by an accredited waste removal company and legally disposed of. Disposal certificates will be kept on site for audit purposes; 4. Sufficient waste receptacles will be placed around the site allowing the separation of waste as source.	Life of Operation	1	2	2	2	2	**20**	**L No Management Required**
Biodiversity Impacts																		
Direct	Destruction of potential floral habitats for species of conservational concern as a result continual disturbance of soils leading to altered floral habitats, erosion and sedimentation.	3	3	2	2	2	**32**	**ML Maintain Current Management**	Protection of floral habitats	1. The operational footprint must be kept as small as possible in order to minimise impact on the surrounding environment; 2. Edge effect control needs to be implemented within construction areas, with specific consideration to erosion control and alien floral species management; 3. Erosion berms and hessian sheets are to be used in areas where soils are susceptible to high levels of erosion; 4. No vehicles are allowed to indiscriminately drive through sensitive wetland and natural areas; 5. Upon completion of construction activities and decommissioning of temporary access road, all impacted and disturbed areas should be ripped, re-profiled and reseeded with an indigenous veldgrass mixture that will assist to stabilise soils as soon as possible; 6. During the operational phases of the project, erosion berms may be installed to prevent gully formation and siltation of the wetland resources associated with improved floral habitat; 7. The following points should serve to guide the placement of erosion berms: - Where the track has a slope of less than 2%, berms every 50m should be installed; - Where the track slopes between 2% and 10%, berms every 25 m should be installed; - Where the track slopes between 10% and 15%, berms every 20 m should be installed; - Where the track has a slope greater than 15%, berms every 10 m should be installed.	Life of Operation	1	2	2	2	2	**20**	**L No Management Required**
	Alternative 2	3	3	3	2	2	**36**	**ML Maintain Current Management**				2	2	2	2	2	**24**	**L No Management Required**
	Alternative 3	3	3	3	2	2	**36**	**ML Maintain Current Management**				2	2	2	2	2	**24**	**L No Management Required**
Direct	Impact on floral diversity as a result of increased alien species proliferation and ongoing edge effects from maintenance operations.	3	3	2	2	2	**32**	**ML Maintain Current Management**	Prevent impacts on floral diversity.	1. Species specific and area specific eradication recommendations include the following: - Care should be taken with the choice of herbicide to ensure that no additional impact and loss of indigenous plant species occurs due to the herbicide used. The use of herbicides must be limited and only be used under strict control and when no other alternative exists; - Footprint areas should be kept as small as possible when removing alien plant species; - No vehicles should be allowed to drive through designated sensitive wetland areas during the eradication of alien and weed species.	Life of Operation	2	2	2	2	2	**24**	**L No Management Required**
	Alternative 2	3	3	2	2	2	**32**	**ML Maintain Current Management**				2	2	2	2	2	**24**	**L No Management Required**
	Alternative 3	3	3	2	2	2	**32**	**ML Maintain Current Management**				2	2	2	2	2	**24**	**L No Management Required**
Direct	Impact on floral species of conservational concern as a result of an increased in alien species proliferation and ineffective rehabilitation of exposed areas	3	3	3	2	2	**36**	**ML Maintain Current Management**	Protection of species of Conservational Concern	1. As far as possible, indigenous grassland species, including grasses, should be used to revegetate bare areas. It is suggested that species such as *Cynodon dactylon* and *Eragrostis sp* be used for revegetation purposes; 3. Establishment of reintroduced vegetation must be monitored during the operational phase; 4. Monitoring of relocation success of rescued and relocated floral species of conservational concern should take place during the operational phase; 5. Harvesting of protected floral species by mining and operational personnel	Life of Operation	1	1	2	2	2	**16**	**L No Management Required**

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelihood (Probability)		Significance (Degree to	Significance Rating				Consequence			Likelihood (Probability)		Significance (Degree to	Significance Rating
	Alternative 2	3	3	3	2	2	36	ML Maintain Current Management		should be strictly prohibited.	Life of Operation	2	1	2	2	2	20	L No Management Required
	Alternative 3	3	3	2	2	2	32	ML Maintain Current Management			Life of Operation	1	1	2	2	2	16	L No Management Required
Direct	Generation of waste and incorrect disposal from construction material leading to disturbance of boundary natural vegetation.	2	2	3	2	2	28	ML Maintain Current Management	Minimise disturbance to natural habitats.	1. No dumping of waste should take place. If any spills occur, they should be immediately cleaned up.	Life of Operation	1	1	2	2	2	16	L No Management Required
Direct	Loss of faunal habitat and ecological structure as a result of increased fires during operation and introduction of alien species, leading to transformation of the natural habitat	3	2	3	2	2	32	ML Maintain Current Management	Minimise the impact on the local faunal habitat and ecological structure.	1. No uncontrolled fires whatsoever should be allowed; 2.In the event of a breakdown, maintenance of vehicles must take place with care and the recollection of spillage should be practiced to prevent the ingress of hydrocarbons into the topsoil; 3. All alien plants within the linear development should be cleared, with follow up activities running concurrently for one year.	Life of Operation	1	2	2	1	1	10	L No Management Required
	Alternative 2	3	3	3	2	2	36	ML Maintain Current Management				1	2	2	2	1	15	L No Management Required
	Alternative 3	3	3	3	2	2	36	ML Maintain Current Management				1	1	2	2	2	16	L No Management Required
Indirect	Loss of faunal diversity and ecological integrity as a result of alien species proliferation, poaching, and collision of vehicles with animals	3	3	2	2	2	32	ML Maintain Current Management	Minimise the loss of faunal diversity as a result of operational activities	1. Restrict vehicles to travelling only on designated roadways to limit the ecological footprint of the proposed development activities; 2. Implement speed limit and traffic calming devices along roadways; 3. Ensure that all vehicles utilise existing designated road networks; 4. Erect warning signs to pro-actively prevent collisions; 5. Access control must be implemented to ensure that no illegal trapping or poaching takes place.	Life of Operation	1	1	2	2	2	16	L No Management Required
	Alternative 2	3	3	2	2	2	32	ML Maintain Current Management				1	2	2	2	2	20	L No Management Required
	Alternative 3	3	3	3	2	2	36	ML Maintain Current Management				2	2	2	2	2	24	L No Management Required
Indirect	Impact of faunal species of conservational concern due to habitat loss within the operational footprint and increased alien species proliferation	2	1	2	2	3	25	L No Management Required	Protection of indigenous vegetation.	1. All soils compacted as a result of construction activities should be ripped and profiled. Special attention should be paid to alien and invasive plant control within these areas.	Life of Operation	1	1	2	1	2	12	L No Management Required
Indirect	Discharge and contamination from operational facilities may pollute receiving environment, impacting on faunal diversity	2	2	2	2	2	24	L No Management Required	Ensure adequate planning to prevent habitat destruction.	1. Edge effects of operational activities need to be actively managed so as to minimise further impacts to the receiving environment; 2. No polluted water may be discharged to the receiving environment without approval from the DWS.	Life of Operation	1	2	1	1	1	8	L No Management Required
Wetland and Aquatic Impacts																		
Direct	Loss of habitat and wetland ecological structure as a result of continual wetland disturbance and uncontrolled wetland degradation.	2	3	3	3	3	48	MH Maintain Current Management	Protection of Wetland Habitat and wetland ecological structure.	1. Operational vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed development activities; 2. It must be ensured that contractor laydown areas are located outside of wetland and riparian areas and associated 100 m buffer zones and excluded from clearing activities in order to minimise vegetation loss and resultant erosion and sedimentation where not approved by DWS; 3. Compacted areas are to be ripped, re-profiled and revegetation as soon as areas becomes available;	Life of Operation	1	2	2	2	2	20	L No Management Required
	Alternative 2	2	3	3	3	3	48	MH Maintain Current Management				1	2	2	2	2	20	L No Management Required

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelihood (Probability)		Significance (Degree to	Significance Rating				Consequence			Likelihood (Probability)		Significance (Degree to	Significance Rating
	Alternative 3	2	3	3	3	3	**48**	**MH Maintain Current Management**		4. Any areas where active erosion within the wetland features are observed must be immediately rehabilitated in such a way as to ensure that the hydrology of the area is re-instated to conditions which are as natural as possible; 5. Cutting/ clearing of the herbaceous layer within the wetland areas along the linear development should be avoided so as to retain soil stability provided by the grass root structures.		3	2	2	2	2	**28**	**ML Maintain Current Management**
Direct	Impact on the wetlands systems as a result of changes to the sociocultural service provisions through uncontrolled vegetation clearance, waste management and wetland disturbance	2	3	3	3	3	**48**	**MH Maintain Current Management**	Minimise change and effectiveness of wetland service provision	1. As much vegetation growth as possible should be promoted within the wetland features in order to protect soils. In this regard, special mention is made of the need to prevent the loss of large areas of the freshwater features' vegetation and the use of indigenous vegetation species' where hydro seeding and rehabilitation planting (where applicable) are to be implemented; 2. No dumping of waste should take place within wetland and riparian areas or their buffer zones. If any spills occur, they should be immediately cleaned up; 3. It must be ensured that mining related waste or spillage and effluent do not affect the sensitive habitat boundaries, wetland resources and associated buffer zones. All waste and rubble must be removed from site and disposed of according to relevant SABS standards; 4. Implement an alien vegetation control program within the wetland features and ensure establishment of indigenous species within areas previously dominated by alien vegetation; 5. Maintain the REC for each of the wetland features, as stated within the wetland report during the life of the development.	Life of Operation	2	2	2	2	2	**24**	**L No Management Required**
	Alternative 2	2	3	3	3	3	**48**	**MH Maintain Current Management**				2	2	2	2	2	**24**	**L No Management Required**
	Alternative 3	2	3	3	3	3	**48**	**MH Maintain Current Management**				2	2	2	2	2	**24**	**L No Management Required**

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelihood (Probability)		Significance (Degree to	Significance Rating				Consequence			Likelihood (Probability)		Significance (Degree to	Significance Rating
Direct	Potential poor planning, resulting in the placement of the linear development within wetland habitat, leading to altered habitat	2	3	2	2	2	**28**	**ML Maintain Current Management**	Protect hydrological functioning of the wetland systems.	1. Rehabilitation should be conducted in a manner that ensures that the wetland features' conditions are reinstated to as natural a state as possible.	Life of Operation	1	2	2	2	2	**20**	**L No Management Required**
Indirect	Impact on the hydrological functioning of the wetland systems as a result of reduce wetland footprints and uncontrolled disturbance during maintenance activities	2	3	3	3	2	**40**	**MH Maintain Current Management**	Conserve the hydrological function of the surrounding wetlands.	1. Flow continuity and connectivity of the freshwater features must be reinstated post- construction activities; 2. Regular monitoring of water quality must be implemented in order to ensure the impacts of runoff and decant of water into wetland resources is prevented or minimised; 3. Adequate storm water management must be incorporated into the design of the proposed development throughout all phases in order to prevent erosion of topsoil and the loss of floral and faunal habitat. In this regard, special mention is made of: - Sheet runoff from cleared areas, paved surfaces and access roads needs to be curtailed; - Runoff from paved surfaces should be slowed down by the strategic placement of berms; - All topsoil and waste stockpiles must have berms and catchment paddocks at their toe to contain runoff of the facilities.	Life of Operation	1	2	2	2	3	**25**	**L No Management Required**
Indirect	Impacts on the hydrological functioning of the wetland as a result of the Pit 1 expansion	4	3	3	4	3	**70**	**MH Maintain Current Management**	Minimise impact on wetland and riparian habitat	1. Dirty water must be recycled back into the mining system; 2. All wetland areas adjacent to the operational footprint will demarcated as no-go areas.	Life of Operation	2	2	3	2	2	**28**	**ML Maintain Current Management**
Air Quality Impacts																		
Direct	Possible increase in dust generation, PM10 and PM2.5 as a result of stockpiling material, use of heavy machinery, and material movement.	3	3	2	4	4	**64**	**MH Maintain Current Management**	Minimise emissions to the atmosphere impacting on employees, local land users, and climate change.	1. When and where applicable, soil stockpiles that will not be used should be re-vegetated as soon as possible, or kept wet during windy periods; 2. During the operational phases for the proposed project any bare ground surrounding the main operational area but within the boundaries of the facility must be covered with suitable vegetation that will be able to grow in the area; 3. When fugitive dust can be observed leaving the area, additional dust suppression should be applied to the affected areas; 4. Additional dust monitoring equipment needs to be installed in order to effectively monitor dust related impacts from the proposed project area to the northwest and thereafter dust emissions can be managed better; 5. A continuous PM10 and PM2.5 monitor should be installed at the mine or if possible at sensitive receptors in close proximity to the mine; 6. Conduct periodic independent audits of monitoring systems and the implementation of management plans to ensure that the system is maintained and that suitable data is obtained for decision making.	Life of Operation	1	1	1	4	1	**15**	**L No Management Required**
Direct	Increase in carbon emissions and ambient air pollutants (NO2 and SO2) as a result of movement of vehicles and operation of machinery/equipment.	3	3	2	2	2	**32**	**ML Maintain Current Management**		1. In places of high vehicular traffic on unpaved roads, dust suppression measures on the roads should be implemented to reduce dust levels from the entrainment of dust. These measures will range from watering of roads, application of a chemical dust suppressant where watering is impractical, and/or paving of roads. 2. Reduce the possibility of spillage from vehicles by ensuring all loads are covered, for example, with tarpaulin.	Life of Operation	2	1	1	2	1	**12**	**L No Management Required**

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelihood (Probability)		Significance (Degree to	Significance Rating				Consequence			Likelihood (Probability)		Significance (Degree to	Significance Rating
Blast and Vibration Impacts																		
Direct	Impact of ground vibration on houses, boreholes and roads, resulting in possible damage to infrastructure	4	3	3	3	4	**70**	**MH Maintain Current Management**	Minimise impacts on infrastructure and land occupiers during blasting activities.	1. Reduce Charge Mass/Delay over decreasing distance towards POI's of concern; 2. Relocate POI's of concern at least 600 m; 3. Re-drill boreholes further away which will be impacted on by the blasting activities, should these boreholes be utilised at a later stage.; 4. Reroute affected roads; 5. Notify all affected parties in advance prior to any blasting activity; 6. Prior to blasting a 500 m radius must be cleared of people and animals; 7. Immediate action will take place should thresholds exceed legal requirements for air blast (134 dB) and ground vibration (12.5 mm/s).	Life of Operation	2	2	2	3	3	**36**	**ML Maintain Current Management**
Direct	Air blast impact on houses, boreholes and roads, resulting in possible damage to infrastructure	4	3	3	3	4	**70**	**MH Maintain Current Management**		1. Reduce Charge Mass/Delay over decreasing distance towards POI's of concern; 2. Relocate POI's of concern at least 600 m;	Life of Operation	2	2	2	3	3	**36**	**ML Maintain Current Management**
Direct	Fly rock impact on houses, boreholes and roads, resulting in possible damage to infrastructure;	2	2	3	2	3	**35**	**ML Maintain Current Management**		1. Increase stemming length; 2. Put in controls for management of stemming lengths, 3. Relocate POI's of concern at least 600 m.	Life of Operation	2	2	3	2	2	**28**	**ML Maintain Current Management**
Direct	Impact of fumes on nearby land occupiers, boreholes and road users.	1	2	2	3	3	**30**	**ML Maintain Current Management**		1. Use correct products; 2. Control product quality; 3. Prevent sleep time for charged blast holes; 4. Same day charge and blast.	Life of Operation	1	2	3	2	3	**30**	**ML Maintain Current Management**
Visual Impacts																		
Direct	Visual intrusion as a result of the movement of machinery and the erection of contractor camps.	2	2	2	2	3	**30**	**ML Maintain Current Management**	To minimise visual disturbance and sense of place.	1. Where possible, natural vegetation around the expansions must be retained; 2. If vegetation is to be cleared on site, erosion control measures should be in place, to reduce the potential for visually scarring of the landscape by erosion 2. The topsoil stockpile should be vegetated to reduce the visual impact associated with the bare soil; 4. Concurrent revegetation of the sides of the overburden stockpiles should be undertaken; thus reducing the visual impacts associated with the stockpile; 5. External signage should be kept to a minimum, and where possible should be attached to existing buildings.	Life of Operation	1	1	2	2	2	**16**	**L No Management Required**
Direct	Scaring of the landscape as a result of the clearance of vegetation and preparation of the Pit 1 expansion.	2	2	2	2	2	**24**	**L No Management Required**			Life of Operation	1	1	1	1	1	**6**	**L No Management Required**
Direct	Indirect visual impact due to dust generation as a result of the movement of vehicles and materials, to and from the site area.	1	2	2	3	3	**30**	**ML Maintain Current Management**			Life of Operation	1	1	1	2	2	**12**	**L No Management Required**
Noise Impacts																		
Direct	The use of vehicles and machinery during the construction phase may generate noise in the immediate vicinity	3	3	3	4	4	**72**	**MH Maintain Current Management**	Minimise the emission of noise pollution during construction and mining activities.	1. Hauling vehicles with low noise levels to be used and must be maintained in a good order at all times; 2. Vehicle maintenance plan to be put in place and to be followed; 3. Implement a noise monitoring programme to measure against the baseline noise assessment; 4. The project will investigate using equipment and applying technology that results in the generation of less noise than existing equipment and technology; 5. Building activities to take place during daytime only; 6. Safe blasting methods to be used under controlled conditions; 7. Emergency generators to be placed in such a manner that it is away from residential areas.	Life of Operation	1	2	2	2	3	**25**	**L No Management Required**
Direct	Increase in ambient noise levels as a result of the mining activities.	2	2	2	3	3	**36**	**ML Maintain Current Management**	Reduce noise emissions during operation.	1. The roll over mining method must include the construction of a noise barrier on the north west side of each current Pit area using the removed topsoil and stripped overburden; 2. It is strongly recommended that the high Pitched alarms be replaced with devices that produce high levels of broadband noise.	Life of Operation	1	1	2	3	3	**24**	**L No Management Required**
Soil, Land Use and Land Capability Impacts																		

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		Consequence			Likelihood (Probability)		Significance (Degree to	Significance Rating				Consequence			Likelihood (Probability)		Significance (Degree to	Significance Rating
Direct	Operation of opencast Pits, use of haul roads, and permanent displacement of soil from buildings will reduce the land capability and agricultural potential and sterilise the soils.	3	2	2	3	3	**42**	**MH Maintain Current Management**	Prevent soil contamination and ensure rehabilitation of contamination.	1. Existing established roads should be used wherever possible; 2. Access roads should be designed with a camber to avoid ponding and to encourage drainage to side drains; where necessary, culverts should be installed to permit free drainage of existing water courses; 3. The side drains of the roads can be protected with sediment traps and/or gabions to reduce the erosive velocity of water during storm events and where necessary geo-membrane lining can be used; 4. Losses of fuel and lubricants from the oil sumps and steering racks of vehicles and equipment should be contained using a drip tray with plastic sheeting filled with absorbent material; 5. Using biodegradable drilling fluids, using lined sumps for collection of drilling fluids, recovering drilling muds and treating them off-site, and securely storing dried waste mud by burying it in a purpose-built containment area; 6. Avoiding waste disposal at the site wherever possible, by segregating, trucking out, and recycling waste; 7. Processing areas should be contained and systems designed to effectively manage and dispose of contained stormwater, effluent and solids.	Life of Operation	1	2	2	2	2	**20**	**L No Management Required**
Direct	Impacts on soil resources due to daily traffic on roads for inspection and maintenance of infrastructure, leading to soil compaction and pollution.	2	2	3	2	2	**28**	**ML Maintain Current Management**	Minimise loss of Soil resources.	1. The activities of construction contractors or employees will be restricted to the planned areas; 2. Instructions must be included in contracts that will restrict construction work and construction workers to the clearly defined limits of the construction site; 3.Locate all topsoil stockpiles in areas where they will not have to be relocated prior to replacement for final rehabilitation; 4. The ideal is to place all overburden materials removed at mine opening in their final closure location, or as close as practicable to it; 5. Ensure all topsoil stockpiles are clearly and permanently demarcated and located in defined no-go areas; 6. Map all stockpile locations; 7. Topsoil should never be used as a filling material for roads	Life of Operation	1	2	3	2	2	**24**	**L No Management Required**

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)					
		Consequence			Likelihood (Probability)		Significance (Degree to	Significance Rating				Consequence			Likelihood (Probability)		Significance (Degree to	Significance Rating
Direct	Loss of soil resource and utilisation as a result of the cleaning and topsoil stripping of the construction footprint.	2	3	2	2	2	**28**	**ML Maintain Current Management**		1. The existing pre-construction mine layout and design must aim to minimise the area to be occupied by mine infrastructure (workshops, administration, product stockpile, etc.) to as small as practically possible; 2. All footprint areas should also be clearly defined and demarcated and edge effects beyond these areas clearly defined; 3. Height of stockpiles be restricted between of 4 – 5 metres maximum. For extra stability and erosion protection, the stockpiles may be benched; 4. Stripping of topsoil should not be conducted earlier than required (maintain vegetation cover for as long as possible) in order to prevent the erosion (wind and water) of organic matter, clay and silt; 5. Reducing slope gradients as far as possible along road cuts and disturbed areas to gradients at or below the angle of repose of those disturbed surfaces; 6. Using drainage control measures and culverts to manage the natural flow of surface runoff;	Life of Operation	1	2	3	2	2	**24**	**L No Management Required**
Direct	As a result of construction activities, the land use will have altered from grazing and agriculture to that of construction for mining activities	2	3	3	2	2	**32**	**ML Maintain Current Management**	Minimise loss of agricultural land.	7. Soil stockpiles must be sampled, ameliorated (if necessary) and re-vegetated as soon after construction as possible; 8. Use recycled grey water from washing facilities to spray un-vegetated areas to combat dust; 9. Soils should be loosely packed during stockpiling; 10. Re-spread and rip soil to alleviate compaction; 11. Minimise re-handling of stripped soil and locate stockpiles as close as possible to their respective intended post-use areas; 12. Stockpiles are managed so they do not become contaminated and then need additional handling or disposal; 13. Equipment, and vehicle maintenance and washdown areas, are contained and appropriate means provided for treating and disposing of liquids and solids;	Life of Operation	2	2	2	2	2	**24**	**L No Management Required**
Direct	Soil contamination as a result of operational activities can be as a result of a number of activities (i.e. hazardous substance storage, incidental hydrocarbon leakages from construction vehicles).	3	2	3	3	2	**40**	**MH Maintain Current Management**	Prevent soil sterilisation and contamination.	1. Topsoil stockpiles can be contaminated by dumping waste materials next to or on the stockpiles, contamination by coal dust from product stockpile and the pumping out of contaminated water from the underground mine or Pits are all hazards faced by stockpiles. This should be avoided at all cost and if it occurs, should be cleaned up immediately; 2. Waste piles should be placed on impervious layer to prevent direct soil contact; 3. Excavate and dispose of any contaminated soil at the appropriate landfill as per waste classification; 4. A low process or storage inventory must be held to reduce the potential volume of material that could be accidentally released or spilled; 5. Storage tanks of fuels, oils or other chemicals stored are above ground, preferably with inspectable bottoms, or with bases designed to minimise corrosion. Aboveground (rather than in-ground) piping systems should be provided. Containment bunds should be sealed to prevent spills contaminating the soil and groundwater;	Life of Operation	1	2	2	2	2	**20**	**L No Management Required**
Heritage Impacts																	
Direct	The proposed project has the potential to impact on local graves within the area. Two grave sites were observed within the footprint of the proposed pipeline route	4	2	2	4	4	**64**	**MH Maintain Current Management**	Prevent destruction of graves.	1. Change the trajectory of the proposed route. If impact cannot be prevented a Phase 2 study is required followed with a destruction permit application from SAHRA; 2. Known sites should be located and isolated, e.g. by fencing them off; 4. In areas where the vegetation is threatening the heritage sites, e.g. growing trees pushing walls over, it should be removed, but only after permission for the methods proposed has been granted by SAHRA. A heritage official should be part of the team executing these measures; 5. Maintain a 100 m buffer zone around identified grave that will not be relocated.	Life of Operation	2	2	2	2	2	**24**	**L No Management Required**
	Alternative 2	4	2	2	4	4	**64**	**MH Maintain Current Management**				2	2	2	2	2	**24**	**L No Management Required**
	Alternative 3	4	2	2	4	4	**64**	**MH Maintain Current Management**				2	2	2	2	2	**24**	**L No Management Required**
Direct	The proposed project has the potential to impact on sites of archaeological importance. Historic power line pylons are present within the proposed footprint.	4	2	2	4	4	**64**	**MH Maintain Current Management**	Conserve heritage artefacts and buildings.	1. Monitor and control the mining activities to prevent impact on the historical power line pylons (Site 9). If impact cannot be prevented a Phase 2 study is required followed with a destruction permit application from SAHRA; 2. However, care should be taken that, when development commences, if any archaeological and/or historical sites are discovered, a qualified archaeologist be called in to investigate the occurrence; 3. All discoveries shall be reported immediately to a heritage practitioner so that an investigation and evaluation of the finds can be made; 4. Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site.	Life of Operation	2	2	2	2	2	**24**	**L No Management Required**
Palaeontology Impacts																	

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		Consequence			Likelihood (Probability)		Significance (Degree to	Significance Rating				Consequence			Likelihood (Probability)		Significance (Degree to	Significance Rating
Direct	Sealing-in or destruction of the fossils during earth moving activity	4	3	4	2	2	**44**	**MH Maintain Current Management**	Protection of Palaeontological findings	1. 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 for shallow caves.	Life of Operation	2	1	1	2	2	**16**	**L No Management Required**
Topography Impacts																		
Direct	The continuous placement of ore material onto the demarcated ore stockpile area will modify the local topography of the site specific area.	3	3	2	2	2	**32**	**ML Maintain Current Management**	Reduce impacts on topographic character.	1. Bush clearance will only take place in designated areas and as minimal as possible; 2. The operational site will be kept neat and tidy and free of litter; 3. Building rubble will be removed daily; 4. The operational site of Pit 1 will be screened to minimise the visual disturbance to surrounding land owners.	Life of Operation	2	2	2	2	2	**24**	**L No Management Required**
Direct	Progressive mining of the Pit 1 expansion area will ultimately alter the topography.	3	3	4	3	3	**60**	**MH Maintain Current Management**			Life of Operation	3	3	4	2	1	**30**	**ML Maintain Current Management**
Geology Impacts																		
Direct	Removal of local geology as a result of pipeline trenching and expansion of Pit 1	2	2	3	2	2	**28**	**ML Maintain Current Management**	Minimise the generation of mining waste.	1. The extent of this impact is extremely localised and the impact has been rated to have a Low significance rating; 2. Mining will be conducted strictly according to the mine plan submitted to the DMR; 3. Optimally exploit this resource in terms of tonnage of rock mined and cost as provided for in the mine plan.	Life of Operation	1	2	2	2	2	**20**	**L No Management Required**
Climate Impacts																		
Direct	Emissions of Green House Gases as a result of the use of plant, heavy moving machinery, generators etc.	2	3	2	3	3	**42**	**MH Maintain Current Management**	Reduce greenhouse gas emissions.	1. Plant and machinery will be maintained so that no unnecessary emissions are expelled; 2. Appropriate technology and machinery will be utilised for the job at hand; 3. A Green House Gas Emissions assessment will be calculated as part of the initiative to reduce greenhouse gas emissions.	Life of Operation	1	1	3	2	2	**20**	**L No Management Required**
Cumulative Impacts																		
Indirect	Increased generation of dust, PM10 and PM2.5 within the local area	2	3	2	3	2	**35**	**ML Maintain Current Management**	To minimise air quality emissions and health impacts.	1. Through the implementation of all the above mentioned mitigation measures, the overall significance of the activity's impact can be lowered to LOW.	Life of Operation	2	2	2	2	2	**24**	**L No Management Required**
Indirect	Reduced land availability for agricultural use	2	3	2	3	2	**35**	**ML Maintain Current Management**	To minimise cumulative loss of natural vegetation in the region.			2	2	2	2	2	**24**	**L No Management Required**
Indirect	Increased loss of indigenous vegetation and loss of soil resources.	2	3	2	3	2	**35**	**ML Maintain Current Management**				2	2	2	2	2	**24**	**L No Management Required**

13.4 Decommissioning and Post - Closure Phase

The main activity that will take place during this phase of the project is the demolition and removal of mining related infrastructure. The potential impacts associated with demolition activities are similar to the anticipated impacts to occur during the construction phase. The impacts and mitigation measures have been dealt with during the discussions of the construction activities and will not be recaptured in this section, only references will be made where applicable.

13.4.1 Demolition of Project Related Infrastructure

The following activities will be associated with the demolition of majority of the project related Infrastructure:

- Demolish and remove all infrastructure not required post-closure;
- Depending on the material used for the pipe construction (preferably inert material) and the depth of the pipeline underground (more than 500 mm), the pipeline will remain in situ, as long as the end land use objectives can still be obtained.

13.4.2 Potential Impacts and Mitigation Measures

It is anticipated that the potential impacts of this activity in the rehabilitation phase will be the same as the anticipated impacts listed in the construction phase. It is therefore recommended that the mitigation/management measures applicable to the construction phase are implemented. The following additional mitigation measures, as listed in Table 13-4, can be applied during the closure/rehabilitation phase in terms of the demolition of the project related infrastructure:

Table 13-4: Additional Mitigation Measures

Environmental Aspect	Additional Mitigation Measures
Soil, Land Use and Land Capability	• Once the site has been cleared of infrastructure and potential contamination, the slope must be re-graded (slope) in order to approximate the pre-mining aspect and contours. The previous infrastructure footprint area must be ripped a number of times in order to reduce soil compaction. The area must then be covered with topsoil material from the stockpiles. • Replacement of nutrient and organic carbon needs and requirements at time of rehabilitation, landscaping of the topographic slope, cultivation of soils and replacement of vegetative cover as soon after replacement of materials as possible. Monitoring of vegetative growth until self-sustaining. • Ensure that the Soil Conservation Plan is implemented where necessary during the rehabilitation phase; • All buildings, structures and foundations not part of the post-closure land use plan must be demolished and removed from site; • Frequent visual observations should be undertaken to confirm if vegetation has re-established and if any erosion gullies have developed. In the event that vegetation has not re-established and erosion gullies have developed, remedial action should be taken.
Biodiversity	• All soils compacted as a result of closure activities should be ripped and profiled. • Special attention should be paid to alien and invasive control within these areas. Alien and invasive vegetation control should take place throughout all development including decommissioning phases to prevent loss of faunal habitat. • All project related disturbed habitat areas must be rehabilitated and planted with indigenous floral species as soon as possible to ensure that faunal habitat is reinstated.

Environmental Aspect	Additional Mitigation Measures
	• A bi-annual alien vegetation clearance program should be implemented for up to 2 years after closure. • It must be ensured that mining related waste or spillage and effluent do not affect the sensitive habitat boundaries and associated buffer zones after closure. • Post closure groundwater management will need to be very carefully managed to ensure that no impact on the wetland areas and riparian resources in the area takes place after closure has taken place. • Rehabilitation efforts must be implemented and continuously monitored for a period of at least 5 years after decommissioning and closure.
Surface water	• Demolition activities will be undertaken during the dry season, where possible to minimise the potential for stormwater runoff. • During closure and rehabilitation activities, clean water diversion berms upstream of the area will be constructed. • Routine surface water quality monitoring up and down stream of closure and rehabilitation activities will be undertaken as per the surface water monitoring programme. • Maintain stormwater collection systems.
Groundwater	• Implement a groundwater monitoring programme during the closure and rehabilitation phase. • Implement active remediation if impacted groundwater is contaminated and monitor for at least 2-3 years; • All mined areas should be flooded as soon as possible to bar oxygen from reacting with remaining pyrite; • 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; • The drilling of boreholes into mining areas is recommended so that recovery of water in mining areas can be monitored; • Intercepting decant by a downstream trench is an option to investigate; • Treating of decanting mine water to acceptable water quality levels can be achieved by the installation of a treatment plant.
Social	• The upskilling of workers to enhance re-employment opportunities following closure and decommissioning must be implemented well in advanced of the decommissioning phase; • Where possible, Exxaro must provide assessment and counselling services for affected individuals; • Establishment of clear criteria for socio-economic projects and corporate social investment activities, that incorporate partnerships, exist strategy and sustainability; • Adhere to the mine closure plan.

Table 13-5: Decommissioning Residual Impacts Associated with the proposed Project

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating		Management and Mitigation Measures	Timeframe	Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Freqquency: Activity	Frequency: Impact						Severity	Spatial	Duration	Freqquency: Activity	Frequency: Impact		
Direct	Contaminated groundwater seepage to streams (salt load)	3	2	2	3	2	**35**	**ML Maintain Current Management**	Rehabilitated mining areas	1. Groundwater levels in the backfilled Pits will recover. Pollution plumes may migrate to surface water bodies. 2. All mined areas should be flooded as soon as possible to bar oxygen from reacting with remaining pyrite. 3. The final backfilled opencast topography should be engineered such that runoff is directed away from the opencast areas. 4. The final layer (just below the topsoil cover) should be as clayey as possible and compacted if feasible, to reduce recharge to the opencasts. 5. Surface water monitoring of the streams will be essential. 6. Quarterly groundwater sampling should be done to establish a database of plume movement trends, to aid eventual mine closure. 7. The drilling of boreholes into mining areas is recommended so that recovery of water in mining areas can be monitored. 8. Intercepting decant by a downstream trench is an option to investigate.	Duration of the decommissioning/ rehabilitation phase	2	2	2	3	2	**30**	**ML Maintain Current Management**
Indirect	Groundwater contaminant plume	3	2	2	3	2	**35**	**ML Maintain Current Management**	Rehabilitated mining areas	1. Groundwater levels in the backfilled Pits will recover. Pollution plumes may migrate to surface water bodies. 2. All mined areas should be flooded as soon as possible to bar oxygen from reacting with remaining pyrite. 3. The final backfilled opencast topography should be engineered such that runoff is directed away from the opencast areas. 4. The final layer (just below the topsoil cover) should be as clayey as possible and compacted if feasible, to reduce recharge to the opencasts. 5. Intercepting decant by a downstream trench is also an option to investigate. 6. Surface water monitoring of the streams will be essential. 7. Quarterly groundwater sampling should be done to establish a database of plume movement trends, to aid eventual mine closure. 8. The drilling of boreholes into mining areas is recommended so that recovery of water in mining areas can be monitored. The absence of groundwater users should be assessed bi-annually	Duration of the decommissioning/ rehabilitation phase	2	2	2	3	2	**30**	**ML Maintain Current Management**

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating		Management and Mitigation Measures	Timeframe	Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Freqquency: Activity	Frequency: Impact						Severity	Spatial	Duration	Freqquency: Activity	Frequency: Impact		
Residual	Mine decant	4	4	5	3	3	**78**	**H Improve Current Management**	Rehabilitated mining areas	1. It is very difficult to mitigate against AMD, as is evidenced by the water quality concerns within the Upper Olifants River catchment. 2. In order to manage AMD, it is important that a detailed water balance be calculated for the mine and that the expected decant points and decant qualities are determined. 3. Water influx into the mine should also be kept to the absolute minimum possible. In this regard the fracturing of the overlying strata due to blasting or surface subsidence should be avoided at all cost, so as to prevent increased infiltration of surface water into the mine workings. 4. Treating of decanting mine water to acceptable water quality levels can be achieved by the installation of a treatment plant. 5. Exxaro must continue with the investigations to the most effective way to possibly treat water on site if needed at the end of LoM. The level to which the water is treated depends on the use of the water after treatment, but should be determined in consultation with the DWS. 6. As a minimum, treated water should meet the standards for use for livestock watering and irrigation. 7. Water treatment plants are however very energy intensive, raising questions about the long term viability of treatment plants as a solution to AMD, especially given the energy crisis in South Africa and South Africa's dependence on coal as a source of electricity. 8. The installation of an RO plant should be seen as a last option. Hodgson et al. (WRC Report 1263/1/07; 2007) recommend the following measures for management of mine water: 9. The feasibility and effectiveness of employing these measures at Dorstfontein should be investigated. - Select the mining method based on environmental considerations (deep bord-and-pillar mining generates the smallest water volumes, opencast mining the highest.); - Mine from deep to shallow; - Flood the mine workings; - Flush the mines after being flooded	Duration of the decommissioning/ rehabilitation phase	3	3	3	2	2	**36**	**ML Maintain Current Management**

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating		Management and Mitigation Measures	Timeframe	Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Freqquency: Activity	Frequency: Impact						Severity	Spatial	Duration	Freqquency: Activity	Frequency: Impact		
Cumulative	Deterioration in water quality	4	3	4	3	4	**77**	**H Improve Current Management**	Rehabilitated mining areas	1. It is very difficult to mitigate against Acid Mine Drainage. Current standard practice does not successfully deal with this problem, as evidenced by the water quality concerns within the Upper Olifants catchment. 2. Typically mitigation measures follow one of two routes (or a combination of both): - Limiting the amount of water entering the voids left by the mined out areas can be achieved by replacing spoils in such a manner as to be free-draining and preventing the collection and pooling of water on rehabilitated mined land and thus reducing the volumes of water infiltrating into the old box cut. To further reduce infiltration of water, an impermeable or partially permeable layer should be recreated at variable depth within the rehabilitated landscape. This will prevent deeper infiltration of water into the mined out Pits, but will also retain water in the landscape so as to increase productivity and re-create a semblance of the processes driving biodiversity support within the highveld. - Treating of decanting mine water to acceptable water quality levels can be achieved by the installation of a treatment plant. Exxaro must continue with the investigations to the most effective way to possibly treat water on site if needed at the end of LoM. The level to which the water is treated depends on the use of the water after treatment, but should be determined in consultation with the DWS. As a minimum, treated water should meet the standards for use for livestock watering and irrigation. Water treatment plants are however very energy intensive, raising questions about the long term viability of treatment plants as a solution to AMD, especially given the energy crisis in South Africa and South Africa's dependence on coal as a source of electricity. The timing, location and amount of decant that is expected to occur post mining should be determined to allow more detailed ecisions to be made regarding possible mitigation and management measures to be implemented. The necessity and feasibility of treating the decanting water should also be investigated and treatment implemented if necessary	Duration of the decommissioning/ rehabilitation phase	4	3	4	3	4	**77**	**H Improve Current Management**

13.4.3 Post - Closure Phase

The post closure period will be a period of maintenance and monitoring of the areas that would have been associated with the various project related structures and infrastructure. The activities are limited to monitoring activities, limited erosion and vegetation repair if necessary, as well as water management following mining activities. It is not anticipated that any significant impacts will arise during this period which cannot be mitigated and managed. Water ingress and accumulation during the post closure phase has been accounted for in the rehabilitation phase of the project. The financial liability assessment has taken cognisance of the need to manage water post closure. The Pit will be backfilled to prevent the accumulation of water. Should water need to be pumped, this will be undertaken during this phase.

An examination of the risks that fall into the environmental category indicates that the risks relate primarily to water and impacts on water quality or quantity. There are a variety of indicators that can be used to indicate how the water may have been impacted during operations, which can then be used to inform the rehabilitation actions. These indicators include:

- Water quality of both the surface and groundwater resources that are predicted to be impacted on by the activities;
- Groundwater elevations to indicate whether the aquifers in the vicinity of the open Pit and underground workings are impacted;
- Aquatic ecology of Steenkoolspruit and the Olifants River;
- Aquatic ecology of the wetlands.

14 Summary of Specialist Studies

The following section provides a summary of all the specialist studies that were conducted for the proposed project.

14.1 Social Assessment

The construction and operation of the Dorstfontein East Extension Project do not present any major socio-economic risks, assuming that all activities during construction and operation will be executed in line with relevant Exxaro standards and requirements, Exxaro Safety, Health and Environmental policies, as well as relevant South African regulations such as the Mine Health and Safety Act No. 29 of 1996.

The impact assessment, after the implementation of mitigation measures, generated the results described in the impact after mitigation table and aligns with the objectives of this impact assessment. The main benefit of the project could be the employment and procurement of services from the communities within the study area during construction, followed by those in the region. However, in light of the lack of skills and education evident within the study area, it is unlikely that these communities will optimally benefit from employment and procurement from Dorstfontein East Extension Project.

To ensure that the local area and the region will benefit from the project, the critical recommendation is that identification, training and development of local people and suppliers commence prior to commencement of the project.

The potential impacts that could be experienced as a result of the influx of job seekers and employees are the main potential negative impact in light of the low performing social statistics of the communities in the study area. However, this could be considered as a cumulative impact due to the

high number of mines and energy generation activities currently underway and planned in the broader study area.

14.2 Groundwater Assessment

The numerical model should be updated once every three years or after significant changes in mine schedules or plans by using the measured water ingress and water levels to re-calibrate and refine the impact predictive scenario. Updates to the model should be carried out more frequently if significant changes are made to the mine schedule or plan.

Three potential decant points have been determined for the opencast Pits. The decant calculations show that with varying porosity and recharge rates the time-to-decant ranges between 25 and 154 years and the discharge rate ranges between approximately 91 and 585 m^3/d. The impact of decant on surface water is likely. It is proposed to treat the water emanating for the opencasts to increase the decant water quality.

Groundwater flow directions will be directed towards the mining areas due to the mine dewatering during the operational phase. Therefore, contamination will be contained within the mining area, and little contamination will be able to migrate away from the mining area as can be confirmed by the good groundwater quality in the areas surrounding areas.

14.3 Surface water Assessment

The surface water specialist study provides an indication of the steps and processes required in order to meet the Regulation 704 criteria. These include the;

- Separation of clean and dirty water streams and the release and containment of each stream respectively.
- The impact of MAR changes on the local and quaternary catchment level.
- The potential impact on infrastructure by the 1:100-year flood event and the
- Operating water balance for the Pit extension.

The Pit extension requires a clean water cut off canal to the south west to prevent the situation of surface runoff from entering the Pit extension during rainfall events. The canal will discharge the water to the west and east as it straddles a high point in the middle of the canal.

The nature of a Pit excavation results in a reduced likelihood of dirty water, generated at the Pit extension, from flowing into the environment. A sump has been indicated for the Pit extension as a means of creating a point from which to pump the water out and to a suitable containment and treatment location. The Pit extension means that the current infrastructure need only be extended in order to facilitate the requirement set out above.

The Pit extension will affect the MAR by approximately 5% on a local scale and by 0.2% on a quaternary scale.

The pipeline extension between the Dorstfontein East Mine and Dorstfontein West Mine has been conceptually drawn at a distance of no closer than 100 m from a water course where possible. However, due to the topography of the area being relatively flat, the 1:100-year flood line exceeds the 100 m buffer. This is primarily at the pipeline origin point at Dorstfontein West Mine, where the pipeline crosses the conveyor section, travelling east, before turning north for a distance. It is recommended that the pipeline be rerouted to skirt the current office area as much as possible, thereby avoiding the area of inundation. A second point of interest in the floodline results is approximately midway between Dorstfontein East Mine and Dorstfontein West Mine. The pipeline

crosses a defined watercourse. The 1:100-year floodline extent has been calculated for this position. The infrastructure required for the pipeline should be located outside of this zone as far as possible.

14.4 Biodiversity Assessment

Based on the terrestrial impact assessment of potential impacts on floral and faunal habitat, diversity and species of conservational concern along the linear development and surrounding habitats, it is evident that impacts are medium low prior to mitigation, decreasing to low significance levels should mitigation measures be implemented. Should any floral species of conservational concern be encountered during the construction of the linear development, they should be relocated to suitable habitat in the vicinity of the linear development by a suitably qualified specialist. From the above results of the site assessment and the impact assessment, it is recommended that Route 1 be considered as the favorable route, as it is deemed to have the lowest impact levels on the surrounding environment. Furthermore, following the site assessment, the Pit expansion area is not deemed to provide any viable floral or faunal habitat, and is predominated by crop fields. As such, development in this area is not deemed to be detrimental to floral and faunal species within the area.

It is the opinion of the ecologists that, from a terrestrial ecological point of view, the proposed development be considered favourably provided that the recommended mitigation measures for the identified impacts are adhered to.

14.5 Wetland Assessment

The background information available from national and provincial databases indicates that the linear development has several freshwater resources. The proposed route falls within close vicinity to and traverses several of these wetland features.

Since watercourses were identified within the study area, either a WUL or a General Authorisation in terms of Section 21 (c) and (i) of the NWA may be required, depending on the exact locality and nature of the proposed activities.

The implementation of an ongoing alien vegetation control plan is recommended after the operational phase has commenced. This will ensure that all wetland features impacted upon by the development will be maintained.

It is acknowledged that it will not be feasible to avoid the crossing of all the freshwater features identified within the dragline route. As such, impacts associated with the development were assessed in detail in the impact assessment. Mitigation recommendations are presented in line with the mitigation hierarchy, in order to ensure informed decision-making and improved sustainable development in the study area.

Should the proposed linear development be approved, it is recommended that, as far as possible, the extent of construction activities (such as contractor laydown areas) should be kept outside of the wetland areas, so as not to impact on the wetland features further. These impacts were assessed in detail in the impact assessment. Mitigation recommendations are presented in line with the mitigation hierarchy, in order to ensure informed decision-making and improved sustainable development in the study area. These recommendations also include specific management measures applicable to individual wetland resources, infrastructure activities, and general management measures applicable to the project.

After the assessment of the various routes, wetland features and possible impacts, it is in the opinion of the specialists that route 1 is considered to be the preferable route.

14.6 Air Quality Assessment

Based on the meteorological data from the on-site weather station, the climate in the project area is expected to be seasonal, with distinct warm months (September to February) and cool months (March to August). Rainfall is higher during the months from October to April and lower from May to September. The prevailing winds for this period are from the north, west-southwest and southeast, with lower occurrences from the east, east-southeast and south-southeast. The average wind speed measured for all hours is 4.47 m/s with maximum speeds less than 11.1 m/s and with calms (<0.5 m/s) of 1.72%.

The monthly dust fallout concentrations shows that dust fallout concentration have exceeded the Residential Area limit of 600 mg/m^2/day 361 times out of 1118 (32.3%) recorded dust fallout measurements. The Non-residential Area limit was exceeded 27 times out of 119 (22.7%) dust fallout measurements.

The towns in the surrounding area i.e. Kriel, Tubelihle and Boskrans, have been identified as potential areas of impact, at the commencement of the study. The dispersion model was set up to predict PM10, PM2.5 and dust fallout concentrations from the proposed development at these towns and surrounding areas. Based on the nature of the activities and the dispersion modelling results, the receptors are unlikely to be impacted should management measures be implemented.

With respect to dust (dust fallout, PM10 and PM2.5) concentrations, the predicted emissions resulting from the proposed operations were determined to be medium-high without management and low with management measures in place. Dust fallout concentrations will not exceed the limits at the closest sensitive receptors.

Based on the findings of this assessment the proposed project will result in dust generation, however, the concentrations will be low and below the PM10, PM2.5 and the dust fallout thresholds at the closest receptors, should management measures be implemented. Receptors in close proximity will not be impacted by the proposed project as impacts are predicted to be low beyond the boundary of the mine. In addition, the peak concentrations are predicted to occur closer to the new activities.

14.7 Blast and Vibration Assessment

The evaluation of effects yielded by blasting operations was evaluated over an area as wide as a 3500 m radius from where blasting will take place. The range of structures observed and considered in this evaluation ranged between rural buildings, farm buildings, industrial buildings, power lines and provincial roads.

The project area does have houses and communities at very close distance to the project area. The nearest house or buildings is found 293 m away. There are various farmsteads and small settlements in the area. Specific attention will be required for adjustments in the blasting operations to ensure expected levels of ground vibration and air blast are within the required limits. Consideration will need to be given to relocation of households in close proximity to the Pit area. A recommended distance should at least be all within 500 m from area. There are also regulations that will need to be followed for permission to conduct blasting operations as these installations area within 500 m from the blast operations. The ground vibration levels predicted for all installations evaluated surrounding the Pit area ranged between 0.9 mm/s and very high. Ground vibration levels at the nearest buildings where people may be present is 28.7 mm/s.

Providing opinion if the project may continue it can be indicated that only with recommended mitigations and careful planning of blasting operations it is possible. The Pit is located such that free

blasting will not be possible and will require detail planning and considerations of the recommendations. Considering this there is no reason to believe that this operation cannot continue.

Air blast predicted for the maximum charge ranges between 105 and 143 dB for all the POI's considered. Air blast observed and predicted showed greater concern than ground vibration. In view of the predicted levels the probability of damages exist if blasting operations does not take careful planning of stemming length and material into consideration. Damages are only expected to occur at levels greater than 134dB. On prediction it is expected that air blast will be greater than 134 dB at a distance of 500 m and closer to the Pit boundary. Various private installation is within 500 m from the Pit boundary. Air blast that could lead to complaints is expected to reach distances of 1250 m from the Pit area. The levels at other private houses or settlements are expected to be within limits and not damaging.

14.8 Noise Assessment

The ambient noise levels in immediate environment of the Pit 1 extension are dominated by road traffic on the R547 and R544 which includes a large percentage of heavy vehicles. These noise contributions will to a large extent mask the impact of the noise emissions caused by the future mining operations;

The resulting total ambient noise levels largely conform to those recommended by SANS 10103 5. There will either be no increase in ambient noise levels or it will range between 'Negligible' and 'Insignificant'. According to SANS 10103 5 the expected community response to these increase will range between 'No reaction' and 'Little with sporadic complaints. Although the assessments according to the SRK methodology result in a Significance rating of Medium Low the consultant is of the considered opinion that it should rather be Low.

14.9 Soils, Land use and Land Capability Assessment

Almost the entire project site supports crop production with small areas of wetland land capability as well as grazing land capability that have natural vegetation which are suitable for cattle and sheep grazing. The proposed extension of the Dorstfontein East Coal Mine area consisting of a new open Pit area and associated infrastructure (including a water pipeline), will impact upon soil and land capability properties as well as current land uses in the areas where the footprint will cause surface disturbance. Cumulative impacts are also related to increase in the surface footprint. These impacts can be reduced by keeping the footprint minimised where possible and strictly following soil management measures pertaining to topsoil stripping, stockpiling and conservation of the soil quality of topsoil stockpiles.

14.10 Heritage Assessment

No Stone Age or Iron Age settlements, structures, features, assemblages or artefacts were recorded during the survey.

Although a total of nine sites were recorded during the survey only seven sites are older than 60 years and are therefore protected under the NHRA (Act No. 25 of 1999). A total of four graveyards (Sites 3, 4, 5, and 8) were recorded as well as two farmhouse complexes (Sites 1 and 6) and a historical power line (Site 9) (consisting of several pylons). Note two sites are not older than 60 years, namely the farmworker home complex (Site 7) and a modern farmhouse complex (Site 2).

If the exhumation and reburial of the graveyards are envisaged it will entail social consultation and permit application. Other legislative measures which may be pertinent include the Removal of Graves and Dead Bodies Ordinance (Ordinance No. 7 of 1925), Regulations Relating to the Management of Human Remains (GNR 363 of 22 May 2013).

14.11 Palaeontology Assessment

All the land involved in the development was assessed and none of the property is unsuitable for development. All information needed for the Phase 1 Palaeontological Impact Assessment and Field scope was provided by the Consultant. All technical information was provided by SRK. Areas that would involve mitigation and may need a permit from the SAHRA are discussed.

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 for shallow caves.

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.

15 Environmental Consideration between Alternatives

An assessment of the specialist studies has indicated that the proposed alternative 1 for the pipeline route is the most preferable route. However, the heritage assessment has indicated the presence of graves in close proximity. The biodiversity, wetland, soils and land capability have identified the alternative 1 as the most preferable route.

The mining methodology employed, has minimal impact across alternatives. Mining will inherently alter the landscape of the area. The soil assessment has identified soils of wetland importance on the boundary of the mining area. Through a combination of mining methodologies, the protection of these soils will be conducted as far as feasible. Management measures proposed on the EMPr will minimise the impact on these areas.

The proposed alternatives will impact on the biophysical and social aspects of the environment in the area, however not to a degree that these cannot be effectively mitigated and managed, subject to the implementation of the EMPr.

16 Environmental Impact Statement

This section of the report presents the outline of:

- The key findings of the Impact Assessment; and
- A comparative assessment of the positive and negative implications of the proposed development and identified alternatives.

An EIA has been conducted in accordance with the EIA regulations which included the required PPP aimed at the key Organs of State and the identified I&APs. Where potential biophysical or social impacts have been identified mitigation and management measures have been proposed to control and monitor the magnitude of impacts associated with the various aspects of the proposed project.

The proposed project will form part of the exiting mining operations undertaken by Exxaro. Exxaro strive to undertake their operations in a social and environmental responsible manner, while fulfilling their corporate responsibility.

The proposed project is justified trough the manageable environmental impacts and positive benefits founded during the operation of the proposed project which ill optimally mine the local coal resources.

16.1 Summary of Key Findings of the EIA

The impacts evident from the detailed impact assessment (Section 13) of the proposed project are both positive and negative in nature. The key positive and negative findings outlined below.

16.1.1 Key Positive Impacts After Mitigation

The following section outlines the impacts which were determined to have a positive impact, either directly or through the spin–offs generated by the development and operation of the proposed Pit 1 expansion and construction of the water pipeline. These positive impacts are not listed per phase of the project, but as consolidated impacts during construction, operation and closure

Pre- Construction and Construction Phase

This section will detail the positive impacts that may arise as a result of the pre-construction, construction phase and operational phases.

Socio – Economic

It is important to note that while this project will have socio-economic impacts, they will largely be negligible because the study area is already largely impacted by mining activities and located in a brownfield area. As such, influence on the perceived agricultural and rural sense of place would be largely undetected due to existing mining infrastructure and activities, some of which have been in existence for more than 20 years.

In terms of local economy, there is the potential for multiple benefits to both local and regional businesses, as well as local employment opportunities. This would be highest during the construction phase, due to the requirement of significant contractor numbers (for services and materials). This has opportunities for both the formal and informal sectors, as smaller enterprises, including spaza shops, are likely to be established during the construction period to supply contractors and others with food and other amenities. According to the updated mine works programme, additional people would be hired during the construction phase. This is positive, and would provide financial capital to those employed. Many available jobs during construction would require low skills levels, and as such there is potential for local work seekers who largely appear to have a low skills base.

Operational Phase

Socio - Economic

The operation would require new employees to mine the extended Pit. As such, the employment opportunities of local work seekers will be available, although relatively low and unlikely. For the entirety of the operation, an estimated 128 jobs will be created during peak production.

Closure and Decommissioning

Socio - Economic

As a result of closure and decommissioning additional job opportunities will be made available. These job opportunities will however be benched against the possible retrenchment of permanent employees. AS a result of the operational phase of the project, it is expected that the skills development programme will counteract the negative impact that may arise as a result of closure of the Dorstfontein East Coal Mine.

16.1.2 Key Negative Impacts After Mitigation

This section will detail the negative impacts that may arise as a result of the operational phase. The major findings of the negative impacts on the proposed development were the following:

- The highest negative impact was determined to be MEDIUM HIGH significance before mitigation and MEDIUM LOW after mitigation. No HIGH negative impacts after mitigation were determined for the proposed development. Most of the impacts can be mitigated to a LOW significance.

Pre – Construction and Construction

Socio - Economic

Construction material and supplies will need to be transported to and from the study area. This will result in additional trucks and construction vehicles on the study area roads, which can cause damage to the road surface as well as littering and irresponsible driving (i.e. speeding). Although the immediate construction area is not currently inhabited, the outlying parts of the study area are frequented by school children, herders and their livestock, other light motor vehicles and pedestrians.

Linked to contractors on site are social pathologies arising from the influx of job seekers and contractor camps. These job seekers, who can potentially travel from across national borders, are known to settle informally in close proximity to construction sites.

Groundwater Impacts

- Local spillages of hydrocarbons and chemicals used during the pre-construction and construction phase which may leach to groundwater;
- Monitoring borehole on the border of the Pit 1 expansion area may be a conduit of flow to the groundwater unless sealed.

Surface Water

- Impact on surface water flow as a result of impeding flow while under construction of the pipeline over the non-perennial streams;
- Impact on surface water quality as a result of accidental spillages of hazardous substances from construction vehicles used during construction of the crossings, as well as from hazardous storage areas;
- Debris from poor handling of materials and/or waste blocking watercourses, resulting in flow impediment and pollution;
- Contaminated dirty water runoff to surrounding areas resulting in the impact on local surface water quality;
- Increase in turbidity of the local water streams as a result of runoff of cleared areas;
- Increase of surface runoff and potentially contaminated water that needs to be maintained in the areas where site clearing occurred;
- Construction of possible river diversion may temporarily disturb the water course affecting the hydrology of the water courses;
- Increase of erosion potential during construction activities associated with the river crossings and Pit 1 expansion;
- Removal of MAR from the catchment, as this runoff will now be considered dirty water and will need to be contained within the mining area;

- Contamination of runoff by poor materials/waste handling practices, impacting on surface water quality.

Biodiversity Impacts

- Destruction of potential floral habitats for species of conservational concern as a result of site clearing, alien species, waste management and soil compaction;
- Impact on floral diversity as a result of site clearance, anthropogenic activity, and possible uncontrolled fires;
- Impact on floral species of conservational concern as a result of clearing, anthropogenic activity, and uncontrolled fires;
- Potential spreading of alien invasive species as a result of floral disturbance;
- Generation of waste and incorrect disposal from construction material leading to disturbance of natural vegetation;
- Loss of faunal habitat and ecological structure as a result of site clearing, alien invasive species, erosion, and general construction activities;
- Impact of faunal species of conservational concern due to habitat loss and collision with construction vehicles;
- Habitat fragmentation as a result of construction activities of the pipeline leading to loss of floral diversity.
- Failure to initiate a rehabilitation plan and alien control plan during the construction phase may lead to further impacts during the operation phase;
- Loss of faunal divert and ecological integrity as a result of construction activities, erosion, poaching and faunal specie trapping;
- Insufficient planning of infrastructure placement and design leading to floral habitat loss of potential species of conservational concern.

Wetland Impacts

- Loss of habitat and wetland ecological structure as a result of site clearance activities and uncontrolled wetland degradation;
- Impact on the wetlands systems as a result of changes to the sociocultural service provisions
- Impact on the hydrological functioning of the wetland systems;
- Increased runoff due to topsoil removal and vegetation clearance leading to possible erosion and sedimentation of wetland and riparian resources;
- Soil compaction and levelling as a result of construction activities and vehicle movement leading to loss of wetland and riparian habitat.

Air Quality Impacts

- Possible increase in dust generation, PM10 and PM2.5 as a result of bulk earthworks, operation of heavy machinery, and material movement.
- Increase in carbon emissions and ambient air pollutants (NO_2 and SO_2) as a result of movement of vehicles and operation of machinery/equipment.

Blast and Vibration Impacts

- Impact of ground vibration on houses, boreholes and roads, resulting in possible damage to infrastructure;
- Air blast impact on houses, boreholes and roads, resulting in possible damage to infrastructure;
- Fly rock impact on houses, boreholes and roads, resulting in possible damage to infrastructure;
- Impact of fumes on nearby land occupiers, boreholes and road users.

Visual Impacts

- Visual intrusion as a result of the movement of machinery and the erection of contractor camps;
- Scaring of the landscape as a result of the clearance of vegetation and preparation of the Pit 1 expansion;
- Indirect visual impact due to dust generation as a result of the movement of vehicles and materials, to and from the site area.

Noise Impacts

- The use of vehicles and machinery during the construction phase may generate noise in the immediate vicinity;
- Increase in ambient noise levels as a result of the mining activities.

Soil, Land Use and Lad Capability

- Chemical pollution of soils as a result of vehicle hydrocarbon spillages and compaction;
- Clearing of vegetation and compaction of the construction footprint will result in the soils being particularly more vulnerable to soil erosion;
- Loss of soil resource and utilisation as a result of the cleaning and topsoil stripping of the construction footprint;
- As a result of construction activities, the land use will have altered from grazing and agriculture to that of construction for mining activities;
- Handling and storage of building materials and different kinds of waste leading to soil sterilisation.
- Permanent loss of land capability and land use.

Heritage Impacts

- The proposed project has the potential to impact on local graves within the area. Two grave sites were observed within the footprint of the proposed pipeline route
- The proposed project has the potential to impact on sites of archaeological importance. Historic power line pylons are present within the proposed footprint.

Palaeontology Impacts

- Sealing-in or destruction of the fossils during earth moving activity.

Operation

Socio – Economic

Mining roads are already well established in and around the study area, however traffic will most likely be increased during operation due to the additional tonnage of waste material and ore product.

Graves are located on the border of the proposed pipeline route. Relocation of these may incur grievances by local land occupiers.

Due to the occurrence of additional trucks on the roads, and the incidence of construction workers on site, health and safety impacts on local communities may include construction workers lighting fires on site, littering and driving irresponsibly.

Groundwater

- Impact on groundwater quality as a result of hydrocarbon spillages from machinery;
- Storage of hydrocarbons and chemicals, which may impact on groundwater as a result of spillages and uncontrolled release;
- Monitoring borehole on the border of the Pit 1 expansion area may be a conduit of flow to the groundwater unless sealed.

Surface water

- Impact on water quality and erosion as a result of the pipeline breaking and spillage to non-perennial streams;
- Pump failure will result in dirty water accumulation in the Pit, leading to uncontrolled dirty water management and associated pollution;
- Impact on water quality and availability as a result in ineffective dirty water separation, and dirty water entering into the wetland;
- High rate of ground water ingress causing flooding of the Pit;
- The rainfall water within the designated dirty water area of the Pit 1 expansion area that forms part of the MAR to the local water courses will be removed from the catchment. This will result in a lower intensity potential on the local surface water resource;
- Increase in volume of contaminated water that needs to be managed within the footprint;
- Erosion of stream banks as a result of crossings and diversions leading to siltation of the streams;
- Impacts on surface water resources quality as a result of incorrect waste management practises and pollution.

Biodiversity Impacts

- Destruction of potential floral habitats for species of conservational concern as a result continual disturbance of soils leading to altered floral habitats, erosion and sedimentation;
- Impact on floral diversity as a result of increased alien species proliferation and ongoing edge effects from maintenance operations;
- Impact on floral species of conservational concern as a result of an increased in alien species proliferation and ineffective rehabilitation of exposed areas;
- Generation of waste and incorrect disposal from construction material leading to disturbance of boundary natural vegetation;
- Loss of faunal habitat and ecological structure as a result of increased fires during operation and introduction of alien species, leading to transformation of the natural habitat;
- Loss of faunal diversity and ecological integrity as a result of alien species proliferation, poaching, and collision of vehicles with animals;

- Impact of faunal species of conservational concern due to habitat loss within the operational footprint and increased alien species proliferation;
- Discharge and contamination from operational facilities may pollute receiving environment, impacting on faunal diversity.

Wetland Impacts

- Loss of habitat and wetland ecological structure as a result of continual wetland disturbance and uncontrolled wetland degradation;
- Impact on the wetlands systems as a result of changes to the sociocultural service provisions through uncontrolled vegetation clearance, waste management and wetland disturbance;
- Potential poor planning, resulting in the placement of the linear development within wetland habitat, leading to altered habitat;
- Impact on the hydrological functioning of the wetland systems as a result of reduce wetland footprints and uncontrolled disturbance during maintenance activities;
- Impacts on the hydrological functioning of the wetland as a result of the Pit 1 expansion.

Air Quality Impacts

- Possible increase in dust generation, PM10 and PM2.5 as a result of stockpiling material, use of heavy machinery, and material movement;
- Increase in carbon emissions and ambient air pollutants (NO_2 and SO_2) as a result of movement of vehicles and operation of machinery/equipment.

Blast and Vibration Impacts

- Impact of ground vibration on houses, boreholes and roads, resulting in possible damage to infrastructure;
- Air blast impact on houses, boreholes and roads, resulting in possible damage to infrastructure;
- Fly rock impact on houses, boreholes and roads, resulting in possible damage to infrastructure;
- Impact of fumes on nearby land occupiers, boreholes and road users.

Visual Impacts

- Visual intrusion as a result of the movement of machinery and the erection of contractor camps;
- Scaring of the landscape as a result of the clearance of vegetation and preparation of the Pit 1 expansion;
- Indirect visual impact due to dust generation as a result of the movement of vehicles and materials, to and from the site area.

Noise Impacts

- The use of vehicles and machinery during the construction phase may generate noise in the immediate vicinity;
- Increase in ambient noise levels as a result of the mining activities.

Soil, Land Use and Land Capability

- Operation of opencast Pits, use of haul roads, and permanent displacement of soil from buildings will reduce the land capability and agricultural potential and sterilise the soils;

- Impacts on soil resources due to daily traffic on roads for inspection and maintenance of infrastructure, leading to soil compaction and pollution;
- Loss of soil resource and utilisation as a result of the cleaning and topsoil stripping of the construction footprint;
- As a result of construction activities, the land use will have altered from grazing and agriculture to that of construction for mining activities;
- Soil contamination as a result of operational activities can be as a result of a number of activities (i.e. hazardous substance storage, incidental hydrocarbon leakages from construction vehicles).

Heritage Impacts

- The proposed project has the potential to impact on local graves within the area. Two grave sites were observed within the footprint of the proposed pipeline route
- The proposed project has the potential to impact on sites of archaeological importance. Historic power line pylons are present within the proposed footprint.

Palaeontology Impacts

- Sealing-in or destruction of the fossils during earth moving activity

Closure and Decommissioning

The residual risk associated with the proposed project will largely relate to water management the rehabilitation following the operational phase. The rehabilitation of the Pit as well as the latent water influx will need to be managed to as to prevent any residual impact in years following decommissioning. These monitoring requirements have been addressed in the EMPr.

The main impacts that will result from the closure phase will relate to the ineffectiveness of the construction and operational phase to eradicate alien vegetation, which will ultimately result in the loss of indigenous fauna and flora. In additional to this the decommissioning activities may further impact on the established vegetation in the area, resulting in the loss of biodiversity species, habitats and ecological structure. All the impacts that may result from the decommissioning activities of the proposed project have been effectively addressed in the construction phase assessment, as well as the EMPr. These risks can be effectively managed to a LOW significance.

17 Opinion on Proposed Development and Conditions of Authorisation

The proposed project will inherently prolong the LOM of the Dorstfontein East Coal mine which will directly impact on the availability of job opportunities in the immediate area.

Environmental impacts arising from the proposed project are primarily negative with scattered positive social impacts. Where negative impacts are identified, these can be effectively managed and mitigated subject to the effective implementation of the EMPr. This taking cognisance of the high percentage of land disturbed by the proposed project will be degraded and previously cultivated areas.

The majority of the negative environmental impacts that will be experienced during the construction and operational phases can be effectively mitigated.

The preponderance of these impacts will have a MEDIUM HIGH to MEDIUM LOW significance which can be satisfactorily mitigated to a LOW significance.

The management of the impacts identified in the EMPr for the construction, operation and closure phase is through a comprehensive range of programmes and plans contained in the EMPr. Implementation of these plans and programmes together with mitigation measures stipulate in the EMPr will be institutionalized through regular monitoring and auditing.

In order to achieve relative environmental management standards and ensure that the findings of the environmental assessment are implemented through practical measures, the recommendations and management measures from this EIA study are included within an EMPr.

The EMPr must be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for the life cycle phases of the project is considered to be vital in achieving the appropriate environmental management standards as detailed for this project.

In addition, the following key conditions should be included as part of the authorisation:

- The proponent is not negated from complying with any other statutory requirements that is applicable to the undertaking of the activity. Relevant key legislation that must be complied with by the proponent includes inter alia:
    - Provisions of the National Environmental Management Waste Act (No. 59 of 2008);
    - Provisions of the National Water Act, 1998 (Act No 36 of 1998);
    - Provisions of the National Forests Act (Act No 84 of 1998); and
    - Provisions of the National Heritage Resources Act, 1999 (Act No. 25 of 1999);
- The proponent must appoint a suitably experienced (independent) ECO for the construction phase of the development that will have the responsibility to ensure that the mitigation rehabilitation measures and recommendations are implemented and to ensure compliance with the provisions of the EMPr;
- The Stormwater Management Plan must be adhered to;
- The soil management plan should form part of the Environmental Authorisation;
- The Katspruit, Rensburg and Longlands soil forms on the boundaries of the site be excluded from the area proposed for the mining development as far as feasible. These areas have wetland land capability that is a valuable natural asset;
- The EMPr must be enforced throughout the life of the project;
- Environmental audits reports must be submitted on a monthly basis to the proponent and DMR once construction has begun and for at least one year into the operational phase. This is to ensure that mitigation measures are being implemented and to prevent environmental degradation (e.g. erosion) during the operational phase.

It can be concluded that the proposed development will comply with the principles of the NEMA, which embraces sustainability. The PPP has been undertaken as per NEMA and the EIA Regulations of 2014 and is believed that stakeholders have been provided with sufficient time to raise any comments or concerns, and those that have been raised have been adequately addressed.

It is the opinion of the EAP that the proposed opencast mining and Alternative 1 for the pipeline route is the Best Practical Environmental Option for the objectives of the project. It is thus advised that this project should be authorised with conditions.

18 Assumptions, and Gaps in Knowledge

SRK has exercised all due care in reviewing the supplied information. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data.

Opinions presented in this report apply to the information about the site and the project as it existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

All the data and information supplied to SRK is assumed to be accurate and reflective of the current condition of the affected area. It is assumed that the baseline information scrutinised and used to explain the environmental profile is accurate.

Exxaro will comply with all legislation pertaining to the activities of this proposed project and that all permits and licenses that may be required will be identified and applied for prior to commencement of construction activities.

The public involvement process has been sufficiently effective in identifying the critical issued needing to be addressed in the EIA / EMP by the EAP. The public involvement process has sought to involve key stakeholders and individual landowners.

Wherever possible the information requested and comments raised by I&APs during the initiation phase and Scoping Report review periods, has been sufficiently addressed and incorporated into the EIA and EMPr for perusal and comment. These requests and any further comments will be tracked and recorded in the Comments and Response Report.

SRK assumes that Exxaro will implement the measures contained in the EMPr, and will adhere to any monitoring procedures. A monitoring and evaluation system, including auditing, will be established and operationalized to track the implementation of the EMPr ensuring that management measures are effective to avoid, minimize and mitigate impacts and that corrective action is being undertaken to address shortcomings and / or non-conformances.

18.1 Biodiversity Assessment

The following assumptions and limitations are applicable to the biodiversity assessment:

- The ecological assessment is confined to the linear development (30 m survey area) and does not include the neighbouring and adjacent properties; these were however considered as part of the desktop assessment;
- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most floral and faunal communities have been accurately assessed and considered;
- Due to the nature and habits of most faunal taxa, the high level of surrounding anthropogenic activities and the time (season) of the assessment, it is unlikely that all species would have been observed during a field assessment. Therefore, site observations were compared with literature studies where necessary;
- Sampling by its nature, means that not all individuals are assessed and identified. Some species and taxa within the linear development may have been missed during the assessment;
- The data presented in this report are based on one site visit, undertaken in June 2016. A more accurate assessment would require that assessments take place in all seasons of the year. However, on-site data was significantly augmented with all available desktop data, and the

findings of this assessment are considered to be an accurate reflection of the ecological characteristics of the linear development.

18.2 Heritage Assessment

The survey area is severely disturbed due to farming and mining activities. As a result, not all areas were investigated in detail, as it was relatively easy to determine which areas will probably not yield archaeological and historical remains.

18.3 Palaeontological Assessment

The accuracy and reliability of the Palaeontological Assessment may be limited by the following constraints:

- Most development areas have never been surveyed by a palaeontologist or geophysicist;
- Variable accuracy of geological maps and associated information;
- Poor locality information on sheet explanations for geological maps;
- Lack of published data;
- Lack of rocky outcrops.

18.4 Soil Land Use and Land Capability

The following assumptions were made during the assessment and reporting phases of the soil, land use and land capability assessment:

- The footprint of the proposed extension will be limited to the areas assessed i.e. the Pit extension and one of the three alternative pipeline alignments;
- The most significant impacts on soil, land use and agricultural potential will be as a result of the earth-moving activities associated with the proposed project;
- The earth-moving activities causing impacts will be that typically associated with opencast mining and pipeline construction.

18.5 Surface water

The following assumptions made in calculating the water contained in the Pit, that will require pumping:

- Existing Pit will be backfilled and rehabilitated as the Pit extension is opened;
- The Pit extension will develop as a continuation of the existing Pit;
- Pit extension will be completely open (0.85 km^2).

18.6 Blasting and Vibration Assessment

The following assumptions have been made as part of the blasting and vibration assessment:

- The anticipated levels of influence estimated in this report are calculated using standard accepted methodology according to international and local regulations;
- The assumption is made that the predictions are a good estimate with significant safety factors to ensure that expected levels are based on worst case scenarios. These will have to be confirmed with actual measurements once the operation is active;

- The work done is based on the author's knowledge and information provided by the project applicant.

Wetland Assessment

The following assumptions and limitations are applicable to the wetland assessment:

- The freshwater assessment is confined to the linear development and 15 m buffer thereof as well as areas of relevance immediately adjacent to the project footprint up to 500 m from the project footprint which were assessed on a desktop level in accordance with Regulation GN 1199. The general surroundings were however considered in the desktop assessment undertaken for the project;
- The freshwater resource delineations as presented in this report are regarded as a best estimate of the freshwater resource boundaries based on the site conditions at the time of the assessment;
- With ecology being dynamic and complex, certain aspects (some of which may be important) may have been overlooked. It is, however, expected that the linear development has been accurately assessed and considered, based on the field observations undertaken and the consideration of existing studies and monitoring data in terms of the wetland ecology;
- The freshwater resources were delineated according to "DWAF, 2008: A practical Guideline Procedure for the Identification and Delineation of Wetlands and Riparian Zones". The delineation as presented is considered the best estimate of the functional boundary based on the site conditions present at the time of assessment. Global Positioning System (GPS) technology is inherently inaccurate and some inaccuracies due to the use of handheld GPS instrumentation may occur. If more accurate assessments are required, the freshwater resources will need to be surveyed and pegged according to surveying principles.

19 Closure Action Plan and Financial Provision

A risk assessment was conducted in a workshop format where selected personnel from the mine attended. A generic risk assessment was undertaken to establish the baseline. This required participants to determine the probability and consequence of a risk. SRK utilised generic terminology to establish the baseline, with specific criteria attached to the definition of either probability or consequence. SRK uses this generic approach, as it has been our experience that participants begin to focus on definitions rather than on identifying the risk. Our experience is that a generic approach allows the risks to be identified, which is required for the current level of planning. As the closure plan evolves through further iterations and more information becomes available a more quantifiable approach to ranking can be undertaken.

The outcomes of the risk assessment can be found in Table 19-1.

The risks described below, have been used to inform the actions that are incorporated into the EMPr and discussed further in this section. Where these risks are not mitigated by the existing closure obligations as contained in the mines EMPr and Integrated Waste and Water Management Plan, addition closure actions have been developed to mitigate the impact that these risks could have on the environment, should the risk realise and result in impacts at or post closure.

19.1 Annual plan risk assessment changes

This report is the first plan to be compiled and an explanation of changes to the risk assessment results will only become applicable in subsequent updates.

Table 19-1: Closure Risk Assessment

Unwanted Event	Cause	Impact Area	Impact	Probability	Consequence	Risk
Fatality on mine site after closure	Ineffective Security Controls	Financial	Compensation/punitive measured	Possible	Catastrophic	High
		Stakeholder				
		Legal/compliance	Statutory non compliance	Possible	Catastrophic	High
		S&H				
		Enviro				
Water accumulation in the dams	Rainfall; Seepage from discard dumps;	Financial				
		Stakeholder	Reputational issues and problems with neighbours	Almost Certain	Major	High
		Legal/compliance	Non compliance with WUL	Almost Certain	Major	High
		S&H	Drowning	Likely	Catastrophic	High
		Enviro	Uncontrolled release into the environment; GW and SW impacts	Almost Certain	Major	Significant
Spontaneous combustion	Exposed discard coal / remnant coal;	Financial	Litigation as a result of injury / fatality			
		Stakeholder	Reputational issues	Almost Certain	Major	Significant
		Legal/compliance	MHS	Almost Certain	Major	Significant
		S&H	Injury / fatality due to access from community	Unlikely	Catastrophic	Significant
		Enviro	Feld fires and impact on biodiversity and Air Quality impact	Unlikely	Major	Significant
	Unmined coal in pits	Financial	Litigation as a result of injury / fatality			
		Stakeholder	Reputational issues	Almost Certain	Major	High
		Legal/compliance	MHS	Almost Certain	Major	High
		S&H	Injury / fatality due to access from community	Unlikely	Catastrophic	Significant
		Enviro	Air Quality	Unlikely	Major	Significant
	Spoils	Financial	Litigation as a result of injury / fatality			
		Stakeholder	Reputational issues	Almost Certain	Major	High
		Legal/compliance	MHS	Almost Certain	Major	High
		S&H	Injury / fatality due to access from community	Likely	Catastrophic	High
		Enviro	Feld fires and impact on biodiversity and Air Quality impact	Likely	Moderate	Significant
Insufficient liability and trust funds	Under estimated or miscalculation of impact	Financial	Insufficient funds available	Possible	Moderate	Significant
		Stakeholder				
		Legal/compliance				
		S&H				
		Enviro				
	Cash flow	Financial	Timing of cash flow to account for rehab before claiming	Almost Certain	Moderate	Significant
		Stakeholder				
		Legal/compliance				
		S&H				
		Enviro				
Change in legislation	Regulatory	Financial	Financial and legal issue	Possible	Moderate	Significant
		Stakeholder				
		Legal/compliance				
		S&H				
		Enviro				

Unwanted Event	Cause	Impact Area	Impact	Probability	Consequence	Risk
Local economy deterioration	Job losses; Reduced SLP contribution; Social contribution reduction; Ghost infrastructure	Financial				
		Stakeholder	Loss of livelihood and social unrest; increase in social diseases	Almost Certain	Major	High
		Legal/compliance				
		S&H				
		Enviro				
Loss of land capability and destruction of infrastructure	Gully erosion of geotechnicaly unstable areas (Pit 1 near to Bethal / Clewer road - R544	Financial	Damage to provincial road and need to re-route	Almost Certain	Major	High
		Stakeholder				
		Legal/compliance	Delay closure / Unwanted latent financial liability	Almost Certain	Major	High
		S&H				
		Enviro				
Disturbance of natural flow of SW and GW	Opencast mining and associated infrastructure	Financial				
		Stakeholder				
		Legal/compliance				
		S&H				
		Enviro	Less water in catchment for downstream users ; Clean and dirty water	Almost Certain	Minor	Significant
Not meeting post closure land use objectives	Change in land use and degradation of soil quality	Financial				
		Stakeholder				
		Legal/compliance	Not achieving closure	Almost Certain	Major	Significant
		S&H				
		Enviro				
	Poor implementation of plan;	Financial				
		Stakeholder				
		Legal/compliance	Not achieving closure	Almost Certain	Major	High
		S&H				
		Enviro				
Impact on water quality, not reaching objectives	Material placement not optimised as per rock types	Financial				
		Stakeholder				
		Legal/compliance				
		S&H				
		Enviro	On going water quality issues (SW and GW)	Likely	Major	Significant
Decanting of poor quality water	Natural infilling of water into mined out areas	Financial	High costs of treatment	Almost Certain	Major	High
		Stakeholder				
		Legal/compliance				
		S&H				
		Enviro	Impact on water quality	Almost Certain	Major	Significant
Dust emissions form haul roads and discard dumps	Change in maintenance regime. No more dust suppression	Financial				
		Stakeholder				
		Legal/compliance				
		S&H				
		Enviro	Air quality impact	Likely	Moderate	Medium

Unwanted Event	Cause	Impact Area	Impact	Probability	Consequence	Risk
Alien vegetation infestation	Disturbance of floral habitats	Financial				
		Stakeholder				
		Legal/compliance				
		S&H				
		Enviro	Loss of indigenous flora	Likely	Minor	Medium
Health and safety impact on legal and illegal occupants	Abandonment	Financial				
		Stakeholder				
		Legal/compliance				
		S&H	Injury / fatality	Almost Certain	Catastrophic	High
		Enviro				
Haz/gen Waste accumulation	Additional waste streams	Financial	Cost of waste management	Almost Certain	Minor	Significant
		Stakeholder				
		Legal/compliance				
		S&H				
		Enviro				

19.2 Final Land Use

Post closure land use (PCLU) is determined in consultation with stakeholders so that the PCLU meets the requirements of the stakeholders, within the context of the closure plan. This activity is undertaken for the whole mine lease area affected by mining activities and integrates stakeholder requirements with risk mitigation.

As specific consultation regarding PCLU has not been undertaken at this stage of the closure process, for purposes of current planning and liability costing, the assumption is made that post rehabilitation and closure, the land capability developed on the footprints where covers are placed and vegetation established will be a land capability defined as grazing by the Chamber of Mines. This implies a growth medium cover of a minimum of 250 mm on average across the footprints rehabilitated.

19.3 Closure Actions

The rehabilitation actions that the mine intends undertaking at the end of the life of the DCM East are described below. These actions are designed to comply with the requirements of this rehabilitation plan's objectives in particular the risk mitigation closure strategies identified during the risks assessment.

19.3.1 Infrastructure

All infrastructures will be decommissioned and the footprints rehabilitated for the establishment of vegetation. Infrastructure where there is a third party use and where the residual health and safety risks are acceptable to Exxaro will be legally transferred to the relevant parties.

Material inventories will be managed near the end of operations to minimize any surplus materials at closure. Fuel, lubricants and other materials needed to support the closure activities will be utilized during the closure period. The majority of the fuel storage facility will be closed during the first year of closure activities, but some fuel storage capacity will be required until all equipment has been demobilized from the site at the end of the closure period.

All equipment will be rinsed with raw water and rinse water will be captured in the internal water management infrastructure for evaporation.

Where practicable, equipment and materials with value not needed for post-closure operations will be sold and removed from the site. All other equipment will be demolished and disposed of on-site. Equipment with scrap or salvage value will be removed from the plant and stored either in the existing salvage yard or in a facility designated for this purpose during the closure period.

A soil contamination investigation will be conducted on completion of demolition activities, particularly in excavations remaining open following decommissioning. The purpose of this is to identify areas of possible contamination and design and implement appropriate remedial measures to ensure that the soil closure criteria are obtained.

Excavations remaining following demolition and foundation and slab removal and those where contamination remediation has been undertaken will be filled with waste rock and covered with 300 mm of growth medium.

Closure actions will include:

- All power and water services to be disconnected and certified as safe prior to commencement of any demolition works;

- All remaining inert equipment and demolition debris will be placed in the base of the box cut or failing this into the nearest general waste disposal facility;
- Salvageable equipment will be removed and transported offsite prior to the commencement of demolition;
- All fittings, fixtures and equipment within buildings will be dismantled and removed to designated temporary disposal yards;
- All tanks, pipes and sumps containing hydrocarbons to be flushed or emptied prior to removal to ensure no hydrocarbon/chemical residue remains;
- All above ground electrical, water and other service infrastructure and equipment to be removed and placed in box cut or the designated temporary salvage yards;
- All pond liners to be removed for disposal in designated landfills;
- Electrical, water and other services that are more than 400 mm below ground surface will remain;
- All pipes and structures deeper than 400 mm need to be sealed to prevent possible ingress and ponding of water;
- Non-hazardous concrete slabs and footings will be broken. This concrete (and metal) will be broken up and disposed of in the box cut;
- All concrete below 500 mm depth will remain underground with the invert of all structures broken/sealed to prevent possible ingress and ponding of water;
- Soils beneath the plant, storage tanks and chemical storage areas will be sampled. Any contaminated soils found will be removed for disposal;
- All excavations resulting from demolition of plant, buildings, roads, conveyor platforms, etc. and earth structures will be left in a safe manner;
- All telecommunication towers and dishes will be dismantled and removed.

The yard areas (e.g. platforms created for buildings, laydown areas, salvage yards, and other disturbed areas) will be closed and re-graded to control storm water runoff and erosion. Once the structures and foundations are demolished, removed, or buried, the yard areas will be inspected for any areas of hydrocarbon contamination.

Growth medium covers will be placed with the thickness of the covers dependent on the PCLU as well as on the volume of material available for closure.

19.3.2 Open Pit

During early planning of the mine, the previous owners thought that a final void would be required in the landscape as the material balance would not allow for full backfill of the Pit in a manner where the final surface could be profiled to be free draining. However, recent material balance information, as received from Exxaro, has indicated that with the bulking that has occurred during blasting and excavation, there will be approximately 3,3 million m^3 of excess material available for backfill (Table 19-2).

Table 19-2: Current Material Balance

Component	Volume (m^3)
VOID	19 334 640
Cut volume including in Pit stockpiles	5 639 115

Component	Volume (m^3)
O/B Softs and Topsoil	16 990 686
Surplus	-3 295 161

Given that the material balance now indicates that complete backfill is an option, this will be the preferred closure action for the open Pits. Closure will therefore entail the backfilling of the box cut with overburden stripped ahead of mining, followed by the placement of growth medium and the establishment of vegetation. The final surface developed during backfilling and rehabilitation will simulate surrounding topography while ensuring that the surface is free draining. There may be a requirement to include sacrificial erosion protection measures on the surface while vegetation is being established.

19.3.3 Underground workings

The underground workings will be decommissioned through the implementation of the following actions:

- All salvageable equipment and plant is to be removed as the miners retreat on closure of mining operations;
- All tanks, pipes and sumps containing hydrocarbons or any other fluids to be flushed or emptied prior to removal or abandonment once underground mine is sealed off;
- All power and water services to be disconnected and certified as safe. Where practicable cabling containing copper is to be brought to surface;
- Surface openings (air vents, shafts, portals, etc.) will be sealed with a steel or concrete cover that attaches to the existing concrete collar. The entrance area immediately behind access portals to be backfilled with rock as a further deterrent. The seal to the box cut will be engineered to with stand potential pressure exerted on the seal from water as the working fill during groundwater rebound;
- All surface openings (air vents, shafts, portals, etc.) to be sealed with a steel or concrete cover that attaches to the existing concrete collar.

19.3.4 Roads and Parking Areas

Mine roads that are not needed for closure and post-closure uses at the site (e.g. security and monitoring) will be closed. Closure actions will include:

- Removal of all signage, fencing, shade structures, traffic barriers, etc.;
- All ‘hard top’ surfaces to be ripped and bitumen/concrete removed along with any culverts and concrete structures;
- All concrete lined drainage channels and sumps will be broken up and removed;
- All potentially contaminated soils are to be identified and demarcated for later remediation; and
- All haul routes that have been treated with saline dust suppression water need to be treated as “sealed” roads with the upper surface ripped and removed to designated contaminant disposal areas.

19.3.5 Conveyor Route and Rail Loop

The coal produced from both DCM East and West is conveyed to rail loop onto the RBTC railway line from where it the coal is transported to Richards Bay The closure actions for this infrastructure include:

- All power and water services to be disconnected and certified as safe prior to commencement of any demolition works.; Electrical, water and other services that are more than 400 mm below ground surface will remain;
- Conveyor belting to be removed, cut up and disposed of in the openPits;
- Salvageable equipment will be removed and transported offsite prior to the commencement of demolition;
- Concrete slabs and footings will be broken and buried in situ. This concrete (and metal) will be broken up and disposed of in the Pits;
- All concrete below 500 mm depth will remain underground with the invert of all structures broken/sealed to prevent possible ingress and ponding of water;
- Rails tracks will be removed and sold as scrap
- Ballast will be collected and disposed of in the Pit prior to backfill. It is assumed that the removal of ballast and associated rehabilitation of the surface will mitigate any historical spillages along railway lines and that no additional clean-up is necessary.
- Embankments will be reshaped where necessary.

All excavations resulting from demolition of the conveyor plinths will be left in a safe manner.

19.3.6 Pollution Control Dam

All dams will be reclaimed and the area shaped to form a stable landform congruent with the surrounding landscape.

The PCD will however be retained during the majority of the closure period to provide water for closure activities as well as to capture any residual seepage and contact water which may be generated on the site. The expectation is that as rehabilitation of the mines footprint is implemented, the size of the contact water catchment reduces until there is no further need for the PCD. During the reduction in catchment size, the contained contact water will be evaporated as runoff and seepage to the PCD diminishes, with the result that there will not be a need to manage excess inventory in the PCD at closure. Closure actions for the dams will include:

- Demolish all concrete structures;
- Remove any silt that accumulated in the dam in line with the Hazardous waste management strategy for the operation;
- Remove liners and following waste classification testing dispose appropriately;
- Backfill excavations with material removed during construction which will be located adjacent to the PCD; and
- Profile footprint to be free draining with no low points to accumulated water.

19.3.7 Groundwater Management

The contaminant plume emanating from the western opencast and the co-disposal facility will move in a northerly direction towards the Olifants River (maximum distance from the mining area is approximately 500 m). The contaminant concentration is likely to increase over time as the plume develops. Shallow contaminated seepage may impact on the nonperennial tributaries to the Olifants River. Furthermore, there is the potential that mildly acidic, saline water may be generated from the mining area at a rate of 500 to 1 200 m3/d between 25 and 150 years after closure.

As numerical models have an inherent associated uncertainty, the closure action will be to utilise operational ground and surface water monitoring data to determine whether there will be a post closure requirement to install a mechanism to intercept the plume as there is the expectation that further plume generation will be limited by the placement of covers on the co-disposal facility and the backfilling of the Pit with both mechanisms expected to retard pyrite oxidation and the generation of poor quality seepage.

As the potential to decant is only expected between 25 and 150 years after closure, data collected during the post closure period will be utilised to refine the decant predictions and determine whether technology is required to intercept and treat the decant. As the volume of decant expected are low, even if the higher decant volumes are realised, it is likely that a passive system of treatment can be implemented. Possible decant points can be found in the Groundwater Assessment found in Appendix J.

Definite actions that will be implemented to obtain the data required to determine post closure water management measures will include:

- Monitor groundwater quality and level in backfilled working (both underground and opencast);
- Optimize storage of mine water make in mined out underground sections;
- Construct covers on discard facility;
- 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;
- Surface water monitoring of the streams will be essential;
- Quarterly groundwater sampling should be done to establish a database of plume movement trends, to aid eventual mine closure;
- The drilling of boreholes into mining areas is recommended so that recovery of water in mining areas can be monitored;
- Intercepting decant by a downstream trench is an option to investigate;
- Backfill opencast Pits;
- All mined areas should be flooded as soon as possible to bar oxygen from reacting with remaining pyrite
- In order to manage AMD, it is important that a detailed water balance be calculated for the mine and that the expected decant points and decant qualities are determined;
- Treating of decanting mine water to acceptable water quality levels can be achieved by the installation of a treatment plant.

19.3.8 Stormwater Management

Prior to closure a water management plan will be prepared to identify which structures are required at closure and which can be decommissioned. Ditches decommissioned will be closed by backfilling the excavations with the material removed, and placed adjacent to the structures, during construction. Bunds not required will be flattened by redistributing the material across the footprint used to borrow the material for construction.

19.3.9 Fuel Storage and Dispensing

Closure of these facilities will focus on physical closure and investigation of potential subsurface contamination from petroleum products. Closure of these facilities will include:

- Removing remaining fuel inventory;
- Decontaminating equipment including tanks, piping, and dispensing equipment, as needed;
- Removing equipment;
- Demolishing all storage tanks and buildings;
- Removing any appurtenances including piping and electrical;
- Breaking walls and foundations to grade;
- Hauling non-hazardous demolition debris to box cut;
- Sampling soils beneath and surrounding the facility;
- Classifying and removing any contaminated soils identified and treating them on site to acceptable standards or disposing of them to a licensed facility if hazardous; and
- Re-grading the footprints in line with adjacent yard footprints.

A portion of the fuel inventory will be used during closure. Near the end of the closure period, after the primary earthwork is complete, the fuel storage and dispensing facilities will be decommissioned.

19.3.10 Fencing and walling

Various areas at the site are enclosed by a perimeter fencing and walls. Due to the maintenance costs associated with retaining a fence, it will be removed as the areas are reclaimed. Service roads providing access to the fences will be rehabilitated.

19.3.11 Remediation of Contaminated Areas

Hydrocarbon contamination

- All soil, contaminated with hydrocarbons, will be identified, excavated, if possible to at least 200 mm below the contaminated zone and then treated by land farming;
- All tanks, pipes and sumps containing hydrocarbons will be flushed or emptied; and
- Removed soils will be managed as determined by the nature and extent of the contamination.

Chemical contamination

- DCM East will flush or empty all tanks, sumps and pipes containing non-biodegradable chemicals (liquid solid or gas) to ensure that chemical residues are removed from the site;
- Liquid storage tanks (including septic tanks) will be emptied, the structure demolished and sub-surface holes filled; and
- All equipment and plant in which chemicals have been stored or transported will be cleaned and disposed of in a suitable disposal facility.

19.3.12 Vegetation and wildlife

Successful revegetation will help control erosion of soil resources, maintain soil productivity and reduce sediment loading in streams utilizing non-invasive plants that fit the criteria of the habitat (e.g. soils, water availability, slope and other appropriate environmental factors). Invasive species will be

avoided and the area will be managed to control the spread of these species in accordance with the Biodiversity Action Plan (BAP)

The slopes at the mine residue facilities are likely to be susceptible to erosion, even after vegetation establishment. To counter the effects of erosion, naturally occurring grassland species will be planted on the slopes and tops of the facilities. At this time, these species will provide soil holding capacity and reduce runoff velocity. The composition of the natural species and their planting strategy will be detailed in the BAP.

The flatter areas will be re-vegetated with the objective of creating a sustainable ecosystem similar to an analogues reference plot.

19.3.13 Waste management

Waste management activities will include:

- Hazardous waste will be managed as per the operational Waste Management Plan and will be disposed of off-site;
- Non-hazardous demolition rubble will be disposed of in the base of the Pits;
- The waste and scrap yard will be retained for the disposal of mobile equipment, structural steel and mechanical equipment. Only once this material has been taken out of the yard will the yard be demolished; and
- It may be necessary to fence temporary salvage yards for security reasons, particularly where these are located close to public roads.

19.3.14 Threats, opportunities and uncertainties

As the closure plan is currently being developed early in the mine life cycle and the plan is based on predicted risks rather than actual risks measured during operations, there are a number of assumptions that have been made around the biophysical and socio economic environment that will exist at the end of the life of operations. These assumptions represent uncertainties and threats, that cannot at this stage be adequately defined. The guideline in the regulations requires that a list of these uncertainties and threats and opportunities be identified and maintained during subsequent revisions of the closure plan. SRK understands that the purpose of this list is to inform future revisions of the plan relating to the focus of resource. During these revisions, it is expected that resources can be focused to determine whether either the threats or opportunities are realised and whether uncertainties are addressed. The uncertainties, threats and opportunities are reflected in the Table 19-3.

Table 19-3: Uncertainties, Threats and Opportunities

Uncertainty	**Threat**
• Technology to be adopted for groundwater decant • Stakeholder requirements at closure	• Overgrazing • Climate change • Changing political environment • Varied land owners • High dependency on mining
Opportunity	
• Well defined rehabilitation practices • Time to develop water management alternative • Existing stakeholder engagement forums • SLP to manage social impacts	

19.4 Decant

The backfilled rock has some net acid potential and the water in the oxic zone will acidify to a pH of 3.5 - 4.5 in the unsaturated zone within less than 20 years. The saturated zone will be near neutral and the pH at the contact between the unsaturated and saturated zone will be <pH 6 reaching pH 4.5 over time. The decant water of the mine will eventually be acidic. In terms of mitigation it is therefore the ideal is to place hotspot material (especially carbonaceous material) below the decant elevation.

19.5 Closure Cost Estimate

The liability for closure of the aspects associated with the Dorstfontein East Coal Mine has been determined using the approach advocated in the Department of Minerals and Energy (DME) now the Department of Mineral Resources (DMR) Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provisions Provided by a Mine (2005). Golder Associates developed the model for all the Exxaro Coal operations, with this being updated annually in line with the requirements of the DME. A summary of the current Golder Associated based model for the mine is presented in Table 19-4, with details of the quantities, rates and costs provided in Appendix T. The model presented in the table is that as supplied to SRK by Dorstfontein East Coal Mine.

Table 19-4: Summary of the liability for Dorstfontein East Coal Mine

Closure Costs as at June 2017 - Summary			
		Scheduled Closure (Unspecified)	**Unscheduled Closure (June 2017)**
INFRASTRUCTURE AND RELATED ASPECTS			
1	Infrastructural aspects	R 25 384 614	R 25 404 231
2	Mining aspects	R 146 526 190	R 465 519 072
3	General surface reclamation	R 8 325 736	R 9 184 024
4	Water management	R 68 676 000	R 74 445 642
	SUB-TOTAL 1 (Infrastructure and related aspects)	R 248 912 540	R 574 552 969
5	Post closure aspects	R 3 098 110	R 3 098 110
	SUB-TOTAL 2 (Post-closure aspects)	R 3 098 110	R 3 098 110
6	**ADDITIONAL ALLOWANCES**		
6.1	Preliminary and general	R 29 869 505	R 68 946 356
6.2	Contingencies	R 24 891 254	R 57 455 297
	SUB-TOTAL 3 (Additional allowances)	R 54 760 759	R 126 401 653
	GRAND TOTAL Excluding VAT. (Sub-total 1+2+3)	**R 306 771 409**	**R 704 052 732**
	Including VAT (14 %)	**R 349 719 406**	**R 802 620 115**

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20 Undertaking to Comply with the Provision of the Act

I _____ the undersigned and duly authorised by Exxaro Central Coal (Pty) Ltd hereby undertake to give effect to every undertaking contained in this document, and accept full responsibility thereof.

Signed at _____ on this _____ day of _____20___

_____

Witnesses:

1. _____ 2. _____

_____ _____

Signature Signature

Approval

Approved in terms of the provisions of the National Environmental Management Act (Act No. 107 of 1998).

Signed at _____ on this _____ day of _____20___

_____

Director

Region: _____

21 EAP Declaration

I, Andrew Caddick, declare that:

- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will ensure that the comments of all interested and affected parties are considered and recorded in reports that are submitted to the Competent Authority in respect of the application, provided that comments that are made by interested and affected parties in respect of a final report that will be submitted to the Competent Authority may be attached to the report without further amendment to the report; and
- I will ensure that the plan of study for undertaking the environmental impact assessment will be clearly communicated with the interested and affected parties to ensure that everyone involved is aware and in agreement in terms of the plan of study.
- Neither SRK nor any of the authors of this report, its specialist / sub consultants and / or associates have any material present or contingent interest in the outcome of this report, nor do they have any pecuniary or other interest that could be reasonably regarded as being capable of affecting their independence or that of SRK.
- SRK, nor any sub- consultants and specialists, have any correlation or interest in the proposed project or future/present developments influenced by this project in any way.

Signature of the environmental assessment practitioner:

Name of company : SRK Consulting (South Africa) (Pty) Ltd

Date :20 October 2017

22 Conclusions and Recommendations

SRK has undertaken the EIA and EMPr for the proposed Pit 1 expansion and water pipeline construction project in accordance with the requirements of the MPRDA and NEMA. This has included a comprehensive stakeholder engagement process which has sought to identify stakeholders, provide these parties with an adequate opportunity to participate in the project process and guide technical investigations that have taken place as part of the Impact Assessment Phase of this study. Extensive specialist input has been sought for all key environmental aspects.

To date, there are no serious flaws that have been identified for the proposed project. However, certain of the identified, potential impacts require careful mitigation and monitoring. An EMPr has been developed as part of this EIA to ensure the mitigation of these impacts as far as practicable. It is anticipated that it will be possible to successfully mitigate the majority of the environmental impacts to acceptable levels and the implementation will be monitored and audited to determine the effectiveness of the measures implemented. The EMPr is considered to assist the project in striving towards the principles of the NEMA.

It is recommended that the proposed project is allowed to proceed, given the relatively potential contribution of the project to cumulative impacts (given appropriate environmental management) and also considering the positive social impacts associated with the project.

Prepared by

Andrew Caddick (Pr.Sci.Nat)

Senior Environmental Scientist

Reviewed by

Manda Hinsch

Principal Scientist/Partner (Pr.Sci.Nat)

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

23 Bibliography

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Appendices

Appendix A: Curriculum Vitae of the Project Team

Appendix B: Environmental Management Programme

Appendix C: Proof of Site Notices and Newspaper Advertisements

Appendix D: Comments and Response Report

Appendix E: Copies of Stakeholder Comments

Appendix F: Stakeholder Database

Appendix G: Proof of Written Notification to Stakeholders and Commenting Authorities

Appendix H: Minutes of the Meeting held with the Competent Authorities

Appendix I: Sensitivity Maps

Appendix J: Geo-hydrological Assessment

Appendix K: Hydrological Assessment

Appendix L: Blasting Assessment

Appendix M: Archaeological Assessment

Appendix N: Noise Assessment

Appendix O: Air Quality Assessment

Appendix P: Ecological Assessment

Appendix Q: Wetland Assessment

Appendix R: Soils, Land Use and Land Capability Assessment

Appendix S: Social Assessment

Appendix T: Rehabilitation and Closure Assessment

Appendix U: Palaeontological Assessment

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